FINAL
2019 TWO PARTY MONITORING REPORT

U.S. Army Garrison Alaska

Contract W911KB-16-D-0005
Task Order W911KB18F0053

February 2020

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

February 20, 2020

Directorate of Public Works

SUBJECT: Submission of the Final 2019 Monitoring Report, Two-Party Sites, to State of Alaska Department Environmental Conservation.

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

Dear Ms. Blake:

This letter documents transmission of the Final 2019 Monitoring Report, Two-Party Sites, on Fort Wainwright to State of Alaska Department Environmental Conservation.

A digital copy of the document will be provided to you and two CD's will be delivered to ADEC in Fairbanks. A copy of the letter is being provided to Mr. Kevin Fraley, Environmental Program Specialist, Alaska Department of Environmental Conservation. 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 the undersigned at (907) 361-6623 or email brian.m.adams18.civ@mail.mil, Ms. Bri Clark, Alternate Remedial Program Manager (907) 361-3001 or email brianne.r.clark.civ@mail.mil or you may contact Mr. Seth Reedy, Alternate Remedial Program Manager (907) 361-6489 or email seth.a.reedy.civ@mail.mil.

Sincerely,

Brian M Adams
Remedial Project Manager

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

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FINAL

2019 TWO-PARTY MONITORING REPORT

DRMO Two-Party Sites

(ADEC Hazard ID 1122/25010, ADEC File ID 108.38.069.01/108.26.029)

Neely Road Building 3570 Former PX Gas Station

(ADEC Hazard ID 3691, ADEC File ID 108.38.078)

Former Building 1168

(ADEC Hazard ID 1125, ADEC File ID 108.38.069.02)

Former Building 2250

(ADEC Hazard ID 2490, ADEC File ID 108.38.081)

Former Building 3564

(ADEC Hazard ID 25015, ADEC File ID 108.26.028)

Former Building 5110

(ADEC Hazard ID 1677, ADEC File ID 108.38.037)

U.S. Army Garrison Alaska

February 2020

Prepared for

U.S. Army Corps of Engineers, Alaska District

Post Office Box 6898
JBER, Alaska 99506-6898
Contract W911KB-16-D-0005, TO W911KB18F0053

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FES Project No. 9011-22

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFCEE	Air Force Center for Engineering and the Environment
AS	air sparge
bgs	below ground surface
BTEX	benzene, ethylbenzene, toluene and xylene
btoc	below top of casing
CAP	Corrective Action Plan
CDQR	Chemical Data Quality Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLOSES	Cleanup Operation and Site Exit Strategy
COC	contaminant of concern
CUL	cleanup level
DERA	Defense Environmental Restoration Account
DRMO	Defense Reutilization Marketing Office
DO	dissolved oxygen
DoD	Department of Defense
DRO	diesel range organics
E&E	Ecology and Environment, Inc.
EDB	1,2-dibromoethane
ENSR	ENSR, Inc.
EPA	Environmental Protection Agency
FES	Fairbanks Environmental Services Inc.
FS	Feasibility Study
GRO	gasoline range organics
HQAES	Headquarters Army Environment System
IBC	intermediate bulk container
IC	Institutional Control
IDW	investigation-derived waste
IRACR	Interim Remedial Action Completion Report
ISCO	in-situ chemical oxidation
LTMO	Long Term Monitoring Optimization
MAROS	Monitoring and Remediation Optimization System
mg/L	milligrams per liter
µg/L	micrograms per liter
mV	millivolts
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NRC	National Response Corporation
ORP	oxidation reduction potential
PCE	Tetrachloroethene
OU2	Operable Unit 2
POL	petroleum, oil, and lubricants
PX	Post Exchange

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

QSM	Quality Systems Manual
RA	Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
ROST	Rapid Optical Screening Tool
RPM	Remedial Program Managers
RRO	residual range organics
SGS	SGS North America, Inc.
SVE	soil vapor extraction
TCE	Trichloroethene
TCLP	toxicity characteristic leaching procedure
TMB	Trimethylbenzene
TSD	treatment, storage, and disposal
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compounds

EXECUTIVE SUMMARY

This report presents the results and analysis of groundwater sampling performed at six Two-Party source areas located on Fort Wainwright in 2019. The six sites are the Defense Reutilization Marketing Office (DRMO) Yard Two-Party sites, Building 3570 Former Post Exchange (PX) Gas Station (Neely Road), Former Building 1168, Former Building 2250, Former Building 3564, and Former Building 5110. Previously these sites have been reported separately.

DRMO Yard Two-Party Sites

There are three Two-Party sites located within the DRMO Yard: the DRMO1 Two-Party site, DRMO2/Building 5010 site, and the DRMO5 site. These sites were all impacted by various petroleum releases that occurred within the DRMO Yard. Groundwater monitoring for these sites have been previously included in the Operable Unit 2 (OU2) monitoring reports. Air sparge (AS) / soil vapor extraction (SVE) systems operated at the DRMO1 and DRMO5 during the 1990s; there was no active treatment at the DRMO2/Building 5010 site although a contaminated soil removal action was conducted. The DRMO1 and DRMO5 sites have been monitored in recent years on a 5-year frequency, coinciding with the Fort Wainwright Five Year Review process. The DRMO2/Building 5110 site has been monitored on an annual basis.

A total of six DRMO Yard wells were sampled, two wells at each site; all samples were submitted for analysis of diesel range organics (DRO), dissolved iron, and sulfate; samples from the DRMO2/Building 5110 site were also submitted for analysis of volatile organic compounds (VOCs). Five of the six DRMO Two-Party site wells had DRO concentrations exceeding the Alaska Department of Environmental Conservation (ADEC) cleanup level (CUL). Naphthalene and 1,2,4-Trimethylbenzene (TMB) also exceeded ADEC CULs in one DRMO2/Building 5110 well. Geochemical data indicates that biodegradation of remaining petroleum hydrocarbon contamination is continuing in each area. Contaminant trend analysis showed that none of the wells have an increasing DRO concentration trend. All three DRMO Yard sites (including DRMO2/Building 5010) are recommended for a five-year sampling frequency, coinciding with Five Year Reviews.

Neely Road

The Neely Road site was the former Post Exchange Gas Station and later operated as auto shop. Building 3570 was demolished in June 2002. An AS/SVE treatment system operated (discontinuously) between 2005 and 2014, and was effective in remediating groundwater contamination with the exception of DRO.

The Neely Road site is currently sampled on a semi-annual basis; five wells were sampled during June and September 2019 events. Samples were submitted for analysis of GRO, DRO, VOCs, dissolved iron, dissolved manganese, and sulfate. DRO, gasoline range organics (GRO), ethylbenzene, 1,2,4-TMB, 1,3,5-TMB, naphthalene, and manganese exceeded ADEC CULs in one or more wells during the 2019 sampling event. Geochemical data indicates that biodegradation

of remaining petroleum hydrocarbon contamination is continuing in each area. Contaminant trend analysis of individual wells showed a variety of trends from "decreasing" to "increasing", and the contaminant mass evaluation indicated an "increasing" trend. These likely reflect some contaminant rebound following the shutdown of the AS/SVE system, however, the plume analysis showed that the plume spread was decreasing.

Former Building 1168

Former Building 1168 was originally a motor pool and vehicle storage facility, and was later used as petroleum testing laboratory. Fuels and solvents were discharged to a leach well located on the site which resulted in groundwater contamination. The Building 1168 site was included as part of OU2.

An AS/SVE system operated at the site between 1994 and 1998, reducing groundwater concentrations below cleanup goals, and was decommissioned in 2003. Benzene and DRO concentrations rebounded in a few wells following shutdown of the treatment system. An in-situ chemical oxidation (ISCO) treatability study was completed during October 2010 to address residual benzene concentrations, and was effective in decreasing benzene concentrations to below the remedial goal. An Interim Remedial Action Completion Report (IRACR) was prepared in 2018 that demonstrated that the remedy was constructed and operated successfully in accordance with the OU2 Record of Decision (ROD). As a result, the Building 1168 site was removed from OU2, and is currently being managed in accordance with the Two-Party Agreement established between ADEC and the U.S. Army.

Groundwater samples are currently collected from three wells on an annual basis and submitted for analysis of DRO, VOCs, dissolved iron, and sulfate. There were no contaminant concentrations that exceeded ADEC CULs in any of the 2019 groundwater samples; the last ADEC CUL exceedances occurred in 2017. Geochemical data indicates that biodegradation of remaining petroleum contamination is continuing. Contaminant trend analysis showed two of the three wells have decreasing DRO trends. Since groundwater sample results have been below ADEC CULs for two years and contaminant trends are "decreasing", the sampling frequency is recommended to be increased to every five years, coinciding with the Five-Year Review.

Former Building 2250

Former Building 2250 was a Quonset hut located on the Fort Wainwright golf course that was used for pesticide storage and mixing. The building was removed in 1991. A Remedial Investigation (RI) conducted at the site did not detect elevated levels of pesticides; however, it did find petroleum, oil, and lubricants (POL) contamination in the soil and groundwater. An AS/SVE system was installed at the site in 1995 and operated until 2004. The AS/SVE system was decommissioned and removed from the site in the summer 2011. The site has been on a five-year sample frequency since 2004.

Groundwater samples were collected from three wells and submitted for analysis of DRO, dissolved iron, and sulfate. DRO exceeded the ADEC CUL in two wells. Geochemical results indicate that groundwater across the area is moderately reduced based upon the negative oxidation reduction potential (ORP), and elevated dissolved iron concentrations. The data supports that remaining petroleum contamination at the site is being anaerobically degraded. The DRO trends in Former Building 2250 wells are varied and are based on a limited data set. Groundwater sampling should continue on a five year frequency coinciding with the Five Year Review.

Former Building 3564

Former Building 3564 was the standby generator plant for the Post between 1954 and 1999. Diesel fuel leaked from underground storage tanks (USTs) associated with the generator. An AS/SVE operated at the site between 1996 and 1998. Groundwater sampling is conducted annually, partly due to the proximity of the site to the Post drinking water well.

Groundwater samples were collected from six wells and submitted for laboratory analysis of DRO, residual range organics (RRO), dissolved iron, and sulfate. One well could not be sampled due to damage to the well casing. Four wells had DRO concentrations exceeding the ADEC CUL in 2019. Groundwater directly downgradient of Former Building 3564 appears to be highly reduced based upon the negative ORP, very high dissolved oxygen (DO), and depleted sulfate concentrations. The data suggests that there is lack of electron acceptors to enable anaerobic biodegradation of remaining petroleum hydrocarbons at the site. However, groundwater in wells located further downgradient and crossgradient have essentially background geochemistry, indicating that the influence of the contaminant plume is not expanding in those directions. Groundwater sampling should continue on a annual frequency.

Former Building 5110

Former Building 5110, which was used as the Range Control Building, was located south of the Richardson Highway. Diesel fuel leaked from a heating oil tank resulting in groundwater contamination. Product recovery was conducted in 1994 with limited success. Groundwater sampling has been conducted on a five-year frequency.

Three wells were sampled in 2019 and submitted for analysis of GRO; DRO; benzene, toluene, ethylbenzene, and xylenes (BTEX); dissolved iron; dissolved manganese; and sulfate. DRO and ethylbenzene exceeded ADEC CULs in all three Former Building 5110 wells that were sampled in 2019. Xylenes and benzene exceeded the ADEC CUL in two and one well, respectively. Contaminant concentrations generally have stable and decreasing trends, and none of the wells have increasing trends for benzene, DRO, or GRO. Groundwater sampling should continue on a five-year frequency coinciding with the Five Year Review.

1.0 INTRODUCTION

This report presents results of the 2019 groundwater sampling events conducted at six Two-Party sites located on Fort Wainwright; Defense Reutilization Marketing Office (DRMO) Yard Two-Party sites, Neely Road Building 3570 Former Post Exchange (PX) Gas Station (Neely Road), Former Building 1168, Former Building 2250, Former Building 3564, and Former Building 5110. Fairbanks Environmental Services (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE), Contract Number W911KB-16-D-0005, Task Order W911KB18F0053. The work was guided by the 2019 Two-Party Work Plan (FES, 2019) and the Postwide Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP; FES, 2016).

1.1 Project Overview and Monitoring Report Organization

The purpose of the 2019 sampling effort was to provide current data on groundwater contaminant concentrations for the various Two-Party sites. The data collected are compared to historical data to evaluate trends in contaminant attenuation over time. A description of the procedures and results associated with these activities are presented in the following sections:

- Section 2 – Groundwater Sampling and Data Assessment Summary
- Section 3 - DRMO Yard (Two-Party Sites)
- Section 4 – Neely Road
- Section 5 – Former Building 1168
- Section 6 – Former Building 2250
- Section 7 – Former Building 3564
- Section 8 – Former Building 5110
- Section 9 – References

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

- Appendix A – Groundwater Sample Tracking and Analytical Result Tables
- Appendix B – Chemical Data Quality Review (CDQR) and Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklists
- Appendix C – Groundwater Sampling Forms, Field Notes, and Field Parameter Summary
- Appendix D – MAROS Contaminant Trend and Plume Stability Analysis Output
- Appendix E – Photographic Log

1.2 Project Location and Background

The Two-Party sites are located on Fort Wainwright, Alaska, which occupies 1,578,304 acres on the east side of Fairbanks to south of Delta, Alaska. The DRMO Yard, Neely Road, Former Building 1168, Former Building 2250, and Former Building 3564 sites are located on the Main Cantonment Area of Fort Wainwright; Former Building 5110 site, the Former Range Control Building, is located south of the Richardson Highway. Figure 1-1 shows the locations of each of the Two-Party sites included in this report.

Fort Wainwright was originally established in 1938 as a cold weather testing station. Currently, primary missions include training of infantry soldiers in the Arctic environment, testing of equipment in Arctic conditions, preparation of troops for defense of the Pacific Rim, and preparation for rapid deployment of troops worldwide. In 2001, Fort Wainwright was selected as the home for third Stryker Brigade Combat Team. Fort Wainwright's mission is to deploy combat ready forces to support joint military operations worldwide and serve as the Joint Force Land Component Command to support Joint Task Force Alaska.

Fort Wainwright is located in the interior of Alaska within the Tanana and Chena River drainage basins. The area is subject to extreme seasonal temperature variations with annual precipitation of approximately 11 inches.

The aquifer material beneath Fort Wainwright is Chena alluvium consisting of sands and sand and gravel mixtures. These deposits are up to 400 feet thick (to bedrock), and are overlain by silt in some areas. Groundwater is relatively shallow across Fort Wainwright, groundwater depths of approximately 8 to 20 feet were measured at the Two-Party sites during 2019. The regional groundwater flow direction is towards the northwest.

1.3 Project Sites and Source Area Tracking Numbers

Table 1-1 summarizes site names, Headquarters Army Environment System (HQAES) site numbers, and ADEC file and hazard identification numbers.

Table 1-1. Crosswalk: Source Area to Administrative Tracking Numbers

Report Name	HQAES Source Area	HQAES Number	ADEC File Number	ADEC Hazard ID
DRMO Yard Two-Party Sites	DRMO POL Sites	02871.1068	108.38.069.01 (DRMO1/DRMO5)	1122 (DRMO1/DRMO5)
			108.26.029 (Building 5010)	25010 (Building 5010)
Neely Road	Neely Road POL Point	02871.1078	108.38.078	3691
Former Building 1168	Oil Water Separator at Building 1168	02871.1049	108.38.069.02	1125
Former Building 2250	UST Building 2250	02871.1077	108.38.081	2490
Former Building 3564	UST Building 3564	02871.1076	108.26.028	25015
Former Building 5110	UST Building 5110	02871.1062	108.38.037	1677

POL – petroleum, oil, and lubricants; UST – underground storage tank

1.4 Site Descriptions

Groundwater sampling was conducted at six source areas in 2019. The source areas are shown on Figure 1-1, and monitoring results and discussion are included in Sections 3 through 8. Details of the sampling program are described in Section 2.

1.4.1 DRMO Yard Two-Party Sites

The Fort Wainwright DRMO Yard is located on Badger Road near the Richardson Highway. Historical activities conducted at the DRMO Yard have included vehicle maintenance, drum storage, and open burning. The 25-acre site was operated as a vehicle maintenance shop compound from 1945 until 1961 when it was converted to a salvage yard. A treatment, storage, and disposal (TSD) facility for hazardous waste was operated at the DRMO Yard until the early 2000s. Spills have occurred routinely at the DRMO Yard in the past. DRMO no longer utilizes buildings or yard space at the site. The DRMO Yard is now utilized for military vehicle storage and storage for deployed soldiers.

A Remedial Investigation (RI)/Feasibility Study (FS) was performed for all of Operable Unit 2 (OU2) in 1995, and characterized contamination throughout the DRMO Yard (HLA, 1996). The DRMO Yard source area was divided into six sub-areas (DRMO1 through DRMO6) based on investigation findings. A Record of Decision (ROD), prepared following completion of the RI/FS, specified the remedial actions to be undertaken to treat soil and groundwater contamination. Areas of petroleum contamination were addressed under the Two-Party Agreement.

The DRMO1 and DRMO5 Two-Party AS/SVE systems were operated seasonally from 1996 until February 2003. Monitoring of these systems has shown that the majority of volatile contaminant

components have been removed, leaving mostly diesel range organics (DRO) which does not respond well to AS/SVE treatment. Both systems were decommissioned during 2008.

The DRMO1 and DRMO5 sites are monitored on a 5-year sampling frequency while the DRMO2/Building 5010 site is currently monitored annually due to the proximity to a water supply well. DRO is the primary contaminant of concern (COC) at each of the sites.

1.4.2 Neely Road

The Neely Road site (also referred to as Former Building 3570) was the Former Post Exchange (PX) Gas Station and is located at the corner of Neely Road and 11th Street. The station operated between 1955 and 1981, dispensing fuel and servicing vehicles. The station used two 10,000-gallon gasoline underground storage tanks (USTs) and one 550-gallon used oil UST; all three were removed in 1987. The station was used as an Auto Skill Center before being vacated in the late 1990s and demolished in June 2002.

Two RIs were conducted in 2002 and 2003 and identified soil and groundwater petroleum, oil, and lubricants (POL) contamination at the site. A Corrective Action Plan (CAP) was prepared in 2005 that identified a Remedial Action (RA) was required to return the groundwater quality to levels meeting state and federal drinking water standards, and recommended the installation of an air sparge (AS)/soil vapor extraction (SVE) treatment system (ENSR, Inc [ENSR], 2005). The AS/SVE treatment system was installed during late 2005 and expanded in 2009 and 2012. After concentrations of site COCs (with the exception of DRO) had achieved cleanup levels, the decision was reached by the Remedial Program Managers (RPMs) to shut down the treatment system in 2014 and start a contaminant rebound study.

1.4.3 Former Building 1168

The Former Building 1168 site is located on Trainor Gate Road on Fort Wainwright. Building 1168 was originally a motor pool and vehicle storage facility. In the 1960s, the building was converted into a laboratory for analyzing POL. Floor drains in the building connected to an oil/water separator, which connected to a leach well situated about 100 feet southwest of the building. The types of products suspected of having entered the leach well include used oil from engines and transmissions, gasoline, diesel, jet fuel, and solvents. Building 1168 was demolished in the late 1990s. The Building 1168 site was included as part of OU2; the OU2 RI was completed in 1996 and the OU2 ROD was signed in 1997.

An AS/SVE system was installed at the Former Building 1168 in 1994, centered around the leach well. The system was operated between 1994 and 1998 and was effective at reducing groundwater concentrations below cleanup goals. Benzene and DRO concentrations rebounded in a few wells following shutdown of the treatment system. However, evaluation of the groundwater data showed that limited natural attenuation was occurring at this site and

contaminant migration was not evident. As a result, the treatment system was decommissioned by ENSR in 2003.

An in-situ chemical oxidation (ISCO) treatability study was completed during October 2010 to address residual benzene concentrations, and was effective in decreasing benzene concentrations to below the remedial goal (FES, 2017).

Long term groundwater monitoring has been conducted at the site, and sampling results show that the COCs regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) have achieved the remedial goals presented in the ROD. The only contaminants remaining in groundwater are petroleum-related and are subject to the CERCLA Petroleum Exclusion (EPA, 1987). As a result, the Building 1168 site was removed from OU2, and is currently being managed in accordance with the Two-Party Agreement established between the ADEC and the U.S. Army.

1.4.4 Former Building 2250

Former Building 2250 was a Quonset hut located on the Fort Wainwright golf course that was used for pesticide storage and mixing. The building was removed in 1991. A UST associated with the building was removed in 1994 (Oil Spill Technology, 1994). The UST at Building 2250 was a clean closure; therefore it was determined that the POL in soil and groundwater at the Building 2250 site was most likely from the floor drains in the Building; however, this was never confirmed. A RI conducted at the site did not detect elevated levels of pesticides; however, it did find POL contamination in the soil and groundwater. An AS/SVE system was installed at the site in 1995 and operated until 2004 (ENSR, 1995). A subsequent Rapid Optical Screening Tool (ROST) investigation showed that remaining subsurface contamination was confined to a limited area. The plume appears to be stable and not increasing. A 2004 Cleanup Operations and Site Exit Strategy (CLOSES) evaluation recommended the Building 2250 site be monitored every 5 years prior to the installation 5-Year Review (CH2M Hill, 2004a). The 5-year sampling schedule was instituted and the site was sampled in 2004, 2010, and 2015. The AS/SVE system was decommissioned and removed from the site in the summer 2011.

1.4.5 Former Building 3564

Former Building 3564 was the standby generator plant for the Post between 1954 and 1999. Arctic diesel fuel for the generators was stored in two 25,000-gallon USTs north of Former Building 3564. USTs at Building 3564 were removed in 1994 (Oil Spill Technology, 1994) and holes were identified in the northernmost tank which resulted in arctic diesel being released to groundwater. A release investigation conducted in 1994 found DRO, gasoline range organics (GRO), and benzene in groundwater (Hart Crowser, 1997). A former leach pit was also located on the north side of Former Building 3564. The pit was connected to a sump pump beneath a diesel generator in Former Building 3564. Water mixed with diesel fuel, lubricating oil, and

antifreeze was pumped into the leach pit. An AS/SVE system was installed in 1996, operated until 1998, and was decommissioned in October 2002. Groundwater monitoring has been conducted at the site since 1996; annual sampling has been conducted at this site since 1999, partly due to the proximity of the site to the Post drinking water well.

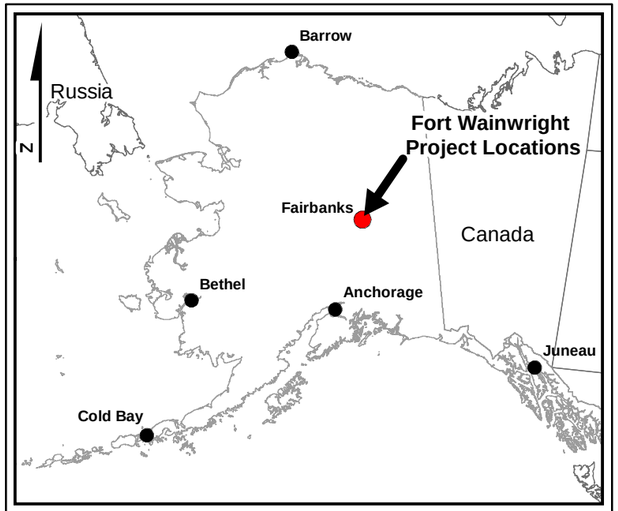
1.4.6 Former Building 5110

Former Building 5110, the Former Range Control Building, was located south of the Richardson Highway. The former heating oil UST (#317) was removed in May 1990. For an unknown length of time prior to removal of the UST, the adjacent storage building was not in use but a heating oil UST (#317) was continued to be filled. Given that the fuel stored in the UST was not being consumed for heating, the loss of fuel from the UST was apparently due to leakage. Floating product was observed in well AP-5918 in 1993 (CH2MHILL, 1993). Product recovery was attempted in 1994 in this well but with only limited success.

Subsequent investigations indicated that discontinuous permafrost had substantially reduced the ability of the COCs to migrate and concluded that because of the relatively remote location of the site, nearly flat water table gradient, and distance to the nearest downgradient water-supply well, it was unlikely that remaining groundwater contamination would migrate offsite and affect downgradient receptors. A 2004 CLOSES evaluation recommended the Former Building 5110 site be monitored every 5 years prior to the installation 5-Year Review (CH2M HILL, 2004b). The five-year sampling schedule was instituted and the site was sampled in 2005, 2010, and 2015.

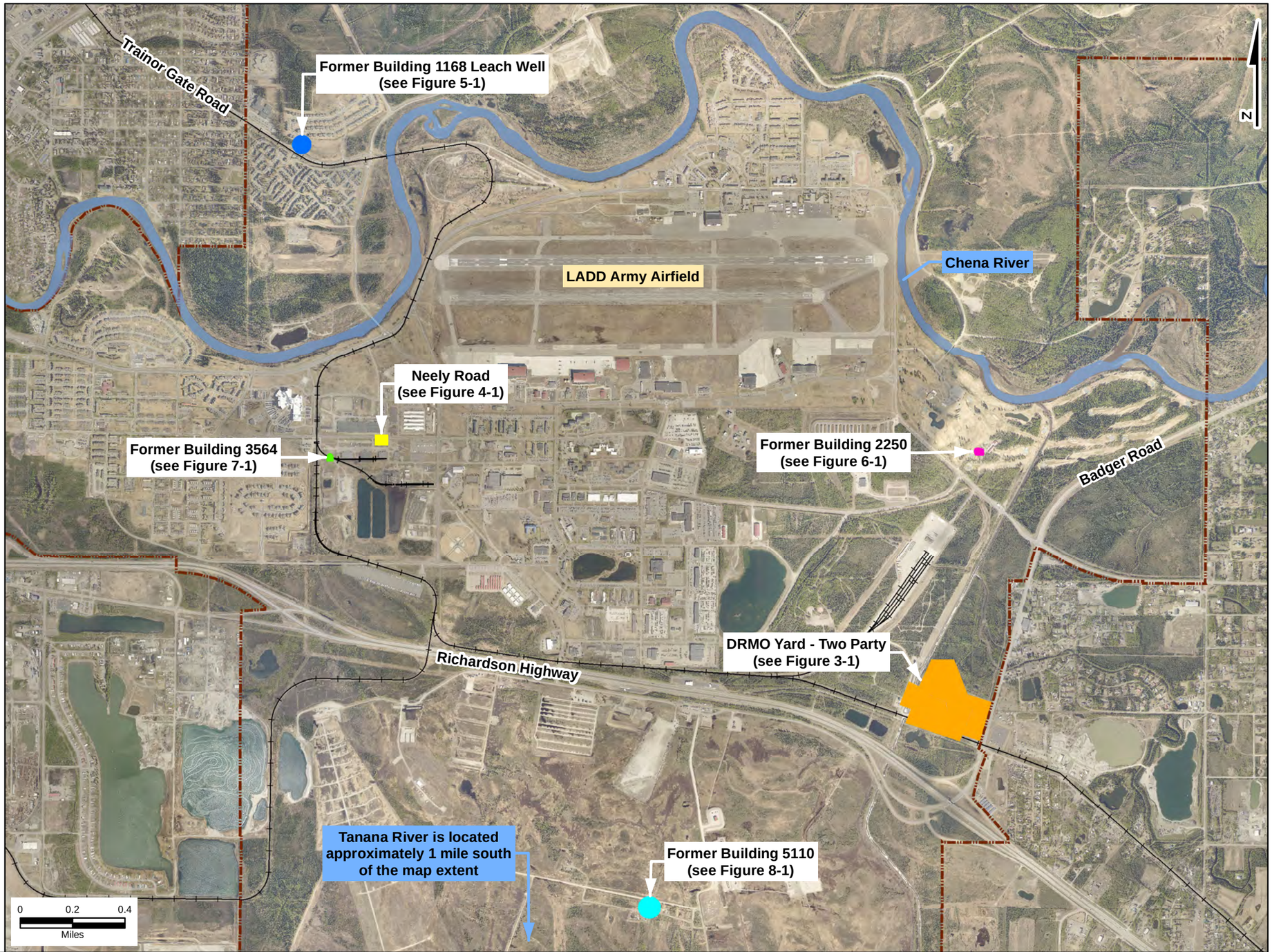
1.5 Groundwater Cleanup Levels

The Fort Wainwright Two-Party sites are governed by the Fort Wainwright Two-Party Agreement (U.S. Army, 1998) and are subject to State of Alaska petroleum regulation requirements. Table C of Title 18, Section 75 of the Alaska Administrative Code [AAC]; (ADEC, 2018) identifies applicable ADEC groundwater cleanup levels.



LEGEND:

- DRMO Yard - 2 Party
- Neely Road
- Former Building 1168 Leach Well
- Former Building 2250
- Former Building 3564
- Former Building 5110
- Alaska Railroad
- Fort Wainwright Post Boundary



Note:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Project Site Location Map

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 1-1	Date: 11/19

2.0 GROUNDWATER SAMPLING AND DATA ASSESSMENT SUMMARY

Groundwater sampling was conducted at all sites during June 2019; a second sampling event was conducted at the Neely Road site in September 2019. Groundwater samples were collected from six monitoring wells at the DRMO Yard sites, five monitoring wells at the Neely Road site, three monitoring wells at the Former Building 1168 site, three monitoring wells at the Former Building 2250 site, six monitoring wells at the Former Building 3564 site, and three monitoring wells at the Former Building 5110 site on Fort Wainwright, Alaska.

2.1 Groundwater Sampling and Analysis

Groundwater monitoring wells were sampled to assess contaminant trends over time. Techniques used to purge and sample groundwater were consistent with low-flow sampling methodology (Puls and Barcelona, 1996). This method was developed by the EPA and allows for faster stabilization of geochemical parameters while purging, due to the decreased agitation of the groundwater. The low-flow procedures were used to purge and sample the wells at a rate between 0.03 and 0.15 gallons per minute. Groundwater samples were collected with a submersible pump, employing dedicated telflon-lined tubing for each monitoring well, and groundwater met the stabilization criteria identified in the ADEC Field Sampling Guidance (ADEC, 2019a) prior to sample collection.

Groundwater parameters were measured with a handheld YSI multiparameter instrument connected to a flow-through cell. Measured parameters included pH, temperature, specific conductivity, dissolved oxygen (DO) concentration, and oxidation reduction potential (ORP). Turbidity was also measured using an Oakton turbidity meter. When the parameters stabilized, the flow-through cell was disconnected and samples were collected using the pump set at a low-flow rate. Field parameters were recorded on standard groundwater forms presented in Appendix A and are summarized on Table A-1.

Groundwater samples were submitted for one or more of the following contaminant analyses: DRO by Alaska Method AK 102SV; residual range organics (RRO) by Alaska Method AK 103SV; GRO by Alaska Method AK101; benzene, ethylbenzene, toluene, and xylenes (BTEX) by EPA method 8260C; and volatile organic compounds (VOCs) by EPA Method 8260C. To allow evaluation of groundwater geochemical changes resulting from biodegradation processes, groundwater samples were also submitted for laboratory analysis of dissolved (field-filtered) iron and sulfate by EPA Methods 6020A and 300.0, respectively. Groundwater samples from wells associated with the Neely Road and Former Building 5110 were also analyzed for dissolved manganese using EPA Method 6020A. All project and quality control samples were analyzed by SGS North America, Inc. (SGS) of Anchorage, Alaska.

2.1.1 DRMO Yard (Two-Party Sites)

Groundwater samples were collected from the Two-Party sites within the DRMO Yard on June 19 and 20, 2019 and were submitted for laboratory analysis of DRO, dissolved iron, and sulfate. The samples from AP-7346 and AP-7348 were also submitted for analysis of VOCs. Groundwater sampling activities and results for the DRMO Yard are discussed in Section 3. The following six wells were sampled:

PI-3	MP-4	AP-5826
AP-6806	AP-7346	AP-7348

2.1.2 Neely Road

Groundwater samples were collected twice from the Neely Road site on June 24, 2019 and September 1, 2019 and were submitted for laboratory analysis of VOCs, GRO, DRO, dissolved iron, dissolved manganese, and sulfate. Groundwater sampling activities and results for the Neely Road site are discussed in Section 4. The following five wells were sampled:

AP-8211	AP-9003	AP-9459
AP-9684	AP-9685	

2.1.3 Former Building 1168

Groundwater samples were collected from the Former Building 1168 site on June 19 and 20, 2019 and were submitted for laboratory analysis of VOCs, DRO, dissolved iron, and sulfate. Groundwater sampling activities and results for the Former Building 1168 site are discussed in Section 5. The following three wells were sampled:

AP-5751	AP-6809	AP-10037MW

2.1.4 Former Building 2250

Groundwater samples were collected from the Former Building 2250 site on June 19, 2019 and were submitted for laboratory analysis of DRO, dissolved iron, and sulfate. Groundwater sampling activities and results for the Former Building 2250 site are discussed in Section 6. The following three wells were sampled:

AP-5976	AP-7151	AP-7153

2.1.5 Former Building 3564

Groundwater samples were collected from the Former Building 3564 site on June 21 and 24, 2019 and were submitted for laboratory analysis of DRO, RRO, dissolved iron, and sulfate. Groundwater sampling activities and results for the Former Building 3564 site are discussed in Section 7. The following six wells were sampled:

MW3564-1	AP-6729	AP-7178
AP-7183	AP-7189	AP-7191

*Well AP-7187 was found damaged and was not sampled.

2.1.6 Former Building 5110

Groundwater samples were collected from the Former Building 5110 site on June 26, 2019 and were submitted for laboratory analysis of BTEX, GRO, DRO, dissolved iron, dissolved manganese, and sulfate. Groundwater sampling activities at the Former Building 5110 site are discussed in Section 8. The following three wells were sampled:

AP-5737	AP-5738	AP-5918R

2.2 Data Quality Summary

The DRMO Yard, Neely Road, and Former Buildings 1168, 2250, 3564, and 5110 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 Two-Party UFP-QAPP (FES, 2019), the ADEC Technical Memorandum (ADEC, 2019b), and the Department of Defense (DoD) Quality Systems Manual (QSM), Version 5.1 (DoD, 2017).

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

2.3 Long Term Monitoring Optimization

The Monitoring and Remediation Optimization System (MAROS) software was used to evaluate contaminant concentration trends in monitoring wells at each of the Two-Party sites. Plume stability analysis was also performed for the Neely Road and the Former Building 3564 sites; the remaining sites have too few wells to conduct plume analysis. The Air Force Center for

Engineering and the Environment (AFCEE) developed the MAROS software (AFCEE, 2006) as a tool to evaluate groundwater data trend analysis and is one among several tools that have been recommended for use in Long Term Monitoring Optimization (LTMO) (EPA, 2005).

2.4 Investigation-Derived Waste Handling and Disposal

Investigation-derived waste (IDW) generated during Two-Party field activities in 2019 included purge water and general refuse (disposable tubing, nitrile gloves, etc.) from monitoring well sampling activities. All IDW and other waste streams were managed according to the procedures outlined in the Work Plan (FES, 2019).

Purge water was containerized at the time of sampling in 15-gallon poly drums. The drums were labeled and taken to the Fort Wainwright Defense Environmental Restoration Account (DERA) building for temporary storage. The water in the IDW drums for all POL sites on Fort Wainwright (including Two-Party sites) was then transferred to two 275-gallon intermediate bulk container (IBC) poly tanks. The water was characterized using the laboratory results from the individual wells and a sample from each IBC. The samples from the IBCs were analyzed using the toxicity characteristic leaching procedure (TCLP) for VOCs. Results of the analysis showed that contaminants in the purge water were non-hazardous and the water was disposed as petroleum-contaminated water by National Response Corporation (NRC) Alaska at their facility in Anchorage, AK. The disposal was conducted in accordance with their permit with the Anchorage Water and Wastewater Utility.

Purge water from one well at Neely Road (AP-9685) is considered CERCLA waste due to previous detections of PCE and TCE above the MCL. The purge water from this well was containerized at the time of each sampling event in separate 15-gallon polyethylene drums. The drums were labeled with a unique ID, and clearly identified as "CERCLA Waste". An IDW form was also completed documenting the well ID and purge volume. The drums were taken to the Fort Wainwright Defense Environmental Restoration Account (DERA) building for temporary storage prior to disposal as CERCLA waste.

Complete documentation of the CERCLA waste disposal will be provided in the 2019 IDW Technical Memorandum.

2.5 Institutional Controls Inspections

Institutional Control (IC) inspections were conducted at each of the Two-Party sites in 2019. There were no IC compliance concerns identified at any of the sites. IC inspection results will be detailed in the forthcoming 2019 IC Annual Monitoring Report.

3.0 DRMO YARD (TWO-PARTY SITES)

This section presents the 2019 groundwater monitoring results for the Two-Party sites within the DRMO Yard. Wells were sampled within three separate areas of the DRMO Yard; the DRMO1 Two-Party site, the DRMO2/Building 5010 site, and the DRMO5 site. Three-Party sites within the DRMO Yard are reported in the 2019 OU2 Monitoring Report (FES, 2019b).

3.1 Monitoring Well Locations and Groundwater Elevations

Six wells within the DRMO Yard were sampled; their locations are shown on Figure 3-1. Water levels were measured prior to sampling each well. Monitoring well details, water levels, and groundwater elevations are summarized in Table 3-1. Groundwater elevations were calculated and elevation contours were developed and are shown on Figure 3-1. The groundwater elevations indicate a westerly groundwater flow direction which slightly deviates from the northwesterly regional groundwater flow direction; however, the inferred groundwater flow direction may be influenced by all of the wells being on an east-west plane. Figure 3-2 includes groundwater elevations from past sampling events; the 2019 groundwater elevations appear to be relatively average for the site.

Table 3-1 – Monitoring Well Summary, DRMO Yard Two-Party Sites

Source Area	Well Number	Total Well Depth (feet btoc)	Screened Interval (feet bgs)	Well Elevation (feet - NGVD29)	Date	Water Level (btoc)	Water Elevation (feet - NGVD29)
DRMO1 (Two-Party)	AP-5826	17.2	4.5 - 14.5	453.55	6/19/2019	10.23	443.32
	MP-4	15.0	No Info	452.19	6/19/2019	8.97	443.22
DRMO2/ Building 5010	AP-7346	12.7	4 - 14	451.72	6/19/2019	8.21	443.51
	AP-7348	15.3	6 - 16	453.84	6/20/2019	10.29	443.55
DRMO5	PI-3	19.6	No Info	453.47	6/19/2019	11.31	442.16
	AP-6806	20.6	2.1 - 14.5	453.69	6/19/2019	11.33	442.36

bgs - below ground surface
btoc - below top of casing
NGVD29 – National Geodetic Vertical Datum of 1929

3.2 Groundwater Contaminant Analytical Results

Six wells were sampled during the 2019 sampling event. Current and historical COC concentrations are summarized on Figure 3-2. Groundwater samples were submitted for laboratory analysis of DRO, dissolved iron, and sulfate as summarized in Table A-1; samples from AP-7346 and AP-7348 were also submitted for analysis of VOCs. Final field measurements recorded prior to groundwater sample collection are presented on Table C-1. Groundwater contaminant concentrations for samples collected at the DRMO1 (Two-Party) and DRMO5 site

between 2010 and 2019 are included in Table 3-2; and contaminant concentrations for samples collected at the DRMO2/Building 5010 site between 2014 and 2019 are included in Table 3-3. Complete analytical results are presented in Table A-2.

Four out of the six wells sampled contained DRO in concentrations that exceeded the ADEC cleanup level. The following sections present results from wells located in the three DRMO Yard areas that were sampled.

3.2.1 DRMO1 (MP-4 and AP-5826)

DRO concentrations in both DRMO1 wells exceeded the ADEC cleanup level (CUL) of 1,500 µg/L; DRO concentrations in MP-4 and AP-5826 were 4,200 µg/L and 5,630 µg/L, respectively. The DRO concentration in MP-4 has exceeded the ADEC CUL in every sampling event except one (September 2002), while the DRO concentration in AP-5826 varies above and below the ADEC CUL. Samples results between 2010 and 2019 are presented in Table 3-2.

3.2.2 DRMO5 (PI-3 and AP-6806)

The DRO concentration in AP-6806 was 9,800 µg/L, exceeding the ADEC CUL; the DRO concentration in PI-3 was 1,420 µg/L, just below the ADEC CUL. The DRO concentration in AP-6806 has always exceeded the ADEC CUL since sampling began in September 1994, while the DRO concentration in PI-3 varies above and below the ADEC CUL. Samples results between 2010 and 2019 are presented in Table 3-2.

3.2.3 DRMO2/Building 5010 (AP-7346 and AP-7348)

DRO, 1,2,4-TMB, and naphthalene exceeded ADEC CULs in AP-7348. DRO has always exceeded the ADEC CUL in AP-7348, and 1,2,4-TMB and naphthalene have exceeded the ADEC CUL since sampling those analytes began in 2017. There were no contaminant concentration exceedances in AP-7346; the last contaminant exceedance in this well was in 1998. Sample results between 2014 and 2019 are presented in Table 3-3.

3.3 Geochemical Field Measurements and Analytical Results

In general, the geochemical sample results are consistent with expected changes resulting from anaerobic biodegradation of hydrocarbons. Wells located within the contaminant plume generally have reduced concentrations of electron acceptors, and increased concentrations of biodegradation byproducts. The following geochemical trends indicate that biodegradation is occurring:

- DO concentrations were between 0.49 and 2.52 milligrams per liter (mg/L) at all well locations, indicating that available oxygen is limited for aerobic biodegradation in these wells.

Therefore, anaerobic biodegradation, where ferric iron and sulfate act as electron acceptors, is generally the favorable pathway.

- Background dissolved iron concentrations at Fort Wainwright are typically around 1 mg/L. Dissolved iron in DRMO1 and DRMO5 (dissolved iron was not measured in DRMO2/Building 5010 wells) monitoring wells ranged between 2.70 mg/L and 15.4 mg/L, indicating that iron reduction is occurring in each of the areas.
- Background sulfate concentrations at Fort Wainwright are typically around 40 mg/L. Sulfate ranged from 0.883 mg/L to 23.9 mg/L in DRMO1 and DRMO5 monitoring wells (sulfate was not measured in DRMO2/Building 5110 wells). Sulfate concentrations were well below the background, indicating that sulfate reduction may be occurring in each of the areas.
- AP-7348 had the lowest DO concentration (0.49 mg/L) and the most negative ORP (-101.1 millivolts [mV]) indicating that groundwater is highly reduced in the area, which would be expected due to the very high DRO concentration (21,400 µg/L) in the well. The downgradient well (AP-7346) has near background concentrations of DO (around 2 mg/L) and ORP (above zero), and low DRO concentrations; demonstrating that groundwater contamination in the vicinity of AP-7348 appears to attenuate prior to reaching AP-7346.

3.4 Contaminant Concentration Trend

Mann-Kendall trend analysis was performed for the DRMO Yard Two-Party wells using MAROS software to evaluate DRO concentration trends over time. Plume stability trend analysis could not be performed due to an insufficient number of wells. The Mann-Kendall trend was evaluated using groundwater data between 2003 and 2019 for the DRMO1 and DRMO5 sites, which represented the timeframe following the AS/SVE treatment system operation. Since there was no active remediation occurring at the DRMO2/Building 5010 site, the entire groundwater sampling time period of 1997 to 2019 was used for the evaluation. Mann-Kendall results are presented in Appendix D and are summarized in Table 3-4.

Table 3-4. Mann-Kendall Trend Analysis Summary, DRMO Yard Two-Party Wells

Site	Well	Contaminant of Concern
		DRO
DRMO1 (Two-Party)	MP-4	**No Trend**
	AP-5826	**No Trend**
DRMO5	PI-3	**Stable**
	AP-6806	**No Trend**
DRMO2/Building 5010	AP-7346	Stable
	AP-7348	**Decreasing**

BOLD indicates DRO concentration exceeded ½ the ADEC CUL in 2019

None of the DRMO Yard Two-Party wells have increasing Mann-Kendall DRO trends. AP-7348 which is located upgradient of the DRMO Water Supply wells has a decreasing trend.

3.5 Summary and Recommendations

DRO is the primary COC at the DRMO Yard sites and appears to be slowly attenuating. None of the wells have increasing contaminant trends. The DRMO2/Building 5010 site has been sampled on an annual basis, in part due to the contaminant plume being upgradient of a water supply well. Since usage of the water supply well has been significantly restricted and the well immediately upgradient of the water supply well has not had contaminant concentrations exceeded ADEC CUL in over 20 years, the groundwater sampling frequency should be reduced to every five years. Groundwater sampling at the DRMO1 and DRMO5 sites should continue on a five-year basis. The next scheduled sampling event for these wells is 2024, in advance of the 2025 Five Year Review.

Table 3-2. 2010 - 2019 Groundwater Sample Results
DRMO Yard - DRMO1 (Two-Party) and DRMO5

Well Number	Sample Number	Date	Geochemical Parameters				Contaminant Concentrations (µg/L)
			ORP (mV)	Dissolved Oxygen (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	DRO
ADEC CLEANUP LEVELS[1]			*NA*	*NA*	*NE*	*NE*	**1,500**
DRMO1 (Two-Party)							
AP-5826	10FW2D03WG	6/2/2010	-74.8	0.25	NA	NA	**3,900 QL**
	11FW2D02WG	6/3/2011	84.6	0.79	2.16	20.7	**1,600**
	15WOU210WG	5/13/2015	32.8	0.57	1.87	15.5	1,010
	19FWDY03WG	6/19/2019	-19.5	1.5	2.62	10.3	**5630 J**
	19FWDY04WG				2.70	9.94	**1700 J**
MP-4	10FW2D01WG	6/1/2010	-80.4	0.4	NA	NA	**2,400 QL**
	10FW2D01WG[2]				NA	NA	**2,400 QL**
	11FW2D01WG	6/2/2011	50.4	0.9	10.9	4.06	**8,000**
	15FWOU205WG	5/12/2015	57.9	0.2	15.1	8.12	**3,540**
	15FWOU206WG[2]				15.0	8.04	**3,160**
	19FWDY02WG	6/19/2019	-19.5	2.1	9.95	0.883	**4,200**
DRMO5							
PI-3	10FW2E02WG	6/1/2010	-87.6	0.5	NA	NA	690 QL
	11FW2E01WG	6/2/2011	46.7	1.3	9.04	28.7	**2,700**
	15WOU213WG	5/13/2015	41.7	0.8	5.13	32.9	**4,090**
	19FWDY01WG	6/19/2019	-16.7	0.8	10.2	23.9	1,420
AP-6806	10FW2E01WG	6/1/2010	-109.5	0.5	NA	NA	**2,000 QL**
	11FW2E02WG	6/3/2011	45.6	0.9	15.7	26.2	**9,300**
	15WOU212WG	5/13/2015	22.4	0.5	4.75	35.1	**2,700**
	19FWDY05WG	6/19/2019	22.4	0.5	15.4	16.9	**9,800**

Notes

Results in green and bold font exceeded ADEC CULs

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

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

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).

Acronyms/Abbreviations

DRO - diesel range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
NE - not established
NGVD29 - National Geodetic Vertical Datum of 1929
ORP - oxidation-reduction potential

Table 3-3. 2014 - 2019 Groundwater Sample Results
DRMO Yard - DRMO2/Former Building 5010

Well Number	Sample Number	Date	Geochemical Parameters		Contaminant Concentrations (µg/L)		
			ORP (mV)	Dissolved Oxygen (mg/L)	DRO	1,2,4-Trimethylbenzene	Naphthalene
ADEC CLEANUP LEVELS[1]			*NA*	*NA*	**1,500**	**56**	**1.7**
AP-7346	14FWOU216WG	10/10/2014	136	1.71	ND(300)	ND (0.5)	ND (5)
	15FWOU208WG	5/13/2015	74.8	0.90	ND(318)	ND (0.5)	ND (5)
	15WOU209WG[2]				ND(313)	ND (0.5)	ND (5)
	16FWOU202WG	7/8/2016	59	1.10	ND(600)	ND (0.5)	ND (5)
	16FWOU203WG[2]				194 J,B	ND (0.5)	ND (5)
	17FWOU207WG	5/31/2017	-0.4	1.08	ND(318)	ND (0.5)	ND (0.5)
	17FWOU208WG[2]				215 J	ND (0.5)	ND (0.5)
	18FWOU206WG	6/4/2018	27.3	2.27	217 J,B	ND (0.5)	ND (0.5)
	18FWOU207WG[2]				233 J,B	ND (0.5)	ND (0.5)
	19FWDY06WG	6/19/2019	-10	1.92	285 (278) J	ND (0.5)	ND (0.5)
	19FWDY07WG[2]				NA	ND (0.5)	ND (0.5)
AP-7348	14FWOU218WG	10/10/2014	-0.2	0.4	**4,810**	18.4	**11.1**
	15FWOU211WG	5/13/2015	-3.7	0.35	**11,100**	**61.8**	**42.4**
	16FWOU204WG	7/8/2016	-18.7	0.34	**26,800**	**95**	**99 J**
	17FWOU210WG	5/31/2017	-93.5	0.39	**10,700**	**75.7**	**86**
	18FWOU208WG	6/4/2018	-90.6	0.93	**14,000**	**72.6**	**67**
	19FWDY08WG	6/20/2019	-101.1	0.49	**21,400**	**98.7**	**60**

Notes

Results in green and bold font exceeded ADEC CULs

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

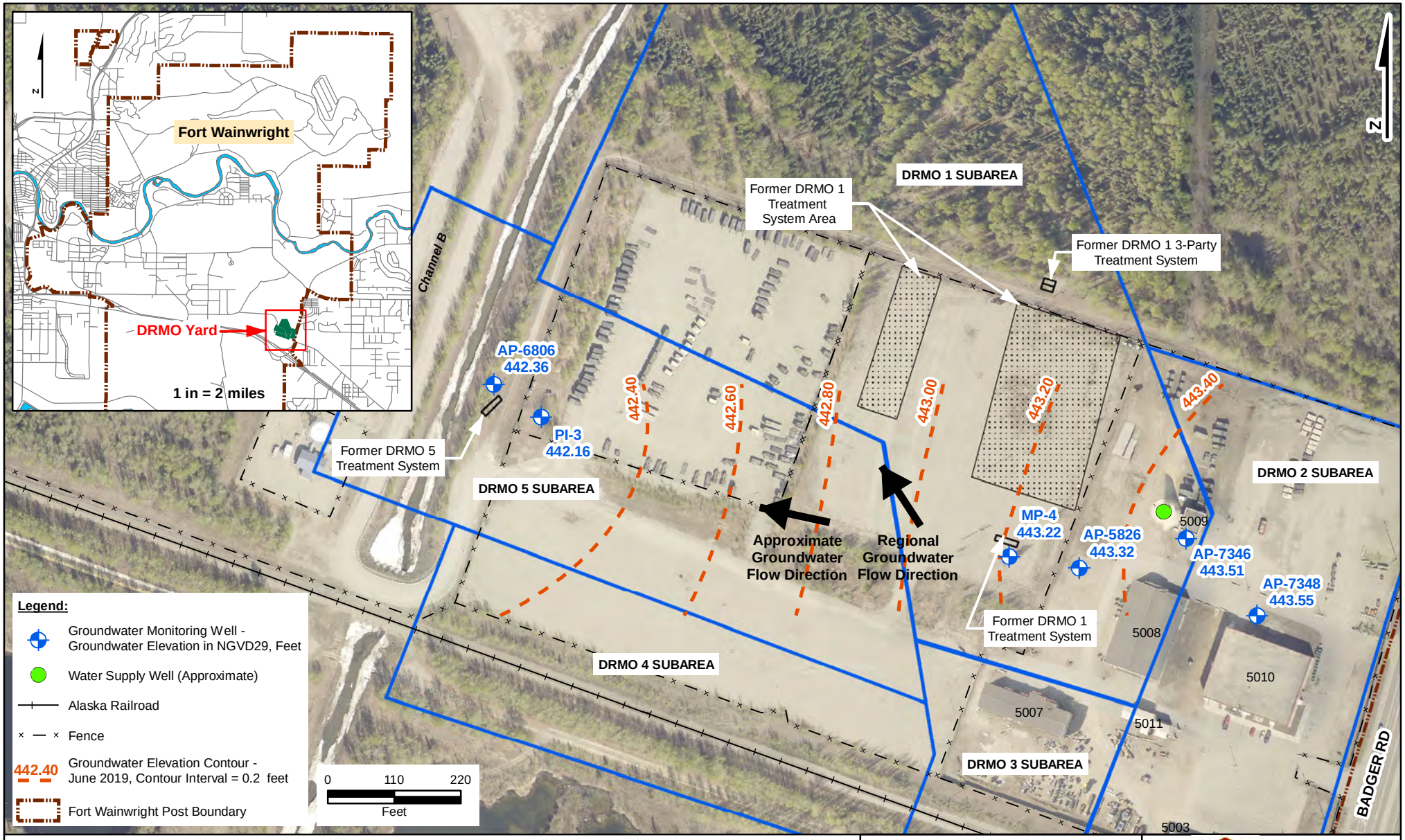
[2] Sample is a Field Duplicate of the sample immediately above.

