FINAL
2018 Groundwater Monitoring Report

Operable Unit 6

HQAES No. 02871.1088
ADEC Hazard ID. 4140, File No. 108.38.085

Contract No. W911KB-16-D-0005

Task Order W911KB18F0053

July 2019

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

July 22, 2019

Directorate of Public Works

Subject: Submission of the Final 2018 Monitoring Report, Operable Unit 6, 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 2018 Monitoring Report, Operable Unit 6, on Fort Wainwright to State of Alaska Department Environmental Conservation.

A digital copy of the document will be provided to you through the Army's Safe File Access Exchange (SAFE), and two CDs with the PDF and all native files will be delivered to the ADEC office in Fairbanks. A copy of the letter is being provided to Kevin Fraley, Environmental Program Specialist, Alaska Department of Environmental Conservation; and Ms. Sandra Halstead, Federal Facilities Superfund Site Manager, Environmental Protection Agency. If you would like to receive a hard copy of this document, please notify us within the next few weeks.

If you have additional 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, (907) 361-3001 or email: brianne.r.clark.civ@mail.mil, or you may contact Mr. Seth Reedy, Alternate Remedial Program Manager at (907)361-6489 or email: seth.a.reedy.civ@mail.mil.

Sincerely;

Brian M. Adams
Remedial Program Manager

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

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

July 22, 2019

Directorate of Public Works

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Mr. Kevin Fraley
Environmental Program Specialist
Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, AK 99709

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

REPLY TO
ATTENTION OF:

July 22, 2019

Directorate of Public Works

Subject: Submission of the Final 2018 Monitoring Report, Operable Unit 6, to Environmental Protection Agency.

Ms. Sandra Halstead
Environmental Protection Agency
Federal Facilities Superfund Site Manager
Alaska Operations Office
222 W. 7th Ave, #19
Anchorage, AK 99513

Dear Ms. Halstead:

This letter documents transmission of the Final 2018 Monitoring Report, Operable Unit 6, on Fort Wainwright to the Environmental Protection Agency.

A digital copy of the document will be provided to you through the Army's Safe File Access Exchange (SAFE). A copy of the letter is being provided to Ms. Erica Blake, Environmental Program Specialist, Alaska Department of Environmental Conservation; and 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.

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Sincerely;

Brian M. Adams
Remedial Program Manager

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

FINAL 2018 ANNUAL GROUNDWATER MONITORING REPORT

OPERABLE UNIT 6
FORMER COMMUNICATIONS SITE

For:

U.S. Army Garrison Alaska

July 2019

Prepared under contract to

U.S. Army Corps of Engineers, Alaska District

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

Prepared by

Fairbanks Environmental Services

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FES Project No. 9011-07

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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
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
bgs	below ground surface
CaCO3	calcium carbonate
CDQR	Chemical Data Quality Review
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Cost Effective Sampling
COC	contaminant of concern
CY	cubic yards
DCE	dichloroethene
DERA	Defense Environmental Restoration Account
DO	dissolved oxygen
DOD	Department of Defense
DRO	diesel range organics
ECC	Environmental Compliance Consultants
EPA	Environmental Protection Agency
FES	Fairbanks Environmental Services Inc.
FCS	Former Communication Site
FFA	Federal Facility Agreement
GAC	granular activated carbon
GIS	geographic information system
HQAES	Headquarters Army Environmental System
IC	Institutional Control
ICIAP	Institutional Controls Implementation Action Plan
IDW	investigation-derived waste
MAROS	Monitoring and Remediation Optimization System
MNA	monitored natural attenuation
mV	millivolts
mg/L	milligrams per liter
µg/L	micrograms per liter
msl	mean sea level
NAPL	non-aqueous phase liquids
ND	not detected
ORP	oxidation/reduction potential
OU6	Operable Unit 6
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PSEs	Preliminary Source Evaluations
PCL	project cleanup level
POL	petroleum, oil, and lubricants
QC	quality control
QSM	Quality Systems Manual

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

RAG	Remedial Action Goals
RAO	Remedial Action Objective
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RRO	residual range organics
SVOC	semivolatile organic compounds
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TCP	1,2,3-trichloropropane
TW	temporary well
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

EXECUTIVE SUMMARY

This report presents results of the groundwater monitoring conducted at the Operable Unit 6 (OU6) Former Communications Site (FCS) on Fort Wainwright, Alaska. The Record of Decision (ROD) selected remedy for OU6 consists of institutional controls (ICs) for soil and institutional controls with monitored natural attenuation (MNA) of contaminants of concern (COCs) in groundwater. Groundwater monitoring results were evaluated to determine the effectiveness of natural attenuation with respect to Remedial Action Goals (RAGs), and to support decisions regarding the effectiveness of the ROD remedy.

GROUNDWATER MONITORING

Historical data have defined three areas of groundwater contamination within the OU6 FCS. Three adjacent diesel range organics (DRO) plumes, a 1,2,3-trichloropropane (TCP) plume, and a trichloroethene (TCE) plume. Groundwater samples were collected from 25 wells, associated with the five groundwater plumes, during June and September 2018. Groundwater monitoring results between 2007 and 2018 were used to conduct a statistical evaluation of the groundwater contaminant plumes in the OU6 FCS. In general, the results showed the contaminant plumes are adequately delineated and are not expanding. As monitoring data are accumulated, the results are also used to modify the monitoring approach. In addition to monitoring contaminant plumes, groundwater monitoring of sentry wells located near a Fort Wainwright water supply well was conducted.

DRO Plumes

Groundwater samples were submitted for analysis of DRO, residual range organics (RRO), and geochemical parameters from 13 wells associated with the main DRO plume. DRO exceed the project cleanup level (PCL) in three wells. DRO concentrations that exceed the PCL downgradient of the plume source are stable; however, concentrations at the source of the plume are increasing. RRO did not exceed the PCL in any well during 2018; however, the limit of detection (LOD) was significantly elevated in the source well (MW33), and RRO exhibits an increasing trend in this well. DRO and RRO concentrations at the source well are expected to persist above the PCL, due to residual non-aqueous phase liquids (NAPL) remaining in the soils that continues to be solubilized in the groundwater. Metal and sulfate reduction, as well as methanogenesis, appear to be significant biodegradation processes within the main DRO plume. An estimation of the time to cleanup could not be determined for DRO or RRO in monitoring wells associated with the main DRO plume since there were no decreasing trends.

Groundwater samples were submitted for analysis of DRO, RRO, and geochemical parameters from two wells associated with the MW62 and MW77 DRO plumes. DRO exceed the PCL during both 2018 monitoring events in MW77; however statistical analysis showed no trend for DRO in MW77 in 2018. Very high concentrations of nitrate/nitrite as nitrogen at MW77 suggest that

when dissolved oxygen (DO) concentrations are less than approximately 1.0 milligrams per liter (mg/L), nitrate reduction would predominate; however, manganese reduction appears to be a minor contributor to DRO and RRO biodegradation. DRO concentrations will likely persist above the PCL in MW77 due to residual NAPL remaining in the soils in this area. A cleanup date cannot be estimated for the MW77 plume until the residual NAPL is depleted and decreasing trends are seen.

DRO was below the PCL in June and at the PCL during September in MW62. Statistical analysis also showed no trend for DRO in MW62 in 2018. DRO and RRO in MW62 have been at or below the PCL since 2012. Manganese reduction is most likely the predominant biodegradation process at MW62. Residual NAPL may have been depleted within the MW62 plume, for which there are no significant spikes in the data; however, additional monitoring is required to establish a decreasing trend. At least two more rounds of sampling with persistent low contaminant levels are required at MW62 to meet EPA guidance for attainment of PCLs (Environmental Protection Agency [EPA], 2014).

TCP Plume

Groundwater samples were submitted for analysis of low level volatile organic compounds (VOCs) and geochemical parameters from four wells associated with the TCP plume and four downgradient sentry wells. MW47 and MW79 are within the plume and were both found to have TCP concentrations above the PCL during the spring and fall 2018 sampling events. The trend results show the TCP concentration is decreasing in downgradient well MW47, and increasing in upgradient well MW79. The high TCP concentrations observed at monitoring well MW79 suggest the presence of TCP in nearby soil. Aerobic to mildly reducing conditions appear to be predominate in this plume; however, decreases in TCP concentrations may also be attributed to advection, dispersion, and dilution. TCP has remained below the PCL in wells upgradient, crossgradient, and downgradient of the TCP plume; suggesting minimal plume spread from the source area.

Natural attenuation processes are expected to reduce concentrations in downgradient monitoring well MW47 to full remediation in 2033. In contrast, exceedances will likely continue at monitoring well MW79 until the suspected TCP soil source is depleted.

TCE Plume

TCE concentrations at MW61 and MW80 have been less than the PCL since 2011. Statistical analysis shows a continued decreasing trend at MW61. The 95% upper confidence limit (UCL) of the regression curve suggests that remedial goals were met in 2014 at MW61. This indicates that the TCE PCL has been achieved in accordance with EPA requirements (EPA, 2014a).

Sentry Wells

Groundwater samples were collected from four sentry wells (MW39, MW78, MW91, MW93) located near a Fort Wainwright water supply well (Building 3559). The samples were analyzed for TCP and vinyl chloride. TCP was detected below the ROD PCL (and LOD) in two wells (MW39 and MW78) during the September 2018 sampling event. TCP was not detected in the remaining samples and vinyl chloride was not detected in any sample.

INSTITUTIONAL CONTROL INSPECTIONS

The annual IC inspection of OU6 was conducted during July 2018. The purpose of the inspection was to evaluate the implementation and effectiveness of ICs, to verify that ICs continue to function as intended, and to identify corrective actions based on findings of the site inspection. The only IC deficiency was intentional excavation (probably by dogs) in the backyards of several residences. The Army contacted the housing operator who issued notices to the five residents where holes were observed in their backyards and the deficiencies were corrected.

1.0 INTRODUCTION

This report presents results of the biannual groundwater monitoring conducted at the Operable Unit 6 (OU6) Former Communications Site (FCS) on Fort Wainwright, Alaska during June and September 2018. Fairbanks Environmental Services, Inc. (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE), Contract Number W911KB-16-D-0005, Task Order 11. The work was completed according to the 2018 Postwide Work Plan (FES, 2018), under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and in compliance with the OU6 Record of Decision (ROD), Federal Facility Agreement (FFA), and state of Alaska regulations.

The primary objectives for the 2018 work at the OU6 FCS described in this report include the following:

- Collect and analyze groundwater for contaminants of concern (COCs) as presented in the OU6 ROD (USACE, 2014a), previously detected contaminants (USACE, 2012b), and geochemical parameters.
- Compare results with ROD-established project cleanup levels (PCLs) (USACE, 2014a); the newly issued Alaska Department of Environmental Conservation (ADEC) cleanup levels (ADEC, 2018) are presented for reference.
- Assess current and historical results to identify contaminant trends and predict cleanup dates.
- Review geochemical data for consistency with the selected remedy of monitored natural attenuation (MNA).
- Summarize findings of the Institutional Control (IC) inspections conducted at OU6 during 2018.

All activities were conducted in accordance with the plans and procedures outlined in the following documents:

- *Final 2018 Postwide Work Plan, Fort Wainwright, Alaska* (FES, 2018)
- *Final Postwide Uniform Federal Policy for Quality Assurance Project Plans, Fort Wainwright, Alaska* (FES, 2016)
- *Record of Decision, Operable Unit 6, Former Communications Site, Fort Wainwright, Alaska* (USACE, 2014a)
- *Operable Unit 6, Former Communications Site, Fort Wainwright, Alaska, Remedial Design/Remedial Action Work Plan, Remedial Design/Remedial Action (RD/RA) Work Plan* (USACE, 2015)

1.1 Project Overview and Monitoring Report Organization

The 2018 sampling effort evaluates progress towards achieving remedial objectives in groundwater. 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 – Field Activities Summary
- Section 3 – Groundwater Monitoring Analytical Results and Discussion
- Section 4 – Institutional Control Survey
- Section 5 – Conclusions
- Section 6 – References

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

- Appendix A – Groundwater Sampling Forms and Field Book
- Appendix B – Chemical Data Quality Review (CDQR) and ADEC Laboratory Data Review Checklists
- Appendix C – Groundwater Sample Summary and Analytical Result Tables
- Appendix D – Monitoring and Remediation Optimization System (MAROS) Software Concentration Trend and Plume Stability Results
- Appendix E Photographic Log

1.2 Project Location and Background

1.2.1 Site History

The OU6 FCS is commonly referred to as the Tanana Trails Family Housing Development, formerly known as Taku Gardens. This site is located on Fort Wainwright, an active U.S. Army installation occupying a 911,604-acre military reservation east of Fairbanks, Alaska (Figure 1-1). The OU6 FCS is located between Alder and Neely Roads, south of the Basset Army Hospital. OU6 previously contained or was used for barracks, company headquarters, communications and radar systems, salvage/reclamation yard activities, debris disposal, firefighting training, and possible ammunition storage. The site was selected for construction of future military housing in 2002/2003, and construction began in 2005.

During construction of the housing development in 2005, environmental contamination of soil and groundwater were found. Characterization and remedial activities conducted between 2005 and 2013 identified polychlorinated biphenyls (PCBs), petroleum compounds, chlorinated

compounds, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and discarded military munitions and munitions debris. Two of the VOCs that were found to persist in groundwater plumes were trichloroethene (TCE) and 1,2,3-trichloropropane (TCP). The TCE and TCP plumes were likely related to historical salvage and waste operations at the FCS between 1942 and 1962 (USACE, 2010).

1.2.2 Investigation Summary

Groundwater monitoring to assess contaminant levels, contaminant trends, and the effectiveness of the ROD-selected remedy of MNA at this site began in 2005, continued through the Remedial Investigation (RI) (USACE, 2010), and continues into the present. There are no data from 2013 to 2015, either because data were not accepted or because sampling did not occur during these years. Since 2005, 95 monitoring wells have been installed at the FCS. The following is a summary of the investigation history at the FCS:

- Initially, 13 temporary monitoring wells, wells generally used to aid in determining the optimal locations for the permanent wells, were installed and sampled during Preliminary Source Evaluations (PSEs) that were conducted between 2005 and 2006.
- An RI was conducted between 2007 and 2010
    - In 2007, 64 monitoring wells were installed to investigate and delineate potential groundwater contamination and to collect data for use in a risk assessment (USACE, 2010).
    - In 2008, five additional monitoring wells were installed to delineate the boundaries of the contaminated groundwater plumes (USACE, 2010).
    - In 2009, nine additional monitoring wells were installed as part of the TCP investigation to delineate TCE and diesel range organics (DRO) plume boundaries (USACE, 2010).
- Post-RI activities were conducted between 2010 and 2017
    - In 2010, two deep monitoring wells (sentry wells) were installed outside of the fence on the northeast boundary of the FCS to determine whether TCP contamination threatened the FWA drinking water supply wells (USACE, 2012a).
    - In 2012, one deep monitoring well (sentry well) was installed between the TCP plume and the FWA drinking water supply wells within the capture zone of the FWA drinking water supply wells (USACE, 2013).
    - In 2013, two unusable wells were decommissioned and two permanent monitoring wells were installed to serve as replacement monitoring wells (USACE, 2014b).
    - In 2016, 57 monitoring wells were decommissioned or abandoned in place with the approval and guidance of ADEC (USACE, 2018a).
    - In 2017, six additional monitoring wells and one temporary well were decommissioned (USACE, 2018b).

1.2.3 Remedial Summary

Debris, drums, munitions-related items, and contaminated soil encountered during the series of investigation activities were removed to the greatest extent practical and properly disposed of, including an estimated 3,368 cubic yards (CY) of PCB-contaminated soil; 66 CY of pesticide-contaminated soil; and 3,354 CY of petroleum, oil, and lubricants (POL)/solvent-contaminated soil (USACE, 2014b). In addition, 2,934 items of munitions-related debris and 1,061 drums were disposed of. Soil contaminated with POL and residual concentrations of VOCs, SVOCs, pesticides, and explosive compounds remains in the subsurface between 5 and 15 feet below ground surface (bgs).

1.2.4 Long Term Monitoring

Between 2005 and 2013, a total of 95 monitoring wells were installed, including three deep monitoring wells (sentry wells) on the northeast boundary of the site to determine whether contamination threatened the Fort Wainwright drinking water supply wells (USACE, 2012a; 2013). Five groundwater plumes have been identified: one TCE plume; one 1,2,3-TCP plume; one main DRO plume; and two smaller DRO plumes associated with wells MW62 and MW77.

The RD/RA Work Plan (USACE, 2015) identified 25 existing wells for continued monitoring to support the ROD-selected remedy of MNA (USACE, 2014a) as shown on Table 1-1. Groundwater COCs at the FCS are TCE, TCP, DRO, and residual range organics (RRO). Although the OU6 ROD identified TCE as a COC (USACE, 2014a), TCE concentrations have been below the PCL since 2011.

Table 1-1 Monitoring Wells Operational During the 2018 OU6 MNA Program

OU6 Monitoring Wells						
MW03	MW13	MW35	MW47	MW62	MW79	*MW90*
MW06A	MW28	MW37	MW48	MW64	MW80	MW91
MW08	MW32R	MW38	MW58	MW77	MW82	*MW92*
MW12R	MW33	MW39	MW61	MW78	*MW85*	MW93

Notes: *Italicized* wells were not sampled in the 2018 field effort in accordance with the work plan (FES, 2018).

1.3 Regulatory Considerations

Remedial Action Objectives (RAOs) and PCLs for groundwater were identified in the OU6 ROD (USACE, 2014a) and are summarized below.

1.3.1 Remedial Action Objectives

The OU6 ROD established the following RAOs for groundwater COCs at the OU6 Former Communications Site:

- Protect against human exposure to COCs in soil. This RAO will be achieved if COCs in soil at concentrations exceeding PCLs are managed through administrative processes, or if COCs in soil meet PCLs.
- Protect against human exposure to COCs in groundwater. This RAO will be attained if the exposure pathway to human receptors is limited or eliminated through administrative processes, or if COC concentrations in groundwater are reduced to meet PCLs.
- Return groundwater to its beneficial use as a drinking water source. VOCs are expected to reach PCLs within 25 years; it is expected that remediation of DRO and RRO will take longer. This RAO will be achieved when groundwater COCs meet PCLs.

1.3.2 Project Cleanup Levels

Based on the results of the baseline risk assessment for current and projected land use at the site, COCs were identified and PCLs were established. Table 1-2 presents the PCLs for the OU6 FCS COCs identified in the ROD.

Table 1-2. OU6 Project Cleanup Levels for Groundwater

Contaminants of Concern	ROD Project Cleanup Level (µg/L)
1,2,3-TCP	0.12
TCE	5
DRO	1,500
RRO	1,100

µg/L – micrograms per liter

After PCLs have been achieved and/or by agreement of the Army, EPA, and ADEC; the site may be transferred to the Two-Party program. To achieve site closure under the Two-Party program, groundwater concentrations must meet the cleanup levels in Title 18 of the Alaska Administrative Code (AAC), Chapter 75.345, Table C (ADEC, 2018a). Contaminant concentrations are compared to both ROD cleanup levels (when applicable) and current ADEC cleanup levels in the Appendix C. Analytes detected during the 2018 sampling events that exceed ROD PCLs and/or current ADEC cleanup levels are highlighted in these tables.

1.4 OU6 Source Area Tracking

The OU6 source area is tracked in the ADEC Contaminated Sites database, which is maintained by the ADEC project manager assigned to the source area and by the Army in the Headquarters Army Environmental System (HQAES) for funding purposes. Source area identification and historical spill numbers are presented in Table 1-3.

Table 1-3. Source Area Identification and Spill Numbers

Source Area Name	ADEC File Numbers[1]	ADEC Spill Numbers	ADEC Hazard ID	Army HQAES Number[1]
OU6 Former Communications Site (Taku Gardens)	108.38.085	05309914702 05309914703 06309911001 06309931201	4140	02871.1088

[1] Based on information from the ADEC Contaminated Sites Database available at http://dec.alaska.gov/spar/csp/db_search.htm and the Army HQAES

NOTES:

1. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

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

Operable Unit 6 Location and Vicinity
2018 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

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

2.0 FIELD ACTIVITIES SUMMARY

Two groundwater sampling events were conducted at the FCS, the first between June 20th and 25th, 2018 and the second between September 20th and 27th, 2018. The work was completed according to the 2018 Postwide Work Plan (FES, 2018) and the Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2016). This section discusses the sampling activities; analytical data are presented in Section 3.

2.1 Pre-sampling Activities

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

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

2.2 Groundwater Sampling Procedures

Techniques used to purge and sample the groundwater were consistent with low-flow sampling methodology (Puls and Barcelona, 1996) and are detailed in the OU Sites UFP-QAPP (FES, 2016). The low-flow sampling method utilized submersible pumps and dedicated Teflon-lined tubing in all but one well (MW91); samples from MW-91 were collected using a disposable bladder pump because the top of this well is damaged below the ground surface, resulting in the inability to lower a submersible pump to the screen depth.

Groundwater was purged at a rate between 0.03 and 0.15 gallons per minute. Water quality measurements were recorded every five minutes and monitoring wells were purged until water quality parameters stabilized, per ADEC guidance (ADEC, 2017). Field parameters were measured using YSI water quality meters installed in a flow through cell. The instruments were calibrated at the beginning of each day according to the manufacturer's instructions. Measured parameters included pH, temperature, specific conductivity, dissolved oxygen (DO), and oxidation/reduction potential (ORP). Field parameters are discussed further in Section 2.3.2. In addition, turbidity and drawdown were measured for each well and were recorded on sampling forms. Groundwater sampling forms are presented in Appendix A, and a summary of the field parameters is provided in Appendix A, Table A-1. A photographic log of groundwater sampling activities is provided in Appendix E.

2.3 OU6 Groundwater Sampling Program Summary

Groundwater sampling conducted in 2018 is summarized in Table 2-1. The locations of the wells included in the 2018 sampling events are presented in Figure 2-1 and plume areas are defined on Figure 3-1.

Table 2-1. OU6 Groundwater Sampling Summary

Contaminant Area	Number of Wells	Monitoring Wells to be Sampled	Analytical Parameters	2018 Monitoring Frequency
Background	2	MW03[2], MW13[1]	(VOC [low level])[1], (DRO/RRO)[2], MNA Parameters[3]	Spring (June) and Fall (September)
DRO Plumes	13	MW06A, MW12R, MW28, MW32R[1], MW33, MW35, MW37, MW38, MW58, MW62, MW64, MW77, MW82	(VOC [low level])[1], DRO/RRO, MNA Parameters[3]	
1,2,3-TCP Plume	4	MW08, MW47, MW48, MW79	VOC [low level], MNA Parameters[3]	
TCE Plume	2	MW61, MW80	VOC, MNA Parameters[3]	
Sentry Wells	4	MW39, MW78, MW91, MW93	VOC [low level]	

[1] Wells MW13 and MW32R were also analyzed for low-level VOCs.
[2] Well MW03 was also analyzed by DRO/RRO.
[3] Monitored natural attenuation (MNA) parameters include methane, dissolved iron/manganese/phosphorus/potassium, sulfate, alkalinity, ammonia, and nitrate/nitrite as nitrogen

2.3.1 Contaminant Monitoring

Groundwater samples collected from the monitoring wells were submitted for the analyses as indicated above in Table 2-1. All samples collected during the spring and fall sampling events were submitted to and analyzed by Agriculture & Priority Pollutants Laboratories, Inc. (APPL) of Clovis, California. An evaluation of data quality is detailed in the CDQR and ADEC Laboratory Data Review Checklists. The CDQR and ADEC Checklists are provided in Appendix B. The sample summary and analytical results tables are presented in Appendix C. The analytical methods used to analyze groundwater samples are listed below.

- Environmental Protection Agency (EPA) Method 8260C (VOCs) – 1,1-dichloroethene (DCE), cis-1,2-DCE, trans-1,2-DCE, tetrachloroethene (PCE), and TCE
- EPA Method 8260C-SIM (VOC [low level]) – 1,2,3-TCP and vinyl chloride
- AK Method 102 (DRO)
- AK Method 103 (RRO)

2.3.2 Geochemical Parameter Monitoring

Geochemical conditions were evaluated to ensure they are supportive of MNA. Geochemical data were collected during 2018 sampling efforts for 25 wells, consisting of the following parameters as described in *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water* (EPA, 1998):

- pH – Conditions may become more acidic (lower pH) in areas of high biological activity due to the production of organic acids (intermediate degradation products) and the accumulation of carbon dioxide (the endpoint of oxidation, forming carbonic acid). Neutral pH is 7.
- Eh (the standard thermodynamic measure of electrochemical potential, measures approximately 235 millivolts [mV] greater than the field-measured ORP) – Conditions may become more reducing (lower Eh) in areas where microbes have consumed the available oxygen and switched to progressively less favorable electron acceptors (such as nitrate, manganese, iron, and sulfate). ORP results provide a general understanding of redox conditions but generally are a poor indicator of predominant terminal electron acceptor processes.
- DO (preferred electron acceptor) – Microbes preferentially consume oxygen before other less favorable electron acceptors (such as nitrate, manganese, iron, sulfate, and carbonate) are used.
- Nitrate – In the absence of more favorable electron acceptors, microbes producing ammonia can utilize nitrate and nitrite. Nitrogen in all forms is also an essential nutrient.
- Manganese – In the absence of more favorable electron acceptors, manganese can serve as an electron acceptor and can result in elevated concentrations of dissolved manganese in groundwater.
- Iron – In the absence of more favorable electron acceptors, virtually insoluble (at neutral pH) ferric (oxidized) iron serves as an electron acceptor and can result in elevated concentrations of dissolved ferrous iron in groundwater.
- Sulfate – In the absence of more favorable electron acceptors, sulfate can be used by microbes, leading to decreased sulfate concentrations and the production of hydrogen sulfide gas or insoluble sulfide minerals under anaerobic conditions. Indirect evidence of sulfate reduction may include decreasing concentrations of sulfate along a contaminant flow path, or sulfate concentrations lower than background levels.
- Methane – When other more favorable electron acceptors are depleted, methanogenesis (carbonate reduction) may occur, resulting in increased concentrations of methane. However, in the Fairbanks area, low methane concentrations in groundwater are often observed and may be the result of migration from natural occurring sources (e.g., peat or thawing permafrost).

Geochemical parameter monitoring was performed concurrently with contaminant monitoring. These parameters, along with water levels and drawdown, are summarized in Appendix A, Table A-1. In select wells, groundwater samples were also submitted to APPL, Inc. and analyzed for the following geochemical parameters:

- Dissolved (field-filtered) iron and manganese using EPA Method 6010C
- Sulfate using EPA Method 300.0
- Ammonia as nitrogen using EPA Method 350.1
- Nitrate/Nitrite as nitrogen using EPA Method 353.2
- Methane using Method RSK 175
- Alkalinity as calcium carbonate ($CaCO_3$) using EPA Method SM2320B

Analytical results for geochemical parameters are presented in Appendix C, Table C-2. Relative changes in these geochemical indicators can provide an indirect measure of biodegradation of petroleum hydrocarbons. Discussion regarding groundwater geochemistry at OU6 is included in Section 3.5. The CDQR in Appendix B discusses the quality of the analytical results and is summarized in Section 2.4.

2.4 Groundwater Sample Data Quality

Project and quality control (QC) analytical data were reviewed to assess whether the data met the designated quality objectives and were acceptable for project use. The project data were reviewed for deviations to the requirements presented in the Final 2018 Postwide Work Plan (FES, 2018); Final Postwide UFP-QAPP (FES, 2016); ADEC Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling Technical Memo (ADEC, 2017); and United States Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (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 overall project due to the data qualifications was minor. The specific data quality issues found during the review are presented in the CDQR and ADEC Laboratory Data Review Checklist in Appendix B. The reviewed data are presented in Appendix C, Table C-2 and are used in tables and figures throughout the report.

2.5 Statistical Evaluation of Contaminant Concentration Trends

Groundwater monitoring data collected between 2007 and 2018 were used to conduct a statistical evaluation of groundwater contamination in the FCS. This evaluation builds on the results of previous analyses, and documents the progress towards achieving the RAOs described in the OU6 ROD (USACE, 2014a). The analysis tools and decision criteria are consistent with the previous analyses and recommendations from the RD/RA Work Plan for OU6 (USACE, 2015).

The statistical tests used in this evaluation for individual wells include the nonparametric Mann-Kendall trend test, and a geometric (lognormal) regression plot for those wells statistically demonstrating a decreasing trend. Statistical tests for plume-wide evaluation included spatial moment analysis (for plume stability), the Delaunay method (for well redundancy), and the modified Cost-Effective Sampling (CES) method (for sampling frequency). The Mann-Kendall trends, spatial moment analysis, Delaunay evaluation, and CES method were calculated using the MAROS software developed by the Air Force Center for Engineering and the Environment (AFCEE, 2006). The geometric regression plots were calculated using the Groundwater Statistics Tool developed by the EPA (EPA, 2014a). The Groundwater Statistics Tool also provides an evaluation of whether or not a cleanup level has been met for a particular COC by calculating the 95% upper confidence limit (UCL) on the mean. For wells with decreasing trends, the tool can predict when to expect the cleanup level may be achieved. EPA recommends a minimum of eight data points should be used for these calculations to provide confidence that the cleanup level has been met and is expected to continue to be met (EPA, 2014b). If a well has achieved the cleanup level for all COCs at this level of confidence, it may be recommended for removal from the monitoring program and decommissioning. The complete analysis results are presented in Appendix D.

2.6 Decontamination

Reusable sampling equipment consisted of a water level meter and submersible pumps, which were decontaminated between every well. The decontamination procedure consisted of an Alconox detergent wash followed by a potable water rinse. Dedicated Teflon-lined tubing prevented cross-contamination when using the submersible pump. Following groundwater sampling, the submersible pumps were decontaminated in accordance with the UFP-QAPP (FES, 2016).

The decontamination water generated during groundwater sampling was containerized and treated using granular activated carbon (GAC). The treated water was discharged at the OU6 source area, at a location that was vegetated and at least 100 feet from any surface water body source. The discharge location is shown on Figure 2-1.

2.7 Investigation-Derived Waste Handling and Disposal

Investigation-derived waste (IDW) generated during OU6 field activities in 2018 included purge water, decontamination water, and general refuse (disposable tubing, nitrile gloves, etc.) from groundwater monitoring activities. All IDW and other waste streams were managed according to the procedures outlined in the 2018 Postwide Work Plan (FES, 2018) and the UFP-QAPP (FES, 2016).

Purge water was containerized at the time of sampling in 15-gallon polyethylene drums. The drums were labeled with a unique ID, and a form was completed documenting the ID and purge

volume from each well. The drums were taken to the Fort Wainwright Defense Environmental Restoration Account (DERA) building for temporary storage. The purge water from OU6 was characterized using the results from individual wells and a separate toxicity characteristic leaching procedure (TCLP) analysis. The purge water from OU6 was disposed of as CERCLA waste. The drums of purge water were provided to Environmental Compliance Consultants (ECC – the Fort Wainwright waste disposal contractor) at the completion of the sampling activities. Complete documentation of the CERCLA waste disposal will be provided in the 2018 IDW Technical Memorandum.

2.8 Institutional Controls

An IC inspection was conducted at OU6 between July 1st and July 26th 2018. The purpose of the inspection is to evaluate the implementation and effectiveness of ICs, to verify that ICs continue to function as intended, and to identify corrective actions based on findings of the site inspection. The specific objectives of the ICs at OU6 are as follows:

- Prevent access to or use of the groundwater beneath OU6 until PCLs are met.
- Maintain the effectiveness of the MNA remedy for groundwater by developing specific operation and maintenance activities for the monitoring well network, which will remain in place until PCLs are met.
- Prevent unauthorized access to soil greater than 6 inches bgs until PCLs are met.

The results of the IC survey are presented in the 2018 Annual Institutional Controls Report and summarized in Section 4.

NOTES:

1. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

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

2018 Groundwater Monitoring Locations

2018 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

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

3.0 GROUNDWATER MONITORING ANALYTICAL RESULTS AND DISCUSSION

This section presents the 2018 groundwater monitoring results for OU6. Groundwater monitoring was completed in accordance with the 2018 Postwide Work Plan (FES, 2018). Current and historical data were used to support statistical and geochemical assessments of natural attenuation of groundwater contaminated with DRO, RRO, TCP, and TCE within the OU6 source area. Complete analytical results are presented in Appendix C, Table C-2.

Figure 3-1 shows the current DRO and TCP groundwater plumes, and lists the 2018 PCL exceedances. Current and historical DRO exceedances identify a main plume delineated by four monitoring wells, and two additional plumes each identified by one well. In addition to the three DRO plumes, current and historical TCP exceedances of the PCL in two wells define the TCP plume. Historically a TCE plume has been defined by PCL exceedances in one well.

3.1 Groundwater Elevations

Groundwater elevation data were collected prior to sampling each well during the 2018 sampling events. Groundwater elevations for June and September 2018 are shown on Table 3-1. Groundwater elevations are lowest in the early spring prior to thawing of the Chena and Tanana Rivers, and are typically highest during the fall. The elevation data show that the water levels were approximately 1.25 feet higher in September 2018 than June 2018.

Groundwater elevations are too inconsistent across the site to create groundwater elevation contours. In addition, survey elevations for many wells could not be located and the survey elevation of MW-82 appears to be off by over 30 feet. Monitoring well elevations should be resurveyed.

3.2 Petroleum Hydrocarbon Plume Results

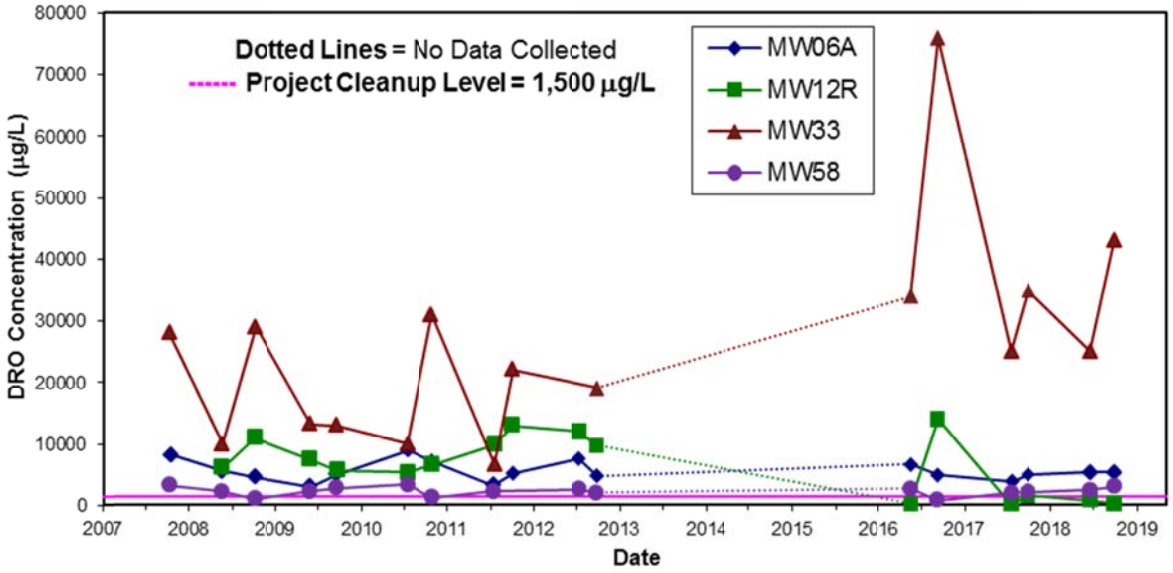
Analytical results identified a DRO plume delineated by four monitoring wells (MW06A, MW12R, MW33, and MW58), which was designated as the main DRO plume and is discussed in Section 3.2.1. DRO exceedances were also identified in two separate wells (MW62 and MW77); the plumes associated with these wells are discussed in Section 3.2.2.

3.2.1 DRO and RRO in the Main DRO Plume

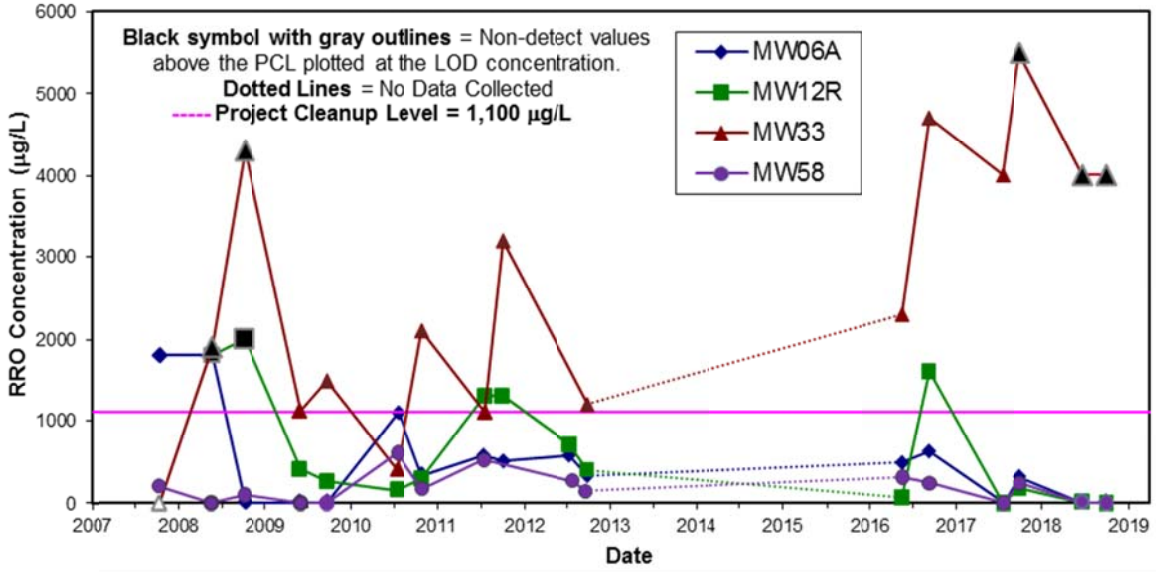
The main DRO plume, depicted in detail on Figure 3-2, originates north White Street and extends approximately 500 feet to the north-northwest in the direction of groundwater flow. Figure 3-2 also lists the current and historical DRO and RRO results for each of the four in-plume wells. Table C-2 in Appendix C presents 2018 results for DRO and RRO from spring and fall sampling of the four wells within the main DRO plume as well as the seven surrounding sentry or background wells.

DRO concentrations were greater than the PCL (1,500 micrograms per liter [µg/L]) in three of the four main DRO plume wells. DRO concentrations ranged between 290 µg/L (fall 2018 result in MW12R) and 39,000 µg/L (fall 2018 result in MW33). Wells MW12R and MW33 have had historical RRO exceedances above the PCL (1,100 µg/L), though RRO was not detected (ND) in either of these wells in 2018; however, the LOD was significantly elevated (4,000 µg/L) in MW33 resulting from the extremely high DRO concentration in this well. RRO concentrations in monitoring wells MW06A and MW58 have been either ND or below the PCL since 2007. DRO and RRO concentrations in the background well MW03 were ND. Graphs 3-1 and 3-2 show historical DRO and RRO concentrations, respectively, as a function of time for the four main DRO Plume wells.

Graph 3-1 Historical DRO Concentrations in the Main DRO Plume



Graph 3-2 Historical RRO Concentrations in the Main DRO Plume



Statistical Evaluation of DRO and RRO in the Main DRO Plume

The DRO evaluation in the main DRO plume included several elements from the MAROS software; including Mann Kendall trends of contaminant concentrations in individual wells, Mann-Kendall trends for contaminant plume stability (spatial moment analysis), the Delaunay method for sampling location optimization, and the modified CES method for sampling frequency optimization. The evaluation of RRO consisted of Mann-Kendall trends in individual wells only, since RRO has been detected above the PCL in only two wells and there was not sufficient information to conduct a plume-wide evaluation.

The Mann-Kendall trends for DRO and RRO concentrations in individual wells within the main DRO plume are presented in Table 3-2. The results are associated with wells that have had PCL exceedances of DRO and/or RRO since 2007.

Table 3-2 Mann-Kendall Trend Results for the Main DRO Plume

Well ID	Analyte	Mann-Kendall Statistic	Coefficient of Variation	Trend Confidence	Trend
MW06A	DRO	-7	0.3	59.6%	**Stable**
MW12R	DRO	-28	0.74	88.6%	Stable ***(No Trend)***
	RRO	-5	1.13	57.1%	No Trend *(Probably Decreasing)*
MW33	DRO	42	0.64	96.8%	**Increasing *(Probably Increasing)***
	RRO	46	1.03	97.9%	Increasing
MW58	DRO	0	0.35	48.2%	**Stable**

2017 results are shown in parentheses if different from 2018 result
BOLD indicates the concentration was above the PCL in 2017 and/or 2018

The Mann-Kendall trend results in Table 3-2 show an increasing trend in one source area well (MW33) and stable trends or no trend in the remaining three wells. MW33 has had the highest DRO concentrations within the main DRO plume, with concentrations consistently more than an order of magnitude higher than the PCL. This suggests that the well is located in an area with residual non-aqueous phase liquids (NAPL) in the soil that continues to be solubilized in the groundwater. There does not appear to be significant migration of DRO contamination from MW33, as the well immediately upgradient (MW12R) had a DRO concentration below the PCL in 2018 and a stable concentration trend, and the well immediately downgradient (MW06A) had

DRO concentrations above the PCL with a stable trend. The furthest downgradient well in the main DRO plume (MW58) also has persistent DRO concentrations above the PCL and a stable trend. Sentry wells downgradient of MW58 (MW35 and MW37) consistently have DRO detections below the PCL. All of these results suggest that the main DRO plume is not expanding.

Mann-Kendall trend results for RRO were determined for the two wells with exceedances of the PCL since monitoring began in 2007 (MW12R and MW33). The result in MW12R was no trend, and RRO was not detected above the PCL in 2018. The trend in MW33 was increasing. RRO was not detected above the PCL in MW33 during 2018; however, the LOD was significantly elevated due to the required dilution associated with the high DRO concentrations in this well. The results will continue to be evaluated in future monitoring events. RRO continues to be detected below the PCL in downgradient wells MW06A and MW58 which suggests the RRO plume is not migrating.

Further evaluation of the stability of the main DRO plume was conducted using the spatial moment analysis tools associated with the MAROS software. The analysis consisted of the zeroth moment (estimate of contaminant dissolved mass), first moment (estimate of the location of the center of mass relative to the source), and the second moment (estimate of plume spread in the direction of and perpendicular to groundwater flow). One of the most important input parameters for this analysis is the makeup of the monitoring network. The results can be easily biased if different wells or different numbers of wells are included in the various monitoring events associated with the analysis. Since the same network of wells was sampled between 2016 and 2018, data from this time period for the main DRO plume wells (MW06A, MW12R, MW33, and MW58) and surrounding wells (MW28, MW32R, MW35, MW37, MW64, and MW82) were used in the spatial moment analysis. A summary of the plume stability results for the main DRO plume network is presented in Table 3-3. The complete results are presented in Appendix D.

Table 3-3 Plume Stability Results for the Main DRO Plume Network

Plume Stability Parameter	Mann-Kendall Trend Result[1]
	DRO
Zeroth Moment (Dissolved Mass)	No Trend
First Moment (Distance from the Source to the Center of Mass)	Probably Increasing
Second Moment (Plume Spread)	
Parallel to Groundwater Flow	No Trend
Perpendicular to Groundwater Flow	Probably Increasing

[1] Based on monitoring results between 2016 and 2018

The plume stability results indicate there is no trend for the dissolved DRO mass since 2016. There has been wide variation in DRO concentrations over time in several wells due to fluctuations in

groundwater elevations and residual NAPL remaining in source area soils; however, this has not resulted in a significant change in overall dissolved mass within the DRO plume.

The first moment results indicate there is a probably increasing trend in the distance from the source to the center of mass since 2016. Overall variation between 2016 and 2018 was approximately 100 feet. However, the variation in 5 of the 6 calculations since 2016 was only 42 feet, and the location was centered near MW06A.

The second moment results indicate no trend in the plume spread parallel to groundwater flow, which is consistent with the trend result associated with DRO concentrations in individual wells. These results suggest there is no downgradient migration of DRO above the PCL from the source area. However, a probably increasing trend was determined for DRO perpendicular to groundwater flow. This trend is likely a result of the variation observed in DRO concentrations throughout the main DRO plume, since no exceedances of the PCL for DRO have been observed outside of the four wells that are associated with the main DRO plume. This trend will continue to be evaluated in future monitoring events.

In addition to stability of the DRO plume, potential redundancy of the monitoring network and sampling frequency were evaluated using the MAROS software. The complete analysis results are presented in Appendix D and are summarized in this paragraph. Results from the monitoring well redundancy evaluation showed that the DRO plume is primarily characterized by a moderate level of uncertainty, and suggests the DRO plume has been adequately delineated. In addition, the redundancy evaluation did not recommend removal of any wells from the monitoring network. This is supported by the qualitative observation that the wells surrounding the main DRO plume area are the most immediate downgradient wells for the main DRO plume and/or the MW62 and MW77 DRO plumes.

The sampling frequency evaluation showed that annual sampling would be sufficient to monitor DRO concentration changes over time in the main DRO plume. Previous analysis has shown that there is not a strong seasonal effect on DRO concentration in the main DRO plume area, with the exception of concentrations in MW33 (USACE, 2018b). The DRO concentrations in this well are typically highest in the fall when water levels are highest. This is likely a result of groundwater coming into contact with immobile residual NAPL that persists in the smear zone in the vicinity of this well. This NAPL is likely above the groundwater during times of lower water levels. Based on these results, annual sampling for these wells should be conducted in the fall.

The geometric regression analysis and estimation of the time to cleanup using the EPA statistics tool could not be completed for DRO or RRO in monitoring wells associated with the main DRO plume since there were no decreasing Mann-Kendall trends. This possibility will continue to be evaluated following future monitoring events.

