



**Pacific Air Forces
Regional Support Center**

Joint Base Elmendorf-Richardson, Alaska

**2016 ANNUAL GROUNDWATER
MONITORING REPORT**

**FORMER RADIO RELAY STATION
PORT HEIDEN, ALASKA**

**Final
February 2019**

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ACRONYMS AND ABBREVIATIONS

611 CES	611 Civil Engineer Squadron
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
APCS	APC Services, LLC
bgs	below ground surface
BLO	Black Lagoon Outfall
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
DL	detection limit
DQA	Data Quality Assessment
DRO	diesel-range organics
DSA	Drum Storage Area
DTW	depth to water
FPC	Former Pipeline Corridor
GAC	granulated activated carbon
GLO	Gray Lagoon Outfall
GRO	gasoline-range organics
LOD	limit of detection
LOQ	limit of quantitation
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MNA	monitored natural attenuation
MW	monitoring well

mV	millivolts
NVPH	Native Village of Port Heiden
PG1	pad grid 1
PID	photoionization detector
POL	petroleum, oil, and lubricants
ppm	parts per million
PVC	polyvinyl chloride
RI/FS	Remedial Investigation/Feasibility Study
RRO	residual-range organics
RRS	Radio Relay Station
TCE	trichloroethene
TOC	top of casing
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
UST	Underground Storage Tank
VOC	volatile organic compound

1. INTRODUCTION

This Annual Groundwater Monitoring Report describes the groundwater monitoring activities conducted during October 2016 at the former Port Heiden Radio Relay Station (RRS) and Former Pipeline Corridor (FPC) sites FPC-029, FPC-066 and FPC-215. APC Services, LLC (APCS) performed this work for the U.S. Air Force (USAF) 611 Civil Engineer Squadron (611 CES) under the U.S. Army Corps of Engineers (USACE) contract W911KB-15-C-0025, Tasks 5 and 6.

Activities were conducted in general accordance with the plans and procedures in the *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Port Heiden, Alaska* (USAF 2016, Amended April 2017). Deviations from this Work Plan are described in Section 2.0.

1.1 REPORT ORGANIZATION

This report is organized as follows:

- **Section 1.0** presents the project, the site history and background, and the scope of work.
- **Section 2.0** presents Work Plan deviations.
- **Section 3.0** presents the project execution approach.
- **Section 4.0** presents a summary of the analytical data.
- **Section 5.0** presents a summary of the historical data.
- **Section 6.0** presents a summary of the waste management activities.
- **Section 7.0** presents conclusions and recommendations.
- **Section 8.0** lists documents referenced in this report.
- **Appendix A** contains project photographs.
- **Appendix B** contains the Data Quality Assessment (DQA), which includes analytical data and laboratory documentation associated with sampling.
- **Appendix C** contains a well diagram, boring logs, well monitoring logs, and field notes.
- **Appendix D** contains a list of the key project personnel, roles, and qualifications.

- **Appendix E** presents the responses to comments.

1.2 SITE BACKGROUND

The former RRS site is located approximately 3.5 miles north of the village of Port Heiden on the northern coast of the Alaska Peninsula (Figure 1-1). The former RRS site was a Distant Early Warning Line radar station active until 1981. It was constructed between 1955 and 1960 over a footprint of several square miles. This area occupied a small portion of the former Fort Morrow Army installation, which housed up to 5,000 personnel during World War II.

Historical activities supporting the former RRS occurred at the Marine Terminal Area (a former petroleum tank farm and pump house where Airport Road used to reach the Port Heiden Lagoon) and the fuel pipeline corridor (FPC) connecting the Marine Terminal Area to the former RRS along Airport Road and Site Road.

A Remedial Investigation/Feasibility Study (RI/FS) was conducted in 2004 on behalf of the 611 CES. The RI/FS characterized the soil and groundwater throughout Port Heiden (USAF 2006). The Native Village of Port Heiden (NVPH), under two cooperative agreements administered by the USACE, carried out subsequent groundwater monitoring events at the FPC sites in 2008/2009 and at the former RRS and the FPC sites in 2010, 2011, and 2012.

In 2008, the fuel pipeline was removed from the Marine Terminal to the former composite building located at the former RRS (NVPH 2010). Two sites contaminated by diesel-range organics (DRO) along the FPC still exist and are annually monitored. These areas are FPC-066 located near the Port Heiden School and FPC-215 located near the airport (Figure 1-1). DRO-contaminated groundwater exists at both locations. Site FPC-029 (Figure 1-1) groundwater had been monitored for DRO contamination but was approved for monitoring well (MW) decommissioning which was completed in 2016. At the former RRS, historical effluent discharged via a garage floor drain in the composite building and was piped downslope and discharged into a berm-reinforced ponding area named the Black Lagoon Outfall (BLO). This area has contributed to significant soil and groundwater contamination at the BLO.