Data Qualifiers

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

Acronyms/Abbreviations

DRO - diesel range organics
LOD - limit of detection
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
NGVD29 - National Geodetic Vertical Datum of 1929
ORP - oxidation-reduction potential



Note:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N
2. Groundwater elevations are in the National Geodetic Vertical Datum (NGVD29), feet

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Well Locations and Groundwater Elevations, DRMO Yard (Two-Party)

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 3-1	Date: 11/19

DRMO 1

OU2 Treatment System Area (Decommissioned in 2008)

MP-4	Jul-97	Oct-97	Jan-98	Jun-98	Aug-98	Oct-98
GW Elev	-	-	-	-	-	-
DRO	9,200	5,000	7,200	5,500	4,900	2,450
MP-4	**Feb-99**	**May-99**	**Jun-02**	**Sep-02**	**Sep-03**	**May-04**
GW Elev	442.21	442.65	444.15	444.5	444.65	444.08
DRO	2,690	5,570	3,200	220	7,780	1,300
MP-4	**Sep-04**	**May-05**	**Oct-05**	**May-06**	**Sep-06**	**May-07**
GW Elev	443.46	443.73	443.62	442.89	443.35	442.56
DRO	4,860	4,050	5,860	3,050	6,200	2,300
MP-4	**Sep-07**	**Jun-08**	**Oct-08**	**May-09**	**Jun-10**	**Jun-11**
GW Elev	443.6	442.97	443.26	443.26	443.26	443.29
DRO	3,600	4,200	6,200	5,300	2,400	8,000
MP-4	**May-15**	**Jun-19**				
GW Elev	445.08	443.22				
DRO	3,540	4,200				

AP-5826	Sep-94	May-97	Oct-97	May-98	Oct-98	Jun-99
GW Elev	-	-	443.2	442.87	443.33	-
DRO	670	NA	NA	NA	NA	NA
AP-5826	**Sep-99**	**Jun-00**	**Sep-00**	**Nov-00**	**May-01**	**Sep-01**
GW Elev	443.13	443.95	444.34	443.65	443.45	443.74
DRO	NA	1,160	2,250	1,380	12,900	568
AP-5826	**Sep-02**	**Sep-03**	**May-04**	**Sep-04**	**May-05**	**Oct-05**
GW Elev	442.96	444.88	444.19	443.55	443.83	443.72
DRO	5,900	2,340	779	870	1,200	1,050
AP-5826	**May-06**	**Oct-06**	**May-07**	**Sep-07**	**Jun-08**	**Oct-08**
GW Elev	442.95	443.46	442.68	443.92	443.09	443.35
DRO	7,370	1,100	1,200	560	2,700	1,900
AP-5826	**May-09**	**Jun-10**	**Jun-11**	**May-15**	**Jun-19**	
GW Elev	443.47	442.5	443.4	445.19	443.32	
DRO	1,000	3,900	1,600	1,010	5,630	

Former DRMO 1 Treatment System

MP-4

AP-5826

5008

5011

Approximate Groundwater Flow Direction

0 50 100 Feet

DRMO 2 - BUILDING 5010

AP-7346	Jun-98	Jul-98	Sep-98	Jul-99	Sep-02	Sep-03
GW Elev	-	-	-	-	444.51	445.2
DRO	15,600	200	170	66	R	199
Benzene	7.2	ND(1)	ND(1)	0.061	R	ND(0.4)
AP-7346	**Sep-04**	**Oct-05**	**May-06**	**Oct-06**	**May-07**	**Sep-07**
GW Elev	443.86	443.89	443.12	443.68	442.83	442.61
DRO	170	127	137	120	88	89
Benzene	ND(0.4)	ND(0.4)	ND(0.4)	ND(1)	ND(1)	ND(1)
AP-7346	**Jun-08**	**Oct-08**	**May-09**	**Jun-10**	**Jun-11**	**Aug-12**
GW Elev	443.22	443.57	444.01	442.83	443.56	443.92
DRO	110	82	100	89	66	62
Benzene	ND(1)	0.1	ND(1)	0.08	0.07	ND(0.1)
AP-7346	**May-13**	**Oct-14**	**May-15**	**Jul-16**	**May-17**	**Jun-18**
GW Elev	442.5	444.78	444.35	444.24	444.05	444.18
DRO	ND(410)	ND(300)	ND(313)	194	215	223
Benzene	ND(0.24)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
1,2,4-TMB	-	-	-	-	ND(0.5)	ND(0.5)
Naphthalene	-	-	-	-	ND(0.5)	ND(0.5)

AP-7346	Jun-19
GW Elev	443.51
DRO	285
Benzene	ND(0.2)
1,2,4-TMB	ND(0.5)
Naphthalene	ND(0.5)

5009

AP-7346

AP-5826

AP-7348

5008

5010

Approximate Groundwater Flow Direction

AP-7348	Dec-97	Jul-99	Sep-02	Sep-03	Sep-04	Oct-05
GW Elev	-	-	445.65	445.07	443.89	444.04
DRO	22,000	27,000	33,000	33,500	27,200	10,100
Benzene	NA	7	15	11.4	3.2	0.42
AP-7348	**May-06**	**Oct-06**	**May-07**	**Sep-07**	**Jun-08**	**Oct-08**
GW Elev	443.34	443.82	443.04	444.16	443.44	443.81
DRO	20,200	14,000	19,000	15,000	21,000	3,400
Benzene	1.49	1.6	1.6	2	1.6	0.29
AP-7348	**May-09**	**Jun-10**	**Jun-11**	**Aug-12**	**May-13**	**Oct-14**
GW Elev	443.82	442.86	443.76	443.87	442.44	444.74
DRO	10,000	11,000	7,000	31,000	14,500	4,810
Benzene	ND(1)	1.2	0.55	2.2	0.6	ND(0.2)
AP-7348	**May-15**	**Jul-16**	**May-17**	**Jun-18**	**Jun-19**	
GW Elev	444.1	444.36	444.15	444.38	443.55	
DRO	11,100	26,800	10,700	14,000	21,400	
Benzene	0.49	0.62	0.333	0.42	0.58	
1,2,4-TMB	-	-	75.7	72.6	98.7	
Naphthalene	-	-	86	67	60.1	

Fort Wainwright Post Boundary

0 50 100 Feet

DRMO 5

AP-6806	Sep-94	Oct-96	Jan-97	Jul-97	Oct-97	Jan-98
GW Elev	443.48	-	-	-	-	-
DRO	4,200	9,200	14,000	4,300	1,900	8,100
AP-6806	**Jun-98**	**Aug-98**	**Oct-98**	**Feb-99**	**May-99**	**Oct-99**
GW Elev	-	-	-	441.36	441.63	441.95
DRO	1,500	14,000	8,470	3,690	2,730	1,530
AP-6806	**Apr-00**	**Jul-00**	**Sep-00**	**Nov-00**	**Sep-01**	**Jun-02**
GW Elev	441.86	442.65	442.89	442.69	442.07	439.99
DRO	12,800	1,830	6,860	2,100	2,460	2,000
AP-6806	**Sep-02**	**Sep-03**	**May-04**	**Sep-04**	**May-05**	**Oct-05**
GW Elev	442.79	443.78	443.41	443.22	443.21	442.64
DRO	1,900	14,800	6,750	3,910	2,340	7,010
AP-6806	**May-06**	**Oct-06**	**May-07**	**Sep-07**	**Jun-08**	**Oct-08**
GW Elev	442.1	442.48	441.79	442.61	442.12	442.38
DRO	8,950	2,700	1,500	1,900	3,900	16,000
AP-6806	**May-09**	**Jun-10**	**Jun-11**	**May-15**	**Jun-19**	
GW Elev	442.57	441.59	442.51	442.68	442.36	
DRO	8,200	2,000	9,300	2,700	9,800	

AP-6806

Former DRMO 5 Treatment System

PI-3

Channel B

Approximate Groundwater Flow Direction

PI-3	Sep-00	Nov-00	May-01	Sep-01	Sep-03	May-04
GW Elev	-	-	-	-	-	-
DRO	1,920	2,680	12,100	2,790	5,940	3,790
PI-3	**Sep-04**	**May-05**	**Oct-05**	**May-06**	**Oct-06**	**May-07**
GW Elev	-	-	-	-	-	-
DRO	11,000	3,180	2,990	1,440	1,500	860
PI-3	**Sep-07**	**Jun-08**	**Oct-08**	**May-09**	**Jun-10**	**Jun-11**
GW Elev	-	-	-	442.55	441.9	442.83
DRO	1,500	1,900	3,100	2,700	690	2,700
PI-3	**May-15**	**Jun-19**				
GW Elev	442.83	442.16				
DRO	4,090	1,420				

Acronyms and Abbreviations:

Units
µg/L - micrograms per liter

Analytes
1,2,4-TMB - 1,2,4-Trimethylbenzene
DRO - Diesel Range Organics

Other
AAC - Alaska Administrative Code
ADEC - Alaska Department of Environmental Conservation
CULs - Cleanup Levels
DRMO - Defense Reutilization and Marketing Office
GW - groundwater
Elev - elevation
NA - not analyzed
NA - sample collected, but analysis not performed
ND - Not Detected (limit of detection)
- Data not available

0 50 100 Feet

Legend:

- DRMO 1 Groundwater Monitoring Well
- DRMO 2 / Building 5010 Groundwater Monitoring Well
- DRMO 5 Groundwater Monitoring Well
- Water Supply Well (Approximate)
- Alaska Railroad
- Fence

ADEC GROUNDWATER CULs 18 AAC 75, Table C, 2018 Units in µg/L	
DRO	1,500
Benzene	4.6
1,2,4-TMB	56
Naphthalene	1.7

Notes:

1. Sample data shown in GREEN indicate analyte concentration exceeds ADEC CULs (18 AAC 75, Table C)
2. DRMO-1 (2-Party), DRMO-5 (2-Party), AND DRMO-1 (3-Party) Treatment Systems were decommissioned in the fall of 2008.
3. Starting in 2009, DRMO 2-Party sites are sampled in the spring and DRMO 3-Party sites are sampled in the fall.
4. Data flags are not included on figure due to map space limitations. Data flags are presented on Table A-2.
5. Groundwater elevations are in the National Geodetic Vertical Datum (NGVD29), feet
6. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Groundwater Contaminant Concentrations, DRMO Yard (Two-Party)

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005 | Figure: 3-2 | Date: 11/19

4.0 NEELY ROAD

This section presents the 2019 groundwater monitoring results for the Neely Road site. The first 2019 groundwater sampling event was conducted in June and the second groundwater sampling event was conducted in September.

4.1 Monitoring Well Locations and Groundwater Elevations

Five wells at the Neely Road site were sampled during each event; their locations are shown on Figure 4-1. Water levels were measured prior to sampling each well. Monitoring well details, water levels, and groundwater elevations are summarized in Table 4-1. Groundwater elevations were calculated and elevation contours were developed and are shown on Figure 4-1. The groundwater elevation for AP-9003 was not used for the groundwater contours (consistent with past years) as it appears that the well survey elevation is not accurate. Groundwater elevations indicate a northwesterly groundwater flow direction consistent with the regional groundwater flow direction. Figure 4-2 includes groundwater elevations from past sampling events; the 2019 groundwater elevations appear to be relatively average for the site.

Table 4-1 – Monitoring Well Summary, Neely Road

Well Number	Total Well Depth (feet btoc)	Screened Interval (feet bgs)	Well Elevation (feet – NAVD88)	Date	Water Level (feet btoc)	Water Elevation (feet – NAVD88)
AP-8211	22.1	9.5-19.5	453.43	6/24/2019	18.07	435.36
				9/1/2019	15.35	438.08
AP-9003	22.4	10-20	454.06	6/24/2019	19.25	434.81
				9/1/2019	16.51	437.55
AP-9459	22.9	12.9	452.47	6/24/2019	17.22	435.25
				9/1/2019	14.48	437.99
AP-9684	24.8	12-22	453.65	6/24/2019	18.31	435.34
				9/1/2019	15.58	438.07
AP-9685	22.2	12.2-22.2	449.39	6/24/2019	14.33	435.06
				9/1/2019	11.55	437.84

NAVD88 - North American Vertical Datum of 1988

4.2 Groundwater Contaminant Analytical Results

Five monitoring wells were sampled during each sampling event. Well locations and current and historical groundwater contaminant concentrations are presented on Figure 4-2. Groundwater samples were submitted for laboratory analysis of GRO, DRO, VOC, dissolved manganese, dissolved iron, and sulfate as summarized in Table A-1. Final field measurements recorded prior

to groundwater sample collection are presented on Table C-1. Groundwater contaminant concentrations of samples collected between 2015 and 2019 are included in Table 4-3. Complete analytical results are presented in Table A-3.

Groundwater contaminant concentrations exceeded ADEC CULs in at least one of the 2019 groundwater sampling events in four out of the five wells. The following summarizes 2019 contaminant concentrations that exceeded ADEC CULs.

- DRO exceeded the ADEC CUL in one well, AP-8211, in both 2019 sampling events.
- GRO exceeded the ADEC CUL in AP-8211 in the June 2019 sampling event.
- Ethylbenzene exceeded the ADEC CUL in both sampling events of AP-8211 and the June 2019 sampling event of AP-9003.
- 1,2,4-Trimethylbenzene (TMB) exceeded the ADEC CUL in both sampling events of AP-8211 and the June 2019 sampling event of AP-9684.
- 1,3,5-TMB exceeded the ADEC CUL in both sampling events of AP-8211.
- Naphthalene exceeded the ADEC CUL in both sampling events of AP-8211, AP-9459 (in one of the field duplicates), and AP-9003.
- Manganese exceeded the ADEC CUL in both sampling events of AP-8211, AP-9003, AP-9459, and AP-9684. Although manganese is a naturally occurring metal, manganese groundwater concentrations typically increase as a result of anaerobic biodegradation processes of petroleum hydrocarbons.

4.2.1 Source Area Wells (AP-8211, AP-9003, AP-9459, and AP-9684)

The source area wells include AP-8211, AP-9003, AP-9459, and AP-9684. Previous monitoring reports had focused on four COCs that historically exceeded CULs in source area wells; DRO, GRO, benzene and 1,2-dibromoethane (EDB). However, as a result of changes in ADEC CULs in recent years, additional analytes (ethylbenzene, 1,2,4-TMB, 1,3,5-TMB, naphthalene, and manganese) exceed ADEC CULs. Historical data for the additional analytes is not readily available and thus is not included in contaminant trend analysis.

DRO concentrations in AP-8211 have always been above the ADEC CUL, while DRO concentrations in AP-9459 and AP-9003 have oscillated around the ADEC CUL. Operation of the AS/SVE appeared to have a limited influence on DRO concentrations during system operation; however, DRO concentrations appear to be similar to pre-treatment levels as indicated by Graph 4-1. The DRO concentration in AP-9684 has never exceeded the cleanup level.

GRO concentrations in source area wells are presented on Graph 4-2. GRO concentrations in source area wells declined significantly as a result of the operation of the AS/SVE system and

have been below the ADEC CUL since 2011, with the exception of the June 2019 GRO concentration in AP-8211.

Benzene was not detected above the ADEC cleanup level in any well during 2018. The AS treatment system expansion in 2012 appears to have been successful in reducing the benzene contaminant concentrations. Benzene concentrations in the four source area wells are shown on the Graph 4-3.

EDB has historically exceeded the ADEC CUL in two wells, AP-8211 and AP-9684, as shown on Graph 4-4. EDB was last detected in AP-8211 in 2016, at concentrations below the ADEC CUL. Operation of the AS/SVE system appeared to be effective in decreasing EDB concentrations at the site.

4.2.2 Downgradient Well (AP-9685)

The Neely Road site has one downgradient well, AP-9685. Neither DRO nor GRO have ever exceeded the ADEC CUL in this well. Benzene, PCE, and TCE have historically exceeded the ADEC CUL in this well. Benzene concentrations have been below the ADEC CUL in AP-9685 since July 2009 and benzene has not been detected since 2014.

PCE and TCE have sporadically exceeded the current ADEC CUL in AP-9685 since 2008 and are not believed to be related the Neely Road source contamination. Tetrachloroethene (PCE) and trichloroethene (TCE) did not exceed the current ADEC CUL in either 2019 sampling event of AP-9685. The Army has contracted a Preliminary Source Investigation of chlorinated solvents in the vicinity of AP-9685, referred to as the Building 3030 South Loading Dock-Neely Road area, and is scheduled to occur in 2020.

4.3 Geochemical Field Measurements and Analytical Results

In general, the geochemical sample results are consistent with expected changes resulting from anaerobic biodegradation of hydrocarbons. Wells located within the contaminant plume generally have reduced concentrations of electron acceptors, and increased concentrations of biodegradation byproducts. Table 4-2 presents geochemical data for Neely Road wells between 2015 and 2019. The following geochemical trends indicate that biodegradation is occurring:

- DO concentrations were below 1 mg/L in all source area wells, indicating that available oxygen is limited for aerobic biodegradation in these wells. Therefore, anaerobic biodegradation, where ferric iron and sulfate act as electron acceptors, is generally the favorable pathway.
- Background dissolved iron concentrations at Fort Wainwright are typically less than 1 mg/L. Dissolved iron in source area monitoring wells ranged between 2.45 mg/L and 16.3 mg/L, indicating that iron reduction is occurring within the source area.

- Background dissolved manganese concentrations at Fort Wainwright are typically less than 1 mg/L. Dissolved manganese in source area monitoring wells ranged between 1.65 mg/L and 5.86 mg/L, indicating that manganese reduction is occurring within the source area.
- Background sulfate concentrations at Fort Wainwright are typically around 40 mg/L; however aeration of groundwater through AS can result in elevated sulfate concentrations for many years. Elevated but declining sulfate concentrations are evident in AP-8211, AP-9003, and AP-9684. These wells were located within the influence of the AS system. While sulfate concentrations remain above background within the source, the decreasing sulfate concentrations in recent years indicate that sulfate reduction may be occurring as a result of anaerobic biodegradation of residual petroleum hydrocarbons.

4.4 Contaminant Trend and Plume Stability Evaluation

The MAROS software was used to evaluate DRO and RRO contaminant trends in individual wells. DRO plume stability was also evaluated using MAROS. The MAROS output is included in Appendix D and the results are summarized in the following sections.

4.4.1 Mann-Kendall Trend

Mann-Kendal Concentration trends for contaminants exceeding ADEC CULs were determined at the Neely Road site for the post-treatment period (1998 through 2019) and are presented in Table 4-4.

Table 4-4. Mann-Kendall Trend Analysis Summary, Neely Road

Well	Mann-Kendall Trend						
	GRO	**DRO**	**Benzene**	**1,2,4-TMB**	**1,3,5-TMB**	**Ethylbenzene**	**Naphthalene**
AP-8211	**NT**	**NT**	NT	**NT**	**I**	**NT**	**NT**
AP-9003	**I**	**I**	NT	PI	NT	**I**	**I**
AP-9459	NT	**NT**	NT	S	NT	I	**NT**
AP-9684	PD	PD	D	NT	**NT**	**NT**	**PD**
AP-9685	NT	NT	PD	I	NT	I	I

BOLD indicates contaminant concentration was more than ½ the ADEC CUL in 2019
D – Decreasing, PD – Potential Decreasing, S – Stable, I – Increasing, PI – Potentially Increasing

The Mann-Kendall analysis showed a variety of contaminant concentrations trends for wells at the site, however only AP-8211 and AP-9003 had increasing trends for contaminants that exceeded ½ the ADEC CUL in 2019.

4.4.2 Plume Stability Evaluation

The MAROS software spatial moment analysis was used to evaluate the DRO plume stability based on estimated contaminant mass, the trend in the distance from the source to the center of

mass, and the trend of plume spread around the center of mass. The MAROS output is included in Appendix D and is summarized as follows:

- Analysis showed the DRO contaminant mass had an "increasing" trend which may be the result of the increasing DRO concentration in AP-9003.
- The distance from the center of mass to the source had a "stable" trend.
- The contaminant plume spread had a "decreasing" trend.

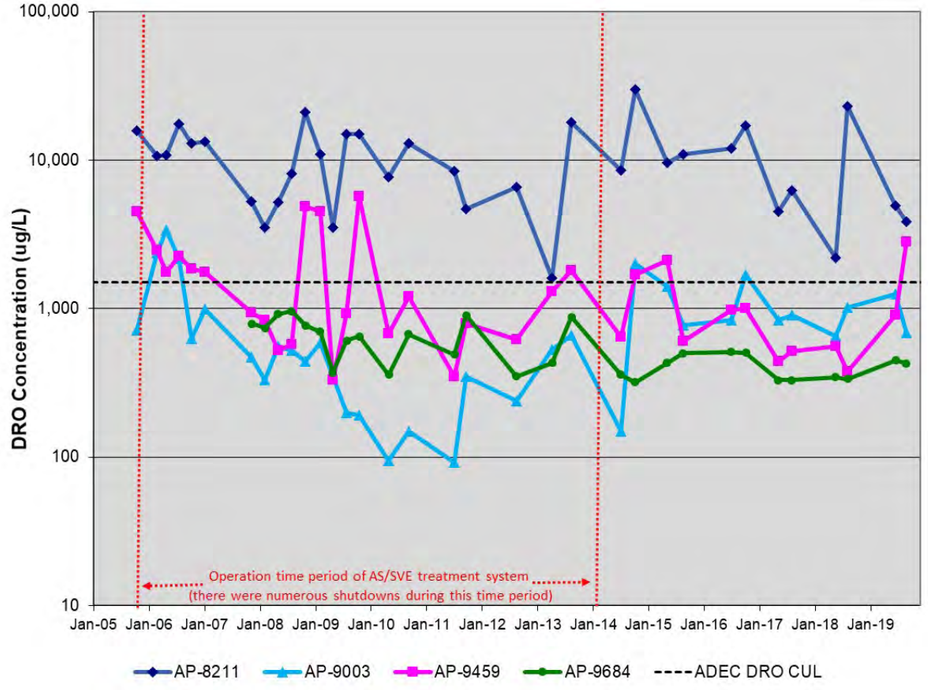
4.4.3 Sample Frequency Optimization

The MAROS analysis recommended decreasing the sampling frequency from semi-annual to annual.

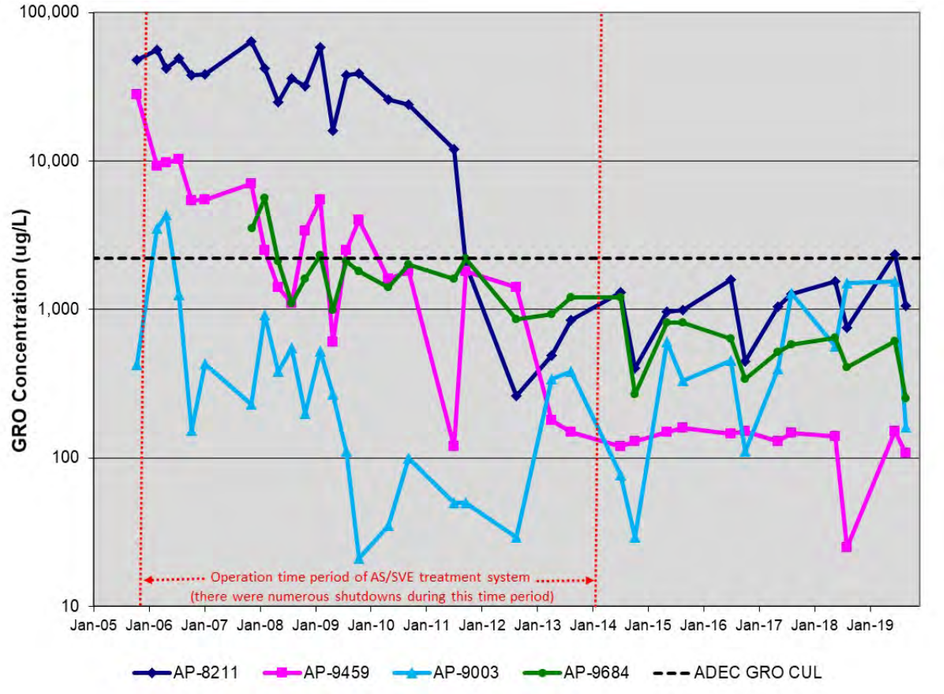
4.5 Summary and Recommendations

With the exception of DRO and associated analytes in one well, contaminant concentrations are near or below ADEC CULs. Geochemical data demonstrates that remaining contaminants are continuing to be biodegraded. Since sufficient data has been collected to establish contaminant trends and plume stability, the sampling frequency should be reduced to annual. While seasonal contaminant concentration correlations are not strong at the Neely Road site, there appears to be higher concentrations during lower groundwater elevations, therefore groundwater sampling should occur during spring or early summer.

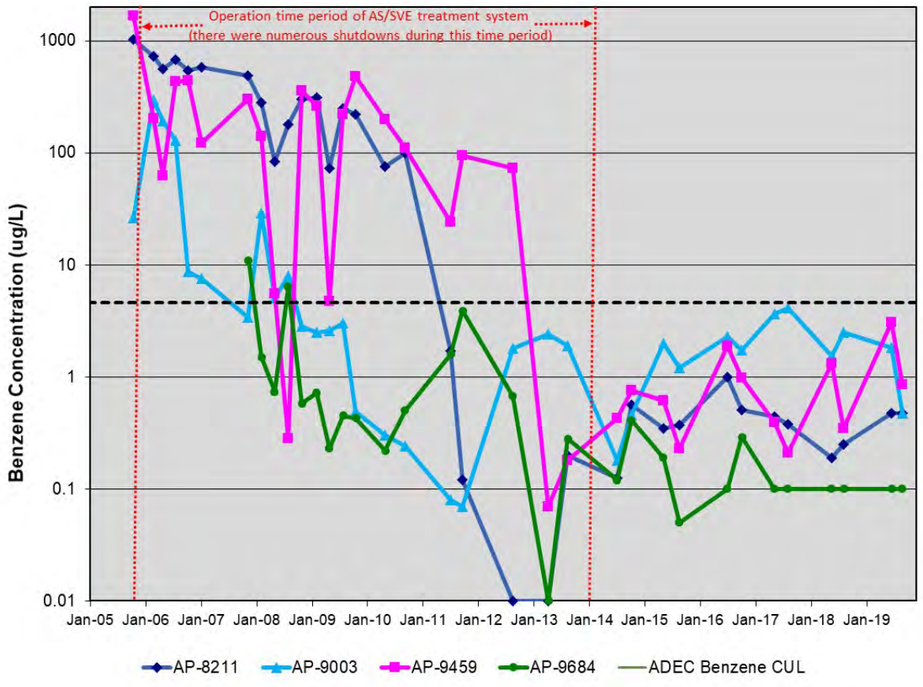
Graph 4-1 DRO Concentrations in Source Area Wells



Graph 4-2 GRO Concentrations in Source Area Wells



Graph 4-3 Benzene Concentrations in Source Area Wells



Graph 4-4 EDB Concentrations in Source Area Wells

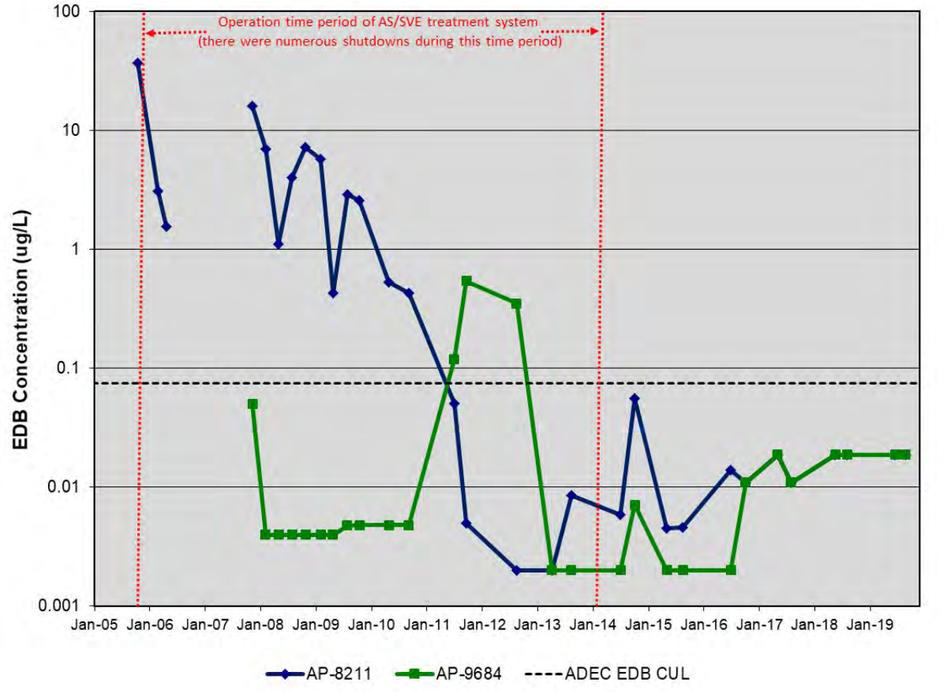


Table 4-2. 2015-2019 Geochemical and Field Parameters in Groundwater Samples
Neely Road AS/SVE Treatment System

Location	Sample Date	Sample Number	Dissolved Oxygen (mg/L)	Dissolved Iron[1] (mg/L)	Dissolved Manganese[1] (mg/L)	Sulfate (mg/L)
ADEC Cleanup Levels[3]				NE	0.43	NE
AP-8211	5/11/15	15FWNR04WG	0.24	13.40	**7.25**	155
	5/11/15	15FWNR05WG[2]	0.24	13.20	**7.23**	167
	8/24/15	15FWNR10WG	0.25	10.90	**6.51**	132
	8/24/15	15FWNR11WG[2]		11.30	**6.62**	125
	7/6/16	16FWNR02WG	0.41	10.50	**6.43**	175
	7/6/16	16FWNR03WG[2]		11.00	**7.11**	180
	10/10/16	16FWNR11WG	0.59	10.10 J	**8.50**	295
	10/10/16	16FWNR12WG[2]		14.10 J	**8.88**	299
	5/11/17	17FWNR05WG	8.11	3.72	**6.24**	176
	8/8/17	17FWNR09WG	0.55	7.54	**5.78**	139
	5/24/18	18FWNR05WG	0.96	6.41	**3.80**	57.0
	8/10/18	18FWNR11WG	0.94	10.10	**3.40**	198
	6/24/19	19FWNR05WG	0.53	7.98	**5.86**	152
	9/1/19	19FWNR07WG	0.57	3.21	**4.18**	80.7
AP-9459	5/11/15	15FWNR02WG	0.52	5.46	**5.98**	63.4
	8/24/15	15FWNR08WG	0.21	3.61	**3.98**	48.3
	7/6/16	16FWNR04WG	0.28	3.96	**4.54**	45.0
	10/10/16	16FWNR09WG	0.29	3.81	**3.15**	33.0
	5/11/17	17FWNR01WG	0.42	2.78	**3.24**	34.3
	5/11/17	17FWNR02WG[2]		2.87	**3.18**	33.9
	8/8/17	17FWNR11WG	0.06	3.13	**3.31**	38.0
	8/8/17	17FWNR12WG[2]		3.11	**3.30**	39.0
	5/24/18	18FWNR03WG	0.82	4.25	**3.60**	31.8
	5/24/18	18FWNR04WG[2]		4.23	**3.62**	32.4
	8/10/18	18FWNR09WG	0.35	4.04	**3.12**	36.2
	8/10/18	18FWNR10WG[2]		3.95	**3.01**	36.1
	6/24/19	19FWNR02WG	0.42	7.58	**3.45**	23.6
	6/24/19	19FWNR03WG[2]		7.62	**3.57**	26.3
	9/1/19	19FWNR09WG	0.37	3.99	**2.82**	28.0
	9/1/19	19FWNR10WG[2]		3.76	**2.50**	28.1
AP-9003	5/11/15	15FWNR03WG	0.55	4.93	**3.61**	130.0
	8/24/15	15FWNR09WG	0.50	4.25	**2.26**	101.0
	7/6/16	16FWNR05WG	0.49	5.51	**3.59**	97.9
	10/10/16	16FWNR10WG	0.21	0.91	**2.86**	135.0
	5/11/17	17FWNR06WG	0.45	6.32	**4.34**	104.0
	8/8/17	17FWNR10WG	0.7	7.66	**4.76**	96.7
	5/24/18	18FWNR06WG	1.16	6.86	**3.04**	56.5
	8/10/18	18FWNR12WG	0.96	6.79	**3.40**	83.2
	6/24/19	19FWNR04WG	0.68	16.30	**5.58**	89.0
	9/1/19	19FWNR08WG	0.77	2.45	**1.65**	63.3
AP-9685	5/11/15	15FWNR06WG	0.48	0.03	0.38	35.4
	8/24/15	15FWNR13WG	0.65	0.02	0.19	32.6
	7/6/16	16FWNR06WG	0.36	1.35	**1.72**	48.3
	10/10/16	16FWNR13WG	0.35	0.25	0.02	37.6
	5/11/17	17FWNR03WG	0.51	0.21	**1.06**	45.1
	8/8/17	17FWNR14WG	3.42	ND(0.25)	0.07	31.2
	5/24/18	18FWNR01WG	0.83	ND(0.25)	**1.18**	36.3
	8/10/18	18FWNR07WG	5.07	ND(0.25)	0.0097	35.5
	6/24/19	19FWNR06WG	2.20	ND(0.25)	0.34	32.8
	9/1/19	19FWNR12WG	1.82	ND (0.125)	0.581	20.1
AP-9684	5/11/15	15FWNR01WG	0.55	13.20	**2.32**	83.6
	8/24/15	15FWNR12WG	0.17	11.80	**2.21**	52.1
	7/6/16	16FWNR01WG	0.29	9.01	**2.06**	53.7
	10/10/16	16FWNR08WG	0.29	5.76	**1.97**	115.0
	5/11/17	17FWNR04WG	0.15	10.10	**2.37**	69.3
	8/8/17	17FWNR13WG	0.25	8.92	**2.54**	75.1
	5/24/18	18FWNR02WG	0.58	7.32	**1.94**	60.3
	8/10/18	18FWNR08WG	0.58	10.70	**2.24**	73.9
	6/24/19	19FWNR01WG	0.60	14.80	**2.86**	76.9
	9/1/19	19FWNR11WG	0.55	9.73	**2.27**	88.8

Notes:

Green and bold results exceed current ADEC groundwater cleanup levels

[1] Prior to 2011, iron, manganese, and sulfate samples were analyzed employing an Orion field-screening instrument. As such, non-detect results are reported to be less than the instrument detection limit.

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

[3] Cleanup level established from Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC, 2018)

B - Analyte dedection may be due to cross-contamination
btoc - below top of casing
J - Analyte is reported between the detection limit and LOQ
LOD - limit of detection
LOQ - limit of quantitation
mg/L - milligrams per liter
ND - not detected (LOD in parenthesis)
NE - not established

Table 4-3. 2015-2019 Groundwater Sample Results
Neely Road

Location	Sample Date	Sample Number	Geochemical Parameters				Contaminant Concentrations (µg/L)										
			Dissolved Oxygen (mg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	DRO	GRO	Benzene	Ethylbenzene	Xylenes	1,2,4-TMB	1,3,5-TMB	Naphthalene	PCE	TCE	EDB
ADEC Cleanup Levels[1]			*NA*	*NE*	**0.43**	*NE*	**1,500**	**2,200**	**4.6**	**15**	**190**	**56**	**60**	**1.7**	**41**	**2.8**	**0.075**
AP-8211	05/11/15	15FWNR04WG	0.24	13.40	**7.25**	155	**12,000**	950	0.42 J	**20 J**	96.6 J	**250**	57 J	**69**	0.11 J	ND(0.1)	0.0045 J
	05/11/15	15FWNR05WG[2]	0.24	13.20	**7.23**	167	**9,600**	950	0.35 J	**18**	93	**270**	57	**74**	ND(0.2)	ND(0.1)	ND(0.004)
	08/24/15	15FWNR10WG	0.25	10.90	**6.51**	132	**9,600**	960	0.37J,MH,QL	**34 QL**	132.2 MH,QL	**340 QL**	48 J,QL	**79 QL**	ND(0.2)	ND(0.1)	0.0041 J
	08/24/15	15FWNR11WG[2]		11.30	**6.62**	125	**11,000**	990	0.37J,MH,QL	**32 QL**	132.0 MH,QL	**340 QL**	46 QL	**99 QL**	ND(0.2)	ND(0.1)	0.0046 J
	07/06/16	16FWNR02WG	0.41	10.50	**6.43**	175	**10,800**	1,340 J+	ND(2)	**22.8 J**	**234 J**	**449 J**	**75.5 J**	**138**	ND(5)	ND(5)	0.014 J-
	07/06/16	16FWNR03WG[2]		11.00	**7.11**	180	**12,000**	1,580 J+	ND(2)	**31.1 J**	**327 J**	**640 J**	**112 J**	**184**	ND(5)	ND(5)	0.014 J-
	10/10/16	16FWNR11WG	0.59	10.10 J	**8.50**	295	**17,800 J**	383	0.46 B,J+	1.62 J	46.0	**58.9 J**	33.0	**39.4**	ND(0.5)	ND(0.5)	ND(0.0218)
	10/10/16	16FWNR12WG[2]		14.10 J	**8.88**	299	**12,200 J**	445	0.51 B	2.66 J	57.1	**81.8 J**	36.9	**46.9**	ND(0.5)	ND(0.5)	ND(0.022)
	05/11/17	17FWNR05WG	8.11	3.72	**6.24**	176	**4,520**	1,040	0.44	**18.2**	115.0	**412**	**145**	**121**	ND(0.5)	ND(0.5)	ND(0.0375)
	08/08/17	17FWNR09WG	0.55	7.54	**5.78**	139	**6,220**	1,270	0.38 J	**16.2**	120	**524**	**150**	**135**	ND(0.5)	ND(0.5)	ND(0.0218)
	05/24/18	18FWNR05WG	0.96	6.41	**3.80**	57.0	**2,200**	1,540	0.19 J	**22.6**	114.0	**389**	**101**	**121**	ND(0.5)	ND(0.5)	ND(0.0375)
	08/10/18	18FWNR11WG	0.94	10.10	**3.40**	198	**22,900**	749	0.25	10.1	81.5	**319**	**105**	**100**	ND(0.5)	ND(0.5)	ND(0.0375)
	06/24/19	19FWNR05WG	0.53	7.98	**5.86**	152	**4,920**	**2,350 J+**	0.477	**30.3**	**202**	**780**	**225**	**201**	ND(0.5)	ND(0.5)	ND(0.0375)
	09/01/19	19FWNR07WG	0.57	3.21	**4.18**	80.7	**3,860**	1,060	0.47	**17.6**	126	**482 J**	**152**	**150**	ND(0.5)	ND(0.5)	ND(0.0375)
AP-9459	05/11/15	15FWNR02WG	0.52	5.46	**5.98**	63.4	**2,100**	150	0.61	0.27 J	0.26 J	1.6 J	2.60	0.59 J,B	ND(0.2)	ND(0.1)	ND(0.004)
	08/24/15	15FWNR08WG	0.21	3.61	**3.98**	48.3	600 J	160	0.23 J	0.13 J	0.19 J	2.5	3.60	0.44 J,B,QL	ND(0.2)	ND(0.1)	ND(0.004)
	07/06/16	16FWNR04WG	0.28	3.96	**4.54**	45.0	973	146	1.89	ND(0.5)	ND(1.5)	3.01	3.88	ND(5)	ND(0.5)	ND(0.5)	ND(0.004)
	10/10/16	16FWNR09WG	0.29	3.81	**3.15**	33.0	1,000	152 B	0.98	0.32 J	ND(1.5)	6.46	5.82	ND(5)	ND(0.5)	ND(0.5)	ND(0.022)
	05/11/17	17FWNR01WG	0.42	2.78	**3.24**	34.3	339 J,B	109	0.27 J	ND(0.5)	ND(1.5)	1.91	2.64	0.5 J,B	ND(0.5)	ND(0.5)	ND(0.0375)
	05/11/17	17FWNR02WG[2]		2.87	**3.18**	33.9	442 J,B	130	0.39 J	ND(0.5)	ND(1.5)	1.9	2.6	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.0375)
	08/08/17	17FWNR11WG	0.06	3.13	**3.31**	38.0	443 J	148	0.21 J	0.35 J	ND(1.5)	3.12	3.61	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.0222)
	08/08/17	17FWNR12WG[2]		3.11	**3.30**	39.0	518 J	118	0.2 J	ND(0.5)	ND(1.5)	3.05	3.45	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.022)
	05/24/18	18FWNR03WG	0.82	4.25	**3.60**	31.8	559 J,B	362 J	1.39	ND(0.5)	ND(1.5)	1.80	2.36	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.0375)
	05/24/18	18FWNR04WG[2]		4.23	**3.62**	32.4	555 J,B	139 J	1.31	ND(0.5)	ND(1.5)	1.61	2.23	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.0375)
	08/10/18	18FWNR09WG	0.35	4.04	**3.12**	36.2	347 J	ND(50)	0.35 J	ND(0.5)	ND(1.5)	2.16	2.99	0.53 J	ND(0.5)	ND(0.5)	ND(0.0375)
	08/10/18	18FWNR10WG[2]		3.95	**3.01**	36.1	375 J	ND(50)	0.35 J	ND(0.5)	ND(1.5)	2.25	3.03	0.58 J	ND(0.5)	ND(0.5)	ND(0.0375)
	06/24/19	19FWNR02WG	0.42	7.58	**3.45**	23.6	901	125	2.63	3.10	2.81 J	7.14	2.99 J	1.68	ND(0.5)	ND(0.5)	ND(0.0375)
	06/24/19	19FWNR03WG[2]		7.62	**3.57**	26.3	860	152	3.08	3.99	3.59	9.04	4.39 J	**1.86**	ND(0.5)	ND(0.5)	ND(0.0375)
	09/01/19	19FWNR09WG	0.37	3.99	**2.82**	28.0	445 J, B	73.6 J	0.86	0.36 J, B	ND(1.5)	1.73	2.68	0.72 J	ND(0.5)	ND(0.5)	ND(0.0375)
	09/01/19	19FWNR10WG[2]		3.76	**2.50**	28.1	375 J, B	108 J	0.82	0.36 J, B	ND(1.5)	1.88	2.57	**1.74 J**	ND(0.5)	ND(0.5)	ND(0.0375)
AP-9003	05/11/15	15FWNR03WG	0.55	4.93	**3.61**	130.0	1,400	600	2	**30**	11.8	12	2.0 J	0.88 J,B	ND(0.2)	ND(0.1)	ND(0.004)
	08/24/15	15FWNR09WG	0.50	4.25	**2.26**	101.0	770 J	330	1.2	8.1	2.7	2.6	0.6 J	**4.5**	ND(0.2)	ND(0.1)	ND(0.004)
	07/06/16	16FWNR05WG	0.49	5.51	**3.59**	97.9	834 B	450 J	2.3	**67.9**	60.4	9.02	0.73 J	ND(5)	ND(0.5)	ND(0.5)	ND(0.004)
	10/10/16	16FWNR10WG	0.21	0.91	**2.86**	135.0	**1,700**	110 B	1.74	1.00	ND(1.5)	0.77 J	ND(0.5)	ND(5)	ND(0.5)	ND(0.5)	ND(0.0218)
	05/11/17	17FWNR06WG	0.45	6.32	**4.34**	104.0	831 B	398	3.65	**57.4**	22.7	21.6	3.72	**21.9**	ND(0.5)	ND(0.5)	ND(0.0218)
	08/08/17	17FWNR10WG	0.7	7.66	**4.76**	96.7	902	1,290 J	4.13	**181**	110	14.3	10.9	**43**	ND(0.5)	ND(0.5)	ND(0.0217)
	05/24/18	18FWNR06WG	1.16	6.86	**3.04**	56.5	652 B	565	1.54	**78**	7.2	2.19	ND(0.5)	**5.15**	ND(0.5)	ND(0.5)	ND(0.0375)
	08/10/18	18FWNR12WG	0.96	6.79	**3.40**	83.2	1,020	1,500 J	2.49	**144**	59.7	27.8	10.8	**42.4**	ND(0.5)	ND(0.5)	ND(0.0375)
	06/24/19	19FWNR04WG	0.68	16.30	**5.58**	89.0	1,250	1,550 J	1.83	**173**	66	29.7	5.38	**25.5**	ND(0.5)	ND(0.5)	ND(0.0375)
	09/01/19	19FWNR08WG	0.77	2.45	**1.65**	63.3	683 B	162	0.47	12.1	2.52 B	2.16	0.41	**4.63**	ND(0.5)	ND(0.5)	ND(0.0375)

Table 4-3. 2015-2019 Groundwater Sample Results
Neely Road

Location	Sample Date	Sample Number	Geochemical Parameters				Contaminant Concentrations (µg/L)										
			Dissolved Oxygen (mg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	DRO	GRO	Benzene	Ethylbenzene	Xylenes	1,2,4-TMB	1,3,5-TMB	Naphthalene	PCE	TCE	EDB
ADEC Cleanup Levels[1]			*NA*	*NE*	**0.43**	*NE*	**1,500**	**2,200**	**4.6**	**15**	**190**	**56**	**60**	**1.7**	**41**	**2.8**	**0.075**
AP-9685	05/11/15	15FWNR06WG	0.48	0.03	0.38	35.4	140 J,B	ND(25)	ND(0.1)	0.07 J	ND(0.2)	0.12 J,B	ND(0.2)	ND(0.3)	1.2	0.47 J	ND(0.004)
	08/24/15	15FWNR13WG	0.65	0.02	0.19	32.6	110 J	ND(25)	ND(0.1)	ND(0.1)	ND(0.2)	0.46 J	0.1 J	0.19 J,B,QL	2.3	0.7	ND(0.004)
	07/06/16	16FWNR06WG	0.36	1.35	**1.72**	48.3	287 J,B	35.8 J	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	ND(5)	10.6	**3.73**	ND(0.004)
	10/10/16	16FWNR13WG	0.35	0.25	0.02	37.6	315 J,B	36.1 J,B	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	ND(5)	5.3	1.01	ND(0.0221)
	05/11/17	17FWNR03WG	0.51	0.21	**1.06**	45.1	213 J,B	46.1 J	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	ND(0.5)	20.0	**5.20**	ND(0.0221)
	08/08/17	17FWNR14WG	3.42	ND(0.25)	0.07	31.2	ND(310)	ND(50)	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	ND(0.5)	1.83	0.32 J	ND(0.0215)
	05/24/18	18FWNR01WG	0.83	ND(0.25)	**1.18**	36.3	ND(318)	ND(50)	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	ND(0.5)	25.9	**5.06**	ND(0.0375)
	08/10/18	18FWNR07WG	5.07	ND(0.25)	0.0097	35.5	204 J	ND(50)	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	ND(0.5)	2.70	0.32 J	ND(0.0375)
	06/24/19	19FWNR06WG	2.20	ND(0.25)	0.34	32.8	311 J	ND(50)	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	ND(0.5)	1.24 [0.5]	ND(0.5)	ND(0.0375)
	09/01/19	19FWNR12WG	1.82	ND (0.125)	0.581	20.1	281 J, B	ND(50)	ND(0.2)	ND(0.5)	ND(1.5)	ND(0.5)	ND(0.5)	0.84 J	10.7	1.21	ND(0.0375)
AP-9684	05/11/15	15FWNR01WG	0.55	13.20	**2.32**	83.6	430 J	810	0.19 J	0.55	1.8	**62**	17	0.54 J,B	ND(0.2)	0.18 J	ND(0.004)
	08/24/15	15FWNR12WG	0.17	11.80	**2.21**	52.1	500 J	810	ND(0.1) QL	0.73 QL	2.5 QL	50 QL	24 QL	**2.2 QL**	ND(0.2)	ND(0.1)	ND(0.004)
	07/06/16	16FWNR01WG	0.29	9.01	**2.06**	53.7	509 J,B	634	ND(0.2)	0.34 J	2.56 J	**62.7**	24.3	ND(5)	ND(0.5)	0.45 J	ND(0.004)
	10/10/16	16FWNR08WG	0.29	5.76	**1.97**	115.0	505 J,B	338	0.29 J	ND(0.5)	ND(1.5)	29.7	8.66	ND(5)	ND(0.5)	ND(0.5)	ND(0.0219)
	05/11/17	17FWNR04WG	0.15	10.10	**2.37**	69.3	329 J,B	516	ND(0.2)	ND(0.5)	1.11 J	**66.5**	19.2	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.0221)
	08/08/17	17FWNR13WG	0.25	8.92	**2.54**	75.1	330 J	583	ND(0.2)	ND(0.5)	ND(1.5)	**62.6**	17.5	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.0219)
	05/24/18	18FWNR02WG	0.58	7.32	**1.94**	60.3	346 J,B	646	ND(0.2)	ND(0.5)	ND(1.5)	46.9	18.1	0.37 J	ND(0.5)	ND(0.5)	ND(0.0375)
	08/10/18	18FWNR08WG	0.58	10.70	**2.24**	73.9	336 J	410	ND(0.2)	ND(0.5)	ND(1.5)	40.7	13.5	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.0375)
	06/24/19	19FWNR01WG	0.60	14.80	**2.86**	76.9	447 J	614	ND(0.2)	ND(0.5)	ND(1.5)	**60.3**	22.4	0.45 J	ND(0.5)	ND(0.5)	ND(0.0375)
	09/01/19	19FWNR11WG	0.55	9.73	**2.27**	88.8	429 J, B	250	ND(0.2)	ND(0.5)	ND(1.5)	21.4	7.33	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.0375)

Notes:

Green and bold results exceed current ADEC groundwater cleanup levels

[1] Cleanup level established from Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC, 2018)

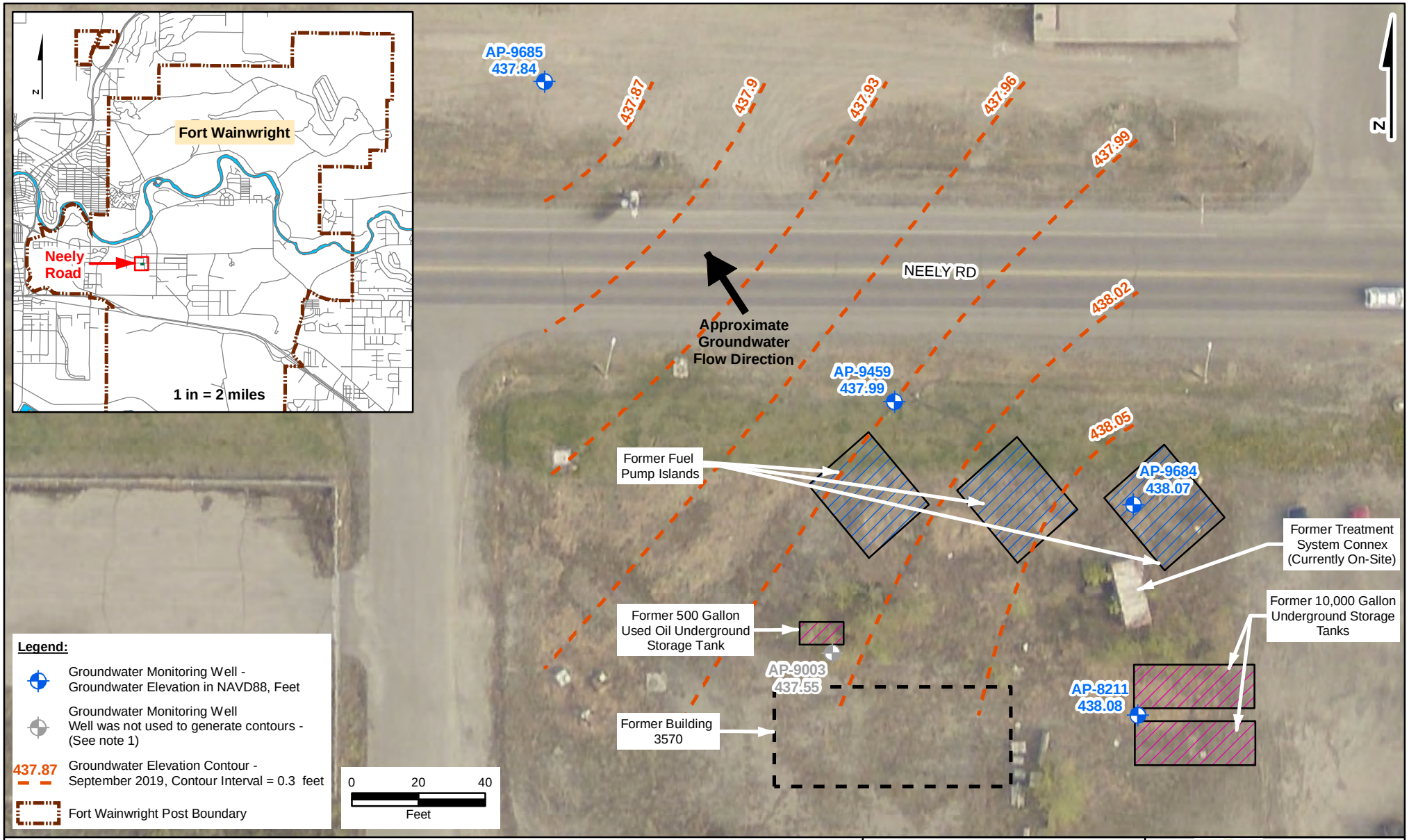
[2] Sample is a field duplicate of the sample immediately above.

Abbreviations and Acronyms:

ADEC - Alaska Department of Environmental Conservation
DRO - diesel range organics
GRO - gasoline range organics
EDB - 1,2-dibromoethane
NA - not analyzed or not applicable
NE - not established
TMB - trimethylbenzene
LOD - limit of detection

Data Qualifiers:

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data or older).
Q - Result is estimated due to a QC failure (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high) [flag discontinued after 2013].
M - Result is biased due to matrix interference (pre-2014 data only). If direction of bias is known, it is further indicated with a "L" (low) or "H" (high) [flag discontinued after 2013]



Notes:

1. The groundwater elevation for well AP-9003 was not consistent with other water elevaitons. The elevation was not used to generate the groundwater contours.
2. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Well Locations and Groundwater Elevations, Neely Road

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 4-1	Date: 11/19

AP-9685	Nov-07	May-08	May-09	May-10	Jul-11	Aug-12	Aug-13	Jul-14	May-15	Aug-15	Jul-16	Oct-16	May-17	Aug-17	May-18	Aug-18	Jun-19	Sep-19
GW Elev	434.98	435.22	435.18	434.65	436.89	435.46	435.10	438.79	435.59	436.25	435.99	437.13	436.01	435.99	436.57	436.43	435.06	437.84
DRO	230	160	130	74	73	64	64	130	140	110	287	315	213,B	ND(310)	ND(318)	204	311	281
GRO	27	59	76	20	24	ND(25)	ND(25)	20	ND(25)	ND(25)	35.8	36.1	46	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)
Benzene	0.46	6.9	14	0.57	0.18	ND(0.1)	ND(0.1)	0.12	ND(0.1)	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)
Toluene	0.85	0.20	0.36	0.07	ND(0.5)	0.09	0.36	0.7	0.09	1/0/00	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Ethylbenzene	0.22	ND(1)	ND(1)	ND(0.50)	ND(0.5)	ND(0.1)	0.06	0.05	0.07	ND(0.1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Xylenes	2.04	0.58	0.67	ND(0.50)	ND(0.5)	ND(0.2)	0.29	0.2	ND(0.2)	ND(0.2)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)
1,2,4-TMB	0.97	0.44	ND(1)	0.07	ND(2)	ND(0.2)	ND(0.2)	0.14	0.12,B	1/0/00	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
1,3,5-TMB	0.26	0.38	ND(1.0)	ND(2.0)	ND(2.0)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	1/0/00	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Naphthalene	0.43	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(0.3)	0	ND(0.3)	ND(0.3)	0.19,B,QL	ND(5)	ND(5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.84
PCE	0.92	69	41	22	41	2.5	2.5	46	1.2	2.3	10.6	5.3	20	1.83	25.9	2.7	1.24	10.7
TCE	0.40	3.2	3.9	2.1	2.8	0.25	0.25	2.9	0.47	0.67	3.73	1.01	5.20	0.32	5.06	0.32	ND(0.5)	1.21

AP-9459	Oct-05	Jul-06	Nov-07	Nov-08	Oct-09	May-10	Sep-11	Aug-12	Aug-13	Oct-14	May-15	Aug-15	Jul-16	Oct-16	May-17	Aug-17	May-18	Aug-18	Jun-19	Sep-19
GW Elev	438.11	438.21	435.21	435.51	435.19	434.75	436.48	435.64	435.33	437.23	435.79	436.49	436.16	437.29	436.18	435.90	436.76	436.61	435.25	437.99
DRO	4,510	2,250	940	4,900	5,700	680	790	620	1,800	1,700	2,100	600	973	1,000	442	518	559	375	901	445
GRO	28,200	10,300	7,000	3,400	4,000	1,600	1,800	1,400	150	130	150	160	146	152	130	148	362	ND(50)	152	108
Benzene	1,660	435	300	360	480	200	95	73	0.18	0.75	0.61	0.23	1.89	0.98	0.39	0.21	1.39	0.35	3.08	0.86
Toluene	2,580	328	170	80	54	3	21	11	0.49	0.10	0.11	0.20	ND(0.5)	ND(0.5)	0.63	ND(0.5)	ND(0.5)	ND(0.5)	0.49	ND(0.5)
Ethylbenzene	1,660	320	160	210	210	29	98	110	0.42	0.25	0.27	0.13	ND(0.5)	0.32	ND(0.5)	0.35	ND(0.5)	ND(0.5)	3.99	0.36
Xylenes	8,050	1,100	860	503	369	34	269	283	1.53	0.70	0.26	0.19	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	3.59	ND(1.5)
1,2,4-TMB	2,040	697	420	390	290	83	130	140	10	8.70	1.60	2.5	3.01	6.46	1.91	3.12	1.80	2.25	9.04	1.88
1,3,5-TMB	NA	NA	76	87	66	23	41	34	1.70	7.90	2.60	3.60	3.88	5.82	2.64	3.61	2.36	3.03	4.39	2.68
Naphthalene	NA	NA	59	97	80	11	35	29	1.30	1.40	0.59	0.44	ND(5)	ND(5)	0.50	ND(0.5)	ND(0.5)	0.58	1.86	1.74
PCE	ND(0.5)	ND(31)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	0.14	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TCE	4.2	ND(31)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

AP-9684	Nov-07	Aug-08	Aug-09	Sep-10	Sep-11	Aug-12	Aug-13	Jul-14	May-15	Aug-15	Jul-16	Oct-16	May-17	Aug-17	May-18	Aug-18	Jun-19	Sep-19
GW Elev	435.30	437.34	435.50	435.80	436.52	435.72	435.39	439.01	435.88	436.57	436.24	437.38	436.19	436.00	436.00	436.82	436.69	435.34	438.07
DRO	790	960	610	670	900	350	880	360	430	500	509	505	329	330	330	346	336	447	429
GRO	3,500	1,100	2,100	2,000	2,200	860	1,200	1,200	810	810	634	338	516	583	583	646	410	614	250
Benzene	11	6.4	0.45	0.5	3.9	0.67	0.28	0.12	0.19	ND(0.1)	ND(0.2)	0.29	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Toluene	1.00	1.60	0.23	0.32	0.43	0.37	0.63	1.2	0.31	0.46	ND(0.5)	ND(0.5)	0.45	ND(0.5)	ND(0.5)	0.34	0.4	0.359	0.31
Ethylbenzene	46	16	15	8.4	11	2.4	2.3	1.2	0.55	0.73	0.34	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Xylenes	102	38	33.57	15.00	53.6	6.4	6.48	4.66	1.8	2.5	2.56	ND(1.5)	1.11	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)	ND(1.5)
1,2,4-TMB	390	100	230	250	240	61	120	75	62	50	62.7	29.7	66.5	62.6	62.6	46.9	40.7	60.3	21.4
1,3,5-TMB	130	34	44	51	69	12	27	21	17	24	24.3	8.66	19.2	17.5	17.5	18.1	13.5	22.4	7.33
Naphthalene	28	5.70	10	5.10	4.40	0.43	2.1	0.80	0.54	2.2	ND(5)	ND(5)	ND(0.5)	ND(0.5)	ND(0.5)	0.37	ND(0.5)	0.45	ND(0.5)
PCE	ND(1)	ND(1)	0.45	0.66	0.12	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TCE	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.5)	0.27	ND(0.35)	0.22	0.18	ND(0.1)	0.45	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

ADEC GROUNDWATER CULs 18 AAC 75, Table C, 2018 Units in µg/L	
DRO	1,500
GRO	2,200
Benzene	4.6
Toluene	1,100
Ethylbenzene	15
Xylenes	190
1,2,4-TMB	56
1,3,5-TMB	60
Naphthalene	1.7
PCE	41
TCE	2.8

Legend:

Groundwater Monitoring Well

0 30 60
Feet

AP-9003	Jun-05	May-06	Nov-07	Aug-08	May-09	May-10	Jul-11	Aug-12	Aug-13	Oct-14	May-15	Aug-15	Jul-16	Oct-16	May-17	Aug-17	May-18	Aug-18	Jun-19	Sep-19
GW Elev	-	436.80	435.23	437.27	436.12	434.24	436.58	435.19	434.86	436.81	435.35	435.97	435.71	436.83	435.70	435.51	436.26	436.17	434.81	437.55
DRO	1,020	3370	470	520	350	94	92	240	660	2,000	1,400	770	834	1,700	831	902	652 B	1,020	1,250	683
GRO	3780	4340	230	550	270	35	ND(100)	29	380	29 J	600	330	450	110	398	1,290	565	1,500	1,550	162
Benzene	226	193	3.4	8	2.6	0.3	0.08	1.8	1.9	0.46 J	2	1.2	2.3	1.74	3.65	4.13	1.54	2.49	1.83	0.47
Toluene	228	12	1.90	0.68	0.26	0.17	0.06	0.12	0.93	0.14 J	1.80	1.4	4.06 B	0.43	2.64	6.11	1.69 B	4.54	8.73	1.03
Ethylbenzene	67.2	177	1.2	17	0.23	ND(0.50)	ND(0.5)	0.32	1.6	ND(0.1)	30	8.1	67.9	1.00	57.4	181	78	144	173	12.1
Xylenes	325.1	195.44	4.7	1.1	ND(2)	ND(0.50)	ND(0.5)	0	1.8	0.78 J	11.8	2.7	60.4	ND(1.5)	22.7	110	7.2	59.7	66	3.52
1,2,4-TMB	158	210	3.1	0.53	0.28	0.14	ND(2)	0	4.60	1.1 J	12	2.6	9.02	0.77 J	21.6	14.3	2.19	27.8	29.7	2.16
1,3,5-TMB	NA	NA	0.55	0.56	ND(1.0)	ND(2.0)	ND(2.0)	ND(0.2)	ND(0.2)	0.36 J	2.0 J	0.6 J	0.73 J	ND(0.5)	3.72	10.9	ND(0.5)	10.8	5.38	0.41
Naphthalene	NA	NA	1	ND(1.0)	ND(1.0)	ND(2.0)	ND(2.0)	ND(0.3)	13 QH	0.10 J	0.88 J,B	4.5	ND(5)	ND(5)	21.9	43	5.15	42.4	25.5	4.63
PCE	ND(1)	ND(0.31)	0	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TCE	ND(1)	ND(0.31)	ND(1)	ND(1)	ND(1)	ND(0.5)	ND(0.5)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

AP-8211	Oct-02	Oct-05	Jul-06	Nov-07	Aug-08	Aug-09	May-10	Sep-11	Aug-12	Aug-13	Oct-14	May-15	Aug-15	Jul-16	Oct-16	May-17	Aug-17	May-18	Aug-18	Jun-19	Sep-19
GW Elev	-	438.54	438.76	435.34	437.34	435.53	434.93	436.54	435.74	435.43	437.37	435.88	436.58	436.25	437.41	436.23	436.03	436.72	435.36	438.08
DRO	39,200	15,800	19,100	5,300	8,100	15,000	7,700	4,700	6,600	18,000	30,000	12,000	11,000	12,000	17,800	4,520	6,220	22,900	4,920	3,860
GRO	121,000	48,100	48,300	64,000	36,000	38,000	26,000	2,000	260	850	400	950	990	1,580	445	1,040	1,270	749	2,350	1,060
Benzene	2,660	1,020	680	490	180	250	76	0.12	ND(0.1)	0.2	0.56	0.42	0.37	ND(2)	0.51	0.44	0.38	0.25	0.477	0.26
Toluene	19,400	10,300	7,220	6,800	3,500	3,200	1,500	38	0.12	1.50	2.90	0.77	0.99	ND(5)	2.33	1.84	2.1	1.97	2.91	1.86
Ethylbenzene	2,420	993	815	800	740	700	690	10	7.7	3.4	1.6	20	34	31.1	2.66	18.2	16.2	10.1	30.3	17.6
Xylenes	15,830	13,130	9,920	10,800	5,600	9,400	5,000	460	61	102	45	97	132	327	57.1	115.0	120	81.5	202	126
1,2,4-TMB	4,640	3,200	3,290	3,000	2,300	2,300	2,500	330	100	470	130	270	340	640	81.8	412	524	319	780	482
1,3,5-TMB	NA	NA	NA	780	530	590	660	110	34	160	56	57	48	112	36.9	145	150	105	225	152
Naphthalene	NA	NA	NA	620	530	740	740	110	20	98	50	74	99	184	46.9	121	135	100	201	150
PCE	ND(1,000)	ND(0.31)	ND(155)	ND(1)	ND(50)	ND(5)	ND(5)	ND(0.5)	ND(0.2)	ND(0.2)	ND(0.2)	0.11	ND(0.2)	ND(5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
TCE	ND(1,000)	3.03	ND(155)	ND(1)	ND(50)	ND(5)	ND(5)	ND(0.5)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

Acronyms and Abbreviations:

Units
µg/L - micrograms per liter

Analytes
DRO - Diesel Range Organics
GRO - Gasoline Range Organics
TMB - Trimethylbenzene
PCE - Tetrachloroethene
TCE - Trichloroethene

Other
AAC - Alaska Administrative Code
ADEC - Alaska Department of Environmental Conservation
GW - groundwater
CULs - Cleanup Levels
Elev - elevation
NA - not analyzed
ND - Not Detected (limit of detection)

Notes:

1. Sample data shown in GREEN indicate analyte concentration exceeds ADEC CULs (18 AAC 75, Table C)
2. Data flags are not included on figure due to map space limitations. Data flags are presented on Table A-3.
3. Groundwater elevations are in the North American Vertical Datum (NAVD88), feet
4. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Groundwater Contaminant Concentrations, Neely Road

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005 | Figure: 4-2 | Date: 11/19

5.0 FORMER BUILDING 1168

This section presents the 2019 groundwater monitoring results for the Former Building 1168 site.