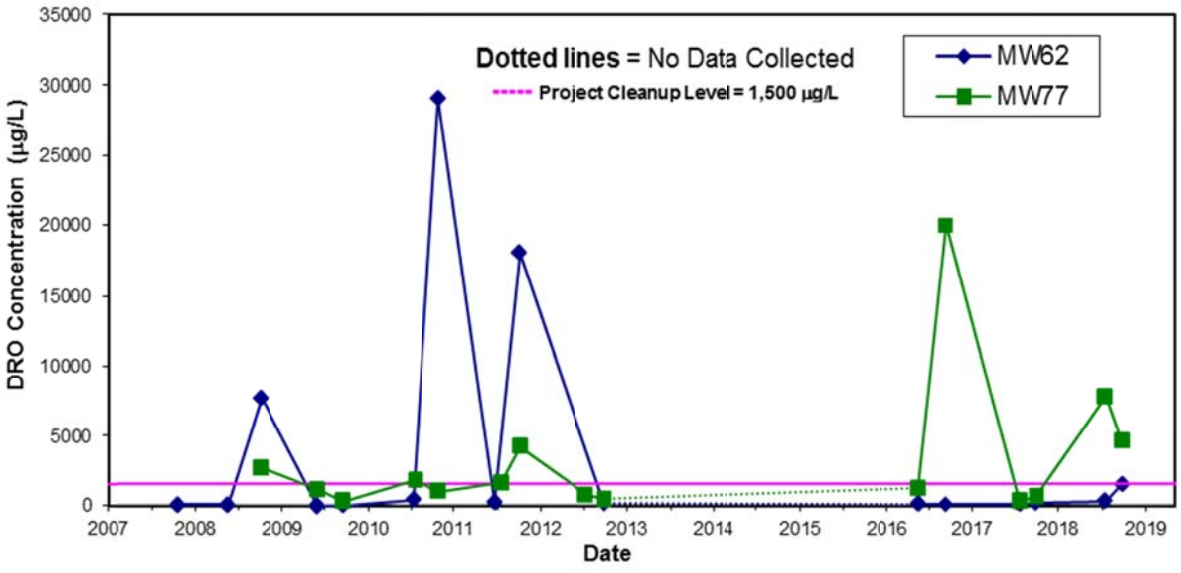
3.2.2 DRO and RRO in MW62 AND MW77 PLUMES

The MW62 and MW77 DRO plumes, depicted in detail on Figure 3-2, are located approximately 150 and 400 feet, respectively, north-northeast of the main DRO plume. These plumes each contain a single well. A crossgradient well (MW38) is located east of MW77. Figure 3-2 also lists the current and historical DRO and RRO results for MW62 and MW77. Table C-2 in Appendix C also presents the 2018 DRO and RRO results from spring and fall sampling of the two in-plume wells (MW62 and MW77) and the sentry well (MW38).

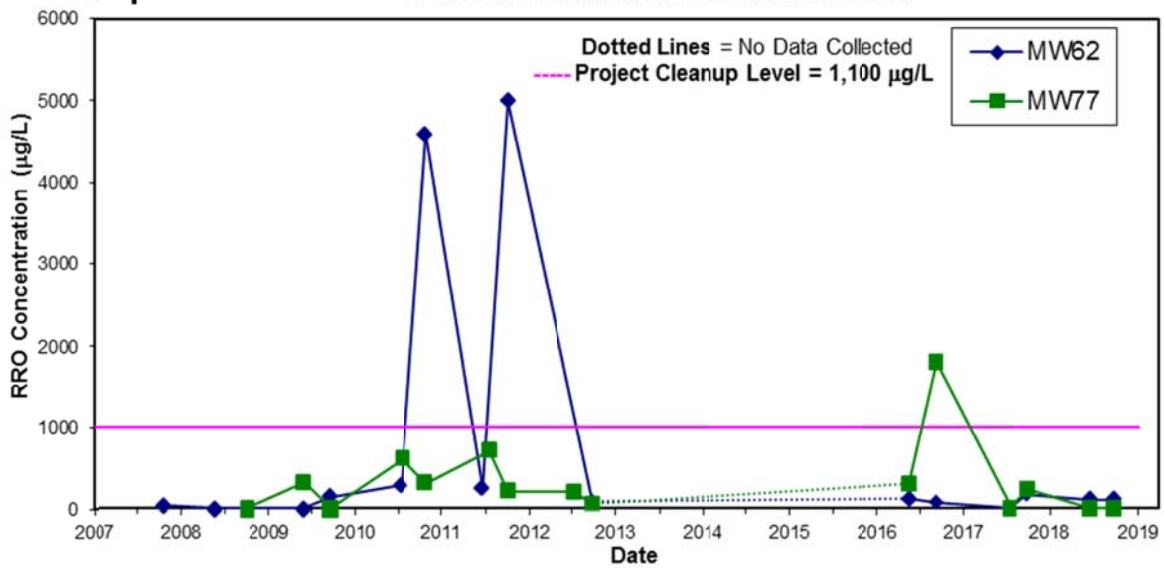
DRO exceeded the PCL during the 2018 spring and fall sampling events of MW77. DRO was detected at the PCL of 1,500 µg/L during the fall sampling event of MW62; this is the highest concentration of DRO detected in MW62 since fall 2011. DRO was below the PCL in MW77 during the spring and fall 2017 sampling events, and the spring 2018 event. RRO was not detected in either MW62 or MW77 during 2018. Sentry well MW38 has never exceeded the PCL for any analyte since sampling began in 2007.

Graphs 3-3 and 3-4 present historical data collected at monitoring wells MW62 and MW77 for DRO and RRO, respectively. The data are dominated by strong seasonal fluctuations in some years. In MW62, DRO exhibited strong seasonal fluctuations in 2010 and 2011, with spring results below the PCL and fall results at or greater than the PCL. In contrast, 2016 and 2017 results from MW62 are far less than the PCLs in both spring and fall. In MW77, a strong seasonal fluctuation was only observed in 2016.

Graph 3-3 Historical DRO Concentrations at MW62 and MW77



Graph 3-4 Historical RRO Concentrations at MW62 and MW77



Statistical Evaluation of DRO and RRO in MW62 and MW77 Plumes

DRO and RRO in the MW62 and MW77 plumes were evaluated using Mann-Kendall concentration trends determined with the MAROS software. The trend results are presented in Table 3-4.

Table 3-4 Mann-Kendall Trend Results for DRO and RRO in MW62 and MW77

Well ID	Analyte	Mann-Kendall Statistic	Coefficient of Variation	Trend Confidence	Trend
MW62	DRO	19	2.28	78.8%	**No Trend**
	RRO	11	2.25	67.1%	No Trend
MW77	DRO	9	1.58	65.1%	**No Trend**
	RRO	-17	1.26	78.2%	No Trend

BOLD indicates the concentration was at or above the PCL in 2018

The 2018 Mann-Kendall results in MW62 and MW77 showed no trend for DRO and RRO concentrations. This was consistent with the 2017 trend results, although DRO was identified above the PCL in MW77 during both 2018 monitoring events and was below the PCL in 2017. RRO was not detected above the PCL in MW77 in 2017 or 2018. DRO and RRO have historically had large fluctuations in concentration in this well, indicating residual NAPL may remain in the soil in the vicinity of this well (similar to MW33). The DRO concentrations in downgradient well MW82 and crossgradient well MW38 have remained below the PCL, indicating DRO concentrations above the PCL are not expanding from this area.

In MW62, DRO and RRO have been detected at or below the PCL in seven consecutive sampling events. Although the DRO and RRO concentrations have shown wide variation in the past, sampling results since 2012 have been generally consistent which indicates the residual NAPL in the surrounding soil may be depleted. DRO and RRO concentrations in downgradient well MW64 have also remained below the PCL, indicating natural attenuation may have reduced groundwater contamination to below the PCL upgradient of this well.

The geometric regression analysis and estimation of the time to cleanup using the EPA statistics tool could not be completed for DRO or RRO in monitoring wells associated with the MW62 and MW77 DRO plumes since there were no decreasing Mann-Kendall trends. This possibility will continue to be evaluated following future monitoring events.

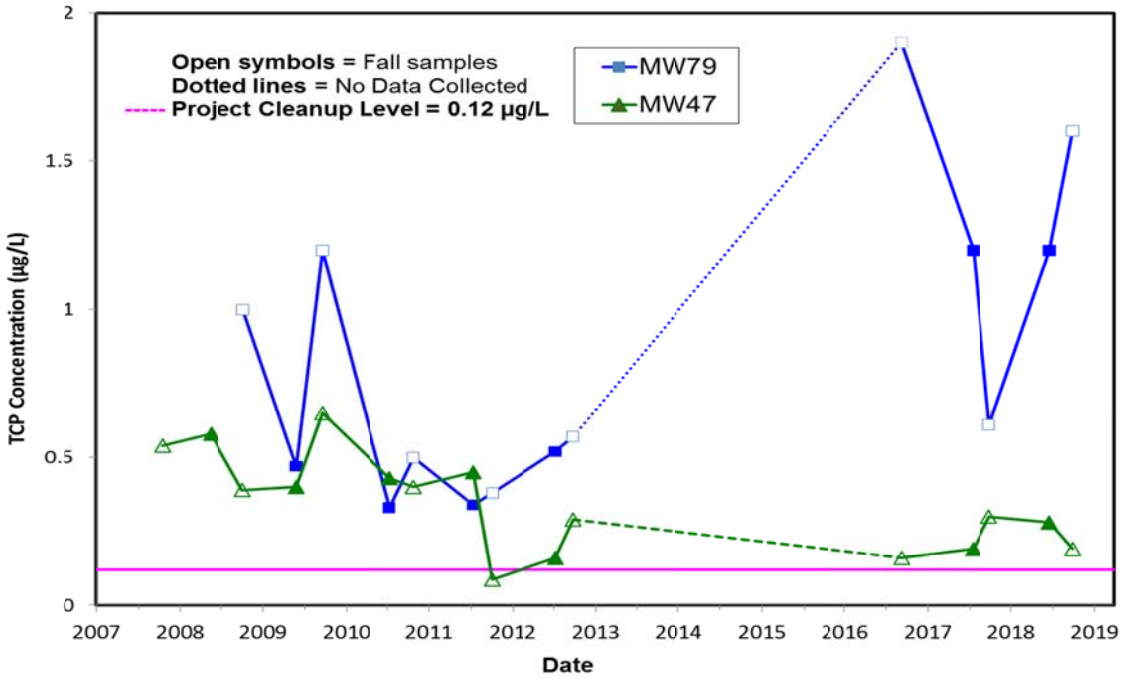
3.3 TCP Plume Results

The TCP plume (Figure 3-3) is characterized by PCL exceedances in MW47 and MW79 in the northeast corner of the OU6 FCS, and likely resulted from historical salvage and waste operations at the FCS between 1942 and 1962 (USACE, 2010). During both sampling events in 2018, TCP concentrations exceeded the PCL (0.12 μg/L) in monitoring wells MW47 and MW79. Consistent with recent historical results, there was not much variation between spring and fall sampling events in 2018; concentrations in MW47 were 0.28 μg/L (spring) and 0.19 μg/L (fall), and concentrations in MW79 were 1.2 μg/L (spring) and 1.6 μg/L (fall). The 2018 sampling results for in-plume, upgradient, and downgradient sentry wells around the TCP plume are presented in Appendix C, Table C-2.

TCP was not detected above the LOD in any of the TCP plume sentry wells (MW39, MW78, MW91, and MW93) during the 2018 spring sampling event. Although TCP was detected (at estimated concentrations below the LOQ) in two wells (MW39 and MW78) during the 2018 fall sampling event, the observed concentrations were less than the concentrations seen in 2017. MW39 and MW78 are located downgradient, but slightly crossgradient, of the TCP plume area.

TCP concentrations at background monitoring wells MW08 and MW13 have not exceeded the PCL since 2012 and 2008, respectively; however, some of the ND results from these locations had LODs greater than the PCL (Figure 3-3). TCP was detected in MW08 in the fall 2018 sample at a concentration approximately half of the PCL. TCP concentrations have exceeded the PCL in every sampling event since 2008 in MW79 and all but one sampling event since 2007 in MW47, as shown on Graph 3-5.

Graph 3-5 Historical TCP Concentrations in MW47 and MW79



Statistical Evaluation of the TCP Plume

The TCP plume was evaluated using Mann-Kendall concentration trends from the MAROS software, and geometric regression for wells with a decreasing trend. The Mann-Kendall trends for TCP concentration in each of the wells is presented in Table 3-5.

Table 3-5 Mann-Kendall Trend Results for the TCP Plume, MW47 and MW79

Well ID	Analyte	Mann-Kendall Statistic	Coefficient of Variation	Trend Confidence	Trend
MW47	TCP	-45	0.60	98.6%	**Decreasing**
MW79	TCP	33	0.66	96.0%	**Increasing (No Trend)**

2017 results are shown in parentheses if different from 2018 result
BOLD indicates the concentration was above the PCL in 2018 (or 2017)

The trend results show the TCP concentration is decreasing in downgradient well MW47, and increasing in upgradient well MW79. Concentrations were above the PCL in both wells during 2018, and have been consistently detected above the PCL since analysis began in 2007. However, TCP has remained below the PCL outside of the TCP plume; including upgradient wells, and wells that are in the downgradient, but slightly crossgradient direction, suggesting minimal plume spread from the source area.

The TCP concentrations in MW47 were further evaluated using the EPA Groundwater Statistics tool since the concentrations exhibited a decreasing trend. MW79 was not evaluated since the well does not have a decreasing TCP trend. The TCP concentration in MW08 was also evaluated, since this upgradient well has had several PCL exceedances since 2007 (most recently in July 2012) and has a declining trend. The results of the analysis are summarized in Table 3-6, and the complete results are presented in Appendix D.

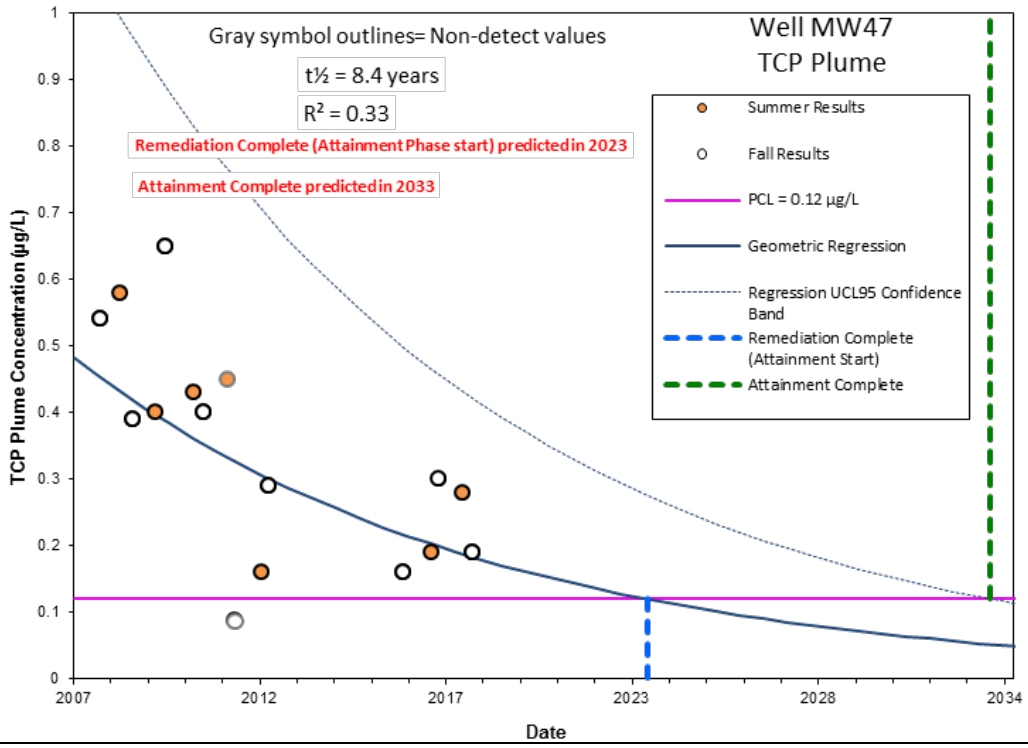
Table 3-6. Statistical Evaluation of TCP in MW47and MW08

Well ID	Trend Result	Number of Data Points	95% UCL	Has PCL been Achieved?	Year Expected to Achieve PCL based on 95% UCL? ("Attainment Complete")
MW47	Decreasing	15	0.533	No	2033
MW08	Decreasing	13	0.13	No	2019

The analysis is based on the EPA Groundwater Statistics Tool, available from https://www.epa.gov/superfund/superfund-groundwater-groundwater-response-completion
UCL – Upper Confidence Limit

The geometric regression plot for MW47 (Graph 3-6) shows that TCP exhibits a decreasing trend and that TCP concentrations are expected to achieve the PCL in 2023 (identified in the graph as "Remediation Complete", also defined by EPA as "Attainment Start"). The geometric regression plot for MW47 based on the 95% UCL indicates that statistical attainment (defined by EPA as "Attainment Complete") of the PCL could be achieved by 2033 if the present trend continues. A decreasing trend is also observed in MW08, and the concentration is expected to achieve the PCL based on the 95% UCL in 2019.

Graph 3-6. Geometric Regression of TCP Concentrations at MW47



The high TCP concentrations observed during fall sampling events at monitoring well MW79 suggest that the well may be located within or nearby an area containing TCP-contaminated soil. Natural attenuation processes are expected to reduce concentrations in downgradient monitoring well MW47 with attainment complete expected in 2033. In contrast, exceedances will likely continue at monitoring well MW79 until the suspected TCP soil source is depleted.

The current ADEC cleanup level for TCP in groundwater is 0.0075 µg/L (ADEC, 2018), and further evaluation of the TCP concentrations in groundwater relative to the ADEC cleanup level is expected after attainment of the PCL is achieved.

3.4 TCE Plume Results

Two monitoring wells (MW61 and MW80) are sampled to evaluate the TCE contamination identified at the OU6 FCS. The 2018 sampling results for TCE are presented in Figure 3-4 and in Appendix C, Table C-2. Regular groundwater monitoring of TCE began in 2007, but the number of monitoring wells required to assess the status of the TCE plume was reduced to two in the 2015 RD/RA Work Plan (USACE, 2015).

TCE concentrations have declined steadily since 2007 in MW61 and the last exceedance of the ROD-defined PCL (5 µg/L) was in October 2010. TCE concentrations at MW80, located approximately 50 feet upgradient of MW61, have been ND or less than the PCL at all sampling events since the well was installed in 2008.

Statistical Evaluation of TCE

TCE concentration trends were evaluated using the Mann-Kendall test from the MAROS software, and the cleanup complete evaluation was completed using geometric regression and the EPA Statistics Tool.

The Mann-Kendall trend analysis for MW61 is summarized in Table 3-7. A trend for MW80 was not determined since TCE has not been detected in this well since 2010.

Table 3-7 Mann-Kendall Trend Results for the TCE Plume, MW61

Well ID	Analyte	Mann-Kendall Statistic	Coefficient of Variation	Trend Confidence	Trend
MW61	TCE	-101	0.92	100.0%	Decreasing

The Mann-Kendall trend results in Table 3-7 show TCE concentrations are decreasing with 100 percent confidence. Based on this result, the TCE concentrations were further evaluated using the EPA Groundwater Statistics tool, and the results are summarized in Table 3-8.

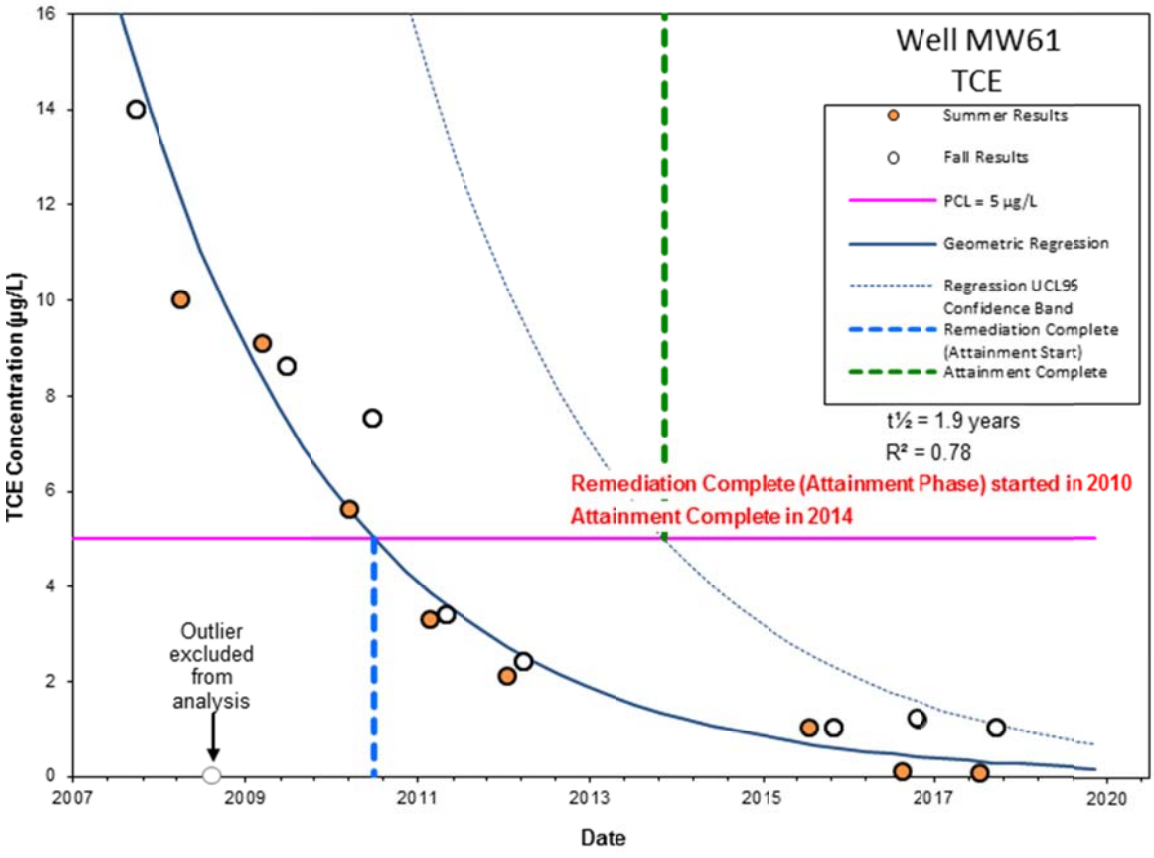
Table 3-8. Cleanup Complete Evaluation for TCE in MW61

Well ID	Trend Result	Number of Data Points[1]	95% UCL	95% UCL Value[2]	Achieve PCL?
MW61	Decreasing	10	3.1	1.1	**Yes**

The analysis is based on the EPA Groundwater Statistics Tool, available from https://www.epa.gov/superfund/superfund-groundwater-groundwater-response-completion
Gray highlight indicates the PCL has been achieved and will continue to achieve at a 95% confidence limit
[1] Number of data points represents the attainment phase
[2] Represents the value of the 95% UCL value at the final sampling event

The Cleanup Complete evaluation was completed using results from the attainment phase, or when TCE concentrations decreased below the PCL for the first time in 2011. The results show the 95% UCL is less than the PCL, and concentrations continue to decrease. The time-series results from MW61 are reasonably described by a first-order decay regression curve with a half-life of 2.5 years (Graph 3-7). The 95% UCL of the regression curve suggests that remedial goals were met in 2014 at MW61. This indicates that the TCE PCL has been achieved in accordance with EPA requirements (EPA, 2014a). However, the current ADEC cleanup level for TCE in groundwater is 2.8 µg/L (ADEC, 2018), and further evaluation of the TCE concentrations in groundwater relative to the ADEC cleanup level is recommended.

Graph 3-7 Geometric Regression of TCE Concentrations at MW61



3.5 Natural Attenuation Evaluation

Groundwater geochemistry was evaluated to assess the potential for biodegradation of groundwater contaminants. Fuel contaminants such as DRO are more rapidly degraded under aerobic conditions while chlorinated contaminants like TCP and TCE are more effectively degraded under reduced conditions. Groundwater at Fort Wainwright is generally only slightly aerobic with background DO concentrations typically around 2 milligrams per liter (mg/L).

The evaluation included analysis of field and laboratory data. Field parameters, most importantly DO and ORP, are presented on groundwater sampling forms and Table A-1 included in Appendix A. Laboratory analysis included dissolved iron, dissolved manganese, sulfate, alkalinity (as CaCO3), methane, ammonia as nitrogen, nitrate-nitrite as nitrogen, potassium, and total phosphorus.

3.5.1 Geochemical Conditions within the DRO Plumes

Geochemical data associated with the DRO plumes is presented in Table 3-9. For comparison purposes, data associated with background well MW13 is included. Background well MW3 is not included since the data (negative ORP and elevated dissolved iron) suggests that the well does not represent background conditions. The following summarizes interpretations of the 2018 geochemical data.

- DO concentrations were relatively low (between 0.10 and 1.63 mg/L) in all of the DRO plume wells. However the background well MW13 also had low DO concentrations; although the June 2018 sampling event had the highest DO concentration at 2.32 mg/L. As a result of the low DO concentrations, aerobic biodegradation is limited.
- ORP values measured in all main DRO plume wells were negative, ranging from -60.4 to -153.2 mV. Surrounding ORP values ranged from -58.5 to 126.1 mV. ORP values in MW62 and MW77 were slightly positive, between 14.5 and 47.6 mV while the ORP in background well MW13 was 31.60 (spring) and 57.2 (fall) mV. The negative ORP values within the Main DRO plume are consistent with the conversion of oxygen and other electron acceptors to their reduced forms during biodegradation.
- Ferrous iron (identified by the dissolved iron analysis) is a soluble redox indicator produced under reducing conditions. Background dissolved iron concentrations at Fort Wainwright are typically around 1 mg/L as indicated by MW13. Dissolved iron in main DRO plume wells ranged between 9.32 and 45.9 mg/L. The highest dissolved iron concentrations were measured in MW33, corresponding to the highest DRO concentration. Elevated ferrous iron concentrations indicate iron reduction likely due to biodegradation of fuel constituents (Wiedemeier et al., 1999).
- Manganese, a soluble redox indicator produced under reducing conditions, ranged between 0.667 and 3.58 mg/L in the DRO plume wells, while the manganese concentration in background well MW13 was 0.323 and 0.0851 mg/L in the June and September sampling

events, respectively. The highest manganese concentrations were detected in MW33, also the location of the highest DRO concentrations. Elevated manganese concentrations indicate manganese reduction has occurred likely due to biodegradation of DRO and RRO, although to a lesser extent than iron reduction (Wiedemeier et al., 1999).

- Sulfate, an electron acceptor utilized under strongly reducing conditions, ranged in concentration between 4.0 and 64.3 mg/L in DRO plume wells, and compared to 39.8 and 57.0 mg/L in background well MW13. The lowest sulfate concentrations of 4.0 (spring) and 6.8 (fall) mg/L were detected in MW33. Low in-plume sulfate concentrations likely reflect its conversion to sulfide during anaerobic biodegradation after consumption of the other electron acceptors (Wiedemeier et al., 1999).
- Methane, produced under strongly reducing conditions, ranged in concentration from 0.0046 to 0.44 mg/L in DRO plume wells compared to 0.032 and 0.0086 mg/L in background well MW13. Thawing permafrost and/or peaty soils could also contribute to concentrations of methane. The relatively low methane concentrations indicate limited methanogenesis is occurring at the site.
- Ammonia, a nutrient and electron donor, expressed as nitrogen, was low in all wells during both sampling events and ranged from ND to 0.45 mg/L. Although nitrogen availability may be limited, it's not believed to be a limiting factor for in-plume bacterial activity.
- Nitrate/nitrite, a nutrient and electron acceptor expressed as nitrogen, ranged from ND to 0.5 mg/L in main DRO plume wells. Nitrate/nitrite concentrations are generally very low across the FCS, however there are isolated areas (including MW77) with elevated nitrate/nitrite. Past annual monitoring reports have theorized that since these wells are located in comparatively lush grass, the elevated nitrate/nitrite there may reflect over-application of fertilizer (Jacobs, 2018). With the exception of MW77, areas with elevated nitrate/nitrite concentrations are outside of areas of DRO contamination. As indicated by the ammonia analysis, nitrogen availability may be a limiting factor for in-plume bacterial activity.
- High alkalinity concentrations can be an indicator of aerobic biodegradation. However, although alkalinity concentrations vary across the site, there does not appear to be a link to areas of DRO contamination. This is an indicator that aerobic biodegradation is not occurring at a rapid rate, in part due to the low DO concentrations (EPA, 1998).
- Potassium and phosphorus are both nutrients that can support biodegradation. Sampling data indicate that sufficient potassium is available to support bacterial activity. Although the phosphorus concentrations are much lower, it should not be a limiting factor for biodegradation of the DRO contamination.

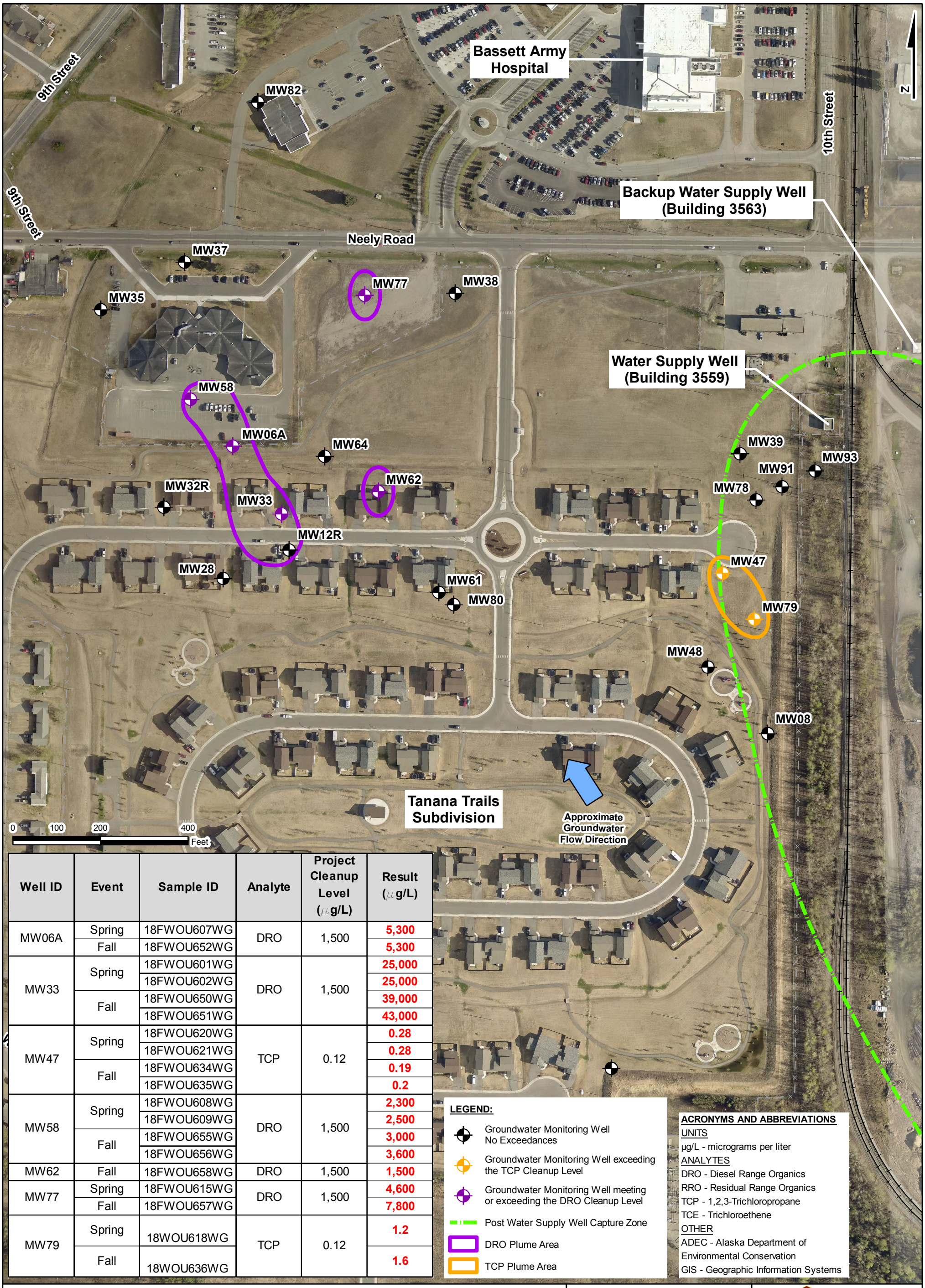
The geochemical data indicate that groundwater near MW33 has the strongest reducing conditions, consistent with having the highest DRO concentrations.

3.5.2 Geochemical Conditions in the TCP Plume

Geochemical data for wells located within the TCP Plume (MW47 and MW79) is similar to background well MW13, with the exception that dissolved iron is slightly elevated in MW79. TCP is a persistent groundwater pollutant that has low abiotic and biotic degradation rates (EPA, 2014b). No microbes capable of using TCP as a carbon source for growth under aerobic conditions have been isolated, but TCP may serve as an electron acceptor under anaerobic conditions (Yan, 2009). Data are limited, so it is unclear if any biological processes are contributing to the attenuation of the TCP plume. Physical processes that might lead to observed decreases in TCP concentration include advection, dispersion, and dilution.

3.5.3 Geochemical Conditions in the TCE Plume

Elevated dissolved iron and dissolved manganese in the two TCE Plume wells (MW61 and MW80) indicate that groundwater in this area is reduced, creating a favorable environmental for reductive dechlorination of TCE. The presence of daughter products cis-DCE and trans-DCE in MW61 demonstrate that reductive dechlorination is occurring. All daughter products have concentrations below ADEC CULs. As a result, TCE has attenuated to less than the PCL.



Well ID	Event	Sample ID	Analyte	Project Cleanup Level (µg/L)	Result (µg/L)
MW06A	Spring	18FWOU607WG	DRO	1,500	5,300
	Fall	18FWOU652WG			5,300
MW33	Spring	18FWOU601WG	DRO	1,500	25,000
		18FWOU602WG			25,000
	Fall	18FWOU650WG			39,000
		18FWOU651WG			43,000
MW47	Spring	18FWOU620WG	TCP	0.12	0.28
		18FWOU621WG			0.28
	Fall	18FWOU634WG			0.19
		18FWOU635WG			0.2
MW58	Spring	18FWOU608WG	DRO	1,500	2,300
		18FWOU609WG			2,500
	Fall	18FWOU655WG			3,000
		18FWOU656WG			3,600
MW62	Fall	18FWOU658WG	DRO	1,500	1,500
MW77	Spring	18FWOU615WG	DRO	1,500	4,600
	Fall	18FWOU657WG			7,800
MW79	Spring	18WOU618WG	TCP	0.12	1.2
	Fall	18WOU636WG			1.6

LEGEND:

- Groundwater Monitoring Well No Exceedances
- Groundwater Monitoring Well exceeding the TCP Cleanup Level
- Groundwater Monitoring Well meeting or exceeding the DRO Cleanup Level
- Post Water Supply Well Capture Zone
- DRO Plume Area
- TCP Plume Area

ACRONYMS AND ABBREVIATIONS

UNITS
µg/L - micrograms per liter
ANALYTES
DRO - Diesel Range Organics
RRO - Residual Range Organics
TCP - 1,2,3-Trichloropropane
TCE - Trichloroethene
OTHER
ADEC - Alaska Department of Environmental Conservation
GIS - Geographic Information Systems

NOTES:

1. Results shown in red meet or exceed the project cleanup level.
2. All groundwater sample results are in µg/L.
3. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
4. Only results for sample locations that had at least one ADEC cleanup level exceedance are shown.
5. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

IMAGERY 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

2018 Groundwater Monitoring Well Exceedances and Plume Boundaries
2018 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005 | Figure: 3-1 | Date: 2/19

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW58 Screen Interval (Ft bgs) 9.0-19.01	OCT 2007	07FWBMW58-GW(F)	3,200	200
	MAY 2008	08FWTMW58-GW(S)	2,200	ND (94)
	OCT 2008	08FWTMW58-GWF	1,000	100
	JUN 2009	09FWTMW58-GW(S)	2,250	ND (150)
	SEP 2009	09FWTMW58-GWF	2,830	ND (144)
	JUL 2010	10FWAMW58-GWS	3,300	610
	OCT 2010	10FWAMW58-GWF	1,200	170
	JUL 2011	11FWAMW58-GWS	2,200	520
	JUL 2012	12FWAMW58-GWS	2,600	270
	SEP 2012	12FWAMW58-GWF	2,000	140
	MAY 2016	16FWAMW58X-GWS	2,700	310
	SEP 2016	16FWAMW58Z-GWF	800	240
	JUL 2017	17FWAMW58Y-GWS	2,000	ND (220)
	SEP 2017	17FWAMW58Y-GWF	2,100	240
	JUN 2018	18FWOU608WG	2,500	ND (400)
	SEP 2018	18FWOU655WG	3,600	ND (200)

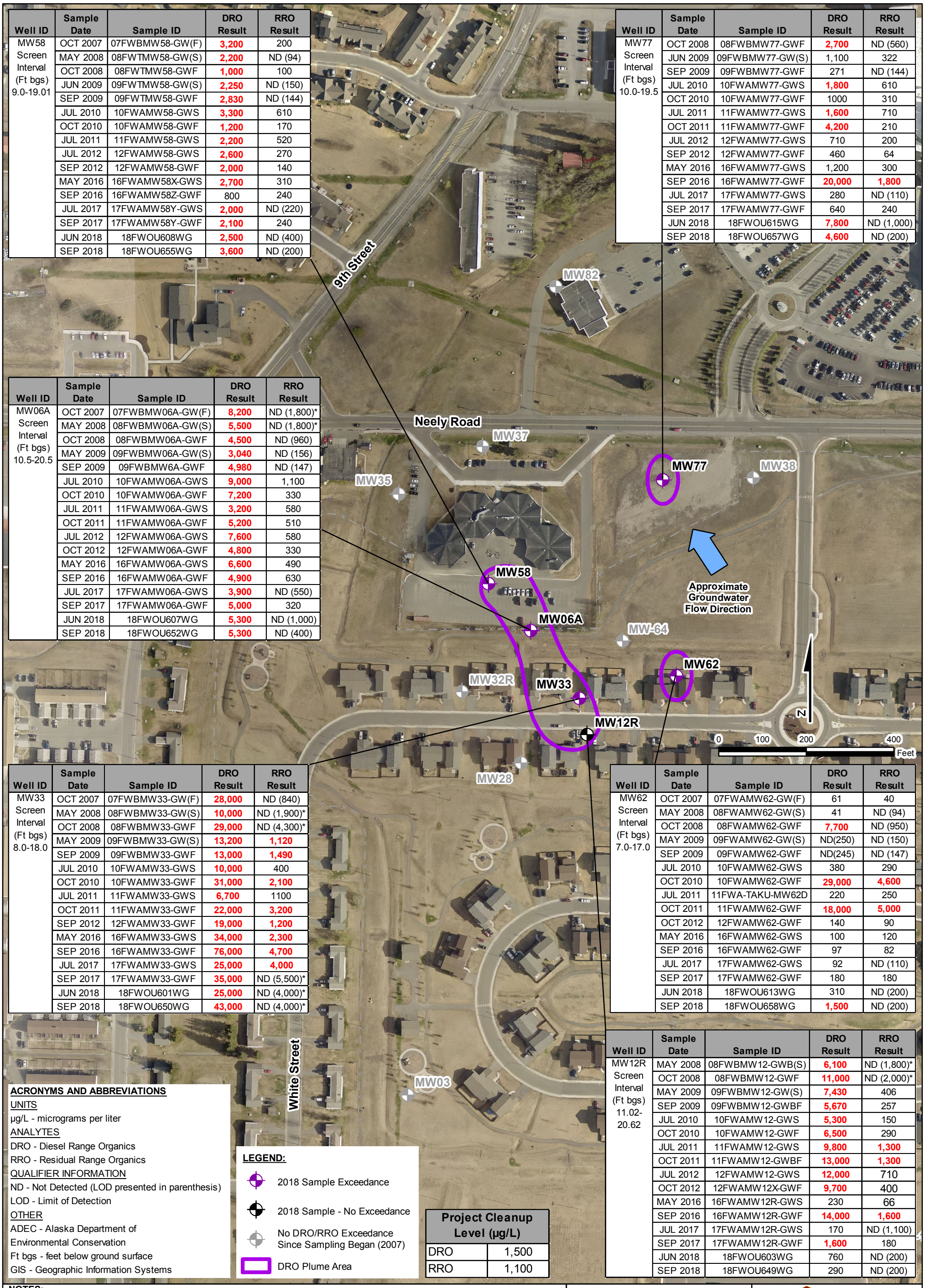
Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW77 Screen Interval (Ft bgs) 10.0-19.5	OCT 2008	08FWBMW77-GWF	2,700	ND (560)
	JUN 2009	09FWBMW77-GW(S)	1,100	322
	SEP 2009	09FWBMW77-GWF	271	ND (144)
	JUL 2010	10FWAMW77-GWS	1,800	610
	OCT 2010	10FWAMW77-GWF	1000	310
	JUL 2011	11FWAMW77-GWS	1,600	710
	OCT 2011	11FWAMW77-GWF	4,200	210
	JUL 2012	12FWAMW77-GWS	710	200
	SEP 2012	12FWAMW77-GWF	460	64
	MAY 2016	16FWAMW77-GWS	1,200	300
	SEP 2016	16FWAMW77-GWF	20,000	1,800
	JUL 2017	17FWAMW77-GWS	280	ND (110)
	SEP 2017	17FWAMW77-GWF	640	240
	JUN 2018	18FWOU615WG	7,800	ND (1,000)
	SEP 2018	18FWOU657WG	4,600	ND (200)

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW06A Screen Interval (Ft bgs) 10.5-20.5	OCT 2007	07FWBMW06A-GW(F)	8,200	ND (1,800)*
	MAY 2008	08FWBMW06A-GW(S)	5,500	ND (1,800)*
	OCT 2008	08FWBMW06A-GWF	4,500	ND (960)
	MAY 2009	09FWBMW06A-GW(S)	3,040	ND (156)
	SEP 2009	09FWBMW06A-GWF	4,980	ND (147)
	JUL 2010	10FWAMW06A-GWS	9,000	1,100
	OCT 2010	10FWAMW06A-GWF	7,200	330
	JUL 2011	11FWAMW06A-GWS	3,200	580
	OCT 2011	11FWAMW06A-GWF	5,200	510
	JUL 2012	12FWAMW06A-GWS	7,600	580
	OCT 2012	12FWAMW06A-GWF	4,800	330
	MAY 2016	16FWAMW06A-GWS	6,600	490
	SEP 2016	16FWAMW06A-GWF	4,900	630
	JUL 2017	17FWAMW06A-GWS	3,900	ND (550)
	SEP 2017	17FWAMW06A-GWF	5,000	320
	JUN 2018	18FWOU607WG	5,300	ND (1,000)
	SEP 2018	18FWOU652WG	5,300	ND (400)

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW33 Screen Interval (Ft bgs) 8.0-18.0	OCT 2007	07FWBMW33-GW(F)	28,000	ND (840)
	MAY 2008	08FWBMW33-GW(S)	10,000	ND (1,900)*
	OCT 2008	08FWBMW33-GWF	29,000	ND (4,300)*
	MAY 2009	09FWBMW33-GW(S)	13,200	1,120
	SEP 2009	09FWBMW33-GWF	13,000	1,490
	JUL 2010	10FWAMW33-GWS	10,000	400
	OCT 2010	10FWAMW33-GWF	31,000	2,100
	JUL 2011	11FWAMW33-GWS	6,700	1100
	OCT 2011	11FWAMW33-GWF	22,000	3,200
	SEP 2012	12FWAMW33-GWF	19,000	1,200
	MAY 2016	16FWAMW33-GWS	34,000	2,300
	SEP 2016	16FWAMW33-GWF	76,000	4,700
	JUL 2017	17FWAMW33-GWS	25,000	4,000
	SEP 2017	17FWAMW33-GWF	35,000	ND (5,500)*
	JUN 2018	18FWOU601WG	25,000	ND (4,000)*
	SEP 2018	18FWOU650WG	43,000	ND (4,000)*

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW62 Screen Interval (Ft bgs) 7.0-17.0	OCT 2007	07FWAMW62-GW(F)	61	40
	MAY 2008	08FWAMW62-GW(S)	41	ND (94)
	OCT 2008	08FWAMW62-GWF	7,700	ND (950)
	MAY 2009	09FWAMW62-GW(S)	ND(250)	ND (150)
	SEP 2009	09FWAMW62-GWF	ND(245)	ND (147)
	JUL 2010	10FWAMW62-GWS	380	290
	OCT 2010	10FWAMW62-GWF	29,000	4,600
	JUL 2011	11FWA-TAKU-MW62D	220	250
	OCT 2011	11FWAMW62-GWF	18,000	5,000
	OCT 2012	12FWAMW62-GWF	140	90
	MAY 2016	16FWAMW62-GWS	100	120
	SEP 2016	16FWAMW62-GWF	97	82
	JUL 2017	17FWAMW62-GWS	92	ND (110)
	SEP 2017	17FWAMW62-GWF	180	180
	JUN 2018	18FWOU613WG	310	ND (200)
	SEP 2018	18FWOU658WG	1,500	ND (200)

Well ID	Sample Date	Sample ID	DRO Result	RRO Result
MW12R Screen Interval (Ft bgs) 11.02-20.62	MAY 2008	08FWBMW12-GWB(S)	6,100	ND (1,800)*
	OCT 2008	08FWBMW12-GWF	11,000	ND (2,000)*
	MAY 2009	09FWBMW12-GW(S)	7,430	406
	SEP 2009	09FWBMW12-GWBF	5,670	257
	JUL 2010	10FWAMW12-GWS	5,300	150
	OCT 2010	10FWAMW12-GWF	6,500	290
	JUL 2011	11FWAMW12-GWS	9,800	1,300
	OCT 2011	11FWAMW12-GWBF	13,000	1,300
	JUL 2012	12FWAMW12-GWS	12,000	710
	OCT 2012	12FWAMW12X-GWF	9,700	400
	MAY 2016	16FWAMW12R-GWS	230	66
	SEP 2016	16FWAMW12R-GWF	14,000	1,600
	JUL 2017	17FWAMW12R-GWS	170	ND (1,100)
	SEP 2017	17FWAMW12R-GWF	1,600	180
	JUN 2018	18FWOU603WG	760	ND (200)
	SEP 2018	18FWOU649WG	290	ND (200)



ACRONYMS AND ABBREVIATIONS

UNITS

µg/L - micrograms per liter

ANALYTES

DRO - Diesel Range Organics

RRO - Residual Range Organics

QUALIFIER INFORMATION

ND - Not Detected (LOD presented in parenthesis)

LOD - Limit of Detection

OTHER

ADEC - Alaska Department of Environmental Conservation

Ft bgs - feet below ground surface

GIS - Geographic Information Systems

LEGEND:

- 2018 Sample Exceedance
- 2018 Sample - No Exceedance
- No DRO/RRO Exceedance Since Sampling Began (2007)
- DRO Plume Area

Project Cleanup Level (µg/L)	
DRO	1,500
RRO	1,100

NOTES:

1. Results shown in red meet or exceed the project cleanup level.
2. * The ND result indicates that LOD is higher than the project cleanup level.
3. All groundwater sample results are in µg/L.
4. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
5. Only results for sample locations that had at least one ADEC cleanup level exceedance are shown.
6. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