Additional areas of concern at the former RRS include the Gray Lagoon Outfall (GLO), Drum Storage Area (DSA), former underground storage tanks (UST), Pad Grid 1 (PG1), septic system and septic system outfall, and various landfills and debris burial areas.

Previous investigations have identified contamination plumes in groundwater at the BLO and DSA. The plume identified at the BLO is composed of DRO and trichloroethene (TCE). A separate TCE contamination plume is located beneath the former composite building and DSA (NVPH 2013).

1.3 PROJECT OBJECTIVES

The primary project objectives for 2016 were as follows:

- Groundwater sampling and analysis to provide data for the evaluation of contamination levels
- USAF-approved decommissioning of three wells at FPC-029 with concurrence from the Alaska Department of Environmental Conservation (ADEC) due to the presence of contaminants of concern (COCs) at concentrations below cleanup levels
- Installation of two new groundwater monitoring wells at FPC-215 near well 215-MW09 to attempt to bracket the area of the DRO plume with concentrations above cleanup levels

1.4 SCOPE OF WORK

The definable features of work for the 2016 groundwater monitoring field activities included the following:

- **Site setup, including site controls and integrated data management facilities:** Site controls were used to mitigate potential migration of COCs, and data management procedures were used to organize and protect data generated by field activities and laboratory analyses.
- **Annual groundwater monitoring:** The 2016 Scope of Work included annual groundwater monitoring at 3 areas and decommissioning of wells at FPC-29:
 - Nineteen wells at the former RRS: GLO-MW-03, GLO-MW-04, DSA-MW-01, DSA-MW-02, DSA-MW-03; DSA-MW-04, DS-MW-05, DSA-MW-06, DSA-MW-07, UST-MW-02, PG1-MW-01, BLO-MW-01, BLO-MW-02, BLO-MW-05, BLO-MW-06, BLO-MW-07, RRS-MW-02 (depth to water measurement only), RRS-MW-05, and RRS-MW-06;
 - Five wells at site FPC-215: Two new wells were installed - 215-MW-11, 215-MW-12;

and wells 215-MW-08, 215-MW-09, 215-MW-10, 215-MW-11, 215-MW-12 were planned to be sampled.

- Four wells at site FPC-066: 066-MW-04, 066-MW-05, 066-MW-6, 066-MW-07. These wells were initially scoped to be decommissioned but were added back into the groundwater monitoring program based on a June 2016 sample result from 066-MW-05 that exceeded the DRO cleanup level.
- **Well decommissioning:** Three wells at FPC-029 site were decommissioned with USAF approval and ADEC concurrence, because COC concentrations were below cleanup levels.

Field monitoring parameters included depth to water, temperature, turbidity, conductivity, pH, dissolved oxygen, and oxidation-reduction potential. Water samples were submitted for laboratory analysis of DRO, gasoline-range organics (GRO), residual-range organics (RRO), volatile organic compounds (VOCs), and monitored natural attenuation (MNA) parameters of wells at the RRS. Table 1-1 presents the groundwater monitoring program as it was conducted in 2016. Wells that were part of the 2016 plan but not sampled are noted



Former RRS



FPC-215

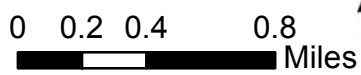


FPC-066



FPC-029

Site Rd
 Lower Site Rd
 Airfield
 Airport Rd
 Pit Rd
 Swan Lake Rd
 Hud Rd
 Village of Port Heiden
 Trapper Hill Rd



NAD 1983 UTM Zone 4N

PROJECT LOCATION MAP AND SITE LOCATIONS FOR THE FORMER PORT HEIDEN RRS, FPC-029, FPC-066 AND FPC-215 INVESTIGATIONS, 2016