5.1 Monitoring Well Locations and Groundwater Elevations

Three wells located at the Former Building 1168 site were sampled during 2019; their locations are shown on Figure 5-1. Water levels were measured prior to sampling each well. Monitoring well details, water levels, and groundwater elevations are summarized in Table 5-1. Groundwater elevations were calculated and elevation contours were developed and are shown on Figure 5-1. Groundwater elevations indicate a northwesterly groundwater flow direction consistent with the regional groundwater flow direction.

Table 5-1 – Monitoring Well Summary, Former Building 1168

Well Number	Total Well Depth (feet btoc)	Screened Interval (feet bgs)	Well Elevation (feet – NAVD88)	Date	Water Level (feet btoc)	Water Elevation (feet – NAVD88)
AP-5751	20.3	7-17	444.83	6/19/19	17.58	427.25
AP-6809	27.0	17-27	444.56	6/19/19	17.43	427.13
AP-10037MW	25.3	12-22	445.90	6/20/19	18.67	427.23

5.2 Groundwater Contaminant Analytical Results

Three monitoring wells were sampled during the 2019 sampling event. Well locations and current and historical groundwater contaminant concentrations are presented on Figure 5-2. Groundwater samples were submitted for laboratory analysis of DRO, VOC, dissolved iron, and sulfate as summarized in Table A-1. Final field measurements recorded prior to groundwater sample collection are presented on Table C-1. Groundwater contaminant concentrations of samples collected between 2015 and 2019 are included in Table 5-2. Complete analytical results are presented in Table A-4.

There were no contaminant concentrations that exceeded ADEC CULs in any of the 2019 groundwater samples. The last ADEC CUL exceedances were in the 2017 samples collected from AP-5751; DRO and naphthalene both exceeded the current ADEC CUL in that sample.

5.3 Geochemical Field Measurements and Analytical Results

Table 5-2 presents geochemical data for Former Building 1168 wells between 2015 and 2019. Geochemical results indicate that groundwater in the vicinity of AP-10037MW is highly reduced based upon the negative ORP, elevated dissolved iron, and decreased sulfate concentrations.

This suggests that there is some remaining petroleum contamination in the vicinity of AP-10037MW which is being anaerobically degraded. However, groundwater geochemistry AP-5751 and AP-6809, located directly upgradient and downgradient of AP-10037MW respectively, is near background conditions indicating that remaining contamination in the vicinity of AP-10037MW is limited.

5.4 Contaminant Concentration Trend and Plume Stability Evaluation

Mann-Kendall trend analysis was performed for Former Building 1168 wells using MAROS software to evaluate DRO concentration trends over time. Plume stability trend analysis could not be performed due to an insufficient number of wells. The Mann-Kendall trend was evaluated using groundwater data between 1999 and 2019, the timeframe following the AS/SVE treatment system operation. Mann-Kendall results are presented in Appendix D and are summarized in Table 5-3.

Table 5-3. Mann-Kendall Trend Analysis Summary, Former Building 1168

Well	Contaminant of Concern
	DRO
AP-5751	**Decreasing**
AP-6809	Decreasing
AP-10037MW	No Trend

BOLD indicates DRO concentration above ½ ADEC CUL in 2019

The Mann-Kendall analysis showed decreasing DRO trends in both AP-5751 and AP-6809, and no trend in AP-10037MW.

5.5 Summary and Recommendations

There have been no groundwater contaminant concentration exceedances of ADEC CULs in Former Building 1168 wells since 2017. As a result, the groundwater sampling frequency should change to every five years and planned to coincide with Five Year Reviews. The next scheduled sampling event for these wells is 2024, in advance of the 2025 Five Year Review.

Table 5-2. 2015-2019 Groundwater Sample Results
Former Building 1168

Well Number	Sample Number	Date	Geochemical Parameters				Contaminant Concentrations (µg/L)							
			ORP (mV)	Dissolved Oxygen (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	DRO	Benzene	Naphthalene	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE
ADEC CLEANUP LEVEL[1]			*NA*	*NA*	*NE*	*NE*	**1,500**	**4.6**	**1.7**	**2.8**	**41**	**0.19**	**280**	**36**
AP-5751	15FWOU204WG	5/12/2015	87.2	0.4	0.27	29.7	968 J-	ND(0.2)	ND (5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	16FWOU209WG	7/9/2016	61.4	1.4	0.31	25.3	**1,940**	0.32 J	ND (5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	17FWOU204WG	5/17/2017	80.2	3.5	0.55	32.7	**1,510**	0.17 J	**3.3**	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	18FWOU204WG	6/3/2018	113.1	2.9	ND(0.25)	29.2	1,470	ND(0.2)	1.7	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	19FW6801WG	6/19/2019	84.60	1.50	0.216	30.1	916	ND (0.2)	0.53 J	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
AP-10037MW	15FWOU202WG	5/12/2015	24.7	0.27	8.3	34.2	677	2.75	ND (5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	15FWOU203WG[2]				8.37	34.1	610 J	2.78	ND (5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	16FWOU207WG	7/9/2016	-34.2	0.38	12.2	18.4	1,010	0.52	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	16FWOU208WG[2]				12.5	18.5	1,010	0.5	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	17FWOU201WG	5/17/2017	41.9	0.95	14.1	15.7	511 J	1.4	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	17FWOU202WG[2]				14.6	15.8	932	1.1	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	18FWOU202WG	6/3/2018	-70.0	0.62	20.9	17.6	663	0.68	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	18FWOU203WG[2]				22	17.8	836	0.64	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	19FW6803WG	6/20/2019	-83.6	0.62	23.1	13.1	693	0.45	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	19FW6804WG[2]	6/20/2019			23.6	12.8	630	0.47	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
AP-6809	15FWOU201WG	5/12/2015	94.9	0.4	1.3	71.7	567 J	0.48	ND (5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	16FWOU206WG	7/9/2016	101.3	0.62	0.38 J	63.2	922	0.35 J	ND (5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	17FWOU303WG	5/17/2017	59.2	0.61	2.5	66.6	737	0.5	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	18FWOU201WG	6/3/2018	71.9	0.86	0.57	60.1	815	ND(0.2)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)
	19FW6802WG	6/19/2019	46.0	0.73	0.802	76.5	399	ND(0.2)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.075)	ND(0.5)	ND(0.5)

Notes

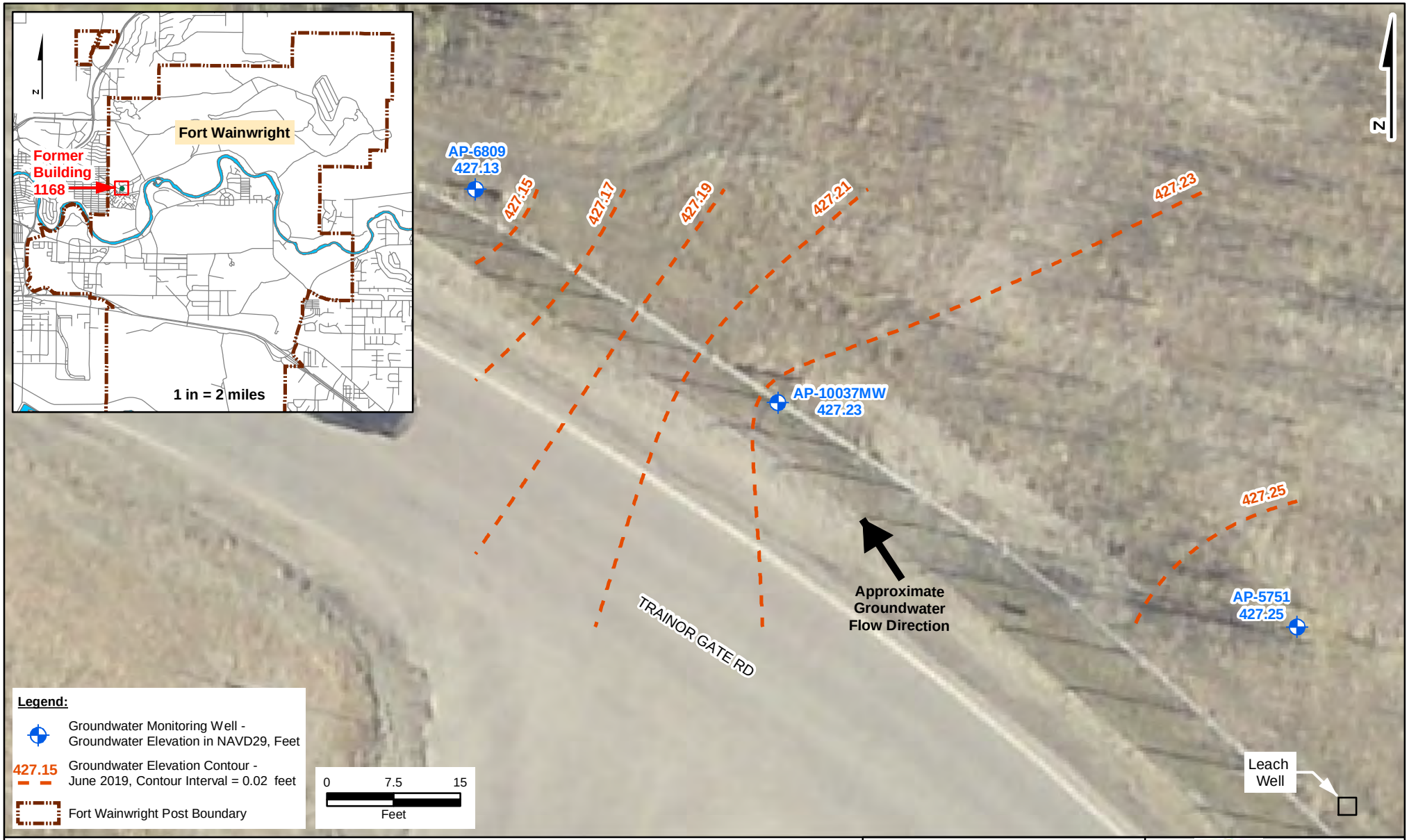
Results in green and bold font exceeded ADEC CULs

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

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

Acronyms/Abbreviations

DCE - dichloroethene
DRO - diesel range organics
PCE - tetrachloroethene
TCE - trichloroethene
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
NE - not established
ORP - oxidation-reduction potential



Notes:

1. See figure 5-2 for former building 1168 location
2. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Well Locations and Groundwater Elevations, Former Building 1168

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 5-1	Date: 11/19

AP-6809	Jun-98	Sep-98	Dec-98	Mar-99	May-00	Sep-00	May-01	Sep-01	Jul-02	Sep-02	Sep-03	Sep-04
GW Elev	426.28	428.23	425.66	426.27	426.7	429.74	426.59	427.87	-	-	430.39	426.58
DRO	1,920	1,160	818	658	2,290	1,680	1,250	869	1,150	850	1,240	1,480
TCE	3.36	1.8	1.6	1.53	1.2	ND(1)	1.37	1.2	1.2	ND(2)	ND(1)	0.85
Benzene	9.96	5.11	2.64	1.85	6.5	3.58	4.48	4.01	4.25	1.9	1.74	4.28
AP-6809	**Oct-05**	**May-06**	**Sep-06**	**May-07**	**Sep-07**	**Jun-08**	**Oct-08**	**May-09**	**Jun-10**	**Sep-10**	**Nov-10**	**Jan-11**
GW Elev	428.03	426.26	427.32	426.67	427.54	427.18	427.24	428.07	426.51	426.88	NM	425.76
DRO	2,450	2,160	1,500	2,100	730	1,600	310	700	1,000	1,300	870	1,400
TCE	0.75	0.78	0.68	0.81	0.37	0.54	0.22	0.1	0.54	0.28	0.25	0.32
Benzene	3.76	3.28	1.2	2.6	0.3	2	0.3	0.95	1.3	0.68	0.49	1
AP-6809	**Jun-11**	**Aug-11**	**Sep-11**	**Aug-12**	**May-13**	**Oct-14**	**May-15**	**Jul-16**	**May-17**	**Jun-18**	**Jun-19**	
GW Elev	427.61	427.82	428.56	427	425.92	428.98	427.53	428.62	429.09	430.07	427.13	
DRO	2,100	1,300	1,600	1,200	1,630	ND(318)	567	922	737	815	399	
TCE	0.29	0.24	0.22	0.12	ND(0.62)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	
Benzene	0.73	0.69	0.81	0.55	0.63	ND(0.2)	0.48	0.35	0.5	ND(0.2)	ND(0.2)	
Naphthalene	-	-	-	-	-	-	-	-	ND(0.5)	ND(0.5)	ND(0.5)	

ADEC GROUNDWATER CULs 18 AAC 75, Table C, 2018 Units in µg/L	
DRO	1,500
TCE	2.8
Benzene	4.6
Naphthalene	1.7

Legend:

- Groundwater Monitoring Well
- Alaska Railroad

0 15 30 Feet

AP-10037MW	Nov-94	Dec-94	Apr-95	Jul-95	Oct-95	Feb-96	Apr-96	Jul-96	Oct-96	Jan-97	May-97	Aug-97
GW Elev	-	-	-	-	-	-	-	-	-	-	-	-
DRO	11,000	15,000	18,000	4,400	4,300	8,100	15,000	5,660	3,600	4,500	2,200	3,200
TCE	310	ND(10)	39	19	34	76	ND(1)	NA	NA	33	3	9
Benzene	140	140	83	31	40	110	86	NA	64	36	68	71
AP-10037MW	**Oct-97**	**Sep-98**	**Dec-98**	**Mar-99**	**May-00**	**Sep-00**	**May-01**	**Sep-01**	**Jun-02**	**Sep-03**	**Sep-04**	**Jan-05**
GW Elev	-	-	-	-	-	-	-	-	-	-	-	-
DRO	2,000	317	335	409	882	476	670	1,020	460	919	1,590	2,390
TCE	8	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.81 J	NA
Benzene	46	ND(1)	ND(1)	ND(1)	1.31	1.88	4.44	8.53	6.8	1.08	23.7	13.8
AP-10037MW	**Oct-05**	**May-06**	**Sep-06**	**May-07**	**Sep-07**	**Jun-08**	**Oct-08**	**May-09**	**Jun-10**	**Jul-10**	**Sep-10**	**Nov-10**
GW Elev	-	-	-	-	-	-	-	-	-	-	427.05	NM
DRO	2,340	2,430	2,500	1,600	1,400	1,600	2,500	910	1,300	1,200	1,600	810
TCE	ND(1)	1.69	1.3	0.84	0.53	0.39	0.77	0.12	0.86	ND(0.5)	ND(0.5)	0.13
Benzene	7.67	14.4	12	7.7	10	5.7	15	6.1	15	1.4	0.91	0.47
AP-10037MW	**Jan-11**	**Jun-11**	**Aug-11**	**Sep-11**	**Aug-12**	**May-13**	**Oct-14**	**May-15**	**Jul-16**	**May-17**	**Jun-18**	**Jun-19**
GW Elev	426.23	427.8	428.08	428.75	427.15	426.08	429.13	427.82	428.79	429.51	430.2	427.23
DRO	640	1,500	1,100	1,300	1,100	1,760	990	677	1,010	932	836	693
TCE	0.15	0.33	0.3	0.21	ND(0.1)	ND(0.62)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Benzene	0.3	0.42	0.59	0.53	1.3	1.76	ND(0.2)	2.78	0.52	1.1	0.7	0.47
Naphthalene	-	-	-	-	-	-	-	-	-	ND(0.5)	ND(0.5)	ND(0.5)

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

AP-5751	Aug-94	Sep-04	Jan-05	Oct-05	May-06	Sep-06	May-07	Sep-07	Jun-08	Oct-08	May-09	Jan-11
GW Elev	427.77	426.68	426.55	428.22	426.38	427.46	426.82	427.76	427.37	427.38	428.23	426.19
DRO	34,000	15,100	18,000	5,140 Q	13,000	3,500	15,000	3,100	12,000	1,600	3,800	7,400
TCE	23	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	0.43	ND(1)	0.49	0.1	ND(1)	0.49
Benzene	ND(2)	0.23	0.9	ND(0.4)	ND(0.4)	ND(1)	0.57	ND(1)	0.46	0.19	ND(1)	0.4
AP-5751	**Jun-11**	**Aug-11**	**Sep-11**	**Aug-12**	**May-13**	**Oct-14**	**May-15**	**Jul-16**	**May-17**	**Jun-18**	**Jun-19**	
GW Elev	427.78	428.03	428.71	427.13	426.06	429.12	427.55	428.75	429.2	430.21	427.25	
DRO	3,300	2,900	2,600	1,300	4,520	1,210	968	1,940	1,510	1,470	916	
TCE	0.49	0.11	ND(0.50)	ND(0.10)	ND(0.10)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	
Benzene	0.28	0.08	0.07	0.09	0.41	ND(0.2)	ND(0.2)	0.32	0.17	ND(0.2)	ND(0.2)	
Naphthalene	-	-	-	-	-	-	-	-	3.3	1.7	0.53	

Acronyms and Abbreviations:

Units
µg/L - micrograms per liter

Analytes
DRO - Diesel Range Organics
TCE - Trichloroethene

Other
AAC - Alaska Administrative Code
CULs - Cleanup Levels
GW - groundwater
Elev - elevation
NA - not analyzed
ND - Not Detected (limit of detection)
ADEC - Alaska Department of Environmental Conservation

Notes:

1. Sample data shown in **GREEN** indicate analyte concentration exceeds ADEC CULs (18 AAC 75, Table C)
2. PS-23 was replaced by AP-10037MW in July 2010.
3. Regenesis Regenox and ORC-A Injection completed near AP-10037MW in October 2010.
4. Data flags are not included on figure due to map space limitations. Data flags are presented on Table A-4.
5. Groundwater elevations are in the National Geodetic Vertical Datum (NGVD29), feet
6. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

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Groundwater Contaminant Concentrations, Former Building 1168

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005 | Figure: 5-2 | Date: 11/19

6.0 FORMER BUILDING 2250

This section presents the 2019 groundwater monitoring results for the Former Building 2250 site.

6.1 Monitoring Well Locations and Groundwater Elevations

Three wells located at the Former Building 2250 site were sampled during 2019; their locations are shown on Figure 6-1. Water levels were measured prior to sampling each well. Monitoring well details, water levels, and groundwater elevations are summarized in Table 6-1. Groundwater elevations were calculated and elevation contours were developed and are shown on Figure 6-1. Groundwater elevations indicate a northwesterly flow direction however the limited number of wells limits the accuracy of the flow direction determination.

Table 6-1 – Monitoring Well Summary, Former Building 2250

Well Number	Total Well Depth (feet btoc)	Screened Interval (feet bgs)	Well Elevation (feet – NGVD29)	Date	Water Level (feet btoc)	Water Elevation (feet – NGVD29)
AP-5976	21.6	10-20	453.89	6/19/19	15.97	437.92
AP-7151	29.9	17-27	453.20	6/19/19	15.28	437.92
AP-7153	24.72	15-25	449.7	6/19/19	11.18	438.52

6.2 Groundwater Contaminant Analytical Results

Three monitoring wells were sampled for the 2019 sampling event. Well locations and current and historical groundwater contaminant concentrations are presented on Figure 6-2. Groundwater samples were submitted for laboratory analysis of DRO, dissolved iron, and sulfate as summarized in Table A-1. Final field measurements recorded prior to groundwater sample collection are presented on Table C-1. DRO, dissolved iron, and sulfate concentrations of samples collected between 2010 and 2019 are included in Table 6-2. Complete analytical results are presented in Table A-5.

DRO exceeded the ADEC CUL in two wells, AP-5976 and AP-7151. The DRO concentration in AP-5976 has exceeded every sampling event with the exception of the June 2004 sampling event. The DRO concentration has periodically exceeded the ADEC CUL in AP-7151; the DRO concentration has never exceeded the ADEC CUL in upgradient AP-7153.

6.3 Geochemical Field Measurements and Analytical Results

Table 6-2 includes geochemical data for Former Building 2250 wells between 2010 and 2019. Geochemical results indicate that groundwater across the area is moderately reduced based upon the negative ORP, and elevated dissolved iron concentrations. The data supports that remaining petroleum contamination at the site is being anaerobically degraded.

6.4 Contaminant Concentration Trend and Plume Stability Evaluation

Mann-Kendall trend analysis was performed for the Former Building 2250 wells using MAROS software to evaluate DRO concentration trends over time. Plume stability trend analysis could not be performed due to an insufficient number of wells. The trend was evaluated using groundwater data between 1996 and 2019, and the results are presented in Appendix D and summarized in Table 6-3.

Table 6-3. Mann-Kendall Trend Analysis Summary, Former Building 2250

Well	Contaminant of Concern
	DRO
AP-5976	**No Trend**
AP-7151	**Probably Increasing**
AP-7153	Stable

BOLD indicates DRO concentration above ½ ADEC CUL for 2019

The DRO trends in Former Building 2250 are varied and are based on a limited data set. AP-7151 has a "probably increasing" trend, however the DRO concentration has been below the ADEC CUL in two of the past three sampling events.

6.5 Summary and Recommendations

The installation and sampling of a downgradient well to delineate the extent of groundwater contamination will be considered for the next sampling event which tentatively will occur in 2020.

Table 6-2. 2010 - 2019 Groundwater Sample Results
Former Building 2250

Well Number	Sample Number	Date	Geochemical Parameters				Contaminant Concentrations (µg/L)
			ORP (mV)	Dissolved Oxygen (mg/L)	Dissolved Iron (mg/L)	Sulfate (mg/L)	DRO
ADEC CLEANUP LEVELS[1]							**1,500**
AP-5976	10FW2202WG	10/28/2010	-65.6	0.19	NA	NA	**6,770**
	15FW2202WG	7/22/2015	-94.4	0.23	14.1	11.2	**8,670**
	19FW2202WG	6/19/2019	-115.1	0.34	15.6	6.22	**2,980**
	19FW2203WG				15.5	6.47	**3,370**
AP-7151	10FW2201WG	10/28/2010	-71.6	0.62	12.4	19.8	738 J
	15FW2201WG	7/22/2015	-92.2	0.30	13.2	24.8	803
	19FW2204WG	6/19/2019	-100	0.53	17.7	18.4	**4,380**
AP-7153	10FW2203WG	10/28/2019	-20	1.06	NA	NA	275 J
	15FW2204WG	7/22/2015	-77.5	0.30	14.30	34.1	434 J
	19FW2201WG	6/19/2019	-94.8	0.57	8.53	19.6	542 J

Notes

Results in green and bold font exceeded ADEC CULs

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

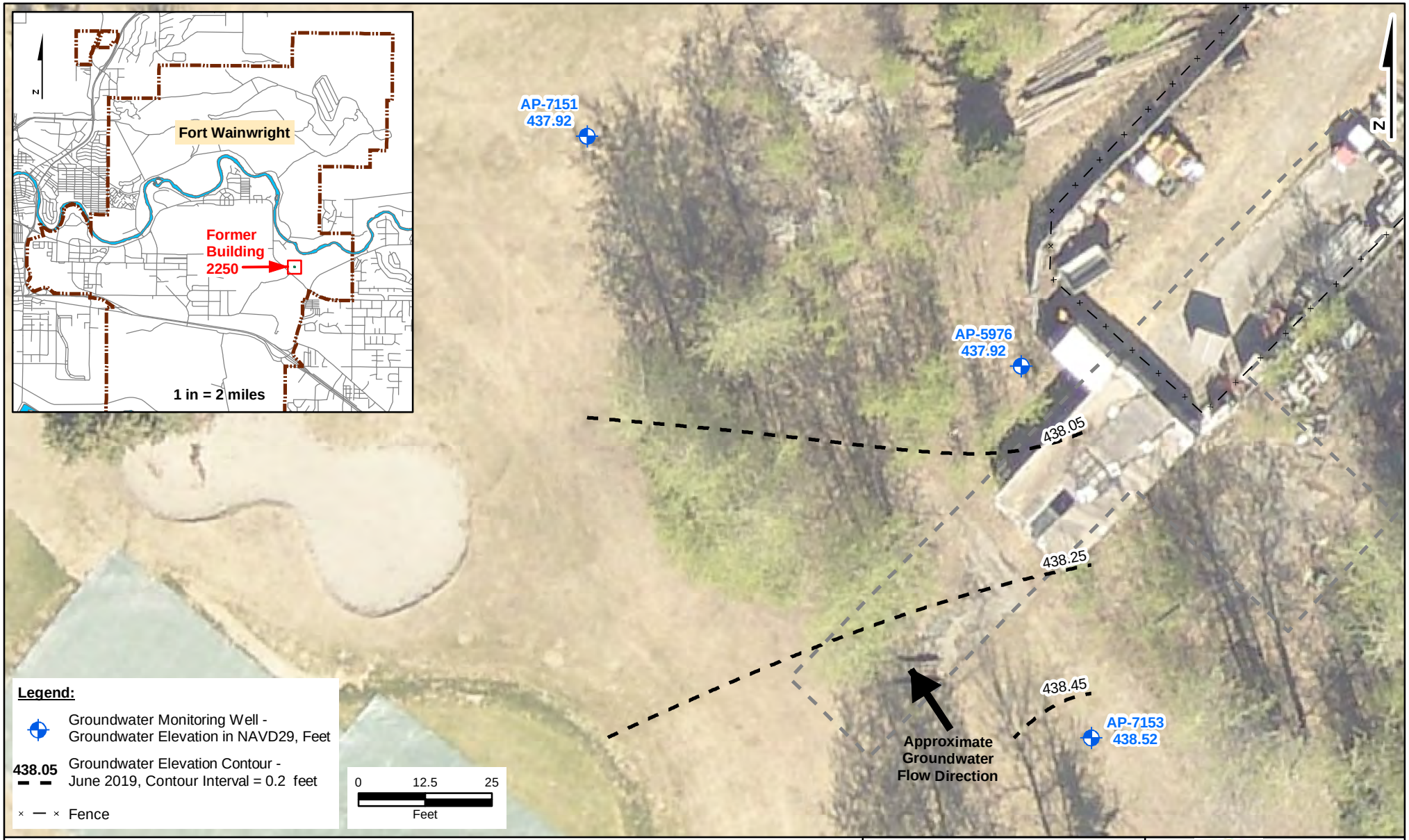
[2] Sample is a Field Duplicate of the sample immediately above.

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).

Acronyms/Abbreviations

DRO - diesel range organics
LOD - limit of detection
LOQ - limit of quantitation
µg/L - micrograms per liter
mg/L - milligrams per liter
mV - millivolts
NA - not analyzed or not applicable
ORP - oxidation-reduction potential



Note:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

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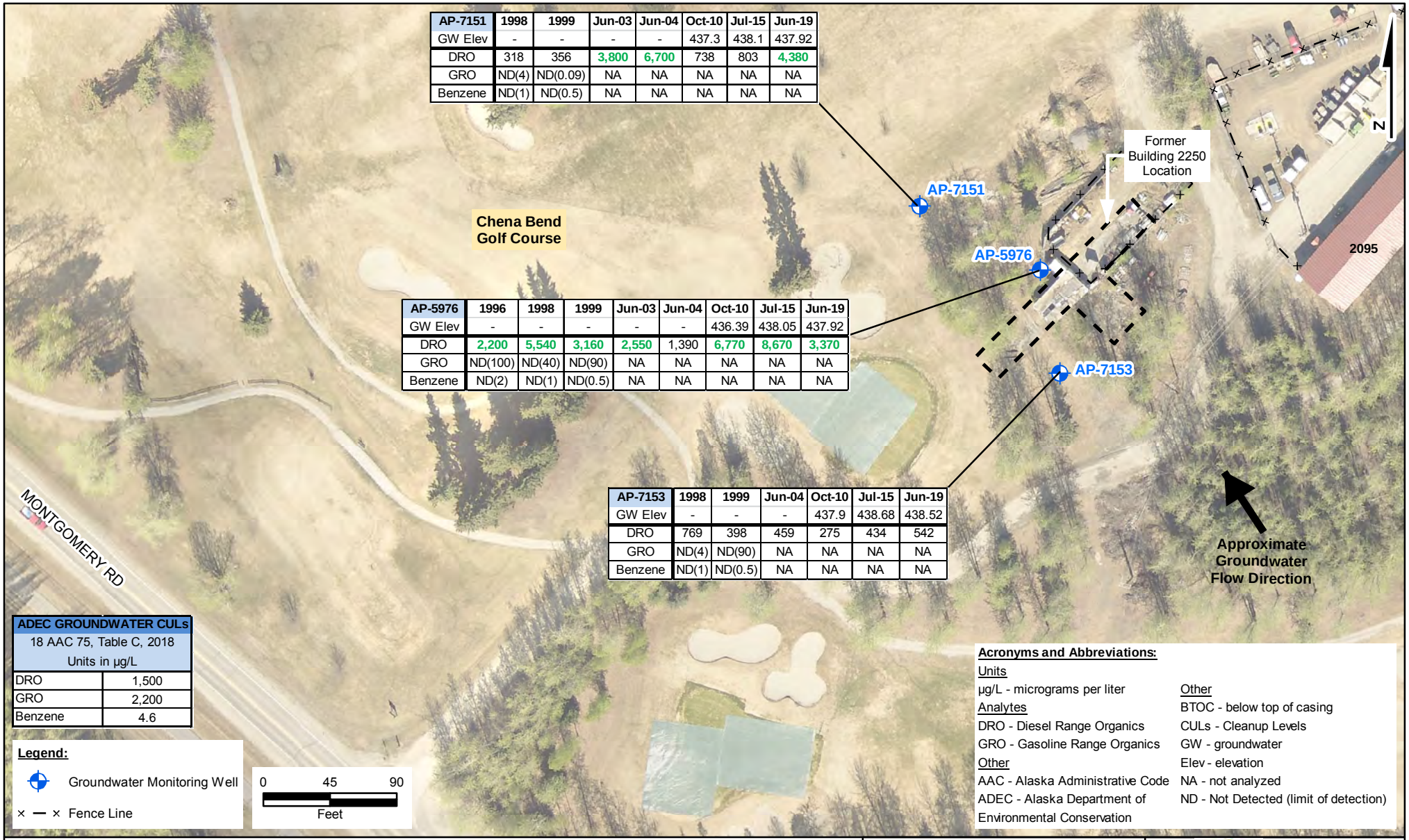
Well Locations and Groundwater Elevations, Former Building 2250

2019 Two-Party Sites Work Plan
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 6-1	Date: 11/19



AP-7151	1998	1999	Jun-03	Jun-04	Oct-10	Jul-15	Jun-19
GW Elev	-	-	-	-	437.3	438.1	437.92
DRO	318	356	3,800	6,700	738	803	4,380
GRO	ND(4)	ND(0.09)	NA	NA	NA	NA	NA
Benzene	ND(1)	ND(0.5)	NA	NA	NA	NA	NA

AP-5976	1996	1998	1999	Jun-03	Jun-04	Oct-10	Jul-15	Jun-19
GW Elev	-	-	-	-	-	436.39	438.05	437.92
DRO	2,200	5,540	3,160	2,550	1,390	6,770	8,670	3,370
GRO	ND(100)	ND(40)	ND(90)	NA	NA	NA	NA	NA
Benzene	ND(2)	ND(1)	ND(0.5)	NA	NA	NA	NA	NA

AP-7153	1998	1999	Jun-04	Oct-10	Jul-15	Jun-19
GW Elev	-	-	-	437.9	438.68	438.52
DRO	769	398	459	275	434	542
GRO	ND(4)	ND(90)	NA	NA	NA	NA
Benzene	ND(1)	ND(0.5)	NA	NA	NA	NA

ADEC GROUNDWATER CULs 18 AAC 75, Table C, 2018 Units in µg/L	
DRO	1,500
GRO	2,200
Benzene	4.6

Legend:

Groundwater Monitoring Well

Fence Line

0 45 90
Feet

Acronyms and Abbreviations:

Units
µg/L - micrograms per liter

Analytes
DRO - Diesel Range Organics
GRO - Gasoline Range Organics

Other
AAC - Alaska Administrative Code
ADEC - Alaska Department of Environmental Conservation
BTOC - below top of casing
CULs - Cleanup Levels
GW - groundwater
Elev - elevation
NA - not analyzed
ND - Not Detected (limit of detection)

Notes:

1. Sample data shown in **GREEN** indicate analyte concentration exceeds ADEC CULs (18 AAC 75, Table C)
2. Cleanup levels for GRO changed from 1,300 to 2,200 µg/L in October 2008
3. Data flags are not included on figure due to map space limitations. Data flags are presented on Table A-5.
4. Groundwater elevations are in the National Geodetic Vertical Datum (NGVD29), feet
5. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

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Groundwater Contaminant Concentrations, Former Building 2250

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 6-2	Date: 11/19

7.0 FORMER BUILDING 3564

This section presents the 2019 groundwater monitoring results for the Former Building 3564 site.

7.1 Groundwater Elevations

Groundwater elevation data were collected prior to sampling each well during the 2019 sampling event. Well AP-7187 could not be sampled in 2019 as the overcasing was bent, preventing the installation of a pump. A comparison of groundwater elevations shows a very slight northwest trend in the groundwater flow direction; however, overall, the groundwater gradient is relatively flat. Well completion data and survey data were not available for MW3564-1. Groundwater levels are shown on Figure 3-1 and Table 3-1 presents groundwater elevations.

Table 7-1 – Monitoring Well Summary, Former Building 3564

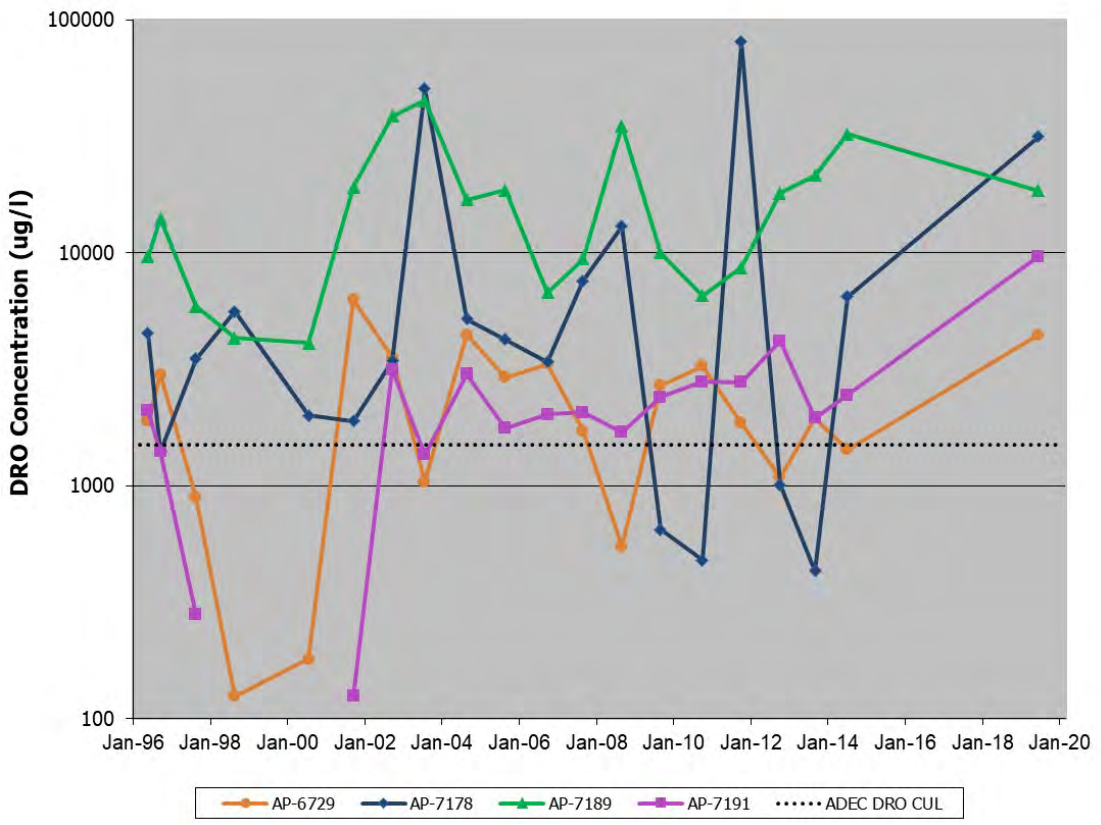
Well Number	Total Well Depth (feet btoc)	Well Elevation (feet – NAVD88)	Date	Water Level (feet btoc)	Water Elevation (feet – NAVD88)
AP-6729	26.5	447.93	6/24/19	18.43	429.50
AP-7178	21.33	444.94	6/24/19	14.49	430.45
AP-7183	21.7	447.31	6/24/19	17.91	429.40
AP-7187	17.9	446.41	6/21/19	Well Broken	
AP-7189	21.8	446.54	6/24/19	17.02	429.52
AP-7191	21.73	446.92	6/21/19	17.53	429.39
MW3564-1	23.43	NA	6/21/19	18.65	NA

7.2 Groundwater Contaminant Analytical Results

Six wells were sampled during the 2019 sampling event. Current and historical COC concentrations are summarized on Figure 7-2. Groundwater samples were submitted for laboratory analysis of DRO, RRO, dissolved iron, and sulfate as summarized in Table A-1. Final field measurements recorded prior to groundwater sample collection are presented on Table C-1. Contaminant and geochemical concentrations for sampling events between 2015 and 2019 are shown in Table 7-2. Complete analytical results are presented in Table A-6.

Four wells had DRO concentrations that exceeded ADEC CULs in 2019. These wells (AP-6729, AP-7178, AP-7189, and AP-7191) are located directly downgradient of Former Building 3564 and historically have had DRO concentrations exceeding the ADEC CUL. Graph 7-1 presents DRO concentrations in these four wells.

Graph 7-1 – DRO Concentrations in Former Building 3564 Wells



The two additional wells that are sampled in 2019, AP-7183 and MW3564-1, have never had DRO (or any other contaminant) exceeding the ADEC CUL. MW3564-1 is located further downgradient from Former Building 3564; while AP-7183 is located crossgradient of Former Building 3564 and in the direction of a Fort Wainwright water supply well (Building 3559).

RRO also exceeded the ADEC CUL in AP-7178 and AP-7189 but has never exceeded the ADEC CUL in any other well (except AP-7187 which can no longer be sampled).

The AS/SVE treatment system at Former Building 3564 operated for a relatively short period of time (between 1996 and 1998) and did not appear to have a long-term influence in DRO and RRO concentrations. However, the system was effective in remediating GRO and benzene at the site.

7.3 Geochemical Field Measurements and Analytical Results

Table 7-2 includes geochemical data for Former Building 3564 wells between 2015 and 2019. Groundwater directly downgradient of Former Building 3564 appears to be highly reduced based upon the negative ORP, very high DO, and depleted sulfate concentrations. The data suggests

that there is a lack of electron acceptors to enable anaerobic biodegradation of remaining petroleum hydrocarbons at the site. However, groundwater in wells located further downgradient (MW3564-1) and crossgradient (AP-7183) have essentially background geochemistry, indicating that the influence of the contaminant plume is not expanding in those directions.

7.4 Contaminant Trend and Plume Stability Evaluation

The MAROS software was used to evaluate DRO and RRO contaminant trends in individual wells. DRO plume stability was also evaluated using MAROS. The MAROS output is included in Appendix D and the results are summarized in the following sections.

7.4.1 Mann-Kendall Trend

Mann-Kendal concentration trends for DRO and RRO were determined at the Former Building 3564 site for the post-treatment period (1998 through 2019) and are presented in Table 7-3.

Table 7-3. Mann-Kendall Trend Analysis Summary, Former Building 3564

Well	Mann-Kendall Trend
	DRO
AP-6729	**No Trend**
AP-7178	**No Trend**
AP-7183	Increasing
AP-7187	**Stable**[1]
AP-7189	**No Trend**
AP-7191	**Increasing**
MW3564-1	Stable

BOLD indicates DRO concentrations were more than ½ the ADEC CUL in 2019

[1] Based on 2018 concentrations

The Mann-Kendall analysis showed a variety of contaminant concentrations trends for wells at the site, although none of the wells had decreasing DRO trends.

7.4.2 Plume Stability Evaluation

The MAROS software spatial moment analysis was used to evaluate the DRO plume stability based on estimated contaminant mass, the trend in the distance from the source to the center of mass, and the trend of plume spread around the center of mass. The MAROS output is included in Appendix D and is summarized as follows:

- Analysis showed the contaminant mass had an "increasing" trend which is consistent with the increasing DRO concentration trend in several wells.

- The distance from the center of mass to the source had a "stable" trend.
- The contaminant plume spread had a "decreasing" trend.

7.4.3 Sample Frequency Optimization

The MAROS analysis recommended continuing the annual sample frequency.

7.4.4 Well Redundancy

The MAROS analysis showed that there is a small-moderate slope factor (uncertainty of contaminant concentrations) in the vicinity of AP-7187. In addition, well AP-7187 is located on the opposite side (upgradient) to the water supply well, and another downgradient well (AP-7189) is located nearby. It is recommended this well be decommissioned.

7.5 Summary and Recommendations

Groundwater results have showed variability in DRO concentrations, but limited contaminant migration. Continuing annual groundwater sampling is recommended. Well AP-7187 has been damaged, cannot be sampled, and should be decommissioned. The well is located slightly cross-gradient of the contaminant source and has had considerably lower DRO/RRO concentrations than AP-7189.

Table 7-2. 2015-2019 Groundwater Sample Results
Former Building 3564

Location	Sample Date	Sample Number	Geochemical Concentrations				Contaminant Concentrations (µg/L)	
			ORP (mV)	Dissolved Oxygen (mg/L)	Dissolved Iron[1] (mg/L)	Sulfate (mg/L)	DRO	RRO
ADEC Cleanup Levels[3]			*NA*	*NA*	*NE*	*NE*	**1,500**	**1,100**
AP-6729	7/21/15	15FW6407WG	-121.8	0.32	45.2	0.79	**4,440**	703
	8/19/16	16FW6407WG	-85.0	0.27	25.5	19.6	**2,240**	381 J, B
	8/3/17	17FW6403WG	-127.1	0.41	28.2	4.5	**3,670**	476 J
	8/9/18	18FW6407WG	-128.5	0.54	34.5	3.63	**6,150**	909
	6/24/19	19FW6407WG	-133.6	0.79	60.4	3.2	**7,870**	837
AP-7178	7/21/15	15FW6408WG	-83.3	0.25	38.10	6.09	**31,500**	**4,060**
	8/19/16	16FW6406WG	-59.2	0.26	20.7	10.9	**8,650**	**1,850**
	8/3/17	17FW6402WG	-98.1	0.44	54.5	1.25	**24,200**	**4,590**
	8/9/18	18FW6406WG	-104.7	0.68	50.8	0.369	**33,700**	**4,530**
	6/24/19	19FW6406WG	-61.2	0.90	40.9	0.26	**29,270**	**5,980**
AP-7183	7/21/15	15FW6406WG	49.50	1.24	ND (0.25)	48.0	ND (332)	202 J
	8/19/16	16FW6408WG	41.20	0.85	ND (0.25)	62.5	175 J	204 J, B
	8/3/17	17FW6401WG	46.60	1.67	ND (0.25)	51.3	325 J, B	ND (256)
	8/9/18	18FW6408WG	46.00	0.82	ND (0.25)	52.5	227 J	ND (272)
	6/24/19	19FW6405WG	75.30	1.78	ND (0.25)	65.1	ND (283)	ND (236)
AP-7187	7/21/15	15FW6404WG	-76.4	0.32	6.68	16.6	**1,840**	501 J
	7/21/15	15FW6405WG			6.52	14.8	1,470	193 J
	8/19/16	16FW6405WG	11.30	0.39	9.42	55.7	**20,700**	**2,430**
	8/4/17	17FW6404WG	-93.5	0.48	7.33	16.6	**4,760**	249 J
	8/9/18	18FW6405WG	-91.7	1.39	22.3	15.8	**8,900**	834
	6/24/19	Well Broken - Could not Collect Sample						
AP-7189	7/21/15	15FW6403WG	-93.3	0.21	87.6	1.27	**53,600**	**2,960**
	8/19/16	16FW6404WG	-32.9	0.25	42.2	4.6	**40,400**	**2,800**
	8/4/17	17FW6408WG	-101.6	0.40	84.6	0.7	**26,200**	**1,760**
	8/8/18	18FW6404WG	-113.5	1.80	57.8	1.17	**33,600**	**2,190**
	6/24/19	19FW6404WG	-102.1	2.55	51.2	0.342	**18,500**	**1,140**
AP-7191	7/21/15	15FW6402WG	-132.4	0.32	57.00	3.8	**9,630**	837
	8/19/16	16FW6402WG	-61.9	0.30	21.1	7.96	**3,950**	540 J,B
	8/19/16	16FW6403WG			21.4	7.76	**3,660**	385 J,B
	8/4/17	17FW6406WG	-134.4	0.5	51.0	1.48	**4,850**	385 J
	8/4/17	17FW6407WG			50.7	1.51	**4,060**	254 J
	8/8/18	18FW6402WG	-146.1	1.00	38.6	0.694	**6,530**	584
	8/8/18	18FW6403WG			37.0	0.657	**6,310**	598
	6/21/19	19FW6402WG	-150	0.49	55.4	3.76	**3,230**	ND (245)
MW3564-1	7/21/15	15FW6401WG	-33.7	0.41	0.739	44.7	ND (347)	ND (289)
	8/19/16	16FW6401WG	-51	0.34	1.59	28.0	332 J	ND (272)
	8/4/17	17FW6405WG	-31.3	0.95	1.53	40.3	497 J, B	ND (250)
	8/8/18	18FW6401WG	-30.40	1.60	0.80	37.3	ND (329)	ND (274)
	6/21/19	19FW6401WG	-32.6	0.87	0.96	43.5	ND (288)	ND (240)

Notes:

Green and bold results exceed current ADEC groundwater cleanup levels

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

[3] Cleanup level established from Title 18, Alaska Administrative Code, Section 75.345, Table C (ADEC, 2018)

Data Qualifiers

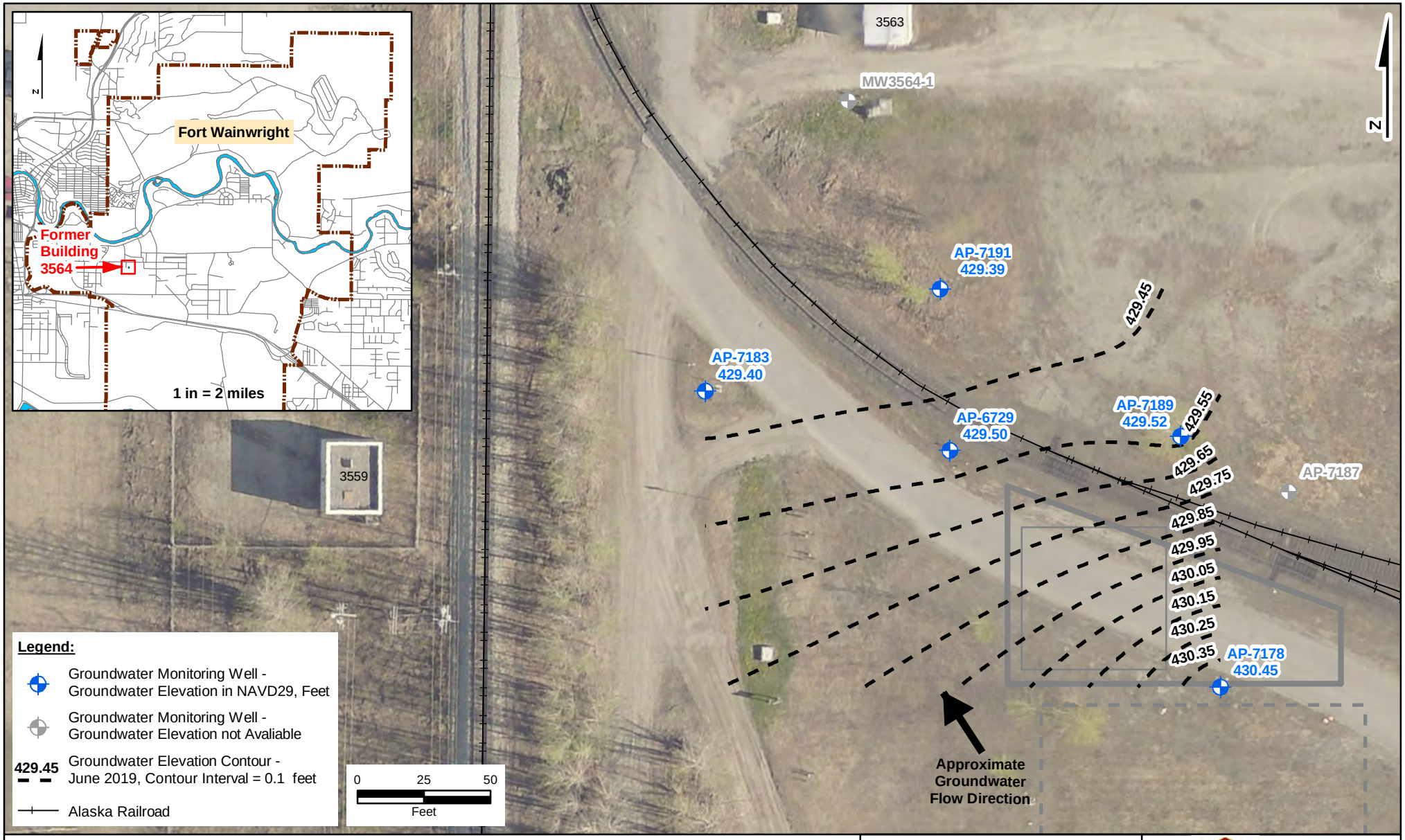
ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)

B - Result is qualified as a potential high estimate due to contamination present in a blank sample

J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).