IMAGERY 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

DRO and RRO Results of Petroleum Hydrocarbon Plumes

2018 Monitoring Report

Operable Unit 6

U.S. Army Garrison Alaska

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

Well ID	Sample Date	Sample ID	TCP Result
MW79 Screen Interval (Ft bgs) 10.0-19.5	OCT 2008	08FWAMW79-GWF	1
	MAY 2009	09FWAMW79-GW(S)	0.47
	SEP 2009	09FWAMW79-GWF	1.2
	JUL 2010	10FWAMW79-GWS	0.33
	OCT 2010	10FWAMW79-GWF	0.5
	JUL 2011	11FWAMW79-GWS	0.34
	OCT 2011	11FWAMW79-GWF	0.38
	JUN 2012	12FWAMW79-GWS	0.52
	SEP 2012	12FWAMW79-GWF	0.57
	SEP 2016	16FWAMW79Z-GWF	1.9
	JUL 2017	127FWAMW79-GWS	1.2
	SEP 2017	17FWAMW79Z-GWF	0.61
	JUN 2018	18FWOU618WG	1.2
	SEP 2018	18FWOU636WG	1.6

Well ID	Sample Date	Sample ID	TCP Result
MW47 Screen Interval (Ft bgs) 7.0-17.0	OCT 2007	07FWAMW47-GW(F)	0.54
	MAY 2008	08FWAMW47-GW(S)	0.59
	OCT 2008	08FWAMW47-GWF	0.5
	MAY 2009	09FWAMW47-GW(S)	0.51
	SEP 2009	09FWAMW47-GWF	0.65
	JUL 2010	10FWAMW47-GWS	0.43
	OCT 2010	10FWAMW47-GWF	0.4
	JUL 2011	11FWAMW47-GWS	ND (0.45)*
	OCT 2011	11FWAMW47-GWF	0.087
	JUN 2012	12FWAMW47X-GWS	0.59
	SEP 2012	12FWAMW47-GWF	0.29
	SEP 2016	16FWAMW47-GWF	0.16
	JUL 2017	17FWAMW47-GWS	0.19
	SEP 2017	17FWAMW47-GWF	0.3
	JUN 2018	18FWOU620WG	0.28
	SEP 2018	18FWOU634WG	0.2

Well ID	Sample Date	Sample ID	TCP Result
MW32R Screen Interval (Ft bgs) 11.72-21.32	OCT 2007	07FWCMW32-GW(F)	ND (0.3)*
	MAY 2008	08FWCMW32-GW(S)	0.12
	OCT 2008	08FWCMW32-GWF	ND (0.014)
	MAY 2009	09FWCMW32-GW(S)	ND (0.014)
	SEP 2009	09FWBMW32-GWF	ND (0.014)
	JUL 2010	10FWAMW32-GWS	ND (0.3)*
	OCT 2010	10FWAMW32-GWF	ND (0.45)*
	JUL 2011	11FWAMW32-GWS	ND (0.1)*
	OCT 2011	11FWAMW32-GWF	ND (0.45)*
	SEP 2012	12FWAMW32-GWF	ND (0.5)*
	SEP 2016	16FWAMW32R-GWF	ND (0.04)
	JUL 2017	17FWAMW32R-GWS	ND (0.0025)
	SEP 2017	17FWAMW32R-GWF	ND (0.0025)
	JUN 2018	18FWOU620WG	ND (0.005)
	SEP 2018	18FWOU634WG	ND (0.005)

Well ID	Sample Date	Sample ID	TCP Result
MW48 Screen Interval (Ft bgs) 7.0-17.0	MAY 2009	09FWAMW48-GWS	ND (1)*
	SEP 2009	09FWAMW48-GWF	ND (1)*
	JUL 2010	10FWAMW48-GWS	ND (1)*
	OCT 2010	10FWAMW48-GWF	ND (1)*
	JUL 2011	11FWAMW48-GWS	ND (0.2)*
	OCT 2011	11FWAMW48-GWF	ND (0.2)*
	JUL 2012	12FWAMW48-GWS	ND (0.2)*
	SEP 2012	12FWAMW48-GWF	ND (0.2)*
	SEP 2016	16FWAMW48-GWF	ND (0.04)
	JUL 2017	17FWAMW48-GWS	ND (0.0025)
	SEP 2017	17FWAMW48-GWF	ND (0.0025)
	JUN 2018	18FWOU620WG	ND (0.005)
	SEP 2018	18FWOU634WG	ND (0.005)

Well ID	Sample Date	Sample ID	TCP Result
MW13 Screen Interval (Ft bgs) 7.0-17.0	OCT 2007	07FWDMW13-GW(F)	ND (0.3)*
	MAY 2008	08FWDMW13-GW(S)	0.21
	OCT 2008	08FWDMW13-GWF	ND (0.014)
	MAY 2009	09FWDMW13-GW(S)	ND (0.014)
	SEP 2009	09FWDMW13-GWF	ND (0.014)
	JUL 2010	10FWAMW13-GWS	ND (0.3)*
	OCT 2010	10FWAMW13-GWF	ND (0.45)*
	JUL 2011	11FWAMW13-GWS	ND (0.45)*
	OCT 2011	11FWAMW13-GWF	ND (0.45)*
	SEP 2012	12FWAMW13-GWF	ND (0.5)*
	MAY 2016	16FWAMW13-GWS	ND (0.1)
	SEP 2016	16FWAMW13-GWF	ND (0.04)
	JUL 2017	17FWAMW13-GWS	ND (0.0025)
	SEP 2017	17FWAMW13-GWF	ND (0.0025)
	JUN 2018	18FWOU620WG	ND (0.005)
	SEP 2018	18FWOU634WG	ND (0.005)

Well ID	Sample Date	Sample ID	TCP Result
MW08 Screen Interval (Ft bgs) 9.0-19.0	OCT 2007	07FWAMW08-GW(F)	ND (0.3)*
	MAY 2008	08FWAMW08-GW(S)	0.023
	OCT 2008	08FWAMW08-GWF	0.23
	MAY 2009	09FWAMW08-GW(S)	0.024
	SEP 2009	09FWAMW08-GWF	0.034
	JUL 2010	10FWAMW08-GWS	ND (0.3)*
	OCT 2010	10FWAMW08-GWF	ND (0.45)*
	JUL 2011	11FWAMW08-GWS	ND (0.45)*
	OCT 2011	11FWAMW08-GWF	0.057
	JUL 2012	12FWAMW08-GWS	0.13
	SEP 2012	12FWAMW08-GWF	ND (0.5)*
	MAY 2016	16FWAMW08-GWS	ND (0.1)
	SEP 2016	16FWAMW08-GWF	0.03
	JUL 2017	17FWAMW08-GWS	0.027
	SEP 2017	17FWAMW08-GWF	0.031
	JUN 2018	18FWOU620WG	ND (0.005)
	SEP 2018	18FWOU634WG	0.062

Neely Road
10th Street
N
MW77
MW38
MW58
MW06A
MW64
MW62
MW32R
MW33
MW12R
MW28
MW61
MW80
MW39
MW93
MW91
MW78
MW47
MW79
MW48
MW08
MW13
Approximate Groundwater Flow Direction

ACRONYMS AND ABBREVIATIONS

UNITS
µg/L - micrograms per liter
ANALYTE
TCP - 1,2,3-Trichloropropane
QUALIFIER INFORMATION
ND - Not Detected (LOD presented in parenthesis)
LOD - Limit of Detection
OTHER
ADEC - Alaska Department of Environmental Conservation
Ft bgs - feet below ground surface
GIS - Geographic Information Systems

LEGEND:

- 2018 Sample Exceedance
- 2018 Sample - No Exceedance
- No TCP Exceedance Since 2007
- TCP Plume Area

Project Cleanup Level (µg/L)	
TCP	0.12

0 80 160 320 Feet

NOTES:

1. Results shown in red exceed the project cleanup level.
2. * The ND result indicates that LOD is higher than the project cleanup level.
3. All groundwater sample results are in µg/L.
4. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
5. Only results for sample locations that had at least one ADEC cleanup level exceedance are shown.
6. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

IMAGERY SOURCE:

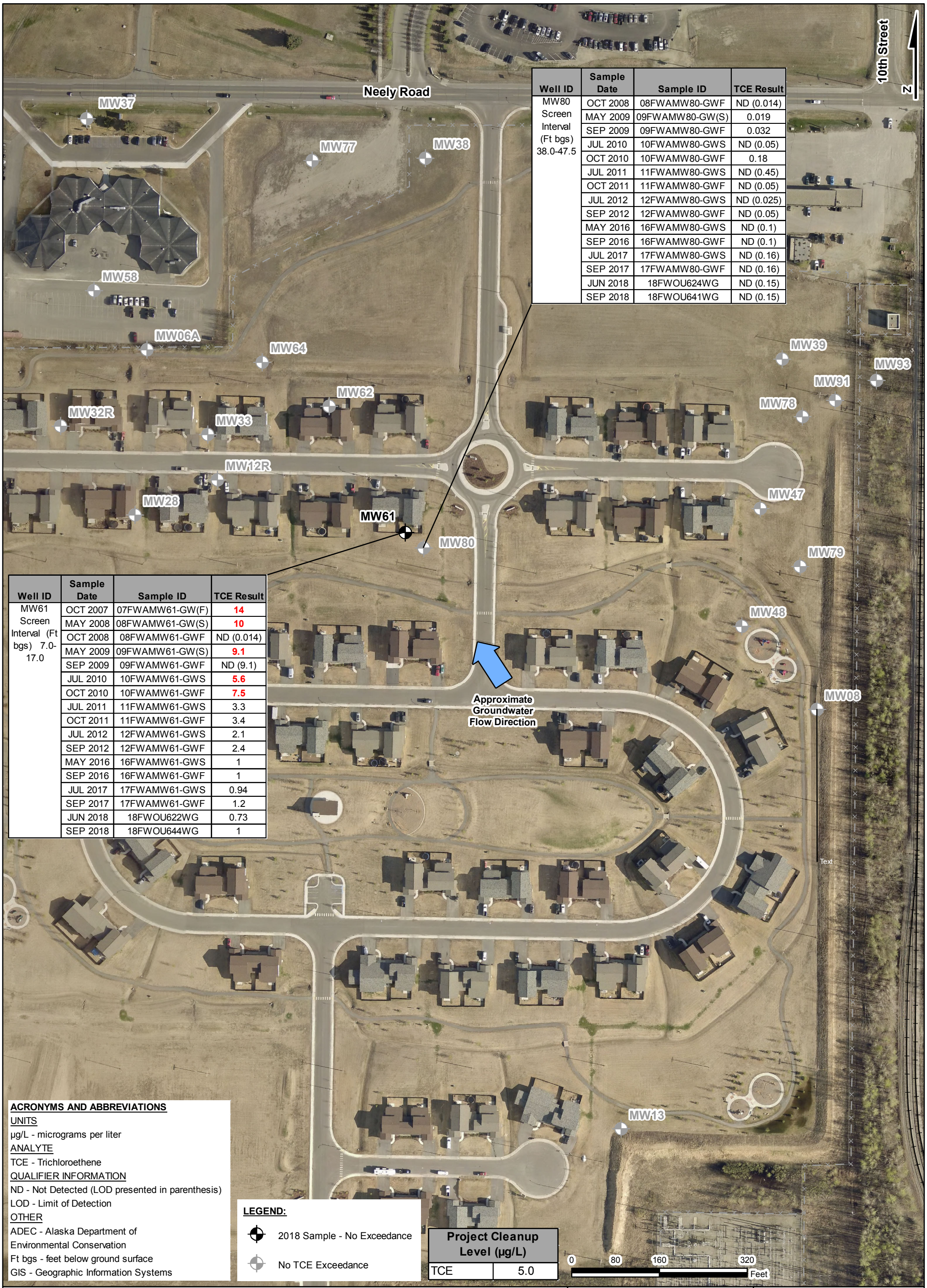
1. Aerial imagery obtained from the Fairbanks North Star Borough GIS department: 2017 Fort Wainwright .SID

Fairbanks Environmental Services
3538 International Street
Fairbanks, Alaska

USAGAK

1,2,3-Trichloropropane Results for In-Plume Wells and Surrounding Wells
2018 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

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



Well ID	Sample Date	Sample ID	TCE Result
MW80 Screen Interval (Ft bgs) 38.0-47.5	OCT 2008	08FWAMW80-GWF	ND (0.014)
	MAY 2009	09FWAMW80-GW(S)	0.019
	SEP 2009	09FWAMW80-GWF	0.032
	JUL 2010	10FWAMW80-GWS	ND (0.05)
	OCT 2010	10FWAMW80-GWF	0.18
	JUL 2011	11FWAMW80-GWS	ND (0.45)
	OCT 2011	11FWAMW80-GWF	ND (0.05)
	JUL 2012	12FWAMW80-GWS	ND (0.025)
	SEP 2012	12FWAMW80-GWF	ND (0.05)
	MAY 2016	16FWAMW80-GWS	ND (0.1)
	SEP 2016	16FWAMW80-GWF	ND (0.1)
	JUL 2017	17FWAMW80-GWS	ND (0.16)
	SEP 2017	17FWAMW80-GWF	ND (0.16)
	JUN 2018	18FWOU624WG	ND (0.15)
	SEP 2018	18FWOU641WG	ND (0.15)

Well ID	Sample Date	Sample ID	TCE Result
MW61 Screen Interval (Ft bgs) 7.0-17.0	OCT 2007	07FWAMW61-GW(F)	**14**
	MAY 2008	08FWAMW61-GW(S)	**10**
	OCT 2008	08FWAMW61-GWF	ND (0.014)
	MAY 2009	09FWAMW61-GW(S)	**9.1**
	SEP 2009	09FWAMW61-GWF	ND (9.1)
	JUL 2010	10FWAMW61-GWS	**5.6**
	OCT 2010	10FWAMW61-GWF	**7.5**
	JUL 2011	11FWAMW61-GWS	3.3
	OCT 2011	11FWAMW61-GWF	3.4
	JUL 2012	12FWAMW61-GWS	2.1
	SEP 2012	12FWAMW61-GWF	2.4
	MAY 2016	16FWAMW61-GWS	1
	SEP 2016	16FWAMW61-GWF	1
	JUL 2017	17FWAMW61-GWS	0.94
	SEP 2017	17FWAMW61-GWF	1.2
	JUN 2018	18FWOU622WG	0.73
	SEP 2018	18FWOU644WG	1

ACRONYMS AND ABBREVIATIONS

UNITS

µg/L - micrograms per liter

ANALYTE

TCE - Trichloroethene

QUALIFIER INFORMATION

ND - Not Detected (LOD presented in parenthesis)

LOD - Limit of Detection

OTHER

ADEC - Alaska Department of Environmental Conservation

Ft bgs - feet below ground surface

GIS - Geographic Information Systems

LEGEND:

2018 Sample - No Exceedance

No TCE Exceedance

Project Cleanup Level (µg/L)	
TCE	5.0

NOTES:

1. Results shown in red exceed the project cleanup level.
2. All groundwater sample results are in µg/L.
3. The highest concentration between primary and duplicate samples is shown where duplicate samples were collected.
4. Only results for sample locations that had at least one ADEC cleanup level exceedance are shown.
5. Horizontal geospatial data: Datum-WGS 1984, Coordinate System-UTM Zone 6, Meters (displayed in feet). Vertical geospatial data (where applicable): NAVD88 in meters.

IMAGERY 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

Trichloroethene Sample Locations and Results
2018 Monitoring Report
Operable Unit 6
U.S. Army Garrison Alaska

USACE Contract: W911KB-16-D-0005	Figure: 3-4	Date: 2/19

Table 3-1. Monitoring Well Groundwater Elevations

Well	Top of Casing Elevation	6/28/2018 Water Level (ft BTOC)	6/28/2018 Water Elevation (ft)	9/20/2018 Water Level (ft BTOC)	9/20/2018 Water Elevation (ft)
MW03	450.61	14.47	436.14	13.34	437.27
MW06A	450.82	14.87	435.95	13.68	437.14
MW08	453.80	17.03	436.77	16.04	437.76
MW12R	No Survey	11.68	NA	10.5	NA
MW13	451.41	15.14	436.27	14.04	437.37
MW28	452.31	16.29	436.02	15.12	437.19
MW32R	No Survey	13.22	NA	12.2	NA
MW33	450.46	14.66	435.80	13.48	436.98
MW35	448.67	13.05	435.62	11.82	436.85
MW37	450.01	14.38	435.63	13.11	436.90
MW38	449.58	13.71	435.87	12.68	436.90
MW39	451.37	15.41	435.96	14.38	436.99
MW47	451.33	15.01	436.32	13.98	437.35
MW48	451.50	15.00	436.50	14.03	437.47
MW58	448.64	12.15	436.49	10.91	437.73
MW61	No Survey	13.77	NA	12.79	NA
MW62	449.11	13.07	436.04	11.78	437.33
MW64	449.66	13.64	436.02	12.44	437.22
MW77	No Survey	16.91	NA	15.59	NA
MW78	No Survey	15.67	NA	14.43	NA
MW79	No Survey	17.02	NA	16.01	NA
MW80	No Survey	13.32	NA	12.33	NA
MW82	482.68	16.37	466.31	15.00	467.68
MW91	No Survey	15.97	NA	14.55	NA
MW93	No Survey	15.91	NA	14.53	NA

NA - not applicable

Note: Vertical Well elevations are NAVD88 U.S. Survey Feet. (Dec 2010 Taku RI)

Table 3-9 - Geochemical Data Associated with DRO Plumes

Location	Well Number	Date	Dissolved Oxygen (mg/L)	ORP (mv)	Dissolved Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	Methane (mg/L)	Nitrogen (ammonia) (mg/L)	Nitrogen (Nitrate-Nitrite) (mg/L)	Alkalinity (as CaCO3) (mg/L)	Potassium (mg/L)	Total Phosphorus (mg/L)
Background	MW13	June	2.32	31.60	1 [0.025]	0.323 [0.004]	39.8 [0.198]	0.032 [0.001]	ND [0.40]	ND [0.100]	324 [1.70] J-	4.01 [0.5]	0.0368 [0.03] J
		Sept	0.60	57.20	0.455 [0.025]	0.0851 [0.004]	57.0 [0.396]	0.0086 [0.001]	ND [0.40]	0.53 [0.100]	447 [1.70]	5.4 [0.5]	ND [0.03]
Main DRO Plume	MW12R	June	1.15	-152.30	11.2 [0.025]	1.02 [0.004]	30.1 [0.990]	0.0046 [0.001] J,J-	0.15 [0.40] J,B	0.11 [0.100] B	183 [1.70]	3.77 [0.5]	0.128 [0.03]
		Sept	1.51	-109.00	9.32 [0.025]	0.897 [0.004]	33.4 [0.198]	0.014 [0.001]	ND [0.40]	ND [0.100]	163 [1.70]	3.99 [0.5]	0.0932 [0.03]
	MW33	June	0.54	-132.00	45.9 [0.025]	3.17 [0.004]	4.0 [0.198]	0.28 [0.001] J-	0.33 [0.40] J,B	0.11 [0.100] B	314 [1.70]	5.16 [0.5]	0.244 [0.03]
		Sept	1.30	-109.00	43.9 [0.025]	3.58 [0.004]	6.8 [0.198]	0.19 [0.001] J	0.42 [0.40] J,J+	ND [0.100]	336 [1.70]	5.41 [0.5]	0.268 [0.03]
	MW06A	June	0.81	-153.20	20.2 [0.025]	1.37 [0.004]	16.6 [0.198]	0.44 [0.001] J-	0.45 [0.40] J,B	0.11 [0.100] B	249 [1.70]	4.85 [0.5]	0.132 [0.03]
		Sept	1.19	-60.40	15.2 [0.025]	1.03 [0.004]	16.4 [0.198]	0.23 [0.001]	0.17 [0.40] J	0.043 [0.100] J	288 [1.70]	4.95 [0.5]	0.1 [0.03]
	MW58	June	1.63	-68.50	14 [0.025]	1.13 [0.004]	16.8 [0.990]	0.2 [0.001] J-	ND [0.40] J	0.50 [0.100]	240 [1.70]	4.34 [0.5]	0.0658 [0.03]
		Sept	1.60	-108.50	15.9 [0.025]	1.13 [0.004]	19.2 [0.198]	0.11 [0.001]	0.14 [0.40] J	0.056 [0.100] J	208 [1.70]	4.54 [0.5]	0.0738 [0.03]
Isolated DRO Plumes	MW62	June	0.38	14.50	1.46 [0.025]	1.39 [0.004]	46.0 [0.990]	0.0098 [0.001] J-	ND [0.40]	0.10 [0.100] B	316 [1.70]	6.58 [0.5]	ND [0.03]
		Sept	0.55	18.20	1.54 [0.025]	1.27 [0.004]	48.5 [0.198]	0.02 [0.001]	ND [0.40]	ND [0.100]	290 [1.70]	6.28 [0.5]	ND [0.03]
	MW77	June	0.42	47.60	0.251 [0.025]	1.11 [0.004]	64.3 [0.990]	ND [0.001] J-	ND [0.40]	34.3 [1.000]	493 [1.70]	10.3 [0.5]	0.0203 [0.03] J
		Sept	0.10	19.90	ND [0.025]	0.667 [0.004]	33	ND [0.001]	ND [0.40]	4.7 [0.100]	361 [1.70]	8.39 [0.5]	ND [0.03]

Acronyms:

DRO - diesel range organics

ORP - oxidation reduction potential

mg/L - milligrams per liter

LOD - limit of detection

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]

4.0 INSTITUTIONAL CONTROL SURVEY

The 2018 IC inspections were conducted at the OU6 FCS in accordance with the Institutional Controls Implementation Action Plan (ICIAP), which was in the 2015 RD/RA Work Plan (USACE, 2015). The IC Inspection was conducted between July 1st and July 26th 2018. The IC inspections included a source area visit to evaluate potential land use changes, site security (monitoring wells, etc., as applicable), unauthorized soil disturbance below 6-inches bgs, or unauthorized groundwater use. In addition to the site visit, reviews of the Fort Wainwright IC geographic information system (GIS) layer and the site-specific information in the ADEC Contaminated Sites database were conducted. A complete summary of the survey and corrective actions taken will be included in the Fort Wainwright Annual IC Inspection Report, anticipated in spring 2019.

The 2018 IC inspection included an inspection of the front, back, and side yards of 110 residential homes; which corresponded to 55 building structures, 2 mechanical buildings, 6 playgrounds, 11 open area/play areas, a summer lawn, a pavilion area, and 28 monitoring wells. Inspection forms were completed for each feature, and included an observation of current conditions, inspection for visual indications of potential problems, and documentation that current residents are adhering to all ICs identified in the ICIAP. The 2018 IC inspection also evaluated potential land use changes that may be harmful to human health and the environment. All inspection observations were documented on inspection form checklists, and georeferenced photographs were taken of all of the sites.

A summary of the IC Inspection and findings includes:

- No dig permits were issued for OU6 in 2018.
- Intentional excavation and soil disturbance by home owners was not observed; however, observations of soil disturbance, potentially by large dogs, were noted at five of the residence backyards. Some of the soil disturbance areas appear to be greater than 6 inches bgs. The Army contacted North Haven who then issued notices to the five residents where holes were observed in their backyards. The deficiencies were corrected.
- Unauthorized installation of water wells was not observed.
- Unauthorized use of the groundwater beneath OU6 was not observed.
- All 28 wells were secured and undamaged.

Based on the findings from the source area inspections, it was determined that OU6 ICs are being implemented and are effective.

5.0 CONCLUSIONS

Historical data have defined five groundwater plumes in the OU6 FCS: The main DRO plume, the MW62 and MW77 DRO plumes, the TCP plume, and the TCE plume. Groundwater monitoring results between 2007 and 2018 were used to conduct an evaluation of the groundwater contaminant plumes in the OU6 FCS. In general, the results showed the contaminant plumes are adequately delineated and are not expanding. The following sections summarize the condition of the OU6 FCS plumes and discuss future groundwater sampling activities.

5.1 DRO Plume Summary

An evaluation of the DRO contaminant trends shows that DRO concentrations at the extent of the main plume are stable; however, concentrations at the center of the plume are increasing. DRO and RRO concentrations in the interior of the plume are expected to persist above the PCL, due to residual NAPL remaining in the soils that continues to be solubilized in the groundwater. Higher concentrations of dissolved manganese and iron, lower concentrations of sulfate, and higher concentrations of methane are evidence that metal and sulfate reduction, as well as methanogenesis, are significant biodegradation processes in the main DRO plume source area. An estimation of the time to cleanup could not be determined for DRO or RRO in monitoring wells associated with the main DRO plume since there were no decreasing trends. When NAPL within the plume is depleted and no longer generates dissolved contaminant concentrations, decreasing trends should become apparent.

Statistical analysis of DRO and RRO concentrations in MW62 and MW77 showed no trend for these contaminants in 2018. This was consistent with the 2017 trend results, although DRO was identified above the PCL in MW77 during both 2018 monitoring events. DRO concentrations are expected to persist above the PCL in MW77 due to residual NAPL remaining in the soils in this area. DRO and RRO in MW62 have been below the PCL since 2012, and natural attenuation may have reduced groundwater contamination below the PCL in this area. Low DO, nitrate, ferrous iron, and methane concentrations coupled with elevated dissolved manganese and sulfate concentrations indicate that manganese reduction is most likely the predominant biodegradation process at MW62. At MW77, very high concentrations of nitrate/nitrate as nitrogen suggest that when DO concentrations are less than approximately 1 mg/L, nitrate reduction would predominate; however, manganese reduction appears to be a minor contributor to DRO and RRO biodegradation.

Cleanup dates cannot be estimated until the residual NAPL is depleted and decreasing trends are seen. This may have occurred in MW62, for which there are no significant spikes in the 2016, 2017, or 2018 data compared with previous year's results; however, additional monitoring is required before a decreasing trend is established and a statistical evaluation of cleanup complete for MW62 can be conducted. At least two more rounds of sampling with persistent low

contaminant levels are required at MW62 to meet EPA guidance for attainment of PCLs (EPA, 2014a).

5.2 TCP Plume Summary

MW47 and MW79 were both found to have TCP concentrations above the PCL during the spring and fall 2018 sampling events. The trend results show the TCP concentration is decreasing in downgradient well MW47, and increasing in upgradient well MW79. The high TCP concentrations observed at monitoring well MW79 suggest the presence of TCP in nearby soil. Geochemical data suggest that aerobic to mildly reducing conditions are predominate in this plume where sulfate concentrations at in-plume wells are comparable to background and methane concentrations are lower than 0.2 mg/L, indicating no significant methanogenesis is taking place. Decreases in TCP concentrations may also be attributed to advection, dispersion, and dilution.

TCP has remained below the PCL in upgradient, downgradient, and crossgradient wells outside of the TCP plume; suggesting minimal plume spread from the source area.

Natural attenuation processes are expected to reduce concentrations in downgradient monitoring well MW47, and the 95% UCL is predicted to be below the PCL in 2033. In contrast, exceedances will likely continue at monitoring well MW79 until the suspected TCP soil source is depleted.

5.3 TCE Plume Summary

TCE concentrations at MW61 have been less than the PCL since 2011, and TCE has never exceeded the PCL in MW80 and has not been detected since 2010. Statistical analysis shows a continued decreasing trend at MW61, and the 95% UCL of the regression curve suggests that remedial goals were met in 2014. This indicates that the TCE PCL has been achieved in accordance with EPA requirements (EPA, 2014a).

5.4 Discussion of Future Activities

5.4.1 Elimination of Wells Including in the Groundwater Monitoring Program

The following wells should be considered for elimination from the monitoring program.

- Upgradient wells MW03 and MW13 may be eliminated since the background geochemistry of the site has been well established.
- Eliminate MW38 since it is located approximately 200 feet west (crossgradient) of MW77 and has never exceeded the PCL since sampling began in 2007. DRO is intermittently

detected above the PCL in MW77, and potential DRO migration is evaluated by sampling downgradient MW82.

- Monitoring well MW80, upgradient of the TCE plume characterized by MW61, may be eliminated since TCE concentrations have achieved the PCL in MW61, and TCE has never been detected in MW80.
- Monitoring well MW61 may also be eliminated if U.S. Army, EPA, and ADEC agree that cleanup of TCE meets the PCL of 5 μg/L (USACE, 2014a).

5.4.2 Reduction in Sample Frequency

A decrease in groundwater monitoring frequency from semiannual to annual is recommended. Statistical analysis showed annual sampling will be sufficient for decision making at the sites until more decreasing contaminant concentration trends are observed.

5.4.3 Decrease in Sample Analyses

Groundwater geochemistry at the site has been well established, and reductions in sample analyses should be considered.

- Methane analysis should be discontinued as the relatively low methane concentrations indicate limited methanogenesis is occurring at the site.
- Alkalinity analysis should be discontinued as alkalinity concentrations vary across the site and do not appear to be strongly related to contaminant concentrations.
- Ammonia and nitrate-nitrite analysis should be eliminated as there is not a significant nitrogen source available in the area of DRO contamination.
- Nutrient availability has been established for the site by past analysis of potassium and phosphate. Concentrations of these analytes are unlikely to appreciably change over time, therefore potassium and phosphate analyses should be removed.
- Dissolved iron, dissolved manganese, and sulfate data are important to evaluate biodegradation of DRO groundwater contamination at the site. The remaining analyses should be discontinued.

5.4.4 2019 Groundwater Sampling Program

Table 5-1 summarizes the sampling summary for 2019.

Table 5-1. 2019 OU6 Groundwater Sampling Summary

Contaminant Area	Number of Wells	Monitoring Wells to be Sampled	Analytical Parameters	2019 Monitoring Frequency
DRO Plumes	12	MW06A, MW12R, MW28, MW32R[1], MW33, MW35, MW37, MW58, MW62, MW64, MW77, MW82	(VOC [low level])[1], DRO/RRO, MNA Parameters[2]	Annual
1,2,3-TCP Plume	4	MW08, MW47, MW48, MW79	VOC [low level], MNA Parameters[2]	
TCE Plume	1	MW61[3]	VOC, MNA Parameters[2]	
Sentry Wells	4	MW39, MW78, MW91, MW93	VOC [low level]	

[1] Well MW32R should also be analyzed for low-level VOCs.
[2] Monitored natural attenuation (MNA) parameters include dissolved iron, dissolved manganese, and sulfate.
[3] Well MW61 can be eliminated if there is agreement that the TCE plume has been successfully remediated.

5.4.5 Monitoring Well Resurvey

Many wells (including nine wells that are currently sampled) do not have surveyed elevations. In addition wells were resurveyed at different times and the groundwater elevations are inconsistent across the site preventing accurate determination of groundwater elevation contours and flow direction. All wells should be resurveyed.

5.4.6 Reduction in IC Inspections

IC inspection of residences within OU6 will be reduced from 100% to 20% beginning in 2019. In addition, any residences that IC deficiencies were noted will be included in the following year IC inspection. All public use areas (i.e. playgrounds, open area/play areas, summer lawn, and pavilion area) and the two mechanical buildings will continue to be inspected annually.

6.0 REFERENCES

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APPENDIX A

GROUNDWATER SAMPLING FORMS, GROUNDWATER FIELD MEASUREMENTS, AND FIELD FORMS

Table A-1. 2018 OU6 Groundwater Sample Field Measurements

Well ID	Sample ID	Sample Date	Sample Time	Field Measurements									
				Water Depth[1] (feet btoc)	Water Table Within Well Screen Interval (Y/N)	Drawdown (feet)	Temp (°C)	Conductivity (mS/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Well Stabilized[3] (Y/N)
MW-03	18FWOU605WG	6/20/2018	1420	14.28	Y	0.00	7.21	0.608	0.61	6.89	-74.30	7.36	Y
	18FWOU647WG	9/26/2018	910	13.34	Y	0.00	6.85	0.567	1.42	6.77	-92.00	12.93	Y
MW-06A	18FWOU607WG	6/20/2018	1630	14.68	Y	0.00	7.02	0.576	0.81	6.87	-153.20	1.78	Y
	18FWOU652WG	9/26/2018	1510	13.68	Y	0.00	7.33	0.660	1.19	6.63	-60.40	4.15	Y
MW-08	18FWOU623WG	6/22/2018	1640	16.90	Y	0.00	4.27	0.668	1.39	6.63	117.10	1.01	Y
	18FWOU639WG	9/21/2018	1200	16.04	Y	0.00	5.94	0.603	1.66	6.65	123.60	1.37	Y
MW-12R	18FWOU603WG	6/20/2018	1300	11.48	N	0.00	4.86	0.459	1.15	7.01	-152.30	2.41	Y
	18FWOU649WG	9/26/2018	1155	10.50	N	0.00	6.45	0.390	1.51	7.01	-109.00	5.45	Y
MW-13	18FWOU627WG	6/25/2018	1200	15.09	Y	0.00	4.39	0.706	2.32	6.78	31.60	1.17	Y
	18FWOU640WG	9/21/2018	1320	14.04	Y	0.00	4.75	0.939	0.60	6.55	57.20	1.00	Y
MW-28	18FWOU604WG	6/20/2018	1440	16.10	Y	0.00	8.18	0.712	1.29	6.78	94.40	3.13	Y
	18FWOU648WG	9/26/2018	1040	15.12	Y	0.00	8.79	0.570	0.84	6.79	53.90	4.01	Y
MW-32R	18FWOU628WG	6/25/2018	1330	13.14	Y	0.00	6.94	0.986	3.33	6.62	112.40	5.74	Y
	18FWOU642WG	9/21/2018	1450	12.20	N	0.00	6.63	0.792	0.81	6.63	106.90	4.60	Y
MW-33	18FWOU601WG	6/20/2018	1045	14.49	Y	0.00	5.40	0.754	0.54	6.87	-132.00	10.79	Y
	18FWOU650WG	9/26/2018	1315	13.48	Y	0.00	7.50	0.765	1.30	6.65	-109.00	11.85	Y
MW-35	18FWOU610WG	6/21/2018	1020	12.85	Y	0.00	4.99	0.852	1.88	6.81	88.10	1.80	Y
	18FWOU653WG	9/26/2018	1645	11.82	Y	0.00	6.56	0.684	0.75	6.69	46.50	4.23	Y
MW-37	18FWOU612WG	6/21/2018	1145	14.17	Y	0.00	13.47	0.669	1.17	7.03	97.70	1.15	Y
	18FWOU654WG	9/26/2018	1835	13.11	Y	0.00	13.32	0.640	1.34	6.89	68.10	1.32	Y
MW-38	18FWOU606WG	6/20/2018	1610	13.46	Y	0.00	6.67	0.783	1.65	7.02	53.00	3.76	Y
	18FWOU646WG	9/21/2018	1615	12.68	Y	0.00	6.26	0.713	0.60	6.81	-52.60	16.10	Y
MW-39	18FWOU617WG	6/22/2018	945	15.22	Y	0.00	5.75	0.533	0.97	7.15	-116.00	7.21	Y
	18FWOU631WG	9/20/2018	1045	14.38	Y	0.00	6.50	0.443	1.08	7.08	-113.60	34.81	Y
MW-47	18FWOU620WG	6/22/2018	1445	14.84	Y	0.00	5.98	0.727	1.94	6.91	81.80	0.70	Y
	18FWOU634WG	9/20/2018	1440	13.98	Y	0.00	7.78	0.682	4.23	6.85	53.20	4.11	Y
MW-48	18FWOU626WG	6/25/2018	1030	14.94	Y	0.00	4.84	0.698	2.62	6.97	70.80	1.39	Y
	18FWOU637WG	9/21/2018	1040	14.03	Y	0.00	7.25	0.827	1.01	6.87	76.30	2.80	Y
MW-58	18FWOU608WG	6/21/2018	845	11.96	Y	0.00	4.86	0.543	1.63	6.90	-68.50	4.53	Y
	18FWOU655WG	9/27/2018	900	10.91	Y	0.00	4.83	0.468	1.60	6.92	-108.50	7.93	Y
MW-61	18FWOU622WG	6/22/2018	1445	13.62	Y	0.00	6.11	0.685	0.84	7.85	26.90	6.29	Y
	18FWOU644WG	9/21/2018	1500	12.79	Y	0.00	6.81	0.717	1.58	6.84	-58.50	6.27	Y
MW-62	18FWOU613WG	6/21/2018	1135	12.82	Y	0.00	5.89	0.708	0.38	7.15	14.50	2.02	Y
	18FWOU658WG	9/27/2018	1045	11.78	Y	0.00	7.00	0.655	0.55	6.64	18.20	2.07	Y
MW-64	18FWOU611WG	6/21/2018	1005	13.43	Y	0.00	5.84	0.475	2.38	7.22	-15.70	13.56	Y
	18FWOU659WG	9/27/2018	1030	12.41	Y	0.00	6.56	0.493	1.81	6.99	-28.50	3.63	Y
MW-77	18FWOU615WG	6/21/2018	1310	16.62	Y	0.00	6.43	1.204	0.42	7.06	47.60	4.71	Y
	18FWOU657WG	9/27/2018	930	15.59	Y	0.00	4.80	0.836	0.10	6.69	19.90	3.30	Y
MW-78	18FWOU616WG	6/22/2018	845	15.44	N	0.00	6.05	0.456	0.94	7.25	-150.20	18.23	Y
	18FWOU633WG	9/20/2018	1330	14.43	N	0.00	6.58	0.424	1.51	7.18	-127.60	8.03	Y
MW-79	18FWOU618WG	6/22/2018	1100	16.92	Y	0.00	4.90	0.640	1.40	6.92	-21.20	7.34	Y
	18FWOU636WG	9/21/2018	930	16.01	Y	0.00	7.32	0.668	1.51	6.87	-8.70	5.71	Y
MW-80	18FWOU624WG	6/22/2018	1555	13.15	N	0.00	5.51	0.378	0.40	8.32	-5.80	5.96	Y
	18FWOU641WG	9/21/2018	1330	12.33	N	0.00	5.22	0.372	1.33	7.18	-119.10	6.18	Y
MW-82	18FWOU614WG	6/21/2018	1315	16.17	Y	0.00	7.62	0.865	1.87	6.73	126.10	1.91	Y
	18FWOU660WG	9/27/2018	1130	15.00	Y	0.00	7.46	0.895	1.57	6.67	61.10	1.32	Y
MW-91	18FWOU625WG	6/25/2018	915	15.78	N	0.00	5.80	0.392	0.63	7.40	-159.20	0.61	Y
	18FWOU638WG	9/21/2018	1115	14.55	N	0.00	5.42	0.367	0.55	7.23	-118.90	1.88	Y
MW-93	18FWOU619WG	6/22/2018	1315	15.40	N	0.00	6.81	0.399	0.90	7.60	-150.40	0.61	Y
	18FWOU632WG	9/20/2018	1200	14.53	N	0.00	6.00	0.376	1.07	7.48	-148.60	2.33	Y

Notes:

[1] Water depth shown was the static level measured on the date shown prior to purging the well

[2] Drawdown measured during the last three readings.

[3] Stabilization parameters described in ADEC Field Sampling Guidance (ADEC, 2016a). Impact to data quality is discussed in the CDQR.

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
NA - not applicable or not available
NM - not measured
NTU - nephelometric turbidity units
ORP - oxidation reduction potential

GROUNDWATER SAMPLE FORM OU6 Ft. Wainwright, Alaska

Project #: 9011-07 Site Location: Former Communications Site

Date: 6/20/18 Probe/Well #: MW33

Time: 1045 Sample ID: 18FWOU6 01 WG

Sampler: SK

Weather: Clear Outside Temperature: 60°F

QA/QC Sample ID/Time/LOCID: 18FWOU602WG / 1100 / MW331 MS/MSD Performed? (Yes) No

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

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

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

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

Total Depth in Probe/Well (feet btoc): 20.95 Well Screened (Across) / Below water table

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

Column of Water in Probe/Well (feet): = 6.46 *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): 1.05

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.51	1.020	2.53	6.63	-129.4	19.65	14.62
1.0	10	5.59	0.951	1.69	6.68	-131.4	18.59	14.67
1.5	15	5.23	0.870	1.32	6.75	-132.6	16.26	14.67
2.0	20	5.27	0.834	1.09	6.77	-134.3	15.16	14.65
2.5	25	5.36	0.802	0.86	6.81	-135.3	14.14	14.64
3.0	30	5.29	0.775	0.65	6.84	-132.5	12.56	14.65
3.5	35	5.32 ✓	0.760 ×	0.59 ×	6.86 ✓	-131.2 ✓	11.70 ×	14.65
4.0	40	5.40	0.754	0.54	6.87	-132.0	10.79	14.65

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, (DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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: SK

GROUNDWATER SAMPLE FORM | OU6 | Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/20/18 | Probe/Well #: MW12R

Time: 1300 | Sample ID: 18FWOU6 03 WG

Sampler: SK | Outside Temperature: 66 °F

Weather: Clear

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

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

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 4 | Water Level: SOL 3

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

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

Total Depth in Probe/Well (feet btoc): 22.59 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 11.48 | Depth tubing / pump intake set* approx. 17.6 feet below top of casing

Column of Water in Probe/Well (feet): = 11.11 | *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): 1.8

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.31	0.452	4.85	7.03	-162.8	3.86	11.53
1.0	10	4.91	0.451	3.28	7.16	-158.3	2.55	11.53
1.5	15	4.75	0.453	2.43	7.01	-156.1	4.04	11.53
2.0	20	4.73	0.455	1.89	7.03	-155.5	2.21	11.53
2.5	25	4.80	0.457	1.50	7.02	-153.9	2.96	11.53
3.0	30	4.86	0.459	1.15	7.01	-152.3	2.41	11.53

SK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | OU6 | Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site

Date: ~~1440~~ 6/20/18 | Probe/Well #: MW28

Time: 1440 | Sample ID: 18FWOU6 04 WG

Sampler: JK

Weather: Clear | Outside Temperature: 65°F

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

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

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 4 | Water Level: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 19.06 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 16.10 | Depth tubing / pump intake set* approx. 17.1 feet below top of casing

Column of Water in Probe/Well (feet): = 2.96 | *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)
0.5	5	8.02	0.696	8.24	6.63	96.5	28.03	16.16
1.0	10	8.06	0.705	2.64	6.66	97.5	17.04	16.16
1.5	15	8.23	0.710	2.24	6.69	96.9	12.15	16.16
2.0	20	8.15	0.711	2.02	6.72	95.8	11.28	16.16
2.5	25	8.26	0.713	1.81	6.74	95.7	8.13	16.16
3.0	30	8.20 ✓	0.713 ✓	1.49 ✓	6.76 ✓	95.4 ✓	6.39 ✓	16.16
3.5	35	8.17	0.713	1.32	6.78	93.6	5.19	16.16
4.0	40	8.18	0.712	1.29	6.78	94.4	3.13	16.16

JK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, NO_3+/N- as Nitrogen

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 Trailer) / CERCLA Waste * Purge water stored in the DERA Building for characterization prior to disposal

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM OU6 Ft. Wainwright, Alaska

Project #: 9011-07
Date: 6/20/18
Time: 1420
Sampler: CB
Weather: PARTLY CLOUDY

Site Location: Former Communications Site
Probe/Well #: MW-03
Sample ID: 18FWOU6 05 WG
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 #: 12 Water Level: 14

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 22.30
Depth to Water from TOC (feet): - 14.28
Column of Water in Probe/Well (feet): = 8.02

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): 1.31

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx 16.2 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)
0.5	5	6.97	0.605	1.63	6.64	-44.2	146.0	14.30
1	10	7.18	0.607	1.12	6.73	-54.0	79.42	14.30
1.5	15	7.64	0.607	0.85	6.84	-65.0	60.01	14.31
2	20	7.28	0.608	0.70	6.84	-66.7	46.02	14.31
2.5	25	7.18	0.609	0.67	6.86	-69.1	19.29	14.31
3	30	7.23	0.608	0.65	6.88	-72.3	11.71	14.31
3.5	35	7.20	0.608	0.62	6.89	-74.0	7.21	14.31
4	40	7.21	0.608	0.61	6.89	-74.3	7.36	14.31
5	FINAL							
Chris Bolte								

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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 OU6 Ft. Wainwright, Alaska

Project #: 9011-07 Site Location: Former Communications Site

Date: 6/20/18 Probe/Well #: MW38

Time: ~~1610~~ 1610 Sample ID: 18FWOU6 06 WG

Sampler: CB

Weather: PARTLY 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 #: 12 Water Level: 14

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 19.80

Depth to Water from TOC (feet): - 13.46

Column of Water in Probe/Well (feet): = 6.34

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): 1.03

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 15.4 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)
0.5	5	7.15	0.785	1.26	6.90	-64.9	310.1	13.45
~~1~~ 1	10	7.00	0.782	1.37	6.92	-60.5	58.55	13.51
1.5	15	6.86	0.780	1.46	6.95	-60.8	25.50	13.51
2	20	6.73	0.779	1.52	6.97	-61.7	15.36	13.51
2.5	25	6.70	0.780	1.60	7.01	-58.4	9.26	13.51
3	30	6.65	0.782	1.62	7.03	-55.5	5.92	13.51
3.5	35	6.67	0.783	1.65	7.02	-53.0	3.76	13.51
4	FINAL							

Chris Bolle

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

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

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

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

Well Condition: Locked / N Labeled with LOC ID: (Y) / N Comments: * INITIAL WATER WAS

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, NO_3/N- as Nitrogen

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

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 6/20/18
Probe/Well #: MW06A
Time: 1630
Sample ID: 18FWOU6 07 WG
Sampler: SK
Weather: Clear
Outside Temperature: 65 °F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder
Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 11
Water Level: 8.2 13
Free Product Observed in Probe/Well? Yes/(No) If Yes, Depth to Product: 2
Column of Water in Probe/Well
Sampling Depth 10' screen
Total Depth in Probe/Well (feet btoc): 22.41
Well Screened (Across) / Below water table
Depth to Water from TOC (feet): 14.68
Depth tubing / pump intake set* approx. 15.6 feet below top of casing
Column of Water in Probe/Well (feet): = 7.73
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.3

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	8.88	0.580	2.41	6.75	-137.1	36.29	14.69
1.0	10	6.81	0.577	1.87	6.72	-138.9	10.80	14.69
1.5	15	6.91	0.576	1.43	6.79	-145.9	5.67	14.69
2.0	20	6.99	0.576	0.93	6.88	-152.4	4.09	14.69
2.5	25	6.94	0.576	0.89	6.90	-153.8	3.67	14.69
3.0	30	7.02	0.576	0.81	6.87	-153.2	1.78	14.69

SK

Did groundwater parameters stabilize? (Yes) No If no, why not?
Did drawdown stabilize? (Yes) No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?
Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Locked (Y)/N Labeled with LOC ID: (Y)/N Comments:
Sheen: Yes (No) Odor: (Yes) No Notes/Comments: slight
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y)/N Approximate volume added (mL): HCl = 0 HNO_3 = 0

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

GROUNDWATER SAMPLE FORM | OU6 | Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/21/18 | Probe/Well #: MW58

Time: 0845 | Sample ID: 18FWOU6 08 WG

Sampler: SK

Weather: Cloudy | Outside Temperature: 65°F

QA/QC Sample ID/Time/LOCID: 18FWOU6D9WG / 0900 / MW581 | MS/MSD Performed? Yes/(No)

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

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

Free Product Observed in Probe/Well? (Yes)/No | If Yes, Depth to Product: 0101

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

Total Depth in Probe/Well (feet btoc): 18.27 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 11.96 | Depth tubing / pump intake set* approx 13 feet below top of casing

Column of Water in Probe/Well (feet): = 6.31 | *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): 1.03

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	4.85	0.504	9.25	6.95	-102.4	260.4	12.00
1.0	10	5.26	0.526	5.47	6.87	-83.3	65.94	12.00
1.5	15	4.91	0.541	3.70	6.86	-73.4	32.64	12.00
2.0	20	4.86	0.547	3.09	6.86	-69.7	17.94	12.00
2.5	25	4.76	0.549	2.48	6.87	-68.5	11.54	12.00
3.0	30	4.91	0.546	2.18	6.88	-69.0	8.29	12.00
3.5	35	4.78	0.545	1.92	6.89	-68.4	6.35	12.00
4.0	40	4.86	0.543	1.63	6.90	-68.5	4.53	12.00

SK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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: SK

GROUNDWATER SAMPLE FORM OU6 Ft. Wainwright, Alaska

Project #: 9011-07 Site Location: Former Communications Site

Date: 6/21/18 Probe/Well #: MW35

Time: 1020 Sample ID: 18FWOU6 10 WG

Sampler: SK

Weather: Cloudy Outside Temperature: 65°F

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

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

Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 11 Water Level: SOL13

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

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

Total Depth in Probe/Well (feet bloc): 19.13 Well Screened Across / Below water table

Depth to Water from TOC (feet) - 12.85 Depth tubing / pump intake set* approx 13.85 feet below top of casing

Column of Water in Probe/Well (feet): = 6.28 *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): 1.02

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.86	0.871	12.25	6.75	61.4	37.30	12.92
1.0	10	5.61	0.853	6.94	6.88	67.9	12.14	12.94
1.5	15	5.19	0.852	2.80	6.76	77.2	5.26	12.94
2.0	20	4.90	0.848	2.30	6.80	81.5	2.57	12.94
2.5	25	5.03	0.847	1.94	6.81	84.9	2.07	12.94
3.0	30	4.99	0.852	1.88	6.81	88.1	1.80	12.94

SK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

Gallons generated: 3.75 Containerized and disposed as IDW? (Yes) No If No, why not?