PORT HEIDEN, ALASKA

DATE:
27 APR 2018

PROJECT MANAGER:
Greg DuBois

FIGURE NO.
1-1

Table 1-1 2016 Groundwater Monitoring Plan

Well ID	Well Diameter (inches)	Screened Interval (feet)	TOC Elevation* (feet)	Easting* (meters)	Northing* (meters)	Analytical Suites
Former RRS Monitoring Wells						
GLO-MW-03	2 PVC	52.0 to 62.0	143.142	520997.61	6315008.07	VOCs, MNA
GLO-MW-04	2 PVC	35.0 to 45.0*	140.914	521005.26	6314937.55	VOCs, MNA
DSA-MW-01	2 PVC	45.0 to 58.0	137.145	520907.4	6314977.64	VOCs, MNA
DSA-MW-02	2 PVC	57.5 to 67.5	146.2	520937.64	6314915.38	GRO, DRO, RRO, VOCs, MNA
DSA-MW-03	This well was part of the sampling plan but was damaged and decommissioned in 2011.					
DSA-MW-04	2 PVC	92.0 to 97.0	146.03	520931.73	6314906.31	GRO, DRO, RRO, VOCs, MNA
DSA-MW-05	2 PVC	82.0 to 87.0	137.366	520904.89	6314968.99	VOCs, MNA
DSA-MW-06	2 PVC	85.0 to 90.0	134.708	520898.7	6315022.41	VOCs, MNA
DSA-MW-07	2 PVC	45.0 to 55.0	133.763	520888.41	6315021.82	VOCs, MNA
UST-MW-02	2 PVC	54.5 to 69.5	148.311	520999.27	6314873.83	The casing was bent. DTW was measured but neither a pump nor bailer could be lowered into the well for sampling.
RRS-MW-02	2 PVC	52.5 to 62.5	143.899	521136.69	6314793.94	DTW
RRS-MW-04	This well had been part of the sampling plan but was damaged and decommissioned in 2011.					
RRS-MW-05	2 PVC	46.0 to 56.0	136.851	520863.08	6314986.41	VOCs, MNA
RRS-MW-06	2 PVC	55.0 to 56.0	142.373	520921.19	6314769.31	VOCs, MNA
PG1-MW-01	2 PVC	51.9 to 61.9	142.431	520934.06	6314817.47	PVC casing was sticking up 8' above excavation ground surface and was not

Well ID	Well Diameter (inches)	Screened Interval (feet)	TOC Elevation* (feet)	Easting* (meters)	Northing* (meters)	Analytical Suites
						sampled.
BLO-MW-01	2 PVC	40.0 to 50.0	131.505	520759.35	6314853.2	GRO, DRO, RRO, VOCs, MNA
BLO-MW-02	2 PVC	36.0 to 46.0	125.136	520642.33	6314914.04	No sampling
BLO-MW-05	2 PVC	42.5 to 52.5	135.602	520821	6314815.05	GRO, DRO, RRO, VOCs, MNA
BLO-MW-06	2 PVC	38.5 to 48.5	131.499	520757.29	6314820.13	GRO, DRO, RRO, VOCs, MNA
BLO-MW-07	2 PVC	35.0 to 45.0	128.549	520753.59	6314922.47	GRO, DRO, RRO, VOCs, MNA
FPC-066 Monitoring Wells						
066-MW-04	1.5 PVC	2.5 to 12.5	75.234	520584	6309057	DRO
066-MW-05	1.5 PVC	2.5 to 12.5	76.804	520573	6309075	DRO
066-MW-06	1.5 PVC	2.5 to 12.5	75.079	520593	6309034	DRO
0660MW-07	1.5 PVC	2.5 to 12.5	75.894	520635	6209089	DRO
FPC-215 Monitoring Wells**						
215-MW-08	1.5 PVC	9.0 to 19.0	82.45	521937.88	6312877.23	DRO
215-MW-09	1.5 PVC	9.0 to 18.0	83.79	521910.45	6312852.43	DRO
215-MW-10	1.5 PVC	12.0 to 22.0	124.24	521897.05	6312848.65	Not Sampled
215-MW-11 (new - 2016)	2 PVC	7.0 to 17.0	122.43	521900.01	6312871.91	DRO (soil and groundwater)
215-MW-12 (new - 2016)	2 PVC	7.0 to 17	124.6	521918.96	6312830.37	DRO (soil and groundwater)
Wells Decommissioned at FPC-029 in 2016						
029-MW-01	1.5 PVC	5.0 to 15	71.038	519664	6308416	--

Well ID	Well Diameter (inches)	Screened Interval (feet)	TOC Elevation* (feet)	Easting* (meters)	Northing* (meters)	Analytical Suites
029-MW-02	1.5 PVC	5.0 to 15	65.16	519644	6308450	--
029-MW-03	1.5 PVC	5.0 to 15	64.391	519649	6308427	--

VOCs – Volatile organic compounds: benzene, ethylbenzene, toluene, M,P-xylene, O-xylene, xylenes, 1,1,-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, trans-1,2-dichloroethene, trichloroethene, vinyl chloride

GRO – gasoline range organics

DRO – diesel range organics

RRO – residual range organics

MNA- monitored natural attenuation: iron, manganese, alkalinity, nitrate-nitrite, total Kjeldahl nitrogen, total nitrogen, sulfate

DTW - depth to water

PVC – polyvinyl chloride

*Based on 2014 survey data

**Locations and elevation data is based on a 2016 survey

- Waste management and decontamination:** Investigation-derived wastes generated during the field activities were managed as contaminated wastes. Disposal included treatment of groundwater through granular activated carbon and solid waste at the Port Heiden landfill.