Acronyms/Abbreviations

DRO - diesel range organics
RRO - residual range organics
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - not analyzed or not applicable
NE - not established
LOD - limit of detection
LOQ - limit of quantitation
ORP - oxidation-reduction potential
mV - millivolts



Note:

1. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Well Locations and Groundwater Elevations, Former Building 3564

2019 Two-Party Sites Work Plan
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 7-1	Date: 11/19

AP-7183	Jun-96	Oct-96	Sep-97	Sep-98	Aug-00	Oct-02
GW Elev	-	-	-	-	-	430.61
DRO	210	160	110	ND(250)	65	ND(550)
RRO	NA	NA	NA	NA	NA	ND(1,100)
GRO	49	ND(100)	ND(34)	ND(100)	ND(100)	ND(90)
Benzene	0.05	ND(1)	ND(1)	ND(1)	ND(2)	ND(0.5)
AP-7183	**Aug-03**	**Sep-04**	**Sep-05**	**Oct-06**	**Sep-07**	**Sep-08**
GW Elev	431.81	429.56	430.28	429.88	430.31	430.93
DRO	ND(120)	96.3	101	94.9	68	43
RRO	ND(190)	302	222	284	206	54
GRO	ND(90)	ND(90)	ND(90)	14.7	ND(100)	ND(50)
Benzene	ND(0.5)	ND(0.5)	ND(0.5)	0.181	ND(0.5)	ND(1)
AP-7183	**Sep-09**	**Oct-10**	**Oct-11**	**Oct-12**	**Sep-13**	**Jul-14**
GW Elev	430.18	429.09	430.11	429.81	429.91	433.19
DRO	110	ND(800)	ND(652)	ND(388)	ND(396)	ND(300)
RRO	98	219	NA	NA	NA	ND(250)
GRO	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	ND(0.24)	NA	NA
AP-7183	**Jul-15**	**Aug-16**	**Aug-17**	**Aug-18**	**Jun-19**	
GW Elev	429.37	433.12	430.13	430.71	429.40	
DRO	ND(332)	175	325	227	ND(283)	
RRO	ND(202)	204	ND(256)	ND(272)	ND(236)	
GRO	NA	NA	NA	NA	NA	
Benzene	NA	NA	NA	NA	NA	

AP-7191	Jun-96	Oct-96	Sep-97	Aug-00	Oct-02	Aug-03	Sep-04	Sep-05	Oct-06	Sep-07	Sep-08	Sep-09	Oct-10	Oct-11	Oct-12	Sep-13	Jul-14	Jul-15	Aug-16	Aug-17	Aug-18	Jun-19
GW Elev	-	-	-	-	430.74	431.87	429.56	430.25	429.87	430.32	430.92	430.19	428.97	430.11	429.92	429.96	433.04	429.5	433.01	430.01	430.48	429.39
DRO	2,100	1,400	280	62	3,150	1,360	3,010	1,770	2,020	2,070	1,700	2,400	2,790	2,780	4,190	1,950	2,450	9,630	3,950	4,850	6,530	3,230
RRO	NA	NA	NA	NA	ND(1,100)	ND(330)	704	499	445	536	190	200	518	NA	NA	NA	175	837	540	385	598	ND(245)
GRO	150	74	ND(34)	ND(100)	ND(90)	ND(90)	37.3	ND(90)	23.8	20.1	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.25	ND(1)	ND(0.1)	ND(2)	ND(0.5)	ND(0.5)	0.158	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	NA	NA	NA	ND(0.24)	NA	NA	NA	NA	NA	NA	NA

MW3564-1	Sep-04	Sep-05	Oct-06	Sep-07	Sep-08	Sep-09	Oct-10	Oct-11	Oct-12	Sep-13	Jul-14	Jul-15	Aug-16	Aug-17	Aug-18	Jun-19
GW Elev	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DRO	420	138	305	388	220	470	359	325	326	ND(386)	283	ND(347)	332	497	ND(329)	ND(288)
RRO	358	233	231	306	63	120	255	NA	NA	NA	NA	ND(261)	ND(289)	ND(272)	ND(250)	ND(240)
GRO	17.6	ND(90)	14	23.9	ND(50)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	ND(0.5)	ND(0.5)	ND(0.5)	0.223	0.35	NA	NA	NA	ND(0.24)	NA	NA	NA	NA	NA	NA	NA

AP-7189	Jun-96	Oct-96	Sep-97	Sep-98	Aug-00	Oct-01	Oct-02	Aug-03	Sep-04	Sep-05	Oct-06	Sep-07
GW Elev	-	-	-	-	-	429.89	431.94	431.94	429.61	430.39	429.97	430.45
DRO	9,600	14,000	5,900	4,300	4,100	19,100	39,600	45,100	16,900	18,600	6,760	9,410
RRO	NA	NA	NA	NA	NA	1,300	ND(6,060)	2,320	1,280	2,330	506	1,500
GRO	2,600	3,400	ND(34)	830	1,100	970	755	712	999	394	371	418
Benzene	45	28	11	ND(1)	5.5	9.7	3.8	1.9	5.1	3.91	3.59	2.79
AP-7189	**Sep-08**	**Sep-09**	**Oct-10**	**Oct-11**	**Oct-12**	**Sep-13**	**Jul-14**	**Jul-15**	**Aug-16**	**Aug-17**	**Aug-18**	**Jun-19**
GW Elev	431.12	430.28	429.14	430.27	430.04	430.06	433.2	429.72	433.14	430.06	430.67	429.52
DRO	35,000	10,000	6,530	8,650	18,000	21,500	32,300	53,600	40,400	26,200	33,600	18,500
RRO	990	730	811	NA	NA	NA	3,070	2,960	2,800	1,760	2,190	1,140
GRO	420	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.71	NA	NA	NA	1.9	NA	NA	NA	NA	NA	NA	NA

AP-6729	Jun-96	Oct-96	Sep-97	Sep-98	Aug-00	Oct-01
GW Elev	-	-	-	-	-	429.84
DRO	1,900	3,000	890	ND(250)	180	6,300
RRO	NA	NA	NA	NA	NA	1,100
GRO	50	180	ND(34)	ND(100)	ND(100)	ND(90)
Benzene	8.9	16	ND(0.1)	ND(1)	ND(2)	ND(0.5)
AP-6729	**Oct-02**	**Aug-03**	**Sep-04**	**Sep-05**	**Oct-06**	**Sep-07**
GW Elev	430.79	431.73	429.62	430.38	429.95	430.40
DRO	3,550	1,040	4,440	2,920	3,330	1,720
RRO	ND(1,130)	ND(335)	884	759	477	801
GRO	ND(90)	ND(90)	40.8	ND(90)	41.3	43.4
Benzene	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.319	ND(0.5)
AP-6729	**Sep-08**	**Sep-09**	**Oct-10**	**Oct-11**	**Oct-12**	**Sep-13**
GW Elev	431.06	430.30	429.11	430.26	430.02	430.02
DRO	550	2,700	3,270	1,860	1,090	1,950
RRO	110	320	701	NA	NA	NA
GRO	0.02	NA	NA	NA	NA	NA
Benzene	0.35	NA	NA	NA	ND(0.24)	NA
AP-6729	**Jul-14**	**Jul-15**	**Aug-16**	**Aug-17**	**Aug-18**	**Jun-19**
GW Elev	433.32	429.65	433.20	430.24	430.80	429.50
DRO	1,430	4,440	2,240	3,670	6,150	7,870
RRO	ND(250)	703	381	476	909	837
GRO	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA

AP-7178	Jun-96	Oct-96	Sep-97	Sep-98	Aug-00	Oct-01	Oct-02	Aug-03	Sep-04	Sep-05	Oct-06	Sep-07	Sep-08	Sep-09	Oct-10	Oct-11	Oct-12	Sep-13	Jul-14	Jul-15	Aug-16	Aug-17	Aug-18	Jun-19
GW Elev	-	-	-	-	-	430.04	431	432.04	429.82	430.35	429.81	430.22	430.35	431.04	429.88	430.84	430.59	430.75	433.96	430.32	433.85	430.86	431.39	430.45
DRO	4,500	14,000	3,500	5,600	2,000	1,900	3,440	50,600	5,200	4,240	3,400	7,560	13,000	650	480	80,600	1,010	431	6,490	31,500	8,650	24,200	33,700	29,200
RRO	NA	NA	NA	NA	NA	ND(1,100)	1,180	6,550	1,340	941	704	1,240	670	120	185	NA	NA	NA	438	4,060	1,850	4,590	4,530	5,980
GRO	940	600	ND(34)	ND(100)	ND(100)	ND(90)	ND(90)	ND(50)	30.8	ND(90)	22.3	18.6	ND(50)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	22	19	ND(0.1)	ND(1)	ND(2)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	0.216	0.351	ND(0.5)	0.38	NA	NA	NA	ND(0.24)	NA	NA	NA	NA	NA	NA	NA

AP-7187	Jun-96	Oct-96	Sep-97	Sep-98	Aug-00	Oct-01	Oct-02	Aug-03	Sep-04	Oct-06	Sep-07	Sep-08	Sep-09	Oct-10	Oct-11	Oct-12	Sep-13	Jul-14	Jul-15	Aug-16	Aug-17	Aug-18	Jun-19
GW Elev	-	-	-	-	-	429.93	430.89	432.02	429.68	430.03	430.49	431.16	430.41	429.26	430.31	430.06	430.18	433.3	429.72	433.19	430.26	430.55	NA
DRO	4,500	4,400	4,300	4,600	2,700	4,900	31,300	39,200	2,840	4,310	30,600	44,000	9,500	7,360	10,500	5,390	5,850	28,400	1,840	20,700	4,762	8,900	Well Damaged - No Sample Collected
RRO	NA	NA	NA	NA	NA	ND(1,100)	ND(5,750)	2,380	534	526	3,780	3,000	730	1,060	1,260	454	291	3,830	501	2,430	249	834	
GRO	3,100	2,000	930	1,100	600	520	350	770	122	92.8	159	610	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Benzene	29	13	10	ND(5)	ND(2)	ND(0.5)	0.6	ND(0.5)	0.16	0.353	ND(0.5)	0.38	NA	NA	NA	ND(0.24)	NA	NA	NA	NA	NA	NA	

Backup Water Supply Well (Building 3563)

MW3564-1

AP-7191

AP-7183

AP-6729

AP-7189

AP-7187

AP-7180

AP-7178

Water Supply Well (Building 3559)

Approximate extent of concrete ballast buried 12.5' to 15' below grade

Approximate extent of former AS/SVE treatment system

Former Building 3564

AP-7185

Approximate Groundwater Flow Direction

AP-7176

Legend:

- Groundwater Monitoring Well
- Alaska Railroad
- Fence Line

0 35 70 Feet

Acronyms and Abbreviations:

Units
- µg/L - micrograms per liter

Analytes
- DRO - Diesel Range Organics
- GRO - Gasoline Range Organics
- RRO - Residual Range Organics

Other
- AAC - Alaska Administrative Code
- ADEC - Alaska Department of Environmental Conservation
- BTOC - below top of casing
- CULs - Cleanup Levels
- GW - groundwater
- Elev - elevation
- NA - not analyzed
- ND - Not Detected (limit of detection)

ADEC GROUNDWATER CULs 18 AAC 75, Table C, 2018 Units in µg/L	
DRO	1,500
RRO	1,100
GRO	2,200
Benzene	4.6

Notes:

1. Sample data shown in GREEN indicate analyte concentration exceeds ADEC CULs (18 AAC 75, Table C)
2. Wells no longer sampled are shown in grayscale.
3. Data flags are not included on figure due to map space limitations. Data flags are presented on Table A-6.
4. Groundwater elevations are in the National Geodetic Vertical Datum (NGVD29), feet
5. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Groundwater Contaminant Concentrations, Former Building 3564

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005 | Figure: 7-2 | Date: 11/19

8.0 FORMER BUILDING 5110

This section presents the 2019 groundwater monitoring results for the Building 5110 site.

8.1 Monitoring Well Locations and Groundwater Elevations

Three wells located at the Former Building 5110 site were sampled during 2019; their locations are shown on Figure 8-1. Water levels were measured prior to sampling each well. Monitoring well details, water levels, and groundwater elevations are summarized in Table 8-1. The well elevation for AP-5918R is not available and thus the groundwater elevation cannot be determined. In addition, the relative groundwater elevations of the remaining two wells (AP-5737 and AP-5738) is greater (nearly one foot) than would be expected over a relatively small horizontal distance (approximately 30 feet). Groundwater at the site would be expected follow the northwesterly regional groundwater flow direction.

Table 8-1 – Monitoring Well Summary, Former Building 5110

Well Number	Total Well Depth (feet btoc)	Screened Interval (feet bgs)	Well Elevation (feet – NAVD88)	Date	Water Level (feet btoc)	Water Elevation (feet – NAVD88)
AP-5737	20.3	7-17	444.83	6/19/19	17.58	440.57
AP-5738	27.0	17-27	444.56	6/19/19	17.43	439.45
AP-5918R	25.3	12-22	NA	6/19/19	18.67	NA

NA – not available

8.2 Groundwater Contaminant Analytical Results

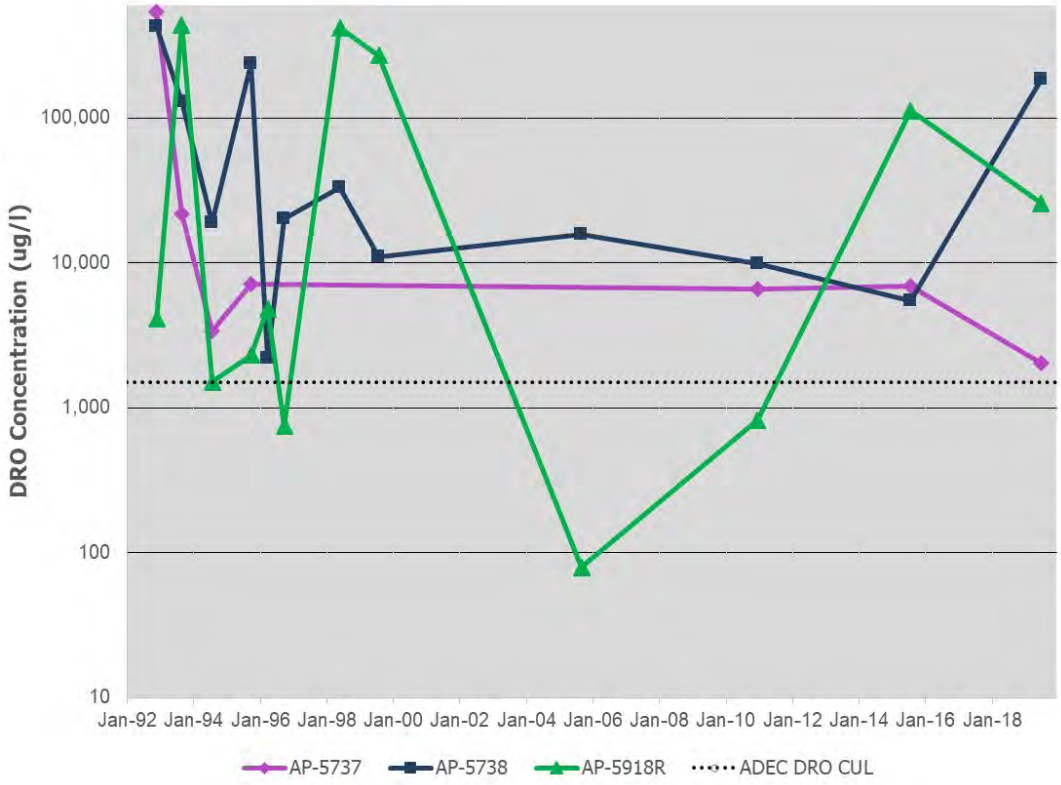
Three monitoring wells were sampled during the 2019 sampling event. Well locations and current and historical groundwater contaminant concentrations are presented on Figure 8-2. Groundwater samples were submitted for laboratory analysis of GRO, DRO, BTEX, dissolved iron, dissolved manganese, and sulfate as summarized in Table A-1. Final field measurements recorded prior to groundwater sample collection are presented on Table C-1. Groundwater contaminant concentrations of samples collected between 2010 and 2019 are included in Table 8-2. Complete analytical results are presented in Table A-7.

DRO and ethylbenzene exceeded ADEC CULs in all three Former Building 5110 wells that were sampled in 2019. Xylenes exceeded the ADEC CUL in AP-5737 and AP-5738, and benzene and GRO exceeded the ADEC CUL in AP-5738.

DRO concentrations have fluctuated at the Former Building 5110 site, varying by nearly four orders of magnitude in AP-5918R. The DRO concentration was highest in AP-5738 in 2019. DRO concentrations have remained above the ADEC CUL in AP-5737 and AP-5738 in every sampling

event, and has been below the ADEC CUL in only three of 12 sampling events of AP-5918R. Graph 8-1 presents DRO concentrations in Former Building 5110 wells.

Graph 8-1 – DRO Concentrations in Former Building 5110 Wells



Benzene concentrations have decreased by two orders of magnitude in Former Building 5110 wells. While benzene slightly exceeded the ADEC CUL in AP-5738 in 2019; benzene was not detected, or detected below the LOQ, in the other two wells. Graph 8-2 presents benzene concentrations in Former Building 5110 wells.

Graph 8-2 – Benzene Concentrations in Former Building 5110 Wells

8.3 Geochemical Field Measurements and Analytical Results

Table 8-2 presents geochemical data for Former Building 5110 wells between 2010 and 2019. Geochemical results indicate that groundwater in the vicinity of the three monitoring wells located at the site is highly reduced as a result of biodegradation of petroleum hydrocarbons. Low and/or negative ORP, low DO, elevated dissolved iron and manganese, and decreased sulfate concentrations are all indicative of reduced groundwater geochemistry. Biodegradation of remaining petroleum contamination is likely limited by a lack of electron acceptors. However, based upon the decreases over time in benzene and other contaminants, natural attenuation of non-DRO contaminants appears to continue.

8.4 Contaminant Concentration Trend and Plume Stability Evaluation

Mann-Kendall trend analysis was performed for the Former Building 5110 wells using MAROS software to evaluate DRO concentration trends over time. Plume stability trend analysis could not be performed due to an insufficient number of wells. The trend was evaluated using groundwater data between 1991 and 2019, and the results are presented in Appendix D and summarized in Table 8-3.

Table 8-3. Mann-Kendall Trend Analysis Summary, Former Building 5110

Well	Mann-Kendall Trend		
	Benzene	**DRO**	**GRO**
AP-5737	**Decreasing**	**Probably Decreasing**	**Stable**
AP-5738	**Decreasing**	**No Trend**	**Stable**
AP-5918R	**Probably Decreasing**	**Decreasing**	**No Trend**

BOLD indicates DRO concentration above ½ the ADEC CUL in 2019

Table 8-3 indicates that the wells generally have stable and decreasing trends, and none of the wells have increasing trends for benzene, DRO, or GRO.

8.5 Summary and Recommendations

Although contaminant concentrations remain above ADEC CULs, geochemical data demonstrates that contaminant degradation is continuing and trend analysis shows that contaminant concentrations are primarily decreasing or are stable. Groundwater sample frequency should continue every five years and be conducted to coincide with Five Year Reviews. The next scheduled sampling event for these wells is 2024, in advance of the 2025 Five Year Review.

Table 8-2. 2010 - 2019 Groundwater Sample Results
Former Building 5110

Well Number	Sample Number	Date	Geochemical Parameters					Contaminant Concentrations (µg/L)				
			ORP (mV)	Dissolved Oxygen (mg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	GRO	DRO	Benzene	Ethylbenzene	Xylenes
ADEC CLEANUP LEVELS[1]			*NA*	*NA*	*NE*	**0.43**	*NE*	**2200**	**1500**	**4.60**	**15**	**190**
AP-5737	10FW5104WG	12/16/2010	NA	NA	NA	NA	NA	**2,210**	**6,660**	**26.6**	**35**	**764**
	15FW5101WG	7/22/2015	3.9	0.69	8.65	**1.48**	0.373	236	**6,860**	ND (0.2)	1.95 Q	7.75 Q
	15FW5102WG[2]	7/22/2015			8.5	**1.45**	0.397	209	**6,530**	0.13 J	2.96 Q	11.2 Q
	19FW5102WG	6/26/2019	22.6	0.79	4.88	0.404	0.388	1090 J+	**2,030**	0.12 J	**25.8**	**216**
	19FW5103WG[2]	6/26/2019			5.28	0.394	0.418	1260 J+	**1,900**	0.13 J	**30.3**	**255**
AP-5738	10FW5102WG	12/16/2010	NA	NA	NA	NA	NA	**3780 Q**	**9800 Q**	**12.9**	**59.9**	**1,486**
	10FW5103WG[2]	12/16/2010			NA	NA	NA	**3700 Q**	**7,210**	**13.5**	**62.2**	**1,511**
	15FW5101WG	7/22/2015	-58.4	0.26	19.7	**4.41**	0.185	1,360	**5,550**	**8.1**	**28.2**	**224**
	19FW5103WG	6/26/2019	-72.8	0.91	35.9	**2.34**	0.452	**6,390**	**186,000**	**7.85**	**204**	**2,120**
AP-5918R	10FW5101WG	12/16/2010	NA	NA	11.1	NA	20.4	42 J	ND (821)	ND (0.4)	0.7 J	2.32
	15FW5101WG	7/22/2015	-41.8	0.41	16.0	**1.75**	7.48	1180 Q	**112,000**	ND (0.2)	**53.2**	136
	19FW5101WG	6/26/2019	-44.4	0.80	14.9	**1.630**	11	756 J	**25,700**	ND (0.2)	**19.6**	94.9

Notes

Results in green and bold font exceeded ADEC CULs

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

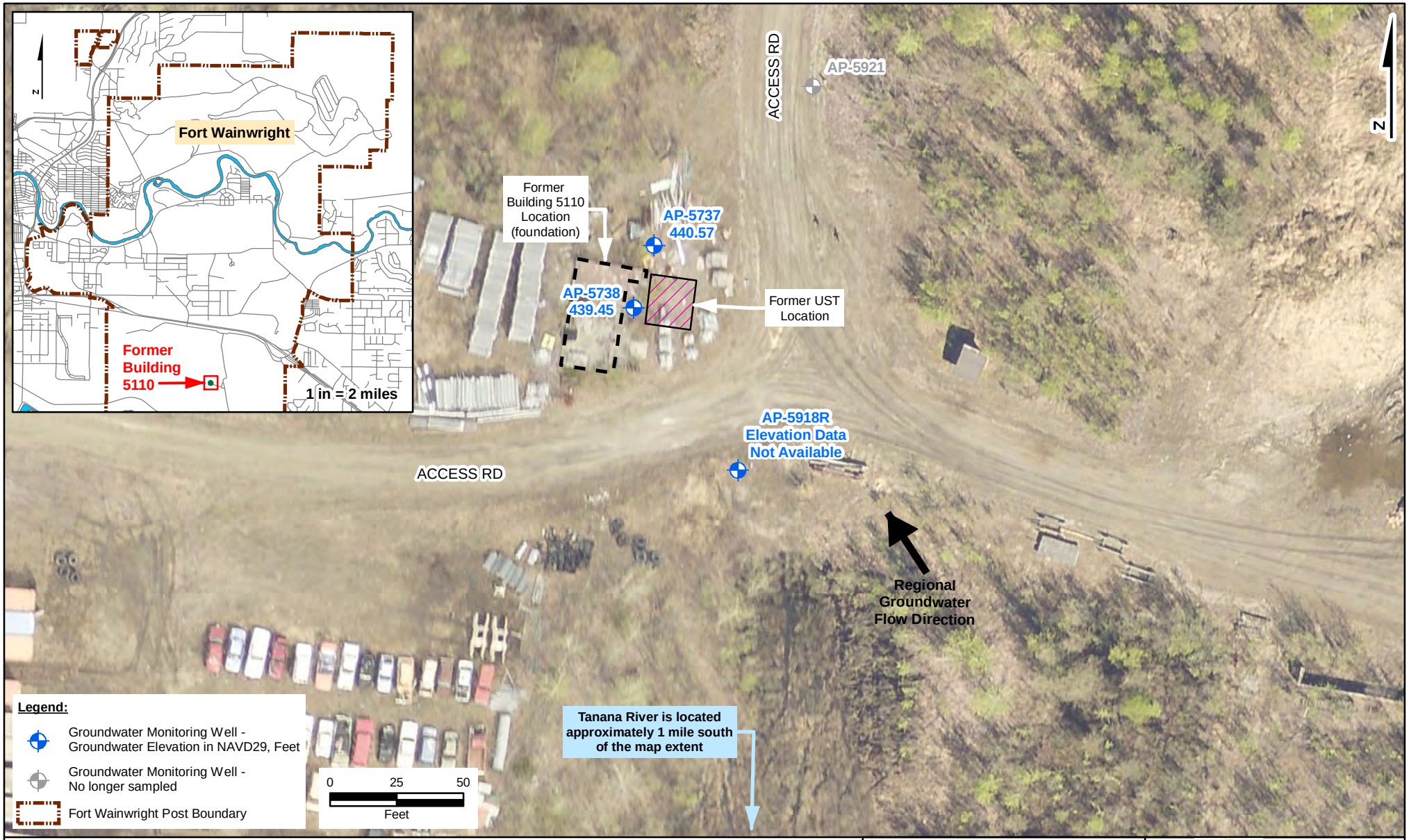
[2] Sample is a Field Duplicate of the sample immediately above.

Data Qualifiers

ND - Not detected at the detection limit (LOD in parentheses; LOQ in parentheses for data prior to 2012.)
B - Result is qualified as a potential high estimate due to contamination present in a blank sample
J - Result is estimated due to a QC issue or because it is less than the LOQ. If result is biased low or high, it is specified as "J-" and "J+", respectively (for 2014 data and later).
Q - result qualifed as estimate due to QC failure

Acronyms/Abbreviations

DRO - diesel range organics
GRO - gasoline range organics
µg/L - micrograms per liter
mg/L - milligrams per liter
NA - not analyzed or not applicable
NE - not established
LOD - limit of detection
LOQ - limit of quantitation
ORP - oxidation-reduction potential
mV - millivolts



Note:

1. Not enough data (only 2 data points) to create groundwater elevation contours
2. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

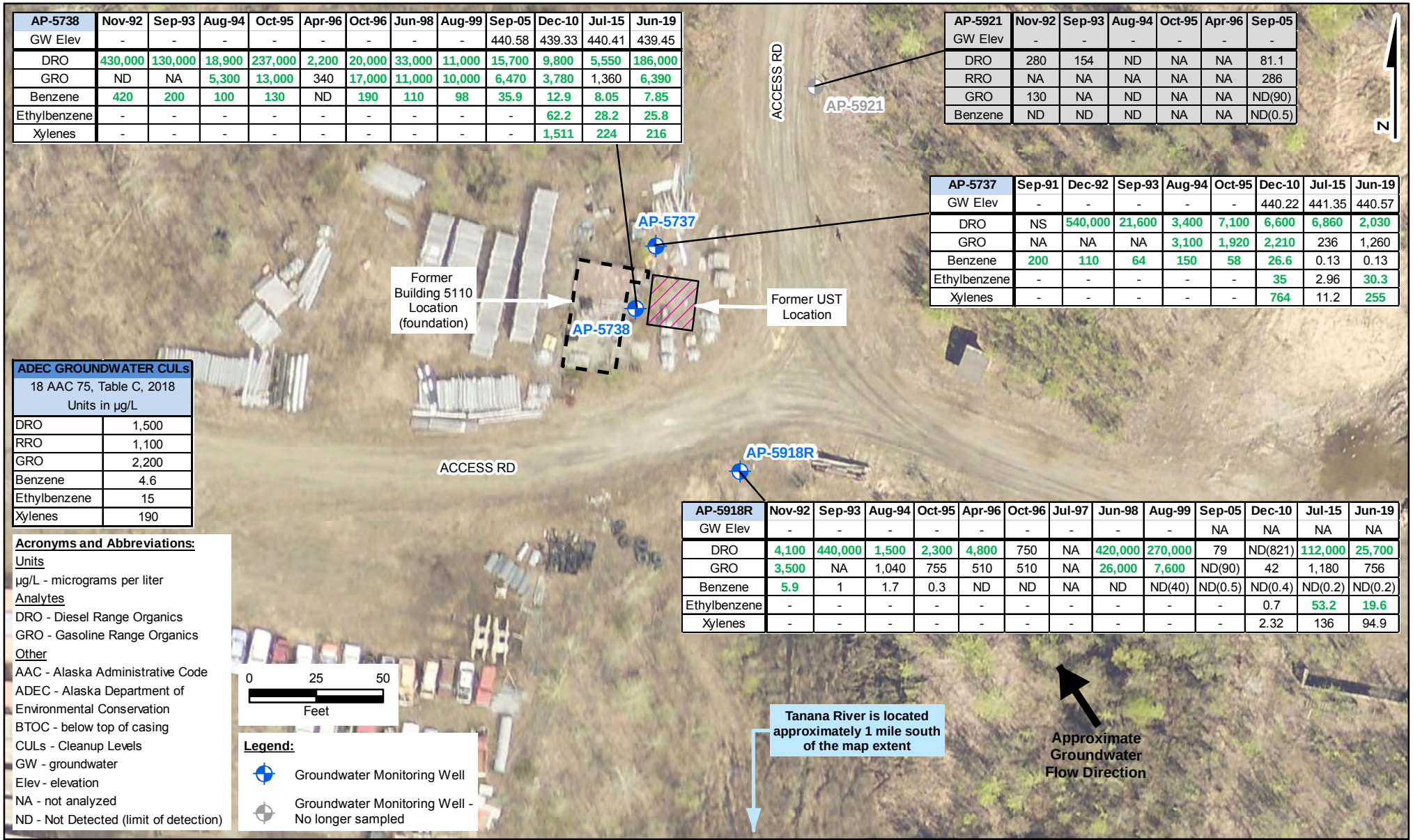
Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Well Locations and Groundwater Elevations, Former Building 5110

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005	Figure: 8-1	Date: 11/19



AP-5738	Nov-92	Sep-93	Aug-94	Oct-95	Apr-96	Oct-96	Jun-98	Aug-99	Sep-05	Dec-10	Jul-15	Jun-19
GW Elev	-	-	-	-	-	-	-	-	440.58	439.33	440.41	439.45
DRO	430,000	130,000	18,900	237,000	2,200	20,000	33,000	11,000	15,700	9,800	5,550	186,000
GRO	ND	NA	5,300	13,000	340	17,000	11,000	10,000	6,470	3,780	1,360	6,390
Benzene	420	200	100	130	ND	190	110	98	35.9	12.9	8.05	7.85
Ethylbenzene	-	-	-	-	-	-	-	-	-	62.2	28.2	25.8
Xylenes	-	-	-	-	-	-	-	-	-	1,511	224	216

AP-5921	Nov-92	Sep-93	Aug-94	Oct-95	Apr-96	Sep-05
GW Elev	-	-	-	-	-	-
DRO	280	154	ND	NA	NA	81.1
RRO	NA	NA	NA	NA	NA	286
GRO	130	NA	ND	NA	NA	ND(90)
Benzene	ND	ND	ND	NA	NA	ND(0.5)

AP-5737	Sep-91	Dec-92	Sep-93	Aug-94	Oct-95	Dec-10	Jul-15	Jun-19
GW Elev	-	-	-	-	-	440.22	441.35	440.57
DRO	NS	540,000	21,600	3,400	7,100	6,600	6,860	2,030
GRO	NA	NA	NA	3,100	1,920	2,210	236	1,260
Benzene	200	110	64	150	58	26.6	0.13	0.13
Ethylbenzene	-	-	-	-	-	35	2.96	30.3
Xylenes	-	-	-	-	-	764	11.2	255

ADEC GROUNDWATER CULs 18 AAC 75, Table C, 2018 Units in µg/L	
DRO	1,500
RRO	1,100
GRO	2,200
Benzene	4.6
Ethylbenzene	15
Xylenes	190

AP-5918R	Nov-92	Sep-93	Aug-94	Oct-95	Apr-96	Oct-96	Jul-97	Jun-98	Aug-99	Sep-05	Dec-10	Jul-15	Jun-19
GW Elev	-	-	-	-	-	-	-	-	-	NA	NA	NA	NA
DRO	4,100	440,000	1,500	2,300	4,800	750	NA	420,000	270,000	79	ND(821)	112,000	25,700
GRO	3,500	NA	1,040	755	510	510	NA	26,000	7,600	ND(90)	42	1,180	756
Benzene	5.9	1	1.7	0.3	ND	ND	NA	ND	ND(40)	ND(0.5)	ND(0.4)	ND(0.2)	ND(0.2)
Ethylbenzene	-	-	-	-	-	-	-	-	-	-	0.7	53.2	19.6
Xylenes	-	-	-	-	-	-	-	-	-	-	2.32	136	94.9

Acronyms and Abbreviations:

Units
µg/L - micrograms per liter
Analytes
DRO - Diesel Range Organics
GRO - Gasoline Range Organics
Other
AAC - Alaska Administrative Code
ADEC - Alaska Department of Environmental Conservation
BTOC - below top of casing
CULs - Cleanup Levels
GW - groundwater
Elev - elevation
NA - not analyzed
ND - Not Detected (limit of detection)

Notes:

1. Sample data shown in **GREEN** indicate analyte concentration exceeds ADEC CULs (18 AAC 75, Table C)
2. Wells no longer sampled are shown in grayscale.
3. Data flags are not included on figure due to map space limitations. Data flags are presented on Table A-7.
4. Groundwater elevations are in the National Geodetic Vertical Datum (NGVD29), feet
5. Coordinate System - Projection: World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM), Zone 6N

Source:

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

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

Groundwater Contaminant Concentrations, Former Building 5110

2019 Two-Party Sites Monitoring Report
U.S. Army Garrison Alaska

USACE Contract: W911-KB-16-D-0005 | Figure: 8-2 | Date: 11/19

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APPENDIX A

GROUNDWATER SAMPLE TRACKING AND ANALYTICAL RESULTS TABLES

Table A-1. 2019 Sample Summary
Two-Party Sites
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Type	Matrix	Sampler Initials	Sample Date	Sample Time	VOC 8260C	BTEX 8260C	GRO AK101	DRO AK102SV	RRO AK103SV	Dissolved Fe 6020A	Dissolved Mn 6020A	SO4 300.0	Sample Data Group	Cooler ID
DRMO Yard																
19FWDY01WG	PI-3	Primary	WG	CB	6/19/19	1055				X		X		X	1193255	062002,-03
19FWDY02WG	MP-4	Primary	WG	CB	6/19/19	1210				X		X		X	1193255	062002,-03
19FWDY03WG	AP-5826	Primary/MS/MSD*	WG	CB	6/19/19	1315				X*		X*		X*	1193255	062002,-03
19FWDY04WG	AP-4040 (AP-5826)	Field Duplicate of 19FWDY03WG	WG	CB	6/19/19	1330				X		X		X	1193255	062002,-03
19FWDY05WG	AP-6806	Primary	WG	CB	6/19/19	1425				X		X		X	1193255	062002,-03
19FWDY06WG	AP-7346	Primary/MS/MSD*	WG	CB	6/19/19	1520	X*			X					1193255	062001,-03
19FWDY07WG	AP-5050 (AP-7346)	Field Duplicate of 19FWDY06WG	WG	CB	6/19/19	1535	X								1193255	062001
19FWDY08WG	AP-7348	Primary	WG	AS	6/20/19	1220	X			X					1193255	062001,-03
Neely Road																
19FWNR01WG	AP-9684	Primary	WG	AS	6/24/19	1100	X		X	X		X	X	X	1193407	062601,-02
19FWNR02WG	AP-9459	Primary/MS/MSD*	WG	AS	6/24/19	1215	X*		X*	X*		X*	X*	X*	1193407	062601,-02
19FWNR03WG	AP-8080 (AP-9459)	Field Duplicate of 19FWNR02WG	WG	AS	6/24/19	1230	X		X	X		X	X	X	1193407	062601,-02
19FWNR04WG	AP-9003	Primary	WG	AS	6/24/19	1340	X		X	X		X	X	X	1193407	062601,-02
19FWNR05WG	AP-8211	Primary	WG	AS	6/24/19	1500	X		X	X		X	X	X	1193407	062601,-02
19FWNR06WG	AP-9685	Primary	WG	AS	6/24/19	1630	X		X	X		X	X	X	1193407	062601,-02
19FWNR07WG	AP-8211	Primary	WG	CB	9/1/19	955	X		X	X		X	X	X	1195158	090301,-02
19FWNR08WG	AP-9003	Primary	WG	CB	9/1/19	1100	X		X	X		X	X	X	1195158	090301,-02
19FWNR09WG	AP-9459	Primary/MS/MSD*	WG	CB	9/1/19	1150	X*		X*	X*		X*	X*	X*	1195158	090301,-02
19FWNR10WG	AP-8080 (AP-9459)	Field Duplicate of 19FWNR09WG	WG	CB	9/1/19	1205	X		X	X		X	X	X	1195158	090301,-02
19FWNR11WG	AP-9684	Primary	WG	CB	9/1/19	1245	X		X	X		X	X	X	1195158	090301,-02
19FWNR12WG	AP-9685	Primary	WG	CB	9/1/19	1420	X		X	X		X	X	X	1195158	090301,-02
Former Building 1168																
19FW6801WG	AP-5751	Primary	WG	AS	6/19/19	1635	X			X		X		X	1193255	062001,-02,-04
19FW6802WG	AP-6809	Primary	WG	AS	6/19/19	1740	X			X		X		X	1193255	062001,-02,-04
19FW6803WG	AP-10037MW	Primary/MS/MSD*	WG	AS	6/20/19	1000	X*			X*		X*		X*	1193255	062001,-02,-04
19FW6804WG	AP-6060 (AP-10037MW)	Field Duplicate of 19FW6803WG	WG	AS	6/20/19	1015	X			X		X		X	1193255	062001,-02,-04
Former Building 2250																
19FW2201WG	AP-7153	Primary	WG	AS	6/19/19	1120				X		X		X	1193255	062002,-03
19FW2202WG	AP-5976	Primary/MS/MSD*	WG	AS	6/19/19	1250				X*		X*		X*	1193255	062002,-03
19FW2203WG	AP-3030 (AP-5976)	Field Duplicate of 19FW2202WG	WG	AS	6/19/19	1300				X		X		X	1193255	062002,-03
19FW2204WG	AP-7151	Primary	WG	AS	6/19/19	1440				X		X		X	1193255	062002,-03
Former Building 3564																
19FW6401WG	MW3564-1	Primary	WG	CB	6/21/19	1050				X	X	X		X	1193407	062001,-02
19FW6402WG	AP-7191	Primary/MS/MSD*	WG	CB	6/21/19	1205				X*	X*	X*		X*	1193407	062001,-02
19FW6403WG	AP-7070 (AP-7191)	Field Duplicate of 19FW6402WG	WG	CB	6/21/19	1220				X	X	X		X	1193407	062001,-03
19FW6404WG	AP-7189	Primary	WG	CB	6/24/19	1100				X	X	X		X	1193407	062001,-03
19FW6405WG	AP-7183	Primary	WG	CB	6/24/19	1320				X	X	X		X	1193407	062001,-03
19FW6406WG	AP-7178	Primary	WG	CB	6/24/19	1500				X	X	X		X	1193407	062001,-03
19FW6407WG	AP-6729	Primary	WG	CB	6/24/19	1550				X	X	X		X	1193407	062001,-03
--	AP-7187	--	--	--	6/21/19	Well was found damaged (broken below ground surface) and could not be sampled.										

Table A-1. 2019 Sample Summary
Two-Party Sites
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Type	Matrix	Sampler Initials	Sample Date	Sample Time	VOC 8260C	BTEX 8260C	GRO AK101	DRO AK102SV	RRO AK103SV	Dissolved Fe 6020A	Dissolved Mn 6020A	SO4 300.0	Sample Data Group	Cooler ID
Former Building 5110																
19FW5101WG	AP-5737	Primary/MS/MSD*	WG	CB	6/26/19	1010		X*	X*	X*		X*	X*	X*	1193407	062001,-03
19FW5102WG	AP-9090 (AP-5737)	Field Duplicate of 19FW5101WG	WG	CB	6/26/19	1025		X	X	X		X	X	X	1193407	062001,-03
19FW5103WG	AP-5738	Primary	WG	CB	6/26/19	1115		X	X	X		X	X	X	1193407	062001,-03
19FW5104WG	AP-5918R	Primary	WG	CB	6/26/19	1215		X	X	X		X	X	X	1193407	062001,-03
Quality Control Samples																
19FW2PEB01WQ	Rinsate 1	Equipment Blank	WQ	AS	6/20/19	1400	X			X		X		X	1193255	062001,-02,-03
19FW2PTB01WQ	Trip Blank	Trip Blank	WQ	--	6/19/19	800	X								1193255	062001
19FW2PEB02WQ	Rinsate 2	Equipment Blank	WQ	CB	6/24/19	1700				X	X				1193407	062603
19FW2PEB03WQ	Rinsate 3	Equipment Blank	WQ	AS	6/24/19	1800	X		X			X	X	X	1193407	062601
19FW2PTB02WQ	Trip Blank	Trip Blank	WQ	--	6/21/19	800	X		X						1193407	062601
19FW2PEB04WQ	Rinsate 4	Equipment Blank	WQ	CB	9/1/19	1550	X		X	X		X	X	X	1195158	090301,-02
19FW2PTB03WQ	Trip Blank	Trip Blank	WQ	--	9/1/19	800	X		X						1195158	090301

Notes:

All samples were submitted to SGS North America, Inc., of Anchorage, AK for analysis. The standard 21-day turnaround time was requested for all analyses. All work was performed under NPDL work order number 19-098.

* - denotes sample submitted for MS/MSD analysis

BTEX - benzene, toluene, ethylbenzene, xylenes
DRO - diesel range organics
Fe - iron
GRO - gasoline range organics
Mn - manganese
RRO - residual range organics
SO4 - sulfate
VOC - volatile organic compound

AS - Aaron Swank
CB - Chris Boese
mL - milliliter
MS/MSD - matrix spike/matrix spike duplicate
HCl - hydrochloric acid
HDPE - high-density polyethylene

Water Sample Collection (all samples were field-preserved at 0 to 6°C)
VOC/BTEX - three HCl-preserved, 40 mL VOA vials
GRO - three HCl-preserved, 40 mL VOA vials
DRO/RRO - two HCl-preserved, 250 mL amber bottles
Fe/Mn - one HNO3-preserved, 250 mL HDPE bottle, field-filtered
SO4 - one non-preserved, 125 mL HDPE bottle

Table A-2. 2019 Groundwater Sample Results
DRMO Yard
Fort Wainwright, Alaska

			Sample ID	19FWDY01WG	19FWDY02WG	19FWDY03WG	19FWDY04WG	19FWDY05WG	19FWDY06WG	19FWDY07WG	19FWDY08WG	19FW2PEB01WQ	19FW2PTB01WQ
			Location ID	PI-3	MP-4	AP-5826	AP-4040	AP-6806	AP-7346	AP-5050	AP-7348	Rinsate 1	Trip Blank
			Sample Data Group	1193255	1193255	1193255	1193255	1193255	1193255	1193255	1193255	1193255	1193255
			Laboratory ID	1193255001	1193255002	1193255003	1193255006	1193255007	1193255008	1193255025	1193255011	1193255012	1193255026
			Collection Date	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/20/2019	6/20/2019	6/19/2019
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WQ	WQ
			Sample Type	Primary	Primary	Primary/MS/MSD	Field Duplicate of 19FWDY03WG	Primary	Primary/MS/MSD	Field Duplicate of 19FWDY06WG	Primary	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	1,500	1420 [283]	**4200 [283]**	**5630 [283] J**	**1700 [278] J**	**9800 [283]**	285 [278] J	-	**21400 [283]**	ND [350]	-
Iron	SW6020A	µg/L	NE	10200 [250]	9950 [250]	2620 [250]	2700 [250]	15400 [250]	-	-	-	ND [250]	-
Sulfate	E300.0	µg/L	NE	23900 [500]	883 [100]	10300 [500]	9940 [500]	16900 [500]	-	-	-	ND [100]	-
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	10,000	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	-	-	-	-	-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1-Dichloroethane	SW8260C	µg/L	28	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloropropene	SW8260C	µg/L	NE	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trimethylbenzene	SW8260C	µg/L	56	-	-	-	-	-	ND [0.5]	ND [0.5]	**98.7 [0.5]**	ND [0.5]	ND [0.5]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
1,2-Dibromoethane	SW8260C	µg/L	0.075	-	-	-	-	-	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichloroethane	SW8260C	µg/L	1.7	-	-	-	-	-	0.19 [0.25] J	0.18 [0.25] J	ND [0.25]	ND [0.25]	ND [0.25]
1,2-Dichloropropane	SW8260C	µg/L	8.2	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	60	-	-	-	-	-	ND [0.5]	ND [0.5]	45.8 [0.5]	ND [0.5]	ND [0.5]
1,3-Dichlorobenzene	SW8260C	µg/L	300	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3-Dichloropropane	SW8260C	µg/L	4.7	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
2,2-Dichloropropane	SW8260C	µg/L	NE	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
2-Butanone	SW8260C	µg/L	5,600	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
2-Chlorotoluene	SW8260C	µg/L	NE	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
2-Hexanone	SW8260C	µg/L	38	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
4-Chlorotoluene	SW8260C	µg/L	NE	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
4-Isopropyltoluene	SW8260C	µg/L	NE	-	-	-	-	-	ND [0.5]	ND [0.5]	4.39 [0.5]	ND [0.5]	ND [0.5]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Benzene	SW8260C	µg/L	4.6	-	-	-	-	-	ND [0.2]	ND [0.2]	0.58 [0.2]	ND [0.2]	ND [0.2]
Bromobenzene	SW8260C	µg/L	62	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromochloromethane	SW8260C	µg/L	NE	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromodichloromethane	SW8260C	µg/L	1.3	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	0.39 [0.25] J	ND [0.25]
Bromoform	SW8260C	µg/L	33	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	7.5	-	-	-	-	-	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]
Carbon disulfide	SW8260C	µg/L	810	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Carbon tetrachloride	SW8260C	µg/L	4.6	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chlorobenzene	SW8260C	µg/L	78	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
Chloroethane	SW8260C	µg/L	21,000	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chloroform	SW8260C	µg/L	2.2	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	0.56 [0.5] J	ND [0.5]
Chloromethane	SW8260C	µg/L	190	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	-	-	0.36 [0.5] J	0.34 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
Dibromochloromethane	SW8260C	µg/L	8.7	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	0.22 [0.25] J	ND [0.25]
Dibromomethane	SW8260C	µg/L	8.3	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	200	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Ethylbenzene	SW8260C	µg/L	15	-	-	-	-	-	ND [0.5]	ND [0.5]	9.44 [0.5]	ND [0.5]	ND [0.5]
Hexachlorobutadiene	SW8260C	µg/L	1.4	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Isopropylbenzene	SW8260C	µg/L	450	-	-	-	-	-	ND [0.5]	ND [0.5]	4.79 [0.5]	ND [0.5]	ND [0.5]
Methylene chloride	SW8260C	µg/L	110	-	-	-	-	-	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Naphthalene	SW8260C	µg/L	1.7	-	-	-	-	-	ND [0.5]	ND [0.5]	**60.1 [0.5]**	ND [0.5]	ND [0.5]
n-Butylbenzene	SW8260C	µg/L	1,000	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
n-Propylbenzene	SW8260C	µg/L	660	-	-	-	-	-	ND [0.5]	ND [0.5]	6.19 [0.5]	ND [0.5]	ND [0.5]
o-Xylene	SW8260C	µg/L	190	-	-	-	-	-	ND [0.5]	ND [0.5]	34.2 [0.5]	ND [0.5]	ND [0.5]
sec-Butylbenzene	SW8260C	µg/L	2,000	-	-	-	-	-	ND [0.5]	ND [0.5]	3.14 [0.5]	ND [0.5]	ND [0.5]
Styrene	SW8260C	µg/L	1,200	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]

Table A-2. 2019 Groundwater Sample Results
DRMO Yard
Fort Wainwright, Alaska

			Sample ID	19FWDY01WG	19FWDY02WG	19FWDY03WG	19FWDY04WG	19FWDY05WG	19FWDY06WG	19FWDY07WG	19FWDY08WG	19FW2PEB01WQ	19FW2PTB01WQ
			Location ID	PI-3	MP-4	AP-5826	AP-4040	AP-6806	AP-7346	AP-5050	AP-7348	Rinsate 1	Trip Blank
			Sample Data Group	1193255	1193255	1193255	1193255	1193255	1193255	1193255	1193255	1193255	1193255
			Laboratory ID	1193255001	1193255002	1193255003	1193255006	1193255007	1193255008	1193255025	1193255011	1193255012	1193255026
			Collection Date	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/20/2019	6/20/2019	6/19/2019
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WQ	WQ
			Sample Type	Primary	Primary	Primary/MS/MSD	Field Duplicate of 19FWDY03WG	Primary	Primary/MS/MSD	Field Duplicate of 19FWDY06WG	Primary	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
tert-Butylbenzene	SW8260C	µg/L	690	-	-	-	-	-	ND [0.5]	ND [0.5]	0.9 [0.5] J	ND [0.5]	ND [0.5]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Toluene	SW8260C	µg/L	1,100	-	-	-	-	-	ND [0.5]	ND [0.5]	0.75 [0.5] J	ND [0.5]	ND [0.5]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Trichloroethene (TCE)	SW8260C	µg/L	2.8	-	-	-	-	-	0.35 [0.5] J	0.35 [0.5] J	ND [0.5]	ND [0.5]	ND [0.5]
Trichlorofluoromethane	SW8260C	µg/L	5,200	-	-	-	-	-	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Vinyl acetate	SW8260C	µg/L	410	-	-	-	-	-	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	-	-	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]
Xylene, Isomers m & p	SW8260C	µg/L	190	-	-	-	-	-	ND [1]	ND [1]	26.1 [1]	ND [1]	ND [1]
Xylenes	SW8260C	µg/L	190	-	-	-	-	-	ND [1.5]	ND [1.5]	60.3 [1.5]	ND [1.5]	ND [1.5]

Results in green and bold font exceed ADEC CULs

Grey shaded results are non-detect with LODs above ADEC CULs

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

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

Acronyms:
CUL - cleanup level
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
NE - not established
QC - quality control
WG - groundwater
WQ - water QC sample

Table A-3. 2019 Groundwater Sample Results
Neely Road
Fort Wainwright, Alaska

				Sample ID	19FWNR01WG	19FWNR02WG	19FWNR03WG	19FWNR04WG	19FWNR05WG	19FWNR06WG	19FWNR07WG	19FWNR08WG	19FWNR09WG	19FWNR10WG	19FWNR11WG	19FWNR12WG
				Location ID	AP-9684	AP-9459	AP-8080	AP-9003	AP-8211	AP-9685	AP-8211	AP-9003	AP-9459	AP-8080	AP-9684	AP-9685
				Sample Data Group	1193407	1193407	1193407	1193407	1193407	1193407	1195158	1195158	1195158	1195158	1195158	1195158
				Laboratory ID	1193407001	1193407002	1193407005	1193407006	1193407007	1193407008	1195158001	1195158002	1195158003	1195158006	1195158007	1195158008
				Collection Date	6/24/2019	6/24/2019	6/24/2019	6/24/2019	6/24/2019	6/24/2019	09/01/2019	09/01/2019	09/01/2019	09/01/2019	09/01/2019	09/01/2019
				Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
				Sample Type	Primary	Primary/MS/MSD	Field Duplicate of 19FWNR02WG	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 19FWNR09WG	Primary	Primary
Analyte	**Method**	**Units**	**ADEC CUL[1]**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	µg/L	2,200		614 [50]	125 [50]	152 [50]	1550 [50] J+	**2350 [50] J+**	ND [50]	1060 [50]	162 [50]	73.6 [50] J	108 [50] J	250 [50]	ND [50]
Diesel Range Organics	AK102	µg/L	1,500		447 [288] J	901 [288]	860 [288]	1250 [288]	**4920 [294]**	311 [288] J	**3860 [283]**	683 [288] B	445 [278] J,B	375 [283] J,B	429 [283] J,B	281 [183] J,B
Sulfate	E300.0	µg/L	NE		76900 [500]	23600 [500]	26300 [500]	89000 [500]	152000 [1000]	32800 [500]	80700 [1000]	63300 [1000]	28000 [200]	28100 [200]	88800 [1000]	20100 [200]
Iron	SW6020A	µg/L	NE		14800 [250]	7580 [250]	7620 [250]	16300 [250]	7980 [250]	ND [250]	3210 [125]	2450 [125]	3990 [125]	3760 [125]	9730 [125]	ND [125]
Manganese	SW6020A	µg/L	430		**2860 [5]**	**3450 [5]**	**3570 [5]**	**5580 [5]**	**5860 [5]**	343 [1]	**4180 [0.500]**	**1650 [0.500]**	**2820 [0.500]**	**2500 [0.500]**	**2270 [0.500]**	**581 [0.500]**
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	10,000		ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41		ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]	ND [0.200]
1,1-Dichloroethane	SW8260C	µg/L	28		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,1-Dichloroethene	SW8260C	µg/L	280		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,1-Dichloropropene	SW8260C	µg/L	NE		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2,4-Trimethylbenzene	SW8260C	µg/L	56		**60.3 [0.5]**	7.14 [0.5]	9.04 [0.5]	29.7 [0.5]	**780 [5]**	ND [0.5]	**482 [0.500] J**	2.16 [0.500]	1.73 [0.500]	1.88 [0.500]	21.4 [0.500]	ND [0.500]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE		ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
1,2-Dibromoethane	SW8260C	µg/L	0.075		ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,2-Dichloroethane	SW8260C	µg/L	1.7		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
1,2-Dichloropropane	SW8260C	µg/L	8.2		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,3,5-Trimethylbenzene	SW8260C	µg/L	60		22.4 [0.5]	2.99 [0.5] J	4.39 [0.5] J	5.38 [0.5]	**225 [5]**	ND [0.5]	**152 [0.500]**	0.41 [0.500] J	2.68 [0.500]	2.57 [0.500]	7.33 [0.500]	ND [0.500]
1,3-Dichlorobenzene	SW8260C	µg/L	300		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
1,3-Dichloropropane	SW8260C	µg/L	4.7		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
2,2-Dichloropropane	SW8260C	µg/L	NE		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
2-Butanone	SW8260C	µg/L	5,600		ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	11.2 [5.00]	ND [5.00] J	11.5 [5.00] J	ND [5.00]	ND [5.00]
2-Chlorotoluene	SW8260C	µg/L	NE		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
2-Hexanone	SW8260C	µg/L	38		ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
4-Chlorotoluene	SW8260C	µg/L	NE		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
4-Isopropyltoluene	SW8260C	µg/L	NE		1.96 [0.5]	ND [0.5]	0.313 [0.5] J	5.26 [0.5]	25.7 [0.5]	ND [0.5]	16 [0.500]	1.01 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300		ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
Benzene	SW8260C	µg/L	4.6		ND [0.2]	2.63 [0.2]	3.08 [0.2]	1.83 [0.2]	0.477 [0.2]	ND [0.2]	0.26 [0.200] J	0.47 [0.200]	0.86 [0.200]	0.82 [0.200]	ND [0.200]	ND [0.200]
Bromobenzene	SW8260C	µg/L	62		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Bromochloromethane	SW8260C	µg/L	NE		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Bromodichloromethane	SW8260C	µg/L	1.3		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Bromoform	SW8260C	µg/L	33		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Bromomethane	SW8260C	µg/L	7.5		ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]
Carbon disulfide	SW8260C	µg/L	810		ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
Carbon tetrachloride	SW8260C	µg/L	4.6		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Chlorobenzene	SW8260C	µg/L	78		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Chloroethane	SW8260C	µg/L	21,000		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Chloroform	SW8260C	µg/L	2.2		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Chloromethane	SW8260C	µg/L	190		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	0.4 [0.500] J	0.52 [0.500] J	ND [0.500]	0.35 [0.500] J	ND [0.500]	ND [0.500]
cis-1,2-Dichloroethene	SW8260C	µg/L	36		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	0.71 [0.500] J
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Dibromochloromethane	SW8260C	µg/L	8.7		ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]	ND [0.250]
Dibromomethane	SW8260C	µg/L	8.3		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Dichlorodifluoromethane	SW8260C	µg/L	200		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Ethylbenzene	SW8260C	µg/L	15		ND [0.5]	3.1 [0.5]	3.99 [0.5]	**173 [0.5]**	**30.3 [0.5]**	ND [0.5]	**17.6 [0.500]**	12.1 [0.500]	0.36 [0.500] J,B	0.36 [0.500] J,B	ND [0.500]	ND [0.500]
Hexachlorobutadiene	SW8260C	µg/L	1.4		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Isopropylbenzene	SW8260C	µg/L	450		1.05 [0.5]	0.338 [0.5] J	0.395 [0.5] J	21.3 [0.5]	14.4 [0.5]	ND [0.5]	8.09 [0.500]	3.28 [0.500]	ND [0.500]	ND [0.500]	0.52 [0.500] J	ND [0.500]
Methylene chloride	SW8260C	µg/L	110		ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]	ND [2.50]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140		ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]	ND [5.00]
Naphthalene	SW8260C	µg/L	1.7		0.45 [0.5] J	1.68 [0.5]	**1.86 [0.5]**	**25.5 [0.5]**	**201 [5]**	ND [0.5]	**150 [0.500]**	**4.63 [0.500]**	0.72 [0.500] J,J+	**1.74 [0.500] J,J+**	ND [0.500]	0.84 [0.500] J,J-
n-Butylbenzene	SW8260C	µg/L	1,000		ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]

Table A-3. 2019 Groundwater Sample Results
Neely Road
Fort Wainwright, Alaska

			Sample ID	19FWNR01WG	19FWNR02WG	19FWNR03WG	19FWNR04WG	19FWNR05WG	19FWNR06WG	19FWNR07WG	19FWNR08WG	19FWNR09WG	19FWNR10WG	19FWNR11WG	19FWNR12WG
			Location ID	AP-9684	AP-9459	AP-8080	AP-9003	AP-8211	AP-9685	AP-8211	AP-9003	AP-9459	AP-8080	AP-9684	AP-9685
			Sample Data Group	1193407	1193407	1193407	1193407	1193407	1193407	1195158	1195158	1195158	1195158	1195158	1195158
			Laboratory ID	1193407001	1193407002	1193407005	1193407006	1193407007	1193407008	1195158001	1195158002	1195158003	1195158006	1195158007	1195158008
			Collection Date	6/24/2019	6/24/2019	6/24/2019	6/24/2019	6/24/2019	6/24/2019	09/01/2019	09/01/2019	09/01/2019	09/01/2019	09/01/2019	09/01/2019
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary/MS/MSD	Field Duplicate of 19FWNR02WG	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 19FWNR09WG	Primary	Primary
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
n-Propylbenzene	SW8260C	µg/L	660	6.01 [0.5]	ND [0.5]	0.394 [0.5] J	22.6 [0.5]	26.4 [0.5]	ND [0.5]	16.7 [0.500]	1.95 [0.500]	ND [0.500]	ND [0.500]	2.78 [0.500]	ND [0.500]
o-Xylene	SW8260C	µg/L	190	ND [0.5]	ND [0.5]	ND [0.5]	6.84 [0.5]	11 [0.5]	ND [0.5]	10.5 [0.500] B	0.63 [0.500] J,B	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
sec-Butylbenzene	SW8260C	µg/L	2,000	0.562 [0.5] J	ND [0.5]	ND [0.5]	5.22 [0.5]	4.99 [0.5]	ND [0.5]	2.9 [0.500]	1.25 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Styrene	SW8260C	µg/L	1,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
tert-Butylbenzene	SW8260C	µg/L	690	ND [0.5]	ND [0.5]	ND [0.5]	9.99 [0.5]	9.58 [0.5]	ND [0.5]	6.18 [0.500]	2.02 [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	1.24 [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	10.7 [0.500]
Toluene	SW8260C	µg/L	1,100	0.359 [0.5] J	0.419 [0.5] J	0.486 [0.5] J	8.73 [0.5]	2.91 [0.5]	ND [0.5]	1.86 [0.500] B	1.03 [0.500] B	ND [0.500]	ND [0.500]	0.31 [0.500] J,B	ND [0.500]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	0.94 [0.500] J
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]
Trichloroethene (TCE)	SW8260C	µg/L	2.8	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	ND [0.500]	1.21 [0.500]
Trichlorofluoromethane	SW8260C	µg/L	5,200	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]	0.58 [0.500] J	0.49 [0.500] J	ND [0.500]	0.34 [0.500] J
Vinyl chloride	SW8260C	µg/L	0.19	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]	ND [0.0750]
Xylene, Isomers m & p	SW8260C	µg/L	190	ND [1]	2.81 [1]	3.59 [1]	59.1 [1]	**191 [1]**	ND [1]	115 [1.00]	2.89 [1.00] B	ND [1.00]	ND [1.00]	ND [1.00]	ND [1.00]
Xylenes	SW8260C	µg/L	190	ND [1.5]	2.81 [1.5] J	3.59 [1.5]	66 [1.5]	202 [1.5]	ND [1.5]	126 [1.50]	3.52 [1.50] B	ND [1.50]	ND [1.50]	ND [1.50]	ND [1.50]