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | OU6 | Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/21/18 | Probe/Well #: MW64

Time: 1005 | Sample ID: 18FWOU6 11 WG

Sampler: CB

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 # 9 | Turbidity Meter #: 12 | Water Level: 14

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 20.04

Depth to Water from TOC (feet): 13.43

Column of Water in Probe/Well (feet): = 6.61

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): 1.07

Sampling Depth

Well Screened (across) / Below water table

Depth tubing / pump intake set* approx. 15.4 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)
0.5	5	6.97	0.465	5.06	7.51	-24.0	103.1	13.51
1	10	6.87	0.467	3.12	7.38	-18.1	56.96	13.51
1.5	15	5.90	0.470	2.72	7.28	-16.8	36.18	13.51
2	20	5.80	0.472	2.58	7.24	-15.5	22.92	13.51
2.5	25	5.82	0.473	2.50	7.23	-15.2	15.08	13.51
3	30	5.82	0.475	2.42	7.23	-15.7	12.11	13.51
3.5	35	5.84	0.475	2.38	7.22	-15.7	13.56	13.51
4	FINAL							
Chris Beltz								

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/21/18 | Probe/Well #: MW37

Time: 1145 | Sample ID: 18FWOU6 12 WG

Sampler: SK

Weather: Clear | Outside Temperature: 74°F

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

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

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

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 19.72

Depth to Water from TOC (feet): − 14.17

Column of Water in Probe/Well (feet): = 5.58

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

Volume of Water in 1 Probe/Well Casing (gal): 0.91

Sampling Depth

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 15.2 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 0.33 to 0.15 GPM until parameters stabilize or 3 casing volumes have been removed. If well draws down below tubing or pump intake, stop purging and sample as a low-yield well using a no-purge technique.

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	13.51	0.684	8.35	7.10	83.8	7.80	14.23
1.0	10	13.29	0.681	5.08	7.00	92.8	11.51	14.23
1.5	15	13.30	0.681	3.09	7.01	95.8	3.17	14.23
2.0	20	13.33	0.680	1.71	7.03	96.7	1.95	14.23
2.5	25	13.36	0.675	1.28	7.04	96.3	1.59	14.23
3.0	30	13.42	0.676	1.32	7.05	95.1	1.34	14.23
3.5	35	13.47	0.669	1.17	7.03	97.7	1.15	14.23

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

Gallons generated: 3.75 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | OU6 | Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/21/18 | Probe/Well #: MW62

Time: 1135 | Sample ID: 18FWOU6 13 WG

Sampler: CB

Weather: MOSTLY CLOUDY | Outside Temperature: 76°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 #: 12 | Water Level: 14

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

Column of Water in Probe/Well | **Sampling Depth**

Total Depth in Probe/Well (feet btoc): 20.09 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 12.82 | Depth tubing / pump intake set* approx. 14.8 feet below top of casing

Column of Water in Probe/Well (feet): = 7.27 | *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): 1.19

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.16	0.703	0.75	7.22	16.9	17.19	12.86
1	10	6.12	0.704	0.73	7.20	15.8	10.72	12.88
1.5	15	6.21	0.704	0.58	7.17	15.6	5.00	12.88
2	20	6.01	0.707	0.49	7.16	15.5	2.86	12.88
2.5	25	5.95	0.708	0.37	7.15	14.9	1.98	12.88
3	30	5.89	0.708	0.38	7.15	14.5	2.02	12.88
4	FINAL							

Chris Bosse

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO/RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 6/21/18
Probe/Well #: MW82
Time: 1315
Sample ID: 18FWOU614 WG
Sampler: SK
Weather: Clear
Outside Temperature: 76°F
QA/QC Sample ID/Time/LOCID: ←
MS/MSD Performed? Yes (No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder
Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 09 Turbidity Meter #: 11
Water Level: SOL / 3
Free Product Observed in Probe/Well? Yes (No) If Yes, Depth to Product: ∅

Column of Water in Probe/Well
Total Depth in Probe/Well (feet btoc): 21.78
Depth to Water from TOC (feet): - 16.17
Column of Water in Probe/Well (feet): = 5.61
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): 0.91

Sampling Depth: 10' screen
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)
0.5	5	7.02	0.836	3.52	6.69	115.0	4.14	16.21
1.0	10	7.88	0.855	3.17	6.69	119.1	2.55	16.21
1.5	15	7.68	0.860	2.65	6.71	122.6	1.95	16.21
2.0	20	7.63	0.864	2.24	6.71	124.6	2.62	16.21
2.5	25	7.57	0.866	2.05	6.72	125.4	2.22	16.21
3.0	30	7.62	0.865	1.87	6.73	126.1	1.91	16.21

SK

Did groundwater parameters stabilize? (Yes) / No If no, why not?
Did drawdown stabilize? (Yes) / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?
Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Locked (Y) N Labeled with LOC ID: (Y) N Comments:
Sheen: Yes / (No) Odor: Yes / (No) Notes/Comments:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) N Approximate volume added (mL): HCl = ∅ HNO_3 = ∅

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/21/18 | Probe/Well #: MW77

Time: 1310 | Sample ID: 18FWOU6 15 WG

Sampler: CB

Weather: MOSTLY CLOUDY | Outside Temperature: 81°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 #: 12 | Water Level: 14

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

Column of Water in Probe/Well | Sampling Depth

Total Depth in Probe/Well (feet btoc): 22.65 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 16.62 | Depth tubing / pump intake set* approx. 18.6 feet below top of casing

Column of Water in Probe/Well (feet): = 6.03 | *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): 0.98

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.56	1.283	1.26	7.18	44.9	30.32	16.78
1	10	6.77	1.236	0.74	7.09	45.0	16.92	16.83
1.5	15	6.50	1.215	0.50	7.09	46.0	8.90	16.84
2	20	6.45	1.210	0.45	7.07	47.6	6.04	16.84
2.5	25	6.43	1.204	0.42	7.06	47.6	4.71	16.84
3	30							
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 / N Labeled with LOC ID: Y / N Comments:

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO/RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, NH_4/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site
Date: 6/22/18 | Probe/Well #: MW78
Time: 0845 | Sample ID: 18FWOU6 16 WG
Sampler: SK
Weather: Lt. Rain | Outside Temperature: 59°F
QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 11 | Water Level: SOL13
Free Product Observed in Probe/Well? Yes (No) | If Yes, Depth to Product: —
Column of Water in Probe/Well | Sampling Depth 10' screen
Total Depth in Probe/Well (feet btoc): 37.20 | Well Screened Across / (Below) water table
Depth to Water from TOC (feet): - 15.44 | Depth tubing / pump intake set* approx 32 feet below top of casing
Column of Water in Probe/Well (feet): = 21.76 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 3.5

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.92	0.452	5.86	7.23	-136.1	60.05	15.48
1.0	10	6.03	0.453	2.92	7.23	-145.2	59.23	15.48
1.5	15	6.03	0.453	2.09	7.23	-147.9	48.73	15.48
2.0	20	6.12	0.454	1.15	7.24	-147.6	33.94	15.48
2.5	25	6.06	0.455	1.05	7.25	-145.8	27.31	15.48
3.0	30	6.05	0.456	1.14	7.26	-149.1	23.65	15.48
3.5	35	6.05	0.456	0.94	7.25	-150.2	18.23	15.48

SK

Did groundwater parameters stabilize? (Yes) / No If no, why not?
Did drawdown stabilize? (Yes) / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? (Yes) / No If no, why not?
Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Locked (Y) N Labeled with LOC ID (Y) N Comments:
Sheen: Yes (No) Odor: Yes (No) Notes/Comments:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, (VOC-LL), DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (N/A) Approximate volume added (mL): HCl = NA HNO_3 = NA

Purge Water
Gallons generated: 3.75 Containerized and disposed as IDW? (Yes) / No If No, why not?
Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site
Date: 6/22/18 | Probe/Well #: MW39
Time: 0945 | Sample ID: 18FWOU6 17 WG
Sampler: SK
Weather: Cloudy/Lt Rain | Outside Temperature: 60°F
QA/QC Sample ID/Time/LOCID: ——— | MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 11 | Water Level: SOL 13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —
Column of Water in Probe/Well | Sampling Depth: 20' screen
Total Depth in Probe/Well (feet btoc): 31.99 | Well Screened (Across) / Below water table
Depth to Water from TOC (feet): - 15.22 | Depth tubing / pump intake set* approx 16.2 feet below top of casing
Column of Water in Probe/Well (feet): = 16.77 | *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): 2.7

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.21	0.504	5.11	7.02	-51.9	165.3	15.25
1.0	10	6.50	0.511	2.04	7.06	-79.8	80.11	15.25
1.5	15	5.96	0.518	1.40	7.09	-96.5	32.30	15.25
2.0	20	5.72	0.524	1.26	7.11	-104.2	12.31	15.25
2.5	25	5.78	0.525	1.14	7.14	-109.5	10.97	15.25
3.0	30	5.88	0.528	1.04 x	7.14 ✓	-111.8 ✓	6.91	15.25
3.5	35	5.75	0.533	0.97	7.15	-116.0	7.21	15.25

SK

Did groundwater parameters stabilize? (Yes) / No If no, why not? ———
Did drawdown stabilize? (Yes) / No If no, why not? ———
Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? ———
Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: ———
Well Condition: Locked (Y) N Labeled with LOC ID (Y) N Comments: ———
Sheen: Yes (No) Odor: Yes (No) Notes/Comments: ———
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: Y N Approximate volume added (mL): HCl = NA HNO_3 = NA

Purge Water
Gallons generated: 3.75 Containerized and disposed as IDW? (Yes) / No If No, why not?
Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/22/18 | Probe/Well #: MW79

Time: 1100 | Sample ID: 18FWOU6 18 WG

Sampler: SK

Weather: Cloudy | Outside Temperature: 57°F

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

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

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

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

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

Total Depth in Probe/Well (feet btoc): 21.61 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 16.92 | Depth tubing / pump intake set* approx: 18 feet below top of casing

Column of Water in Probe/Well (feet): = 4.69 | *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): 0.8

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.32	0.686	11.01	6.77	40.6	135.5	16.98
1.0	10	4.73	0.658	4.48	6.81	22.1	27.91	16.98
1.5	15	4.86	0.650	3.46	6.85	40.6	20.02	16.98
2.0	20	4.90	0.638	1.72	6.90	-10.3	9.66	16.98
2.5	25	4.96	0.638	1.57	6.91	-15.9	7.03	16.98
3.0	30	4.90	0.640	1.40	6.92	-21.2	7.34	16.98

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, (VOC-LL), DRO, RRO, (Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen)

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/22/18 | Probe/Well #: MW93

Time: 1315 | Sample ID: 18FWOU6 19 WG

Sampler: JK

Weather: Cloudy | Outside Temperature: 55°F

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

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

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

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

Column of Water in Probe/Well | Sampling Depth: 20 'Screen

Total Depth in Probe/Well (feet btoc): 72.72 | Well Screened Across / (Below) water table

Depth to Water from TOC (feet): - 15.40 | Depth tubing / pump intake set* approx. 62.7 feet below top of casing

Column of Water in Probe/Well (feet): = 57.32 | *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): 9.3

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.78	0.398	3.68	7.44	-129.2	8.57	15.49
1.0	10	6.69	0.398	2.12	7.53	-140.9	1.73	15.49
1.5	15	6.94	0.398	1.72	7.56	-144.6	1.35	15.49
2.0	20	6.87	0.398	1.08	7.60	-149.3	0.84	15.49
2.5	25	6.86	0.398	1.01	7.61	-149.7	0.74	15.49
3.0	30	6.81	0.399	0.90	7.60	-150.4	0.61	15.49

JK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, (VOC-LL), DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/22/18 | Probe/Well #: MW47

Time: 1445 | Sample ID: 18FWOU6 20 WG

Sampler: SK | Weather: Cloudy | Outside Temperature: 61°F

QA/QC Sample ID/Time/LOCID: 18FWOU621WG / 1500 / MW471 | MS/MSD Performed? (Yes) / No

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

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 11 | Water Level: SOL13

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

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

Total Depth in Probe/Well (feet btoc): 19.83 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 14.84 | Depth tubing / pump intake set* approx 15.8 feet below top of casing

Column of Water in Probe/Well (feet): = 4.99 | *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): 0.8

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.60	0.763	7.64	6.85	45.4	8.38	14.93
1.0	10	6.11	0.751	5.80	6.88	57.1	5.14	14.92
1.5	15	6.04	0.742	4.86	6.89	67.5	3.17	14.92
2.0	20	6.06	0.735	3.37	6.90	74.2	1.41	14.92
2.5	25	5.99	0.730	2.09	6.91	77.7	1.22	14.92
3.0	30	5.98	0.727	1.94	6.91	81.8	0.70	14.92

SK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, (VOC-LL), [redacted], Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

pH checked of samples: (Y) / N Approximate volume added (mL): HCl = NA HNO_3 = 20

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM OU6 Ft. Wainwright, Alaska

Project #: 9011-07 Site Location: Former Communications Site

Date: 6/22/18 Probe/Well #: MW61

Time: 1445 Sample ID: 18FWOU6 22 WG

Sampler: CB

Weather: MOSTLY CLOUDY Outside Temperature: 64 °F VOC's ONLY

QA/QC Sample ID/Time/LOCID: 18FWOU630WG / MW611 / 1500 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 #: 12 Water Level: 14

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 20.15

Depth to Water from TOC (feet): - 13.62

Column of Water in Probe/Well (feet): = 6.53

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): 1.06

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)
0.5	5	6.28	0.690	2.04	7.21	97.7	213.8	13.79
1	10	6.51	0.684	1.34	7.52	71.4	79.47	13.79
1.5	15	6.16	0.686	1.17	7.63	58.6	49.02	13.79
2	20	6.02	0.685	1.02	7.72	46.6	25.55	13.79
2.5	25	6.08	0.685	0.90	7.80	34.8	10.10	13.79
3	30	6.10	0.685	0.87	7.82	30.8	7.18	13.79
3.5	35	6.12	0.685	0.85	7.84	28.5	5.14	13.79
4	40	6.11	0.685	0.84	7.85	26.9	6.25	13.79
4.5	FINAL							
Chris Burke								

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

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

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

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

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

Sheen: Yes / No Odor: Yes / No Notes/Comments: VERY ORANGE - IRON

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, NO_3/N- as Nitrogen

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 | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/22/08 | Probe/Well #: MW08

Time: 1640 | Sample ID: 18FWOU623 WG

Sampler: SK

Weather: Cloudy / Windy | Outside Temperature: 65°F

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

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

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

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

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

Total Depth in Probe/Well (feet bloc): 22.18 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 16.90 | Depth tubing / pump intake set* approx 17.9 feet below top of casing

Column of Water in Probe/Well (feet): = 5.28 | *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): 0.86

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.90	0.688	11.34	6.56	88.8	4.22	17.04
1.0	10	4.73	0.685	7.51	6.58	99.3	1.86	17.04
1.5	15	4.42	0.684	4.56	6.60	106.5	1.29	17.04
2.0	20	4.39	0.676	3.305	6.61	112.1	1.10	17.04
2.5	25	4.25	0.674	1.76	6.62	115.0	1.14	17.04
3.0	30	4.27	0.668	1.39	6.63	117.1	1.01	17.04

SK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC / VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site
Date: 6/22/18 | Probe/Well #: MW 80
Time: 1555 | Sample ID: 18FWOU6 24 WG
Sampler: CB
Weather: MOSTLY CLOUDY/WINDY RAIN | Outside Temperature: 66°F
QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 9 | Turbidity Meter #: 12 | Water Level: 14
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product:

Column of Water in Probe/Well
Total Depth in Probe/Well (feet btoc): 46.80
Depth to Water from TOC (feet): − 13.15
Column of Water in Probe/Well (feet): = 33.65
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 5.5

Sampling Depth
Well Screened Across / (Below) water table
Depth tubing / pump intake set* approx. 41.8 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

NEW PUMP

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.73	0.368	1.34	8.20	20.3	254.7	13.16
1	10	6.72	0.370	0.92	8.21	14.2	208.9	13.16
1.5	15	6.72	0.374	0.77	8.22	10.7	176.1	13.16
2	20	6.21	0.376	0.59	8.28	2.8	69.8	13.16
2.5	25	5.59	0.376	0.55	8.30	-0.5	30.30	13.16
3	30	5.55	0.376	0.45	8.32	-1.9	17.29	13.16
3.5	35	5.52	0.377	0.43	8.32	-3.9	11.43	13.16
4	40	5.52	0.377	0.43	8.32	-4.0	10.48	13.16
4.5	45	5.51	0.378	0.40	8.32	-5.8	5.96	13.16
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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) N Approximate volume added (mL): HCl = ____ 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

Submersible Pump Equipment Blank

Rinsate #: RINSATE 01

Sample ID: 18FWOUGEB01WQ

Date: 6/21/18

Time: 1410

Analysis: Methane / VAP / ORS/NRO

Well that the pump was last used on: MW77

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 6/25/18
Probe/Well #: MW91
Time: 0915
Sample ID: 18FWOU625WG
Sampler: SK
Weather: Clear
Outside Temperature: 60°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes / No

Purge Method: Peristaltic Pump / Submersible / Bladder
Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 11 Water Level: SOL 13
Free Product Observed in Probe/Well? Yes / No If Yes, Depth to Product: X

Column of Water in Probe/Well
Total Depth in Probe/Well (feet btoc): 76.13
Depth to Water from TOC (feet): - 15.78
Column of Water in Probe/Well (feet): = 60.35
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 9.8

Sampling Depth: 20' screen
Well Screened Across / Below water table
Depth tubing / pump intake set* approx. 66.1 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.86	0.392	2.15	7.32	-127.5	1.11	15.79
1.0	10	5.99	0.392	1.27	7.35	-143.4	0.73	15.79
1.5	15	5.90	0.392	0.99	7.37	-150.0	0.64	15.79
2.0	20	5.82	0.392	0.79	7.38	-155.2	0.77	15.79
2.5	25	5.84	0.393	0.67	7.39	-157.2	0.46	15.79
3.0	30	5.80	0.392	0.63	7.40	-159.2	0.61	15.79

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: Y / N Approximate volume added (mL): HCl = NA HNO_3 = NA

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

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site
Date: 6/25/18 | Probe/Well #: MW48
Time: 1030 | Sample ID: 18FWOU626 WG
Sampler: JK
Weather: Clear | Outside Temperature: 57°F
QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 11 | Water Level: SOL 13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —

Column of Water in Probe/Well | Sampling Depth: 10' screen
Total Depth in Probe/Well (feet btoc): 20.34 | Well Screened/Across / Below water table
Depth to Water from TOC (feet): - 14.94 | Depth tubing / pump intake set* approx. 17 feet below top of casing
Column of Water in Probe/Well (feet): = 5.40 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): ~~0.88~~ 0.88

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.00	0.769	9.19	6.92	59.1	29.83	15.06
1.0	10	5.45	0.726	4.33	6.93	68.3	11.36	15.06
1.5	15	4.98	0.714	2.46	6.95	76.5	6.20	15.06
2.0	20	4.81	0.711	3.16	6.95	79.6	3.58	15.06
2.5	25	4.92	0.701	2.82	6.97	77.9	1.77	15.06
3.0	30	4.84	0.698	2.62	6.97	70.8	1.39	15.06

JK

Did groundwater parameters stabilize? (Yes) / No If no, why not?
Did drawdown stabilize? (Yes) / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?
Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) / N Comments:
Sheen: Yes / (No) Odor: Yes / (No) Notes/Comments:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): (VOC) VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) N Approximate volume added (mL): HCl = NA HNO_3 = 10

Purge Water
Gallons generated: 3.75 Containerized and disposed as IDW? (Yes) / No If No, why not?
Disposal method*: POL Water / ~~CERCLA Waste~~ * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: JK

GROUNDWATER SAMPLE FORM | OU6 | Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site

Date: 6/25/18 | Probe/Well #: MW13

Time: 1200 | Sample ID: 18FWOU6 27 WG

Sampler: SK

Weather: Clear | Outside Temperature: 60°F

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

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

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

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

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

Total Depth in Probe/Well (feet btoc): 19.21 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): − 15.09 | Depth tubing / pump intake set* approx. 16.1 feet below top of casing

Column of Water in Probe/Well (feet): = 4.12 | *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): 0.7

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	4.02	0.722	3.62	6.67	108.0	13.59	15.17
1.2	10	4.28	0.706	2.99	6.74	73.9	6.37	15.17
1.5	15	4.34	0.701	2.70	6.76	57.3	7.63	15.17
2.0	20	4.37	0.704	2.44	6.77	41.5	2.07	15.17
2.5	25	4.36	0.703	2.42	6.78	36.0	1.33	15.17
3.0	30	4.39	0.706	2.32	6.78	31.6	1.17	15.17

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, (VOC-LL), DRO, RRO, (Methane), (Dissolved Metals*), (Sulfate), (Alkalinity), (Ammonia), N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: ~~1330~~ 6/25/18 | Probe/Well #: ~~MW32R~~ MW32R

Time: 1330 | Sample ID: 18FWOU6 28 WG

Sampler: SK

Weather: Clear | Outside Temperature: 60°F

QA/QC Sample ID/Time/LOCID: 18FWOU629WG / 1345 / MW32I | MS/MSD Performed? Yes/No

DRO/RRO only

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

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 4 | Water Level: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 22.98

Depth to Water from TOC (feet): - 13.14

Column of Water in Probe/Well (feet): = 9.84

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 14.1 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

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

Volume of Water in 1 Probe/Well Casing (gal): 1.6

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.07	1.074	10.08	6.49	133.0	32.56	13.17
1.0	10	7.61	1.050	7.19	6.54	133.5	30.32	13.17
1.5	15	6.67	1.025	3.95	6.56	127.1	11.48	13.18
2.0	20	6.89	1.008	3.63	6.59	122.2	8.85	13.19
2.5	25	6.96	0.997	3.49	6.61	117.4	6.00	13.19
3.0	30	6.94 ✓	0.986 ✓	3.33 X	6.62 ✓	112.4 ✓	5.74	13.19

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

Submersible Pump Equipment Blank

Rinsate #: Rinsate 02

Sample ID: 18FW006EB02WQ

Date: 6/25/18

Time: 1700

Analysis: VOC-LL/DRO/RRO/Methane/Metals
SO_4/Alkalinity/Ammonia/($N+/N^-$ as Nitrogen)

Well that the pump was last used on: MW32R

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 9/20/18
Probe/Well #: MW39
Time: 1045
Sample ID: 18FWOU6 31 WG
Sampler: SK
Weather: Lt. Rain
Outside Temperature: 43 °F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes (No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder
Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: SOL/S
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): 31.98
Depth to Water from TOC (feet): - 14.38
Column of Water in Probe/Well (feet): = 17.60
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): 2.87

Sampling Depth 20' screen
Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 15.3 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)
0.5	5	7.22	0.440	1.84	7.02	-89.2	83.61	14.41
1.0	10	6.80	0.441	1.26	7.06	-102.9	56.65	14.41
1.5	15	6.70	0.441	1.19	7.07	-106.2	63.25	14.41
2.0	20	6.59	0.442	1.12	7.08	-109.6	47.86	14.41
2.5	25	6.53	0.443	1.09	7.08	-111.5	32.03	14.41
3.0	30	6.50	0.443	1.08	7.08	-113.6	34.81	14.41

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, (VOC-LL) DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: Y (N) Approximate volume added (mL): HCl = 2 HNO3 = 2

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

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 9/20/18
Probe/Well #: MW93
Time: 1200
Sample ID: 18FWOU6 32 WG
Sampler: SK
Weather: Lt. Rain
Outside Temperature: 43
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes (No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder
Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: SDL13
Free Product Observed in Probe/Well? Yes (No) If Yes, Depth to Product: 2

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 72.72
Depth to Water from TOC (feet): - 14.53
Column of Water in Probe/Well (feet): = 58.19
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): 9.5

Sampling Depth 20' Screen
Well Screened Across / (Below) water table
Depth tubing / pump intake set* approx. 62.7 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.03	0.376	2.17	7.37	-117.0	10.98	14.56
1.0	10	6.04	0.375	1.56	7.42	-132.6	7.62	14.56
1.5	15	5.97	0.375	1.28	7.46	-141.9	4.79	14.56
2.0	20	6.01	0.376	1.15	7.47	-146.7	3.77	14.56
2.5	25	6.00	0.376	1.07	7.48	-148.6	2.33	14.56
~~3.0~~	~~30~~							

SK

Did groundwater parameters stabilize? (Yes) / No If no, why not?
Did drawdown stabilize? (Yes) / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? (Yes) / No If no, why not?
Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) / N Comments:
Sheen: Yes / (No) Odor: (Yes) / No (Slight) Notes/Comments:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC (VOC-LL) DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = 2 HNO3 = 2

Purge Water

Gallons generated: 2.75 Containerized and disposed as IDW? (Yes) / No If No, why not?
Disposal method*: POL Water / (CERCLA Waste) * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 9/20/18
Probe/Well #: MW78
Time: 1330
Sample ID: 18FWOU633 WG
Sampler: SK
Weather: Cloudy
Outside Temperature: 43°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump / Submersible / Bladder
Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12
Water Level: ~~SWL~~ RH
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): 37.20
Depth to Water from TOC (feet): - 14.43
Column of Water in Probe/Well (feet): = 22.77
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): 3.7

Sampling Depth

10' Screen
Well Screened Across / Below water table
Depth tubing / pump intake set* approx. 32 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.77	0.446	1.41	7.04	-91.6	22.45	14.44
1.0	10	5.81	0.426	1.45	7.09	-110.7	22.92	14.45
1.5	15	6.48	0.425	2.72	7.15	-123.9	17.54	14.45
2.0	20	6.57	0.425	2.08	7.16	-127.0	16.45	14.45
2.5	25	6.73	0.424	1.75	7.16	-127.1	10.62	14.45
3.0	30	6.58	0.424	1.51	7.15	-127.6	8.03	14.45
			SK					

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: Y / N Approximate volume added (mL): HCl = 2 HNO3 = 2

Purge Water

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | **Site Location:** Former Communications Site

Date: ~~1440~~ 9/20/18 | **Probe/Well #:** MW 47

Time: 1440 | **Sample ID:** 18FWOU6 34 WG

Sampler: SK

Weather: Cloudy | **Outside Temperature:** 43°F

QA/QC Sample ID/Time/LOCID: 18FWOU635WG/1500/MW471 | **MS/MSD Performed?** Yes / No

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

Equipment Used for Sampling: YSI # 8 | **Turbidity Meter #:** 12 | **Water Level:** SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 19.83 | Well Screened **Across** / **Below** water table

Depth to Water from TOC (feet): - 13.98 | Depth tubing / pump intake set* approx. 15 feet below top of casing

Column of Water in Probe/Well (feet): = 5.85 | *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* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	8.05	0.693	6.44	6.83	17.5	16.22	14.04
1.0	10	8.16	0.685	5.30	6.86	31.5	12.11	14.04
1.5	15	7.67	0.682	4.70	6.85	41.3	6.11	14.04
2.0	20	7.65	0.677	4.49	6.85	45.3	5.81	14.04
2.5	25	7.74	0.679	4.26	6.86	50.1	5.29	14.04
3.0	30	7.78	0.682	4.23	6.85	53.2	4.11	14.04

SK

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

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

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

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

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

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

*** Dissolved metals include iron, manganese, phosphorus, and potassium**

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, NO_3/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 9/21/18
Probe/Well #: MW79
Time: 0930
Sample ID: 18FWOU6 36 WG
Sampler: SK
Weather: Rain
Outside Temperature: 46°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes / No

Purge Method: Peristaltic Pump / Submersible / Bladder
Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: SOL 13
Free Product Observed in Probe/Well? Yes / No If Yes, Depth to Product:

Column of Water in Probe/Well
Total Depth in Probe/Well (feet btoc): 21.61
Depth to Water from TOC (feet): - 16.01
Column of Water in Probe/Well (feet): = 5.60
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): 0.91

Sampling Depth: 10' screen
Well Screened Across / Below water table
Depth tubing / pump intake set* approx. 17 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.67	0.717	5.54	6.78	135.0	43.23	16.07
1.0	10	7.41	0.698	3.35	6.79	56.7	16.31	16.07
1.5	15	7.38	0.685	3.30	6.81	32.1	15.23	16.07
2.0	20	7.36	0.674	1.92	6.83	16.0	8.70	16.07
2.5	25	7.34	0.669	1.69	6.86	-2.3	4.54	16.07
3.0	30	7.32	0.668	1.51	6.87	-8.7	5.71	16.07

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: Y / N Approximate volume added (mL): HCl = NA HNO3 =

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | **Site Location:** Former Communications Site

Date: 9/21/18 | **Probe/Well #:** MW48

Time: 1040 | **Sample ID:** 18FWOU6 37 WG

Sampler: SK

Weather: Rain | **Outside Temperature:** 46°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 # 5 | **Turbidity Meter #:** 12 | **Water Level:** 502 13

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

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

Total Depth in Probe/Well (feet btoc): 20.34

Depth to Water from TOC (feet): - 14.03

Column of Water in Probe/Well (feet): = 6.31

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): 1.03

Well Screened (Across) / Below water table

Depth tubing / pump intake set* approx. 15 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize* ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.14	0.859	8.32	6.87	39.5	46.02	14.07
1.0	10	7.14	0.867	2.77	6.88	48.1	13.29	14.07
1.5	15	7.23	0.858	1.30	6.88	58.3	4.85	14.07
2.0	20	7.30	0.848	1.22	6.886	64.7	3.55	14.07
2.5	25	7.29	0.834	1.10	6.87	70.5	3.74	14.07
3.0	30	7.25 ✓	0.827 ✓	1.01 x	6.87 ✓	76.3 x	2.80 ✓	14.07

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:**

*** Dissolved metals include iron, manganese, phosphorus, and potassium**

Laboratory Analyses (Circle): VOC (VOC-LL) DRO, RRO, (Methane, Dissolved Metals*, Sulfate, Alkalinity) Ammonia, N+/N- as Nitrogen

pH checked of samples: (Y) N **Approximate volume added (mL):** HCl = NA HNO$_3$ = B

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 9/21/18 | Probe/Well #: MW 91

Time: 1115 | Sample ID: 18FWOU6 38 WG

Sampler: CB

Weather: RAIN | Outside Temperature: 47°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 # 599 | Turbidity Meter #: 14 | Water Level: 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): 76.13

Depth to Water from TOC (feet): - 14.55

Column of Water in Probe/Well (feet): = 61.58

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

Volume of Water in 1 Probe/Well Casing (gal): 10

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 66 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.41	0.378	1.06	7.22	-70.1	5.96	14.56
1	10	5.68	0.372	0.77	7.24	-90.2	5.02	14.56
1.5	15	5.64	0.370	0.66	7.26	-110.5	4.88	14.56
2	20	5.50	0.368	0.60	7.24	-112	2.12	14.56
2.5	25	5.46	0.368	0.58	7.23	-115.1	1.76	14.56
3	30	5.45	0.368	0.55	7.23	-116.2	2.12	14.56
3.5	35	5.42	0.367	0.55	7.23	-118.9	1.88	14.56

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

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

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

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

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

Sheen: Yes / No Odor: Yes / No Notes/Comments: WELL BROKEN BOX - COULD NOT GET SUB PUMP DOWN TO SCREEN.

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 9/21/18 | Probe/Well #: MW08

Time: 1200 | Sample ID: 18FWOU639 WG

Sampler: JK

Weather: Cloudy | Outside Temperature: 47°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 # X | Turbidity Meter #: 12 | Water Level: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 22.18 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 16.04 | Depth tubing / pump intake set* approx. 17.0 feet below top of casing

Column of Water in Probe/Well (feet): = 6.14 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Volume of Water in 1 Probe/Well Casing (gal): 1.0

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.83	0.608	4.13	6.61	110.7	5.91	16.05
1.0	10	5.99	0.606	2.37	6.68	115.9	4.31	16.05
1.5	15	6.01	0.605	2.11	6.64	118.4	3.20	16.05
2.0	20	6.06	0.604	1.85	6.65	120.1	3.74	16.05
2.5	25	5.98	0.604	1.72	6.65	121.8	1.83	16.05
3.0	30	5.94	0.603	1.66	6.65	123.6	1.37	16.05

JK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: JK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | **Site Location:** Former Communications Site

Date: 9/21/18 | **Probe/Well #:** MW13

Time: 1320 | **Sample ID:** 18FWOU6 40 WG

Sampler: CB

Weather: OVERCAST | **Outside Temperature:** 50°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:** 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): 19.21

Depth to Water from TOC (feet): - 14.04

Column of Water in Probe/Well (feet): = 5.17

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): 0.84

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)
0.75	5	5.00	1.033	0.78	6.61	60.5	25.50	14.18
1.5	10	4.92	0.962	0.65	6.54	58.2	13.13	14.20
2.25	15	4.88	0.948	0.65	6.55	59.0	9.76	14.21
3	20	4.76	0.942	0.65	6.54	58.7	5.11	14.21
3.75	25	4.78	0.941	0.62	6.55	59.9	2.80	14.21
4.5	~~30~~ FINAL	4.75	0.939	0.60	6.55	57.2	1.00	14.21
5.25	FINAL							

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

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

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

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

Well Condition: Locked (Y) / N Labeled with LOC ID: (Y) / N **Comments:** USED BRAND NEW PUMP

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

*** Dissolved metals include iron, manganese, phosphorus, and potassium**

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

Gallons generated: 4.5 Containerized and disposed as IDW? (Yes) / No If No, why not?

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 9/21/18
Probe/Well #: MW80
Time: 1330
Sample ID: 18FWOU6 41 WG
Sampler: SK
Weather: Rain
Outside Temperature: 48°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder
Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: 502 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): 46.80
Depth to Water from TOC (feet): - 12.33
Column of Water in Probe/Well (feet): = 34.47
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 5.6

Sampling Depth: 10' screen
Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 41.8 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.71	0.350	4.32	6.85	-30.9	14.45	12.36
1.0	10	5.13	0.366	2.64	7.02	-89.2	15.38	12.37
1.5	15	5.09	0.371	1.97	7.09	-105.2	11.77	12.37
2.0	20	5.19	0.371	1.78	7.13	-111.5	8.43	12.37
2.5	25	5.26	0.372	1.48	7.17	-116.9	5.93	12.37
3.0	30	5.22	0.372	1.33	7.18	-119.1	6.18	12.37

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-TL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = NA HNO3 = 0

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 9/21/18 | Probe/Well #: MW32R

Time: 1450 | Sample ID: 18FWOU6 42 WG

Sampler: CB

Weather: RAIN | Outside Temperature: _____ | DRO/RRO ONLY

QA/QC Sample ID/Time/LOCID: 18FWOU643WG / 1505 / MW321 | 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: 15

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): 22.98 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 12.20 | Depth tubing / pump intake set* approx. 18 feet below top of casing

Column of Water in Probe/Well (feet): = 10.78 | *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): 1.76

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)
0.75	5	7.00	0.837	1.31	6.73	83.7	143.3	12.23
1.5	10	6.77	0.819	1.20	6.66	91.8	48.48	12.23
2.25	15	6.75	0.789	1.00	6.63	95.2	25.19	12.23
3	20	6.70	0.785	0.97	6.63	96.0	17.05	12.23
3.75	25	6.68	0.786	0.94	6.63	97.8	12.95	12.23
4.5	30	6.65	0.790	0.80	6.63	101	5.05	12.24
5.25	35	6.62	0.792	0.82	6.63	105.2	4.72	12.24
6	40	6.63	0.792	0.81	6.63	106.5	4.60	12.24
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? → INITIAL

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | **Site Location:** Former Communications Site

Date: 9/21/18 | **Probe/Well #:** MW61

Time: 1500 | **Sample ID:** 18FWOU6 [redacted] 44WK

Sampler: SK

Weather: Cloudy | **Outside Temperature:** 47°F

VOC only

QA/QC Sample ID/Time/LOCID: 18FWOU645WK / 1510 / MW611 | **MS/MSD Performed?** Yes / No

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

Equipment Used for Sampling: YSI # 8 | **Turbidity Meter #:** 12 | **Water Level:** SOL13

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

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

Total Depth in Probe/Well (feet btoc): 20.15

Depth to Water from TOC (feet): - 12.79

Column of Water in Probe/Well (feet): = 7.36

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

Volume of Water in 1 Probe/Well Casing (gal): 1.2

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 13.75 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.36	0.697	6.10	6.77	-11.4	88.16	12.84
1.0	10	7.04	0.702	3.60	6.77	-20.5	48.44	12.84
1.5	15	6.85	0.707	2.63	6.79	-34.5	18.88	12.84
2.0	20	6.68	0.710	2.15	6.81	-44.1	12.16	12.84
2.5	25	6.78	0.716	1.74	6.83	-53.9	5.94	12.84
3.0	30	6.81	0.717	1.58	6.84	-58.5	6.27	12.84
			SK					

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

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

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

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

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

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

*** Dissolved metals include iron, manganese, phosphorus, and potassium**

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 9/21/18 | Probe/Well #: MW38

Time: 1615 | Sample ID: 18FWOU6 46 WG

Sampler: CB

Weather: OVERCAST | Outside Temperature: 50°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: 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): 19.80

Depth to Water from TOC (feet): - 12.68

Column of Water in Probe/Well (feet): = 7.12

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

Volume of Water in 1 Probe/Well Casing (gal): 1.2

Sampling Depth

Well Screened Across / Below water table

Depth tubing / pump intake set* approx. 14 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.75	5	6.63	0.716	0.82	6.97	-65.0	286	12.72
1.5	10	6.37	0.714	0.75	6.86	-64.1	71.29	12.72
2.25	15	6.30	0.713	0.62	6.82	-55.5	20.0	12.73
3	20	6.29	0.713	0.60	6.83	-53.8	15.2	12.73
3.75	25	6.29	0.713	0.59	6.82	-52.5	13.8	12.73
4.5	30	6.26	0.713	0.60	6.81	-52.6	16.1	12.73
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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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 | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site
Date: 9/26/18 | Probe/Well #: MW03
Time: 0910 | Sample ID: 18FWOU647 WG
Sampler: SK
Weather: Cloudy | Outside Temperature: 42°F
QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 12 | Water Level: 502.13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —

Column of Water in Probe/Well | Sampling Depth: 10' screen
Total Depth in Probe/Well (feet btoc): 22.30 | Well Screened (Across) / Below water table
Depth to Water from TOC (feet): - 13.34 | Depth tubing / pump intake set* approx. 14.3 feet below top of casing
Column of Water in Probe/Well (feet): = 8.96 | *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): 1.46

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize: ±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet after initial drawdown
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.14	0.566	3.97	6.41	0.4	249.1	13.35
1.0	10	6.97	0.568	2.40	6.61	-51.2	118.2	13.35
1.5	15	6.72	0.568	1.76	6.69	-74.4	46.75	13.35
2.0	20	6.76	0.568	1.56	6.72	-83.2	31.91	13.35
2.5	25	6.81	0.567	1.54	6.76	-89.5	16.25	13.35
3.0	30	6.85 ✓	0.567 ✓	1.42 ✓	6.77	-92.0	12.93	13.35

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = 0 HNO3 = 0

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site
Date: 9/26/18 | Probe/Well #: MW28
Time: 1040 | Sample ID: 18FWOU6 48 WG
Sampler: SK
Weather: Cloudy | Outside Temperature: 42°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 # 5 | Turbidity Meter #: 12 | Water Level: 30L 13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —
Column of Water in Probe/Well | Sampling Depth 10' Screen
Total Depth in Probe/Well (feet btoc): 19.06 | Well Screened (Across) / Below water table
Depth to Water from TOC (feet): - 15.17 | Depth tubing / pump intake set* approx. 16 feet below top of casing
Column of Water in Probe/Well (feet): = 3.94 | *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): 0.64

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	8.56	0.571	4.32	6.82	30.9	33.32	15.15
1.0	10	8.73	0.570	2.71	6.81	36.5	21.19	15.15
1.5	15	8.75	0.570	1.22	6.80	42.1	10.63	15.15
2.0	20	8.69	0.570	1.04	6.79	45.6	7.86	15.15
2.5	25	8.77	0.570	0.97	6.79	49.9	5.53	15.15
3.0	30	8.79	0.570	0.84	6.79	53.9	4.01	15.15

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): ~~VOC~~ VOC-LL DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) N Approximate volume added (mL): HCl = 8 HNO3 = 0

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 9/26/18 | Probe/Well #: MW 12R

Time: 1155 | Sample ID: 18FWOU6 49 WG

Sampler: SK

Weather: Cloudy | Outside Temperature: 42°F

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

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

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 12 | Water Level: 504 13

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

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

Total Depth in Probe/Well (feet btoc): 22.60 | Well Screened Across (Below) water table

Depth to Water from TOC (feet): - 10.50 | Depth tubing / pump intake set* approx. 17.6 feet below top of casing

Column of Water in Probe/Well (feet): = 12.10 | *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): 1.97

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.48	0.393	5.36	6.90	-71.0	13.40	10.53
1.0	10	6.56	0.392	3.09	6.95	-93.2	6.38	10.53
1.5	15	6.40	0.391	2.34	6.97	-99.8	2.48	10.53
2.0	20	6.52	0.390	1.95	6.98	-102.5	10.68	10.53
2.5	25	6.47	0.390	1.76	6.99	-105.5	7.15	10.53
3.0	30	6.45	0.390	1.51	7.01	-109.0	5.45	10.53

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:

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 9/26/18
Probe/Well #: MW33
Time: 13:15
Sample ID: 18FWOU6 50 WG
Sampler: SK
Weather: P. Cloudy
Outside Temperature: 47°F
QA/QC Sample ID/Time/LOCID: 18FWQU6 51 WG / 1335 / MW331
MS/MSD Performed? Yes / No

Purge Method: Peristaltic Pump / Submersible / Bladder
Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: SOL 13
Free Product Observed in Probe/Well? Yes / No If Yes, Depth to Product: —

Column of Water in Probe/Well
Sampling Depth: 10' screen
Total Depth in Probe/Well (feet btoc): 20.95
Well Screened Across / Below water table
Depth to Water from TOC (feet): - 13.48
Depth tubing / pump intake set* approx. 14.5 feet below top of casing
Column of Water in Probe/Well (feet): = 7.47
*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): 1.22

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.36	0.781	5.37	6.55	-91.7	9.97	13.59
1.0	10	7.54	0.779	3.52	6.60	-98.6	10.45	13.59
1.5	15	7.40	0.774	2.34	6.63	-104.1	10.58	13.59
2.0	20	7.44	0.7782	1.95	6.64	-105.9	11.41	13.59
2.5	25	7.42	0.767	1.59	6.65	-107.9	11.78	13.59
3.0	30	7.50 ✓	0.765 ✓	1.30 X	6.65 ✓	-109.0 ✓	11.85 ✓	13.59

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 Slight Odor: Yes / No Notes/Comments:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: Y / N Approximate volume added (mL): HCl = 0 HNO3 = 0

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site

Date: 9/26/18 | Probe/Well #: MW06A

Time: 1510 | Sample ID: 18FWOU6 52 WG

Sampler: SK | Outside Temperature: 49°F

Weather: Cloudy | MS/MSD Performed? Yes / No

QA/QC Sample ID/Time/LOCID:

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

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 12 | Water Level: SOL 13

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

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

Total Depth in Probe/Well (feet btoc): 22.41 | Well Screened Across / Below water table

Depth to Water from TOC (feet): - 13.68 | Depth tubing / pump intake set* approx. 14.6 feet below top of casing

Column of Water in Probe/Well (feet): = 8.73 | *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): 1.42

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	7.71	0.952	7.52	6.41	-5.9	16.53	13.72
1.0	10	7.32	0.863	4.15	6.45	-16.8	8.19	13.72
1.5	15	7.33	0.787	2.73	6.48	-27.3	7.38	13.72
2.0	20	7.32	0.737	2.19	6.52	-33.7	6.94	13.72
2.5	25	7.37	0.706	1.78	6.54	-41.5	5.02	13.72
3.0	30	7.34	0.697	1.53	6.54	-45.3	7.77	13.72
3.5	35	7.31	0.673	1.32	6.56	-50.3	4.58	13.72
4.0	40	7.35 ✓	0.665 x	1.27 x	6.52 ✓	-50.9 ✓	4.50 x	13.72
4.5	45	7.33	0.660	1.19	6.63	-60.4	4.15	13.72

SK

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

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

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

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

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

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

* Dissolved metals include iron, manganese, phosphorus, and potassium

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

Gallons generated: 5.0 | Containerized and disposed as IDW? Yes / No | If No, why not?