Results in green and bold font exceed ADEC CULs
Grey shaded results are non-detect with LODs above ADEC CULs

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

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

Acronyms:
CUL - cleanup level
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
NE - not established
QC - quality control
WG - groundwater
WQ - water QC sample

Table A-3. 2019 Groundwater Sample Results
Neely Road
Fort Wainwright, Alaska

				Sample ID	19FW2PEB02WQ	19FW2PEB03WQ	19FW2PTB02WQ	19FW2PEB04WQ	19FW2PTB03WQ
				Location ID	Rinsate 2	Rinsate 3	Trip Blank	Rinsate 4	Trip Blank
				Sample Data Group	1193407	1193407	1193407	1195158	1195158
				Laboratory ID	1193407024	1193407025	1193407026	1195158009	1195158010
				Collection Date	6/24/2019	6/24/2019	6/21/2019	09/01/2019	09/01/2019
				Matrix	WQ	WQ	WQ	WG	WG
				Sample Type	Equipment Blank	Equipment Blank	Trip Blank	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	µg/L	2,200		-	ND [50]	ND [50]	ND [50]	ND [50]
Diesel Range Organics	AK102	µg/L	1,500		ND [283]	-	-	141 [150] J,B	-
Sulfate	E300.0	µg/L	NE		-	ND [100]	-	ND [100]	-
Iron	SW6020A	µg/L	NE		-	ND [250]	-	ND [125]	-
Manganese	SW6020A	µg/L	430		-	0.799 [1] J	-	ND [0.500]	-
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7		-	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76		-	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	10,000		-	ND [5]	ND [5]	ND [5.00]	ND [5.00]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41		-	ND [0.2]	ND [0.2]	ND [0.200]	ND [0.200]
1,1-Dichloroethane	SW8260C	µg/L	28		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,1-Dichloroethene	SW8260C	µg/L	280		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,1-Dichloropropene	SW8260C	µg/L	NE		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,2,4-Trimethylbenzene	SW8260C	µg/L	56		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE		-	ND [5]	ND [5]	ND [5.00]	ND [5.00]
1,2-Dibromoethane	SW8260C	µg/L	0.075		-	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,2-Dichloroethane	SW8260C	µg/L	1.7		-	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]
1,2-Dichloropropane	SW8260C	µg/L	8.2		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,3,5-Trimethylbenzene	SW8260C	µg/L	60		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,3-Dichlorobenzene	SW8260C	µg/L	300		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
1,3-Dichloropropane	SW8260C	µg/L	4.7		-	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8		-	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]
2,2-Dichloropropane	SW8260C	µg/L	NE		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
2-Butanone	SW8260C	µg/L	5,600		-	ND [5]	ND [5]	ND [5.00]	ND [5.00]
2-Chlorotoluene	SW8260C	µg/L	NE		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
2-Hexanone	SW8260C	µg/L	38		-	ND [5]	ND [5]	ND [5.00]	ND [5.00]
4-Chlorotoluene	SW8260C	µg/L	NE		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
4-Isopropyltoluene	SW8260C	µg/L	NE		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300		-	ND [5]	ND [5]	3.85 [5.00] J	ND [5.00]
Benzene	SW8260C	µg/L	4.6		-	ND [0.2]	ND [0.2]	ND [0.200]	ND [0.200]
Bromobenzene	SW8260C	µg/L	62		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Bromochloromethane	SW8260C	µg/L	NE		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Bromodichloromethane	SW8260C	µg/L	1.3		-	0.387 [0.25] J	ND [0.25]	ND [0.250]	ND [0.250]
Bromoform	SW8260C	µg/L	33		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Bromomethane	SW8260C	µg/L	7.5		-	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.50]
Carbon disulfide	SW8260C	µg/L	810		-	ND [5]	ND [5]	ND [5.00]	ND [5.00]
Carbon tetrachloride	SW8260C	µg/L	4.6		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Chlorobenzene	SW8260C	µg/L	78		-	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]
Chloroethane	SW8260C	µg/L	21,000		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Chloroform	SW8260C	µg/L	2.2		-	0.534 [0.5] J	ND [0.5]	ND [0.500]	ND [0.500]
Chloromethane	SW8260C	µg/L	190		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
cis-1,2-Dichloroethene	SW8260C	µg/L	36		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7		-	ND [0.25]	ND [0.25]	ND [0.250]	ND [0.250]
Dibromochloromethane	SW8260C	µg/L	8.7		-	0.209 [0.25] J	ND [0.25]	ND [0.250]	ND [0.250]
Dibromomethane	SW8260C	µg/L	8.3		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Dichlorodifluoromethane	SW8260C	µg/L	200		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Ethylbenzene	SW8260C	µg/L	15		-	ND [0.5]	ND [0.5]	0.68 [0.500] J	ND [0.500]
Hexachlorobutadiene	SW8260C	µg/L	1.4		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Isopropylbenzene	SW8260C	µg/L	450		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Methylene chloride	SW8260C	µg/L	110		-	ND [2.5]	ND [2.5]	ND [2.50]	ND [2.50]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140		-	ND [5]	ND [5]	ND [5.00]	ND [5.00]
Naphthalene	SW8260C	µg/L	1.7		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
n-Butylbenzene	SW8260C	µg/L	1,000		-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]

Table A-3. 2019 Groundwater Sample Results
Neely Road
Fort Wainwright, Alaska

			Sample ID	19FW2PEB02WQ	19FW2PEB03WQ	19FW2PTB02WQ	19FW2PEB04WQ	19FW2PTB03WQ
			Location ID	Rinsate 2	Rinsate 3	Trip Blank	Rinsate 4	Trip Blank
			Sample Data Group	1193407	1193407	1193407	1195158	1195158
			Laboratory ID	1193407024	1193407025	1193407026	1195158009	1195158010
			Collection Date	6/24/2019	6/24/2019	6/21/2019	09/01/2019	09/01/2019
			Matrix	WQ	WQ	WQ	WG	WG
			Sample Type	Equipment Blank	Equipment Blank	Trip Blank	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
n-Propylbenzene	SW8260C	µg/L	660	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
o-Xylene	SW8260C	µg/L	190	-	ND [0.5]	ND [0.5]	2.2 [0.500]	ND [0.500]
sec-Butylbenzene	SW8260C	µg/L	2,000	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Styrene	SW8260C	µg/L	1,200	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
tert-Butylbenzene	SW8260C	µg/L	690	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Toluene	SW8260C	µg/L	1,100	-	ND [0.5]	ND [0.5]	0.69 [0.500] J	ND [0.500]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Trichloroethene (TCE)	SW8260C	µg/L	2.8	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Trichlorofluoromethane	SW8260C	µg/L	5,200	-	ND [0.5]	ND [0.5]	ND [0.500]	ND [0.500]
Vinyl chloride	SW8260C	µg/L	0.19	-	ND [0.075]	ND [0.075]	ND [0.0750]	ND [0.0750]
Xylene, Isomers m & p	SW8260C	µg/L	190	-	ND [1]	ND [1]	3.05 [1.00]	ND [1.00]
Xylenes	SW8260C	µg/L	190	-	ND [1.5]	ND [1.5]	5.25 [1.50]	ND [1.50]

Results in green and bold font exceed ADEC CULs
Grey shaded results are non-detect with LODs above ADEC CULs

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

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

Acronyms:
CUL - cleanup level
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
NE - not established
QC - quality control
WG - groundwater
WQ - water QC sample

Table A-4. 2019 Groundwater Sample Results
Former Building 1168
Fort Wainwright, Alaska

			Sample ID	19FW6801WG	19FW6802WG	19FW6803WG	19FW6804WG	19FW2PEB01WQ	19FW2PTB01WQ
			Location ID	AP-5751	AP-6809	AP-10037MW	AP-6060	Rinsate 1	Trip Blank
			Sample Data Group	1193255	1193255	1193255	1193255	1193255	1193255
			Laboratory ID	1193255019	1193255020	1193255021	1193255024	1193255012	1193255026
			Collection Date	6/19/2019	6/19/2019	6/20/2019	6/20/2019	6/20/2019	6/19/2019
			Matrix	WG	WG	WG	WG	WQ	WQ
			Sample Type	Primary	Primary	Primary/MS/MSD	Field Duplicate of 19FW6803WG	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	1,500	916 [288]	399 [283] J	693 [283]	630 [294]	ND [350]	-
Iron	SW6020A	µg/L	NE	216 [250] J	802 [250]	23100 [250]	23600 [250]	ND [250]	-
Sulfate	E300.0	µg/L	NE	30100 [500]	76500 [500]	13100 [500]	12800 [500]	ND [100]	-
1,1,1,2-Tetrachloroethane	SW8260C	µg/L	5.7	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,1,1-Trichloroethane	SW8260C	µg/L	8,000	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1,2,2-Tetrachloroethane	SW8260C	µg/L	0.76	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,1,2-Trichloro-1,2,2-trifluoroethane	SW8260C	µg/L	10,000	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
1,1,2-Trichloroethane	SW8260C	µg/L	0.41	ND [0.2]	ND [0.200]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
1,1-Dichloroethane	SW8260C	µg/L	28	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloroethene	SW8260C	µg/L	280	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,1-Dichloropropene	SW8260C	µg/L	NE	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichlorobenzene	SW8260C	µg/L	NE	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,3-Trichloropropane	SW8260C	µg/L	0.0075	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trichlorobenzene	SW8260C	µg/L	4.0	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2,4-Trimethylbenzene	SW8260C	µg/L	56	0.99 [0.5] J	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dibromo-3-chloropropane	SW8260C	µg/L	NE	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
1,2-Dibromoethane	SW8260C	µg/L	0.075	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]	ND [0.0375]
1,2-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,2-Dichloroethane	SW8260C	µg/L	1.7	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,2-Dichloropropane	SW8260C	µg/L	8.2	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3,5-Trimethylbenzene	SW8260C	µg/L	60	0.49 [0.5] J	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3-Dichlorobenzene	SW8260C	µg/L	300	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
1,3-Dichloropropane	SW8260C	µg/L	4.7	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
1,4-Dichlorobenzene	SW8260C	µg/L	4.8	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
2,2-Dichloropropane	SW8260C	µg/L	NE	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
2-Butanone	SW8260C	µg/L	5,600	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
2-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
2-Hexanone	SW8260C	µg/L	38	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
4-Chlorotoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
4-Isopropyltoluene	SW8260C	µg/L	NE	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
4-Methyl-2-pentanone	SW8260C	µg/L	6,300	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
Benzene	SW8260C	µg/L	4.6	ND [0.2]	ND [0.200]	0.45 [0.2]	0.47 [0.2]	ND [0.2]	ND [0.2]
Bromobenzene	SW8260C	µg/L	62	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromochloromethane	SW8260C	µg/L	NE	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromodichloromethane	SW8260C	µg/L	1.3	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	0.39 [0.25] J	ND [0.25]
Bromoform	SW8260C	µg/L	33	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Bromomethane	SW8260C	µg/L	7.5	ND [2.5]	ND [2.50]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]
Carbon disulfide	SW8260C	µg/L	810	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
Carbon tetrachloride	SW8260C	µg/L	4.6	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chlorobenzene	SW8260C	µg/L	78	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
Chloroethane	SW8260C	µg/L	21,000	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Chloroform	SW8260C	µg/L	2.2	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	0.56 [0.5] J	ND [0.5]
Chloromethane	SW8260C	µg/L	190	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,2-Dichloroethene	SW8260C	µg/L	36	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
cis-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
Dibromochloromethane	SW8260C	µg/L	8.7	ND [0.25]	ND [0.250]	ND [0.25]	ND [0.25]	0.22 [0.25] J	ND [0.25]
Dibromomethane	SW8260C	µg/L	8.3	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Dichlorodifluoromethane	SW8260C	µg/L	200	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Ethylbenzene	SW8260C	µg/L	15	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Hexachlorobutadiene	SW8260C	µg/L	1.4	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Isopropylbenzene	SW8260C	µg/L	450	ND [0.5]	ND [0.500]	3.72 [0.5]	4.19 [0.5]	ND [0.5]	ND [0.5]
Methylene chloride	SW8260C	µg/L	110	ND [2.5]	ND [2.50]	ND [2.5]	ND [2.5]	ND [2.5]	ND [2.5]
Methyl-tert-butyl ether (MTBE)	SW8260C	µg/L	140	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
Naphthalene	SW8260C	µg/L	1.7	0.53 [0.5] J	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
n-Butylbenzene	SW8260C	µg/L	1,000	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
n-Propylbenzene	SW8260C	µg/L	660	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
o-Xylene	SW8260C	µg/L	190	1.36 [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
sec-Butylbenzene	SW8260C	µg/L	2,000	ND [0.5]	ND [0.500]	0.79 [0.5] J	0.87 [0.5] J	ND [0.5]	ND [0.5]
Styrene	SW8260C	µg/L	1,200	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
tert-Butylbenzene	SW8260C	µg/L	690	ND [0.5]	ND [0.500]	ND [0.5]	0.33 [0.5] J	ND [0.5]	ND [0.5]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Toluene	SW8260C	µg/L	1,100	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
trans-1,3-Dichloropropene	SW8260C	µg/L	4.7	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Trichloroethene (TCE)	SW8260C	µg/L	2.8	ND [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Trichlorofluoromethane	SW8260C	µg/L	5,200	1.35 [0.5]	ND [0.500]	ND [0.5]	ND [0.5]	ND [0.5]	ND [0.5]
Vinyl acetate	SW8260C	µg/L	410	ND [5]	ND [5.00]	ND [5]	ND [5]	ND [5]	ND [5]
Vinyl chloride	SW8260C	µg/L	0.19	ND [0.075]	ND [0.0750]	ND [0.075]	ND [0.075]	ND [0.075]	ND [0.075]
Xylene, Isomers m & p	SW8260C	µg/L	190	1.18 [1] J	ND [1.00]	ND [1]	ND [1]	ND [1]	ND [1]
Xylenes	SW8260C	µg/L	190	2.54 [1.5] J	ND [1.50]	ND [1.5]	ND [1.5]	ND [1.5]	ND [1.5]

Results in green and bold font exceed ADEC CULs

Grey shaded results are non-detect with LODs above ADEC CULs

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

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

Acronyms:
CUL - cleanup level
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
NE - not established
QC - quality control
WG - groundwater
WQ - water QC sample

Table A-5. 2019 Groundwater Sample Results
Former Building 2250
Fort Wainwright, Alaska

			Sample ID	**19FW2201WG**	**19FW2202WG**	**19FW2203WG**	**19FW2204WG**	**19FW2PEB01WQ**
			Location ID	AP-7153	AP-5976	AP-3030	AP-7151	Rinsate 1
			Sample Data Group	1193255	1193255	1193255	1193255	1193255
			Laboratory ID	1193255013	1193255014	1193255017	1193255018	1193255012
			Collection Date	6/19/2019	6/19/2019	6/19/2019	6/19/2019	6/20/2019
			Matrix	WG	WG	WG	WG	WQ
			Sample Type	Primary	Primary/MS/MSD	Field Duplicate of 19FW2202WG	Primary	Equipment Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	1,500	542 [300] J	**2980 [294]**	**3370 [300]**	**4380 [302]**	ND [350]
Iron	SW6020A	µg/L	NE	8530 [250]	15600 [250]	15500 [250]	17700 [250]	ND [250]
Sulfate	E300.0	µg/L	NE	19600 [500]	6220 [100]	6470 [500]	18400 [500]	ND [100]

Results in green and bold font exceed ADEC CULs

Grey shaded results are non-detect with LODs above ADEC CULs

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

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J- - result qualified as estimate with a low-bias due to a QC failure
ND - not detected [LOD presented in brackets]

Acronyms:
CUL - cleanup level
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
NE - not established
QC - quality control
WG - groundwater
WQ - water QC sample

Table A-6. 2019 Groundwater Sample Results
Former Building 3564
Fort Wainwright, Alaska

			Sample ID	19FW6401WG	19FW6402WG	19FW6403WG	19FW6404WG	19FW6405WG	19FW6406WG	19FW6407WG	19FW2PEB02WQ	19FW2PEB03WQ
			Location ID	MW3564-1	AP-7191	AP-7070	AP-7189	AP-7183	AP-7178	AP-6729	Rinsate 2	Rinsate 3
			Sample Data Group	1193407	1193407	1193407	1193407	1193407	1193407	1193407	1193407	1193407
			Laboratory ID	1193407009	1193407010	1193407013	1193407014	1193407015	1193407016	1193407017	1193407024	1193407025
			Collection Date	6/21/2019	6/21/2019	6/21/2019	6/24/2019	6/24/2019	6/24/2019	6/24/2019	6/24/2019	6/24/2019
			Matrix	WG	WG	WG	WG	WG	WG	WG	WQ	WQ
			Sample Type	Primary	Primary/MS/MSD	Field Duplicate of 19FW6402WG	Primary	Primary	Primary	Primary	Equipment Blank	Equipment Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	1,500	ND [288]	**3230 [294]**	**3060 [288]**	**18500 [283]**	ND [283]	**29200 [283]**	**7870 [283]**	ND [283]	-
Residual Range Organics	AK103	µg/L	1,100	ND [240]	ND [245]	ND [240]	**1140 [236]**	ND [236]	**5980 [236]**	837 [236]	ND [236]	-
Sulfate	E300.0	µg/L	NE	43500 [500]	3760 [500] J	5450 [500] J	342 [100]	65100 [500]	260 [100]	3230 [100]	-	ND [100]
Iron	SW6020A	µg/L	NE	963 [250]	55400 [1250]	56500 [1250]	51200 [1250]	ND [250]	40900 [250]	60400 [1250]	-	ND [250]

Results in green and bold font exceed ADEC CULs

Grey shaded results are non-detect with LODs above ADEC CULs

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

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J- - result qualified as estimate with a low-bias due to a QC failure
ND - not detected [LOD presented in brackets]

Acronyms:
CUL - cleanup level
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
NE - not established
QC - quality control
WG - groundwater
WQ - water QC sample

Table A-7. 2019 Groundwater Sample Results
Former Building 5110
Fort Wainwright, Alaska

			Sample ID	19FW5101WG	19FW5102WG	19FW5103WG	19FW5104WG	19FW2PEB02WQ	19FW2PEB03WQ	19FW2PTB02WQ
			Location ID	AP-5737	AP-9090	AP-5738	AP-5918R	Rinsate 2	Rinsate 3	Trip Blank
			Sample Data Group	1193407	1193407	1193407	1193407	1193407	1193407	1193407
			Laboratory ID	1193407018	1193407021	1193407022	1193407023	1193407024	1193407025	1193407026
			Collection Date	6/26/2019	6/26/2019	6/26/2019	6/26/2019	6/24/2019	6/24/2019	6/21/2019
			Matrix	WG	WG	WG	WG	WQ	WQ	WQ
			Sample Type	Primary/MS/MSD	Field Duplicate of 19FW5101WG	Primary	Primary	Equipment Blank	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**ADEC CUL[1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Gasoline Range Organics	AK101	µg/L	2,200	1090 [50] J+	1260 [50] J+	**6390 [500]**	756 [50] J+	-	ND [50]	ND [50]
Diesel Range Organics	AK102	µg/L	1,500	**2030 [283]**	**1900 [288]**	**186000 [2830]**	**25700 [273]**	ND [283]	-	-
Sulfate	E300.0	µg/L	NE	388 [100]	418 [100]	452 [100]	11000 [500]	-	ND [100]	-
Iron	SW6020A	µg/L	NE	4880 [250]	5280 [250]	35900 [250]	14900 [250]	-	ND [250]	-
Manganese	SW6020A	µg/L	430	404 [1]	394 [1]	**2340 [1]**	**1630 [1]**	-	0.799 [1] J	-
Benzene	SW8260C	µg/L	4.6	0.12 [0.2] J	0.13 [0.2] J	**7.85 [0.2]**	ND [0.2]	-	ND [0.2]	ND [0.2]
Ethylbenzene	SW8260C	µg/L	15	**25.8 [0.5]**	**30.3 [0.5]**	**204 [10]**	**19.6 [0.5]**	-	ND [0.5]	ND [0.5]
o-Xylene	SW8260C	µg/L	190	50.7 [0.5]	60.7 [0.5]	745 [10]	30.6 [0.5]	-	ND [0.5]	ND [0.5]
Toluene	SW8260C	µg/L	1,100	ND [0.5]	ND [0.5]	12.7 [0.5]	0.43 [0.5] J	-	ND [0.5]	ND [0.5]
Xylene, Isomers m & p	SW8260C	µg/L	190	165 [1]	**194 [1]**	**1370 [20]**	64.3 [1]	-	ND [1]	ND [1]
Xylenes	SW8260C	µg/L	190	216 [1.5]	255 [1.5]	2120 [30]	94.9 [1.5]	-	ND [1.5]	ND [1.5]

Results in green and bold font exceed ADEC CULs

Grey shaded results are non-detect with LODs above ADEC CULs

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

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

Acronyms:
CUL - cleanup level
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
NE - not established
QC - quality control
WG - groundwater
WQ - water QC sample

APPENDIX B

CDQR AND ADEC CHECKLISTS

FINAL

CHEMICAL DATA QUALITY REVIEW

Two-Party Sites (2019)

DRMO Yard
Neely Road
Former Building 1168
Former Building 2250
Former Building 3564
Former Building 5110

NPDL # 19-098

Fort Wainwright, Alaska

Prepared: November 6, 2019

Prepared for and Under Contract to

Army Corps of Engineers - Alaska District

Prepared by

Fairbanks Environmental Services, Inc.

I certify that all data quality review criteria described in Section 1.1 were assessed, and that qualifications were made according to the criteria outlined in the Operable Unit Sites Uniform Federal Policy for Quality Assurance Project Plans.

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Vanessa Ritchie
Senior Chemist

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska
B	analytical result is qualified as a potential high estimate due to contamination present in a blank sample
BTEX	benzene, toluene, ethylbenzene, and xylenes
°C	degrees Celsius
CCV	continuing calibration verification
CDQR	Chemical Data Quality Review
COC	chain-of-custody
CUL	cleanup level
DL	detection limit
DoD	Department of Defense
DQO	data quality objective
DRO	diesel range organics
EDB	1,2-dibromoethane
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
Fe	iron
FES	Fairbanks Environmental Services, Inc
GRO	gasoline range organics
ICV	initial calibration verification
J	analytical result is qualified as an estimated value because the concentration is less than the LOQ
J+	analytical result is qualified as an estimated value with a high-bias due to a QC deviation
J-	analytical result is qualified as an estimated value with a low-bias due to a QC deviation
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
µg/L	micrograms per liter
mg/L	milligrams per liter
Mn	manganese
MS	matrix spike sample
MSD	matrix spike duplicate sample
NA	not applicable
ND	non-detect result
NPDL	North Pacific Division Laboratory
PCE	tetrachloroethene

QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories
R	analytical result is rejected and is not suitable for project use
RPD	relative percent difference
RRO	residual range organics
SDG	sample data group
SGS	SGS North America, Inc.
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USACE	United States Army Corps of Engineers
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION

This Chemical Data Quality Review (CDQR) summarizes the technical review of analytical results generated in support of groundwater sample collection by Fairbanks Environmental Services (FES) at Two-Party sites on Fort Wainwright, Alaska in 2019. The Two-Party sites include DRMO Yard; Neely Road; and Former Buildings 1168, 2250, 3564, and 5110. The groundwater monitoring events are summarized in Section 1.3. Sample summary and analytical results tables are presented in Appendix A.

FES reviewed project and quality control (QC) analytical data to assess whether the data met the designated quality objectives and were acceptable for project use. The project data were reviewed for deviations to the requirements presented in the Final 2019 Two-Party Work Plan (FES, 2019); the Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2016); the Alaska Department of Environmental Conservation (ADEC) Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data Technical Memo (ADEC, 2019a); and the Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.1 (DoD, 2017). The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess contamination), project sample and laboratory QC sample duplicates (to assess precision), laboratory control samples (LCSs) and sample surrogate recoveries (to assess accuracy), and matrix spike sample (MS) recoveries (to assess matrix effects). Calibration curves and continuing calibration verification (CCV) recoveries were not reviewed unless a QC discrepancy was noted by the laboratory in a case narrative. QC deviations that do not impact data quality (e.g., high LCS recovery associated with non-detect results), are not discussed. More elaborate data quality descriptions are reported in the ADEC Laboratory Data Review Checklists, which are included at the end of Appendix B.

Groundwater results and limits of detection (LODs) for non-detect results were compared to ADEC cleanup levels (CULs) presented in Title 18 of the Alaska Administrative Code (AAC) Chapter 75.345, Table C (ADEC, 2018).

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

1.1 Analytical Methods and Data Quality Objectives

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

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

Parameter	Preparation Method	Analytical Method	Limit of Detection	Precision (RPD, %)	Accuracy (%)	Completeness (%)
Gasoline Range Organics (GRO)	SW5030B	AK101	0.050 mg/L	20	60-120	90
Diesel Range Organics (DRO)	SW3520C	AK102SV	0.300 mg/L	20	75-125	90
Residual Range Organics (RRO)	SW3520C	AK103SV	0.250 mg/L	20	60-120	90
Benzene	SW5030B	SW8260C	0.200 µg/L	20	79-120	90
Toluene			0.500 µg/L	20	80-121	90
Ethylbenzene			0.500 µg/L	20	79-121	90
o-Xylene			0.500 µg/L	20	78-122	90
m,p-Xylene			1.00 µg/L	20	80-121	90
1,2-Dichloroethane			0.250 µg/L	20	73-128	90
1,2,4-Trimethylbenzene (TMB)			0.500 µg/L	20	79-124	90
1,2-Dibromoethane (EDB)			0.0375 µg/L	20	77-121	90
Tetrachloroethene (PCE)			0.500 µg/L	20	74-129	90
Remaining Volatile Organic Compounds (VOC)			Analyte Specific[a]	20	Analyte Specific[a]	90
Dissolved Iron (Fe) & Manganese (Mn)	SW3010A	SW6020A	250 µg/L (Fe) 1.0 µg/L (Mn)	20	87-118 (Fe) 87-115 (Mn)	90
Sulfate	E300.0	E300.0	100 µg/L	15	90-110	90

[1] The full suite of VOCs was analyzed, but only contaminants of concern at Two-Party sites are shown. Limits for all VOCs are presented in the 2019 Work Plan (FES, 2019) and associated laboratory reports.
mg/L – milligram per liter; µg/L – micrograms per liter; RPD – relative percent difference

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

- *Accuracy* measures the correctness, or the closeness, between the true value and the quantity detected. It is measured by calculating the percent recovery of known concentrations of spiked compounds that were introduced into the appropriate sample matrix. Surrogate, LCS, and MS sample recoveries were used to measure accuracy for this project. LCS and surrogate recovery criteria are defined in the QSM.
- *Precision* measures the reproducibility of repetitive measurements. It is measured by calculating the relative percent difference (RPD) between duplicate samples. Laboratory duplicate samples, field duplicate samples, MS and matrix spike duplicate sample (MSD) sample pairs, and LCS and laboratory control sample duplicate (LCSD) pairs were used to measure precision for this project. LCS/LCSD precision criteria are defined in the QSM and field duplicate precision criteria are defined in the ADEC Laboratory Data Review Checklist (water: ≤30%).

- *Representativeness* describes the degree to which data accurately and precisely represents site characteristics. This is addressed in more detail below.
- *Comparability* describes whether two data sets can be considered equivalent with respect to the project goal. This is addressed in more detail in the following section(s).
- *Sensitivity* describes the lowest concentration that the analytical method can reliably quantitate, and is evaluated by verifying that the detected results and/or LODs meet the project specific CULs and/or screening levels.
- *Completeness* describes the amount of valid data obtained from the sampling event(s). It is calculated as the percentage of valid measurements compared to the total number of measurements. The completeness goal for this project was set at 90 percent.

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

1.2 Data Qualifiers

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

Table B-2. Summary of Data Qualifiers

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

DL – detection limit; LOQ – limit of detection

1.3 Summary of Groundwater Samples

A total of 39 groundwater samples (including field duplicates) were collected from monitoring wells at Two-Party site during 2019. The number of samples collected at each site is listed below and also presented in Table A-1 (Sample Summary). Field duplicate samples at each site met the 10 percent frequency requirement of the UFP-QAPP.

- DRMO Yard: 6 primary and 2 field duplicate
- Neely Road: 5 primary and 1 field duplicate (both spring and fall)
- Former Building 1168: 3 primary and 1 field duplicate
- Former Building 2250: 3 primary and 1 field duplicate
- Former Building 3564: 6 primary and 1 field duplicate
- Former Building 5110: 3 primary and 1 field duplicate

Extra volume was collected for MS/MSD samples for every analysis and sample data group (SDG) to assess the potential for matrix interference, at the minimum frequency of 1 per 20 samples. Four equipment blank samples were collected during the sampling events to assess the potential for cross-contamination of the submersible pump. In addition, one trip blank sample accompanied each cooler containing samples for volatile analyses. Samples were analyzed by one or more of the analytical methods presented in Table B-1.

All project and QC samples were analyzed by SGS North America Inc. (SGS) of Anchorage, Alaska. The laboratory is approved by the State of Alaska through the Contaminated Sites Program for applicable methods employed for these projects, with the exception of sulfate by United States Environmental Protection Agency (EPA) Method E300.0 (method E300.0 is not listed as a Contaminated Sites analysis). The laboratory is also certified through the Environmental Laboratory Accreditation Program (ELAP) for all methods employed for these projects.

All groundwater samples were shipped in three SDGs and assigned the SGS report numbers 1193255, 1193407, and 1195158. The sites associated with each report are identified below. A sample summary table (Table A-1) and analytical results tables (Tables A-2 through A-7) are included in Appendix A. Groundwater sample data quality is discussed in Section 2.

- 1193255: DRMO Yard, Former Building 1168, and Former Building 2250
- 1193407: Neely Road (spring), Former Building 3564, and Former Building 5110
- 1195158: Neely Road (fall)

2.0 GROUNDWATER DATA REVIEW QUALITY

This section presents the findings of the data quality review and the resulting data qualifications for groundwater samples. Groundwater samples were analyzed by SGS and are included in three SDGs, as discussed in Section 1.3. See the associated ADEC Laboratory Data Review Checklists for more elaborate data quality descriptions.

2.1 Sample Collection

All monitoring wells were purged and sampled with submersible pumps and four equipment blank samples were collected to evaluate the potential for submersible pump cross-contamination. Equipment blank results are further discussed in Section 2.3. 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 UFP-QAPP (FES, 2016) and that low-flow sampling criteria was employed (Puls and Barcelona, 1996). All samples met stabilization criteria, all samples were collected as presented in the Work Plan (FES, 2019), and all groundwater levels were within the screened intervals 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 for each site.

<u>DRMO Yard</u>

- Odor was detected on purge water from all wells. Sheen was not observed.
- Well PI-3 was found broken below ground surface (bentonite was observed on the tubing and pump). However, the well casing was not obstructed and a groundwater sample was collected.
- Black staining was observed on dedicated pump tubing in well AP-7346.

<u>Neely Road</u>

- Odor was detected on purge water from all wells with the exception of furthest downgradient well AP-9685. Sheen was not observed on any purge water.
- The well screen for AP-9685 was below the water table during the fall sampling event. Impact to data quality is negligible as free product has not been previously detected in this well.

<u>Former Building 1168</u>

- Neither odor nor sheen was observed on purge water from any well.

<u>Former Building 2250</u>

- Odor was detected on purge water from source area well AP-5976. Sheen was not observed.
- The well screen for upgradient well AP-7153 and downgradient well AP-7151 was below the water table during the sampling event. Impact to data quality is negligible as free product has not been previously detected in these wells. Source area well AP-5976 was screened across the water table.

Former Building 3564

- Odor was detected on purge water from several wells but sheen was not observed.
- Well AP-7187 was found broken below ground surface and could not be sampled. It appears the well overcasing was struck by a vehicle.

Former Building 5110

- Both odor and sheen was observed on purge water from all wells.
- Black hydrocarbon staining was observed on tubing from well AP-5918R.
- The well screen for AP-5918R was 6.5 feet below the water table during the sampling event, and was also below the water table in 2010 (6.5 feet) and 2015 (7.9 feet). Consequently, measurement of potential free product in this well may be compromised.

2.2 Sample Handling

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

2.3 Blanks

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

Method Blanks

Method blank samples were analyzed in every batch, as required. Diesel range organics (DRO) was detected in a method blank sample and was also detected in the associated project samples listed below within five times the concentration detected in the method blank sample. Consequently, these DRO results were qualified (B) as potential laboratory cross-contamination. Overall, impact to the project is negligible as all affected data are at least half the concentration of the ADEC CUL. Method blank detections that did not result in data qualification are not discussed here. See the associated ADEC Checklists for further discussion.

- DRO: Neely Road samples 19FWNR08WG through 19FWNR12WG and equipment blank sample 19FW2PEB04WQ (1195158)

Trip Blanks

Trip blank samples were shipped in all coolers containing samples for volatile analyses. Target analytes were not detected any trip blank sample.

Equipment Blanks

All monitoring wells sampled at the Two-Party sites were sampled with submersible pumps and a total of four equipment blank samples were collected during the sampling events to evaluate the potential for submersible pump cross-contamination. Analytes that were detected in the equipment blank samples that resulted in data qualification are discussed below. Equipment blank results are further discussed in the associated ADEC Checklist.

The following analytes were detected in equipment blank samples and were also detected in associated project samples within five times the concentration detected in the equipment blanks. Consequently, these analytical results were qualified (B) as potential submersible pump cross-contamination. Impact to the project was negligible as the affected data were less than the ADEC CUL. Equipment blank detections that did not result in data qualification are not discussed here. See the associated ADEC Checklists for further discussion.

- Ethylbenzene: Neely Road samples 19FWNR09WG and 19FWNR10WG (1195158)
- Toluene: Neely Road samples 19FWNR07WG, 19FWNR08WG, and 19FWNR11WG (1195158)
- o-Xylene: Neely Road samples 19FWNR07WG and 19FWNR08WG (1195158)
- m,p-Xylene: Neely Road sample 19FWNR08WG (1195158)
- Total Xylenes: Neely Road sample 19FWNR08WG (1195158)
- DRO detected in the equipment blank sample may be due to laboratory cross-contamination as indicated by a similar detection in the associated method blank sample (see the Method Blank section above). No additional qualifiers were applied to associated Neely Road samples (1195158).

2.4 Laboratory Control Samples

The LCS/LCSD samples were prepared by adding spike compounds to blank samples in order to assess laboratory extraction and instrumentation performance. The performance of a LCS sample is a requirement for every QC batch to evaluate recovery accuracy. In addition, a LCSD is required for all Alaska fuel methods to evaluate batch precision. All LCS and/or LCSD samples were performed, as required.

The accuracy of analyte recoveries for LCS samples, and precision of the LCS/LCSD sample pair (when applicable), was evaluated. No LCS and/or LCSD accuracy or precision discrepancies resulted in data qualification. See the associated ADEC Laboratory Data Review Checklists for additional information.

2.5 Matrix Spike Samples and Duplicates

MS samples were prepared by adding spike compounds to project samples in order to assess potential matrix interference. The performance of a MS sample analysis is a requirement for every QC batch, at the minimum frequency of 1 for every 20 samples, to evaluate recovery accuracy. In

addition, precision of each QC batch must be evaluated by performing either a MSD sample analysis or a sample duplicate analysis and calculating the RPD. All MS/MSD samples were performed, as required, except for the batches noted below. Adequate volume was submitted for MS/MSD analysis but the laboratory split the samples up into multiple batches. Although matrix interference cannot be evaluated in these batches, batch accuracy and precision was evaluated through LCS/LCSD recoveries.

- GRO: batch VXX34821 (1195158, Neely Road)
- VOC: batches VXX34858 and VXX34892 (1195158, Neely Road)

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

- (1195158) The VOC MSD prepared from Neely Road sample 19FWNR09WG had recoveries of bromomethane (144% vs 141%), naphthalene (134% vs 128%), and 1,2,3-trichlorobenzene (132% vs 129%) above the upper control limit. Of these analytes, only naphthalene was detected in the parent sample. Consequently, the naphthalene results for the parent sample and associated field duplicate sample 19FWNR10WG were qualified (J+) as a potential high estimates. Impact to the project is negligible as the MSD recovery exceedance was not significant (6% high) and the MS recovery was within control limits.

2.6 Surrogates

Surrogate compounds were added to project samples by the laboratory prior to analysis, in accordance with method requirements. Surrogate recoveries were then calculated as percentages and reported by the laboratory as a measure of analytical extraction efficiency. The surrogate recovery discrepancies that resulted in data qualification are summarized below. See the associated ADEC Laboratory Data Review Checklists for potential discrepancies that did not result in data qualification.

- (1193407) GRO surrogate 4-bromofluorobenzene had recovery above the upper control limit (150%) for Former Building 5110 samples 19FW5101WG (188%), 19FW5102WG (206%), and 19FW5104WG (199%); and Neely Road samples 19FWNR04WG (178%) and 19FWNR05WG (152%). Consequently, the detected GRO results for these samples were qualified (J+) as potential high estimates. Four of the five impacted GRO results were less than the ADEC CUL, which is consistent with recent results for these wells. The exception is the GRO result for 19FWNR05WG. This result is potentially high-biased and marginally above the ADEC CUL. Although the result may be high-biased, the recovery exceedance was negligible (2% high) and GRO has historically remained near the CUL in this source area well (AP-8211) since the air sparge treatment system was shut down in 2014. GRO will continue to be monitored in this well.

2.7 Field Duplicates

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

Field duplicate results for detected analytes are summarized in Table B-3. In the case where a result was detected in one sample but non-detect in the other, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the limit of quantitation (LOQ; i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the UFP-QAPP. All (applicable) results for the field duplicate sample pairs were comparable (RPD ≤ 30%) except those noted below. Affected results were qualified (J) as estimates due to imprecision in results tables associated with this report. Affected analytes are also identified in grey shading in Table B-3.

- (1193255) DRO (107%) in DRMO Yard samples 19FWDY03WG/19FWDY04WG. Impact to the project is likely negligible as both results were greater than the ADEC CUL, and DRO concentrations are commonly observed near or above the ADEC CUL in this well (AP-5826).
- (1193407) Sulfate (37%) in Former Building 3564 samples 19FW6402WG/19FW6403WG. Impact to the project is negligible as the exceedance was not significant (7% high) and the affected analyte is used to evaluate natural attenuation processes by large (order of magnitude) changes in concentration.
- (1193407) 1,3,5-TMB (38%) in Neely Road samples 19FWNR02WG/19FWNR03WG. Impact to the project is negligible as both results were more than an order of magnitude less the ADEC CUL, which is consistent for this well (AP-9459) since at least 2013. Moreover, 1,3,5-TMB has not exceeded the CUL in this well since 2009.
- (1195158) GRO (38%), 2-butanone (79%), and naphthalene (83%) in Neely Road samples 19FWNR09WG/19FWNR10WG. The affected GRO and 2-butanone data are more than one order of magnitude less than the ADEC CUL. Moreover, GRO has not exceeded the CUL in this well (AP-9459) since 2009. Naphthalene imprecision may be due to matrix interference as suggested by the MSD recovery exceedance. Naphthalene marginally exceeded the ADEC CUL in both the spring and fall 2019 sampling events.

Table B-3. Groundwater Field Duplicate Sample Results Evaluation

Analyte	Method	Units	19FW2202WG[1] AP-5976 Primary	19FW2203WG[1] AP-3030 Field Duplicate	RPD, %	Comparison Criteria Met?[4]
Diesel Range Organics	AK102SV	µg/L	2980 [294]	3370 [300]	12	Yes
Iron	SW6020A	µg/L	15600 [250]	15500 [250]	1	Yes
Sulfate	E300.0	µg/L	6220 [100]	6470 [500]	4	Yes

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

Analyte	Method	Units	19FW6803WG[1] AP-10037MW Primary	19FW6804WG[1] AP-6060 Field Duplicate	RPD, %	Comparison Criteria Met?[4]
Diesel Range Organics	AK102SV	µg/L	693 [283]	630 294]	10	Yes
Iron	SW6020A	µg/L	23100 [250]	23600 [250]	2	Yes
Sulfate	E300.0	µg/L	13100 [500]	12800 [500]	2	Yes
Benzene	SW8260C	µg/L	0.45 [0.2]	0.47 [0.2]	4	Yes
Isopropylbenzene	SW8260C	µg/L	3.72 [0.5]	4.19 [0.5]	12	Yes
sec-Butylbenzene	SW8260C	µg/L	0.79 [0.5] J	0.87 [0.5] J	10	Not Applicable
tert-Butylbenzene	SW8260C	µg/L	ND [0.5]	0.33 [0.5] J	41	Not Applicable
Analyte	**Method**	**Units**	**19FWDY03WG[1] AP-5826 Primary**	**19FWDY04WG[1] AP-4040 Field Duplicate**	**RPD, %**	**Comparison Criteria Met?[4]**
Diesel Range Organics	AK102SV	µg/L	5630 [283]	1700 [278]	107	No
Iron	SW6020A	µg/L	2620 [250]	2700 [250]	4	Yes
Sulfate	E300.0	µg/L	10300 [500]	9940 [500]	3	Yes
Analyte	**Method**	**Units**	**19FWDY06WG[1] AP-7346 Primary**	**19FWDY07WG[1] AP-5050 Field Duplicate**	**RPD, %**	**Comparison Criteria Met?[4]**
1,2-Dichloroethane	SW8260C	µg/L	0.19 [0.25] J	0.18 [0.25] J	5	Not Applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	0.36 [0.5] J	0.34 [0.5] J	6	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	0.35 [0.5] J	0.35 [0.5] J	0	Not Applicable
Analyte	**Method**	**Units**	**19FW5101WG[2] AP-5737 Primary**	**19FW5102WG[2] AP-9090 Field Duplicate**	**RPD, %**	**Comparison Criteria Met?[4]**
Gasoline Range Organics	AK101	µg/L	1090 [50]	1260 [50]	14	Yes
Diesel Range Organics	AK102SV	µg/L	2030 [283]	1900 [288]	7	Yes
Sulfate	E300.0	µg/L	388 [100]	418 [100]	7	Yes
Iron	SW6020A	µg/L	4880 [250]	5280 [250]	8	Yes
Manganese	SW6020A	µg/L	404 [1]	394 [1]	3	Yes
Benzene	SW8260C	µg/L	0.12 [0.2] J	0.13 [0.2] J	8	Not Applicable
Ethylbenzene	SW8260C	µg/L	25.8 [0.5]	30.3 [0.5]	16	Yes
o-Xylene	SW8260C	µg/L	50.7 [0.5]	60.7 [0.5]	18	Yes
Xylene, Isomers m & p	SW8260C	µg/L	165 [1]	194 [1]	16	Yes
Xylenes	SW8260C	µg/L	216 [1.5]	255 [1.5]	17	Yes
Analyte	**Method**	**Units**	**19FW6402WG[2] AP-7191 Primary**	**19FW6403WG[2] AP-7070 Field Duplicate**	**RPD, %**	**Comparison Criteria Met?[4]**
Diesel Range Organics	AK102SV	µg/L	3230 [294]	3060 [288]	5	Yes
Sulfate	E300.0	µg/L	3760 [500]	5450 [500]	37	No
Iron	SW6020A	µg/L	55400 [1250]	56500 [1250]	2	Yes

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

Analyte	Method	Units	19FWNR02WG[2] AP-9459 Primary	19FWNR03WG[2] AP-8080 Field Duplicate	RPD, %	Comparison Criteria Met?[4]
Gasoline Range Organics	AK101SV	µg/L	125 [50]	152 [50]	19	Yes
Diesel Range Organics	AK102SV	µg/L	901 [288]	860 [288]	5	Yes
Sulfate	E300.0	µg/L	23600 [500]	26300 [500]	11	Yes
Iron	SW6020A	µg/L	7580 [250]	7620 [250]	1	Yes
Manganese	SW6020A	µg/L	3450 [5]	3570 [5]	3	Yes
1,2,4-Trimethylbenzene	SW8260C	µg/L	7.14 [0.5]	9.04 [0.5]	23	Yes
1,3,5-Trimethylbenzene	SW8260C	µg/L	2.99 [0.5]	4.39 [0.5]	38	No
4-Isopropyltoluene	SW8260C	µg/L	ND [0.5]	0.313 [0.5] J	46	Not Applicable
Benzene	SW8260C	µg/L	2.63 [0.2]	3.08 [0.2]	16	Yes
Ethylbenzene	SW8260C	µg/L	3.1 [0.5]	3.99 [0.5]	25	Yes
Isopropylbenzene	SW8260C	µg/L	0.338 [0.5] J	0.395 [0.5] J	16	Not Applicable
Naphthalene	SW8260C	µg/L	1.68 [0.5]	1.86 [0.5]	10	Yes
n-Propylbenzene	SW8260C	µg/L	ND [0.5]	0.394 [0.5] J	24	Not Applicable
Toluene	SW8260C	µg/L	0.419 [0.5] J	0.486 [0.5] J	15	Not Applicable
Xylene, Isomers m & p	SW8260C	µg/L	2.81 [1]	3.59 [1]	24	Yes
Xylenes	SW8260C	µg/L	2.81 [1.5] J	3.59 [1.5]	25	Yes
Analyte	**Method**	**Units**	**19FWNR09WG[3] AP-9459 Primary**	**19FWNR10WG[3] AP-8080 Field Duplicate**	**RPD, %**	**Comparison Criteria Met?**
Gasoline Range Organics	AK101	µg/L	73.6 [50] J	108 [50]	38	No
Diesel Range Organics	AK102SV	µg/L	445 [278] J	375 [283] J	17	Not Applicable
Sulfate	E300.0	µg/L	28000 [200]	28100 [200]	6	Yes
Iron	SW6020A	µg/L	3990 [125]	3760 [125]	12	Yes
Manganese	SW6020A	µg/L	2820 [0.500]	2500 [0.500]	0	Yes
1,2,4-Trimethylbenzene	SW8260C	µg/L	1.73 [0.500]	1.88 [0.500]	8	Yes
1,3,5-Trimethylbenzene	SW8260C	µg/L	2.68 [0.500]	2.57 [0.500]	4	Yes
2-Butanone	SW8260C	µg/L	ND [5.00]	11.5 [5.00]	79	No
Benzene	SW8260C	µg/L	0.86 [0.200]	0.82 [0.200]	5	Yes
Chloromethane	SW8260C	µg/L	ND [0.500]	0.35 [0.500] J	35	Not Applicable
Ethylbenzene	SW8260C	µg/L	0.36 [0.500] J	0.36 [0.500] J	0	Not Applicable
Naphthalene	SW8260C	µg/L	0.72 [0.500] J,J+	1.74 [0.500] J+	83	No
Trichlorofluoromethane	SW8260C	µg/L	0.58 [0.500] J	0.49 [0.500] J	17	Not Applicable

The LODs presented for non-detect results were used for RPD calculations.

[1] – Field duplicate samples associated with SGS report 1193255
[2] – Field duplicate samples associated with SGS report 1193407
[3] – Field duplicate samples associated with SGS report 1195158
[4] – RPD of ≤ 30 percent was used for evaluating water-matrix field duplicate samples

2.8 Additional Quality Control Discrepancies

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

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

- (1195158) VOC analyte 1,2,4-TMB was detected above the calibration range in Neely Road sample 19FWNR07WG and there wasn't sufficient volume for reanalysis. Consequently, the result for this sample was qualified (J) as an estimate. 1,2,4-TMB exceeded the ADEC CUL in this source area well (AP-8211) by an order of magnitude. Since 1,2,4-TMB has exceeded the current ADEC CUL since at least 2002, impact to the project is negligible.
- (1195158) The VOC CCV associated with batch VMS19451 had a recovery of naphthalene below the control criterion (75% vs 80%). Neely Road sample 19FWNR12WG had a naphthalene result reported from this batch and the analyte was qualified (J-) as potentially low biased. Although the sample is low biased, naphthalene is typically non-detect in this downgradient well (AP-9685) so impact to the project is negligible. Moreover, the recovery failure was not significant (5% low) and the LCS/LCSD recoveries were within control limits.

2.9 Analytical Sensitivity

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

Analytical sensitivity was evaluated to verify that LODs met ADEC CULs for non-detect results. 1,2,3-Trichloropropane in all samples did not meet the applicable ADEC groundwater CUL listed in 18 AAC 75.345. This analyte may not be detected, if present, at the respective CUL. However, impact to the projects is not significant as the affected analyte is not a contaminant of concern at these Two-Party sites.

2.10 Summary of Qualified Results

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

Table B-4 summarizes the qualified groundwater results associated with the sampling events at the Two-Party sites, including the associated sample numbers, analytes, and the reason for qualification.

Table B-4. Summary of Groundwater Data Qualifications

SDG	Sample Numbers	Analytes	Qualification	Explanation
1193255	19FWDY03WG, 19FWDY04WG	DRO	J	Field duplicate imprecision
1193407	19FW5101WG, 19FW5102WG, 19FW5104WG, 19FWNR04WG, 19FWNR05WG	GRO	J+	High biased surrogate recovery
	19FW6402WG, 19FW6403WG	Sulfate	J	Field duplicate imprecision
	19FWNR02WG, 19FWNR03WG	1,3,5-Trimethylbenzene		
1195158	19FWNR08WG – 19FWNR12WG, equipment blank 19FW2PEB04WQ	DRO	B	Method blank contamination
	19FWNR09WG, 19FWNR10WG	Ethylbenzene		Equipment blank contamination
	19FWNR07WG, 19FWNR08WG, 19FWNR11WG	Toluene		
	19FWNR07WG, 19FWNR08WG	o-Xylene		
	19FWNR08WG	m,p-Xylene total Xylenes		
	19FWNR09WG, 19FWNR10WG	Naphthalene	J+	High biased MS and/or MSD recovery
		GRO 2-Butanone Naphthalene	J	Field duplicate imprecision
	19FWNR07WG	1,2,4-Trimethylbenzene		Calibration range exceedance
	19FWNR12WG	Naphthalene	J-	Low biased CCV recovery

2.11 Completeness

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

A breakdown of the points received for each category and method is shown in Table B-5 on the following page. All Two-Party site data quality categories met the completeness criteria of 90 percent established in the UFP-QAPP for the sampling event. No data were rejected pursuant to the data quality review, and all data may be used, as qualified, for the purposes of the Two-Party Sites Monitoring Report.

Table B-5. Completeness Scores for Groundwater Samples

Data Quality Category	Points VOC	Points GRO	Points DRO	Points RRO	Points Fe/Mn	Points Sulfate
Sample Collection	10	10	10	10	10	10
COC Documentation	10	10	10	10	10	10
Sample Containers/Preservation	10	10	10	10	10	10
Cooler Temperature	10	10	10	10	10	10
Holding Times	10	10	10	10	10	10
Method Blanks	10	10	7	10	10	10
Trip Blanks	10	10	NA	NA	NA	NA
Equipment Blank	8	10	10	10	10	10
LCS/LCSD Recovery & RPD	10	10	10	10	10	10
MS/MSD Recovery & RPD	9	10	10	10	10	10
Surrogate Recovery	10	8	10	10	NA	NA
Field Duplicate	9	9	10	10	10	9
CCV, Internal Stds, other	9	10	10	10	10	10
Sensitivity (DL/LOD)	10	10	10	10	10	10
Total Points Received	135	137	127	130	120	119
Total Points Possible	140	140	130	130	120	120
Percent Completeness	96	100	98	100	100	99

NA – not applicable

3.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2019a. *Technical Memorandum – Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data.* October.

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

ADEC, 2018. *18 AAC 75, Oil and Other Hazardous Substances Pollution Control*. As amended through October 27, 2018.

Department of Defense (DoD), 2017. *DoD Quality Systems Manual for Environmental Laboratories, Version 5.1.* January.

Fairbanks Environmental Services (FES), 2019. *Final 2019 Two-Party Work Plan. U.S. Army Garrison Alaska. June*.

FES, 2016. *Final Postwide Uniform Federal Policy for Quality Assurance Project Plans, Fort Wainwright, Alaska.* August.

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

Laboratory Data Review Checklist

Completed By:

Vanessa Ritchie

Title:

Senior Chemist

Date:

08/07/19

CS Report Name:

Fort Wainwright Two-Party Sites

Report Date:

07/17/19

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

SGS – Anchorage, AK

Laboratory Report Number:

1193255

ADEC File Number:

108.38.069.01 (DRMO1)
108.26.029 (DRMO2; Bldg 5010)
108.38.069.01 (DRMO5)
108.38.081 (Bldg 2250)
108.38.069.02 (Bldg 1168)

Hazard Identification Number:

1122 (DRMO1)
25010 (DRMO2; Bldg 5010)
1122 (DRMO5)
2490 (Bldg 2250)
1125 (Bldg 1168)

1193255

1. Laboratory

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

   (●) Yes ( ) No Comments:

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

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

   ( ) Yes (●) No Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   (●) Yes ( ) No Comments:

   b. Correct Analyses requested?

   (●) Yes ( ) No Comments:

3. Laboratory Sample Receipt Documentation

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

   (●) Yes ( ) No Comments:

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

   (●) Yes ( ) No Comments:

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

   (●) Yes ( ) No Comments:

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

(●) Yes ( ) No Comments:

Not applicable - no discrepancies were noted upon sample receipt.

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

(●) Yes ( ) No Comments:

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

( ) Yes (●) No Comments:

The case narrative described continuing calibration verification (CCV) and second source verification exceptions, which are discussed here.

The VOC CCV associated with batches VMS19086 and VMS19090 had recoveries for 2,2-dichloropropane and vinyl acetate above the control criterion. However, these analytes were not detected in samples in the first batch so no samples were impacted by the high recoveries, and these analytes were not reported in the second batch.

c. Were all corrective actions documented?

(●) Yes ( ) No Comments:

Corrective actions were not necessary for CCV discrepancies. See section 4b above.

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

Comments:

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

5. Samples Results

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

(●) Yes ( ) No Comments:

b. All applicable holding times met?

(●) Yes ( ) No Comments:

c. All soils reported on a dry weight basis?

( ) Yes (●) No Comments:

Soil samples were not included in this work order.

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

( ) Yes (●) No Comments:

Analytical sensitivity was evaluated to verify that LODs met ADEC cleanup levels (CULs) for non-detect results. 1,2,3-Trichloropropane in all samples did not meet the applicable ADEC groundwater CUL listed in 18 AAC 75.345. This analyte may not be detected, if present, at the respective CUL. However, impact to the project is not significant as the affected analyte is not a contaminant of concern at these Two-Party sites.

e. Data quality or usability affected?

( ) Yes (●) No Comments:

See discussion above in 5d.

6. QC Samples

a. Method Blank

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

(●) Yes ( ) No Comments:

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

(●) Yes ( ) No Comments:

No target analytes were detected in method blank samples.

iii. If above LOQ, what samples are affected?

Comments:

No target analytes were detected in method blank samples.

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

(●) Yes ( ) No Comments:

Not applicable. See 6aiii above.

v. Data quality or usability affected?

Comments:

See 6aii above.

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

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

◉ Yes ○ No Comments:

LCS/LCSD and MS/MSD samples were reported in all batches as required.

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

◉ Yes ○ No Comments:

LCS and MS/MSD samples were reported in all batches as required.

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

◉ Yes ○ No Comments:

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

◉ Yes ○ No Comments:

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

Comments:

All recoveries were within control limits.

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

◉ Yes ○ No Comments:

Not applicable. All recoveries were within control limits.

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

Comments:

Not applicable. All recoveries were within control limits.

c. Surrogates – Organics Only

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

◉ Yes ○ No Comments:

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

◉ Yes ○ No Comments:

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

○ Yes ◉ No Comments:

Not applicable. All recoveries were within control limits.

iv. Data quality or usability affected?

Comments:

Not applicable. All recoveries were within control limits.

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

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

○ Yes ◉ No Comments:

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

◉ Yes ○ No Comments:

Trip blank sample 19FW2PTB01WQ was included in cooler 062001.

iii. All results less than LOQ?