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site
Date: 9/26/18 | Probe/Well #: MW35
Time: 1645 | Sample ID: 18FWOU6 53 WG
Sampler: SK
Weather: Cloudy | Outside Temperature: 46°F
QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 12 | Water Level: SOL/3
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: 0

Column of Water in Probe/Well | Sampling Depth: 10' screen
Total Depth in Probe/Well (feet btoc): 19.13 | Well Screened (Across) / Below water table
Depth to Water from TOC (feet): - 11.82 | Depth tubing / pump intake set* approx. 12.8 feet below top of casing
Column of Water in Probe/Well (feet): = 7.31 | *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): 1.2

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.37	0.656	4.56	6.67	28.2	6.15	11.85
1.0	10	6.35	0.658	3.26	6.65	32.5	5.03	11.85
1.5	15	6.39	0.664	1.58	6.66	34.9	4.82	11.85
2.0	20	6.47	0.671	1.05	6.67	37.6	3.95	11.85
2.5	25	6.52	0.679	0.85	6.68	40.6	4.50	11.85
3.0	30	6.51	0.680	0.80	6.68	43.0	4.35	11.85
3.5	35	6.56	0.684	0.75	6.69	46.5	4.23	11.85

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y) / N Approximate volume added (mL): HCl = 0 HNO3 = 0

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

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07 | Site Location: Former Communications Site
Date: 9/26/18 | Probe/Well #: MW37
Time: 1835 | Sample ID: 18FWOU6 54 WG
Sampler: SK
Weather: Cloudy | Outside Temperature: 46°F
QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes / No

Purge Method: Peristaltic Pump / Submersible / Bladder | Sample Method: Peristaltic Pump / Submersible / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 12 | Water Level: SOL 13
Free Product Observed in Probe/Well? Yes/No | If Yes, Depth to Product:

Column of Water in Probe/Well

Total Depth in Probe/Well (feet btoc): 19.75
Depth to Water from TOC (feet): - 13.11
Column of Water in Probe/Well (feet): = 6.64
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.08

Sampling Depth 10' Screen

Well Screened Across / Below water table
Depth tubing / pump intake set* approx. 14 feet below top of casing
*Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	13.48	0.636	9.61	6.94	55.4	6.66	13.14
1.0	10	13.39	0.636	4.80	6.89	59.3	3.30	13.15
1.5	15	13.27	0.635	4.02	6.90	62.1	2.15	13.15
2.0	20	13.37	0.636	2.77	6.89	63.8	1.83	13.15
2.5	25	13.33	0.636	1.45	6.89	66.5	2.30	13.15
3.0	30	13.32	0.640	1.34	6.89	68.1	1.32	13.15

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 slight Notes/Comments:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y)/N Approximate volume added (mL): HCl = 0 HNO3 = 0

Purge Water

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

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | Site Location: Former Communications Site
Date: 9/27/18 | Probe/Well #: MW58
Time: 0900 | Sample ID: 18FWOU655WG
Sampler: SK
Weather: Clear | Outside Temperature: 32°F
QA/QC Sample ID/Time/LOCID: 18FWOU656WG / 0915 / MW581 | MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder | Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 5 | Turbidity Meter #: 12 | Water Level: SOL 13
Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: 2

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

Total Depth in Probe/Well (feet btoc): 18.26 | Well Screened (Across) / Below water table
Depth to Water from TOC (feet): - 10.91 | Depth tubing / pump intake set* approx. 12 feet below top of casing
Column of Water in Probe/Well (feet): = 7.35 | *Tubing/pump intake must be set approximately 2 feet below the water table for wells screened across the water table, or in the middle of the screened interval for wells screened below the water table
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.2

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.46	0.469	4.82	6.64	-48.3	231.4	10.96
1.0	10	5.81	0.469	3.19	6.83	-89.1	55.76	10.96
1.5	15	5.80	0.469	2.58	6.89	-101.0	27.00	10.96
2.0	20	5.80	0.468	2.13	6.91	-105.4	18.23	10.96
2.5	25	5.86	0.468	1.87	6.92	-107.6	12.04	10.96
3.0	30	5.83 ✓	0.468 ✓	1.60 X	6.92 ✓	-108.5 ✓	7.93 X	10.96

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:
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
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 / ~~DERCLA Waste~~ * Purge water stored in the DERA Building for characterization prior to disposal
Sampler's Initials: SK

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | **Site Location:** Former Communications Site

Date: 9/27/18 | **Probe/Well #:** MW77

Time: 0930 | **Sample ID:** 18FWOU6 57 WG

Sampler: CB

Weather: SUNNY | **Outside Temperature:** 32°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:** 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): 22.65 | Well Screened (Across) / Below water table

Depth to Water from TOC (feet): - 15.59 | Depth tubing / pump intake set* approx. 17 feet below top of casing

Column of Water in Probe/Well (feet): = 7.06 | *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): 1.15

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	4.80	0.827	0.21	6.58	26.2	27.92	15.72
1	10	4.81	0.830	0.15	6.65	21.5	14.26	15.74
1.5	15	4.81	0.833	0.11	6.66	20.0	10.11	15.74
2	20	4.81	0.835	0.12	6.68	18.8	5.57	15.74
2.5	25	4.81	0.835	0.11	6.69	19.0	5.32	15.74
3	30	4.80	0.836	0.10	6.69	19.9	3.30	15.74
3.25	FINAL							

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

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

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

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

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

Sheen: Yes / (No) **Odor:** (Yes) / No STRONG FUEL **Notes/Comments:**

*** Dissolved metals include iron, manganese, phosphorus, and potassium**

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+N as Nitrogen

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

Purge Water

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

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

Sampler's Initials: CB

GROUNDWATER SAMPLE FORM | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | **Site Location:** Former Communications Site

Date: 9/27/18 | **Probe/Well #:** MW62

Time: 1045 | **Sample ID:** 18FWOU6 58 WG

Sampler: CB

Weather: SUNNY | **Outside Temperature:** 36°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:** 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): 20.09

Depth to Water from TOC (feet): - 11.78

Column of Water in Probe/Well (feet): = 8.31

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): 1.35

Sampling Depth

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

Depth tubing / pump intake set* approx. 13 feet below top of casing

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

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	6.88	0.654	0.69	6.54	25.8	55.63	11.85
1	10	6.90	0.654	0.60	6.56	22.7	6.18	11.86
1.5	15	6.92	0.654	0.60	6.56	20.1	5.29	11.86
2	20	6.93	0.654	0.61	6.57	17.9	3.86	11.86
2.5	25	6.96	0.654	0.58	6.58	19.4	4.17	11.86
3	30	6.99	0.655	0.57	6.60	18.0	4.26	11.86
3.5	35	6.98	0.655	0.57	6.62	18.5	3.96	11.86
4	40	7.00	0.655	0.55	6.64	18.2	2.07	11.86
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:** WELL

Sheen: Yes / No **Odor:** Yes / No **Notes/Comments:** IN HOMEOWNERS BACK YARD

*** Dissolved metals include iron, manganese, phosphorus, and potassium**

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+N- as Nitrogen

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

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 | **OU6** | **Ft. Wainwright, Alaska**

Project #: 9011-07 | **Site Location:** Former Communications Site

Date: 9/27/18 | **Probe/Well #:** MW64

Time: 1030 | **Sample ID:** 18FWOU6 59 WG

Sampler: SK

Weather: Clear | **Outside Temperature:** 32°F

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

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

Equipment Used for Sampling: YSI # 8 | **Turbidity Meter #:** 2 | **Water Level:** SOL 13

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

Column of Water in Probe/Well | **Sampling Depth** 1.0' screen

Total Depth in Probe/Well (feet btoc): 20.04 | Well Screened **Across** / **Below** water table

Depth to Water from TOC (feet): - 12.41 | Depth tubing / pump intake set* approx. 13.4 feet below top of casing

Column of Water in Probe/Well (feet): = 7.63 | *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): 1.24

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

Field Parameters:		±3% (or ±0.2°C max)	*At least 3 of the 5 parameters below must stabilize*					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.63	0.512	3.67	7.03	-36.6	58.82	12.47
1.0	10	6.55	0.507	2.96	7.02	-37.3	21.99	12.47
1.5	15	6.47	0.504	1.64	7.01	-32.9	11.03	12.47
2.0	20	6.53	0.500	1.75	7.00	-31.7	7.35	12.47
2.5	25	6.50	0.496	1.99	6.99	-30.4	5.36	12.47
3.0	30	6.56	0.493	1.81	6.99	-28.5	3.63	13.47

SK

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

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

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

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

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

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

*** Dissolved metals include iron, manganese, phosphorus, and potassium**

Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen

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

Purge Water

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

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

Sampler's Initials: SK

GROUNDWATER SAMPLE FORM — OU6 — Ft. Wainwright, Alaska

Project #: 9011-07
Site Location: Former Communications Site
Date: 9/27/18
Probe/Well #: MW82
Time: 1130
Sample ID: 18FWOU6 60 WG
Sampler: JK
Weather: Clear
Outside Temperature: 33°F
QA/QC Sample ID/Time/LOCID: —
MS/MSD Performed? Yes/(No)

Purge Method: Peristaltic Pump / (Submersible) / Bladder
Sample Method: Peristaltic Pump / (Submersible) / Hydrasleeve / Bladder / Other
Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: SOL 13
Free Product Observed in Probe/Well? Yes/(No) If Yes, Depth to Product: —

Column of Water in Probe/Well
Total Depth in Probe/Well (feet btoc): 21.77
Depth to Water from TOC (feet): - 15.00
Column of Water in Probe/Well (feet): = 6.77
Circle: Gallons per foot of 1.25" (X 0.064) or (2" (X 0.163)) or 4" (X 0.65)
Volume of Water in 1 Probe/Well Casing (gal): 1.1

Sampling Depth: 10' screen
Well Screened (Across) / Below water table
Depth tubing / pump intake set* approx. 16 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

~~JK~~ JC

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

Field Parameters:		±3% (or ±0.2°C max)	At least 3 of the 5 parameters below must stabilize					<0.33 feet after initial drawdown
			±3%	±10% (<1mg/L, ±0.2 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.5	5	5.90	0.884	4.95	6.71	36.7	3.64	15.04
1.0	10	7.28	0.890	2.52	6.69	44.7	1.85	15.04
1.5	15	7.54	0.892	2.03	6.68	50.3	1.76	15.04
2.0	20	7.47	0.895	1.88	6.67	55.4	1.60	15.04
2.5	25	7.45	0.894	1.72	6.68	58.3	1.44	15.04
3.0	30	7.46	0.895	1.57	6.67	61.1	1.32	15.04

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: —
* Dissolved metals include iron, manganese, phosphorus, and potassium
Laboratory Analyses (Circle): VOC, VOC-LL, DRO, RRO, Methane, Dissolved Metals*, Sulfate, Alkalinity, Ammonia, N+/N- as Nitrogen
pH checked of samples: (Y)/N Approximate volume added (mL): HCl = 0 HNO3 = 0

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

Submersible Pump Equipment Blank

Rinsate #: Rinsate 05

Sample ID: 18FW 006 EB05WQ

Date: 9/27/18

Time: 1215

Analysis: DRO/RRO, NH_3/N^+/N^-, Diss. Metals, SO_4/Alk

Well that the pump was last used on: MW82

Submersible Pump Equipment Blank

Rinsate #: Rinsate 04

Sample ID: 18FW006EB04WQ

Date: 9/20/18

Time: ~~9/20~~ 1630

Analysis: VOC-LL / Methane / Diss Metals / SO_4 / Alk
Ammonia / $N^+/-$

Well that the pump was last used on: MW47

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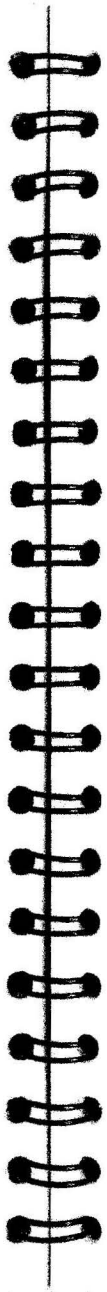

CHRIS BOESE
006 FT. WAINWRIGHT

Rite in the Rain
ALL-WEATHER
JOURNAL
№ 393N

CONTRACT #
W911KB-16-D-0005

F.E.S.
pit 907 3784630

PREP ITEMS INCLUDE:

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

CLEAN UP/END OF DAY ITEMS INCLUDE:

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

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OU6 FT WAINWRIGHT ①

6/20/18

0800 - GROUND WATER SAMPLE PREP. 0845 - 1245 - PREP AND CPS DRUMS. W/ BJ AT MOUT DRUM (PSE PROJECT) THEN MOBILIZE TO OU6 - TAWANA TRAILS 1420 - GWS MW03 - SEE FORM. 1610 - GWS MW38 → SEE FORM. CLEAN-UP. RETURN TO SHOP. CLEANUP 1730 - END OF DAY. NOTES: STOPPED BY AT 1108 TO TAKE PIC OF JK SAMPLING, 1328/1341 - PICS OF NEW PUMP USED IN MW03. 1350 - CB GWS AT MW03 1438 - PIC OF MW03 POST SAMPLE - (LOCKED). 1533 - PIC OF GWS SET UP ON MW38.

Chris Bolte

6/21/18

0800 - SHOP - GWS PREP

0900 - ARRIVE AT TAWANA TRAILS - 0908 - PIC OF JK AT MW58 - MOBE TO MW64 - 0933 - PIC OF SET UP ON MW64. 1003 PIC COLLECTING SAMPLE AT MW64. MOBE TO MW62. 1135 - GWS MW62 - 1115 PIC PIC OF SETUP 1144 - PIC OF LOCKED WELL POST SAMPLING - NOTE: WELL IS IN HOMEOWNERS BACK YARD. MOBE TO MW77. 1310 - GWS MW77 - SEE FORM. 1301 - PIC OF GW SET UP - RETURN TO SHOP. PACK/SHIP SAMPLES AND TRAVEL TO GOLDSTREAK. 1730 - END OF DAY NOTE COLLECTED) RINSATE AT 1410

② ↓

Chris Bolte

6/22/18

0930 - ARRIVE AT SHOP - GWS PREP + PREP TO

GET DIG PERMIT SIGNATURE FOR PSE PROJECT 1020 - ARRIVE ONSITE - PIC OF JK AT 1024. 1330 - BACK ONSITE - SET UP ON MW61. 1445 - SAMPLE MW61. 1555 - GWS MW80 PIC AT 1317 OF SET UP. MW47. 1310 - PIC OF NEW PUMP USED IN MW80. 1500 PIC OF JK AT MW79. CLEAN UP. 1615 - LEAVE SITE - SHOP - CLEAN UP. 1715 - END OF DAY.

Chr Boca

6/25/18

0925 - PIC OF JK DECON WLI 0926 - PIC OF GWS SETUP AT MW48.

~~tet~~ 9/21/18

0800 - SHOP - GWS PREP

~1000 - ON SITE. TALK W/ JK ABOUT PROJECT SPECIFICS. SET UP AND GWS MW91 AT 1115 - SEE FORM. LUNCH 1204 - 3 PICS OF JK GW SAMPLING. 1320 - GWS MW13 - SEE FORM. 1450/1505 - GWS MW32R + DUPLICATE - SEE FORM 1615. GWS MW38 - SEE FORM. CLEAN UP. 1630 LEAVE SITE ~1645 SHOP CLEAN UP. END OF THE DAY AT 1715.

Chr Boca

9/27/18

0730 - SHOP GWS PREP
~0830 - ON SITE. 0930 GWS MW77 - SEE FORM 1045 - GWS MW62 - SEE FORM. CLEAN UP 1055

Chr Boca

Rite in the Rain

OU6
Former Communication Site

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W911KB-16-D-0005
9011-07

10/17/2018 9101

6/20/18 Clear 57°F

0600 - Prepare sample gear and kit for sampling @ OU6
↳ calibrate instruments.

0800 - pick up tubing/pumps/Ritters @ TTT for today

0900 - Pick up ~~Acc~~ empty poly's from DERA Bldg.

0920 - Drive to OU6 to sample DRO wells.
↳ set up @ MW33/MS/MSD/Dup

1104 - CB & BJ stop by to take photos of sample collection.

1130 - move over to sample @ well MW12R

1300 - Water in 12R is very clear but there is neither sheen nor odor.

1/2

Rite in the Rain

2 6/20/18 Clear 75°F

1325 - Move to set up to sample @ well MW28 after bringing sampling materials to CB @ MW03

1500 - Completed @ MW28
↳ move to locate MW58

1510 - MW58 is covered by a parked car, move instead to MW06A.
↳ stop to take a photo of CB @ MW38

1700 - Completed sampling for today. Return to shop to decon pumps.

End Day @ 1800

2 JK

2/2

3 6/21/18 Cloudy 64°F

0600 - Prepare to continue sampling @ OU6
↳ calibrate YSI + Turbidimeter

0710 - Drive to OU6 site and set up to sample @ MW58/Dup

0725 - found well MW58 available to sample since cones were left around the well last night to discourage anyone from parking over it.

1330 - Sampled wells MW58, MW35, MW37, and MW82.
↳ Pick up IDW from CB and deliver to DERA Bldg.
↳ Transfer IDW into 4 IBC's

1730 - En-Route to shop to decon pumps: • Stop @ TT for pumps & Turbidity
• Pick up sample kit @ SGS
• Purchase DI water for Kinsates

End Day 10/17/2018 9:01

4

6/22/18 Lt Rain 59°F

0600 - Prepare for GW sampling @ OU6.

0650 - Drive to site.
↳ set up to sample @ MW78

0730 - QAPP WS#18 states that the screen interval is 9-19' the total depth is actually 37' btoc.
↳ assuming the SI is 10'

1150 - Sampled MW78, MW39, and MW79.
↳ Moved to sample MW91 only to find that the well has a break @ 12.90' btoc
↳ Moved onto sample @ MW93 to find that several trees were cut down and covering access to the well.

1/

5

6/22/18 PCloudy 66°F

1650 - Completed sampling for today @ OU6 +
↳ Deliver IDW to DERA

1830 → Pumps Decaid
→ Samples stored in the fridge

End Day

JK

10/17/2018 9:01

2/2

6/25/18 Pt. Cloudy 56°F

0600 - Prepare to finish the last 4 wells @ OU6

0740 - Drive to OU6 site.

0805 - Set up to sample @ MW91

1415 - Completed sampling @ OU6
↳ Deliver IDW to BERA then return to shop to collect Rinsate 02

1600 - Decon Pumps and Collect Rinsate 02

→ Stored samples in fridge

End Day @ 1700

JK

1/1

9/20/18 Rain 43°F

0615 - Prepare for OU6 GW
→ calibrate equipment
→ print forms
→ check in sample kit

0910 - Drive to site

0930 - arrive @ well MW39.

1042 - Completed sampling MW39.
↳ Demob to well MW93

1216 - Move to MW78

1322 - Move to set up @ MW47

1518 - Completed collecting MS/MSD @ MW47
↳ leaving site.

1630 - Rinsate Collected

End D 10/17/2018 30 9:02

1/1

9/21/18 Lt. Rain 46°F

1615 - Prepare for OU6 GW Sampling

0800 - Drive to Site.
↳ Fuel Van on the way.

0825 - Set up to sample MW79

1530 - Deliver IDW to DERA after completing sampling @ wells MW79, MW48, MW08, MW80 and MW61.
↳ grab extra polys for next week.

1615 - Put samples in fridge
↳ Decon ysi and place pumps in decon water to soak over the weekend.

End Day @ 1630 1/1

9/26/18 Cloudy 42°F

0615 - Prep gear for GW sampling @ OU6
↳ Calibrate YSI/Turbidimeter

~~0720~~ 0720 Drive to DERA to pick up empty polys

0750 - arrive @ Well MW03 to sample.

0914 - Move to well MW28

22

1830 - Completed sampling wells: MW28/MW12R/MW33/MW06A MW35/MW37
↳ Deliver IDW to DERA Bldg after loading gear into van.

1900 - ~~Dec~~ store samples in fridge. Clean out van and prep pumps for decon.

10/17/2018 9:02

End Day @ 2000

10 9/27/18 Clear 32°F

0615 - Prep for OU6 GW

0740 - set up to sample well MW58

1115 - Completed sampling MW64/MW82
↳ Return to shop to collect Rinsate

1230 - Begin COC and packing samples for shipment

1510 - Deliver coolers (6) to Goldstreak.

End Day @ 1600

JK

1/1

10/17/2018 9:02

APPENDIX B

CHEMICAL DATA QUALITY REVIEW, ADEC CHECKLISTS, AND SUPPORTING INFORMATION

FINAL

CHEMICAL DATA QUALITY REVIEW

Operable Unit 6 (2018)

Fort Wainwright, Alaska

NPDL # 18-088

Prepared: January 23, 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 Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP).

_____

Vanessa Ritchie
Senior Chemist

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
B	analytical result is qualified as a potential high estimate due to contamination present in a blank sample
°C	degree Celsius
CCV	continuing calibration verification
CDQR	Chemical Data Quality Review
COC	chain-of-custody
DL	detection limit
DoD	United States Department of Defense
DQO	data quality objective
DRO	diesel range organics
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
FES	Fairbanks Environmental Services, Inc.
ICV	initial calibration verification
J	analytical result is qualified as an estimated value due to its quantitation level (≥DL and <LOQ), or it may signify that there is a QC deviation and the bias is unknown
J+	analytical result is qualified as an estimated value with a high-bias due to a QC deviation
J-	analytical result is qualified as an estimated value with a low-bias due to a QC deviation
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
µg/L	micrograms per liter
MS	matrix spike sample
MSD	matrix spike duplicate sample
N	nitrogen
NA	not applicable
ND	non-detect
OU6	Operable Unit 6
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

ROD	Record of Decision
RRO	residual range organics
SDG	sample data group
SIM	selective ion monitoring
TCE	trichloroethene
UFP-QAPP	Postwide Uniform Federal Policy Quality Assurance Project Plans
USACE	United States Army Corps of Engineers
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 at the Operable Unit 6 (OU6) Former Communications Site during 2018. The groundwater sampling events are summarized in Section 1.3. Sample summary and analytical results tables are presented in Appendix C.

Fairbanks Environmental Services, Inc (FES) reviewed project and quality control (QC) analytical data to assess whether the data met the designated quality objectives and were acceptable for project use. The project data were reviewed for deviations to the requirements presented in the Final 2018 Postwide Work Plan (FES, 2018); Final Postwide Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP; FES, 2016); Alaska Department of Environmental Conservation (ADEC) Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling Technical Memo (ADEC, 2017b); and United States Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 5.1 (DoD, 2017). The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess contamination), project sample and laboratory quality control sample duplicates (to assess precision), laboratory control samples (LCSs) and sample surrogate recoveries (to assess accuracy), and matrix spike sample (MS) recoveries (to assess matrix effects). Calibration curves and continuing calibration verification (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 A.

Groundwater results and limits of detection (LODs) for non-detect results were compared to OU6 Record of Decision (ROD) remedial goals, or cleanup levels presented in Title 18 of the Alaska Administrative Code (AAC) Chapter 75.345, Table C (ADEC, 2018), as appropriate.

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

1.1 Analytical Methods and Data Quality Objectives

The analytical methods and associated data quality objectives (DQOs) used for this review were established in the 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 (µg/L)	Accuracy (%)	Precision (RPD, %)	Completeness (%)
Trichloroethene (TCE) [1]	SW5030B	SW8260C	0.30	79-123	20	90
1,2,3-Trichloropropane [1]	SW5030B	SW8260C-SIM	0.0050	73-122	20	90
Diesel Range Organics (DRO)	SW3520C	AK102	50	75-125	20	90
Residual Range Organics (RRO)	SW3520C	AK103	200	60-120	20	90
Iron (Fe) Manganese (Mn) Phosphorus (P) Potassium (K)	SW3010A	SW6010C	25.0 (Fe) 4.00 (Mn) 30.0 (P) 500 (K)	87-118 (Fe) 87-115 (Mn) 88-113 (P) 86-114 (K)	20	90
Sulfate	E300.0		198	87-112	15	90
Ammonia (as Nitrogen)	E350.1		400	90-110	20	90
Nitrate-Nitrite (as Nitrogen)	E353.2		100	90-110	20	90
Methane	RSK175		1.00	72-125	30	90
Alkalinity (as $CaCO_3$)	A2320B		1700	90-110	20	90

[1] Additional volatile organic compounds (VOCs) were analyzed by mid-level (8260C) and low-level (8260C-SIM) analyses, but only OU6 ROD analytes and natural attenuation parameters are shown. Limits for other VOCs are presented in the Work Plan (FES, 2018), associated laboratory reports, and results Table C-2.
µg/L – micrograms per liter
RPD – relative percent difference
SIM – selective ion monitoring

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

- *Accuracy* measures the correctness, or the closeness, between the true value and the quantity detected. It is measured by calculating the percent recovery of known concentrations of spiked compounds that were introduced into the appropriate sample matrix. Surrogate, LCS, and MS sample recoveries were used to measure accuracy for this project. LCS and surrogate recovery criteria are defined in the QSM.
- *Precision* measures the reproducibility of repetitive measurements. It is measured by calculating the relative percent difference (RPD) between duplicate samples. Laboratory duplicate samples, field duplicate samples, MS and matrix spike duplicate sample (MSD) pairs, and LCS and laboratory control sample duplicate (LCSD) pairs were used to measure precision for this project. LCS/LCSD precision criteria are defined in the QSM and field duplicate precision criteria are defined in the ADEC Laboratory Data Review Checklist (water: ≤30%).
- *Representativeness* describes the degree to which data accurately and precisely represents site characteristics. This is addressed in more detail in the following section(s).
- *Comparability* describes whether two data sets can be considered equivalent with respect to the project goal. This is addressed in more detail in the following section(s).

- *Sensitivity* describes the lowest concentration that the analytical method can reliably quantitate, and is evaluated by verifying that the detected results and/or LODs meet the project specific cleanup levels and/or screening levels.
- *Completeness* describes the amount of valid data obtained from the sampling event(s). It is calculated as the percentage of valid measurements compared to the total number of measurements. The completeness goal for this project was set at 90 percent.

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

1.2 Data Qualifiers

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

Table B-2. Data Qualifier Definitions

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

1.3 Summary of Groundwater Samples

A total of 60 groundwater samples (including 10 field duplicates) were collected from monitoring wells at OU6. Extra volume was collected for MS/MSD samples for every analysis and sample data group (SDG), at the minimum frequency of 1 per 20 samples. Five 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 quality control samples were analyzed by Agriculture & Priority Pollutants Laboratories, Inc. (APPL) of Clovis, CA. The laboratory is validated by the State of Alaska through the Contaminated Sites Program for applicable methods employed for this project, with the exceptions the following natural attenuation parameter: sulfate by United States Environmental Protection Agency (EPA) Method 300.0, ammonia as nitrogen by EPA Method 350.1, nitrate-nitrate as nitrogen by EPA Method 353.2, dissolved methane by RSK 175, and alkalinity as calcium carbonate by Standard Method 2320B. The aforementioned natural attenuation methods are not listed as Contaminated Sites analyses. The laboratory is also certified through the Environmental Laboratory Accreditation Program (ELAP) for all methods employed for this project.

All groundwater samples were shipped in four SDGs and assigned the APPL report numbers 86154, 86178, 86989, and 87031. A sample summary table (Table C-1) and an analytical results table (Table C-2) are included in Appendix C. Groundwater sample data quality is discussed in Section 2.

2.0 GROUNDWATER DATA QUALITY REVIEW

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

2.1 Sample Collection

All monitoring wells were purged and sampled with submersible pumps employing Teflon-lined pump tubing, with the exception of one well noted in the first bullet below. In addition, five equipment blank samples were collected from decontaminated submersible pumps to assess potential sampling 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 A. Groundwater sample forms were reviewed to ensure that well drawdown and groundwater parameters met the stabilization criteria identified in the ADEC Field Sampling Guidance (ADEC, 2017a) and the UFP-QAPP (FES, 2016), that low-flow sampling criteria was employed (Puls and Barcelona, 1996), and that all groundwater levels were within the screened intervals at the time of sampling, as appropriate. All samples met stabilization criteria and all water levels were within the screened interval during sample collection, with the exception of those noted below. Also summarized below are any notable issues/observations discovered during groundwater sampling activities or during review of the groundwater sample forms.

- All wells were sampled with a submersible pump except well MW91 (samples 18FWOU625WG and 18FWOU638WG. This well was purged and sampled using a bladder pump with new, disposable pump bladder and tubing due to a partial well obstruction.
- Free product was not observed on purge water from any well. Sheen was observed on purge water from wells MW33 and MW06A. Petroleum odor was noted during purging of 11 wells during the spring and/or fall sampling events.
- All wells were found screened across the water table during purging and sampling activities, with a few exceptions. Three sentry wells, MW78, MW91, and MW93, were screened below the water table to monitor potential diving of the contaminant plume towards the pump intake of the nearby Water Supply Well (Building 3559). Monitoring well MW80, located within the TCE plume area, was also screened below the water table to evaluate the vertical extent of contamination. Groundwater samples from these wells were collected from within the well screen in order to obtain a representative sample of the aquifer at depth.

2.2 Sample Handling

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

Sample Receiving Discrepancies

- (86989) One sample (18FWOU538WG) was inadvertently not included in the sample shipment received 9/25/18 in cooler 092401. The sample arrived with a later shipment on 9/28/18. The sample was logged in by the laboratory and the requested analysis completed within hold. No data were qualified as a result of the sample arriving in a different shipment.
- (87031) One sample (18FWOU660WG) arrived at the laboratory with two of the three vials broken. The laboratory was able to complete the requested analysis with the one remaining vial and data quality was not impacted.

Sample Headspace Discrepancies

- (86154) The laboratory indicated sample 18FWOU606WG contained headspace "larger than a pea". Methane was detected in the sample and the result was qualified (J-) as a potential low estimate. Impact to the project is negligible as methane is not a contaminant analyte and the results are used to evaluate natural attenuation processes.

Temperature Discrepancies

- (86154) Five of the six coolers arrived at the laboratory containing temperature blanks with readings within the ADEC recommended temperature range of 0° to 6° C. One cooler (ID 062101) containing samples for methane and dissolved metals analyses was received with a temperature blank reading of 7°C. However, the temperature criteria is not applicable to the select dissolved metals (iron, manganese, phosphorous, and potassium) reported in this work order. The metals samples were field filtered and preserved with nitric acid to a pH below 2, as required, so no data were impacted. The methane results for samples 18FWOU601WG through 18FWOU615WG, equipment blank sample 18FWOU5EB01WQ, and trip blank sample 18FWOU6TB01WQ were qualified (J-) as potential low estimates. Impact to the project is negligible as the temperature exceedance was marginal (1° C high), the samples were stored on site in a climate controlled environment, and the shipment was received on-ice and by the laboratory within 12 hours after shipping. Moreover, the affected methane data are used to evaluate natural attenuation processes and is not a site contaminant.

Holding Time Discrepancies

- (86178) Total alkalinity associated with this work order was re-analyzed 3 to 6 days past hold due to a low LCSD recovery in the initial analysis. The re-analysis confirmed the initial results.

The results of the initial analysis are reported and were qualified (J-), as appropriate, due to the low LCSD recovery. See Section 2.4 for further discussion.

- (87031) Sample 18FWOU660WG was inadvertently analyzed 12 days past the 14 day hold time for methane by Method RSK-175. Consequently, the non-detected result was qualified (J-) as a potential low estimate. However, impact to the project is likely not significant as methane was also not detected at this monitoring well sampled in June of 2018.

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. The analytes listed below were detected in method blank samples and were also detected in associated project samples at a concentration less than five-times that of the method blank. Consequently, these results were qualified (B) as potential laboratory cross-contamination. In all cases, impact to the project was negligible as the affected results do not have ADEC cleanup levels and are used to evaluate natural attenuation processes. Method blank contamination, including detections that did not result in data qualification, is further discussed in associated ADEC Checklists.

- Nitrate-nitrite as N: 18FWOU601WG, 18FWOU602WG, 18FWOU603WG, 18FWOU605WG, 18FWOU607WG, 18FWOU613WG, and equipment blank sample 18FWOU6EB01WQ (86154)
- Ammonia as N: 18FWOU601WG, 18FWOU602WG, 18FWOU603WG, and 18FWOU607WG (86154)

Trip Blanks

Trip blank samples were shipped in every cooler containing samples for volatile analyses. No trip blank contamination was noted.

Equipment Blanks

Five equipment blank samples were collected to evaluate the potential for submersible pump cross-contamination. The results of these equipment blank samples were compared against results of associated project samples. All samples are associated with an equipment blank except samples 18FWOU625WG and 18FWOU638WG. These samples were collected from monitoring well MW91, which was purged and sampled with a bladder pump due to a partial well obstruction (see Section 2.1). Analytes that were detected in equipment blank samples that resulted in data qualification are discussed below.

The following analytes were detected in equipment blank samples and were also detected in associated project samples within five-times the concentration detected in the equipment blank. Consequently, these analytical results were qualified (B) as potential submersible pump cross-contamination. In all cases, impact to data quality was negligible as the affected results were either not a site contaminant or were approximately two orders of magnitude or greater less than the applicable action level. Equipment blank contamination that did not result in data qualification is further discussed in associated ADEC Checklists.

(86178) – equipment blank 18FWOU6EB02WQ

- Ammonia as N: 18FWOU618WG and 18FW0U622WG
- Iron: 18FWOU620WG and 18FWOU628WG

(86989) – equipment blank 18FWOU6EB04WQ

- Manganese: 18FWOU637WG and 18FWOU639WG

2.4 Laboratory Control Samples

The LCS/LCSD samples were prepared by adding spike compounds to blank samples in order to assess laboratory extraction and instrumentation performance. The performance of a LCS sample is a requirement for every QC batch to evaluate recovery accuracy. In addition, a LCSD is required for all Alaska fuel methods to evaluate batch precision. For QC batches that do not contain a LCSD, precision is evaluated by performing a sample duplicate, which is further discussed in Section 2.5.

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

- (86178) The total alkalinity LCSD from analytical batch 180628A had a recovery (84.4%) that was below the lower control limit (90%). Due to the low LCSD recovery, the total alkalinity results for the following associated samples were qualified (J-) as potential low estimates: 18FWOU618WG, 18FWOU620WG through 18FWOU624WG, and 18FWOU626WG through 18FWOU628WG. Impact to the project is negligible as the LCSD recovery failure is marginal (less than 6%), the LCS had acceptable recovery, and the results were confirmed through re-analysis.
- (86989) The DRO LCS/LCSD in analytical batch 180927A had recoveries (both 130%) that were above the upper control limit (125%). Consequently, the DRO results for associated samples 18FWOU642WG and 18FWOU643WG were qualified (J+) as potential high estimates. However, impact to the project is not significant as the failures were marginal (5% high) and both results were approximately four times less than the ROD remedial goal.

- (86989) The RRO LCS/LCSD in analytical batch 180927A had recoveries (142% and 138%, respectively) that were above the upper control limit (120%). Consequently, the RRO results for associated samples 18FWOU642WG and 18FWOU643WG were qualified (J+) as potential high estimates. However, impact to the project is not significant as both results were greater than six times less than the ROD remedial goal.

2.5 Matrix Spike Samples and Sample Duplicates

MS samples were prepared by adding spike compounds to project samples in order to assess potential matrix interference. 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 in the extraction batches noted below. Although potential matrix interference could not be evaluated, batch accuracy and precision was evaluated through LCS/LCSD, laboratory duplicates, and/or MS/MSD analysis on another client's sample. More detail is provided on a case-by-case basis in the associated ADEC Laboratory Data Review Checklists.

- DRO/RRO: 180626A (86154); and 181005A (87031)
- Total Alkalinity: 231190 (86154 and 86178); and 181002B (86989); 1810021B (87031); and 233960A (86989 and 87031)
- Sulfate: 180703A (86154); A6180706 (86178); 181004A (86989); and 181006A (87031)
- VOC: 180703BT (86178); and 181003AL (86989)
- Low-level VOC: 181004AM and 1810031A (86989)
- Methane: 181023A (87031)

The accuracy of the analyte recoveries, and the precision of the MS/MSD or laboratory duplicate pairs, was evaluated (when analyzed). The accuracy of analyte recoveries for MS samples, and precision of the MS/MSD sample pair (when applicable), was evaluated The MS/MSD recovery and/or RPD exceedances that resulted in data qualification are summarized below. See the associated ADEC Laboratory Data Review Checklists for more elaborate details.

- (86178) The DRO MS/MSD prepared from sample 18FWOU628WG had recoveries (both 64.0%) that were below the lower control limit (75%). Consequently, the DRO results for the parent sample and associated field duplicate sample 18FWOU629WG were qualified (J-) as potential low estimates. The field duplicate result confirmed the parent result and similar low recoveries were observed in the RRO MS/MSD samples, discussed in the following bullet, indicating the potential for matrix interference. However, impact to the project is not significant as both results were nearly four times less than the ROD remedial goal. DRO has not exceeded the ROD remedial goal in the well (MW32R) since at least 2007.

- (86178) The RRO MS/MSD prepared from sample 18FWOU628WG had recoveries (both 56.2%) that were below the lower control limit (60%). Consequently, the RRO results for the parent sample and associated field duplicate sample 18FWOU629WG were qualified (J-) as potential low estimates. The field duplicate result confirmed the parent result and similar low recoveries were observed in the DRO MS/MSD samples, discussed above, indicating the potential for matrix interference. However, impact to the project is not significant as the failure was not significant (less than 4% low) and both results were greater than four times less than the ROD remedial goal.
- (86178) The total alkalinity MS/MSD prepared from sample 18FWOU620WG (analyzed on the initial run on 6/28/18) had recoveries (81.6% and 83.6%, respectively) that were below the lower control limit (90%). The total alkalinity result of the parent sample and associated field duplicate sample 18FWOU621WG were qualified (J-) as potential low estimates due to a low LCSD recovery (see discussion in Section 2.4) and no additional qualifiers were applied due to the low MS/MSD recoveries.
- (86989) The VOC MS and/or MSD prepared from sample 18FWOU644WG had recoveries below control limits for cis-1,2-dichloroethene (77.0% and 66.0% vs. 78%), trans-1,2-dichloroethene (73.0% and 65.0% vs. 75%), and trichloroethene (TCE) (78.3% vs. 79%). Consequently, the results in the parent sample were qualified (J-) as potential low estimates. However, impact to the project is not significant as the results were at least five times or greater below the ROD remedial goals or ADEC cleanup levels. Moreover, this well (MW61) is located within a known TCE plume and TCE has not exceeded the ROD remedial goal since 2010.
- (86178) The metals MSD prepared from sample 18FWOU628WG had recoveries for manganese (117%) and potassium (125%) that were above the upper control limits (both 114%). Consequently the manganese result in the parent sample was qualified (J+) as potential high estimate. Impact to the project is negligible as the manganese result was nearly and order of magnitude less than the cleanup level. Potassium was detected in the parent sample greater than the spike concentration, so recovery criteria were not applicable.
- (86989) The metals MSD prepared from sample 18FWOU634WG had recoveries for iron (117%), manganese (116%), phosphorus (114%), and potassium (115%) that were above the upper control limits (115%, 114%, 113%, and 114%, respectively). Iron and phosphorus were not detected in the parent sample or the associated field duplicate 18FWOU635WG and the results are considered unaffected by the high recoveries. Potassium was detected in the parent sample greater than the spike concentration, so recovery criterion was not applicable and potassium results were not qualified. Manganese in the parent sample and the associated field duplicate 18FWOU635WG were qualified (J+) as potential high estimates. Impact to the project is negligible as the failure is marginal (2%) and the manganese results were greater than an order of magnitude less than the cleanup level.
- (87031) The ammonia as N MSD prepared from sample 18FWOU650WG had a recovery (112%) that was above the upper control limit (110%). Consequently, the results in the parent sample and the associated field duplicate sample 18FWOU651WG were qualified (J+) as potential high estimates. Impact to the project is likely negligible as the recovery failure

was marginal (2% high), the MS recovery was acceptable, and ammonia as N does not have a cleanup level established.

2.6 Surrogate Recovery

Surrogate compounds were added to project samples by the laboratory prior to analysis, in accordance with method requirements. Surrogate recoveries were then calculated as percentages and reported by the laboratory as a measure of analytical extraction efficiency. No surrogate recoveries that were recovered outside acceptance limits resulted in qualifications to the data. See the associated ADEC Laboratory Data Review Checklists for more elaborate details.

2.7 Field Duplicates

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

Field duplicate results for detected analytes, contaminants of concern (detected and not detected), and natural attenuation parameters are summarized in Table B-3. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with "ND" and the LOD in brackets. If both results of the field duplicate pair were less than the 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) field duplicate sample results are within the ADEC criterion of ≤30% and, therefore, are considered comparable with the exceptions discussed below.

- (86154) Ammonia and N in field duplicate sample pair 18FWOU608WG/18FWOU609WG (189%). Ammonia was not detected in the primary sample and was detected above the LOQ in the field duplicate. Consequently, the ammonia as N results in these samples were qualified (J) as estimates due to imprecision. Impact to the project is negligible as the analyte is not a site contaminant. The results are used to evaluate natural attenuation. All other natural attenuation parameters had RPD values within acceptance limits.
- (87031) Methane (38%) in field duplicate pair 18FWOU650WG/18FWOU651WG. Consequently, the methane results in these samples were qualified (J) as estimates due to imprecision. However, the imprecision has a negligible impact to the project as the results were more than an order of magnitude greater than the LOQs and methane is not a site contaminant (results are used to evaluate natural attenuation processes).