◉ Yes ○ No Comments:

No target analytes were detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

No target analytes were detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

No target analytes were detected in the trip blank sample.

e. Field Duplicate

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

◉ Yes ○ No Comments:

DRMO Yard: two field duplicate samples were collected for six project samples
Former Bldg 1168: one field duplicate sample was collected for three project samples
Former Bldg 2250: one field duplicate sample was collected for three project samples

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

DRMO Yard: sample 19FWDY04WG was a field duplicate of sample 19FWDY03WG
DRMO Yard: sample 19FWDY07WG was a field duplicate of sample 19FWDY06WG
Former Bldg 1168: sample 19FW6804WG was a field duplicate of sample 19FW6803WG
Former Bldg 2250: sample 19FW2203WG was a field duplicate of sample 19FW2202WG

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

○ Yes ◉ No Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 19FW2202WG/19FW2203WG (Building 2250) were comparable (RPD ≤ 30%).

All (applicable) results for field duplicate sample pair 19FW6803WG/19FW6804WG (Building 1168) were comparable (RPD ≤ 30%).

All (applicable) results for field duplicate sample pair 19FWDY03WG/19FWDY04WG (DRMO Yard) were comparable (RPD ≤ 30%) except DRO (107%). Consequently, the DRO results for the duplicate pair were qualified (J) as estimates due to imprecision. Impact to the project is likely negligible as both results were greater than the ADEC CUL, and DRO concentrations are commonly observed near or above the ADEC CUL in this well (AP-5826).

All (applicable) results for field duplicate sample pair 19FWDY06WG/19FWDY07WG (DRMO Yard) were comparable (RPD ≤ 30%).

Analyte	Method	Units	19FW2202WG AP-5976 Primary	19FW2203WG AP-3030 Field Duplicate	RPD, %	Comparison Criteria Met?
Diesel Range Organics	AK102SV	µg/L	2980 [294]	3370 [300]	12	Yes
Iron	SW6020A	µg/L	15600 [250]	15500 [250]	1	Yes
Sulfate	E300.0	µg/L	6220 [100]	6470 [500]	4	Yes

Analyte	Method	Units	19FW6803WG AP-10037MW Primary	19FW6804WG AP-6060 Field Duplicate	RPD, %	Comparison Criteria Met?
Diesel Range Organics	AK102SV	µg/L	693 [283]	630 294]	10	Yes
Iron	SW6020A	µg/L	23100 [250]	23600 [250]	2	Yes
Sulfate	E300.0	µg/L	13100 [500]	12800 [500]	2	Yes
Benzene	SW8260C	µg/L	0.45 [0.2]	0.47 [0.2]	4	Yes
Isopropylbenzene	SW8260C	µg/L	3.72 [0.5]	4.19 [0.5]	12	Yes
Naphthalene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
sec-Butylbenzene	SW8260C	µg/L	0.79 [0.5] J	0.87 [0.5] J	10	Not Applicable

tert-Butylbenzene	SW8260C	µg/L	ND [0.5]	0.33 [0.5] J	41	Not Applicable

Analyte	Method	Units	19FWDY03WG AP-5826 Primary	19FWDY04WG AP-4040 Field Duplicate	RPD, %	Comparison Criteria Met?
Diesel Range Organics	AK102SV	µg/L	5630 [283]	1700 [278]	107	No
Iron	SW6020A	µg/L	2620 [250]	2700 [250]	4	Yes
Sulfate	E300.0	µg/L	10300 [500]	9940 [500]	3	Yes

Analyte	Method	Units	19FWDY06WG AP-7346 Primary	19FWDY07WG AP-5050 Field Duplicate	RPD, %	Comparison Criteria Met?
1,2-Dichloroethane	SW8260C	µg/L	0.19 [0.25] J	0.18 [0.25] J	5	Not Applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	0.36 [0.5] J	0.34 [0.5] J	6	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	0.35 [0.5] J	0.35 [0.5] J	0	Not Applicable

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

Comments:

See 6eiii above.

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

◉ Yes ○ No ○ Not Applicable

Equipment blank sample 19FW2PEB01WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All samples in this work order were collected with a submersible pump.

i. All results less than LOQ?

○ Yes ◉ No Comments:

All detected analytes were less than the LOQ; however, three analytes were detected at concentrations less than the LOQ.

ii. If above LOQ, what samples are affected?

Comments:

Bromodichloromethane, chloroform, and dibromochloromethane were detected in equipment blank sample 19FW2PEB01WQ at concentrations less than the LOQ. However, none of these analytes were detected in project samples, so no data were impacted.

iii. Data quality or usability affected?

Comments:

See 6fi above.

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

a. Defined and appropriate?

○ Yes ◉ No Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed By:

Vanessa Ritchie

Title:

Senior Chemist

Date:

08/08/19

CS Report Name:

Fort Wainwright Two-Party Sites

Report Date:

07/22/19

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

SGS – Anchorage, AK

Laboratory Report Number:

1193407

ADEC File Number:

108.38.037 (Bldg 5110)
108.26.028 (Bldg 3564)
108.38.078 (Neely Rd)

Hazard Identification Number:

1677 (Bldg 5110)
25015 (Bldg 3564)
3691 (Neely Rd)

1193407

1. Laboratory

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

   (●) Yes ( ) No Comments:

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

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

   ( ) Yes (●) No Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   (●) Yes ( ) No Comments:

   b. Correct Analyses requested?

   (●) Yes ( ) No Comments:

3. Laboratory Sample Receipt Documentation

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

   (●) Yes ( ) No Comments:

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

   (●) Yes ( ) No Comments:

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

   (●) Yes ( ) No Comments:

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

(•) Yes ( ) No Comments:

Not applicable - no discrepancies were noted upon sample receipt.

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

(•) Yes ( ) No Comments:

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

( ) Yes (•) No Comments:

The case narrative described MS/MSD and LCS/LCSD exceptions discussed below in 6d, and surrogate exceptions discussed below in 6c. It also discussed low level quantitation checks (LLQC) and calibration blank (CB) exceptions, which are discussed here.

The metals LLQC recovery for arsenic did not meet quality control criteria. However, arsenic was not reported in this work order so no data were impacted.

The metals CB had detections of nickel and manganese (0.983 µg/L) above the LOQ in analysis batch MMS10556. Nickel was not reported in this work order so no data were impacted. Manganese in the associated project samples was detected at concentrations more than two orders of magnitude greater than the detection in the CB, so no data were qualified.

c. Were all corrective actions documented?

(•) Yes ( ) No Comments:

Corrective actions were not necessary for LLQC and CB discrepancies. See section 4b above.

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

Comments:

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

1193407

5. Samples Results

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

(●) Yes ( ) No Comments:

b. All applicable holding times met?

(●) Yes ( ) No Comments:

c. All soils reported on a dry weight basis?

( ) Yes (●) No Comments:

Soil samples were not included in this work order.

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

( ) Yes (●) No Comments:

Analytical sensitivity was evaluated to verify that LODs met ADEC cleanup levels (CULs) for non-detect results. 1,2,3-Trichloropropane in all samples did not meet the applicable ADEC groundwater CUL listed in 18 AAC 75.345. This analyte may not be detected, if present, at the respective CUL. However, impact to the project is not significant as the affected analyte is not a contaminant of concern at these Two-Party sites.

e. Data quality or usability affected?

( ) Yes (●) No Comments:

See discussion above in 5d.

6. QC Samples

a. Method Blank

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

(●) Yes ( ) No Comments:

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

(●) Yes ( ) No Comments:

No target analytes were detected at concentrations greater than the LOQ in method blank samples; however, sulfate was detected at a concentration less than the LOQ.

iii. If above LOQ, what samples are affected?

Comments:

Sulfate was detected in the method blank sample in batch WXX12916 at a concentration less than the LOQ. Sulfate was detected in all associated project samples at concentrations greater than five times of that of the method blank, so no data were qualified.

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

◉ Yes ○ No Comments:

Not applicable. See 6aiii above.

v. Data quality or usability affected?

Comments:

No data were impacted. See 6aii above.

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

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

◉ Yes ○ No Comments:

LCS/LCSD and MS/MSD samples were reported in all batches as required.

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

◉ Yes ○ No Comments:

LCS and MS/MSD samples were reported in all batches as required.

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

○ Yes ◉ No Comments:

The iron MS and MSD prepared from sample 19FW6402WG (Building 3564) were recovered outside of the control criteria. However, the spike amounts were less than the parent sample concentrations, so control criteria were not applicable. No data were qualified.

The manganese MSD prepared from sample 19FWNR02WG (Neely Road) was recovered outside of the control criteria. However, the spike amount was less than the parent sample concentration, so control criteria were not applicable. No data were qualified.

The laboratory noted that naphthalene did not have acceptable recovery in an MSD sample; however, the MSD sample is a non-client sample and does not impact this project.

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

○ Yes ◉ No Comments:

The VOC LCS/LCSD RPD associated with extraction batch VXX34350 exceeded the control criterion (≤20%) for chloromethane (22%). Chloromethane was not detected in any project sample, so no data were qualified. The recovery of chloromethane in both the LCS and LCSD samples were within acceptance criteria.

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

Comments:

No samples were impacted. See 6biii and 6biv above.

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

◉ Yes ○ No Comments:

No samples were impacted. See 6biii and 6biv above.

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

Comments:

No samples were impacted. See 6biii and 6biv above..

c. Surrogates – Organics Only

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

◉ Yes ○ No Comments:

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

○ Yes ◉ No Comments:

GRO surrogate 4-bromofluorobenzene had recovery above the upper control limit (150%) for Former Building 5110 samples 19FW5101WG (188%), 19FW5102WG (206%), and 19FW5104WG (199%); and Neely Road samples 19FWNR04WG (178%) and 19FWNR05WG (152%). Consequently, the detected GRO results for these samples were qualified (J+) as potential high estimates. Four of the five impacted GRO results were less than the ADEC CUL, which is consistent with recent results for these wells. The exception is the GRO result for 19FWNR05WG. This result is potentially high-biased and marginally above the ADEC CUL. Although the result may be high-biased, the recovery exceedance was negligible (2% high) and GRO has historically remained near the CUL in this source area well (AP-8211) since the air sparge treatment system was shut down in 2014. GRO will continue to be monitored in this well.

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

(•) Yes ( ) No Comments:

iv. Data quality or usability affected?

Comments:

Impact to project data was negligible. See 6cii above.

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

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

(•) Yes ( ) No Comments:

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

(•) Yes ( ) No Comments:

Trip blank sample 19FW2PTB02WQ was included in cooler 062601.

iii. All results less than LOQ?

(•) Yes ( ) No Comments:

No target analytes were detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

No target analytes were detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

No target analytes were detected in the trip blank sample.

e. Field Duplicate

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

◉ Yes ○ No Comments:

Former Bldg 5110: one field duplicate sample was collected for three project samples
Former Bldg 3564: one field duplicate sample was collected for six project samples
Neely Road: one field duplicate sample was collected for five project samples

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Former Bldg 5110: sample 19FW5102WG was a field duplicate of sample 19FW5101WG
Former Bldg 3564: sample 19FW6403WG was a field duplicate of sample 19FW6402WG
Neely Road: sample 19FWNR03WG was a field duplicate of sample 19FWNR02WG

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

○ Yes ◉ No Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 19FW5101WG/19FW5102WG (Building 5110) were comparable (RPD ≤ 30%).

All (applicable) results for field duplicate sample pair 19FW6402WG/19FW6403WG (Building 3564) were comparable (RPD ≤ 30%) except for sulfate (37%). Consequently, the sulfate results for the duplicate pair were qualified (J) as estimates due to imprecision. Impact to the project is negligible as the exceedance was not significant (7% high) and the affected analyte is used to evaluate natural attenuation processes by large (order of magnitude) changes in concentration.

All (applicable) results for field duplicate sample pair 19FWNR02WG/19FWNR03WG (Neely Road) were comparable (RPD ≤ 30%) except 1,3,5-trimethylbenzene (38%). Consequently, the 1,3,5-trimethylbenzene results for the duplicate pair were qualified (J) as estimates due to imprecision. Impact to the project is negligible as both results were more than an order of magnitude less the ADEC CUL, which is consistent for this well (AP-9459) since at least 2013. Moreover, 1,3,5-trimethylbenzene has not exceeded the CUL in this well since 2009.

Analyte	Method	Units	19FW5101WG AP-5737 Primary	19FW5102WG AP-9090 Field Duplicate	RPD, %	Comparison Criteria Met?
Gasoline Range Organics	AK101	µg/L	1090 [50]	1260 [50]	14	Yes
Diesel Range Organics	AK102SV	µg/L	2030 [283]	1900 [288]	7	Yes
Sulfate	E300.0	µg/L	388 [100]	418 [100]	7	Yes
Iron	SW6020A	µg/L	4880 [250]	5280 [250]	8	Yes
Manganese	SW6020A	µg/L	404 [1]	394 [1]	3	Yes
Benzene	SW8260C	µg/L	0.12 [0.2] J	0.13 [0.2] J	8	Not Applicable
Ethylbenzene	SW8260C	µg/L	25.8 [0.5]	30.3 [0.5]	16	Yes
o-Xylene	SW8260C	µg/L	50.7 [0.5]	60.7 [0.5]	18	Yes
Toluene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Xylene, Isomers m & p	SW8260C	µg/L	165 [1]	194 [1]	16	Yes
Xylenes	SW8260C	µg/L	216 [1.5]	255 [1.5]	17	Yes

Analyte	Method	Units	19FW6402WG AP-7191 Primary	19FW6403WG AP-7070 Field Duplicate	RPD, %	Comparison Criteria Met?
Diesel Range Organics	AK102SV	µg/L	3230 [294]	3060 [288]	5	Yes
Residual Range Organics	AK103SV	µg/L	ND [245]	ND [240]	2	Not Applicable
Sulfate	E300.0	µg/L	3760 [500]	5450 [500]	37	No
Iron	SW6020A	µg/L	55400 [1250]	56500 [1250]	2	Yes

Analyte	Method	Units	19FWNR02WG AP-9459 Primary	19FWNR03WG AP-8080 Field Duplicate	RPD, %	Comparison Criteria Met?
Gasoline Range Organics	AK101	µg/L	125 [50]	152 [50]	19	Yes
Diesel Range Organics	AK102SV	µg/L	901 [288]	860 [288]	5	Yes
Sulfate	E300.0	µg/L	23600 [500]	26300 [500]	11	Yes
Iron	SW6020A	µg/L	7580 [250]	7620 [250]	1	Yes
Manganese	SW6020A	µg/L	3450 [5]	3570 [5]	3	Yes
1,2,4-Trimethylbenzene	SW8260C	µg/L	7.14 [0.5]	9.04 [0.5]	23	Yes
1,2-Dichloroethane	SW8260C	µg/L	ND [0.25]	ND [0.25]	0	Not Applicable
1,3,5-Trimethylbenzene	SW8260C	µg/L	2.99 [0.5]	4.39 [0.5]	38	No
4-Isopropyltoluene	SW8260C	µg/L	ND [0.5]	0.313 [0.5] J	46	Not Applicable
Benzene	SW8260C	µg/L	2.63 [0.2]	3.08 [0.2]	16	Yes
Ethylbenzene	SW8260C	µg/L	3.1 [0.5]	3.99 [0.5]	25	Yes
Isopropylbenzene	SW8260C	µg/L	0.338 [0.5] J	0.395 [0.5] J	16	Not Applicable
Naphthalene	SW8260C	µg/L	1.68 [0.5]	1.86 [0.5]	10	Yes
n-Propylbenzene	SW8260C	µg/L	ND [0.5]	0.394 [0.5] J	24	Not Applicable
o-Xylene	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Toluene	SW8260C	µg/L	0.419 [0.5] J	0.486 [0.5] J	15	Not Applicable
Trichloroethene (TCE)	SW8260C	µg/L	ND [0.5]	ND [0.5]	0	Not Applicable
Xylene, Isomers m & p	SW8260C	µg/L	2.81 [1]	3.59 [1]	24	Yes
Xylenes	SW8260C	µg/L	2.81 [1.5] J	3.59 [1.5]	25	Yes

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

Comments:

See 6eiii above.

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

◉ Yes ○ No ○ Not Applicable

Equipment blank samples 19FW2PEB02WQ (DRO/RRO) and 19FW2PEB03WQ (GRO, VOC, sulfate, and iron/manganese) were included in this work order to assess the potential for cross-contamination of the submersible pump. All samples in this work order were collected with a submersible pump.

i. All results less than LOQ?

○ Yes ◉ No Comments:

All detected analytes were less than the LOQ; however, four analytes were detected at concentrations less than the LOQ in one equipment blank sample.

ii. If above LOQ, what samples are affected?

Comments:

Manganese, bromodichloromethane, chloroform, and dibromochloromethane were detected in equipment blank sample 19FW2PEB03WQ at concentrations less than the LOQ. Manganese was detected in all project samples at concentrations greater than five times that of the equipment blank sample, so no data were qualified. The remaining aforementioned analytes were not detected in project samples, so no data were impacted.

iii. Data quality or usability affected?

Comments:

See 6fi above.

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

a. Defined and appropriate?

○ Yes ◉ No Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed By:

Vanessa Ritchie

Title:

Senior Chemist

Date:

11/05/19

CS Report Name:

Fort Wainwright Two-Party Sites

Report Date:

10/25/19

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

SGS – Anchorage, AK

Laboratory Report Number:

1195158

ADEC File Number:

108.38.078 (Neely Rd)

Hazard Identification Number:

3691

1195158

1. Laboratory

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

   (●) Yes ( ) No Comments:

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

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

   ( ) Yes (●) No Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   (●) Yes ( ) No Comments:

   b. Correct Analyses requested?

   (●) Yes ( ) No Comments:

3. Laboratory Sample Receipt Documentation

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

   (●) Yes ( ) No Comments:

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

   (●) Yes ( ) No Comments:

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

   (●) Yes ( ) No Comments:

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

(●) Yes ( ) No Comments:

Not applicable - no discrepancies were noted upon sample receipt.

e. Data quality or usability affected?

Comments:

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

4. Case Narrative

a. Present and understandable?

(●) Yes ( ) No Comments:

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

( ) Yes (●) No Comments:

The case narrative described MS/MSD and LCS/LCSD discrepancies which are discussed in section 6b. The case narrative also describes continuing calibration verification (CCV) discrepancies and an analyte detected outside the calibration range, which are discussed below.

VOC analyte 1,2,4-trimethylbenzene was detected above the calibration range in Neely Road sample 19FWNR07WG and there wasn't sufficient volume for reanalysis. Consequently, the result for this sample was qualified (J) as an estimate. 1,2,4-Trimethylbenzene exceeded the ADEC CUL in this source area well (AP-8211) by an order of magnitude. Since 1,2,4-trimethylbenzene has exceeded the current ADEC CUL since at least 2007, impact to the project is negligible.

The VOC CCV associated with batches VMS19432 and VMS19438 had recoveries for bromomethane above the control criterion. However, bromomethane was not detected in the associated Neely Road samples so no data were impacted due to the high recoveries.

The VOC CCV associated with batch VMS19451 had a recovery of naphthalene below the control criterion (75% vs 80%). Neely Road sample 19FWNR12WG had a naphthalene result reported from this batch and the analyte was qualified (J-) as potentially low biased. Although the sample is low biased, naphthalene is typically non-detect in this downgradient well (AP-9685) so impact to the project is negligible. Moreover, the recovery failure was not significant (5% low) and the LCS/LCSD recoveries were within control limits.

c. Were all corrective actions documented?

(●) Yes ( ) No Comments:

See section 4b above.

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

Comments:

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

5. Samples Results

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

(●) Yes ( ) No Comments:

b. All applicable holding times met?

(●) Yes ( ) No Comments:

c. All soils reported on a dry weight basis?

( ) Yes (●) No Comments:

Soil samples were not included in this work order.

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

( ) Yes (●) No Comments:

Analytical sensitivity was evaluated to verify that LODs met ADEC cleanup levels (CULs) for non-detect results. 1,2,3-Trichloropropane in all samples did not meet the applicable ADEC groundwater CUL listed in 18 AAC 75.345. This analyte may not be detected, if present, at the respective CUL. However, impact to the project is not significant as the affected analyte is not a contaminant of concern at this Two-Party site.

e. Data quality or usability affected?

( ) Yes (●) No Comments:

See discussion above in 5d.

6. QC Samples

a. Method Blank

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

(●) Yes ( ) No Comments:

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

(●) Yes ( ) No Comments:

All analytes were detected below the LOQ; however, DRO was detected in the method blank sample associated with batch XXX42214 at a concentration (0.182 mg/L) below the LOQ (0.6 mg/L). DRO in Neely Road samples 19FWNR08WG through 19FWNR12WG and equipment blank sample 19FW2PEB04WQ was detected at a concentration within five times that of the method blank. Consequently, the DRO results for these samples were qualified (B) as potential laboratory cross-contamination. Overall, impact to the project is negligible as all affected data are at least half the concentration of the ADEC CUL.

iii. If above LOQ, what samples are affected?

Comments:

See 6aii above.

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

(●) Yes ( ) No Comments:

v. Data quality or usability affected?

Comments:

See 6aii above.

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

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

(●) Yes ( ) No Comments:

LCS/LCSD and MS/MSD samples were reported in all batches as required, with the exception of GRO batch VXX34821 and VOC batches VXX34858 (all analytes) and VXX34892 (chloromethane and naphthalene only). Adequate volume was submitted for MS/MSD analysis but the laboratory split the samples up into multiple batches. Although matrix interference cannot be evaluated in the aforementioned batches, batch accuracy and precision was evaluated by analysis of the LCS/LCSD samples.

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

(●) Yes ( ) No Comments:

LCS and MS/MSD samples were reported in all batches as required.

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

○ Yes ◉ No Comments:

The LCS and LCSD in batch VXX34838 had recoveries of bromomethane (159%/146% vs 141%) above the upper control limit. However, bromomethane was not detected in the two associated sample in this batch. No data were impacted due to the high recoveries.

The sulfate MS prepared from Neely Road sample 19FWNR09WG was recovered outside of the control criteria. However, the spike amount was less than the parent sample concentration, so control criteria were not applicable. No data were qualified.

The VOC MSD prepared from Neely Road sample 19FWNR09WG had recoveries of bromomethane (144% vs 141%), naphthalene (134% vs 128%), and 1,2,3-trichlorobenzene (132% vs 129%) above the upper control limit. Of these analytes, only naphthalene was detected in the parent sample. Consequently, the naphthalene results for the parent sample and associated field duplicate sample 19FWNR10WG were qualified (J+) as a potential high estimates. Impact to the project is negligible as the MSD recovery exceedance was not significant (6% high) and the MS recovery was within control limits.

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

◉ Yes ○ No Comments:

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

Comments:

See 6biii.

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

◉ Yes ○ No Comments:

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

Comments:

See 6biii.

c. Surrogates – Organics Only

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

(●) Yes ( ) No Comments:

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

(●) Yes ( ) No Comments:

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

( ) Yes (●) No Comments:

Not applicable. All recoveries were within control limits.

iv. Data quality or usability affected?

Comments:

Not applicable. All recoveries were within control limits.

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

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

( ) Yes (●) No Comments:

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

(●) Yes ( ) No Comments:

Trip blank sample 19FW2PTB03WQ was included in cooler 090301.

iii. All results less than LOQ?

(●) Yes ( ) No Comments:

No target analytes were detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

No target analytes were detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

No target analytes were detected in the trip blank sample.

e. Field Duplicate

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

◉ Yes ○ No Comments:

One field duplicate sample was collected for five project samples.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Neely Road sample 19FWNR10WG was a field duplicate of sample 19FWNR09WG

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

○ Yes ◉ No Comments:

All detected analytes and contaminants of concern (detected and not detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. In the event that both results are less than the LOQ (i.e., J-flagged or non-detect), the RPD was calculated but the comparison criterion is not applicable, per the Postwide UFP-QAPP.

All (applicable) results for field duplicate sample pair 19FWNR09WG/19FWNR10WG were comparable (RPD ≤ 30%) except GRO (38%), 2-butanone (79%), and naphthalene (83%). Consequently, the results of the aforementioned analytes for the duplicate pair were qualified (J) as estimates due to imprecision. The affected GRO and 2-butanone data are more than one order of magnitude less than the ADEC CUL. Moreover, GRO has not exceeded the CUL in this well (AP-9459) since 2009. Naphthalene imprecision may be due to matrix interference as suggested by the MSD recovery exceedance. Naphthalene marginally exceeded the ADEC CUL in both the spring and fall 2019 sampling events.

Analyte	Method	Units	19FWNR09WG AP-9459 Primary	19FWNR10WG AP-8080 Field Duplicate	RPD, %	Comparison Criteria Met?
Gasoline Range Organics	AK101	µg/L	73.6 [50] J	108 [50]	38	No
Diesel Range Organics	AK102SV	µg/L	445 [278] J	375 [283] J	17	Not Applicable
Sulfate	E300.0	µg/L	28000 [200]	28100 [200]	6	Yes
Iron	SW6020A	µg/L	3990 [125]	3760 [125]	12	Yes
Manganese	SW6020A	µg/L	2820 [0.500]	2500 [0.500]	0	Yes
1,2,4-Trimethylbenzene	SW8260C	µg/L	1.73 [0.500]	1.88 [0.500]	8	Yes
1,3,5-Trimethylbenzene	SW8260C	µg/L	2.68 [0.500]	2.57 [0.500]	4	Yes
2-Butanone	SW8260C	µg/L	ND [5.00]	11.5 [5.00]	79	No
Benzene	SW8260C	µg/L	0.86 [0.200]	0.82 [0.200]	5	Yes
Chloromethane	SW8260C	µg/L	ND [0.500]	0.35 [0.500] J	35	Not Applicable
Ethylbenzene	SW8260C	µg/L	0.36 [0.500] J	0.36 [0.500] J	0	Not Applicable
Naphthalene	SW8260C	µg/L	0.72 [0.500] J,J+	1.74 [0.500] J+	83	No
Trichlorofluoromethane	SW8260C	µg/L	0.58 [0.500] J	0.49 [0.500] J	17	Not Applicable

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

Comments:

See 6eiii above.

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

◉ Yes ○ No ○ Not Applicable

Equipment blank sample 19FW2PEB04WQ was included in this work order to assess the potential for cross-contamination of the submersible pump. All samples in this work order were collected with a submersible pump.

i. All results less than LOQ?

◉ Yes ○ No Comments:

O-Xylene and m,p-xylene were detected in the equipment blank sample at concentrations above the LOQ and DRO, 4-methyl-2-pentanone, ethylbenzene, and toluene were detected at concentrations less than the LOQ.

ii. If above LOQ, what samples are affected?

Comments:

The DRO detected in the equipment blank sample may be due to laboratory cross-contamination as indicated by a similar detection in the associated method blank sample. No additional qualifiers were applied. 4-Methyl-2-pentanone was not detected in any project sample so no data were impacted.

Ethylbenzene, toluene, o-xylene, m,p-xylene, and total xylene were detected in the Neely Road samples listed below at concentrations within five time that of the equipment blank. Consequently, these results were qualified (B) as potential pump cross-contamination. Impact to the project was negligible as the affected data were less than the ADEC CUL.
- Ethylbenzene: 19FWNR09WG, 19FWNR10WG
- Toluene: 19FWNR07WG, 19FWNR08WG, 19FWNR11WG
- o-Xylene: 19FWNR07WG, 19FWNR08WG
- m,p-Xylene: 19FWNR08WG
- total Xylenes: 19FWNR08WG

iii. Data quality or usability affected?

Comments:

See 6fi above.

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

a. Defined and appropriate?

○ Yes ◉ No Comments:

No other data flags/qualifiers were used.

APPENDIX C

GROUNDWATER SAMPLING FORMS, FIELD BOOKS, AND FIELD PARAMETER SUMMARY

Table C-1. Two-Party Sites 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)
DRMO Yard														
19FWDY01WG	PI-3	6/19/19	1055	Submersible	11.31	Y	0.01	4.92	0.489	2.06	6.16	-16.7	24.71	Y
19FWDY02WG	MP-4	6/19/19	1210	Submersible	8.97	Y	0.00	6.44	0.458	1.61	6.63	-88.8	2.16	Y
19FWDY03WG	AP-5826	6/19/19	1315	Submersible	10.23	Y	0.00	7.54	0.352	1.46	6.62	-19.5	4.28	Y
19FWDY05WG	AP-6806	6/19/19	1425	Submersible	11.33	Y	0.01	5.12	0.489	2.52	6.68	-63.8	5.19	Y
19FWDY06WG	AP-7346	6/19/19	1520	Submersible	8.21	Y	0.00	5.75	0.387	1.92	6.77	-10.0	3.72	Y
19FWDY08WG	AP-7348	6/20/19	1220	Submersible	10.29	Y	0.00	7.63	0.665	0.49	6.17	-101.1	6.82	Y
Neely Road														
19FWNR01WG	AP-9684	6/24/19	1100	Submersible	18.31	Y	0.00	10.82	0.908	0.6	6.27	-92.8	6.58	Y
19FWNR02WG	AP-9459	6/24/19	1215	Submersible	17.22	Y	0.00	17.15	0.841	0.42	6.68	-101.9	6.12	Y
19FWNR04WG	AP-9003	6/24/19	1340	Submersible	19.25	Y	0.00	7.92	1.17	0.68	6.26	-59.5	5.44	Y
19FWNR05WG	AP-8211	6/24/19	1500	Submersible	18.07	Y	0.00	8.6	1.156	0.53	6.25	-37.5	19.59	Y
19FWNR06WG	AP-9685	6/24/19	1630	Submersible	14.33	Y	0.00	12.03	0.842	2.2	6.58	17.1	4.29	Y
19FWNR07WG	AP-8211	9/1/19	955	Submersible	15.35	Y	0.00	9.32	0.936	0.57	6.38	-44.8	10.98	Y
19FWNR08WG	AP-9003	9/1/19	1100	Submersible	16.51	Y	0.01	8.55	1.02	0.77	6.87	45.0	4.00	Y
19FWNR09WG	AP-9459	9/1/19	1150	Submersible	14.48	Y	0.01	17.45	0.778	0.37	6.82	-85.0	3.96	Y
19FWNR11WG	AP-9684	9/1/19	1245	Submersible	15.58	Y	0.01	12.76	0.995	0.55	6.77	-80.1	5.62	Y
19FWNR12WG	AP-9685	9/1/19	1420	Submersible	11.55	N	0.01	9.62	0.89	1.82	6.93	62.0	4.90	Y
Former Building 1168														
19FW6801WG	AP-5751	6/19/19	1635	Submersible	17.58	Y	0.00	5.25	0.715	1.50	6.25	84.6	4.73	Y
19FW6802WG	AP-6809	6/19/19	1740	Submersible	17.43	Y	0.02	5.68	0.73	0.73	6.18	46	32.12	Y
19FW6803WG	AP-10037MW	6/20/19	1000	Submersible	18.67	Y	0.00	5.23	0.824	0.62	6.49	-83.6	11.42	Y
Former Building 2250														
19FW2201WG	AP-7153	6/19/19	1120	Submersible	11.18	N	0.00	4.25	0.511	0.57	6.30	-94.8	6.28	Y
19FW2202WG	AP-5976	6/19/19	1250	Submersible	15.97	Y	0.00	3.52	0.435	0.34	6.33	-115.1	38.19	Y
19FW2204WG	AP-7151	6/19/19	1440	Submersible	15.28	N	0.00	4.52	0.536	0.53	6.47	-100	10.66	Y
Former Building 3564														
19FW6401WG	MW3564-1	6/21/19	1050	Submersible	18.65	Y	0.00	14.94	0.84	0.87	7.05	-32.6	11.71	Y
19FW6402WG	AP-7191	6/21/19	1205	Submersible	17.53	Y	0.00	7.17	0.903	0.49	6.62	-150	3.29	Y
19FW6404WG	AP-7189	6/24/19	1100	Submersible	17.02	Y	?	7.62	0.789	2.55	6.41	-102.1	5.98	Y
19FW6405WG	AP-7183	6/24/19	1320	Submersible	17.91	Y	0.01	9.44	0.961	1.78	6.74	75.3	3.96	Y
19FW6406WG	AP-7178	6/24/19	1500	Submersible	14.49	Y	0.01	6.32	0.788	0.9	6.34	-61.2	13.29	Y
19FW6407WG	AP-6729	6/24/19	1550	Submersible	18.43	Y	0.00	7.49	0.858	0.79	6.79	-133.6	6.27	Y
--	AP-7187	6/21/19	Well found damaged (broken below ground surface) and could not be sampled											
Former Building 5110														
19FW5101WG	AP-5737	6/26/19	1010	Submersible	8.70	Y	0.00	7.18	0.292	0.79	5.98	22.6	11.52	Y
19FW5103WG	AP-5738	6/26/19	1115	Submersible	10.23	Y	0.01	5.38	0.418	0.91	6.46	-72.8	14.16	Y
19FW5104WG	AP-5918R	6/26/19	1215	Submersible	8.73	N	0.00	3.33	0.430	0.80	6.58	-44.4	1.16	Y

Notes:

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

[2] Drawdown measured during the last three readings

[3] Stabilization parameters described in the ADEC Field Sampling Guidance (ADEC, 2017). Impact to data quality is discussed in the CDQR.

Acronyms

bgs - below ground surface
btoc - below top of casing
°C - degree Celsius
CDQR - Chemical Data Quality Review
DO - dissolved oxygen
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric turbidity units
ORP - oxidation reduction potential

GROUNDWATER SAMPLE FORM | **DRMO YARD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: DRMO1 / DRMO2 (Bldg 5010) / DRMO5

Date: 6/19/19 | Probe/Well #: DI-3

Time: 1055 | Sample ID: 19FWDY 01 WG

Sampler: CB

Weather: PARTLY CLOUDY | Outside Temperature: 67°F

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

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

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 13 | Water Level: 3 YEL

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

Column of Water in Probe/Well | Sampling Depth SCREENED INTERVAL

Total Depth in Probe/Well (feet btoc): 18.95 | Well Screened ~~Across~~ / ~~Below~~ water table UNKNOWN - ASSUME 10' SCREEN

Depth to Water from TOC (feet): - 11.31 | Depth tubing / pump intake set* approx. 5.6 feet below top of casing

Column of Water in Probe/Well (feet): = 7.64 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 4.9

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.3	10	5.08	0.491	4.63	5.99	-7.5	166.5	11.36
1.95	15	5.02	0.490	2.96	6.10	-10.2	101.2	11.58
2.6	20	4.93	0.490	2.14	6.13	-12.8	69.92	11.38
3.25	25	4.90	0.489	2.07	6.15	-15.8	47.58	11.38
3.9	30	4.93	0.489	2.10	6.15	-15.5	26.29	11.38
4.55	35	4.92	0.489	2.08	6.15	-16.2	23.08	11.38
5.2	40	4.92	0.489	2.06	6.16	-16.7	24.71	11.39
5.5	FINAL							
			UB					

Did groundwater parameters stabilize? (Yes) / No If no, why not? —

Did drawdown stabilize? (Yes) / No If no, why not? —

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? → ORANGE TINT

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

Well Condition: Lock: (Y) / N Labeled with LOC ID: (Y) / N Comments: WELL BROKEN BGS -

Sheen: Yes / (No) Odor: (Yes) / No Notes/Comments: BENTONITE WAS ON TUBING & PUMP.

Laboratory Analyses (Circle): VOC, DRO, Dissolved Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **DRMO YARD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: (DRMO1) / DRMO2 (Bldg 5010) / DRMO5

Date: 6/19/19 | Probe/Well #: MP-4

Time: 1210 | Sample ID: 19FWDY02 WG

Sampler: CB

Weather: PARTLY CLOUDY | Outside Temperature: 69°F

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

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

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 13 | Water Level: BYE

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

Column of Water in Probe/Well | Sampling Depth SCREENED INTERVAL UNKNOWN ASSUME 10' SCREEN

Total Depth in Probe/Well (feet btoc): 14.85 | Well Screened ~~Across~~ / ~~Below~~ water table

Depth to Water from TOC (feet): - 8.97 | Depth tubing / pump intake set* approx. 10 feet below top of casing

Column of Water in Probe/Well (feet): = 5.88 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 0.96

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	6.38	0.458	1.90	6.57	-60.1	6.77	9.00
2.25	15	6.50	0.459	1.85	6.62	-76.5	5.01	9.00
3	20	6.60	0.459	1.76	6.64	-80.1	3.97	9.00
3.75	25	6.46	0.459	1.66	6.64	-83.4	2.59	9.01
4.5	30	6.47	0.459	1.63	6.64	-85.5	2.52	9.01
5.25	35	6.44	0.458	1.61	6.63	-88.8	2.16	9.01
5.5	FINAL							

Did groundwater parameters stabilize? (Yes) / No If no, why not? —

Did drawdown stabilize? (Yes) / No If no, why not? —

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? —

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

Well Condition: Lock: (Y) N Labeled with LOC ID: (Y) / N Comments: —

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

Laboratory Analyses (Circle): VOC, DRO, Dissolved Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **DRMO YARD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | **Site Location:** DRMO1 / DRMO2 (Bldg 5010) / DRMO5

Date: 6/19/19 | **Probe/Well #:** AP-5826

Time: 1315 | **Sample ID:** 19FWDY03 WG

Sampler: CB

Weather: MOSTLY SUNNY | **Outside Temperature:** 72°F

QA/QC Sample ID/Time/LOCID: 19FWDY04WG/1330/AP-4040 | **MS/MSD Performed?** Yes / No

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

Equipment Used for Sampling: YSI # 6 | **Turbidity Meter #:** 13 | **Water Level:** BTOC

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

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

Total Depth in Probe/Well (feet btoc): 17.10 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 10.23 | Depth tubing / pump intake set* approx. 12.2 feet below top of casing

Column of Water in Probe/Well (feet): = 6.87 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 1.12

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	7.35	0.359	1.27	6.51	-7.5	22.17	10.38
2.25	15	7.52	0.354	1.32	6.57	-10.2	14.68	10.39
3	20	7.55	0.352	1.43	6.61	-15.0	10.96	10.39
3.75	25	7.54	0.352	1.47	6.62	-17.1	6.50	10.39
4.5	30	7.54	0.352	1.46	6.62	-19.5	4.28	10.39
5	FINAL							
				CB				

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

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

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

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

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

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

Laboratory Analyses (Circle): VOC, DRO, Dissolved Iron, Sulfate

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

Purge Water

Gallons generated: 5 | Containerized and disposed as IDW? Yes / No | If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **DRMO YARD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: DRMO1 / DRMO2 (Bldg 5010) / DRMO5

Date: 6/19/19 | Probe/Well #: AP-6806

Time: 1425 | Sample ID: 19FWDY 05 WG

Sampler: CB

Weather: PARTLY CLOUDY | Outside Temperature: 74 OF

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

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

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 13 | Water Level: YES

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 20.51

Depth to Water from TOC (feet): - 11.33

Column of Water in Probe/Well (feet): = 9.18

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

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

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 13.3 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.4	10	4.81	0.480	2.12	6.71	-42.1	15.78	11.38
2.1	15	4.90	0.488	2.37	6.71	-57.5	11.11	11.40
2.8	20	5.07	0.486	2.45	6.70	-60.6	9.37	11.40
3.5	25	5.16	0.490	2.52	6.70	-63.0	5.55	11.40
4.2	30	5.10	0.489	2.50	6.68	-64.0	5.29	11.40
4.9	35	5.12	0.489	2.52	6.68	-63.8	5.19	11.41
6	FINAL							
				CB				

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

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

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

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

Well Condition: Lock: Y / N | Labeled with LOC ID: Y / N | Comments: —

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

Laboratory Analyses (Circle): VOC, DRO, Dissolved Iron, Sulfate

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

Purge Water

Gallons generated: 6 | Containerized and disposed as IDW? Yes / No | If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **DRMO YARD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: DRMO1 / DRMO2 (Bldg 5010) / DRMO5

Date: 6/19/19 | Probe/Well #: AP-7346

Time: 1520 | Sample ID: 19FWDY 06 WG

Sampler: CB

Weather: PARTLY CLOUDY | Outside Temperature: 74°F → VOC ONLY

QA/QC Sample ID/Time/LOCID: 19FWDY07WG / 1535 / AP-5050 | MS/MSD Performed? Yes / No

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

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 3 | Water Level: YES.

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 11.71

Depth to Water from TOC (feet): - 8.21

Column of Water in Probe/Well (feet): = 3.5

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

Volume of Water in 1 Probe/Well Casing (gal): 0.57

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 10.2 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.4	10	6.00	0.386	1.88	6.53	6.7	20.12	8.40
2.1	15	5.85	0.386	1.88	6.62	0.1	14.98	8.40
2.8	20	5.80	0.386	1.90	6.75	-5.6	10.05	8.40
3.5	25	5.75	0.386	1.90	6.77	-6.2	6.79	8.42
4.2	30	5.73	0.386	1.92	6.77	-8.2	6.94	8.42
4.9	35	5.75	0.387	1.92	6.77	-10.0	3.72	8.42
5.5	FINAL							
				CB				

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

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

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

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

Well Condition: Locked Y / N | Labeled with LOC ID Y / N | Comments: BLACK STAINING ON TUBING

Sheen: Yes / No | Odor: Yes / No | FLUSH MOUNT | Notes/Comments:

Laboratory Analyses (Circle): VOC, DRO, Dissolved Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **DRMO YARD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: DRMO1 / (DRMO2 (Bldg 5010)) / DRMO5

Date: 6/20/19 | Probe/Well #: AP-7348

Time: 1220 | Sample ID: 19FWDY08 WG

Sampler: AS

Weather: P. Cloudy | Outside Temperature: 75°F

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

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: Settings 15

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

Column of Water in Probe/Well | **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 15.40 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 10.29 | Depth tubing / pump intake set* approx. 12.3 feet below top of casing

Column of Water in Probe/Well (feet): = 5.11 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 0.83

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	7.72	0.663	0.64	6.31	-100.9	14.46	10.39
2.0	20	7.61	0.659	0.52	6.26	-99.0	9.80	10.39
2.5	25	7.65	0.666	0.47	6.22	-100.2	8.14	10.39
3.0	30	7.67	0.663	0.48	6.19	-100.7	7.06	10.39
3.5	35	7.63	0.665	0.49	6.17	-101.1	6.82	10.39

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

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

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

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

Well Condition: Lock (Y)/ N Labeled with LOC ID: Y / (N) Comments: Added new bolt & ID

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

Laboratory Analyses (Circle): (VOC, DRO, Dissolved Iron, Sulfate)

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

Purge Water

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

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #: 9011-22
Site Location: Neely Road (Former Building 3570)
Date: 6/24/19
Probe/Well #: AP-9684
Time: 1100
Sample ID: 19FWNR 01 WG
Sampler: AS
Weather: Cloudy
Outside Temperature: 65°F
QA/QC Sample ID/Time/LOCID: —— Yellow-clip MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder
Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 9 Turbidity Meter #: #14 Water Level: Red Solinst

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 24.73
Depth to Water from TOC (feet): - 18.31
Column of Water in Probe/Well (feet): = 6.42
Circle: Gallons per foot of 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.04

Sampling Depth

Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 20.3 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	10.72	0.903	1.30	6.35	-74.1	7.17	18.39
2.0	20	10.78	0.904	0.71	6.21	-81.9	7.79	18.39
2.5	25	10.80	0.903	0.61	6.21	-86.5	6.85	18.39
3.0	30	10.81	0.905	0.61	6.24	-90.3	5.96	18.39
3.5	35	10.82	0.908	0.60	6.27	-92.8	6.58	18.39

AS

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

Laboratory Analyses (Circle): (VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate)
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = — HNO3 = —

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? (Yes) / No If No, why not?
Disposal method*: (POL Water) / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Neely Road (Former Building 3570)

Date: 9/24/19 | Probe/Well #: AP-9459

Time: 1215 | Sample ID: 19FWNR 02 WG

Sampler: AS

Weather: P. Cloudy | Outside Temperature: 65°F

QA/QC Sample ID/Time/LOCID: 19FWNR03WG/1230/AP-8080 Small Clip | MS/MSD Performed? (Yes) No

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: Solinist 15

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 22.74

Depth to Water from TOC (feet): - 17.22

Column of Water in Probe/Well (feet): = 5.52

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

Volume of Water in 1 Probe/Well Casing (gal): 0.90

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 19.2 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	16.79	0.852	0.45	6.67	-91.6	8.98	17.28
2.0	20	16.90	0.851	0.42	6.67	-95.8	15.05	17.28
2.5	25	17.05	0.847	0.41	6.67	-98.8	9.98	17.28
3.0	30	17.10	0.844	0.42	6.68	-100.8	7.05	17.28
3.5	35	17.15	0.841	0.42	6.68	-101.9	6.12	17.28

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

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

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

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

Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) / N Comments: Re-labeled

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

Laboratory Analyses (Circle): VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate

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

Purge Water

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

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #:	9011-22	**Site Location:**	Neely Road (Former Building 3570)
Date:	6/24/19	**Probe/Well #:**	AP-9003
Time:	1340	**Sample ID:**	19FWNR 04 WG
Sampler:	JS		
Weather:	P. Cloudy	**Outside Temperature:**	65°F
QA/QC Sample ID/Time/LOCID:	—		yellow clip **MS/MSD Performed? Yes/(No)**

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

Equipment Used for Sampling: YSI # 9 **Turbidity Meter #:** 14 **Water Level:** Solinist 15

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 32.25

Depth to Water from TOC (feet): - 19.25

Column of Water in Probe/Well (feet): = 3.0

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

Volume of Water in 1 Probe/Well Casing (gal): 0.49

Sampling Depth

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

Depth tubing / pump intake set* approx. 21.25 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	8.43	1.165	1.17	6.32	-54.5	17.56	19.35
2.0	20	7.89	1.174	0.81	6.26	-56.2	14.09	19.35
2.5	25	7.95	1.168	10.71	6.26	-57.6	8.23	19.35
3.0	30	7.90	1.172	0.71	6.23	-56.7	5.15	19.35
3.5	35	7.92	1.170	0.68	6.26	-59.5	5.44	19.35

Did groundwater parameters stabilize? (Yes) / No **If no, why not?** —

Did drawdown stabilize? (Yes) / No **If no, why not?** —

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No **If no, why not?** —

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

Well Condition: Lock: (Y) / N Labeled with LOC ID: (Y) / N **Comments:** —

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

Laboratory Analyses (Circle): VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate

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

Purge Water

Gallons generated: 5.0 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: JS

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Neely Road (Former Building 3570)

Date: 7/24/19 | Probe/Well #: AP-8211

Time: 1500 | Sample ID: 19FWNR 05 WG

Sampler: AS

Weather: P. Cloudy | Outside Temperature: 65°F

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

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: Solinist 15

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 21.92

Depth to Water from TOC (feet): - 18.07

Column of Water in Probe/Well (feet): = 3.85

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

Volume of Water in 1 Probe/Well Casing (gal): 0.63

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 20 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ✓ ±3%	✓ ±10% (<1mg/L, ±0.2 mg/L)	✓ ±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	8.56	1.199	0.90	6.34	50.0	34.29	18.44
2.0	20	8.87	1.179	0.67	6.34	17.6	29.65	18.44
2.5	25	8.63	1.175	0.66	6.30	-4.4	26.76	18.44
3.0	30	8.65	1.169	0.66	6.29	-19.4	22.72	18.44
3.5	35	8.62	1.163	0.59	6.25	-28.6	20.53	18.44
4.0	40	8.60	1.156	0.53	6.25	-37.5	19.59	18.44

AS

Did groundwater parameters stabilize? (Yes) / No If no, why not? —

Did drawdown stabilize? (Yes) / No If no, why not? —

Was flowrate between 0.03 and 0.15 GPM? (Yes/No) If no, why not? —

Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: Some silt on initial purge

Well Condition: Lock (Y) / N Labeled with LOC ID: (Y) / N Comments: —

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

Laboratory Analyses (Circle): (VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate)

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

Purge Water

Gallons generated: 5.0 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #:	9011-22	**Site Location:**	Neely Road (Former Building 3570)
Date:	6/24/19	**Probe/Well #:**	MP-9685
Time:	1630	**Sample ID:**	19FWNR 06 WG
Sampler:	AS		
Weather:	P. Cloudy	**Outside Temperature:**	70°F
QA/QC Sample ID/Time/LOCID:	-		Little clip **MS/MSD Performed? Yes/(No)**

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

Equipment Used for Sampling: **YSI #** 9 **Turbidity Meter #:** 14 **Water Level:** Solinst 15

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

Column of Water in Probe/Well **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 22.10 Well Screened (Across) / **Below** water table

Depth to Water from TOC (feet): - 14.33 Depth tubing / pump intake set* approx. 16.3 feet below top of casing

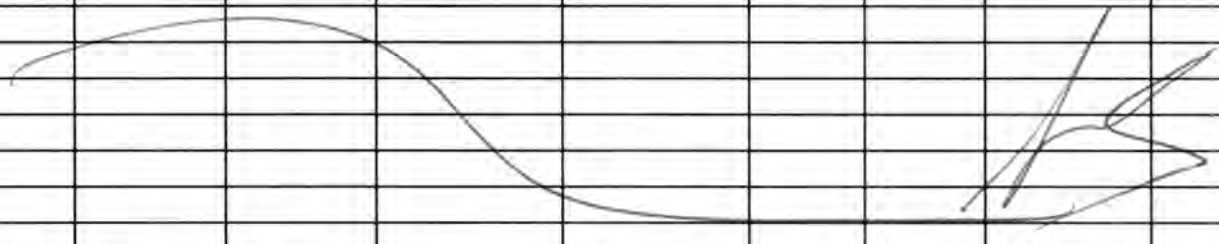
Column of Water in Probe/Well (feet): = 7.77 *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 1.27

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	11.52	0.828	4.06	6.69	39.9	9.94	14.40
2.0	20	11.73	0.835	3.25	6.68	32.3	9.92	14.40
2.5	25	12.01	0.837	2.76	6.64	26.7	7.50	14.40
3.0	30	12.03	0.836	2.33	6.64	22.8	4.39	14.40
3.5	35	12.05	0.840	2.30	6.62	20.0	4.71	14.40
4.0	40	12.03	0.842	2.20	6.58	17.1	4.24	14.40



Did groundwater parameters stabilize? (Yes) / No **If no, why not?**

Did drawdown stabilize? (Yes) / No **If no, why not?**

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No **If no, why not?**

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

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

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

Laboratory Analyses (Circle): (VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate)

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

Purge Water

Gallons generated: 5.0 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Neely Road (Former Building 3570)

Date: 9/1/19 | Probe/Well #: AP-8211

Time: 0955 | Sample ID: 19FWNR07WG

Sampler: CB

Weather: PARTLY CLOUDY/WIND | Outside Temperature: 51 °F

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

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 22.01

Depth to Water from TOC (feet): - 15.35

Column of Water in Probe/Well (feet): = 6.66

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

Volume of Water in 1 Probe/Well Casing (gal): 1.08

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 16.3 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1	10	9.09	1.007	0.55	6.50	-10.8	46.19	15.39
1.5	15	8.89	1.002	0.60	6.47	-17.2	28.14	15.42
2	20	9.07	0.997	0.55	6.40	-30.1	15.15	15.42
2.5	25	9.25	0.950	0.50	6.41	-37.1	12.92	15.42
3	30	9.35	0.942	0.56	6.40	-36.5	13.28	15.43
3.5	35	9.30	0.940	0.55	6.37	-42.1	10.76	15.43
4	40	9.32	0.936	0.57	6.38	-44.8	10.98	15.43
4.5	FINAL							

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

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

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

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

Well Condition: Lock: Y / N | Labeled with LOC ID: Y / N | Comments:

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

Laboratory Analyses (Circle): VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate

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

Purge Water

Gallons generated: 45 | Containerized and disposed as IDW? Yes / No | If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #:	9011-22	**Site Location:**	Neely Road (Former Building 3570)
Date:	9/1/19	**Probe/Well #:**	AP-9003
Time:	1100	**Sample ID:**	19FWNR 08 WG
Sampler:	CB		
Weather:	PARTLY CLOUDY	**Outside Temperature:**	53°F

QA/QC Sample ID/Time/LOCID: **MS/MSD Performed? Yes/ No**

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

Equipment Used for Sampling: **YSI #** 9 **Turbidity Meter #:** 14 **Water Level:** 13

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

Column of Water in Probe/Well **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 22.35 — Well Screened **Across** / **Below** water table

Depth to Water from TOC (feet): - 16.51 — Depth tubing / pump intake set* approx. 17.5 feet below top of casing

Column of Water in Probe/Well (feet): = 5.84 — *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 0.95

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1	10	8.55	1.006	1.22	7.00	53.0	20.19	16.62
1.5	15	8.60	1.009	0.85	6.89	42.1	10.12	16.63
2	20	8.57	1.015	0.81	6.87	45.5	7.02	16.63
2.5	25	8.52	1.018	0.83	6.87	47.8	3.98	16.63
3	30	8.55	1.020	0.77	6.87	45.0	4.00	16.64
3.5	FINAL							

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

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

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

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

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

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

Laboratory Analyses (Circle): VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM NEELY ROAD Ft. Wainwright, Alaska

Project #:	9011-22	**Site Location:**	Neely Road (Former Building 3570)
Date:	9/11/19	**Probe/Well #:**	AP-9459
Time:	1150	**Sample ID:**	19FWNR 09 WG
Sampler:	HSO CB		
Weather:	PARTLY CLOUDY	**Outside Temperature:**	55°F
QA/QC Sample ID/Time/LOCID:	19FWNR10WG/1205/AP-5080	**MS/MSD Performed?**	(Yes) / No

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

Equipment Used for Sampling: YSI # 9 **Turbidity Meter #:** 14 **Water Level:** 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 22.82

Depth to Water from TOC (feet): - 14.48

Column of Water in Probe/Well (feet): = 8.34

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

Volume of Water in 1 Probe/Well Casing (gal): 1.4

Sampling Depth

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

Depth tubing / pump intake set* approx. 15.5 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.3	10	17.42	0.739	0.38	6.84	-77.9	13.50	14.55
1.95	15	17.48	0.752	0.39	6.83	-80.8	10.08	14.55
2.6	20	17.51	0.763	0.40	6.83	-81.0	7.69	14.55
3.25	25	17.50	0.775	0.39	6.82	-82.2	5.72	14.55
3.9	30	17.51	0.776	0.40	6.82	-83.3	5.16	14.56
4.55	35	17.45	0.778	0.37	6.82	-85.0	3.96	14.56
9	FINAL							
	CB							

Did groundwater parameters stabilize? (Yes) / No **If no, why not?** _____

Did drawdown stabilize? (Yes) / No **If no, why not?** _____

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No **If no, why not?** _____

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

Well Condition: Lock: (Y) / N Labeled with LOC ID: (Y) / N **Comments:** _____

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

Laboratory Analyses (Circle): (VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate)

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

Purge Water

Gallons generated: 9 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Neely Road (Former Building 3570)

Date: 9/11/19 | Probe/Well #: AP-9684

Time: 1245 | Sample ID: 19FWNR 11 WG

Sampler: CB

Weather: MOSTLY CLOUDY | Outside Temperature: 60°F

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

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 24.81

Depth to Water from TOC (feet): - 15.58

Column of Water in Probe/Well (feet): = 9.23

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

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

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 16.7 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.2	10	12.25	0.985	1.26	6.75	-60.0	13.92	15.68
1.8	15	12.39	0.992	0.89	6.77	-76.9	8.10	15.68
2.4	20	12.70	0.993	0.60	6.77	-79.5	4.98	15.68
3	25	12.80	0.993	0.58	6.77	-81.1	7.11	15.68
3.6	30	12.76	0.995	0.55	6.77	-80.1	5.62	15.68
4.5	FINAL							
		CB						

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

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

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

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

Well Condition: Lock: (Y) / N Labeled with LOC ID: (Y) / N Comments:

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

Laboratory Analyses (Circle): VOC, GRO, DRO, ~~Dissolved Iron/Manganese~~, Sulfate

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

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **NEELY ROAD** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Neely Road (Former Building 3570)

Date: 9/1/19 | Probe/Well #: AP-9655

Time: 1420 | Sample ID: 19FWNR12WG

Sampler: CB

Weather: PARTLY CLOUDY | Outside Temperature: 62°F

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

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 22.23

Depth to Water from TOC (feet): - 11.55

Column of Water in Probe/Well (feet): = 10.68

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

Volume of Water in 1 Probe/Well Casing (gal): 1.74

Sampling Depth

Well Screened Across / (Below) water table

Depth tubing / pump intake set* approx. 17.2 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.3	10	10.23	0.874	2.07	6.85	64.0	12.87	11.67
1.95	15	10.00	0.859	1.92	6.90	62.1	9.86	11.67
2.6	20	9.75	0.859	1.90	6.93	63.8	6.12	11.67
3.25	25	9.73	0.859	1.90	6.93	63.5	4.44	11.67
3.9	30	9.65	0.859	1.85	6.95	63.3	5.55	11.68
4.55	35	9.62	0.850	1.82	6.93	62.0	4.90	11.68
4.75	FINAL							

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

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

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

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

Well Condition: Lock (Y) / N Labeled with LOC ID: (Y) / N Comments:

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

Laboratory Analyses (Circle): (VOC, GRO, DRO, Dissolved Iron/Manganese, Sulfate)

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

Purge Water

Gallons generated: 4.75 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 1168** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 1168 Leach Well

Date: 6/19/19 | Probe/Well #: MP-5751

Time: 1635 | Sample ID: 19FW680 | WG

Sampler: AS

Weather: Cloudy | Outside Temperature: 70°F

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

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: Solinst 15

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

New, dedicated, teflon-lined tubing placed in the well for sampling. Yellow clip

Column of Water in Probe/Well | **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 20.50 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 17.58 | Depth tubing / pump intake set* approx. 19.5 feet below top of casing

Column of Water in Probe/Well (feet): = 2.92 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 0.48

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	5.21	0.726	2.53	6.26	93.3	3.08	18.20
2.0	20	5.17	0.721	1.44	6.31	89.3	4.26	18.20
2.5	25	5.20	0.723	1.46	6.24	88.1	5.16	18.20
3.0	30	5.23	0.714	1.48	6.26	86.6	4.95	18.20
3.5	35	5.25	0.715	1.50	6.25	84.6	4.73	18.20

Did groundwater parameters stabilize? (Yes) / No If no, why not? —

Did drawdown stabilize? (Yes) / No If no, why not? —

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? —

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

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

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

Laboratory Analyses (Circle): (VOC, DRO, Dissolved Iron, Sulfate)

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

Purge Water

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

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 1168** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | **Site Location:** Former Building 1168 Leach Well

Date: 6/19/19 | **Probe/Well #:** AP-6809

Time: 1740 | **Sample ID:** 19FW68 02 WG

Sampler: AS

Weather: P. Cloudy | **Outside Temperature:** 70°F

QA/QC Sample ID/Time/LOCID: — yellow clip | **MS/MSD Performed? Yes/No**

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

Equipment Used for Sampling: YSI # 9 | **Turbidity Meter #:** 14 | **Water Level:** Solinist 15

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 26.97

Depth to Water from TOC (feet): - 17.43

Column of Water in Probe/Well (feet): = 9.54

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

Volume of Water in 1 Probe/Well Casing (gal): 1.56

Sampling Depth

Well Screened Across / Below water table 15' screen

Depth tubing / pump intake set* approx. 19.4 feet below top of casing

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

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

Field Parameters:		✓ ±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ✓ ±3%	✓ ±10% (<1mg/L, ±0.2 mg/L)	✓ ±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	6.03	1.086	0.81	6.16	83.4	86.95	17.52
2.0	20	5.84	1.074	0.75	6.18	71.4	90.33	17.53
2.5	25	5.64	1.055	0.77	6.18	60.3	78.57	17.55
3.0	30	5.53	1.050	0.77	6.18	52.2	59.20	17.57
3.5	35	5.68	1.055	0.73	6.18	46.0	32.12	17.57

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

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

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

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

Well Condition: Lock Y / N | Labeled with LOC ID Y / N | **Comments:** —

Sheen: Yes / No | **Odor:** Yes / No | **Notes/Comments:** —

Laboratory Analyses (Circle): VOC, DRO, Dissolved Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 1168** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 1168 Leach Well

Date: 6/20/19 | Probe/Well #: AP-10037MW

Time: 1000 | Sample ID: 19FW6803 WG

Sampler: AS

Weather: P. Cloudy | Outside Temperature: 65°F | yellow clip

QA/QC Sample ID/Time/LOCID: 19FW6804WG / 1015 / AP-6060 | MS/MSD Performed? (Yes) No

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: Solinst F

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

Installed new, dedicated, teflon-lined tubing for sampling.