Table B-3. Groundwater Field Duplicate Sample Results Evaluation

Analyte	Method	Units	Primary 18FWOU601WG[1] (MW33)	Field Duplicate 18FWOU602WG[1] (MW331)	RPD, %	Comparable Criteria Met? [5]
Diesel Range Organics	AK102	µg/L	25,000 [1000]	25,000 [1000]	0	YES
Residual Range Organics	AK103	µg/L	ND [4000]	ND [4000]	0	YES
Iron	SW6010C	mg/L	45.9 [0.025]	43.8 [0.025]	5	YES
Manganese	SW6010C	mg/L	3.17 [0.004]	2.96 [0.004]	7	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.244 [0.03]	0.213 [0.03]	14	YES
Potassium	SW6010C	mg/L	5.16 [0.5]	4.75 [0.5]	8	YES
Sulfate	E300.0	mg/L	4.0 [0.198]	4.0 [0.198]	0	YES
Ammonia as N	E350.1	mg/L	0.33 [0.40] J,B	0.33 [0.40] J,B	0	Not applicable
Nitrate-Nitrite as N	E353.2	mg/L	0.11 [0.100] B	0.11 [0.100] B	0	YES
Methane	RSK175	mg/L	0.28 [0.001] J-	0.26 [0.001] J-	7	YES
Alkalinity as CaCO3	A2320B	mg/L	314 [1.70]	320 [1.70]	2	YES
Analyte	**Method**	**Units**	**Primary 18FWOU608WG[1] (MW58)**	**Field Duplicate 18FWOU609WG[1] (MW581)**	**RPD, %**	**Comparable Criteria Met? [5]**
Diesel Range Organics	AK102	µg/L	2,300 [50]	2,500 [100]	8	YES
Residual Range Organics	AK103	µg/L	ND [400]	ND [400]	0	Not applicable
Iron	SW6010C	mg/L	14 [0.025]	12.4 [0.025]	12	YES
Manganese	SW6010C	mg/L	1.13 [0.004]	1.1 [0.004]	3	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.0658 [0.03]	0.0639 [0.03]	3	YES
Potassium	SW6010C	mg/L	4.34 [0.5]	4.44 [0.5]	2	YES
Sulfate	E300.0	mg/L	16.8 [0.990]	17.3 [0.990]	3	YES
Ammonia as N	E350.1	mg/L	ND [0.40] J	4.2 [0.40] J	189	NO
Nitrate-Nitrite as N	E353.2	mg/L	0.50 [0.100]	0.55 [0.100]	10	YES
Methane	RSK175	mg/L	0.2 [0.001] J-	0.27 [0.001] J-	30	YES
Alkalinity as CaCO3	A2320B	mg/L	240 [1.70]	241 [1.70]	0	YES
Analyte	**Method**	**Units**	**Primary 18FWOU620WG[2] (MW47)**	**Field Duplicate 18FWOU621WG[2] (MW471)**	**RPD, %**	**Comparable Criteria Met? [5]**
1,2,3-Trichloropropane	8260SIM	µg/L	0.28 [0.0050]	0.28 [0.0050]	0	YES
Vinyl chloride	8260SIM	µg/L	ND [0.015]	ND [0.015]	0	Not applicable
Iron	SW6010C	mg/L	0.038 [0.025] J	ND [0.025]	104	Not applicable
Manganese	SW6010C	mg/L	0.0211 [0.004]	0.0189 [0.004]	11	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.042 [0.03] J	0.0229 [0.03] J	59	Not applicable
Potassium	SW6010C	mg/L	5.44 [0.5]	5.56 [0.5]	2	YES
Sulfate	E300.0	mg/L	37.1 [0.198]	35.9 [0.198]	3	YES
Ammonia as N	E350.1	mg/L	ND [0.40]	ND [0.40]	0	Not applicable
Nitrate-Nitrite as N	E353.2	mg/L	3.6 [0.100]	3.9 [0.100]	8	YES
Methane	RSK175	mg/L	ND [0.001]	ND [0.001]	0	Not applicable
Alkalinity as CaCO3	A2320B	mg/L	331 [1.70] J-	326 [1.70] J-	4	YES

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

Analyte	Method	Units	Primary 18FWOU622WG[2] (MW61)	Field Duplicate 18FWOU630WG[2] (MW611)	RPD, %	Comparable Criteria Met? [5]
1,1-Dichloroethene	SW8260C	µg/L	ND [0.50]	ND [0.50]	0	Not applicable
1,2,3-Trichloropropane	SW8260C	µg/L	ND [1.00]	ND [1.00]	0	Not applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	5 [0.30]	4.5 [0.30]	11	YES
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable
trans-1,2-Dichloroethene	SW8260C	µg/L	5.9 [0.30]	6.2 [0.30]	5	YES
Trichloroethene (TCE)	SW8260C	µg/L	0.73 [0.30] J	0.79 [0.30] J	8	Not applicable
Vinyl chloride	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable
Analyte	**Method**	**Units**	**Primary 18FWOU628WG[2] (MW32R)**	**Field Duplicate 18FWOU629WG[2] (MW321)**	**RPD, %**	**Comparable Criteria Met? [5]**
Diesel Range Organics	AK102	µg/L	390 [50]	390 [50]	0	YES
Residual Range Organics	AK103	µg/L	230 [200] J	170 [200] J	30	Not applicable
Analyte	**Method**	**Units**	**Primary 18FWOU634WG[3] (MW47)**	**Field Duplicate 18FWOU635WG[3] (MW471)**	**RPD, %**	**Comparable Criteria Met? [5]**
1,2,3-Trichloropropane	8260SIM	µg/L	0.19 [0.0050]	0.20 [0.0050]	5	YES
Vinyl chloride	8260SIM	µg/L	ND [0.015]	ND [0.015]	0	Not applicable
Iron	SW6010C	mg/L	ND [0.025]	ND [0.025]	0	Not applicable
Manganese	SW6010C	mg/L	0.0295 [0.004] J+	0.0311 [0.004] J+	5	YES
Phosphorus, Total (as P)	SW6010C	mg/L	ND [0.03]	ND [0.03]	0	Not applicable
Potassium	SW6010C	mg/L	6.66 [0.5]	6.5 [0.5]	2	YES
Sulfate	E300.0	mg/L	39.5 [0.198]	39.4 [0.198]	0	YES
Ammonia as N	E350.1	mg/L	ND [0.40]	ND [0.40]	0	Not applicable
Nitrate-Nitrite as N	E353.2	mg/L	9.1 [1.000]	8.6 [1.000]	6	YES
Methane	RSK175	mg/L	ND [0.001]	ND [0.001]	0	Not applicable
Alkalinity as CaCO3	A2320B	mg/L	314 [1.70]	320 [1.70]	2	YES
Analyte	**Method**	**Units**	**Primary 18FWOU642WG[3] (MW32R)**	**Field Duplicate 18FWOU643WG[3] (MW321)**	**RPD, %**	**Comparable Criteria Met? [5]**
Diesel Range Organics	AK102	µg/L	380 [50]	370 [50]	3	YES
Residual Range Organics	AK103	µg/L	180 [200] J	150 [200] J	18	Not applicable
1,2,3-Trichloropropane	8260SIM	µg/L	ND [0.0050]	ND [0.0050]	0	Not applicable
Vinyl chloride	8260SIM	µg/L	ND [0.015]	ND [0.015]	0	Not applicable
Iron	SW6010C	mg/L	0.123 [0.025]	0.147 [0.025]	18	YES
Manganese	SW6010C	mg/L	0.215 [0.004]	0.222 [0.004]	3	YES
Phosphorus, Total (as P)	SW6010C	mg/L	ND [0.03]	ND [0.03]	0	Not applicable
Potassium	SW6010C	mg/L	6.77 [0.5]	6.68 [0.5]	1	YES
Sulfate	E300.0	mg/L	48.7 [0.396]	48.9 [0.396]	0	YES
Ammonia as N	E350.1	mg/L	ND [0.40]	ND [0.40]	0	Not applicable
Nitrate-Nitrite as N	E353.2	mg/L	3.1 [0.100]	3.2 [0.100]	3	YES
Methane	RSK175	mg/L	0.011 [0.001]	0.011 [0.001]	0	YES
Alkalinity as CaCO3	A2320B	mg/L	327 [1.70]	322 [1.70]	2	YES

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

Analyte	Method	Units	Primary 18FWOU644WG[3] (MW61)	Field Duplicate 18FWOU645WG[3] (MW611)	RPD, %	Comparable Criteria Met? [5]
1,1-Dichloroethene	SW8260C	µg/L	ND [0.50]	ND [0.50]	0	Not applicable
1,2,3-Trichloropropane	SW8260C	µg/L	ND [1.0]	ND [1.0]	0	Not applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	6.7 [0.30]	5.9 [0.30]	13	YES
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable
trans-1,2-Dichloroethene	SW8260C	µg/L	6.2 [0.30]	5.5 [0.30]	12	YES
Trichloroethene (TCE)	SW8260C	µg/L	1.0 [0.30]	0.99 [0.30] J	1	YES
Vinyl chloride	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable
Analyte	**Method**	**Units**	**Primary 18FWOU650WG[4] (MW33)**	**Field Duplicate 18FWOU651WG[4] (MW331)**	**RPD, %**	**Comparable Criteria Met? [5]**
Diesel Range Organics	AK102	µg/L	39,000 [1000]	43,000 [1000]	10	YES
Residual Range Organics	AK103	µg/L	ND [4000]	ND [4000]	0	Not applicable
Iron	SW6010C	mg/L	43.9 [0.025]	42.7 [0.025]	3	YES
Manganese	SW6010C	mg/L	3.58 [0.004]	3.38 [0.004]	6	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.268 [0.03]	0.269 [0.03]	0	YES
Potassium	SW6010C	mg/L	5.41 [0.5]	4.85 [0.5]	11	YES
Sulfate	E300.0	mg/L	6.8 [0.198]	7.0 [0.198]	3	YES
Ammonia as N	E350.1	mg/L	0.42 [0.40] J,J+	0.50 [0.40] J+	17	YES
Nitrate-Nitrite as N	E353.2	mg/L	ND [0.100]	0.034 [0.100] J	19	Not applicable
Methane	RSK175	mg/L	0.19 [0.001] J	0.13 [0.001] J	38	NO
Alkalinity as CaCO3	A2320B	mg/L	336 [1.70]	337 [1.70]	0	YES
Analyte	**Method**	**Units**	**Primary 18FWOU655WG[4] (MW38)**	**Field Duplicate 18FWOU656WG[4] (MW581)**	**RPD, %**	**Comparable Criteria Met? [5]**
Diesel Range Organics	AK102	µg/L	3,000 [50]	3,600 [50]	18	YES
Residual Range Organics	AK103	µg/L	ND [200]	ND [200]	0	Not applicable
Iron	SW6010C	mg/L	15.9 [0.025]	16 [0.025]	1	YES
Manganese	SW6010C	mg/L	1.13 [0.004]	1.14 [0.004]	1	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.0738 [0.03]	0.0768 [0.03]	4	YES
Potassium	SW6010C	mg/L	4.54 [0.5]	4.25 [0.5]	7	YES
Sulfate	E300.0	mg/L	19.2 [0.198]	19.2 [0.198]	0	YES
Ammonia as N	E350.1	mg/L	0.14 [0.40] J	0.12 [0.40] J	15	Not applicable
Nitrate-Nitrite as N	E353.2	mg/L	0.056 [0.100] J	0.042 [0.100] J	29	Not applicable
Methane	RSK175	mg/L	0.11 [0.001]	0.1 [0.001]	10	YES
Alkalinity as CaCO3	A2320B	mg/L	208 [1.70]	210 [1.70]	1	YES

The LODs are presented for non-detect results and were used for RPD calculations.
[1] – The samples are associated with report 86154
[2] – The samples are associated with report 86178
[3] – The samples are associated with report 86989
[4] – The samples are associated with report 87031
[5] – RPD of ≤30 percent was used for evaluating water-matrix field duplicate samples.
J – Result is estimated since it is reported below the LOQ, or it is qualified due to imprecision
RPD – relative percent difference
ND – non-detect results

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; however, no discrepancy resulted in data qualification (e.g., high CCV recoveries but associated project results were non-detect). All discrepancies are discussed in detail in associated ADEC Laboratory Data Review Checklists.

2.9 Analytical Sensitivity

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

Analytical sensitivity was evaluated to verify that LODs met the applicable OU6 ROD remedial goals and ADEC cleanup level, 18 AAC 75.345, Table C (ADEC, 2018) for non-detect results. RRO by AK103 in four samples did not meet the action level due to sample dilutions and/or matrix interference (reports 86154 and 87031). Also, 1,2,3-trichloropropane and vinyl chloride analyzed by mid-level SW8260C did not meet the applicable action level in all samples submitted for this analysis (reports 86178 and 86989). However, for monitoring wells located in areas where 1,2,3-trichloropropane and vinyl chloride groundwater contaminant plumes exist, samples were submitted for analysis of these two analytes by low-level method 8260C-SIM. Method 8260C-SIM provides an LOD that is less than the ROD remedial goal and ADEC cleanup level.

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 on the next page summarizes the qualified 2018 groundwater results associated with the sampling events at the OU6 site, 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
86154	18FWOU601WG, 18FWOU602WG, 18FWOU603WG, 18FWOU605WG, 18FWOU607WG, 18FWOU613WG, equipment blank 18FWOU6EB01WQ	Nitrate-nitrite as N	B	Method blank contamination
	18FWOU601WG, 18FWOU602WG, 18FWOU603WG, 18FWOU607WG	Ammonia as N		
	18FWOU601WG – 18FWOU615WG equipment blank 18FWOU6EB01WQ trip blank 18FWOU6TB01WQ	Methane	J-	High receiving temperature
	18FWOU606WG			Sample headspace
	18FWOU608WG, 18FWOU609WG	Ammonia as N	J	Field duplicate imprecision
86178	18FWOU618WG, 18FW0U622WG	Ammonia as N	B	Equipment blank contamination
	18FWOU620WG, 18FWOU628WG	Iron		
	18FWOU618WG, 18FWOU620WG – 18FWOU624WG, 18FWOU626WG – 18FWOU628WG	Total alkalinity	J-	Low LCS/LCD recovery
	18FWOU628WG, 18FWOU629WG	DRO RRO		Low MS/MSD recovery
	18FWOU628WG	Manganese	J+	High MS/MSD recovery
86989	18FWOU637WG, 18FWOU639WG	Manganese	B	Equipment blank contamination
	18FWOU642WG, 18FWOU643WG	DRO RRO	J+	High LCS/LCSD recovery
	18FWOU634WG, 18FWOU635WG	Manganese		High MS/MSD recovery
	18FWOU644WG	cis-1,2-Dichloroethene trans-1,2-Dichloroethene Trichloroethene (TCE)	J-	Low MS/MSD recovery
87031	18FWOU650WG, 18FWOU651WG	Ammonia as N	J+	High MS/MSD recovery
	18FWOU650WG, 18FWOU651WG	Methane	J	Field duplicate imprecision
	18FWOU660WG		J-	Sample hold time exceedance

2.11 Completeness

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

A breakdown of the points received for each category and method is shown in Table B-5. All OU6 site data quality categories met the completeness criteria of 90 percent established in the UFP-QAPP for the sampling events. No data were rejected pursuant to the data quality review, and all data may be used, as qualified, for the purposes of the 2018 Annual Monitoring Report.

Table B-5. Completeness Scores for Groundwater Samples

Data Quality Category	Points VOC	Points LLVOC	Points DRO	Points RRO	Points Dissolved Metals	Points Sulfate	Points Ammonia as N	Points Nitrate-Nitrite as N	Points Methane	Points Alkalinity as CaCO3
Sample Collection	10	10	10	10	10	10	10	10	10	10
COC Documentation	10	10	10	10	10	10	10	10	10	10
Sample Containers/	10	10	10	10	10	10	10	10	9	10
Cooler Temperature	10	10	10	10	10	10	10	10	8	10
Holding Times	10	10	10	10	10	10	10	10	9	10
Method Blanks	10	10	10	10	10	10	9	9	10	10
Trip Blanks	10	10	NA	NA	NA	NA	NA	NA	10	NA
Equipment Blank	10	10	10	10	9	10	9	10	10	10
LCS/LCSD Recovery & RPD	10	10	9	9	10	10	10	10	10	9
MS/MSD Recovery & RPD	9	10	9	9	9	10	9	10	10	9
Surrogate Recovery	10	10	10	10	NA	NA	NA	NA	NA	NA
Field Duplicate	10	10	10	10	10	10	9	10	9	10
CCV, Internal Stds, other	10	10	10	10	10	10	10	10	10	10
Sensitivity (DL/LOD)	10	10	10	10	10	10	10	10	10	10
Total Points Received	139	140	128	128	118	120	116	119	125	118
Total Points Possible	140	140	130	130	120	120	120	120	130	120
Percent Completeness	99	100	98	98	98	100	97	99	96	98

NA – not applicable

3.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2018. *18 AAC 75, Oil and Other Hazardous Substances Pollution Control*. As amended through October 27, 2018.

ADEC, 2017a. *Field Sampling Guidance*. August.

ADEC, 2017b. *Technical Memorandum – Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling.* March.

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

Fairbanks Environmental Services (FES), 2018. *Final 2018 Postwide Work Plan, Fort Wainwright, Alaska.* July.

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:

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

Title:

Chemist, ERM

Date:

12/11/2018

CS Report Name:

Operable Unit 6, Fort Wainwright, Alaska

Report Date:

07/09/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

Agriculture & Priority Pollutants Laboratories, Inc (APPL) – Clovis, CA

Laboratory Report Number:

86154

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

86154

1. Laboratory

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

   (•) Yes ( ) No Comments:

Yes; however, methods 300.0, 350.1, 353.2, RSK175, and SM2320B are not listed as CS analyses.

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

   (•) Yes ( ) No 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:

Cooler 062101, containing all samples for methane and dissolved metals analysis, was recorded with a temperature greater than 6° C at 7° C. However, the temperature criteria is not applicable to the select dissolved metals (iron, manganese, phosphorous, and potassium) reported in this work order. The metals samples were field filtered and preserved with nitric acid to a pH below 2, as required, so no data were impacted. The methane results for samples 18FWOU601WG through 18FWOU615WG, equipment blank sample 18FWOU5EB01WQ, and trip blank sample 18FWOU6TB01WQ were qualified (J-) as potential low estimates. Impact to the project is negligible as the temperature exceedance was marginal (1° C high), the samples were stored on site in a climate controlled environment, and the shipment was received on-ice and by the laboratory within 12 hours after shipping. Moreover, the affected methane data are used to evaluate natural attenuation processes and is not a site contaminant.

   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:

The laboratory indicated sample 18FWOU606WG contained headspace “larger than a pea”. Methane was detected in the sample and the result was qualified (J-) as a potential low estimate. Impact to the project is negligible as methane is not a contaminant analyte and the results are used to evaluate natural attenuation processes.

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:

See sections 3a and 3c.

e. Data quality or usability affected?

Comments:

See sections 3a and 3c.

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 method blank contamination and MS/MSD recovery discrepancies, which are discussed in sections 6a, and 6b, respectively. The case narrative also discussed a CCV recovery discrepancy and manual integrations, which are discussed here.

Manual integrations were performed on five samples and three LCS samples for DRO in accordance with the laboratories SOP. Data were not impacted by the laboratory performing manual integrations as needed.

The nitrate-nitrite as N CCV associated with analytical batch 180626A analyzed 07/02/18 at 17:11 was recovered above the upper control limit. Only the equipment blank sample 18FWOU6EB01WQ was bracketed by this CCV. Although the nitrate-nitrite as N result in the equipment blank sample may be a high estimate, impact to the project is not significant as the equipment blank result was also attributed to, and qualified for, laboratory-introduced contamination, as discussed in section 6a. No additional qualifications were applied as a result of the CCV recovery discrepancy.

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

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

Comments:

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

5. Samples Results

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

(•) Yes ( ) No Comments:

b. All applicable holding times met?

(•) Yes ( ) No Comments:

c. All soils reported on a dry weight basis?

(•) Yes ( ) No Comments:

Not applicable, soil samples were not part of this work order.

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

( ) Yes (•) No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ADEC cleanup level and the OU6 ROD remedial goals for non-detect results. RRO in two samples did not meet action levels due to sample dilutions and/or matrix interference.

All affected results are identified with gray shading in the results table (Table C-2) presented in the OU6 Report.

e. Data quality or usability affected?

( ) Yes (•) No Comments:

See discussion above in 5d.

6. QC Samples

a. Method Blank

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

(•) Yes ( ) No Comments:

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

(•) Yes ( ) No Comments:

No analytes were detected in method blanks at concentrations exceeding the LOQ; however, total alkalinity, nitrate-nitrite as N, and ammonia as N, were detected at concentrations below the LOQ, as discussed below.

Total alkalinity (4.4 mg/L) was detected in method blank sample 180625A-BLK contained in batch 180625A at a concentration above the LOQ (2.0 mg/L). Total alkalinity was detected in associated samples at concentrations greater than five-times that of the method blank sample, so no data were impacted.

Nitrate-nitrite as N (0.041 mg/L) and ammonia as N (0.21 mg/L) were detected in method blank samples associated with batch 180626A at concentrations below the LOQs (0.10 mg/L and 0.5 mg/L, respectively). Nitrate-nitrite as N and ammonia as N were detected within five-times that of the method blank samples and the results were qualified (B) as potential laboratory cross-contamination, as listed below. In all cases, impact to the project data was negligible as the affected data do not have cleanup levels established.

Nitrate-nitrite as N: 18FWOU601WG, 18FWOU602WG, 18FWOU603WG, 18FWOU605WG, 18FWOU607WG, 18FWOU613WG, and equipment blank sample 18FWOU6EB01WQ
Ammonia as N: 18FWOU601WG, 18FWOU602WG, 18FWOU603WG, and 18FWOU607WG

iii. If above LOQ, what samples are affected?

Comments:

See 6bii.

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

(•) Yes ( ) No Comments:

See 6bii.

v. Data quality or usability affected?

Comments:

Impact to data was negligible. See 6bii.

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:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in DRO/RRO extraction batch 180626A. Potential matrix interference in this batch could not be evaluated for this project; however, accuracy and precision for the batch was assessed from the LCS/LCSD samples. This batch contained the DRO/RRO results for samples 18FWOU607WG through 18FWOU615WG and the equipment blank sample18FWOU6EB01WQ.

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

(•) Yes ( ) No Comments:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in total alkalinity batch 231190 and sulfate batch 180703A. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batches were assessed from the LCS/LCSD samples. These batches contained the total alkalinity results for equipment blank sample 18FWOU6EB01WQ and the sulfate results for samples 18FWOU603WG through 18FWOU606WG and 18FWOU608WG through 18FWOU615WG.

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 DRO MS/MSD prepared from sample 18FWOU601WG had recoveries (8.0% and -336%, respectively) that were below the lower control limit (75%). DRO was detected in the parent sample at a concentration greater than the spike concentration, so recovery criteria were not applicable. No data were impacted by the low recoveries.

The RRO MS/MSD prepared from sample 18FWOU601WG had recoveries (134% and 127%, respectively) that were above the upper control limit (120%). RRO was not detected in the parent or associated field duplicate sample 18FWOU602WG, so no data were impacted due to the high recoveries.

The methane MS prepared from sample 18FWOU601WG had a recovery (65.9%) that was below lower the lower control limit (72%). Methane was detected in the parent sample at a concentration greater than the spike concentration, so recovery criteria were not applicable. No data were impacted by the low recovery.

The metals MS and/or MSD prepared from sample 18FWOU601WG had recoveries for iron (70% and -70%, respectively) and for manganese (60.0%) that were below the lower control limits (87% and 90%, respectively). Iron and manganese were detected in the parent sample at concentrations greater than the spike concentrations, so recovery criteria were not applicable. No data were impacted by the low recoveries.

The total alkalinity MS/MSD prepared from sample 18FWOU601WG had recoveries (89.2% and 80.0%, respectively) that were below the lower control limit (90%). Total alkalinity was detected in the parent sample greater than the spike concentration, so recovery criteria were not applicable. No data were impacted by the low recovery.

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:

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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:

Qualifications were not necessary.

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

Comments:

Impact to the project was negligible. See 6biii.

c. Surrogates – Organics Only

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

○ Yes ◉ No Comments:

Methane by Method RSK-175 did not report surrogate recoveries; however, surrogate spikes are not required per the Method.

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:

The DRO (AK102) surrogate compound o-terphenyl in samples 18FWOU601WG and 18FWOU602WG were reported as diluted beyond the ability to quantitate recovery. In both instances the samples were analyzed at a dilution factor of 20 and the reported concentrations were greater than an order of magnitude above the OU6 Remedial Goal. No data were qualified.

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

○ Yes ◉ No Comments:

See 6cii above.

iv. Data quality or usability affected?

Comments:

Data was not affected. See 6cii above.

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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 18FWOU6TB01WQ for methane analysis was included in cooler 062101.

iii. All results less than LOQ?

(•) Yes ( ) No Comments:

Methane was not detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable. Methane was not detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

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

e. Field Duplicate

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

(•) Yes ( ) No Comments:

Two field duplicates were collected for the 13 primary samples associated with this work order.

ii. Submitted blind to lab?

(•) Yes ( ) No Comments:

Sample 18FWOU602WG was a field duplicate of 18FWOU601WG and 18FWOU609WG was field duplicate of 18FWOU608WG.

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 for the field duplicate pair are shown in the tables below. 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 the field duplicate sample pairs were comparable (RPD ≤ 30%), with the exception of nitrogen as ammonia in field duplicate sample pair 18FWOU608WG/18FWOU609WG (189%). Nitrogen as ammonia was not detected in the primary sample and was detected above the LOQ in the field duplicate. Consequently, the nitrogen as ammonia results in these samples were qualified (J) as estimates due to imprecision. Impact to the project is negligible as the analyte is not a site contaminant. The results are used to evaluate natural attenuation (NA). All other NA parameters had RPD values within acceptance limits.

Analyte	Method	Units	Primary 18FWOU601WG (MW33)	Field Duplicate 18FWOU602WG (MW331)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	µg/L	25,000 [1000]	25,000 [1000]	0	YES
Residual Range Organics	AK103	µg/L	ND [4000]	ND [4000]	0	YES
Iron	SW6010C	mg/L	45.9 [0.025]	43.8 [0.025]	5	YES
Manganese	SW6010C	mg/L	3.17 [0.004]	2.96 [0.004]	7	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.244 [0.03]	0.213 [0.03]	14	YES
Potassium	SW6010C	mg/L	5.16 [0.5]	4.75 [0.5]	8	YES
Sulfate	E300.0	mg/L	4.0 [0.198]	4.0 [0.198]	0	YES
Nitrogen, Ammonia (as N)	E350.1	mg/L	0.33 [0.40] J,B	0.33 [0.40] J,B	0	Not applicable
Nitrogen, Nitrate-Nitrite (as N)	E353.2	mg/L	0.11 [0.100] B	0.11 [0.100] B	0	YES
Methane	RSK175	mg/L	0.28 [0.001] J-	0.26 [0.001] J-	7	YES
Alkalinity as CaCO3	A2320B	mg/L	314 [1.70]	320 [1.70]	2	YES

Analyte	Method	Units	Primary 18FWOU608WG (MW58)	Field Duplicate 18FWOU609WG (MW581)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	µg/L	2,300 [50]	2,500 [100]	8	YES
Residual Range Organics	AK103	µg/L	ND [400]	ND [400]	0	Not applicable
Iron	SW6010C	mg/L	14 [0.025]	12.4 [0.025]	12	YES
Manganese	SW6010C	mg/L	1.13 [0.004]	1.1 [0.004]	3	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.0658 [0.03]	0.0639 [0.03]	3	YES
Potassium	SW6010C	mg/L	4.34 [0.5]	4.44 [0.5]	2	YES
Sulfate	E300.0	mg/L	16.8 [0.990]	17.3 [0.990]	3	YES
Nitrogen, Ammonia (as N)	E350.1	mg/L	ND [0.40] J	4.2 [0.40] J	189	NO
Nitrogen, Nitrate-Nitrite (as N)	E353.2	mg/L	0.50 [0.100]	0.55 [0.100]	10	YES
Methane	RSK175	mg/L	0.2 [0.001] J-	0.27 [0.001] J-	30	YES
Alkalinity as CaCO3	A2320B	mg/L	240 [1.70]	241 [1.70]	0	YES

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

Comments:

Impact to the project was negligible. See 6eiii.

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

(•) Yes ( ) No ( ) Not Applicable

Equipment blank sample 18FWOU6EB01WQ was collected and included in this work order to assess the potential for cross-contamination during sampling from the submersible pump. All groundwater samples in this work order were associated with this equipment blank sample.

i. All results less than LOQ?

( ) Yes (•) No Comments:

No results were greater than the LOQ in the equipment blank sample; however, iron (17.8 µg/L), manganese (3.8 µg/L), sulfate (0.24 mg/L), and nitrate-nitrite as N (0.098 mg/L) were detected at concentrations below the LOQs (100 µg/L, 10.0 µg/L, 1.00 mg/L, and 0.10 mg/L, respectively).

ii. If above LOQ, what samples are affected?

Comments:

Iron, manganese, and sulfate were detected at concentrations greater than five-times the equipment blank contamination in the associated samples and they are considered not affected. Nitrate-nitrite as N in the equipment blank was attributed to laboratory-introduced contamination and qualifications based on the equipment blank result were not necessary. No data were qualified as a result of the equipment blank.

iii. Data quality or usability affected?

Comments:

See 6fii above.

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

a. Defined and appropriate?

( ) Yes (•) No Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed By:

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

Title:

Chemist, ERM

Date:

12/13/2018

CS Report Name:

Operable Unit 6, Fort Wainwright, Alaska

Report Date:

07/16/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

Agriculture & Priority Pollutants Laboratories, Inc (APPL) – Clovis, CA

Laboratory Report Number:

86178

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

86178

1. Laboratory

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

   (•) Yes ( ) No Comments:

Yes; however, methods 300.0, 350.1, 353.2, RSK175, and SM2320B are not listed as CS analyses.

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

   (•) Yes ( ) No Comments:

Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   (•) Yes ( ) No Comments:

   b. Correct Analyses requested?

   (•) Yes ( ) No Comments:

3. Laboratory Sample Receipt Documentation

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

   (•) Yes ( ) No Comments:

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

   (•) Yes ( ) No Comments:

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

   (•) Yes ( ) No Comments:

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

(•) Yes ( ) No Comments:

No discrepancies were noted upon sample receipt that resulted in any impact to data quality.

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 samples re-analyzed out of hold, method blank contamination, and LCSD and MS/MSD recovery discrepancies, which are discussed in sections 5b, 6a, and 6b. The case narrative also discussed manual integrations and a sample analyzed past the tune window, which are discussed here.

Manual integrations were performed on one project sample and the associated LCS for DRO and inorganic analyses in accordance with the laboratories SOP. Data were not impacted by the laboratory performing manual integrations as needed.

Sample 18FWOU618WG was analyzed 18 minutes past the tune window for 8260C-SIM. The sample was reanalyzed outside of hold with concurring results and the original results were reported. Impact to the project is negligible as the tune window exceedance was marginal, the results were confirmed, and the 1,2,3-trichloropropane detected result was an order of magnitude greater than the ROD remedial goal. No qualifications were applied.

c. Were all corrective actions documented?

(•) Yes ( ) No Comments:

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

Comments:

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

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5. Samples Results

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

(•) Yes ( ) No Comments:

b. All applicable holding times met?

( ) Yes (•) No Comments:

Total alkalinity was re-analyzed 3 to 6 days past hold due to a low LCSD recovery in the initial analysis, discussed in section 6biii. The re-analysis confirmed the initial results. The results of the initial analysis are reported and were qualified (J-), as appropriate, due to the low LCSD recovery. See section 6biii for further discussion.

c. All soils reported on a dry weight basis?

(•) Yes ( ) No Comments:

Not applicable, soil samples were not part of this work order.

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

( ) Yes (•) No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ADEC cleanup level and the OU6 ROD remedial goals for non-detect results. 1,2,3-Trichloropropane and vinyl chloride analyzed by SW8260C did not meet the applicable action level in all samples submitted for this analysis. However, for monitoring wells located in areas where 1,2,3-trichloropropane and vinyl chloride groundwater contaminant plumes exist, samples were submitted for analysis of these two analytes by method 8260C-SIM. Method 8260C-SIM provides an LOD that is less than the ROD remedial goal and ADEC cleanup level.

All affected results are identified with gray shading in the results table (Table C-2) presented in the OU6 Report.

e. Data quality or usability affected?

(•) Yes ( ) No Comments:

See discussion in 5b and 5d above.

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:

Total alkalinity was detected in method blank samples 180628A (3.1 mg/L) and 180712A (4.8 mg/L) at concentrations above the LOQ (both 2.0 mg/L). Total alkalinity was detected in the associated samples at concentrations greater than five-times that of the method blank samples, so no data were impacted.

iii. If above LOQ, what samples are affected?

Comments:

See 6aii.

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

◉ Yes ○ No Comments:

See 6aii.

v. Data quality or usability affected?

Comments:

Data quality or usability were not affected by the method blank samples. See 6aii.

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:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in VOC analytical batch 180703BT. Potential matrix interference in this batch could not be evaluated for this project; however, accuracy and precision for the batch was assessed from the LCS/LCSD samples. This batch contained the VOC results for samples 18FWOU624WG, 18FWOU630WG, and trip blank sample18FWOU6TB02WQ.

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

◉ Yes ○ No Comments:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in total alkalinity batch 231190 or sulfate batch A6180706. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batches were assessed from the LCS/LCSD samples. These batches contained the total alkalinity result for equipment blank sample 18FWOU6EB02WQ and the sulfate result for sample 18FWOU628WG.

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 DRO MS/MSD prepared from sample 18FWOU628WG had recoveries (both 64.0%) that were below the lower control limit (75%). Consequently, the DRO results for the parent sample and associated field duplicate sample 18FWOU629WG were qualified (J-) as potential low estimates. The field duplicate result confirmed the parent result and similar low recoveries were observed in the RRO MS/MSD samples, discussed below, indicating the potential for matrix interference. However, impact to the project is not significant as both results were nearly four times less than the ROD remedial goal. DRO has not exceeded the ROD remedial goal in the well (MW32R) since at least 2007.

The RRO MS/MSD prepared from sample 18FWOU628WG had recoveries (both 56.2%) that were below the lower control limit (60%). Consequently, the RRO results for the parent sample and associated field duplicate sample 18FWOU629WG were qualified (J-) as potential low estimates. The field duplicate result confirmed the parent result and similar low recoveries were observed in the DRO MS/MSD samples, discussed above, indicating the potential for matrix interference. However, impact to the project is not significant as the failure was not significant (less than 4% low) and both results were greater than four times less than the ROD remedial goal.

The methane MS/MSD prepared from sample 18FWOU620WG had recoveries (133% and 140%, respectively) that were above the upper control limit (125%). Methane was not detected in the parent or associated field duplicate sample 18FWOU621WG, so no data were impacted due to the high recoveries.

The methane MS/MSD prepared from sample 18FWOU622WG had recoveries (-54.0% and -74.3%, respectively) that were below the lower control limit (72%). Methane was detected in the parent sample greater than the spike concentration, so recovery criteria were not applicable.

The metals MSD prepared from sample 18FWOU622WG had recoveries for iron (130%) and manganese (120%) that were above the upper control limits (115% and 114%, respectively). Iron and manganese were detected in the parent sample greater than the spike concentrations, so recovery criteria were not applicable.

The metals MSD prepared from sample 18FWOU628WG had recoveries for manganese (117%) and potassium (125%) that were above the upper control limits (both 114%). Consequently the manganese result in the parent sample was qualified (J+) as potential high estimate. Impact to the project is negligible as the manganese result was nearly and order of magnitude less than the cleanup level. Potassium was detected in the parent sample greater than the spike concentration, so recovery criteria were not applicable.

The total alkalinity LCSD from analytical batch 180628A had a recovery (84.4%) that was below the lower control limit (90%). The samples associated with this batch were re-analyzed, as discussed in section 5b. The results for the initial batch were confirmed and reported. Due to the low LCSD recovery, the total alkalinity results for the following associated samples were qualified (J-) as potential low estimates: 18FWOU618WG, 18FWOU620WG through 18FWOU624WG, and 18FWOU626WG through 18FWOU628WG. Impact to the project is negligible as the LCSD recovery failure is marginal (less than 6%), the LCS had acceptable recovery, and the results were confirmed through re-analysis.

The total alkalinity MS/MSD prepared from sample 18FWOU620WG (analyzed on the initial run on 6/28/18) had recoveries (81.6% and 83.6%, respectively) that were below the lower control limit (90%). The total alkalinity result of the parent sample and associated field duplicate sample 18FWOU621WG were qualified (J-) as potential low estimates due to a low LCSD recovery (see discussion in preceding paragraph) and no additional qualifiers were applied due to the low MS/MSD recoveries.

The ammonia as N MS prepared from sample 18FWOU620WG had a recovery (126%) that was above the upper control limit (110%). Ammonia as N was not detected in the parent or associated field duplicate sample 18FWOU621WG, so no data were impacted due to the high recovery.

The nitrate-nitrite as N MS/MSD prepared from sample 18FWOU620WG had recoveries (117% and 112%, respectively) that were above the upper control limit (110%). Nitrate-nitrite was detected in the parent sample greater than the spike concentration, so recovery criteria were not applicable. No data were impacted by the low recoveries.

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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:

Methane by Method RSK-175 did not report surrogate recoveries; however, surrogate spikes are not required per the Method.

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 surrogate recoveries were within control limits.

iv. Data quality or usability affected?

Comments:

Data quality or usability were not affected by the surrogates.

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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 18FWOU6TB02WQ for volatile analyses was included in cooler 062601.

iii. All results less than LOQ?

(•) Yes ( ) No Comments:

Target analytes were not detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable. Target analytes were not detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

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

e. Field Duplicate

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

(•) Yes ( ) No Comments:

Three field duplicates were collected for the 13 primary samples associated with this work order.

ii. Submitted blind to lab?

(•) Yes ( ) No Comments:

Sample 18FWOU621WG was a field duplicate of 18FWOU620WG, 18FWOU630 was a field duplicate of 18FWOU622WG, and18FWOU629WG was field duplicate of 18FWOU628WG.

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 for the field duplicate pairs are shown in the table below. 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 the field duplicate sample pairs were comparable (RPD ≤ 30%).

Analyte	Method	Units	Primary 18FWOU620WG (MW47)	Field Duplicate 18FWOU621WG (MW471)	RPD, %	Comparable Criteria Met?
1,2,3-Trichloropropane	8260SIM	µg/L	0.28 [0.0050]	0.28 [0.0050]	0	YES
Vinyl chloride	8260SIM	µg/L	ND [0.015]	ND [0.015]	0	Not applicable
Iron	SW6010C	mg/L	0.038 [0.025] J	ND [0.025]	104	Not applicable
Manganese	SW6010C	mg/L	0.0211 [0.004]	0.0189 [0.004]	11	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.042 [0.03] J	0.0229 [0.03] J	59	Not applicable
Potassium	SW6010C	mg/L	5.44 [0.5]	5.56 [0.5]	2	YES
Sulfate	E300.0	mg/L	37.1 [0.198]	35.9 [0.198]	3	YES
Nitrogen, Ammonia (as N)	E350.1	mg/L	ND [0.40]	ND [0.40]	0	Not applicable
Nitrogen, Nitrate (as N)	E353.2	mg/L	3.6 [0.100]	3.9 [0.100]	8	YES
Methane	RSK175	mg/L	ND [0.001]	ND [0.001]	0	Not applicable
Alkalinity as CaCO3	A2320B	mg/L	331 [1.70] J-	326 [1.70] J-	4	YES

Analyte	Method	Units	Primary 18FWOU622WG (MW61)	Field Duplicate 18FWOU630WG (MW611)	RPD, %	Comparable Criteria Met?
1,1-Dichloroethene	SW8260C	µg/L	ND [0.50]	ND [0.50]	0	Not applicable
1,2,3-Trichloropropane	SW8260C	µg/L	ND [1.00]	ND [1.00]	0	Not applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	5 [0.30]	4.5 [0.30]	11	YES
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable
trans-1,2-Dichloroethene	SW8260C	µg/L	5.9 [0.30]	6.2 [0.30]	5	YES
Trichloroethene (TCE)	SW8260C	µg/L	0.73 [0.30] J	0.79 [0.30] J	8	Not applicable
Vinyl chloride	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable

Analyte	Method	Units	Primary 18FWOU628WG (MW32R)	Field Duplicate 18FWOU629WG (MW321)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	µg/L	390 [50]	390 [50]	0	YES
Residual Range Organics	AK103	µg/L	230 [200] J	170 [200] J	30	Not applicable

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

Comments:

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

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

◉ Yes ○ No ○ Not Applicable

Equipment blank samples 18FWOU6EB02WQ and 18FWOU6EB03WQ were collected and included in this work order to assess the potential for cross-contamination during sampling from the submersible pump. All groundwater samples in this work order were associated with the equipment blank samples, with the exception of the sample collected from well MW91 (18FWOU625WG). This well was sampled with a bladder pump using new, disposable tubing and pump bladder. A bladder pump was used instead of a submersible pump due to a partial well obstruction.

i. All results less than LOQ?

○ Yes ◉ No Comments:

Target analyte ammonia as N was detected in equipment blank sample 18FWOU6EB02WQ (1 mg/L) at a concentration greater than the LOQ (0.5 mg/L). Additionally, iron was detected in the equipment blank sample 18FWOU6EB02WQ (13.2 µg/L) at a concentration less than the LOQ (100 µg/L).

ii. If above LOQ, what samples are affected?

Comments:

Ammonia as N was detected at a concentration less than five-times that of the equipment blank in samples 18FWOU618WG (0.23 mg/L) and 18FW0U622WG (0.15 mg/L). Consequently the results were qualified (B) as potential field introduced cross-contamination. Impact to the project is negligible as ammonia as N is not a site contaminant and the results are used to evaluate natural attenuation processes.

Iron was detected less than five-times that of the equipment blank in samples 18FWOU620WG (38 µg/L) and 18FWOU628WG (26.6 µg/L). Consequently the results were qualified (B) as potential field introduced cross-contamination. Impact to the project is negligible as iron is not a site contaminant and the results are used to evaluate natural attenuation processes..

iii. Data quality or usability affected?

Comments:

See 6fii 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.

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Laboratory Data Review Checklist

Completed By:

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

Title:

Chemist, ERM

Date:

12/17/2018

CS Report Name:

Operable Unit 6, Fort Wainwright, Alaska

Report Date:

10/19/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

Agriculture & Priority Pollutants Laboratories, Inc (APPL) – Clovis, CA

Laboratory Report Number:

86989

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

86989

1. Laboratory

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

   (•) Yes ( ) No Comments:

Yes; however, methods 300.0, 350.1, 353.2, RSK175, and SM2320B are not listed as CS analyses.

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

   (•) Yes ( ) No 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:

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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:

Sample 18FWOU638WG was inadvertently not included in the sample shipment received 9/25/18 in cooler 092401. The sample arrived with a later shipment on 9/28/18. The sample was logged in by the laboratory and the requested analysis completed within hold. No data were qualified as a result of the sample arriving in a different shipment.

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 method blank contamination and LCS and MS/MSD recovery discrepancies, which are discussed in sections 6a and 6b, respectively. The case narrative also discussed manual integrations, which are discussed here. The case narrative did not address a sample result exceeding the linear calibration range of the instrument discussed here.

Manual integrations were performed on calibration standards for methane in accordance with the laboratory's SOP. Data were not impacted by the laboratory performing manual integrations as needed.

Sample 18FWOU636WG was analyzed twice by method 8260C-SIM for 1,2,3-trichloropropane. In the initial analysis the sample was diluted five times with a result of 1.6 µg/L. In the re-analysis the sample was undiluted with a result of 1.8 µg/L. However, the result from the re-analysis is not preferred as the undiluted result exceeded the linear calibration range of the instrument. The 1,2,3-trichloropropane result from the initial run is used for preparation of the report and decision making purposes.

c. Were all corrective actions documented?

(•) Yes ( ) No Comments:

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

Comments:

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

5. Samples Results

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

(•) Yes ( ) No Comments:

b. All applicable holding times met?

(•) Yes ( ) No Comments:

c. All soils reported on a dry weight basis?

(•) Yes ( ) No Comments:

Not applicable, soil samples were not part of this work order.

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

(•) Yes ( ) No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ADEC cleanup level and the OU6 ROD remedial goals for non-detect results. 1,2,3-Trichloropropane and vinyl chloride analyzed by SW8260C did not meet the applicable action level in all samples submitted for this analysis. However, for monitoring wells located in areas where 1,2,3-trichloropropane and vinyl chloride groundwater contaminant plumes exist, samples were submitted for analysis of these two analytes by method 8260C-SIM. Method 8260C-SIM provides an LOD that is less than the ROD remedial and ADEC cleanup level.

All affected results are identified with gray shading in the results table (Table C-2) presented in the OU6 Report.

e. Data quality or usability affected?

( ) Yes (•) No Comments:

See discussion above in 5d above.

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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:

Total alkalinity was detected in method blank samples 181002A1 (2.4 mg/L) and 1810021B (4.3 mg/L) at concentrations above the LOQ (both 2.0 mg/L). Total alkalinity was detected in the associated samples at concentrations greater than five-times that of the method blank samples, so no data were impacted.

iii. If above LOQ, what samples are affected?

Comments:

See 6aii.

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

(•) Yes ( ) No Comments:

See 6aii.

v. Data quality or usability affected?

Comments:

Data quality or usability were not affected by the method blank samples. See 6aii.

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:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in VOC analytical batch 181003AL and low-level VOC by 8260-SIM batches 181004AM and 1810031A. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batches were assessed from the LCS/LCSD samples. These batches contained the VOC results for samples 18FWOU641WG, 18FWOU645WG, and trip blank sample18FWOU6TB03WQ, and the low-level VOC results for sample 18WOU636WG.

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

(•) Yes ( ) No Comments:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in total alkalinity in batches 181002B and 233960A and sulfate in batch 181004A. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batches were assessed from the LCS/LCSD samples. These batches contained the total alkalinity results for samples 18FWOU641WG through 18FWOU644WG, and equipment blank sample 18FWOU6EB04WQ, and sulfate results for samples 18FWOU637WG, 18FWOU640WG, 18FWOU642WG, and 18FWOU643WG.

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 DRO LCS/LCSD in analytical batch 180927A had recoveries (both 130%) that were above the upper control limit (125%). Consequently, the DRO results for associated samples 18FWOU642WG and 18FWOU643WG were qualified (J+) as potential high estimates. However, impact to the project is not significant as the failures were marginal (5% high) and both results were approximately four times less than the ROD remedial goal.

The RRO LCS/LCSD in analytical batch 180927A had recoveries (142% and 138%, respectively) that were above the upper control limit (120%). Consequently, the RRO results for associated samples 18FWOU642WG and 18FWOU643WG were qualified (J+) as potential high estimates. However, impact to the project is not significant as both results were greater than six times less than the ROD remedial goal.

The RRO MS/MSD prepared from sample 18FWOU642WG had recoveries (123% and 122%, respectively) that were above the upper control limit (120%). This sample and the associated field duplicate sample 18FWOU643WG were also associated with demonstrated poor laboratory accuracy discussed above; consequently, no additional qualifications were applied.

The VOC MS and/or MSD prepared from sample 18FWOU644WG had recoveries below control limits for cis-1,2-dichloroethene (77.0% and 66.0% vs. 78%), trans-1,2-dichloroethene (73.0% and 65.0% vs. 75%), and trichloroethene (TCE) (78.3% vs. 79%). Consequently, the results in the parent sample were qualified (J-) as potential low estimates. However, impact to the project is not significant as the results were at least five times or greater below the ROD remedial goals or ADEC cleanup levels. Moreover, this well (MW61) is located within a known TCE plume and TCE has not exceeded the ROD remedial goal since 2010.

The low-level VOC MSD prepared from sample 18FWOU634WG had a recovery for 1,2,3-trichloropropane (126%) that was above the upper control limit (122%). 1,2,3-Trichloropropane was detected in the parent sample greater than the spike concentration, so recovery criteria were not applicable. No data were impacted by the low recovery.

The metals MSD prepared from sample 18FWOU634WG had recoveries for iron (117%), manganese (116%), phosphorus (114%), and potassium (115%) that were above the upper control limits (115%, 114%, 113%, and 114%, respectively). Iron and phosphorus were not detected in the parent sample or the associated field duplicate 18FWOU635WG and the results are considered unaffected by the high recoveries. Potassium was detected in the parent sample greater than the spike concentration, so recovery criteria were not applicable and potassium results were not qualified. Manganese in the parent sample and the associated field duplicate 18FWOU635WG were qualified (J+) as potential high estimates. Impact to the project is negligible as the failure is marginal (2%) and the manganese results were greater than an order of magnitude less than the cleanup level.

The sulfate MSD prepared from sample 18FWOU634WG had a recovery (114%) that was above the upper control limit (112%). Sulfate was detected in the parent sample at a concentration greater than the spike concentrations, so recovery criteria were not applicable. No data were impacted by the high recovery.

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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:

Methane by Method RSK-175 did not report surrogate recoveries; however, surrogate spikes are not required per the Method.

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 surrogate recoveries were within control limits.

iv. Data quality or usability affected?

Comments:

Data quality or usability were not affected by the surrogates.

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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 18FWOU6TB03WQ for volatile analyses was included in cooler 092401.

iii. All results less than LOQ?

(•) Yes ( ) No Comments:

Target analytes were not detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable. Target analytes were not detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

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

e. Field Duplicate

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

(•) Yes ( ) No Comments:

Three field duplicates were collected for the 12 primary samples associated with this work order.

ii. Submitted blind to lab?

(•) Yes ( ) No Comments:

Sample 18FWOU635WG was a field duplicate of 18FWOU634WG, 18FWOU643WG was a field duplicate of 18FWOU642WG and sample 18FWOU645WG was a field duplicate 18FWOU644WG.

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 for the field duplicate pair are shown in the table below. 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 the field duplicate sample pair were comparable (RPD ≤ 30%).

Analyte	Method	Units	Primary 18FWOU634WG (MW47)	Field Duplicate 18FWOU635WG (MW471)	RPD, %	Comparable Criteria Met?
1,2,3-Trichloropropane	8260SIM	µg/L	0.19 [0.0050]	0.20 [0.0050]	5	YES
Vinyl chloride	8260SIM	µg/L	ND [0.015]	ND [0.015]	0	Not applicable
Iron	SW6010C	mg/L	ND [0.025]	ND [0.025]	0	Not applicable
Manganese	SW6010C	mg/L	0.0295 [0.004] J+	0.0311 [0.004] J+	5	YES
Phosphorus, Total (as P)	SW6010C	mg/L	ND [0.03]	ND [0.03]	0	Not applicable
Potassium	SW6010C	mg/L	6.66 [0.5]	6.5 [0.5]	2	YES
Sulfate	E300.0	mg/L	39.5 [0.198]	39.4 [0.198]	0	YES
Nitrogen, Ammonia (as N)	E350.1	mg/L	ND [0.40]	ND [0.40]	0	Not applicable
Nitrogen, Nitrate (as N)	E353.2	mg/L	9.1 [1.000]	8.6 [1.000]	6	YES
Methane	RSK175	mg/L	ND [0.001]	ND [0.001]	0	Not applicable
Alkalinity as CaCO3	A2320B	mg/L	314 [1.70]	320 [1.70]	2	YES

Analyte	Method	Units	Primary 18FWOU642WG (MW32R)	Field Duplicate 18FWOU643WG (MW321)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	µg/L	380 [50]	370 [50]	3	YES
Residual Range Organics	AK103	µg/L	180 [200] J	150 [200] J	18	Not applicable
1,2,3-Trichloropropane	8260SIM	µg/L	ND [0.0050]	ND [0.0050]	0	Not applicable
Vinyl chloride	8260SIM	µg/L	ND [0.015]	ND [0.015]	0	Not applicable
Iron	SW6010C	mg/L	0.123 [0.025]	0.147 [0.025]	18	YES
Manganese	SW6010C	mg/L	0.215 [0.004]	0.222 [0.004]	3	YES
Phosphorus, Total (as P)	SW6010C	mg/L	ND [0.03]	ND [0.03]	0	Not applicable
Potassium	SW6010C	mg/L	6.77 [0.5]	6.68 [0.5]	1	YES
Sulfate	E300.0	mg/L	48.7 [0.396]	48.9 [0.396]	0	YES
Nitrogen, Ammonia (as N)	E350.1	mg/L	ND [0.40]	ND [0.40]	0	Not applicable
Nitrogen, Nitrate (as N)	E353.2	mg/L	3.1 [0.100]	3.2 [0.100]	3	YES
Methane	RSK175	mg/L	0.011 [0.001]	0.011 [0.001]	0	YES
Alkalinity as CaCO3	A2320B	mg/L	327 [1.70]	322 [1.70]	2	YES

Analyte	Method	Units	Primary 18FWOU644WG (MW61)	Field Duplicate 18FWOU645WG (MW611)	RPD, %	Comparable Criteria Met?
1,1-Dichloroethene	SW8260C	µg/L	ND [0.50]	ND [0.50]	0	Not applicable
1,2,3-Trichloropropane	SW8260C	µg/L	ND [1.0]	ND [1.0]	0	Not applicable
cis-1,2-Dichloroethene	SW8260C	µg/L	6.7 [0.30]	5.9 [0.30]	13	YES
Tetrachloroethene (PCE)	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable
trans-1,2-Dichloroethene	SW8260C	µg/L	6.2 [0.30]	5.5 [0.30]	12	YES
Trichloroethene (TCE)	SW8260C	µg/L	1.0 [0.30]	0.99 [0.30] J	1	YES
Vinyl chloride	SW8260C	µg/L	ND [0.30]	ND [0.30]	0	Not applicable

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

Comments:

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

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

(•) Yes ( ) No ( ) Not Applicable

Equipment blank sample 18FWOU6EB04WQ was collected and included in this work order to assess the potential for cross-contamination during sampling from the submersible pump. All groundwater samples in this work order were associated with this equipment blank sample, with the exception of the sample collected from well MW91 (18FWOU638WG). This well was sampled with a bladder pump using new, disposable tubing and pump bladder. A bladder pump was used instead of a submersible pump due to a partial well obstruction.

The equipment blank sample was analyzed for all analytes/methods, with the exception of the mid-level 8260C analysis. Consequently, the potential for submersible pump cross-contamination for three associated project samples cannot be evaluated. Impact to the project is likely negligible as several of the VOC analytes were non-detect and the detected analytes were at trace concentrations.

i. All results less than LOQ?

( ) Yes (•) No Comments:

No results were greater than the LOQ in the equipment blank sample; however, manganese (5.2 µg/L and sulfate (0.16 mg/L) were detected at concentrations below the LOQs (10.0 µg/L and 1.00 mg/L, respectively).

ii. If above LOQ, what samples are affected?

Comments:

Sulfate was detected in associated field samples greater than five times the equipment blank concentration and the results were not affected.

Manganese was detected less than five times that of the equipment blank concentration in samples 18FWOU637WG and 18FWOU639WG. Consequently, these results were qualified (B) as potential field introduced cross-contamination. Impact to the project is likely negligible as the detected results were approximately two orders of magnitude or greater less than the cleanup level.

iii. Data quality or usability affected?

Comments:

See 6fii.

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

a. Defined and appropriate?

○ Yes ◉ No Comments:

No other data flags/qualifiers were used.

Laboratory Data Review Checklist

Completed By:

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

Title:

Chemist, ERM

Date:

12/17/18

CS Report Name:

Operable Unit 6, Fort Wainwright, Alaska

Report Date:

10/23/2018

Consultant Firm:

Fairbanks Environmental Services

Laboratory Name:

Agriculture & Priority Pollutants Laboratories, Inc (APPL) – Clovis, CA

Laboratory Report Number:

87031

ADEC File Number:

108.38.085

Hazard Identification Number:

4140

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1. Laboratory

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

   (•) Yes ( ) No Comments:

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

   (•) Yes ( ) No Comments:

   Not applicable, samples were not transferred to another laboratory.

2. Chain of Custody (CoC)

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

   (•) Yes ( ) No Comments:

   b. Correct Analyses requested?

   (•) Yes ( ) No Comments:

3. Laboratory Sample Receipt Documentation

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

   (•) Yes ( ) No Comments:

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

   (•) Yes ( ) No Comments:

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

   (•) Yes ( ) No Comments:

   The laboratory indicated sample 18FWOU660WG was received with two of the three vials broken. The laboratory was able to complete the requested analysis with the one remaining vial and data quality was not impacted.

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

(•) Yes ( ) No Comments:

No discrepancies were noted upon sample receipt that resulted in any impact to data quality.

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 an analysis out-of-hold, method blank contamination, LCSD and MS/MSD recovery discrepancies, and surrogate recovery discrepancies, which are discussed in sections 5b, 6a, 6b, and 6c, respectively. The case narrative also discussed manual integrations, which are discussed here.

Manual integrations were performed for DRO in two samples and the calibration standards for methane in accordance with the laboratories SOP. Data were not impacted by the laboratory performing manual integrations as needed.

c. Were all corrective actions documented?

(•) Yes ( ) No Comments:

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

Comments:

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

5. Samples Results

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

(•) Yes ( ) No Comments:

b. All applicable holding times met?

○ Yes ◉ No Comments:

Sample 18FWOU660WG was inadvertently analyzed 12 days past the 14 day hold time for methane by Method RSK-175. Consequently, the non-detected result was qualified (J-) as a potential low estimate. However, impact to the project is likely not significant as methane was also not detected at this monitoring well sampled in June of 2018.

c. All soils reported on a dry weight basis?

◉ Yes ○ No Comments:

Not applicable, soil samples were not part of this work order.

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

○ Yes ◉ No Comments:

Analytical sensitivity was evaluated to verify that LODs met the applicable ADEC cleanup level and the OU6 ROD remedial goals for non-detect results. The LOD for non-detect RRO results in two samples did not meet the ROD remedial goal due to dilutions. Dilutions were required due to high DRO concentrations.

All affected results are identified with gray shading in the results table (Table C-2) presented in the OU6 Report.

e. Data quality or usability affected?

○ Yes ◉ No Comments:

See discussion above in 5b and 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:

Total alkalinity was detected in method blank samples 181004A (1.1 mg/L) and 1810021B (4.3 mg/L) at concentrations above the LOQ (both 2.0 mg/L). Total alkalinity was detected in the associated samples at concentrations greater than five-times that of the method blank samples, so no data were impacted.

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iii. If above LOQ, what samples are affected?

Comments:

See 6aii.

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

(•) Yes ( ) No Comments:

See 6aii.

v. Data quality or usability affected?

Comments:

Data quality or usability were not affected by the method blank samples. See 6aii.

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:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in DRO/RRO analytical batch 181005A and methane batch 181023A. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batches were assessed from the LCS/LCSD samples. These batches contained the DRO/RRO results for samples 18FWOU646WG, 18FWOU647WG, and 18FWOU648WG and methane result for sample 18WOU660WG.

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

(•) Yes ( ) No Comments:

All LCS/LCSD samples were analyzed as required; however, no project MS/MSD samples were reported in total alkalinity in batches 1810021B and 233960, and sulfate in batch 181006A. Potential matrix interference in these batches could not be evaluated for this project; however, accuracy and precision for the batches were assessed from the LCS/LCSD samples. These batches contained the total alkalinity results for samples 18FWOU646WG, 18FWOU647WG, 18FWOU648WG, and equipment blank sample 18FWOU6EB05WQ, and the sulfate result for sample 18FWOU657WG.

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 RRO LCSD in analytical batch 181005A had a recovery (134%) that was above the upper control limit (120%). RRO was not detected in the associated samples so no data were qualified.

The DRO MS/MSD prepared from sample 18FWOU650WG had recovery failures (16% and 512%, respectively) that were outside the control limits (75%-125%). The DRO concentration in the parent sample was greater than the spike concentration, so the recovery criteria were not applicable. No data were qualified.

The RRO MS/MSD prepared from sample 18FWOU650WG had recovery failures (189% and 160%, respectively) that were above the upper control limit (120%). RRO was not detected in the parent sample and was diluted (20x) beyond the ability to accurately quantitate the recovery, so no data were qualified. The sample was diluted due to a high DRO concentration.

The methane MS/MSD prepared from sample 18FWOU650WG had recoveries (157% and 216%, respectively) that were above the upper control limit (125%). Methane concentration in the parent sample was greater than the spike concentration, so the recovery criteria were not applicable. No data were qualified.

The metals MS and/or MSD prepared from sample 18FWOU650WG had a recovery for iron that was above the upper control limit (220% vs. 115%) and for manganese that was below the lower control limit (80.0% vs. 90%). Iron and manganese concentrations in the parent sample were greater than the spike concentrations, so the recovery criteria were not applicable. No data were qualified.

The ammonia as N MSD prepared from sample 18FWOU650WG had a recovery (112%) that was above the upper control limit (110%). Consequently, the results in the parent sample and the associated field duplicate sample 18FWOU651WG were qualified (J+) as potential high estimates. Impact to the project is likely negligible as the recovery failure was marginal (2% high), the MS recovery was acceptable, and ammonia as N does not have a cleanup level established.

The total alkalinity MS/MSD prepared from sample 18FWOU650WG had recoveries (88.4% and 86.4%, respectively) that were below the lower control limit (90%). Total alkalinity concentration in the parent sample was greater than the spike concentration, so the recovery criteria were not applicable. No data were qualified.

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 RRO LCS/LCSD in analytical batch 181005A had an RPD (28.6%) was above the upper control limit (20%). RRO was not detected in the associated samples and no data were qualified.

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

Comments:

See 6biii and 6biv.

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

◉ Yes ○ No Comments:

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

Comments:

See 6biii and 6biv.

c. Surrogates – Organics Only

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

○ Yes ◉ No Comments:

Methane by Method RSK-175 did not report surrogate recoveries; however, surrogate spikes are not required per the Method.

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:

RRO surrogate n-octocosane was recovered above the upper control limit (150%) in samples 18FWOU648WG (183%) and 18FWOU649WG (159%). RRO was not detected in these sample and the data were not affected. No qualifications were applied.

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

○ Yes ◉ No Comments:

See 6cii above.

iv. Data quality or usability affected?

Comments:

Data quality or usability were not affected by the surrogates.

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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 18FWOU6TB04WQ for methane analyses was included in cooler 092701.

iii. All results less than LOQ?

(•) Yes ( ) No Comments:

Target analytes were not detected in the trip blank sample.

iv. If above LOQ, what samples are affected?

Comments:

Not applicable. Target analytes were not detected in the trip blank sample.

v. Data quality or usability affected?

Comments:

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

e. Field Duplicate

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

(•) Yes ( ) No Comments:

Two field duplicates were collected for the 13 primary samples associated with this work order.

ii. Submitted blind to lab?

(•) Yes ( ) No Comments:

Sample 18FWOU651WG was a field duplicate of 18FWOU650WG and sample 18FWOU656WG was a field duplicate 18FWOU655WG.

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 for the field duplicate pair are shown in the table below. 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 the field duplicate sample pair were comparable (RPD ≤ 30%), with the exception of methane (38%) in field duplicate pair 18FWOU650WG/18FWOU651WG. Consequently, the methane results in these samples were qualified (J) as estimates due to imprecision. However, the imprecision has a negligible impact to the project as the results were more than an order of magnitude greater than the LOQs and methane is not a site contaminant (results are used to evaluate natural attenuation processes).

Analyte	Method	Units	Primary 18FWOU650WG (MW33)	Field Duplicate 18FWOU651WG (MW331)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	µg/L	39,000 [1000]	43,000 [1000]	10	YES
Residual Range Organics	AK103	µg/L	ND [4000]	ND [4000]	0	Not applicable
Iron	SW6010C	mg/L	43.9 [0.025]	42.7 [0.025]	3	YES
Manganese	SW6010C	mg/L	3.58 [0.004]	3.38 [0.004]	6	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.268 [0.03]	0.269 [0.03]	0	YES
Potassium	SW6010C	mg/L	5.41 [0.5]	4.85 [0.5]	11	YES
Sulfate	E300.0	mg/L	6.8 [0.198]	7.0 [0.198]	3	YES
Nitrogen, Ammonia (as N)	E350.1	mg/L	0.42 [0.40] J,J+	0.50 [0.40] J+	17	YES
Nitrogen, Nitrate (as N)	E353.2	mg/L	ND [0.100]	0.034 [0.100] J	19	Not applicable
Methane	RSK175	mg/L	0.19 [0.001] J	0.13 [0.001] J	38	NO
Alkalinity as CaCO3	A2320B	mg/L	336 [1.70]	337 [1.70]	0	YES

Analyte	Method	Units	Primary 18FWOU655WG (MW38)	Field Duplicate 18FWOU656WG (MW581)	RPD, %	Comparable Criteria Met?
Diesel Range Organics	AK102	µg/L	3,000 [50]	3,600 [50]	18	YES
Residual Range Organics	AK103	µg/L	ND [200]	ND [200]	0	Not applicable
Iron	SW6010C	mg/L	15.9 [0.025]	16 [0.025]	1	YES
Manganese	SW6010C	mg/L	1.13 [0.004]	1.14 [0.004]	1	YES
Phosphorus, Total (as P)	SW6010C	mg/L	0.0738 [0.03]	0.0768 [0.03]	4	YES
Potassium	SW6010C	mg/L	4.54 [0.5]	4.25 [0.5]	7	YES
Sulfate	E300.0	mg/L	19.2 [0.198]	19.2 [0.198]	0	YES
Nitrogen, Ammonia (as N)	E350.1	mg/L	0.14 [0.40] J	0.12 [0.40] J	15	Not applicable
Nitrogen, Nitrate (as N)	E353.2	mg/L	0.056 [0.100] J	0.042 [0.100] J	29	Not applicable
Methane	RSK175	mg/L	0.11 [0.001]	0.1 [0.001]	10	YES
Alkalinity as CaCO3	A2320B	mg/L	208 [1.70]	210 [1.70]	1	YES

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

Comments:

See 6eiii.

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

(•) Yes ( ) No ( ) Not Applicable

Equipment blank sample 18FWOU6EB05WQ was collected and included in this work order to assess the potential for cross-contamination during sampling from the submersible pump. All groundwater samples in this work order were associated with this equipment blank sample.

i. All results less than LOQ?

(•) Yes ( ) No Comments:

Target analytes were not detected in the equipment blank sample 18FWOU6EB05WQ.

ii. If above LOQ, what samples are affected?

Comments:

Target analytes were not detected in the equipment blank sample 18FWOU6EB05WQ.

iii. Data quality or usability affected?

Comments:

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

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

a. Defined and appropriate?

( ) Yes (•) No Comments:

No other data flags/qualifiers were used.

APPENDIX C

SAMPLE SUMMARY AND ANALYTICAL RESULTS TABLES

Table C-1. Sample Summary
Operable Unit 6
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Depth (feet BTOC)	Sample Type	Matrix	Sampler Initials	Sample Date	Sample Time	VOC 8260C	VOC Low Level 8260C-SIM	DRO AK102	RRO AK103	Dissolved Metals[1] 6010C	Sulfate 300.0	Ammonia as N 350.1	Nitrate-Nitrite as N 353.2	Methane RSK 175	Alkalinity as $CaCO_3$ SM 2320B	Sample Data Group	Cooler ID #
Background																			
18FWOU605WG	MW03	16.2	Primary	WG	CB	06/20/18	1420			X	X	X	X	X	X	X	X	86154	062101,-03,-05
18FWOU627WG	MW13	16.1	Primary	WG	JK	06/25/18	1200		X			X	X	X	X	X	X	86178	062601,-02
18FWOU647WG	MW03	14.3	Primary	WG	JK	09/26/18	910			X	X	X	X	X	X	X	X	87031	092701,02,05,06
18FWOU640WG	MW13	15.5	Primary	WG	CB	09/21/18	1320		X			X	X	X	X	X	X	86989	092401, 02
DRO Plumes																			
18FWOU607WG	MW06A	15.6	Primary	WG	JK	06/20/18	1630			X	X	X	X	X	X	X	X	86154	062101,-03,-05
18FWOU603WG	MW12R	17.6	Primary	WG	JK	06/20/18	1300			X	X	X	X	X	X	X	X	86154	062101,-02,-05
18FWOU604WG	MW28	4.0	Primary	WG	JK	06/20/18	1440			X	X	X	X	X	X	X	X	86154	062101,-03,-05
18FWOU628WG	MW32R	14.1	Primary/MS/MSD	WG	JK	06/25/18	1330		X	X*	X*	X	X	X	X	X	X	86178	062601,-02,-03
18FWOU629WG	MW321	14.1	Field Duplicate of 18FWOU628WG	WG	JK	06/25/18	1345		X	X	X	X	X	X	X	X	X	86178	062603
18FWOU601WG	MW33	15.5	Primary/MS/MSD	WG	JK	06/20/18	1045			X*	X*	X*	X*	X*	X*	X*	X*	86154	062101,-02,-05
18FWOU602WG	MW331 (MW33)	15.5	Field Duplicate of 18FWOU601WG	WG	JK	06/20/18	1100			X	X	X	X	X	X	X	X	86154	062101,-02,-05
18FWOU610WG	MW35	13.9	Primary	WG	JK	06/21/18	1020			X	X	X	X	X	X	X	X	86154	062101,-03,-05
18FWOU612WG	MW37	15.2	Primary	WG	JK	06/21/18	1145			X	X	X	X	X	X	X	X	86154	062101,-04,-05
18FWOU606WG	MW38	15.4	Primary	WG	CB	06/20/18	1610			X	X	X	X	X	X	X	X	86154	062101,-03,-05
18FWOU608WG	MW58	7.3	Primary	WG	JK	06/21/18	845			X	X	X	X	X	X	X	X	86154	062101,-04,-05
18FWOU609WG	MW581 (MW58)	7.3	Field Duplicate of 18FWOU608WG	WG	JK	06/21/18	900			X	X	X	X	X	X	X	X	86154	062101,-04,-05
18FWOU613WG	MW62	14.8	Primary	WG	CB	06/21/18	1135			X	X	X	X	X	X		X	86154	062101,-04,-05
18FWOU611WG	MW64	15.4	Primary	WG	CB	06/21/18	1005			X	X	X	X	X	X	X	X	86154	062101,-04,-05
18FWOU615WG	MW77	18.6	Primary	WG	CB	06/21/18	1310			X	X	X	X	X	X	X	X	86154	062101,-05
18FWOU614WG	MW82	17.2	Primary	WG	JK	06/21/18	1315			X	X	X	X	X	X	X	X	86154	062101,-03,-05
18FWOU652WG	MW06A	14.6	Primary	WG	JK	09/26/18	1510			X	X	X	X	X	X	X	X	87031	092701,03,05,06
18FWOU649WG	MW12R	17.6	Primary	WG	JK	09/26/18	1155			X	X	X	X	X	X	X	X	87031	092701,02,05,06
18FWOU648WG	MW28	16.0	Primary	WG	JK	09/26/18	1040			X	X	X	X	X	X	X	X	87031	092701,02,05,06
18FWOU642WG	MW32R	18	Primary/MS/MSD	WG	CB	09/21/18	1450		X	X*	X*	X	X	X	X	X	X	86989	092401, 02, 03
18FWOU643WG	MW321	18	Field Duplicate of 18FWOU642WG	WG	CB	09/21/18	1505		X	X	X	X	X	X	X	X	X	86989	092401, 02, 03
18FWOU650WG	MW33	14.5	Primary/MS/MSD	WG	JK	09/26/18	1315			X*	X*	X*	X*	X*	X*	X*	X*	87031	092701,03,05,06
18FWOU651WG	MW331 (MW33)	14.5	Field Duplicate of 18FWOU650WG	WG	JK	09/26/18	1335			X	X	X	X	X	X	X	X	87031	092701,02,05,06
18FWOU653WG	MW35	12.8	Primary	WG	JK	09/26/18	1645			X	X	X	X	X	X	X	X	87031	092701,03,05,06
18FWOU654WG	MW37	14	Primary	WG	JK	09/26/18	1835			X	X	X	X	X	X	X	X	87031	092701,04,05,06
18FWOU646WG	MW38	14.0	Primary	WG	CB	09/21/18	1615			X	X	X	X	X	X	X	X	87031	092701,02,05,06
18FWOU655WG	MW58	12	Primary	WG	JK	09/27/18	900			X	X	X	X	X	X	X	X	87031	092701,04,05,06
18FWOU656WG	MW581 (MW58)	12.0	Field Duplicate of 18FWOU655WG	WG	JK	09/27/18	915			X	X	X	X	X	X	X	X	87031	092701,04,05,06
18FWOU658WG	MW62	13	Primary	WG	CB	09/27/18	1045			X	X	X	X	X	X	X	X	87031	092701,04,05,06
18FWOU659WG	MW64	13.4	Primary	WG	JK	09/27/18	1030			X	X	X	X	X	X	X	X	87031	092701,05,06
18FWOU657WG	MW77	17	Primary	WG	CB	09/27/18	930			X	X	X	X	X	X	X	X	87031	092701,04,05,06
18FWOU660WG	MW82	16	Primary	WG	JK	09/27/18	1130			X	X	X	X	X	X	X	X	87031	092701,05,06
1,2,3-Trichloropropane Plume																			
18FWOU623WG	MW08	17.9	Primary	WG	JK	06/22/18	1640		X			X	X	X	X	X	X	86178	062601,-02
18FWOU620WG	MW47	15.8	Primary/MS/MSD	WG	JK	06/22/18	1445		X*			X*	X*	X*	X*	X*	X*	86178	062601,-02
18FWOU621WG	MW471 (MW47)	15.8	Field Duplicate of 18FWOU620WG	WG	JK	06/22/18	1500		X			X	X	X	X	X	X	86178	062601,-02
18FWOU626WG	MW48	17.0	Primary	WG	JK	06/25/18	1030		X			X	X	X	X	X	X	86178	062601,-02
18FWOU618WG	MW79	18.0	Primary	WG	JK	06/22/18	1100		X			X	X	X	X	X	X	86178	062601,-02
18FWOU639WG	MW08	17	Primary	WG	JK	09/21/18	1200		X			X	X	X	X	X	X	86989	092401, 02
18FWOU634WG	MW47	15.0	Primary/MS/MSD	WG	JK	09/20/18	1440		X*			X*	X*	X*	X*	X*	X*	86989	092401, 02
18FWOU635WG	MW471 (MW47)	15	Field Duplicate of 18FWOU634WG	WG	JK	09/20/18	1500		X			X	X	X	X	X	X	86989	092401, 02

Table C-1. Sample Summary
Operable Unit 6
Fort Wainwright, Alaska

Sample Number	Sample Location	Sample Depth (feet BTOC)	Sample Type	Matrix	Sampler Initials	Sample Date	Sample Time	VOC 8260C	VOC Low Level 8260C-SIM	DRO AK102	RRO AK103	Dissolved Metals[1] 6010C	Sulfate 300.0	Ammonia as N 350.1	Nitrate-Nitrite as N 353.2	Methane RSK 175	Alkalinity as $CaCO_3$ SM 2320B	Sample Data Group	Cooler ID #
18FWOU637WG	MW48	15	Primary	WG	JK	09/21/18	1040		X			X	X	X	X	X	X	86989	092401, 02
18FWOU636WG	MW79	17	Primary	WG	JK	09/21/18	930		X			X	X	X	X	X	X	86989	092401, 02
TCE Plume																			
18FWOU622WG	MW61	15.5	Primary/MS/MSD	WG	CB	06/22/18	1445	X*				X	X	X	X	X	X	86178	062601,-02
18FWOU630WG	MW611 (MW61)	15.5	Field Duplicate of 18FWOU622WG	WG	CB	06/22/18	1500	X										86178	062601
18FWOU624WG	MW80	41.8	Primary	WG	CB	06/22/18	1555	X				X	X	X	X	X	X	86178	062601,-02
18FWOU644WG	MW61	13.75	Primary/MS/MSD	WG	JK	09/21/18	1500	X*				X	X	X	X	X	X	86989	092401, 02
18FWOU645WG	MW611 (MW61)	13.75	Field Duplicate of 18FWOU644WG	WG	JK	09/21/18	1510	X				X	X	X	X	X	X	86989	092401
18FWOU641WG	MW80	41.8	Primary	WG	JK	09/21/18	1330	X				X	X	X	X	X	X	86989	092401, 02
Sentry Wells																			
18FWOU617WG	MW39	16.2	Primary	WG	JK	06/22/18	945		X									86178	062601
18FWOU616WG	MW78	32.0	Primary	WG	JK	06/22/18	845		X									86178	062601
18FWOU625WG[2]	MW91[2]	66.1	Primary	WG	JK	06/25/18	915		X									86178	062601
18FWOU619WG	MW93	62.7	Primary	WG	JK	06/22/18	1315		X									86178	062601
18FWOU631WG	MW39	15.3	Primary	WG	JK	09/20/18	1045		X									86989	092401
18FWOU633WG	MW78	32	Primary	WG	JK	09/20/18	1330		X									86989	092401
18FWOU638WG[2]	MW91[2]	66	Primary	WG	CB	09/21/18	1115		X									86989	092401
18FWOU632WG	MW93	62.7	Primary	WG	JK	09/20/18	1200		X									86989	092401
Quality Control Samples																			
18FWOU6EB01WQ	Rinsate 01	--	Equipment Blank	WQ	JK	06/21/18	1410			X	X	X	X	X	X	X	X	86154	062101,-05
18FWOU6TB01WQ	Trip Blank	--	Trip Blank	WQ	--	06/21/18	800									X		86154	062101
18FWOU6EB02WQ	Rinsate 02	--	Equipment Blank	WQ	JK	06/25/18	1700		X	X	X	X	X	X	X	X	X	86178	062601,02,03
18FWOU6EB03WQ	Rinsate 03	--	Equipment Blank	WQ	JK	06/22/18	1615	X										86178	062601
18FWOU6TB02WQ	Trip Blank	--	Trip Blank	WQ	--	06/22/18	800	X	X							X		86178	062601
18FWOU6EB04WQ	Rinsate 01	--	Equipment Blank	WQ	JK	09/20/18	1630		X			X	X	X	X	X	X	86989	092401,02
18FWOU6TB03WQ	Trip Blank	--	Trip Blank	WQ	--	09/20/18	800	X	X							X		86989	092401
18FWOU6EB05WQ	Rinsate 02	--	Equipment Blank	WQ	JK	09/27/18	1215			X	X	X	X	X	X	X	X	87031	092701,05,06
18FWOU6TB04WQ	Trip Blank	--	Trip Blank	WQ	--	09/21/18	800									X		87031	092701

Notes: All samples were submitted to Agriculture & Priority Pollutants Laboratories, Inc (APPL) of Clovis, CA. The standard 21-day turnaround time was requested for all analyses. All work was performed under NPDL work order number 18-088.

* Denotes samples for MS/MSD analysis

[1] Dissolved metals include iron, manganese, phosphorus, and potassium

[2] All wells were purged and sampled with a submersible pump, with the exception of MW91 (samples 18FWOU625WG and 18FWOU638WG). Well MW91 was purged and sampled with a bladder pump due to a partial well obstruction (i.e. the casing is broken below ground surface).

BTOC - below top of casing
°C - degrees Celsius
$CaCO_3$ - calcium carbonate
CB - Chris Boese
DRO - diesel range organics
H_2SO_4 - sulfuric acid
HCl - hydrochloric acid
HDPE - high-density polyethylene
HNO_3 - nitric acid
JK - Josh Klynstra
mL - milliliters
MS/MSD - matrix spike/matrix spike duplicate
N - nitrogen
RRO - residual range organics
VOA - volatile organic analysis
VOC - volatile organic compounds
WG - groundwater matrix
WQ - water quality control

Water Sample Collection (all samples were field-preserved at 0 to 6°C)
VOC - three HCl-preserved, 40 mL VOA vials
VOC Low Level - three HCl-preserved, 40 mL VOA vials
DRO/RRO - two HCl-preserved, 250 mL amber bottles
Dissolved Metals - one HNO_3-preserved, 125 mL HDPE bottle (field filtered)
Sulfate/Alkalinity - one non-preserved, 500 mL HDPE bottle
Ammonia/Nitrate-Nitrite - one H_2SO_4-preserved, 500 mL HDPE bottle
Methane - three HCl-preserved, 40 mL VOA vials

Table C-2. Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	18FWOU601WG	18FWOU602WG	18FWOU603WG	18FWOU604WG	18FWOU605WG	18FWOU606WG	18FWOU607WG	18FWOU608WG	18FWOU609WG	18FWOU610WG	18FWOU611WG	18FWOU612WG	18FWOU613WG	18FWOU614WG	18FWOU615WG
			Location ID	MW33	MW331	MW12R	MW28	MW03	MW38	MW06A	MW58	MW581	MW35	MW64	MW37	MW62	MW82	MW77
			Sample Data Group	86154	86154	86154	86154	86154	86154	86154	86154	86154	86154	86154	86154	86154	86154	86154
			Laboratory ID	AZ75565	AZ75566	AZ75567	AZ75568	AZ75569	AZ75570	AZ75571	AZ75572	AZ75573	AZ75574	AZ75575	AZ75576	AZ75577	AZ75578	AZ75579
			Collection Date	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary/MS/MSD	Field Duplicate of 18FWOU601WG	Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate of 18FWOU608W	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**	**OU6 ROD RG or ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	**1,500**	**25,000 [1000]**	**25,000 [1000]**	760 [50]	380 [50]	230 [50]	170 [50]	**5,300 [250]**	**2,300 [50]**	**2,500 [100]**	290 [50]	ND [50]	1,000 [50]	310 [50]	140 [50]	**7,800 [250]**
Residual Range Organics	AK103	µg/L	**1,100**	ND [4000]	ND [4000]	ND [200]	ND [200]	ND [200]	ND [200]	ND [1000]	ND [400]	ND [400]	ND [200]	ND [200]	ND [200]	ND [200]	ND [200]	ND [1000]
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	SW8260C	µg/L	**0.12**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	8260C-SIM	µg/L	**0.12**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	SW6010C	mg/L	NE	45.9 [0.025]	43.8 [0.025]	11.2 [0.025]	ND [0.025]	14.1 [0.025]	12.6 [0.025]	20.2 [0.025]	14 [0.025]	12.4 [0.025]	ND [0.025]	2.78 [0.025]	ND [0.025]	1.46 [0.025]	ND [0.025]	0.251 [0.025]
Manganese	SW6010C	mg/L	0.43	**3.17 [0.004]**	**2.96 [0.004]**	**1.02 [0.004]**	**1.08 [0.004]**	**0.916 [0.004]**	**1.36 [0.004]**	**1.37 [0.004]**	**1.13 [0.004]**	**1.1 [0.004]**	0.097 [0.004]	0.415 [0.004]	0.159 [0.004]	**1.39 [0.004]**	0.0875 [0.004]	**1.11 [0.004]**
Phosphorus, Total (as P)	SW6010C	mg/L	NE	0.244 [0.03]	0.213 [0.03]	0.128 [0.03]	ND [0.03]	0.111 [0.03]	ND [0.03]	0.132 [0.03]	0.0658 [0.03]	0.0639 [0.03]	ND [0.03]	ND [0.03]	ND [0.03]	ND [0.03]	ND [0.03]	0.0203 [0.03] J
Potassium	SW6010C	mg/L	NE	5.16 [0.5]	4.75 [0.5]	3.77 [0.5]	5.99 [0.5]	4.68 [0.5]	6.61 [0.5]	4.85 [0.5]	4.34 [0.5]	4.44 [0.5]	6.74 [0.5]	4.43 [0.5]	7.45 [0.5]	6.58 [0.5]	7.05 [0.5]	10.3 [0.5]
Sulfate	E300.0	mg/L	NE	4.0 [0.198]	4.0 [0.198]	30.1 [0.990]	52.8 [0.990]	43.0 [0.990]	38.5 [0.990]	16.6 [0.198]	16.8 [0.990]	17.3 [0.990]	39.5 [0.990]	12.8 [0.990]	29.1 [0.990]	46.0 [0.990]	33.2 [0.990]	64.3 [0.990]
Nitrogen, Ammonia (as N)	E350.1	mg/L	NE	0.33 [0.40] J,B	0.33 [0.40] J,B	0.15 [0.40] J,B	ND [0.40]	ND [0.40]	ND [0.40]	0.45 [0.40] J,B	ND [0.40] J	4.2 [0.40] J	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
Nitrogen, Nitrate-Nitrite (as N)	E353.2	mg/L	NE	0.11 [0.100] B	0.11 [0.100] B	0.11 [0.100] B	1.3 [0.100]	0.12 [0.100] B	1.0 [0.100]	0.11 [0.100] B	0.50 [0.100]	0.55 [0.100]	4.0 [0.100]	0.27 [0.100]	8.9 [1.000]	0.10 [0.100] B	1.6 [0.100]	34.3 [1.000]
Methane	RSK175	mg/L	NE	0.28 [0.001] J-	0.26 [0.001] J-	0.0046 [0.001] J,J-	ND [0.001] J-	ND [0.001] J-	0.0031 [0.001] J,J-	0.44 [0.001] J-	0.2 [0.001] J-	0.27 [0.001] J-	ND [0.001] J-	ND [0.001] J-	ND [0.001] J-	0.0098 [0.001] J-	ND [0.001] J-	ND [0.001] J-
Alkalinity as CaCO3	A2320B	mg/L	NE	314 [1.70]	320 [1.70]	183 [1.70]	314 [1.70]	250 [1.70]	364 [1.70]	249 [1.70]	240 [1.70]	241 [1.70]	395 [1.70]	232 [1.70]	275 [1.70]	316 [1.70]	421 [1.70]	493 [1.70]

Yellow highlighted and **bolded** results exceed OU6 ROD remedial goals or ADEC groundwater cleanup levels.

Grey shaded results are non-detect with LODs above OU6 ROD remedial goals or ADEC cleanup levels.

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µg/L - micrograms per liter
mg/L - milligrams per liter
NE - not established
QC - quality control
RG - remedial goal
ROD - Record of Decision
WG - groundwater
WQ - water QC sample

Table C-2. Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	18FWOU616WG	18FWOU617WG	18FWOU618WG	18FWOU619WG	18FWOU620WG	18FWOU621WG	18FWOU622WG	18FWOU623WG	18FWOU624WG	18FWOU625WG	18FWOU626WG	18FWOU627WG	18FWOU628WG	18FWOU629WG	18FWOU630WG
			Location ID	MW78	MW39	MW79	MW93	MW47	MW471	MW61	MW08	MW80	MW91	MW48	MW13	MW32R	MW321	MW611
			Sample Data Group	86178	86178	86178	86178	86178	86178	86178	86178	86178	86178	86178	86178	86178	86178	86178
			Laboratory ID	AZ75682	AZ75683	AZ75684	AZ75685	AZ75686	AZ75687	AZ75688	AZ75689	AZ75690	AZ75691	AZ75692	AZ75693	AZ75694	AZ75699	AZ75695
			Collection Date	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018	6/22/2018			6/25/2018	6/25/2018	6/25/2018	6/22/2018
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU620WG	Primary/MS/MSD	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU628WG	Field Duplicate of 18FWOU622WG
Analyte	**Method**	**Units**	**OU6 ROD RG or ADEC Cleanup Level [1]**			**Result [LOD] Qualifier**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**		**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	**1,500**	-	-	-	-	-	-	-	-	-	-	-	-	390 [50] J-	390 [50] J-	-
Residual Range Organics	AK103	µg/L	**1,100**	-	-	-	-	-	-	-	-	-	-	-	-	230 [200] J,J-	170 [200] J,J-	-
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	-	-	-	ND [0.50]	-	ND [0.50]	-	-	-	-	-	ND [0.50]
1,2,3-Trichloropropane	SW8260C	µg/L	**0.12**	-	-	-	-	-	-	ND [1.00]	-	ND [1.00]	-	-	-	-	-	ND [1.00]
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	-	-	-	5 [0.30]	-	ND [0.30]	-	-	-	-	-	4.5 [0.30]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	-	-	-	ND [0.30]	-	ND [0.30]	-	-	-	-	-	ND [0.30]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	-	-	-	5.9 [0.30]	-	ND [0.30]	-	-	-	-	-	6.2 [0.30]
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	-	-	-	-	-	-	0.73 [0.30] J	-	ND [0.30]	-	-	-	-	-	0.79 [0.30] J
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	-	-	-	ND [0.30]	-	ND [0.30]	-	-	-	-	-	ND [0.30]
1,2,3-Trichloropropane	8260C-SIM	µg/L	**0.12**	ND [0.0050]	ND [0.0050]	**1.2 [0.0250]**	ND [0.0050]	**0.28 [0.0050]**	**0.28 [0.0050]**	-	ND [0.0050]	-	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	ND [0.015]	ND [0.015]	ND [0.075]	ND [0.015]	ND [0.015]	ND [0.015]	-	ND [0.015]	-	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	-	-
Iron	SW6010C	mg/L	NE	-	-	3.34 [0.025]	-	0.038 [0.025] J	ND [0.025]	12.2 [0.025]	ND [0.025]	10.3 [0.025]	-	0.119 [0.025]	1 [0.025]	0.0266 [0.025] J,B	-	-
Manganese	SW6010C	mg/L	0.43	-	-	**0.612 [0.004]**	-	0.0211 [0.004]	0.0189 [0.004]	**1.87 [0.004]**	0.0047 [0.004] J	**0.833 [0.004]**	-	0.068 [0.004]	0.323 [0.004]	0.0621 [0.004] J+	-	-
Phosphorus, Total (as P)	SW6010C	mg/L	NE	-	-	0.0473 [0.03] J	-	0.042 [0.03] J	0.0229 [0.03] J	0.0653 [0.03]	0.0374 [0.03] J	0.187 [0.03]	-	0.0361 [0.03] J	0.0368 [0.03] J	0.0358 [0.03] J	-	-
Potassium	SW6010C	mg/L	NE	-	-	4.97 [0.5]	-	5.44 [0.5]	5.56 [0.5]	5.62 [0.5]	4.79 [0.5]	3.77 [0.5]	-	5.29 [0.5]	4.01 [0.5]	6.24 [0.5]	-	-
Sulfate	E300.0	mg/L	NE	-	-	30.9 [0.198]	-	37.1 [0.198]	35.9 [0.198]	40.5 [0.198]	31.8 [0.198]	29.2 [0.198]	-	36.5 [0.198]	39.8 [0.198]	47.9 [0.198]	-	-
Nitrogen, Ammonia (as N)	E350.1	mg/L	NE	-	-	0.23 [0.40] J,B	-	ND [0.40]	ND [0.40]	0.15 [0.40] J,B	ND [0.40]	ND [0.40]	-	ND [0.40]	ND [0.40]	ND [0.40]	-	-
Nitrogen, Nitrate-Nitrite (as N)	E353.2	mg/L	NE	-	-	1.0 [0.100]	-	3.6 [0.100]	3.9 [0.100]	0.19 [0.100]	2.8 [0.100]	ND [0.100]	-	0.82 [0.100]	ND [0.100]	3.5 [0.100]	-	-
Methane	RSK175	mg/L	NE	-	-	0.12 [0.001]	-	ND [0.001]	ND [0.001]	0.25 [0.001]	ND [0.001]	0.028 [0.001]		ND [0.001]	0.032 [0.001]	ND [0.001]	-	-
Alkalinity as CaCO3	A2320B	mg/L	NE	-	-	289 [1.70] J-	-	331 [1.70] J-	326 [1.70] J-	311 [1.70] J-	307 [1.70] J-	145 [1.70] J-	-	330 [1.70] J-	324 [1.70] J-	362 [1.70] J-	-	-

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QC - quality control
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ROD - Record of Decision
WG - groundwater
WQ - water QC sample

Table C-2. Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	18FWOU631WG	18FWOU632WG	18FWOU633WG	18FWOU634WG	18FWOU635WG	18FWOU636WG	18FWOU637WG	18FWOU638WG	18FWOU639WG	18FWOU640WG	18FWOU641WG	18FWOU642WG	18FWOU643WG	18FWOU644WG	18FWOU645WG
			Location ID	MW39	MW93	MW78	MW47	MW471	MW79	MW48	MW91	MW08	MW13	MW80	MW32R	MW321	MW61	MW611
			Sample Data Group	86989	86989	86989	86989	86989	86989	86989	86989	86989	86989	86989	86989	86989	86989	86989
			Laboratory ID	AZ80512	AZ80513	AZ80514	AZ80515	AZ80516	AZ80517	AZ80518	AZ80519	AZ80520	AZ80521	AZ80522	AZ80523	AZ80524	AZ80525	AZ80526
			Collection Date	9/20/2018	9/20/2018	9/20/2018	9/20/2018	9/20/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU634WG	Primary	Primary	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU642WG	Primary	Field Duplicate of 18FWOU644WG
Analyte	**Method**	**Units**	**OU6 ROD RG or ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	**1,500**	-	-	-	-	-	-	-	-	-	-	-	380 [50] J+	370 [50] J+	-	-
Residual Range Organics	AK103	µg/L	**1,100**	-	-	-	-	-	-	-	-	-	-	-	180 [200] J,J+	150 [200] J,J+	-	-
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	-	-	-	-	-	-	-	ND [0.50]	-	-	ND [0.50]	ND [0.50]
1,2,3-Trichloropropane	SW8260C	µg/L	**0.12**	-	-	-	-	-	-	-	-	-	-	ND [1.0]	-	-	ND [1.0]	ND [1.0]
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	-	-	-	-	-	-	-	ND [0.30]	-	-	6.7 [0.30] J-	5.9 [0.30]
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	-	-	-	-	-	-	-	ND [0.30]	-	-	ND [0.30]	ND [0.30]
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	-	-	-	-	-	-	-	ND [0.30]	-	-	6.2 [0.30] J-	5.5 [0.30]
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	-	-	-	-	-	-	-	-	-	-	ND [0.30]	-	-	1.0 [0.30] J-	0.99 [0.30] J
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	-	-	-	-	-	-	-	ND [0.30]	-	-	ND [0.30]	ND [0.30]
1,2,3-Trichloropropane	8260C-SIM	µg/L	**0.12**	0.0064 [0.0050] J	ND [0.0050]	0.0030 [0.0050] J	**0.19 [0.0050]**	**0.20 [0.0050]**	**1.6 [0.0025]**	ND [0.0050]	ND [0.0050]	0.062 [0.0050]	ND [0.0050]	-	ND [0.0050]	ND [0.0050]	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	ND [0.015]	-	ND [0.015]	ND [0.015]	-	-
Iron	SW6010C	mg/L	NE	-	-	-	ND [0.025]	ND [0.025]	1.88 [0.025]	0.027 [0.025] J	-	ND [0.025]	0.455 [0.025]	9.91 [0.025]	0.123 [0.025]	0.147 [0.025]	9.19 [0.025]	-
Manganese	SW6010C	mg/L	0.43	-	-	-	0.0295 [0.004] J+	0.0311 [0.004] J+	**0.496 [0.004]**	0.0051 [0.004] J,B	-	0.0026 [0.004] J,B	0.0851 [0.004]	**0.801 [0.004]**	0.215 [0.004]	0.222 [0.004]	**2.07 [0.004]**	-
Phosphorus, Total (as P)	SW6010C	mg/L	NE	-	-	-	ND [0.03]	ND [0.03]	ND [0.03]	ND [0.03]	-	ND [0.03]	ND [0.03]	0.144 [0.03]	ND [0.03]	ND [0.03]	0.0291 [0.03] J	-
Potassium	SW6010C	mg/L	NE	-	-	-	6.66 [0.5]	6.5 [0.5]	5.84 [0.5]	6.77 [0.5]	-	5.36 [0.5]	5.4 [0.5]	3.71 [0.5]	6.77 [0.5]	6.68 [0.5]	6.46 [0.5]	-
Sulfate	E300.0	mg/L	NE	-	-	-	39.5 [0.198]	39.4 [0.198]	42.3 [0.198]	48.5 [0.396]	-	31.9 [0.198]	57.0 [0.396]	31.3 [0.198]	48.7 [0.396]	48.9 [0.396]	44.5 [0.198]	-
Nitrogen, Ammonia (as N)	E350.1	mg/L	NE	-	-	-	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	-	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	0.25 [0.40] J	-
Nitrogen, Nitrate-Nitrite (as N)	E353.2	mg/L	NE	-	-	-	9.1 [1.000]	8.6 [1.000]	2.5 [0.100]	3.3 [0.100]	-	0.32 [0.100]	0.53 [0.100]	0.058 [0.100] J	3.1 [0.100]	3.2 [0.100]	0.046 [0.100] J	-
Methane	RSK175	mg/L	NE	-	-	-	ND [0.001]	ND [0.001]	0.015 [0.001]	ND [0.001]	-	ND [0.001]	0.0086 [0.001]	0.011 [0.001]	0.011 [0.001]	0.011 [0.001]	0.023 [0.001]	-
Alkalinity as CaCO3	A2320B	mg/L	NE	-	-	-	314 [1.70]	320 [1.70]	318 [1.70]	406 [1.70]	-	309 [1.70]	447 [1.70]	154 [1.70]	327 [1.70]	322 [1.70]	348 [1.70]	-

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ROD - Record of Decision
WG - groundwater
WQ - water QC sample

Table C-2. Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	18FWOU646WG	18FWOU647WG	18FWOU648WG	18FWOU649WG	18FWOU650WG	18FWOU651WG	18FWOU652WG	18FWOU653WG	18FWOU654WG	18FWOU655WG	18FWOU656WG	18FWOU657WG	18FWOU658WG	18FWOU659WG	18FWOU660WG
			Location ID	MW38	MW03	MW28	MW12R	MW33	MW331	MW06A	MW35	MW37	MW58	MW581	MW77	MW62	MW64	MW82
			Sample Data Group	87031	87031	87031	87031	87031	87031	87031	87031	87031	87031	87031	87031	87031	87031	87031
			Laboratory ID	AZ80756	AZ80757	AZ80758	AZ80759	AZ80760	AZ80761	AZ80762	AZ80763	AZ80764	AZ80765	AZ80766	AZ80767	AZ80768	AZ80769	AZ80770
			Collection Date	9/21/2018	9/26/2018	9/26/2018	9/26/2018	9/26/2018	9/26/2018	9/26/2018	9/26/2018	9/26/2018	9/27/2018	9/27/2018	9/27/2018	9/27/2018	9/27/2018	9/27/2018
			Matrix	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG	WG
			Sample Type	Primary	Primary	Primary	Primary	Primary/MS/MSD	Field Duplicate of 18FWOU650WG	Primary	Primary	Primary	Primary	Field Duplicate of 18FWOU655WG	Primary	Primary	Primary	Primary
Analyte	**Method**	**Units**	**OU6 ROD RG or ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	**1,500**	360 [50]	270 [50]	490 [50]	290 [50]	**39,000 [1000]**	**43,000 [1000]**	**5,300 [100]**	340 [50]	950 [50]	**3,000 [50]**	**3,600 [50]**	**4,600 [50]**	**1,500 [50]**	ND [50]	ND [50]
Residual Range Organics	AK103	µg/L	**1,100**	ND [200]	ND [200]	ND [200]	ND [200]	ND [4000]	ND [4000]	ND [400]	ND [200]	ND [200]	ND [200]	ND [200]	ND [200]	ND [200]	ND [200]	ND [200]
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	SW8260C	µg/L	**0.12**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	8260C-SIM	µg/L	**0.12**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	SW6010C	mg/L	NE	7.97 [0.025]	12.5 [0.025]	ND [0.025]	9.32 [0.025]	43.9 [0.025]	42.7 [0.025]	15.2 [0.025]	ND [0.025]	ND [0.025]	15.9 [0.025]	16 [0.025]	ND [0.025]	1.54 [0.025]	1.59 [0.025]	ND [0.025]
Manganese	SW6010C	mg/L	0.43	**0.919 [0.004]**	**0.798 [0.004]**	**0.925 [0.004]**	**0.897 [0.004]**	**3.58 [0.004]**	**3.38 [0.004]**	**1.03 [0.004]**	0.0735 [0.004]	0.255 [0.004]	**1.13 [0.004]**	**1.14 [0.004]**	**0.667 [0.004]**	**1.27 [0.004]**	0.359 [0.004]	0.0244 [0.004]
Phosphorus, Total (as P)	SW6010C	mg/L	NE	0.0094 [0.03] J	0.113 [0.03]	ND [0.03]	0.0932 [0.03]	0.268 [0.03]	0.269 [0.03]	0.1 [0.03]	ND [0.03]	ND [0.03]	0.0738 [0.03]	0.0768 [0.03]	ND [0.03]	ND [0.03]	ND [0.03]	ND [0.03]
Potassium	SW6010C	mg/L	NE	5.94 [0.5]	4.74 [0.5]	5.67 [0.5]	3.99 [0.5]	5.41 [0.5]	4.85 [0.5]	4.95 [0.5]	6.15 [0.5]	6.75 [0.5]	4.54 [0.5]	4.25 [0.5]	8.39 [0.5]	6.28 [0.5]	4.4 [0.5]	6.74 [0.5]
Sulfate	E300.0	mg/L	NE	37.2 [0.198]	44.2 [0.198]	51.0 [0.198]	33.4 [0.198]	6.8 [0.198]	7.0 [0.198]	16.4 [0.198]	41.9 [0.198]	32.3 [0.198]	19.2 [0.198]	19.2 [0.198]	53.9 [0.396]	48.5 [0.198]	18.4 [0.198]	43.0 [0.198]
Nitrogen, Ammonia (as N)	E350.1	mg/L	NE	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	0.42 [0.40] J,J+	0.50 [0.40] J+	0.17 [0.40] J	ND [0.40]	ND [0.40]	0.14 [0.40] J	0.12 [0.40] J	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
Nitrogen, Nitrate-Nitrite (as N)	E353.2	mg/L	NE	0.53 [0.100]	ND [0.100]	ND [0.100]	ND [0.100]	ND [0.100]	0.034 [0.100] J	0.043 [0.100] J	1.4 [0.100]	5.7 [0.100]	0.056 [0.100] J	0.042 [0.100] J	4.7 [0.100]	ND [0.100]	0.14 [0.100]	3.2 [0.100]
Methane	RSK175	mg/L	NE	0.014 [0.001]	0.013 [0.001]	0.013 [0.001]	0.014 [0.001]	0.19 [0.001] J	0.13 [0.001] J	0.23 [0.001]	ND [0.001]	0.0084 [0.001]	0.11 [0.001]	0.1 [0.001]	ND [0.001]	0.02 [0.001]	0.011 [0.001]	ND [0.001] J-
Alkalinity as CaCO3	A2320B	mg/L	NE	327 [1.70]	267 [1.70]	241 [1.70]	163 [1.70]	336 [1.70]	337 [1.70]	288 [1.70]	338 [1.70]	288 [1.70]	208 [1.70]	210 [1.70]	361 [1.70]	290 [1.70]	246 [1.70]	448 [1.70]

Yellow highlighted and **bolded** results exceed OU6 ROD remedial goals or ADEC groundwater cleanup levels.