Column of Water in Probe/Well | **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 25.31 | Well Screened **(Across)** / **Below** water table

Depth to Water from TOC (feet): - 18.67 | Depth tubing / pump intake set* approx. 20.6 feet below top of casing

Column of Water in Probe/Well (feet): = 6.64 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 1.08

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	5.21	0.887	1.59	6.81	-56.0	132.6	18.75
2.0	20	5.25	0.854	0.87	6.72	-66.1	63.19	18.75
2.5	25	5.20	0.833	0.71	6.64	-74.7	34.04	18.75
3.0	30	5.22	0.831	0.66	6.58	-78.9	20.25	18.75
3.5	35	5.21	0.834	0.63	6.52	-81.1	15.07	18.75
4.0	40	5.23	0.824	0.62	6.49	-83.6	11.42	18.75

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

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

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

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

Well Condition: Lock (Y) / N Labeled with LOC ID: (Y) / N Comments:

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

Laboratory Analyses (Circle): (VOC, DRO, Dissolved Iron, Sulfate)

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

Purge Water

Gallons generated: 5.0 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM **FORMER BUILDING 2250** **Ft. Wainwright, Alaska**

Project #: 9011-22 Site Location: Former Building 2250 UST, Quonset Hut

Date: 6/19/19 Probe/Well #: AP-7153

Time: 1120 Sample ID: 19FW22 01 WG

Sampler: AS

Weather: P. Cloudy Outside Temperature: 65°F

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

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

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 14 Water Level: Stabilized 15

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

Installed new teflon-lined tubing for submersible pump. Dedicated.

Column of Water in Probe/Well **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 22.98 Well Screened Across / (Below) water table

Depth to Water from TOC (feet): - 11.18 Depth tubing / pump intake set* approx. 18 feet below top of casing

Column of Water in Probe/Well (feet): = 11.8 *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 1.92

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	4.15	0.507	1.05	6.45	-79.6	13.31	11.30
2.0	20	4.17	0.513	0.79	6.34	-86.2	9.34	11.30
2.5	25	4.20	0.513	0.69	6.30	-90.5	8.72	11.30
3.0	30	4.22	0.514	0.64	6.30	-93.4	6.77	11.30
3.5	35	4.25	0.511	0.57	6.30	-94.8	6.28	11.30

Did groundwater parameters stabilize? (Yes) / No If no, why not? —

Did drawdown stabilize? (Yes) / No If no, why not? —

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? —

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

Well Condition: Lock: Y / (N) Labeled with LOC ID: (Y) N Comments: Flushmount - threaded cap

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

Laboratory Analyses (Circle): (DRO, Dissolved Iron, Sulfate)

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

Purge Water

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

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 2250** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 2250 UST, Quonset Hut

Date: 6/19/19 | Probe/Well #: AP-5976

Time: 1250 | Sample ID: 19FW22 02 WG

Sampler: AS

Weather: P. Cloudy | Outside Temperature: 70°F

QA/QC Sample ID/Time/LOCID: 19FW2203 WG / 1300 / AP-3030 | MS/MSD Performed? (Yes) No

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

Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 14 | Water Level: Solinist 15

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

Installed new, dedicated, teflon-lined tubing in well for submersible pump.

Column of Water in Probe/Well | Sampling Depth

Total Depth in Probe/Well (feet btoc): 21.60 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 15.97 | Depth tubing / pump intake set* approx. 18 feet below top of casing

Column of Water in Probe/Well (feet): = AS ~~21.60~~ 5.63 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 0.92

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	15	4.41	0.430	0.79	6.53	-92.4	188.7	16.05
2.0	20	4.45	0.432	0.61	6.48	-98.0	175.1	16.05
2.5	25	3.51	0.435	0.49	6.42	-102.1	170.2	16.05
3.0	30	3.50	0.435	0.42	6.37	-105.5	154.8	16.05
3.5	35	3.46	0.436	0.39	6.35	-108.2	121.4	16.05
4.0	40	3.52	0.435	0.40	6.35	-110.7	92.72	16.05
4.5	45	3.49	0.435	0.37	6.34	-112.3	71.73	16.05
5.0	50	3.50	0.435	0.35	6.33	-113.9	54.12	16.05
5.5	55	3.52	0.435	0.34	6.33	-115.1	38.19	16.05

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

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

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: Took a while for turbidity to drop

Well Condition: Lock: (Y) / N Labeled with LOC ID (Y) / N Comments:

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

Laboratory Analyses (Circle): DRO, Dissolved Iron, Sulfate

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

Purge Water

Gallons generated: 6.5 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 2250** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 2250 UST, Quonset Hut

Date: 6/19/19 | Probe/Well #: AP-7151

Time: 1440 | Sample ID: 19FW2204 WG

Sampler: AS

Weather: P. Cloudy | Outside Temperature: 75°F

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

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

Equipment Used for Sampling: YSI # ↑ | Turbidity Meter #: 14 | Water Level: Solinst 15

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

Installed new, dedicated, teflon-lined tubing for submersible pump.

Column of Water in Probe/Well | **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 29.90 | Well Screened **Across** / (**Below**) water table

Depth to Water from TOC (feet): - 15.28 | Depth tubing / pump intake set* approx. 25 feet below top of casing

Column of Water in Probe/Well (feet): = 14.62 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 2.38

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	15	5.05	0.535	0.87	6.50	-82.6	10.25	15.32
1.0	20	4.58	0.531	0.66	6.46	-89.3	13.69	15.32
1.5	25	4.55	0.542	0.59	6.50	-94.4	16.72	15.32
2.0	30	4.57	0.537	0.60	6.45	-97.1	11.41	15.32
2.5	35	4.52	0.536	0.53	6.47	-100.0	10.66	15.32

Did groundwater parameters stabilize? (Yes) / No If no, why not? —

Did drawdown stabilize? (Yes) / No If no, why not? —

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? —

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

Well Condition: Lock (Y) / N Labeled with LOC ID: (Y) / N Comments: —

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

Laboratory Analyses (Circle): (DRO, Dissolved Iron, Sulfate)

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

Purge Water

Gallons generated: 2.5 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: AS

GROUNDWATER SAMPLE FORM **FORMER BUILDING 3564** **Ft. Wainwright, Alaska**

Project #: 9011-22 Site Location: Former Building 3564 Diesel Electric Generator Plant

Date: 6/21/19 Probe/Well #: MW3564-1

Time: 1050 Sample ID: 19FW64 01 WG

Sampler: CB

Weather: SUNNY Outside Temperature: 73°F

QA/QC Sample ID/Time/LOCID: — MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump / Submersible / Bladder Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other

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

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 23.42

Depth to Water from TOC (feet): - 18.65

Column of Water in Probe/Well (feet): = 4.77

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

Volume of Water in 1 Probe/Well Casing (gal): 0.77

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 20.6 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.3	10	15.54	0.848	0.98	7.07	-16.1	96.92	18.71
1.95	15	15.22	0.842	0.84	7.08	-23.7	27.44	18.72
2.6	20	15.00	0.840	0.88	7.06	-26.8	11.91	18.73
3.25	25	15.02	0.840	0.88	7.05	-29.2	12.05	18.73
3.5	30	14.94	0.840	0.87	7.05	-32.6	11.71	18.73
4.5	FINAL							
			CB					

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

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

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

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

Well Condition: Lock: Y / N Labeled with LOC ID: Y / N Comments: —

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

Laboratory Analyses (Circle): DRO, RRO, Dissolved Iron, Sulfate

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

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? Yes / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 3564** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 3564 Diesel Electric Generator Plant
Date: 6/21/19 | Probe/Well #: AP-7191
Time: 1205 | Sample ID: 19FW64 02WG
Sampler: CB
Weather: SUNNY | Outside Temperature: 77°F
QA/QC Sample ID/Time/LOCID: 19FW6403WG/1220/AP-7070 | MS/MSD Performed? (Yes) No

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 13 | Water Level: 13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 21.87
Depth to Water from TOC (feet): - 17.53
Column of Water in Probe/Well (feet): = 4.34
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 0.71

Sampling Depth

Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 19.5 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	7.09	0.904	0.67	6.99	-132.8	26.33	17.66
2.25	15	7.01	0.904	0.59	6.82	-140.1	17.98	17.66
3	20	6.96	0.904	0.54	6.72	-144.7	12.14	17.67
3.75	25	7.10	0.903	0.52	6.69	-146.2	5.00	17.67
4.5	30	7.14	0.903	0.50	6.65	-148.9	3.78	17.67
5.25	35	7.17	0.903	0.49	6.62	-150.0	3.29	17.67
6	FINAL							
				CB				

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

Laboratory Analyses (Circle): (DRO), (RRO), Dissolved Iron, Sulfate
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

Gallons generated: 6 Containerized and disposed as IDW? (Yes) / No If No, why not?
Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: CB

GROUNDWATER SAMPLE FORM **FORMER BUILDING 3564** **Ft. Wainwright, Alaska**

Project #: 9011-22 Site Location: Former Building 3564 Diesel Electric Generator Plant

Date: 6/24/15 Probe/Well #: AP-7189

Time: 1100 Sample ID: 19FW64 04 WG

Sampler: CB

Weather: MOSTLY CLOUDY Outside Temperature: ~~2~~F 62°F

QA/QC Sample ID/Time/LOCID: — MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump / Submersible / Bladder Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 12 Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 21.95

Depth to Water from TOC (feet): - 17.02

Column of Water in Probe/Well (feet): = 4.93

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

Volume of Water in 1 Probe/Well Casing (gal): 0.8

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 19 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	7.80	0.802	4.79	6.01	-64.1	16.77	17.18
2.25	15	7.79	0.795	3.03	6.25	-79.2	16.58	17.22
3	20	7.78	0.788	2.67	6.34	-92.4	13.79	17.25
3.75	25	7.70	0.789	2.60	6.39	-95.2	10.10	17.
4.5	30	7.66	0.789	2.58	6.41	-100.2	7.97	17.
5.25	35	7.62	0.789	2.55	6.41	-102.1	5.88	
6	FINAL							
				CB				

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

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

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

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

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

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

Laboratory Analyses (Circle): DRO, RRO, Dissolved Iron, Sulfate

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

Purge Water

Gallons generated: 6 Containerized and disposed as IDW? Yes / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 3564** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 3564 Diesel Electric Generator Plant

Date: 6/24/19 | Probe/Well #: AP-7183

Time: 1320 | Sample ID: 19FW64 05 WG

Sampler: CB

Weather: MOSTLY CLOUDY | Outside Temperature: 68°F

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

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

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 18 | Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 21.85

Depth to Water from TOC (feet): 17.91

Column of Water in Probe/Well (feet): = 3.94

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

Volume of Water in 1 Probe/Well Casing (gal): 0.64

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 19.9 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	9.69	0.975	2.34	6.66	100.3	9.41	18.55
2.25	15	9.62	0.970	2.03	6.68	93.6	7.29	18.57
3	20	9.52	0.967	1.84	6.72	81.1	5.41	18.59
3.75	25	9.49	0.965	1.80	6.74	77.7	3.59	18.60
4.5	30	9.44	0.961	1.78	6.74	75.3	3.96	18.62
5	FINAL							

CB

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

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

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

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

Well Condition: Locked Y / N Labeled with LOC ID: Y / N Comments: REMOVED XDUCER AT 1242

Sheen: Yes / No Odor: Yes / No Notes/Comments: REPLACED AT 1331

Laboratory Analyses (Circle): ~~DRO, RRO, Dissolved Iron, Sulfate~~

pH checked of samples: Y / N Approximate volume added (mL): HCl = 0 HNO_3 = 2

Purge Water

Gallons generated: 5 Containerized and disposed as IDW? Yes / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 3564** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 3564 Diesel Electric Generator Plant
Date: 6/24/19 | Probe/Well #: AP-7178
Time: 1500 | Sample ID: 19FW64 06 WG
Sampler: CD
Weather: MOSTLY CLOUDY | Outside Temperature: 73°F
QA/QC Sample ID/Time/LOCID: — | MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump / Submersible / Bladder | Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 12 | Water Level: 13
Free Product Observed in Probe/Well? Yes/No | If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 17.43
Depth to Water from TOC (feet): - 14.49
Column of Water in Probe/Well (feet): = 2.94
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 0.48

Sampling Depth

Well Screened Across / Below water table
Depth tubing / pump intake set* approx: 16.5 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	6.42	0.795	1.59	5.98	-30.1	128.1	14.89
2.25	15	6.39	0.793	1.20	6.02	-32.9	74.1	15.06
3	20	6.35	0.793	1.05	6.15	-47.2	55.2	15.15
3.75	25	6.30	0.793	1.00	6.25	-51.5	31.96	15.18
4.5	30	6.30	0.793	0.95	6.28	-56.7	19.21	15.18
5.25	35	6.31	0.792	0.93	6.31	-59.2	16.07	15.15
6	40	6.32	0.788	0.90	6.34	-61.2	13.29	15.15
7	FINAL							

Did groundwater parameters stabilize? Yes / No If no, why not?
Did drawdown stabilize? Yes / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not? → INITAL 1 GALLON WAS VERY TURBID
Water Color: Clear / Yellow / Orange / Brown/Black (Sand/Silt) / Other:
Well Condition: Lock: Y / N Labeled with LOC ID: Y / N Comments: FLUSHMOUNT (OVERNIGHT)
Sheen: Yes / No Odor: Yes / No SLIGHT Notes/Comments:

Laboratory Analyses (Circle): DRO, RRO, Dissolved Iron, Sulfate
pH checked of samples: Y / N Approximate volume added (mL): HCl = 0 HNO_3 = 0

Purge Water

Gallons generated: 7 Containerized and disposed as IDW? Yes / No If No, why not?
Disposal method*: POL Water / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: CD

GROUNDWATER SAMPLE FORM **FORMER BUILDING 3564** **Ft. Wainwright, Alaska**

Project #: 9011-22 Site Location: Former Building 3564 Diesel Electric Generator Plant

Date: 6/24/19 Probe/Well #: 4P-6729

Time: 1550 Sample ID: 19FW64 07 WG

Sampler: CB

Weather: PARTLY CLOUDY Outside Temperature: 72°F

QA/QC Sample ID/Time/LOCID: — MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump / Submersible / Bladder Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 12 Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 26.66

Depth to Water from TOC (feet): - 18.43

Column of Water in Probe/Well (feet): = 8.23

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

Volume of Water in 1 Probe/Well Casing (gal): 1.3

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 20.4 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.5	10	7.32	0.855	1.11	6.82	-116.2	46.52	18.55
2.25	15	7.45	0.857	1.01	6.81	-129.7	25.11	18.55
3	20	7.47	0.857	0.89	6.81	-130.5	10.48	18.55
3.75	25	7.45	0.857	0.78	6.78	-133.8	8.88	18.55
4.5	30	7.49	0.858	0.79	6.79	-133.6	6.27	18.55
5	FINAL							
			CB					

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

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

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

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

Well Condition: Lock (Y) / N Labeled with LOC ID: (Y) / N Comments: —

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

Laboratory Analyses (Circle): DRO, RRO, Dissolved Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM **FORMER BUILDING 3564** **Ft. Wainwright, Alaska**

Project #: 9011-22 **Site Location:** Former Building 3564 Diesel Electric Generator Plant

Date: 6/24/15 **Probe/Well #:** AP-7187

Time: **Sample ID:** 19FW64 WG NO SAMPLE

Sampler: CB

Weather: **Outside Temperature:**

QA/QC Sample ID/Time/LOCID: **MS/MSD Performed? Yes/ No**

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

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

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

Column of Water in Probe/Well **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 17.55 Well Screened **Across / Below** water table

Depth to Water from TOC (feet): - 17.15 Depth tubing / pump intake set* approx. feet below top of casing

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

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) the water table, or in the middle of the screened interval for wells screened below the water table

Volume of Water in 1 Probe/Well Casing (gal): → WELL BROKE - FROM TOP OF OUTER CASING

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
WELL WAS DAMAGED (HIT) - BROKEN								
BGS. DID NOT SAMPLE PER C.M. -								
NEEDS TO BE REPLACED.								

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

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

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

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

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

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

Laboratory Analyses (Circle): DRO, RRO, Dissolved Iron, Sulfate

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

Purge Water

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

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

Sampler's Initials:

GROUNDWATER SAMPLE FORM **FORMER BUILDING 5110** **Ft. Wainwright, Alaska**

Project #: 9011-22 Site Location: Former Building 5110

Date: 6/26/19 Probe/Well #: AP-5737

Time: 1010 Sample ID: 19FW51 01 WG

Sampler: CB

Weather: PARTLY CLOUDY Outside Temperature: 65°F

QA/QC Sample ID/Time/LOCID: 19FW6402WG / AP-9090 / 1025 MS/MSD Performed? (Yes) No

Purge Method: Peristaltic Pump / Submersible / Bladder Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 13 Water Level: 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 14.15

Depth to Water from TOC (feet): 8.70

Column of Water in Probe/Well (feet): = 5.45

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

Volume of Water in 1 Probe/Well Casing (gal): 0.88

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 10.7 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.4	10	7.32	0.284	0.88	6.15	99.2	42.15	10.50
2.1	15	7.25	0.290	0.80	6.09	67.2	29.56	10.50
2.8	20	7.18	0.290	0.79	6.02	50.3	14.28	10.50
3.5	25	7.20	0.292	0.82	5.99	31.7	10.76	10.51
4.2	30	7.15	0.290	0.80	5.98	25.1	11.58	10.51
4.9	35	7.18	0.292	0.79	5.98	22.6	11.52	10.51
5.5	FINAL							
			CB					

Did groundwater parameters stabilize? (Yes) / No If no, why not? ——

Did drawdown stabilize? (Yes) / No If no, why not? ——

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? ——

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

Well Condition: Lock: (Y) / N Labeled with LOC ID: (Y) / N Comments: ——

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

Laboratory Analyses (Circle): BTEX, GRO, DRO, Dissolved Iron/Manganese, Sulfate

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 5110** | **Ft. Wainwright, Alaska**

Project #:	9011-22	**Site Location:**	Former Building 5110
Date:	6/26/19	**Probe/Well #:**	AP-5738
Time:	1115	**Sample ID:**	19FW51 03 WG
Sampler:	CB		
Weather:	MOSTLY CLOUDY	**Outside Temperature:**	69°F
QA/QC Sample ID/Time/LOCID:	—	**MS/MSD Performed? Yes/ No**	

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

Equipment Used for Sampling: YSI # 6 **Turbidity Meter #:** 13 **Water Level:** 13

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 15.32

Depth to Water from TOC (feet): - 10.23

Column of Water in Probe/Well (feet): = 5.09

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

Volume of Water in 1 Probe/Well Casing (gal): 0.83

Sampling Depth

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

Depth tubing / pump intake set* approx. 12.2 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.3	10	6.02	0.424	1.39	6.08	-36.2	65.50	10.78
1.95	15	5.65	0.425	1.12	6.38	-52.2	37.92	10.89
2.6	20	5.53	0.425	1.05	6.45	-68.0	24.40	10.90
3.25	25	5.40	0.421	0.99	6.46	-70.0	18.57	10.90
3.9	30	5.35	0.420	0.95	6.46	-73.1	16.29	10.90
4.55	35	5.38	0.418	0.91	6.46	-72.8	14.16	10.91
5	FINAL							
			CB					

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

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

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

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

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

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

Laboratory Analyses (Circle): BTEX, GRO, DRO, Dissolved Iron/Manganese, Sulfate

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

Purge Water

Gallons generated: 5 Containerized and disposed as IDW? Yes / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **FORMER BUILDING 5110** | **Ft. Wainwright, Alaska**

Project #: 9011-22 | Site Location: Former Building 5110

Date: 6/26/19 | Probe/Well #: AP-5918R

Time: 1205 | Sample ID: 19FW5104WG

Sampler: CB

Weather: PARTLY CLOUDY | Outside Temperature: 72°F

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

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

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 13 | Water Level: 13

Free Product Observed in Probe/Well? Yes/No | If Yes, Depth to Product: 0.01

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 25.21

Depth to Water from TOC (feet): - 8.73

Column of Water in Probe/Well (feet): = 16.48

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

Volume of Water in 1 Probe/Well Casing (gal): 2.7

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 20.2 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.3	10	3.90	0.443	2.31	6.73	-37.3	4.16	8.80
2.6	15	3.61	0.435	1.05	6.60	-38.7	2.92	8.81
3.25	20	3.50	0.430	0.92	6.57	-40.1	3.15	8.81
3.9	25	3.45	0.430	0.85	6.58	-42.6	1.98	8.81
4	30	3.33	0.430	0.80	6.58	-44.4	1.16	8.81
	FINAL							

CB

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

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

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

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

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

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

BLACK STAINING ON TUBING.

Laboratory Analyses (Circle): BTEX, GRO, DRO, Dissolved Iron/Manganese, Sulfate

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

Purge Water

Gallons generated: 4 Containerized and disposed as IDW? Yes / No If No, why not?

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

Sampler's Initials: CB

Submersible Pump Equipment Blank

Rinsate #: 1

Sample ID: 19FW28EB01WQ

Date: 6/20/19

Time: 1400

Analysis: VOC, DRO, Fe, SO_4

Well that the pump was last used on: AP-10037MW (FB1168)

Equipment blank results used to evaluate pump decontamination procedure @ DRMO Yard (Two-Party), Building 1168, & Building 2250 sites.

Submersible Pump Equipment Blank

Rinsate #: 2

Sample ID: 19FW2PEB02WQ

Date: 6/24/19

Time: 1700

Analysis: DRO/RRO ONLY

Well that the pump was last used on: AP-672g

Equipment blank results to be used to evaluate pump decontamination procedure @ Neely Road, Building 3564, & Building 5110 sites

Submersible Pump Equipment Blank

Rinsate #: 3

Sample ID: 19FW2PEB03WQ

Date: 6/24/19

Time: 1800

Analysis: VOC, ERO, Fe/Mn / Sulfate

Well that the pump was last used on: _____

AP-9459

Equipment blank results to be used to evaluate pump decontamination procedure @ Neely Road, Building 3564, & Building 5110 sites.

Submersible Pump Equipment Blank

Rinsate #: 4

Sample ID: 19FW~~AR~~EB04WQ (2P / UB)

Date: 9/1/19

Time: 1550

Analysis: VOC, GRO, DRO, RRO, Fe/Mn, SO4

Well that the pump was last used on: AP-9685

APPENDIX D

MAROS CONTAMINANT TREND AND PLUME STABILITY ANALYSIS

MAROS Output – DRMO Yard Two Party Sites

MAROS Summary 11 —Building 5010 Statistical Trend Analysis Summary

MAROS Statistical Trend Analysis Summary

Project: Bldg 5010_2019
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 12/1/1997 **to** 6/26/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
DIESEL COMPONENTS								
AP-7346	T	18	12	1.1E-01	1.0E-01	No	S	NT
AP-7348	S	23	23	1.8E+01	1.5E+01	No	D	PD

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

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MAROS Summary 12 —DRMO1 Statistical Trend Analysis Summary
(Pre-Treatment)

MAROS Statistical Trend Analysis Summary

Project: OU2 DRMO1 2-Party
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 7/29/1997 **to** 9/1/2003
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
DIESEL COMPONENTS								
AP-5826	S	6	6	4.0E+00	1.8E+00	No	NT	NT
MP4	T	10	10	4.6E+00	5.0E+00	No	D	D

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values

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MAROS Summary 13 —DRMO1 Statistical Trend Analysis Summary
(Post-Treatment)

MAROS Statistical Trend Analysis Summary

Project: DRMO1 2-Party
Location: Fort Wainwright

User Name: FES
State: Alaska

Time Period: 9/15/2003 **to** 6/19/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
DIESEL COMPONENTS								
AP-5826	S	16	16	2.1E+00	1.2E+00	No	NT	PI
MP4	T	16	16	4.6E+00	4.2E+00	No	NT	NT

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values

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MAROS Summary 14 —DRMO5 Statistical Trend Analysis Summary
(Pre-Treatment)

MAROS Statistical Trend Analysis Summary

Project: OU2 DRMO5 2-Party
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 9/1/2003 **to** 5/13/2015
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
DIESEL COMPONENTS								
AP-6806	T	14	14	5.5E+00	3.9E+00	No	NT	S
PI3	S	14	14	3.0E+00	2.7E+00	No	S	S

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values

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MAROS Summary 15 —DRMO5 Statistical Trend Analysis Summary
(Post-Treatment)

MAROS Statistical Trend Analysis Summary

Project: DRMO5 2-Party
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 9/1/2003 **to** 6/19/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
DIESEL COMPONENTS								
AP-6806	T	15	15	5.8E+00	3.9E+00	No	NT	NT
PI3	S	15	15	2.9E+00	2.7E+00	No	S	S

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values

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MAROS Output – Neely Road

Table E-1. MAROS Statistical Analysis Summary for Neely Road

MAROS Statistical Trend Analysis Summary

Project: Neely Road 2019
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 1/1/2014 **to** 9/1/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
1,2,4-TRIMETHYLBENZENE								
AP-8211	S	12	12	4.2E-01	4.0E-01	No	NT	NT
AP-9003	T	12	12	1.0E-02	5.8E-03	No	I	PI
AP-9459	T	12	12	3.7E-03	2.6E-03	No	S	S
AP-9684	T	12	12	4.9E-02	5.5E-02	No	S	NT
AP-9685	T	12	4	4.0E-04	5.0E-04	No	I	I
1,3,5-TRIMETHYLBENZENE (MESITYLENE)								
AP-8211	S	12	12	1.1E-01	1.1E-01	No	PI	I
AP-9003	T	12	8	2.6E-03	5.5E-04	No	NT	NT
AP-9459	T	12	12	3.6E-03	3.3E-03	No	NT	NT
AP-9684	T	12	12	1.6E-02	1.8E-02	No	S	NT
AP-9685	T	12	1	4.7E-04	5.0E-04	No	NT	NT
BENZENE								
AP-8211	S	12	10	3.4E-04	3.8E-04	No	S	NT
AP-9003	T	12	12	1.8E-03	1.8E-03	No	NT	NT
AP-9459	T	12	12	9.3E-04	8.8E-04	No	NT	NT
AP-9684	T	12	4	1.5E-04	1.0E-04	No	D	D
AP-9685	T	12	1	1.0E-04	1.0E-04	No	S	PD
PHC as DIESEL FUEL								
AP-8211	S	12	12	1.1E+01	9.8E+00	No	PD	D
AP-9003	T	12	12	1.0E+00	8.7E-01	No	S	NT
AP-9459	T	12	12	8.5E-01	6.2E-01	No	D	D
AP-9684	T	12	12	4.0E-01	3.9E-01	No	NT	D
AP-9685	T	12	7	1.1E-01	6.8E-02	No	PD	D
PHC as GASOLINE								
AP-8211	S	12	12	1.1E+00	1.1E+00	No	NT	PI
AP-9003	T	12	12	5.9E-01	4.2E-01	No	I	I
AP-9459	T	12	10	1.4E-01	1.5E-01	No	NT	S
AP-9684	T	12	12	5.9E-01	6.0E-01	No	PD	S
AP-9685	T	12	4	2.8E-02	2.5E-02	No	NT	NT

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Table E-1 cont'd. MAROS Statistical Analysis Summary for Neely Road

MAROS Statistical Trend Analysis Summary

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
PHC as GASOLINE								

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

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Table E-1 cont'd. MAROS Statistical Analysis Summary for Neely Road

MAROS Statistical Trend Analysis Summary

Project: Neely Road 2019
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 1/1/2014 to 9/1/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
ETHYLBENZENE								
AP-8211	S	12	12	1.8E-02	1.8E-02	No	NT	NT
AP-9003	T	12	11	6.3E-02	4.4E-02	No	I	I
AP-9459	T	12	6	3.8E-04	4.3E-04	No	I	I
AP-9684	T	12	5	5.4E-04	5.0E-04	No	S	NT
AP-9685	T	12	2	4.3E-04	5.0E-04	No	NT	I
NAPHTHALENE								
AP-8211	S	12	12	1.2E-01	1.2E-01	No	NT	NT
AP-9003	T	12	9	1.2E-02	4.6E-03	No	I	I
AP-9459	T	12	7	6.9E-04	5.0E-04	No	NT	NT
AP-9684	T	12	5	6.6E-04	5.0E-04	No	D	PD
AP-9685	T	12	3	4.7E-04	5.0E-04	No	PI	I

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

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Table E-1 cont'd. MAROS Statistical Analysis Summary for Neely Road

MAROS Statistical Trend Analysis Summary

Project: Neely Road 2019
Location: Fort Wainwright
User Name: FES
State: Alaska

Time Period: 1/1/2014 to 9/1/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
1,2-DIBROMOETHANE (ETHYLENE DIBROMID								
AP-8211	S	12	5	8.3E-06	2.0E-06	No	D	D
AP-9684	T	12	1	2.4E-06	2.0E-06	No	S	PD
1,2-DICHLOROETHANE								
AP-8211	S	12	2	2.0E-04	7.5E-05	No	NT	NT
AP-9459	T	12	2	8.9E-05	7.5E-05	No	S	S
TETRACHLOROETHYLENE(PCE)								
AP-9685	T	12	12	1.1E-02	4.0E-03	No	NT	NT
TRICHLOROETHYLENE (TCE)								
AP-9685	T	12	11	1.8E-03	8.4E-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.

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Table E-2. MAROS Spatial Moment Analysis Summary for Neely Road

MAROS Spatial Moment Analysis Summary

Project: Neely Road 2019 **User Name:** FES
Location: Fort Wainwright **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
1,2,4-TRIMETHYLBENZENE							
7/11/2014	1.0E-02	1,383,371	3,960,261	47	293	269	6
10/13/2014	5.2E-03	1,383,360	3,960,261	56	739	473	6
5/11/2015	2.2E-02	1,383,370	3,960,261	48	347	296	6
8/24/2015	1.4E-02	1,383,369	3,960,261	48	365	308	6
7/6/2016	2.7E-02	1,383,370	3,960,261	47	312	281	6
10/10/2016	6.1E-03	1,383,363	3,960,265	55	579	418	6
5/11/2017	3.2E-02	1,383,370	3,960,261	47	319	282	6
8/8/2017	3.0E-02	1,383,370	3,960,262	48	328	289	6
5/24/2018	1.3E-02	1,383,370	3,960,261	47	344	295	6
8/10/2018	2.9E-02	1,383,369	3,960,261	48	380	315	6
6/24/2019	4.4E-02	1,383,369	3,960,263	49	355	308	6
9/1/2019	1.1E-02	1,383,369	3,960,259	47	384	319	6
1,3,5-TRIMETHYLBENZENE (MESITYLENE)							
7/11/2014	4.6E-03	1,383,369	3,960,258	46	389	308	6
10/13/2014	2.1E-03	1,383,351	3,960,258	62	1,010	557	6
5/11/2015	6.1E-03	1,383,363	3,960,262	54	624	434	6
8/24/2015	4.5E-03	1,383,362	3,960,264	56	619	436	6
7/6/2016	5.8E-03	1,383,364	3,960,263	53	546	399	6
10/10/2016	3.3E-03	1,383,358	3,960,263	59	781	500	6
5/11/2017	9.7E-03	1,383,365	3,960,261	51	523	385	6
8/8/2017	1.4E-02	1,383,365	3,960,261	52	546	396	6
5/24/2018	4.5E-03	1,383,365	3,960,261	52	557	401	6
8/10/2018	1.2E-02	1,383,364	3,960,261	53	597	418	6
6/24/2019	6.0E-03	1,383,366	3,960,262	51	496	374	6
9/1/2019	3.7E-03	1,383,363	3,960,259	52	613	422	6
BENZENE							
7/11/2014	1.8E-04	1,383,340	3,960,263	75	1,069	688	6
10/13/2014	4.3E-04	1,383,349	3,960,266	68	930	593	6
5/11/2015	5.5E-04	1,383,346	3,960,264	70	1,020	631	6
8/24/2015	3.5E-04	1,383,345	3,960,259	68	1,073	654	6
7/6/2016	5.6E-04	1,383,336	3,960,268	80	1,050	628	6
10/10/2016	6.4E-04	1,383,347	3,960,266	70	972	604	6
5/11/2017	5.6E-04	1,383,345	3,960,260	69	1,074	649	6
8/8/2017	5.2E-04	1,383,346	3,960,259	68	1,071	652	6
5/24/2018	4.8E-04	1,383,339	3,960,266	77	1,070	639	6
8/10/2018	4.5E-04	1,383,343	3,960,261	71	1,085	669	6
6/24/2019	6.5E-04	1,383,340	3,960,267	76	1,070	602	6

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Table E-2 cont'd. MAROS Spatial Moment Analysis Summary for Neely Road

Project: Neely Road 2019 **User Name:** FES
Location: Fort Wainwright **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
BENZENE							
9/1/2019	3.0E-04	1,383,341	3,960,264	74	1,080	652	6
PHC as DIESEL FUEL							
7/11/2014	4.9E-01	1,383,358	3,960,259	56	772	532	6
10/13/2014	1.6E+00	1,383,360	3,960,258	55	715	507	6
5/11/2015	1.3E+00	1,383,357	3,960,261	59	789	541	6
8/24/2015	9.4E-01	1,383,360	3,960,259	55	709	507	6
7/6/2016	1.0E+00	1,383,359	3,960,260	56	726	516	6
10/10/2016	1.4E+00	1,383,360	3,960,259	55	689	499	6
5/11/2017	7.1E-01	1,383,356	3,960,259	59	824	555	6
8/8/2017	7.9E-01	1,383,357	3,960,258	57	800	544	6
5/24/2018	5.9E-01	1,383,353	3,960,260	61	993	594	6
8/10/2018	1.1E+00	1,383,362	3,960,255	51	635	469	6
6/24/2019	9.5E-01	1,383,356	3,960,261	59	819	559	6
9/1/2019	6.8E-01	1,383,357	3,960,259	58	812	555	6
PHC as GASOLINE							
7/11/2014	2.5E-01	1,383,362	3,960,265	56	595	420	6
10/13/2014	9.8E-02	1,383,354	3,960,264	63	866	537	6
5/11/2015	4.2E-01	1,383,360	3,960,266	58	674	455	6
8/24/2015	3.5E-01	1,383,360	3,960,266	58	673	454	6
7/6/2016	4.0E-01	1,383,361	3,960,264	57	659	443	6
10/10/2016	1.7E-01	1,383,355	3,960,265	62	834	523	6
5/11/2017	3.3E-01	1,383,359	3,960,264	58	713	467	6
8/8/2017	5.3E-01	1,383,360	3,960,264	57	688	456	6
5/24/2018	4.6E-01	1,383,359	3,960,266	60	701	459	6
8/10/2018	3.8E-01	1,383,361	3,960,260	54	694	452	6
6/24/2019	6.5E-01	1,383,362	3,960,263	55	630	428	6
9/1/2019	1.8E-01	1,383,361	3,960,259	54	712	454	6

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Table E-2 cont'd. MAROS Spatial Moment Analysis Summary for Neely Road

Project: Neely Road 2019 User Name: FES
Location: Fort Wainwright State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	1,2,4-TRIMETHYLBENZENE	0.60	22	92.4%	PI
	1,3,5-TRIMETHYLBENZENE (MESI	0.57	10	72.7%	NT
	BENZENE	0.30	10	72.7%	NT
	PHC as DIESEL FUEL	0.36	-14	81.0%	S
	PHC as GASOLINE	0.46	18	87.5%	NT
1st Moment: Distance to Source					
	1,2,4-TRIMETHYLBENZENE	0.06	0	47.3%	S
	1,3,5-TRIMETHYLBENZENE (MESI	0.08	-20	90.2%	PD
	BENZENE	0.06	14	81.0%	NT
	PHC as DIESEL FUEL	0.05	12	77.0%	NT
	PHC as GASOLINE	0.05	-26	95.7%	D
2nd Moment: Sigma XX					
	1,2,4-TRIMETHYLBENZENE	0.33	14	81.0%	NT
	1,3,5-TRIMETHYLBENZENE (MESI	0.26	-8	68.1%	S
	BENZENE	0.05	28	96.9%	I
	PHC as DIESEL FUEL	0.09	14	81.0%	NT
	PHC as GASOLINE	0.11	4	58.0%	NT
2nd Moment: Sigma YY					
	1,2,4-TRIMETHYLBENZENE	0.19	14	81.0%	NT
	1,3,5-TRIMETHYLBENZENE (MESI	0.15	-8	68.1%	S
	BENZENE	0.04	2	52.7%	NT
	PHC as DIESEL FUEL	0.06	20	90.2%	PI
	PHC as GASOLINE	0.07	-10	72.7%	S

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

Porosity: 0.33 Saturated Thickness: Uniform 10 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.

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Table E-2 cont'd. MAROS Spatial Moment Analysis Summary for Neely Road

MAROS Spatial Moment Analysis Summary

Project: Neely Road 2019
Location: Fort Wainwright
User Name: FES
State: Alaska

	0th Moment	1st Moment (Center of Mass)			2nd Moment (Spread)		
Effective Date	Estimated Mass (Kg)	Xc (ft)	Yc (ft)	Source Distance (ft)	Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
ETHYLBENZENE							
7/11/2014	6.9E-04	1,383,354	3,960,251	58	954	526	6
10/13/2014	6.4E-04	1,383,336	3,960,246	74	1,167	603	6
5/11/2015	4.9E-03	1,383,353	3,960,249	58	964	512	6
8/24/2015	3.6E-03	1,383,358	3,960,249	53	836	460	6
7/6/2016	6.9E-03	1,383,353	3,960,249	58	981	512	6
10/10/2016	1.1E-03	1,383,343	3,960,251	68	1,141	628	6
5/11/2017	6.2E-03	1,383,351	3,960,250	60	1,014	540	6
8/8/2017	8.6E-03	1,383,352	3,960,250	59	1,009	533	6
5/24/2018	7.1E-03	1,383,352	3,960,250	59	990	528	6
8/10/2018	7.5E-03	1,383,349	3,960,251	63	1,071	571	6
6/24/2019	9.9E-03	1,383,354	3,960,250	58	956	513	6
9/1/2019	3.6E-03	1,383,351	3,960,250	60	1,018	541	6
NAPHTHALENE							
7/11/2014	2.4E-03	1,383,362	3,960,250	50	673	423	6
10/13/2014	1.0E-03	1,383,354	3,960,252	58	963	524	6
5/11/2015	2.1E-03	1,383,357	3,960,250	54	847	475	6
8/24/2015	5.1E-03	1,383,362	3,960,253	50	667	427	6
7/6/2016	2.2E-03	1,383,360	3,960,249	51	718	432	6
10/10/2016	1.6E-03	1,383,356	3,960,250	56	902	492	6
5/11/2017	6.9E-03	1,383,359	3,960,249	52	775	449	6
8/8/2017	8.9E-03	1,383,359	3,960,249	52	780	444	6
5/24/2018	4.1E-03	1,383,358	3,960,248	53	797	450	6
8/10/2018	8.3E-03	1,383,358	3,960,250	53	811	462	6
6/24/2019	8.1E-03	1,383,361	3,960,249	51	713	429	6
9/1/2019	4.7E-03	1,383,357	3,960,251	54	840	479	6

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Table E-2 cont'd. MAROS Spatial Moment Analysis Summary for Neely Road

Project: Neely Road 2019 User Name: FES
Location: Fort Wainwright State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	ETHYLBENZENE	0.62	36	99.3%	I
	NAPHTHALENE	0.62	28	96.9%	I
1st Moment: Distance to Source					
	ETHYLBENZENE	0.09	10	72.7%	NT
	NAPHTHALENE	0.05	8	68.1%	NT
2nd Moment: Sigma XX					
	ETHYLBENZENE	0.09	10	72.7%	NT
	NAPHTHALENE	0.11	4	58.0%	NT
2nd Moment: Sigma YY					
	ETHYLBENZENE	0.08	8	68.1%	NT
	NAPHTHALENE	0.07	8	68.1%	NT

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

Porosity: 0.33 **Saturated Thickness:** Uniform 10 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.

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Table E-3. MAROS First Moment Analysis Results for Benzene at Neely Road

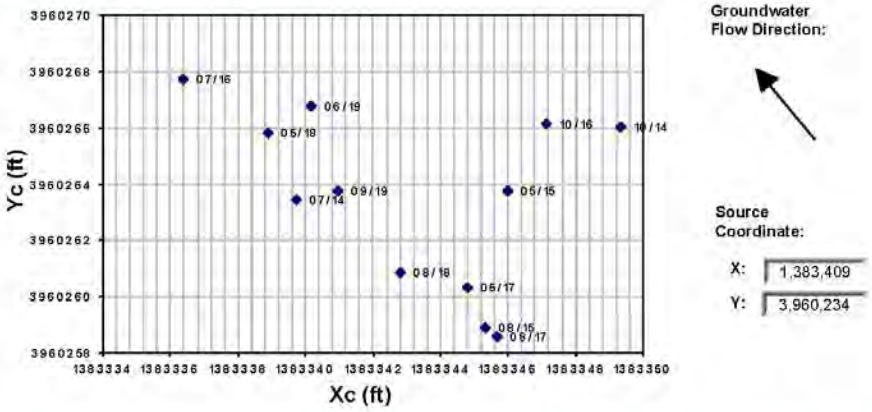
MAROS First Moment Analysis

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: BENZENE

Change in Location of Center of Mass Over Time



Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
7/11/2014	BENZENE	1,383,340	3,960,263	75	6
10/13/2014	BENZENE	1,383,349	3,960,266	68	6
5/11/2015	BENZENE	1,383,346	3,960,264	70	6
8/24/2015	BENZENE	1,383,345	3,960,259	68	6
7/6/2016	BENZENE	1,383,336	3,960,268	80	6
10/10/2016	BENZENE	1,383,347	3,960,266	70	6
5/11/2017	BENZENE	1,383,345	3,960,260	69	6
8/8/2017	BENZENE	1,383,346	3,960,259	68	6
5/24/2018	BENZENE	1,383,339	3,960,266	77	6
8/10/2018	BENZENE	1,383,343	3,960,261	71	6
6/24/2019	BENZENE	1,383,340	3,960,267	76	6
9/1/2019	BENZENE	1,383,341	3,960,264	74	6

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

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Table E-4. MAROS First Moment Analysis Results for DRO at Neely Road

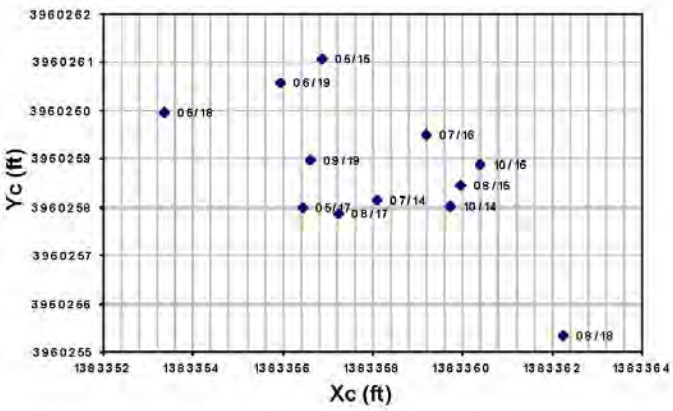
MAROS First Moment Analysis

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: PHC as DIESEL FUEL

Change in Location of Center of Mass Over Time



Groundwater Flow Direction:

Source Coordinate:

X: 1,383,409

Y: 3,960,234

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
7/11/2014	PHC as DIESEL FUEL	1,383,358	3,960,258	56	6
10/13/2014	PHC as DIESEL FUEL	1,383,360	3,960,258	55	6
5/11/2015	PHC as DIESEL FUEL	1,383,357	3,960,261	59	6
8/24/2015	PHC as DIESEL FUEL	1,383,360	3,960,258	55	6
7/6/2016	PHC as DIESEL FUEL	1,383,359	3,960,260	56	6
10/10/2016	PHC as DIESEL FUEL	1,383,360	3,960,259	55	6
5/11/2017	PHC as DIESEL FUEL	1,383,356	3,960,258	58	6
8/8/2017	PHC as DIESEL FUEL	1,383,357	3,960,258	57	6
5/24/2018	PHC as DIESEL FUEL	1,383,353	3,960,260	61	6
8/10/2018	PHC as DIESEL FUEL	1,383,362	3,960,255	51	6
6/24/2019	PHC as DIESEL FUEL	1,383,356	3,960,261	59	6
9/1/2019	PHC as DIESEL FUEL	1,383,357	3,960,259	58	6

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

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Table E-5. MAROS First Moment Analysis Results for GRO at Neely Road

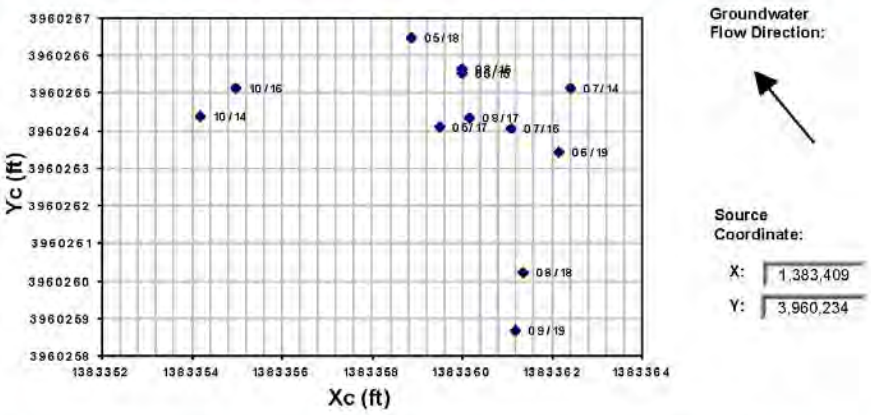
MAROS First Moment Analysis

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: PHC as GASOLINE

Change in Location of Center of Mass Over Time



Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
7/11/2014	PHC as GASOLINE	1,383,362	3,960,265	56	6
10/13/2014	PHC as GASOLINE	1,383,354	3,960,264	63	6
5/11/2015	PHC as GASOLINE	1,383,360	3,960,266	58	6
8/24/2015	PHC as GASOLINE	1,383,360	3,960,266	58	6
7/6/2016	PHC as GASOLINE	1,383,361	3,960,264	57	6
10/10/2016	PHC as GASOLINE	1,383,355	3,960,265	62	6
5/11/2017	PHC as GASOLINE	1,383,359	3,960,264	58	6
8/8/2017	PHC as GASOLINE	1,383,360	3,960,264	57	6
5/24/2018	PHC as GASOLINE	1,383,359	3,960,266	60	6
8/10/2018	PHC as GASOLINE	1,383,361	3,960,260	54	6
6/24/2019	PHC as GASOLINE	1,383,362	3,960,263	55	6
9/1/2019	PHC as GASOLINE	1,383,361	3,960,259	54	6

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

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Table E-6. MAROS First Moment Analysis Results for Ethylbenzene at Neely Road

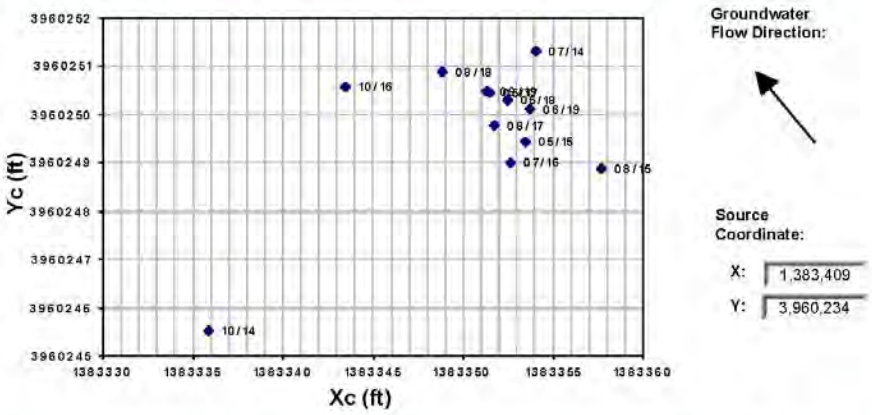
MAROS First Moment Analysis

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: ETHYLBENZENE

Change in Location of Center of Mass Over Time



Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
7/11/2014	ETHYLBENZENE	1,383,354	3,960,251	58	6
10/13/2014	ETHYLBENZENE	1,383,336	3,960,246	74	6
5/11/2015	ETHYLBENZENE	1,383,353	3,960,249	58	6
8/24/2015	ETHYLBENZENE	1,383,358	3,960,249	53	6
7/6/2016	ETHYLBENZENE	1,383,353	3,960,249	58	6
10/10/2016	ETHYLBENZENE	1,383,343	3,960,251	68	6
5/11/2017	ETHYLBENZENE	1,383,351	3,960,250	60	6
8/8/2017	ETHYLBENZENE	1,383,352	3,960,250	59	6
5/24/2018	ETHYLBENZENE	1,383,352	3,960,250	59	6
8/10/2018	ETHYLBENZENE	1,383,349	3,960,251	63	6
6/24/2019	ETHYLBENZENE	1,383,354	3,960,250	58	6
9/1/2019	ETHYLBENZENE	1,383,351	3,960,250	60	6

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

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Table E-7 MAROS First Moment Analysis Results for 1,2,4-TMB at Neely Road

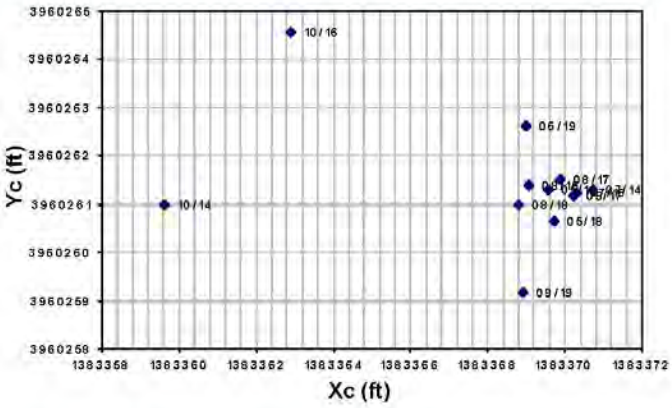
MAROS First Moment Analysis

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: 1,2,4-TRIMETHYLBENZENE

Change in Location of Center of Mass Over Time



Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
7/11/2014	1,2,4-TRIMETHYLBENZENE	1,383,371	3,960,261	47	6
10/13/2014	1,2,4-TRIMETHYLBENZENE	1,383,360	3,960,261	56	6
5/11/2015	1,2,4-TRIMETHYLBENZENE	1,383,370	3,960,261	48	6
8/24/2015	1,2,4-TRIMETHYLBENZENE	1,383,369	3,960,261	48	6
7/6/2016	1,2,4-TRIMETHYLBENZENE	1,383,370	3,960,261	47	6
10/10/2016	1,2,4-TRIMETHYLBENZENE	1,383,363	3,960,265	55	6
5/11/2017	1,2,4-TRIMETHYLBENZENE	1,383,370	3,960,261	47	6
8/8/2017	1,2,4-TRIMETHYLBENZENE	1,383,370	3,960,262	48	6
5/24/2018	1,2,4-TRIMETHYLBENZENE	1,383,370	3,960,261	47	6
8/10/2018	1,2,4-TRIMETHYLBENZENE	1,383,369	3,960,261	48	6
6/24/2019	1,2,4-TRIMETHYLBENZENE	1,383,369	3,960,263	49	6
9/1/2019	1,2,4-TRIMETHYLBENZENE	1,383,369	3,960,259	47	6

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

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Table E-8 MAROS First Moment Analysis Results for 1,3,5-TMB at Neely Road

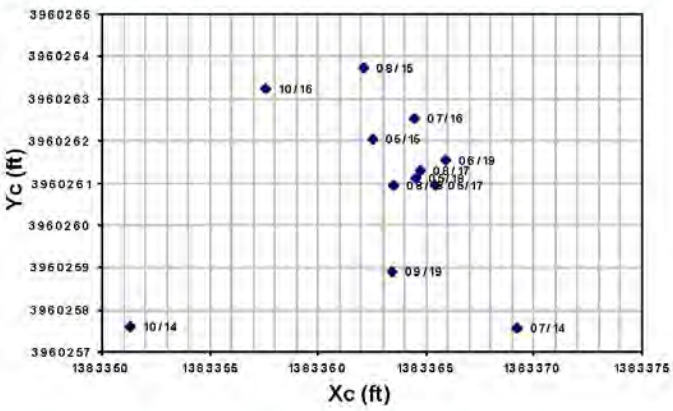
MAROS First Moment Analysis

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: 1,3,5-TRIMETHYLBENZENE (MESITYLENE)

Change in Location of Center of Mass Over Time



Groundwater Flow Direction:

Source Coordinate:

X: 1,383,409

Y: 3,960,234

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
7/11/2014	1,3,5-TRIMETHYLBENZENE (	1,383,369	3,960,258	46	6
10/13/2014	1,3,5-TRIMETHYLBENZENE (	1,383,351	3,960,258	62	6
5/11/2015	1,3,5-TRIMETHYLBENZENE (	1,383,363	3,960,262	54	6
8/24/2015	1,3,5-TRIMETHYLBENZENE (	1,383,362	3,960,264	56	6
7/6/2016	1,3,5-TRIMETHYLBENZENE (	1,383,364	3,960,263	53	6
10/10/2016	1,3,5-TRIMETHYLBENZENE (	1,383,358	3,960,263	59	6
5/11/2017	1,3,5-TRIMETHYLBENZENE (	1,383,365	3,960,261	51	6
8/8/2017	1,3,5-TRIMETHYLBENZENE (	1,383,365	3,960,261	52	6
5/24/2018	1,3,5-TRIMETHYLBENZENE (	1,383,365	3,960,261	52	6
8/10/2018	1,3,5-TRIMETHYLBENZENE (	1,383,364	3,960,261	53	6
6/24/2019	1,3,5-TRIMETHYLBENZENE (	1,383,366	3,960,262	51	6
9/1/2019	1,3,5-TRIMETHYLBENZENE (	1,383,363	3,960,259	52	6

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

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Table E-9 MAROS First Moment Analysis Results for Naphthalene at Neely Road

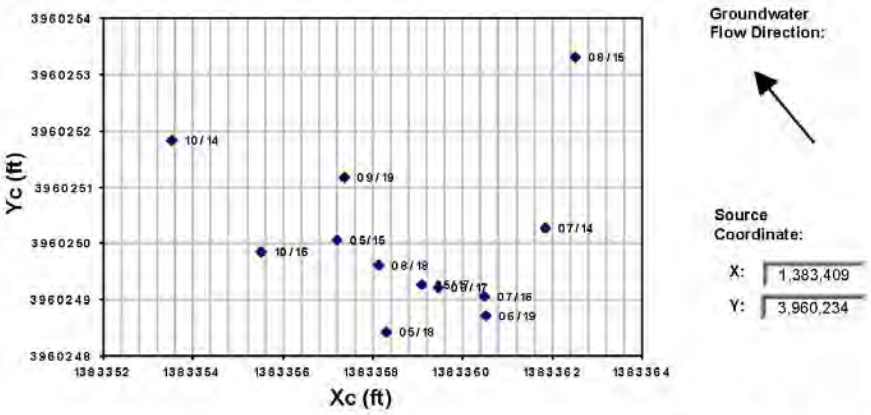
MAROS First Moment Analysis

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: NAPHTHALENE

Change in Location of Center of Mass Over Time



Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
7/11/2014	NAPHTHALENE	1,383,362	3,960,250	50	6
10/13/2014	NAPHTHALENE	1,383,354	3,960,252	58	6
5/11/2015	NAPHTHALENE	1,383,357	3,960,250	54	6
8/24/2015	NAPHTHALENE	1,383,362	3,960,253	50	6
7/6/2016	NAPHTHALENE	1,383,360	3,960,249	51	6
10/10/2016	NAPHTHALENE	1,383,356	3,960,250	56	6
5/11/2017	NAPHTHALENE	1,383,359	3,960,249	52	6
8/8/2017	NAPHTHALENE	1,383,359	3,960,249	52	6
5/24/2018	NAPHTHALENE	1,383,358	3,960,248	53	6
8/10/2018	NAPHTHALENE	1,383,358	3,960,250	53	6
6/24/2019	NAPHTHALENE	1,383,361	3,960,249	51	6
9/1/2019	NAPHTHALENE	1,383,357	3,960,251	54	6

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

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Table E-10. MAROS Sampling Location Optimization Results for Neely Road

MAROS Sampling Location Optimization Results

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 17 (7/11/2014) **to** Sample Event 28 (9/1/2019)

Parameters used:

Constituent	Inside SF	Hull SF	Area Ratio	Conc. Ratio
1,2,4-TRIMETHYLBENZENE	0.2	0.1	0.9	0.8
1,3,5-TRIMETHYLBENZENE (ME	0.2	0.1	0.9	0.8
BENZENE	0.2	0.1	0.9	0.8
PHC as DIESEL FUEL	0.2	0.1	0.9	0.8
PHC as GASOLINE	0.2	0.1	0.9	0.8

Well	X (feet)	Y (feet)	Removable?	Average Slope Factor*	Minimum Slope Factor*	Maximum Slope Factor*	Eliminated?
1,2,4-TRIMETHYLBENZENE							
AP-8211	1383408.63	3960234.00	☑	0.372	0.270	0.532	☐
AP-8213	1383372.38	3960196.75	☑	0.718	0.631	0.766	☐
AP-9003	1383317.13	3960253.25	☑	0.271	0.045	0.673	☐
AP-9004	1383227.75	3960213.00	☑	0.372	0.077	0.565	☐
AP-9459	1383337.00	3960329.25	☑	0.245	0.022	0.534	☐
AP-9684	1383409.00	3960297.25	☑	0.391	0.111	0.626	☐
1,3,5-TRIMETHYLBENZENE (MESITYLENE)							
AP-8211	1383408.63	3960234.00	☑	0.438	0.308	0.709	☐
AP-8213	1383372.38	3960196.75	☑	0.644	0.574	0.714	☐
AP-9003	1383317.13	3960253.25	☑	0.420	0.043	0.614	☐
AP-9004	1383227.75	3960213.00	☑	0.187	0.000	0.492	☐
AP-9459	1383337.00	3960329.25	☑	0.388	0.040	0.668	☐
AP-9684	1383409.00	3960297.25	☑	0.407	0.192	0.772	☐
BENZENE							
AP-8211	1383408.63	3960234.00	☑	0.101	0.008	0.355	☐
AP-8213	1383372.38	3960196.75	☑	0.539	0.293	0.612	☐
AP-9003	1383317.13	3960253.25	☑	0.426	0.175	0.594	☐
AP-9004	1383227.75	3960213.00	☑	0.611	0.434	0.679	☐
AP-9459	1383337.00	3960329.25	☑	0.224	0.025	0.363	☐
AP-9684	1383409.00	3960297.25	☑	0.418	0.095	0.582	☐
PHC as DIESEL FUEL							

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Table E-10 cont'd. MAROS Sampling Location Optimization Results for Neely Road

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Well	X (feet)	Y (feet)	Removable?	Average Slope Factor*	Minimum Slope Factor*	Maximum Slope Factor*	Eliminated?
AP-8211	1383408.63	3960234.00	☑	0.404	0.296	0.521	☐
AP-8213	1383372.38	3960196.75	☑	0.571	0.494	0.642	☐
AP-9003	1383317.13	3960253.25	☑	0.193	0.113	0.269	☐
AP-9004	1383227.75	3960213.00	☑	0.567	0.401	0.623	☐
AP-9459	1383337.00	3960329.25	☑	0.177	0.002	0.439	☐
AP-9684	1383409.00	3960297.25	☑	0.152	0.016	0.334	☐
PHC as GASOLINE							
AP-8211	1383408.63	3960234.00	☑	0.181	0.018	0.347	☐
AP-8213	1383372.38	3960196.75	☑	0.869	0.798	0.900	☐
AP-9003	1383317.13	3960253.25	☑	0.361	0.078	0.614	☐
AP-9004	1383227.75	3960213.00	☑	0.631	0.127	0.770	☐
AP-9459	1383337.00	3960329.25	☑	0.294	0.041	0.746	☐
AP-9684	1383409.00	3960297.25	☑	0.270	0.092	0.521	☐

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

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Table E-10 cont'd. MAROS Sampling Location Optimization Results for Neely Road

MAROS Sampling Location Optimization Results

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 17 7/11/2014 **to** Sample Event 28 9/1/2019

Parameters used:

Constituent	Inside SF	Hull SF	Area Ratio	Conc. Ratio
ETHYLBENZENE	0.2	0.1	0.9	0.8
NAPHTHALENE	0.2	0.1	0.9	0.8

Well	X (feet)	Y (feet)	Removable?	Average Slope Factor*	Minimum Slope Factor*	Maximum Slope Factor*	Eliminated?
ETHYLBENZENE							
AP-8211	1383408.63	3960234.00	☑	0.392	0.156	0.766	☐
AP-8213	1383372.38	3960196.75	☑	0.581	0.197	0.720	☐
AP-9003	1383317.13	3960253.25	☑	0.527	0.089	0.698	☐
AP-9004	1383227.75	3960213.00	☑	0.484	0.061	0.656	☐
AP-9459	1383337.00	3960329.25	☑	0.620	0.041	0.926	☐
AP-9684	1383409.00	3960297.25	☑	0.504	0.031	1.000	☐
NAPHTHALENE							
AP-8211	1383408.63	3960234.00	☑	0.654	0.508	0.846	☐
AP-8213	1383372.38	3960196.75	☑	0.670	0.522	0.736	☐
AP-9003	1383317.13	3960253.25	☑	0.439	0.191	1.000	☐
AP-9004	1383227.75	3960213.00	☑	0.366	0.061	0.598	☐
AP-9459	1383337.00	3960329.25	☑	0.392	0.036	0.776	☐
AP-9684	1383409.00	3960297.25	☑	0.318	0.000	0.557	☐

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

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Figure E-1. MAROS Delaunay Results for Benzene Neely Road Wells

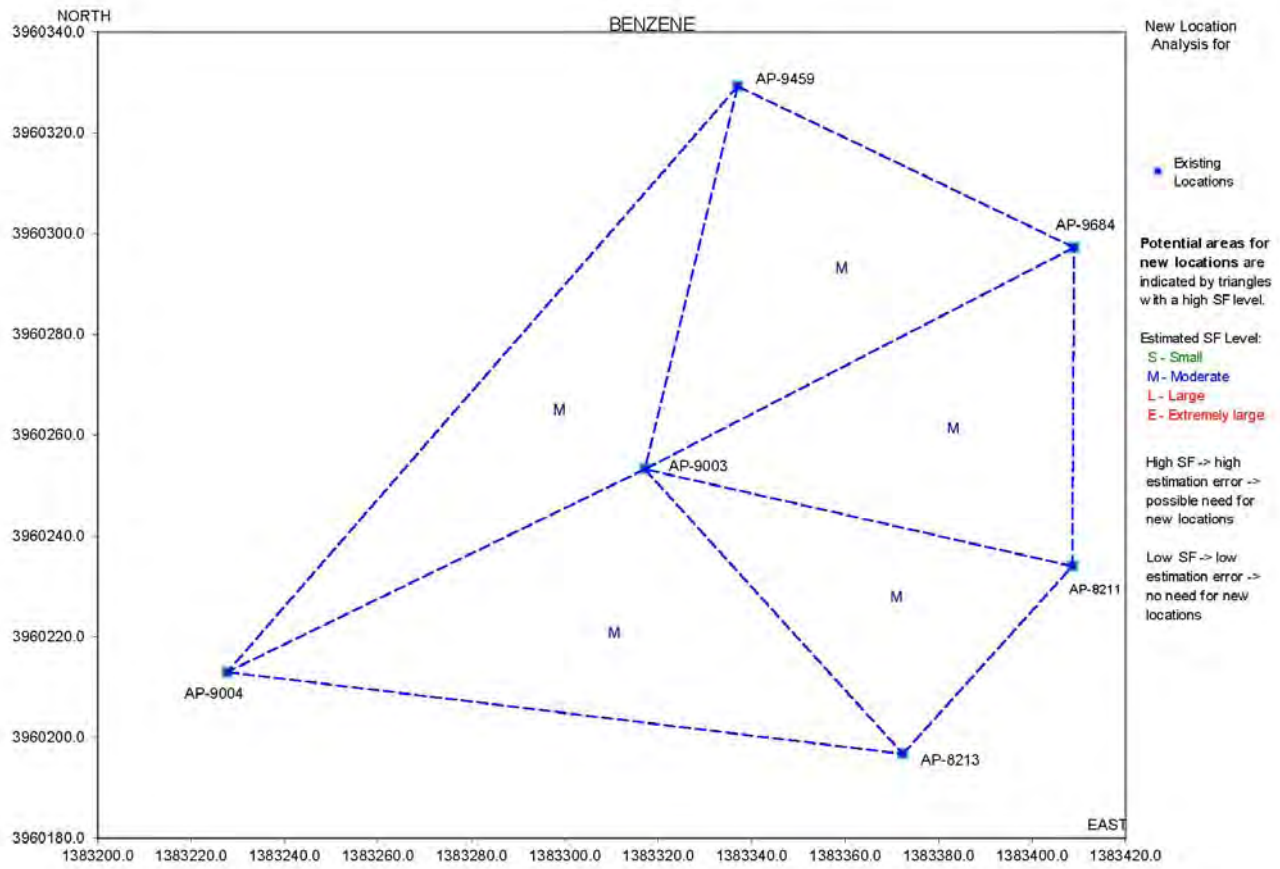

Figure E-2. MAROS Delaunay Results for DRO in Neely Road Wells

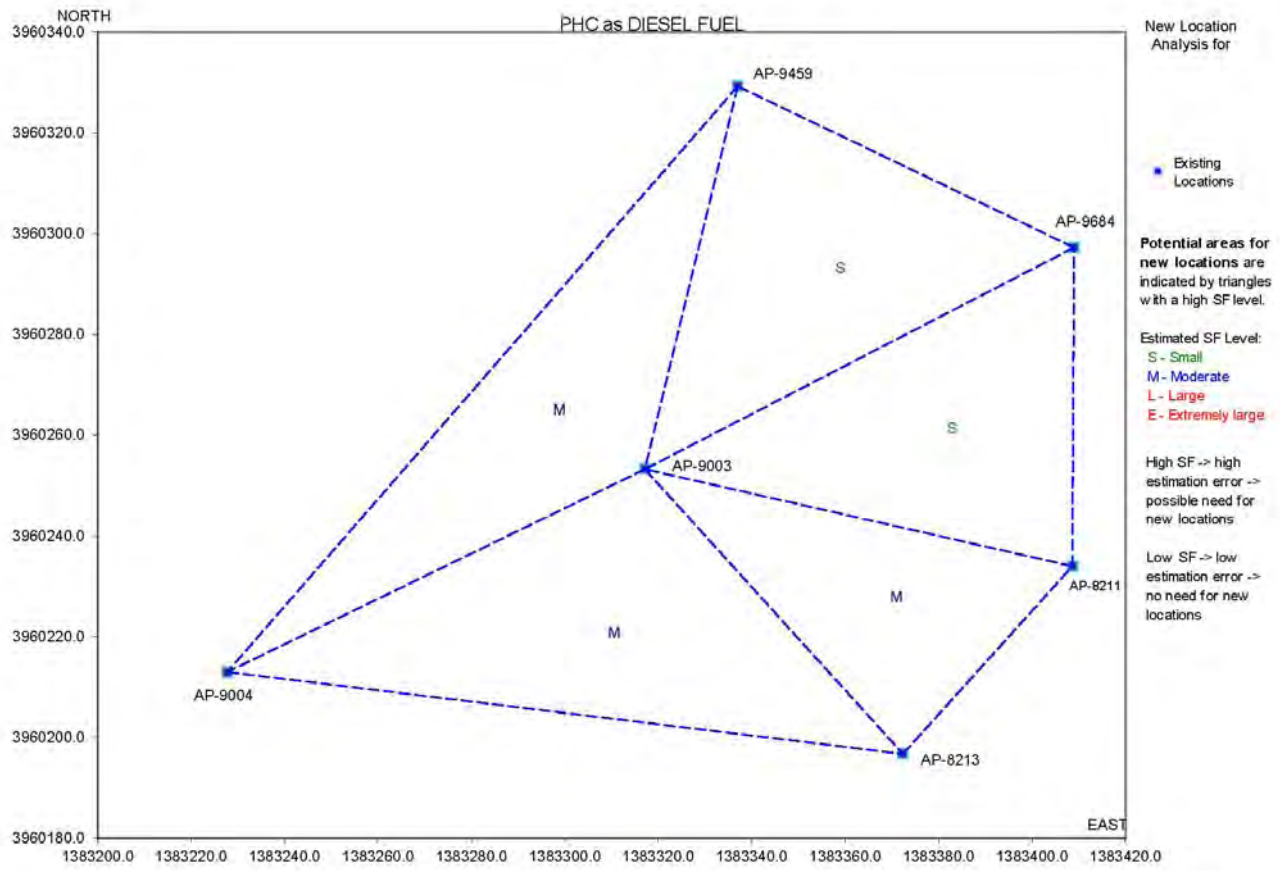

Figure E-3. MAROS Delaunay Results for GRO in Neely Road Wells

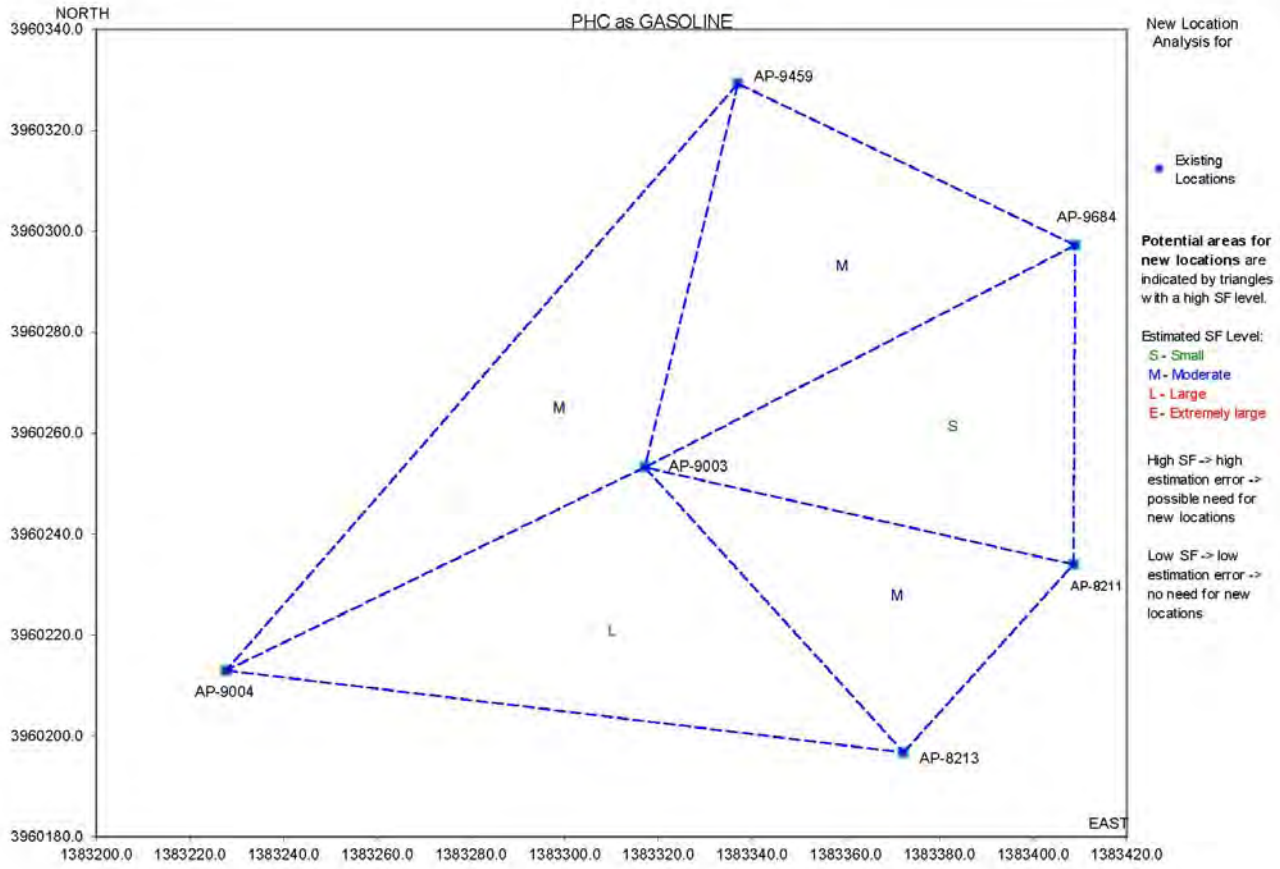

Figure E-4. MAROS Delaunay Results for Ethylbenzene in Neely Road Wells

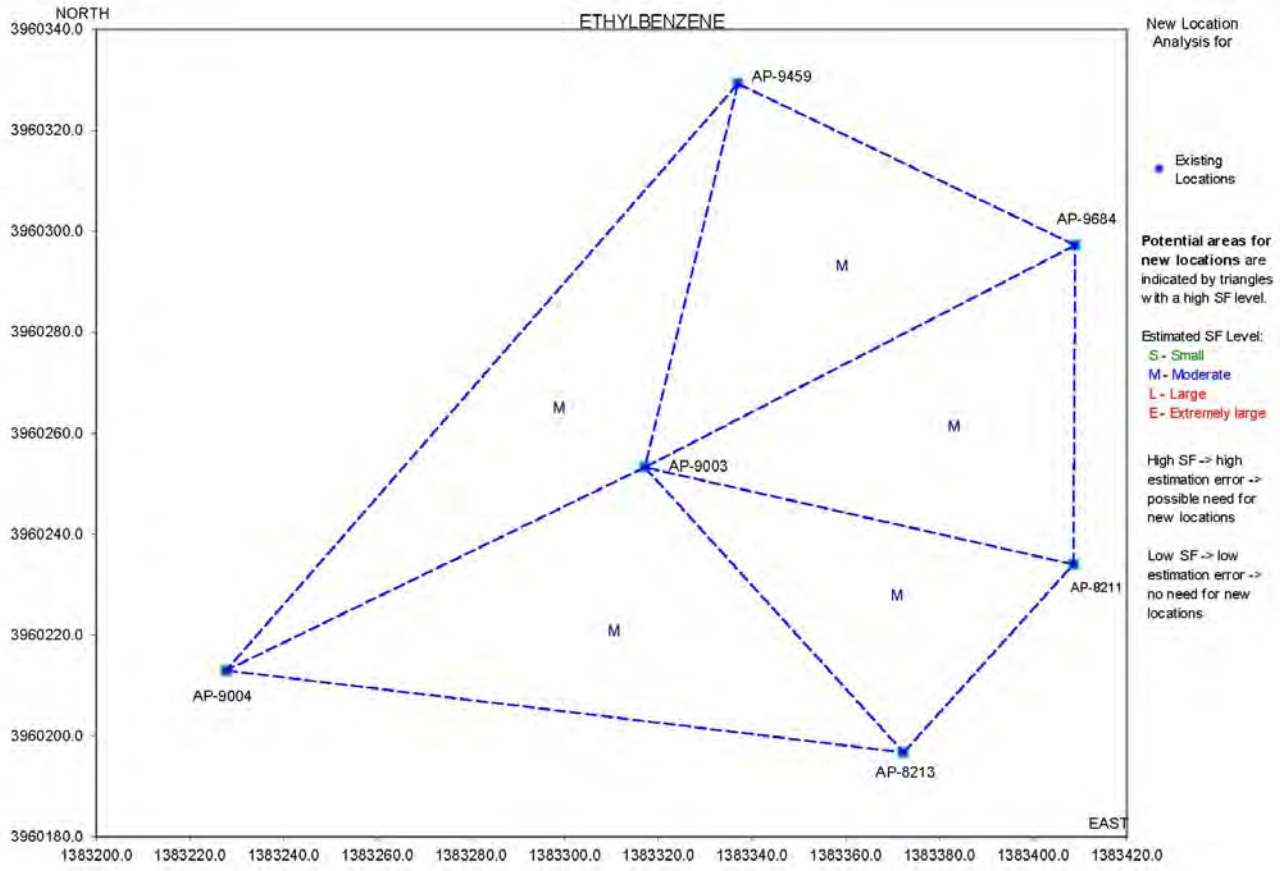

Figure E-5. MAROS Delaunay Results for 1,2,4-TMB in Neely Road Wells

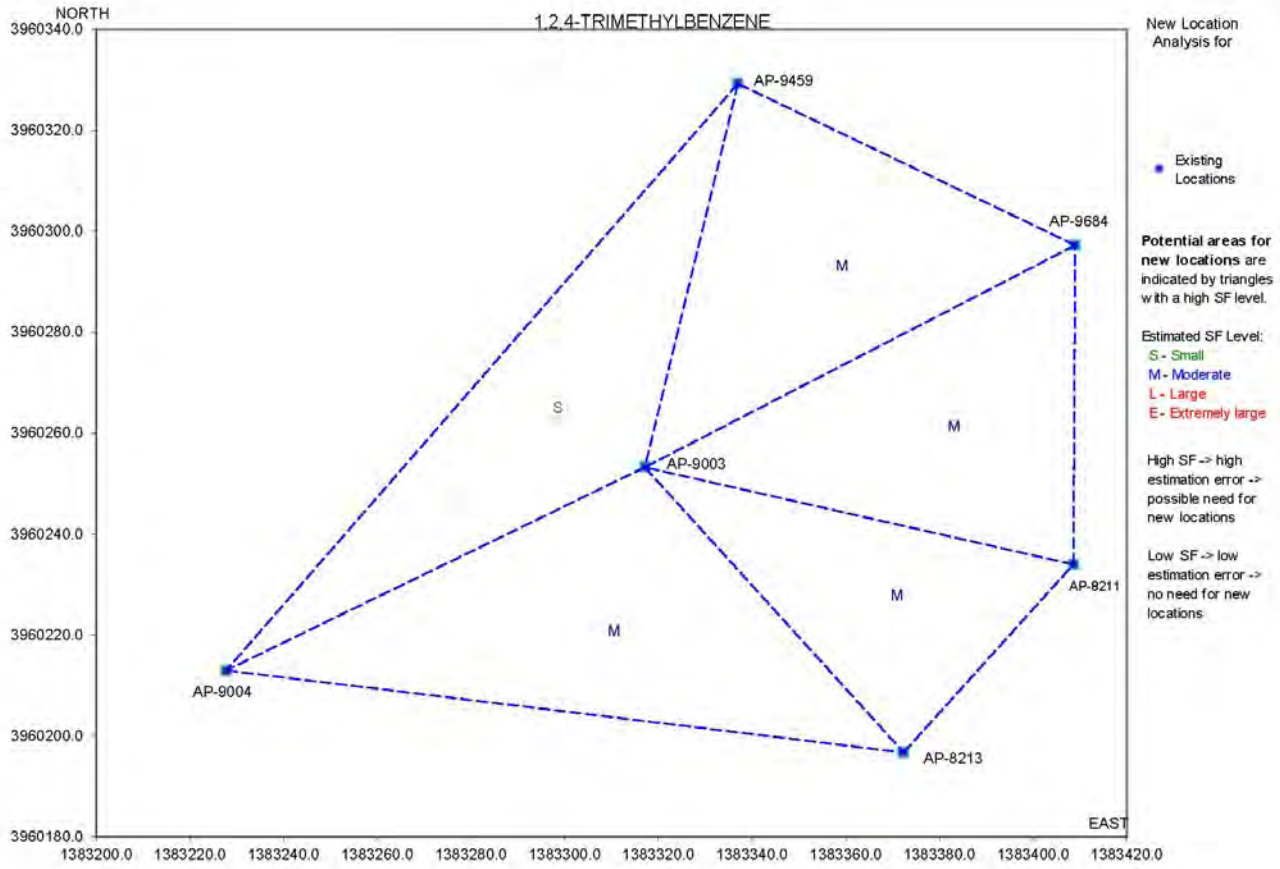

Figure E-6 MAROS Delaunay Results for 1,3,5-TMB in Neely Road Wells

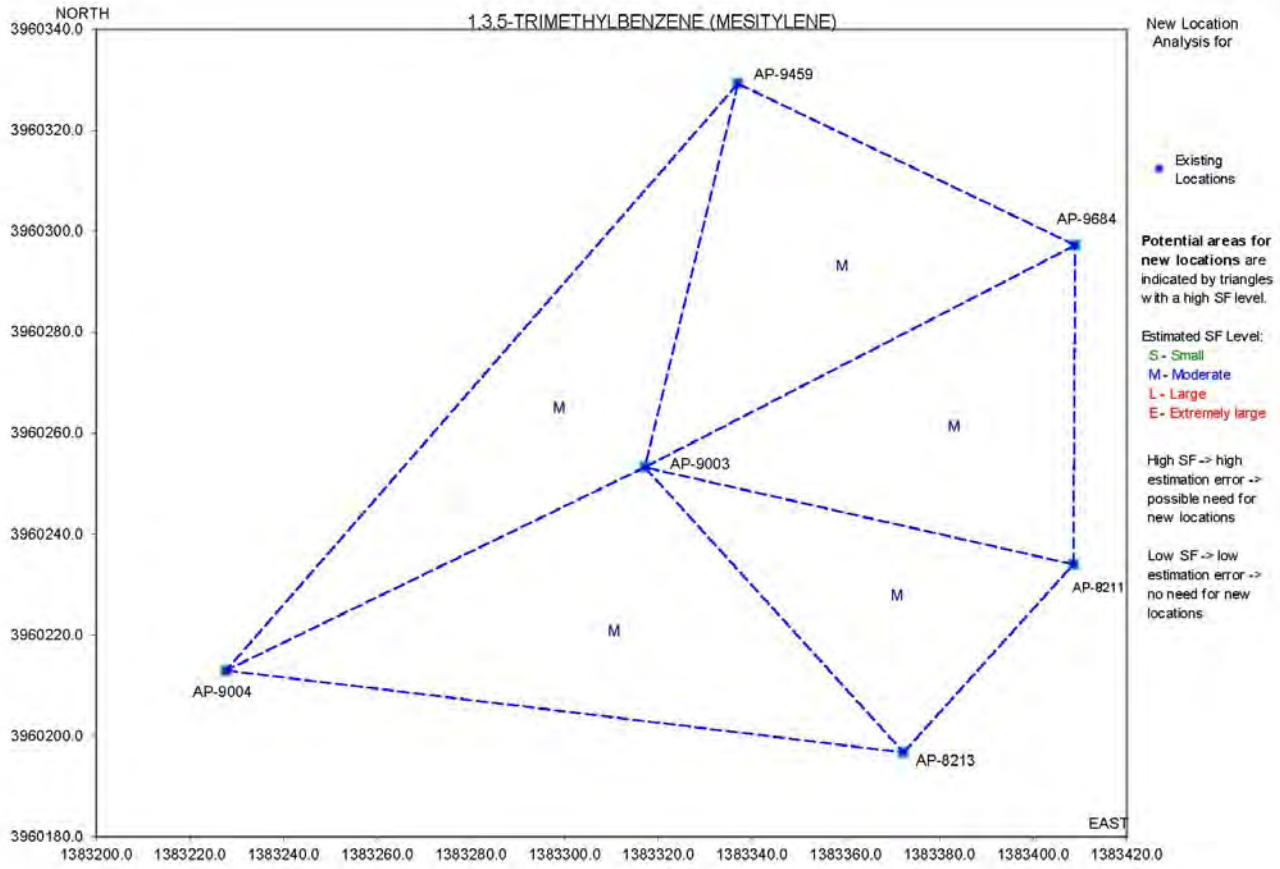

Figure E-7 MAROS Delaunay Results for Naphthalene in Neely Road Wells

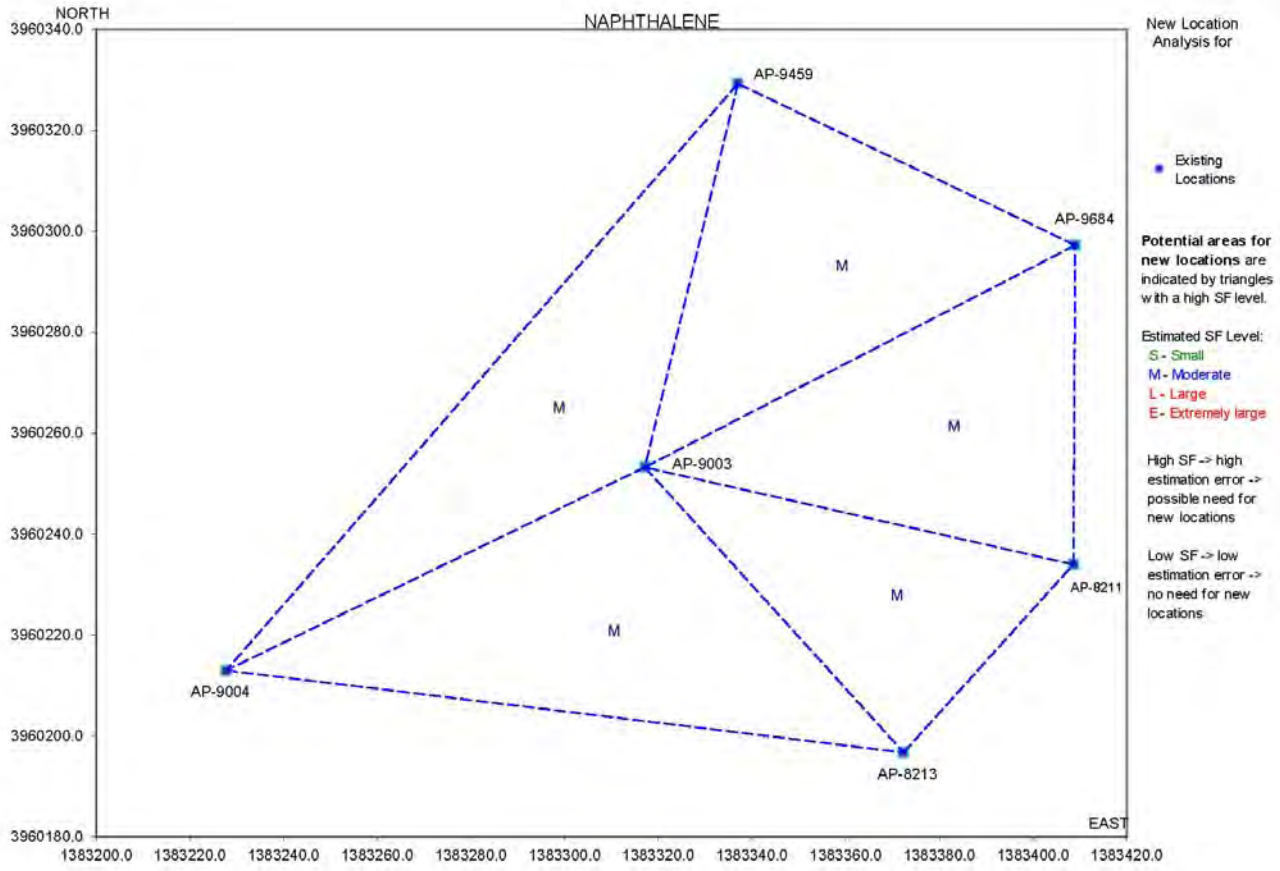

Table E-11. MAROS Sampling Frequency Optimization Results for Neely Road Wells

MAROS Sampling Frequency Optimization Results

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 12

"Recent Period" defined by events: **From** Sample Event 17 (7/11/2014) **To** Sample Event 28 (9/1/2019)

"Rate of Change" parameters used:

Constituent	Cleanup Goal	Low Rate	Medium Rate	High Rate
1,2,4-TRIMETHYLBENZENE	0.056	0.028	0.056	0.112
1,3,5-TRIMETHYLBENZENE (ME	0.06	0.03	0.06	0.12
BENZENE	0.0046	0.0023	0.0046	0.0092
PHC as DIESEL FUEL	1.5	0.75	1.5	3
PHC as GASOLINE	2.2	1.1	2.2	4.4

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
1,2,4-TRIMETHYLBENZENE			
AP-8211	Annual	Annual	Annual
AP-8213	Biennial	Annual	Annual
AP-9003	Annual	Annual	Annual
AP-9004	Biennial	Annual	Annual
AP-9459	Biennial	Annual	Annual
AP-9684	Annual	Annual	Annual
1,3,5-TRIMETHYLBENZENE (MESITYLENE)			
AP-8211	Annual	Annual	Annual
AP-8213	Biennial	Annual	Annual
AP-9003	Biennial	Annual	Annual
AP-9004	Biennial	Annual	Annual
AP-9459	Biennial	Annual	Annual
AP-9684	Biennial	Annual	Annual
BENZENE			
AP-8211	Biennial	Annual	Annual
AP-8213	Biennial	Annual	Annual
AP-9003	Annual	Annual	Annual
AP-9004	Biennial	Annual	Annual

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Table E-11 cont'd. MAROS Sampling Frequency Optimization Results for Neely Road Wells

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Well	Recommended Sampling Frequency	Frequency Based on Recent Data	Frequency Based on Overall Data
AP-9459	Annual	Annual	Annual
AP-9684	Biennial	Annual	Annual
PHC as DIESEL FUEL			
AP-8211	Annual	Annual	Annual
AP-8213	Biennial	Annual	Annual
AP-9003	Annual	Annual	Annual
AP-9004	Biennial	Annual	Annual
AP-9459	Annual	Annual	Annual
AP-9684	Biennial	Annual	Annual
PHC as GASOLINE			
AP-8211	Annual	Annual	Annual
AP-8213	Biennial	Annual	Annual
AP-9003	Annual	Annual	Annual
AP-9004	Biennial	Annual	Annual
AP-9459	Biennial	Annual	Annual
AP-9684	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, November 19, 2019 Page 2 of 2

Table E-11 cont'd. MAROS Sampling Frequency Optimization Results for Neely Road Wells

MAROS Sampling Frequency Optimization Results

Project: Neely Road 2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 12

"Recent Period" defined by events: **From** Sample Event 17 (7/11/2014) **To** Sample Event 28 (9/1/2019)

"Rate of Change" parameters used:

Constituent	Cleanup Goal	Low Rate	Medium Rate	High Rate
ETHYLBENZENE	0.015	0.0075	0.015	0.03
NAPHTHALENE	0.0017	0.00085	0.0017	0.0034

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
ETHYLBENZENE			
AP-8211	Annual	Annual	Annual
AP-8213	Biennial	Annual	Annual
AP-9003	Quarterly	Quarterly	Quarterly
AP-9004	Biennial	Annual	Annual
AP-9459	Annual	Annual	Annual
AP-9684	Biennial	Annual	Annual
NAPHTHALENE			
AP-8211	Quarterly	Quarterly	Quarterly
AP-8213	Biennial	Annual	Annual
AP-9003	Quarterly	Quarterly	Quarterly
AP-9004	Biennial	Annual	Annual
AP-9459	Annual	Annual	Annual
AP-9684	Annual	Annual	Annual

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

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MAROS Output – Former Building 1168

MAROS Statistical Trend Analysis Summary

Project: Bldg 1168_2019

User Name: FES

Location: Fort Wainwright

State: Alaska

Time Period: 3/1/1999 **to** 6/19/2019

Consolidation Period: No Time Consolidation

Consolidation Type: Average

Duplicate Consolidation: Average

ND Values: Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
PHC as DIESEL FUEL								
AP-10037MW	S	32	32	1.2E+00	1.0E+00	No	NT	NT
AP-5751	S	21	21	5.8E+00	3.1E+00	No	D	D
AP-6809	T	32	31	1.2E+00	1.2E+00	No	D	D

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Output – Former Building 2250

MAROS Statistical Trend Analysis Summary

Project: Bldg 2250_2019

User Name: FES

Location: Fort Wainwright

State: Alaska

Time Period: 7/1/1996 **to** 6/19/2019

Consolidation Period: No Time Consolidation

Consolidation Type: Average

Duplicate Consolidation: Average

ND Values: Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
PHC as DIESEL FUEL								
AP-5976	S	8	8	4.2E+00	3.3E+00	No	NT	NT
AP-7151	T	7	7	2.4E+00	8.0E-01	No	PI	NT
AP-7153	S	6	6	4.8E-01	4.5E-01	No	S	S

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Output – Former Building 3564

Table D-1. MAROS Statistical Analysis Summary for Former Building 3564

MAROS Statistical Trend Analysis Summary

Project: Bldg 3564_2019
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/1/2002 **to** 6/21/2019
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
PHC as DIESEL FUEL								
AP-6729	T	18	18	3.0E+00	2.8E+00	No	NT	PI
AP-7178	S	18	18	1.7E+01	7.0E+00	No	NT	NT
AP-7183	T	18	9	1.2E-01	1.0E-01	No	I	I
AP-7187	T	17	17	1.6E+01	9.5E+00	No	S	S
AP-7189	T	18	18	2.4E+01	2.0E+01	No	NT	NT
AP-7191	T	18	18	3.3E+00	2.8E+00	No	I	I
MW3564-1	T	16	12	2.8E-01	3.2E-01	No	S	PD

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); No Detectable Concentration (NDC)

The Number of Samples and Number of Detects shown above are post-consolidation values.

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Table D-2. MAROS Spatial Moment Analysis for the Former Building 3564 Site

MAROS Spatial Moment Analysis Summary

Project: Bldg 3564_2019
Location: Fort Wainwright
User Name: FES
State: Alaska

	0th Moment	1st Moment (Center of Mass)			2nd Moment (Spread)		
Effective Date	Estimated Mass (Kg)	Xc (ft)	Yc (ft)	Source Distance (ft)	Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
PHC as DIESEL FUEL							
10/1/2006	4.5E+00	1,382,281	3,959,998	102	1,474	1,223	7
9/1/2007	6.4E+00	1,382,285	3,959,992	91	1,491	1,202	7
9/1/2008	9.4E+00	1,382,307	3,959,986	80	1,198	1,040	7
9/1/2009	4.1E+00	1,382,276	3,960,009	114	1,557	1,382	7
10/1/2010	3.5E+00	1,382,273	3,960,010	117	1,553	1,323	7
10/1/2011	1.0E+01	1,382,297	3,959,984	83	1,353	850	7
10/1/2012	4.4E+00	1,382,278	3,960,009	114	1,541	1,449	7
9/25/2013	3.7E+00	1,382,279	3,960,004	109	1,403	1,239	7
7/7/2014	8.7E+00	1,382,287	3,959,992	90	1,405	1,196	7
7/21/2015	1.6E+01	1,382,287	3,959,990	93	1,056	921	7
8/19/2016	1.1E+01	1,382,292	3,959,993	93	1,445	1,201	7
8/3/2017	1.2E+01	1,382,285	3,959,993	96	1,426	1,136	7
8/8/2018	1.6E+01	1,382,290	3,959,987	89	1,262	844	7
8/21/2019	1.3E+01	1,382,292	3,959,985	86	1,168	757	7

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Table D-2 cont'd. MAROS Spatial Moment Analysis for the Former Building 3564 Site

Project: Bldg 3564_2019 User Name: FES
Location: Fort Wainwright State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	PHC as DIESEL FUEL	0.51	45	99.3%	I
1st Moment: Distance to Source					
	PHC as DIESEL FUEL	0.13	-17	80.6%	S
2nd Moment: Sigma XX					
	PHC as DIESEL FUEL	0.11	-31	95.0%	D
2nd Moment: Sigma YY					
	PHC as DIESEL FUEL	0.19	-39	98.2%	D

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

Porosity: 0.33 Saturated Thickness: Uniform 18 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.

Table D-3. MAROS First Moment Analysis Results for DRO at Former Building 3564

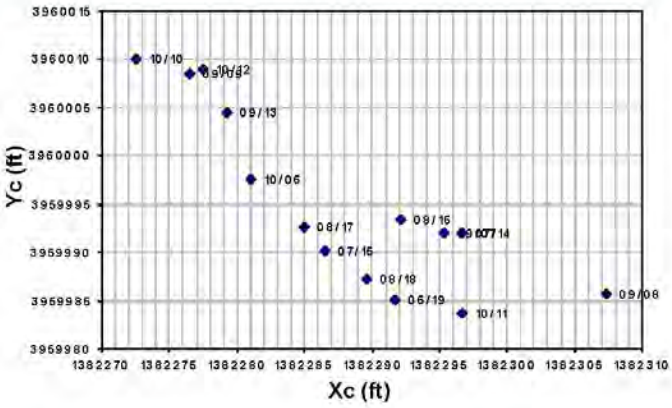
MAROS First Moment Analysis

Project: Bldg 3564_2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

COC: PHC as DIESEL FUEL

Change in Location of Center of Mass Over Time



Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
10/1/2006	PHC as DIESEL FUEL	1,382,281	3,959,998	102	7
9/1/2007	PHC as DIESEL FUEL	1,382,295	3,959,992	91	7
9/1/2008	PHC as DIESEL FUEL	1,382,307	3,959,986	80	7
9/1/2009	PHC as DIESEL FUEL	1,382,276	3,960,009	114	7
10/1/2010	PHC as DIESEL FUEL	1,382,273	3,960,010	117	7
10/1/2011	PHC as DIESEL FUEL	1,382,297	3,959,984	83	7
10/1/2012	PHC as DIESEL FUEL	1,382,278	3,960,009	114	7
9/25/2013	PHC as DIESEL FUEL	1,382,279	3,960,004	109	7
7/7/2014	PHC as DIESEL FUEL	1,382,297	3,959,992	90	7
7/21/2015	PHC as DIESEL FUEL	1,382,297	3,959,990	93	7
8/19/2016	PHC as DIESEL FUEL	1,382,292	3,959,993	93	7
8/3/2017	PHC as DIESEL FUEL	1,382,285	3,959,993	96	7
8/8/2018	PHC as DIESEL FUEL	1,382,290	3,959,987	89	7
8/21/2019	PHC as DIESEL FUEL	1,382,292	3,959,985	86	7

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

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Table D-4. MAROS Sampling Frequency Optimization Results for the Former Building 3564

MAROS Sampling Frequency Optimization Results

Project: Bldg 3564_2019 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 18

"Recent Period" defined by events: **From** Sample Event 15 (10/1/2010) **To** Sample Event 24 (6/21/2019)

"Rate of Change" parameters used:

Constituent	Cleanup Goal	Low Rate	Medium Rate	High Rate
PHC as DIESEL FUEL	1.5	0.75	1.5	3

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
PHC as DIESEL FUEL			
AP-6729	Annual	Annual	Annual
AP-7178	Annual	Annual	Annual
AP-7183	Biennial	Annual	Annual
AP-7187	Annual	Annual	Annual
AP-7189	Quarterly	Quarterly	Annual
AP-7191	Annual	Annual	Annual
MW3564-1	Biennial	Annual	Annual

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

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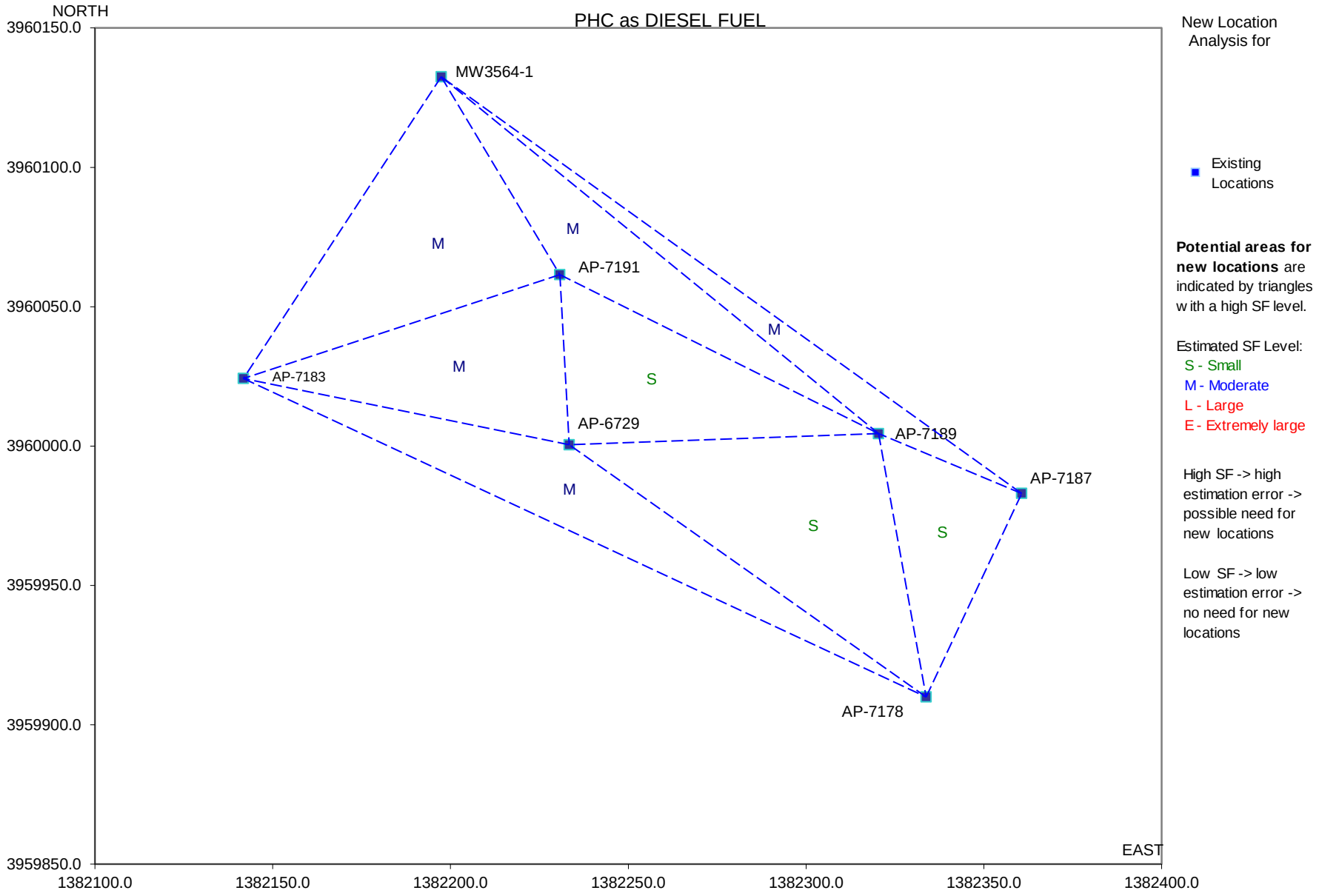
PHC as DIESEL FUEL
NORTH
EAST
3960150.0
3960100.0
3960050.0
3960000.0
3959950.0
3959900.0
3959850.0
1382100.0
1382150.0
1382200.0
1382250.0
1382300.0
1382350.0
1382400.0
MW3564-1
AP-7191
AP-7183
AP-6729
AP-7189
AP-7187
AP-7178
M
M
M
M
S
S
S
New Location Analysis for
Existing Locations
Potential areas for new locations are indicated by triangles with a high SF level.
Estimated SF Level:
S - Small
M - Moderate
L - Large
E - Extremely large
High SF -> high estimation error -> possible need for new locations
Low SF -> low estimation error -> no need for new locations

MAROS Output – Former Building 5110

MAROS Statistical Trend Analysis Summary

Project: Bldg 5110_2019

Location: Fort Wainwright

User Name: FES

State: Alaska

Time Period: 9/1/1991 **to** 6/26/2019

Consolidation Period: No Time Consolidation

Consolidation Type: Average

Duplicate Consolidation: Average

ND Values: Detection Limit

J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Average Conc. (mg/L)	Median Conc. (mg/L)	All Samples "ND" ?	Mann-Kendall Trend	Linear Regression Trend
BENZENE								
AP-5737	T	8	8	8.9E-02	6.1E-02	No	D	D
AP-5738	S	12	11	1.1E-01	9.9E-02	No	D	D
AP-5918R	S	12	4	1.1E-03	5.0E-04	No	PD	PD
PHC as DIESEL FUEL								
AP-5737	T	7	7	8.4E+01	6.9E+00	No	D	PD
AP-5738	S	12	12	9.2E+01	1.9E+01	No	PD	NT
AP-5918R	S	12	12	1.1E+02	4.5E+00	No	NT	D
PHC as GASOLINE								
AP-5737	T	5	5	1.7E+00	1.9E+00	No	S	S
AP-5738	S	10	10	7.5E+00	6.4E+00	No	S	S
AP-5918R	S	11	9	3.8E+00	7.6E-01	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.

APPENDIX E

PHOTOGRAPHIC LOG

Groundwater sampling of AP-7346 (DRMO Yard—DRMO2/Building 5010)
(view NW)

Groundwater Sampling of AP-6729
(view N)

Groundwater Sampling of AP-5737 (Former Building 5110)
(view NE)

Groundwater Sampling of AP-8211 (Neely Road)
(view N)

COMMENTS

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Environmental Conservation

SPILL PREVENTION & RESPONSE
Contaminated Sites Program

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

File: 108.38.076

February 5, 2020

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

RE: DEC comments for the *Draft 2019 Two Party Monitoring Report, U.S. Army Garrison Alaska*, dated January 2020

Dear Mr. Adams:

The Alaska Department of Environmental Conservation (DEC) has completed a review of the above-referenced document describing 2019 groundwater monitoring activities at six, Two-Party sites on Fort Wainwright, Alaska. The six sites are; Defense Reutilization Marketing Office (DRMO) Yard Two-Party sites, Building 3570 Former Post Exchange (PX) Gas Station (Neely Road), Former Building 1168, Former Building 2250, Former Building 3564, and Former Building 5110. Analytical samples were collected for the following petroleum contaminants; gasoline range organics (GRO), diesel range organics (DRO), residual range organics (RRO) and volatile organic compounds (VOCs). Geochemical parameters; dissolved iron and manganese, dissolved oxygen, oxidation-reduction potential and sulfate were also collected to monitor natural attenuation and biodegradation rates of the petroleum contamination.

Based on review of the 2019 results, and review of prior investigations, DEC has recommended additional work at the Former Building 2250 and Former Building 3564 sites. Recent data collected from the Former Building 2250 site indicates the DRO contaminant plume is migrating and not fully delineated. At the Former Building 3564 site, the area to the west and northeast of the existing monitoring well locations do not appear delineated.

DEC has provided review comments (See Enclosure). If there are any questions, please contact me by phone at (907) 451-2182, or by email at erica.blake@alaska.gov.

Sincerely,

Erica Blake

Digitally signed by Erica Blake
Date: 2020.02.05 11:58:54 -09'00'

Erica Blake
Environmental Program Specialist

Enclosure: DEC Review Comments

cc (via email): Sandra Halstead, EPA
Brianne Clark, FWA ENVR
Seth Reedy, FWA ENVR
Matthew Sprau, FWA ENVR Branch Chief
Bob Hazlett, USACE
Robert Glascott, USACE
Andrea Beausang, USACE
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REVIEW COMMENTS

PROJECT: Fort Wainwright, AK

DOCUMENT: Draft 2019 Two Party Monitoring Report

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 2/5/20 REVIEWER: Erica Blake and Kevin Fraley (907-451-2104)					
Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)**	**RESPONSE**	**ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**	**RESPONSE**
1	General – Table of Contents	DEC could not locate Graph's 4-1, 4-2, 4-3 and 4-4 in the document. These graphs are referenced but don't appear to be included in the document text. Please include the graphs, or remove the references to them.	A	Graphs (which are combined on a single page) were mistakenly not included. The graphs will be included in the Final Report.	A	
2	Section 3.3, Bullet Points, Page 3-2 to 3- 3	Statement; "dissolved iron was not measured in DRMO2/Building 5110 wells." Is Building 5110 a typo? Should that be Building 5010? If this is a typo, please revise. If it is a typo, it is in other bullet points in this list.	A	The sentence will be corrected to read "dissolved iron was not measured in DRMO2/Building 5010 wells."	A	
3	Section 3.5 Summary and Recommendations	DEC concurs with the recommendation to change the sampling frequency at the DRMO2/Building 5010 and DRMO5 from an annual frequency to every five years, coinciding with the Five-Year Reviews.	Noted	Understood, the next sampling event is tentatively scheduled for 2024.	A	
4	Figure 3-1 and Figure 3- 2	It would be helpful to put the location of the water supply well on the figure for the DRMO 2/Building 5010 site. Please add the location of the water supply well to Figure 3-1.	A	The well location will be shown on the figures as requested.	A	
5	Section 4.5 Summary and Recommendations	DEC concurs with the recommendation to reduce the sampling frequency to annual. Would the annual sampling occur in the spring/summer or the fall? Please clarify in the report text.	A	The following text will be added "While seasonal contaminant concentration correlations are not strong at the Neely Road site, there appears to be higher concentrations during lower groundwater elevations, therefore groundwater sampling should occur during spring or early summer".	A	
6	Section 5.5 Summary and Recommendations	Statement: "As a result, the groundwater sampling frequency should be increased to every five years.."	A	Text will be revised as suggested. The next sampling event is tentatively scheduled for 2024.	A	

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		Using the word 'increased' implies there will be more sampling events, please revise the statement. Suggest, "As a result, the groundwater sampling frequency should change to every five years."				
7	Section 6.5 Summary and Recommendations	Based on the results from the 2019 sampling event, and from reviewing historical data for this site, it appears the area to the northwest of the source area has not been delineated or investigated properly. Results for the site indicate the petroleum plume is migrating to the northwest, and the most downgradient well (AP-7151) has a potentially increasing diesel range organics (DRO) trend. DEC has concerns for this migrating petroleum plume, and recommends the plume boundaries be defined. In addition to recommending this site be delineated further, DEC does not concur that this site should continue being sampled every five years, and recommends this site be monitored annually until a better DRO trend can be established.	A	Installation of a downgradient well at the Former Building 2250 site will be considered.	A	
8	Section 7.5 Summary and Recommendations	DEC concurs with the recommendation to continue annual groundwater sampling at the Former Building 3564 site and to decommission the damaged AP-7187 monitoring well.	Noted	Understood.	A	
9	Figure 7-2 Former Building 3564	Monitoring well AP-7189 has petroleum detections in the groundwater above DEC cleanup levels. DEC recommends adding	Noted	Release Investigations (RI's) were conducted in 1994 and 1995 to delineate the extent of groundwater	A	

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		a new well in to the area northeast of AP-7189. In past investigations have there been any monitoring wells or temporary wells installed to the west of AP-7183? DEC is concerned that AP-7189 and AP-7183 have increasing trends and there are no results around these areas indicating results are ND. If there are old investigation reports that show these areas have been previously investigated, those references would be helpful to cite and reference.	Noted	contamination at the Former Building 3564 site. The 1994 RI included the sampling of temporary well GPB-6 (north of AP-7187 and AP-7189) there were no detections of GRO, DRO, or BTEX (see attached Figure 6). The 1995 RI included the installation and sampling of temporary wells surrounding the groundwater plume (see attached Figure 4-11). Temporary well location SW11 was located approximately 100 feet north of AP-7187 (northeast of AP-7189). The sample from SW11 was analyzed for GRO, DRO, and VOCs; there were no detections in the sample. AP-7183 has never had any contaminant concentration above the ADEC CUL. Typically, DRO is either not detected in the well or is detected just above the LOD. Although an increasing Mann-Kendall trend was identified for the well it may be the result of higher LOD's in recent sampling events.		
10	Section 8 – General Question	How is this site currently used? Do people visit this area frequently?	Noted	The site is located on the active range and access is restricted. The site is located within the safety danger zone	A	

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				of the small arms range.		
11	Section 8.5 Summary and Recommendations	DEC concurs with the recommendation to continue groundwater sampling every five years, coinciding with the Five-Year Review, at the Former Building 5110 site.	A	Understood. The next sampling event is scheduled to occur in 2024.	A	
12		- End of comments -				