Grey shaded results are non-detect with LODs above OU6 ROD remedial goals or ADEC cleanup levels.

[1] **OU6 ROD analytes and remedial goals are identified in BLUE text.**
The remaining values are ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of October 27, 2018).

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

Acronyms:
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
mg/L - milligrams per liter
NE - not established
QC - quality control
RG - remedial goal
ROD - Record of Decision
WG - groundwater
WQ - water QC sample

Table C-2. Sample Results
Operable Unit 6
Fort Wainwright, Alaska

			Sample ID	18FWOU6EB01WQ	18FWOU6TB01WQ	18FWOU6EB02WQ	18FWOU6EB03WQ	18FWOU6TB02WQ	18FWOU6EB04WQ	18FWOU6TB03WQ	18FWOU6EB05WQ	18FWOU6TB04WQ
			Location ID	Rinsate 01	Trip Blank	Rinsate 02	Rinsate 03	Trip Blank	Rinsate04	TripBlank	Rinsate05	Trip Blank
			Sample Data Group	86154	86154	86178	86178	86178	86989	86989	87031	87031
			Laboratory ID	AZ75580	AZ75581	AZ75696	AZ75697	AZ75698	AZ80527	AZ80528	AZ80771	AZ80772
			Collection Date	6/21/2018	6/20/2018	6/25/2018	6/22/2018	6/22/2018	9/20/2018	9/20/2018	9/27/2018	9/21/2018
			Matrix	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ
			Sample Type	Equipment Blank	Trip Blank	Equipment Blank	Equipment Blank	Trip Blank	Equipment Blank	Trip Blank	Equipment Blank	Trip Blank
Analyte	**Method**	**Units**	**OU6 ROD RG or ADEC Cleanup Level [1]**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**	**Result [LOD] Qualifier**
Diesel Range Organics	AK102	µg/L	**1,500**	ND [50]	-	ND [50]	-	-	-	-	ND [50]	-
Residual Range Organics	AK103	µg/L	**1,100**	ND [200]	-	ND [200]	-	-	-	-	ND [200]	-
1,1-Dichloroethene	SW8260C	µg/L	280	-	-	-	ND [0.50]	ND [0.50]	-	ND [0.50]	-	-
1,2,3-Trichloropropane	SW8260C	µg/L	**0.12**	-	-	-	ND [1.00]	ND [1.00]	-	ND [1.0]	-	-
cis-1,2-Dichloroethene	SW8260C	µg/L	36	-	-	-	ND [0.30]	ND [0.30]	-	ND [0.30]	-	-
Tetrachloroethene (PCE)	SW8260C	µg/L	41	-	-	-	ND [0.30]	ND [0.30]	-	ND [0.30]	-	-
trans-1,2-Dichloroethene	SW8260C	µg/L	360	-	-	-	ND [0.30]	ND [0.30]	-	ND [0.30]	-	-
Trichloroethene (TCE)	SW8260C	µg/L	**5.0**	-	-	-	ND [0.30]	ND [0.30]	-	ND [0.30]	-	-
Vinyl chloride	SW8260C	µg/L	0.19	-	-	-	ND [0.30]	ND [0.30]	-	ND [0.30]	-	-
1,2,3-Trichloropropane	8260C-SIM	µg/L	**0.12**	-	-	ND [0.0050]	-	ND [0.0050]	ND [0.0050]	ND [0.0050]	-	-
Vinyl chloride	8260C-SIM	µg/L	0.19	-	-	ND [0.015]	-	ND [0.015]	ND [0.015]	ND [0.015]	-	-
Iron	SW6010C	mg/L	NE	0.0178 [0.025] J	-	0.0132 [0.025] J	-	-	ND [0.025]	-	ND [0.025]	-
Manganese	SW6010C	mg/L	0.43	0.0038 [0.004] J	-	ND [0.004]	-	-	0.0052 [0.004] J	-	ND [0.004]	-
Phosphorus, Total (as P)	SW6010C	mg/L	NE	ND [0.03]	-	ND [0.03]	-	-	ND [0.03]	-	ND [0.03]	-
Potassium	SW6010C	mg/L	NE	ND [0.5]	-	ND [0.5]	-	-	ND [0.5]	-	ND [0.5]	-
Sulfate	E300.0	mg/L	NE	0.24 [0.198] J	-	ND [0.198]	-	-	0.16 [0.198] J	-	ND [0.198]	-
Nitrogen, Ammonia (as N)	E350.1	mg/L	NE	ND [0.40]	-	1.0 [0.40]	-	-	ND [0.40]	-	ND [0.40]	-
Nitrogen, Nitrate-Nitrite (as N)	E353.2	mg/L	NE	0.098 [0.100] J,B	-	ND [0.100]	-	-	ND [0.100]	-	ND [0.100]	-
Methane	RSK175	mg/L	NE	ND [0.001] J-	ND [0.001] J-	ND [0.001]	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
Alkalinity as CaCO3	A2320B	mg/L	NE	ND [1.70]	-	ND [1.70]	-	-	ND [1.70]	-	ND [1.70]	-

Yellow highlighted and **bolded** results exceed OU6 ROD remedial goals or ADEC groundwater cleanup levels.

Grey shaded results are non-detect with LODs above OU6 ROD remedial goals or ADEC cleanup levels.

[1] **OU6 ROD analytes and remedial goals are identified in BLUE text.**
The remaining values are ADEC Groundwater Human Health values listed in ADEC Title 18, Alaska Administrative Code, Section 75.345, Table C (revised as of October 27, 2018).

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J- - result qualified as estimate with a low-bias due to a QC failure
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Acronyms:
LOD - limit of detection
LOQ - limit of quantitation
MS/MSD - matrix spike/matrix spike duplicate
µg/L - micrograms per liter
mg/L - milligrams per liter
NE - not established
QC - quality control
RG - remedial goal
ROD - Record of Decision
WG - groundwater
WQ - water QC sample

APPENDIX D

LTMO ANALYSIS RESULTS

Exhibit D-1—Mann-Kendall Trends of Main DRO Plume

MAROS Mann-Kendall Statistics Summary

Project: OU6 2018
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/17/2007 **to** 9/26/2018
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PHC as DIESEL FUEL								
MW06A	T	17	17	0.30	-7	59.6%	No	S
MW12R	S	16	16	0.74	-28	88.6%	No	S
MW33	T	16	16	0.64	42	96.8%	No	I
MW58	T	16	16	0.35	0	48.2%	No	S
PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP								
MW12R	S	16	11	1.13	-5	57.1%	No	NT
MW33	T	16	11	1.03	46	97.9%	No	I

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); Source/Tail (S/T)

The Number of Samples and Number of Detects shown above are post-consolidation values.

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Exhibit D-2—Spatial Moment Analysis of Main DRO Plume

MAROS Spatial Moment Analysis Summary

Project: OU6 2018
Location: Fort Wainwright

User Name: FES
State: Alaska

	0th Moment	1st Moment (Center of Mass)			2nd Moment (Spread)		
Effective Date	Estimated Mass (Kg)	Xc (ft)	Yc (ft)	Source Distance (ft)	Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
PHC as DIESEL FUEL							
5/19/2016	4.0E+01	1,380,635	3,959,948	181	6,536	26,459	10
9/9/2016	5.6E+01	1,380,676	3,959,907	123	6,559	24,560	10
7/20/2017	3.3E+01	1,380,624	3,959,957	195	6,915	29,593	10
9/28/2017	5.1E+01	1,380,619	3,959,940	186	6,509	31,953	10
6/20/2018	5.0E+01	1,380,611	3,959,982	223	7,345	38,086	10
9/26/2018	5.6E+01	1,380,608	3,959,961	209	7,158	31,014	10

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Exhibit D-2—Spatial Moment Analysis of Main DRO Plume (continued)

Project: OU6 2018
Location: Fort Wainwright

User Name: FES
State: Alaska

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	PHC as DIESEL FUEL	0.20	3	64.0%	NT
1st Moment: Distance to Source					
	PHC as DIESEL FUEL	0.18	9	93.2%	PI
2nd Moment: Sigma XX					
	PHC as DIESEL FUEL	0.05	7	86.4%	NT
2nd Moment: Sigma YY					
	PHC as DIESEL FUEL	0.16	9	93.2%	PI

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

Porosity: 0.33 **Saturated Thickness:** Uniform: 20 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.

Exhibit D-3 —Uncertainty Results for the Main DRO Plume

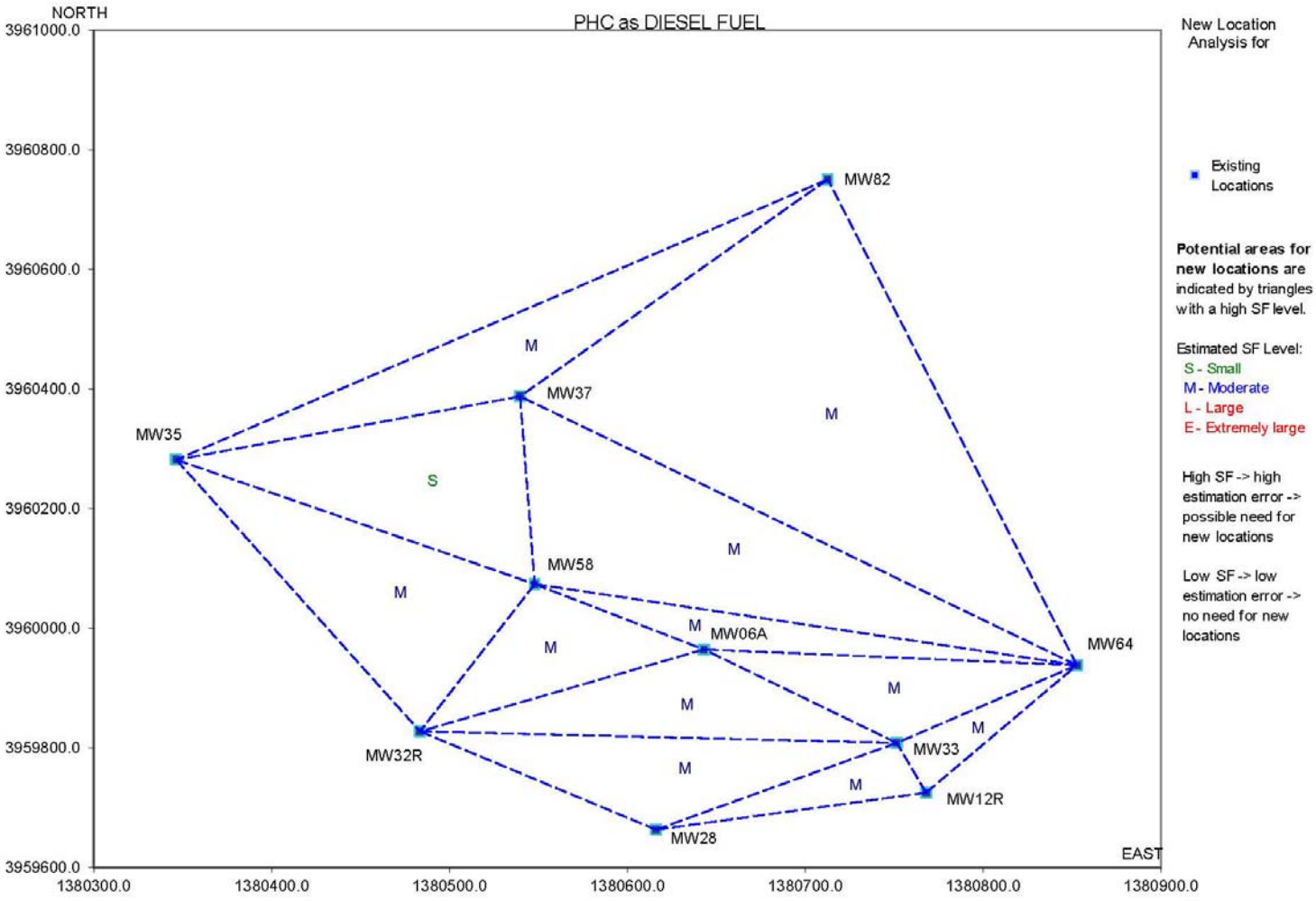

Exhibit D-4—Sample Location Optimization Results for the Main DRO Plume

MAROS Sampling Location Optimization Results

Project: OU6 2018 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

Sampling Events Analyzed: **From** Sample Event 1 (10/17/2007) **to** Sample Event 17 (9/26/2018)

Parameters used:

Constituent	Inside SF	Hull SF	Area Ratio	Conc. Ratio
PHC as DIESEL FUEL	0.2	0.1	0.8	0.8

Well	X (feet)	Y (feet)	Removable?	Average Slope Factor*	Minimum Slope Factor*	Maximum Slope Factor*	Eliminated?
PHC as DIESEL FUEL							
MW06A	1380643.00	3959965.00	☑	0.244	0.218	0.273	☐
MW12R	1380767.88	3959725.50	☑	0.327	0.017	0.543	☐
MW28	1380616.13	3959663.75	☑	0.420	0.309	0.646	☐
MW32R	1380483.38	3959828.00	☑	0.436	0.290	0.531	☐
MW33	1380751.38	3959808.75	☑	0.535	0.435	0.635	☐
MW35	1380346.38	3960282.00	☑	0.356	0.268	0.525	☐
MW37	1380539.63	3960388.00	☑	0.212	0.029	0.332	☐
MW58	1380547.88	3960074.25	☑	0.248	0.113	0.318	☐
MW64	1380852.63	3959938.75	☑	0.772	0.493	0.857	☐
MW82	1380712.63	3960750.75	☑	0.476	0.212	0.779	☐

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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Exhibit D-5—Sampling Frequency Optimization of Main DRO Plume

MAROS Sampling Frequency Optimization Results

Project: OU6 2018 **User Name:** FES

Location: Fort Wainwright **State:** Alaska

The Overall Number of Sampling Events: 6

"Recent Period" defined by events: **From** Sample Event 12 (5/19/2016) **To** Sample Event 17 (9/26/2018)

"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			
MW06A	Annual	Annual	Annual
MW12R	Annual	Annual	Annual
MW28	Biennial	Annual	Annual
MW32R	Biennial	Annual	Annual
MW33	Annual	Annual	Annual
MW35	Annual	Annual	Annual
MW37	Annual	Annual	Annual
MW58	Annual	Annual	Annual
MW64	Biennial	Annual	Annual
MW82	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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Exhibit D-6—Mann-Kendall Trends of MW62 and MW77

MAROS Mann-Kendall Statistics Summary

Project: OU6 2018
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/17/2007 **to** 9/26/2018
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PHC as DIESEL FUEL								
MW62	S	16	14	2.28	19	78.8%	No	NT
MW77	T	15	15	1.58	9	65.1%	No	NT
PHC as HEAVY/RESIDUAL RANGE ORGANIC COMP								
MW62	S	16	10	2.25	11	67.1%	No	NT
MW77	T	15	10	1.26	-17	78.2%	No	NT

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); Source/Tail (S/T)

The Number of Samples and Number of Detects shown above are post-consolidation values.

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Exhibit D-7 —Mann-Kendall Results for TCP Plume Wells

MAROS Mann-Kendall Statistics Summary

Project: OU6 2018
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/17/2007 **to** 9/26/2018
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
1,2,3-TRICHLOROPROPANE								
MW47	S	15	13	0.60	-45	98.6%	No	D
MW79	T	14	14	0.66	33	96.0%	No	I

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); Source/Tail (S/T)

The Number of Samples and Number of Detects shown above are post-consolidation values.

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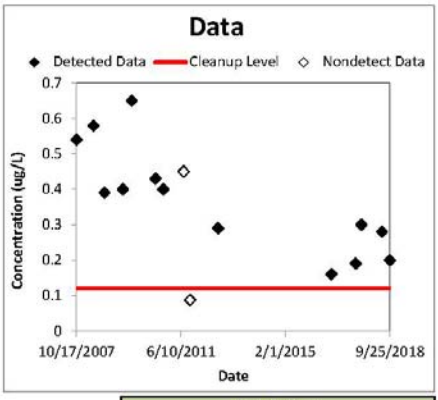
Exhibit D-8 —Groundwater Statistics Output TCP in MW47

Groundwater Statistics Tool

Data input worksheet

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Remediation
Date of Evaluation	12/19/2018
Person performing analysis	AS
Chemical of Concern	TCP
Well Name/Number	MW47
Date Units	Date
Concentration Units	ug/L
Confidence Level Desired	95%
Cleanup Level	0.12
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3
Number of data points:	15
Number of detected results:	13
Number of nondetect results:	2
Detection frequency:	0.866666667

Date (Date)	TCP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
10/17/07	0.5		Yes
5/20/08	0.58		Yes
10/8/08	0.39		Yes
5/30/09	0.4		Yes
9/21/09	0.65		Yes
7/19/10	0.43		Yes
10/29/10	0.4		Yes
7/14/11	0.45	U	No
10/5/11	0.087	U	No
9/26/12	0.29		Yes
9/9/16	0.16		Yes
7/20/17	0.19		Yes
9/28/17	0.3		Yes
6/20/18	0.28		Yes
9/26/18	0.2		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

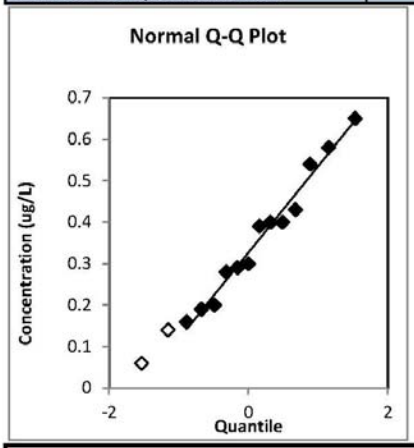
Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

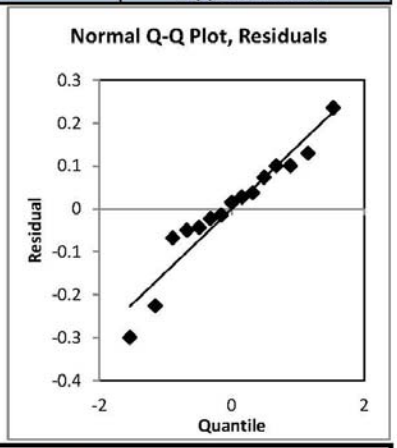
Exhibit D-8 —Groundwater Statistics Output TCP in MW47 (continued)

Groundwater Statistics Tool

Normality Testing Worksheet

Normality Test Results			
Parameter	All Data	Minus Outliers	Residuals
Number of data points	15	15	15
Shapiro-Wilk alpha value	5%	N/A	5%
Slope	0.195118366	N/A	0.147991074
Intercept	0.334	N/A	-1.46543E-17
Correlation, R	0.988728261	N/A	0.960475089
Exact Test Value	0.96789113	N/A	0.943004967
Critical Value	0.881	N/A	0.881
Conclude sample distribution:	Appears normal	N/A	Appears normal





Previous Step: Outliers Screen | Next Step: Trend Screen | Skip Step: UCL Screen

Exhibit D-8 —Groundwater Statistics Output TCP in MW47 (continued)

Groundwater Statistics Tool

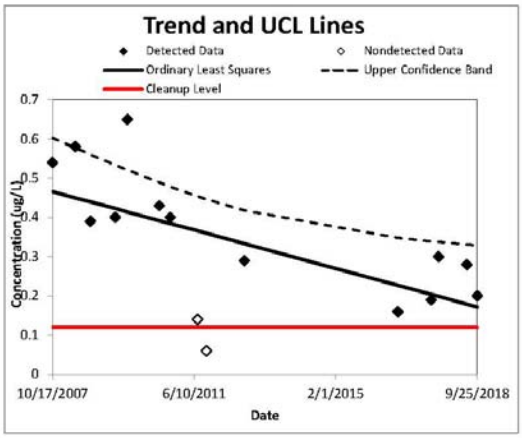
UCL calculations and summary statistics for data sets with nondetects

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Remediation
Date of Evaluation	12/19/2018
Person performing analysis	AS

Chemical of Concern	TCP
Well Name/Number	MW47
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	15
Number of detected results	13
Number of non-detected results	2
Detection frequency	87%
Number at or below cleanup level	1
Are any potential outliers present?	No
Mean of concentration	0.345
Standard deviation of concentration	0.158

95% Upper Confidence Limit (UCL)	0.533
Method for calculating UCL	KM Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	0.329
Trend calculation method	Ordinary Least Squares
Cleanup level	0.12
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	Yes



When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Message: None.	

Data, including imputed values

Date (Date)	TCP Concentration (ug/L)	Data Qualifier	Imputed value*
39372	0.54		0.54
39588	0.58		0.58
39729	0.39		0.39
39963	0.4		0.4
40077	0.65		0.65
40378	0.43		0.43
40480	0.4		0.4
40738	0.45	U	0.14
40821	0.087	U	0.06
41178	0.29		0.29
42622	0.16		0.16
42936	0.19		0.19
43006	0.3		0.3
43271	0.28		0.28
43369	0.2		0.2

* Note that the imputed value column also includes the actual value for detected samples. This is for convenience in copying and pasting the data.

Random Seed Used	57196.81641

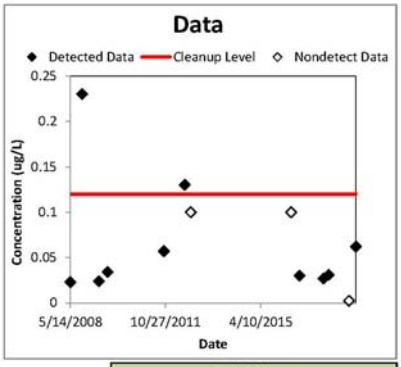
Exhibit D-9 —Groundwater Statistics Output TCP in MW08

Groundwater Statistics Tool

Data input worksheet

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	1/3/2019
Person performing analysis	AS
Chemical of Concern	TCP
Well Name/Number	MW08
Date Units	Date
Concentration Units	ug/L
Confidence Level Desired	95%
Cleanup Level	0.12
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3
Number of data points:	13
Number of detected results:	10
Number of nondetect results:	3
Detection frequency:	0.769230769

Date (Date)	TCP Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
5/14/2008	0.023		Yes
10/17/2008	0.23		Yes
5/27/2009	0.024		Yes
9/19/2009	0.034		Yes
10/4/2011	0.057		Yes
7/9/2012	0.13		Yes
9/24/2012	0.1	U	No
5/17/2016	0.1	U	No
9/7/2016	0.03		Yes
7/19/2017	0.027		Yes
9/28/2017	0.031		Yes
6/22/18	0.0025	U	No
9/21/2018	0.062		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

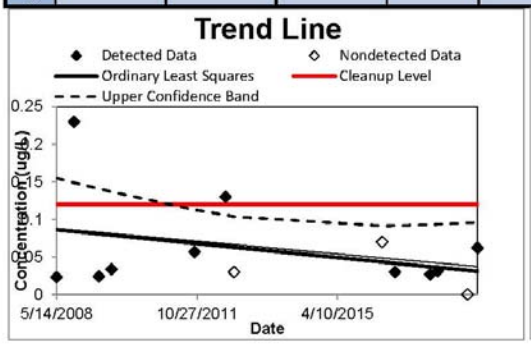
Exhibit D-9 —Groundwater Statistics Output TCP in MW08 (continued)

Groundwater Statistics Tool

Trend test results for datasets with normally distributed residuals (with our without transformation)

i	t (Date)	C (ug/L)	C Predicted	Fit residual	Upper Confidence Band
1	5/14/2008	0.023	0.0864	-0.0634	0.155
2	10/17/2008	0.23	0.0841	0.1459	0.149
3	5/27/2009	0.024	0.0809	-0.0569	0.141
4	9/19/2009	0.034	0.0792	-0.0452	0.137
5	10/4/2011	0.057	0.0682	-0.0112	0.113
6	7/9/2012	0.13	0.0642	0.0658	0.106
7	9/24/2012	0.03	0.063	-0.033	0.104
8	5/17/2016	0.07	0.0435	0.0265	0.0915
9	9/7/2016	0.03	0.0419	-0.0119	0.0918
10	7/19/2017	0.027	0.0372	-0.0102	0.0931
11	9/28/2017	0.031	0.0362	-0.0052	0.0935
12	6/22/2018	0	0.0323	-0.0323	0.0953
13	9/21/2018	0.062	0.0309	0.0311	0.096
14					
15					
16					
17					
18					
19					
20					

Ordinary Least Squares	
Slope	-1.46643E-05
Intercept	0.666844725
Correlation, R^2	0.0922
Test Result	No trend
Test Statistic	-1.232
Critical Value	1.796
When is the concentration predicted to exceed the cleanup level?	Not applicable - slope is not statistically increasing



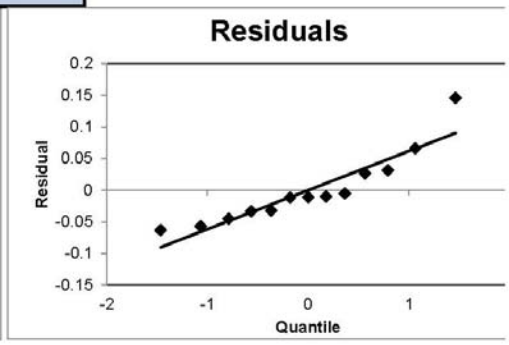


Exhibit D-10 —Mann-Kendall Results for TCE Plume Well

MAROS Mann-Kendall Statistics Summary

Project: OU6 2018
User Name: FES
Location: Fort Wainwright
State: Alaska

Time Period: 10/17/2007 **to** 9/26/2018
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: Detection Limit
J Flag Values : Actual Value

Well	Source/ Tail	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
TRICHLOROETHYLENE (TCE)								
MW61	S	16	16	0.92	-101	100.0%	No	D

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); Source/Tail (S/T)

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Version 2,.2 2006, AFCEE Tuesday, December 18, 2018 Page 1 of 1

Exhibit D-11 —Groundwater Statistics Output TCE in MW61

Groundwater Statistics Tool

Data input worksheet

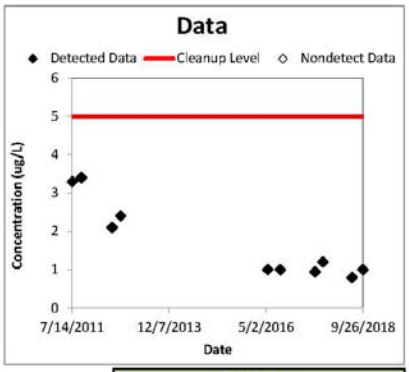
Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/19/2018
Person performing analysis	AS

Chemical of Concern	TCE
Well Name/Number	MW47
Date Units	Date
Concentration Units	ug/L

Confidence Level Desired	95%
Cleanup Level	5
Source of cleanup level (e.g. MCL or risk-based concentration)	MCL
Risk of False Outlier Rejection	1%
Random Seed (may be left blank)	57196.81641
Significant figures to use	3

Number of data points:	10
Number of detected results:	10
Number of nondetect results:	0
Detection frequency:	1

Date (Date)	TCE Concentration (ug/L)	Data Qualifier	Detected? (Yes or No)
7/14/11	3.3		Yes
10/5/11	3.4		Yes
7/11/12	2.1		Yes
9/26/12	2.4		Yes
5/19/16	1		Yes
9/9/16	1		Yes
7/20/17	0.94		Yes
9/28/17	1.2		Yes
6/20/18	0.79		Yes
9/26/18	1		Yes



Axis Values			
Time		Concentration	
Min	Max	Min	Max
Auto	Auto	Auto	Auto

Reset Concentration Axis

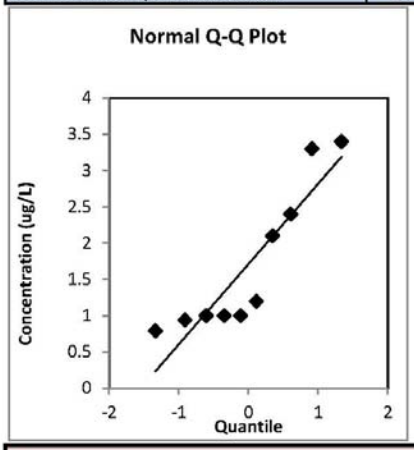
Data Review		Recommendations
Are all necessary data fields entered, and in proper format?	Yes	None
Are at least 4 data points present for statistical analysis?	Yes	None
Are detection limits for nondetects ≤ maximum detected value?	Yes	None
Are all data within chart axis limits?	Yes	None

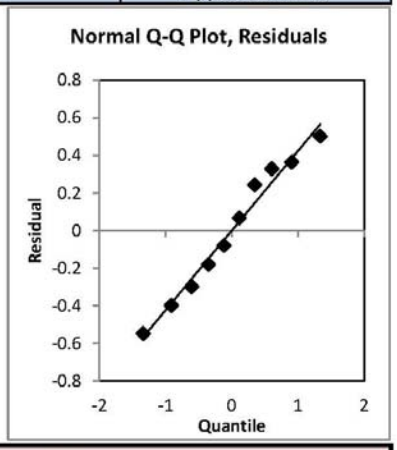
Exhibit D-11 —Groundwater Statistics Output TCE in MW61 (continued)

Groundwater Statistics Tool

Normality Testing Worksheet

Normality Test Results			
Parameter	**All Data**	**Minus Outliers**	**Residuals**
Number of data points	10	10	10
Shapiro-Wilk alpha value	5%	N/A	5%
Slope	1.107021725	N/A	0.424857034
Intercept	1.713	N/A	1.89014E-15
Correlation, R	0.908792777	N/A	0.989763304
Exact Test Value	0.800262263	N/A	0.956399849
Critical Value	0.842	N/A	0.842
Conclude sample distribution:	Does not appear normal	N/A	Appears normal





Previous Step: Outliers Screen | Next Step: Trend Screen | Skip Step: UCL Screen

Exhibit D-11 —Groundwater Statistics Output TCE in MW61 (continued)

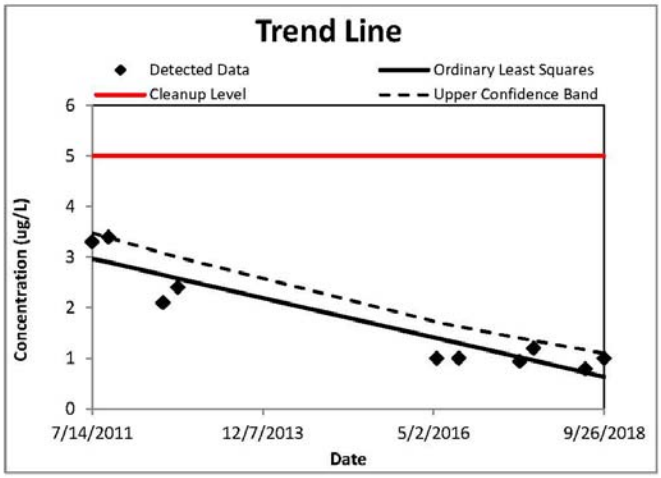
Groundwater Statistics Tool

UCL calculations and summary statistics for nonparametric data sets

Site Name	FCS
Operating Unit (OU)	OU6
Type of Evaluation	Attainment
Date of Evaluation	12/19/2018
Person performing analysis	AS

Chemical of Concern	TCE
Well Name/Number	MW47
Date Units	Date
Concentration Units	ug/L

Confidence Level	95%
Number of results	10
Number < cleanup level	10
Are any potential outliers present?	No
Mean of concentration	1.71
Standard deviation of concentration	1.01



95% Upper Confidence Limit (UCL)	3.1
Method for calculating UCL	Chebyshev UCL
Value of 95% Upper Confidence Band value at final sampling event	1.1
Trend calculation method	Ordinary Least Squares
Cleanup level	5
Source of cleanup level	MCL
Is the trend decreasing or statistically insignificant?	**Yes**

When is the concentration predicted to exceed the MCL?	Not applicable - slope is not statistically increasing
Random Seed Used	57196.81641
Message: None.	

APPENDIX E

PHOTOGRAPHIC LOG

Photograph 1: Collecting groundwater sample at MW-33.
(View to West).

Photograph 2: Collecting groundwater parameters at MW-03.
(View to West).

Photograph 3: Collecting groundwater sample from monitoring well MW-64.
(View to West).

Photograph 4: Collecting filtered iron sample at MW-47.
(View to West).

Photograph 5: Collecting groundwater parameters at MW-08, playground E in background. (View to Northwest).

Photograph 6: Checking PH at groundwater sample MW-48.

REVIEW COMMENTS AND RESPONSES

THE STATE of ALASKA
GOVERNOR MICHAEL J. DUNLEAVY

Department of Environmental Conservation
SPILL PREVENTION & RESPONSE
Contaminated Sites Program

610 University Avenue
Fairbanks, Alaska 99709
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www.dec.alaska.gov

File: 108.38.085

April 2, 2019

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

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

RE: DEC comments for *Draft 2018 Groundwater Monitoring Report, Operable Unit 6, Fort Wainwright, AK.* Dated March 2019.

Dear Mr. Morris and Mr. Adams:

The Alaska Department of Environmental Conservation (DEC) has completed a review of the above-referenced document. The document describes 2018 groundwater monitoring activities for Operable Unit 6 of Fort Wainwright, Alaska (FWA). Additionally, an institutional control (IC) inspection was conducted.

Groundwater sample results showed that diesel range organics (DRO) and residual range organics (RRO) contamination continues to exceed Project Cleanup Levels (PCL) at the main plume and at the MW77 plume, although some manganese reduction appears to be occurring. Plume analysis showed that no plume migration was occurring, and mostly stable or decreasing trends, although one well within the main plume showed an increasing trend for DRO. Additionally, 1,2,3-trichloropropane (TCP) contamination continues to be found above the PCL, and plume results found an increasing trend for monitoring well MW79, but a decreasing trend for MW47. Trichloroethylene (TCE) contamination has remained below the PCL since 2010.

The institutional control (IC) inspection found that IC's were properly in place. It is stated that a full IC inspection report will be delivered to DEC later in 2019.

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

Sincerely,

Kevin Fraley

Digitally signed by Kevin Fraley
Date: 2019.04.02 08:43:37 -08'00'

Kevin Fraley
Environmental Program Specialist

Enclosure: DEC Review Comments

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

REVIEW COMMENTS

PROJECT: Ft Wainwright, AK
DOCUMENT: Draft 2018 Groundwater Monitoring Report, Operable Unit 6

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 4/2/2019 REVIEWER: Kevin Fraley PHONE: 907-451-2104	Action taken on comment by: Fairbanks Environmental Services

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Section 3.2.2, paragraph 2	What might explain the increase in DRO in MW62 in 2018?	Noted	The DRO concentrations in MW62 have exhibited a seasonal trend, as described in Section 3.2.2. Groundwater elevations in 2018 were among the highest that have been observed at Fort Wainwright, and it is possible that residual soil contamination came in contact with groundwater, which resulted in the higher DRO concentration in September 2018. Concentrations will be further evaluated in 2019.	A
2.	Section 3.3, paragraph 4	Since groundwater level doesn't appear to be the driving factor for TCP concentration variation, what other factors could explain this?	A	Although some seasonal variation of TCP concentration has been observed in MW47 and MW79, overall variation between sampling events has been minor. This is discussed in the first paragraph of Section 3.3. Since groundwater elevations do not appear to have a significant impact on TCP concentrations, paragraph 4 in Section 3.3 will be removed for clarity.	A
3.	Graph 3-6	Red text in graph is partially cut off.	A	The text in the graph will be corrected for the final report.	A
4.	Section 3.4	How long will the TCE plume continue to be monitored, considering TCE has been below the PCL? The 2017 groundwater report states: "Continued groundwater monitoring of the TCE plume is recommended until the U.S. Army, EPA, and ADEC agree that TCE has achieved the remediation requirements of the ROD." The ROD and Remedial Design/Remedial Action Work Plan state that monitoring will occur until the PCL has been met.	Noted	Although this report shows that TCE has statistically achieved the PCL, there may be an issue in the future regarding ADEC cleanup levels The 2017 OU6 report also stated that "continued monitoring may be appropriate while the U.S. Army, EPA, and ADEC determine the applicability of the more stringent [2017] ADEC cleanup level." As a result, analysis for TCE in future monitoring	A

REVIEW COMMENTS **PROJECT: Ft Wainwright, AK**
DOCUMENT: Draft 2018 Groundwater Monitoring Report, Operable Unit 6

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 4/2/2019 REVIEWER: Kevin Fraley PHONE: 907-451-2104	Action taken on comment by: Fairbanks Environmental Services

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)
				events is recommended.	
5.	Section 5.4.1	DEC concurs that cleanup of TCE meets the PCL.	Noted	See response to comment #4.	A
6.	Section 5.4.3	DEC concurs with the recommendation for reducing groundwater geochemistry sampling effort.	Noted	The recommendation may be implemented in 2019, based on concurrence from EPA.	A
7.	Section 5.4.4	DEC concurs with the recommendation for an annual monitoring schedule	Noted	The recommendation may be implemented in 2019, based on concurrence from EPA.	A
8.	Section 5.4.5	DEC concurs with the recommendation for monitoring well resurvey.	Noted	The recommendation may be implemented in 2019, based on concurrence from EPA.	A
9.		--- End of Comments ---			

REVIEW COMMENTS

PROJECT: Ft Wainwright, AK

DOCUMENT: Draft 2018 Groundwater Monitoring Report, Operable Unit 6

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	**DATE: 6/26/2019** **REVIEWER: EPA – Sandra Halstead** **PHONE: 907-271-1218**	**Action taken on comment by: Fairbanks Environmental Services**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	RESPONSE	ADEC/EPA RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Executive Summary	Request: add in a sentence to the Executive Summary on the results at the Sentry Wells. Also add in a sentence or two summarizing the IC inspections.	Accepted	The Executive Summary will be revised to include the results at the Sentry Wells and a summary on IC inspection activities/findings.	
2.	3.1	The inconsistency of groundwater elevations, making it difficult to map groundwater contour intervals, is surprising. How have up and downgradient wells been determined in the past if the GW elevations are too inconsistent to create contours? Agree the wells should be resurveyed.	Noted	With the exception of areas adjacent the Chena and Tanana Rivers, and in areas of permafrost, the groundwater flow direction on Fort Wainwright has been well established and is consistently towards the northwest. However, wells that are utilized in the groundwater monitoring program should have accurate survey elevations. Resurvey of all the OU6 wells is planned for 2019.	
3.	Graphs 3-6 and 3-7	The use of the term remediation at the end of the attainment phase isn't clear. I will check with the GW gurus at EPA HQ to see if this is correctly interpreted. No change is needed for the report this year. The EPA guidance provides definitions but it is not clear if they overlap as it talks in terms of a remediation monitoring phase, attainment monitoring phase, and remediation phase completion. Thanks for running the stats – GW is progressing nicely for the VOC plumes. I had a chance to talk with Dr. Dave Bartenfelder, who is with our tech support for CERCLA and wrote the GW stats Excel tool and guidance. He confirmed my comment that the remediation phase goes from active or passive treatment to the point when you first reach the cleanup goal. Then the attainment monitoring phase begins and ultimately ends when you have a minimum of 6-8 data points that statistically are under the 95UCL on the mean, for attainment complete.	Accepted	For consistency with the EPA guidance language, we will change "Remediation Complete" to "Attainment Complete"; and "Attainment Complete" to "Remediation Complete (and Attainment Phase begins)".	

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 6/26/2019 REVIEWER: EPA – Sandra Halstead PHONE: 907-271-1218	Action taken on comment by: Fairbanks Environmental Services

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)
		So what that means for graphs 3-6 and 3-7 is the red text is backwards. Remediation starts first, then attainment is the final completion for GW monitoring. The vertical blue dashed line would be remediation complete (or attainment start), and the green dashed line would be attainment complete. Also its likely the grey dotted line isn't the regression UCL95 but is more likely the confidence band for the UCL95.		Correct, the grey dotted line represents the confidence band for the UCL95. The legends in graphs where this appears will be updated as appropriate.	
4.	Graphs 3-6 and 3-7	Agree the TCE plume has reached attainment for ROD cleanup goals of 5 ug/L at both wells MW-61 and MW-80. The next Five Year Review (9/29/2021) will determine if state groundwater cleanup levels for TCE (2.8 ug/L – 2016 18 AAC 75 Table C) will be required as a new remediation goal.	Noted	The Army agrees that the site Remedial Action Goals (RAGs) should be reviewed as part of the upcoming Five-Year Review but notes that establishing a new RAG for TCE would require an ESD or ROD Amendment or by transferring the site to the Two-Party Program.	
5.	5.4.2	Agree to reducing sampling frequency to fall only	Noted	Sample frequency was changed to annual in the 2019 CERCLA Work Plan.	
6.	5.4.2	Agree to discontinue monitoring for methane, alkalinity, ammonia, nitrate-nitrite, phosphorus and potassium as MNA parameters.	Noted	The referenced analyses were removed from the 2019 CERCLA Work Plan.	
7.	5.4.2	Agree the monitoring wells should be resurveyed	Noted	Resurvey of all the OU6 wells is planned for 2019.	
8.	IC inspections	Although not proposed in this annual monitoring report, we discussed reducing the IC inspections at OU6 to a subset of properties in future inspections. An inspection of 20% of the homes and all playgrounds, common lawn areas, pavilion and the mechanical unit annually would be acceptable unless inspections start to reveal non-	Noted	The 2019 CERCLA Work Plan specifies the following “IC inspection of residences within OU6 will be reduced from 100% to 20% beginning in 2019. In addition, any residences that IC deficiencies were noted will be included in the following year IC inspection.	

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION	DATE: 6/26/2019 REVIEWER: EPA – Sandra Halstead PHONE: 907-271-1218	Action taken on comment by: Fairbanks Environmental Services

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)
		compliance.		All public use areas (i.e. playgrounds, open area/play areas, summer lawn, and pavilion area) and the two mechanical buildings will continue to be inspected annually.	
9.		--- End of Comments ---			