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2. WORK PLAN DEVIATIONS

This section describes deviations from the *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Port Heiden, Alaska* (USAF 2016, amended 2017) during the 2016 groundwater sampling effort:

- Monitoring wells DSA-MW-03 and RRS-MW-04 were not located in 2016. The previous groundwater monitoring report (USAF 2015) also indicated those wells were not located. A 2012 report indicated the wells had been decommissioned in 2011.
- Well 215-MW-10 was damaged and depth-to-water (DTW) measurements, and sample collection could not be completed.
- Well UST-MW-02 was not sampled because the polyvinyl chloride (PVC) pipe was bent and a pump was not able to be lowered for sample collection. The field team was able to get a DTW reading, which was 64.93 feet and found that there was no PVC cap. An approximately ½-inch-diameter tube was also removed from the casing.
- RRS-MW-02 had initially been in the 2016 plan, but subsequent review showed it had been removed from the sampling program in 2014; DTW was measured but it was not sampled.
- Well PG1-MW-01 was in the middle of an excavation, and the outer protective steel casing had been removed. The top of the PVC casing was about 8 feet above the ground and had been supported by a wooden plank. Because of concern about the potential to break the PVC casing and safety concerns, the well was not sampled.
- Well BLO-MW-01 was not successfully purged using the low-flow sample method after two attempts. On October 26, 2016, an interface probe detected approximately 0.01 inch of product, which was interpreted to be the equivalent of a sheen. On October 29, 2016, a bailer was used to purge the well, and no visible layer of product was observed. The field team bailed water until the well was dry. The well was allowed to recover until October 31, 2016, and then was sampled immediately without measuring field parameters.

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3. PROJECT EXECUTION APPROACH

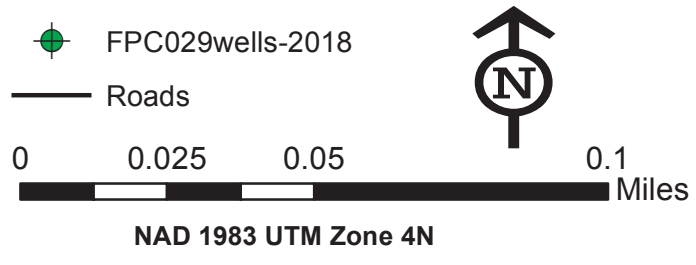
In October 2016, groundwater monitoring wells were decommissioned at FPC-029 and groundwater monitoring was conducted at the FPC-066, FPC-215, and former RRS sites as part of the annual sampling program required by the *Record of Decision for Port Heiden Radio Relay Station, Port Heiden, Alaska* (USAF 2009). Twenty-six previously installed monitoring wells and two new wells to be installed (at FPC-215) were scheduled for sampling with results to be compared to cleanup levels from the ADEC Table C, Groundwater Cleanup Levels (hereafter referred to as “cleanup levels”), as listed under Alaska Administrative Code (AAC), Title 18, Chapter 75, Part 345 (18 AAC 75.345) (ADEC 2017). Sampling was conducted by personnel who meet the ADEC definitions of a qualified environmental professional and/or qualified sampler as defined by 18 AAC 75.990(100). Names and resumes of onsite personnel are available upon request. Key personnel and qualifications are provided in Appendix D. Groundwater samples were analyzed for COCs that had been previously detected above cleanup levels, in addition to the COCs outlined in the Record of Decision (USAF 2009).

3.1 FPC-029 GROUNDWATER MONITORING WELLS DECOMMISSIONING

Groundwater monitoring wells 029-MW-01, 029-MW-02 and 029-MW-03 were decommissioned using a hollow stem auger drill rig to pull the casings. The casings from wells 029-MW-01 and -3 were completely removed from the ground. The top five feet of well 029-MW-02 came out of the ground but the bottom screened portion remained at the bottom of the annulus. The boreholes were backfilled with bentonite with soil covering the top 1 foot. Figure 3-1 shows the location of the decommissioned wells. The well materials were placed into the Port Heiden landfill.

3.2 2016 GROUNDWATER MONITORING

The groundwater monitoring program began in the field on October 4, 2016. APCS and Discovery Drilling travelled to Port Heiden and completed an initial reconnaissance of the wells at the FPC-29 and FPC-215 sites. On October 5, 2017, the wells at FPC-29 were decommissioned and new monitoring wells, 215-MW-11 and 215-MW-12, were installed at the FPC-215 site. High wind and rain delayed further groundwater monitoring activities until October 13, 2017, when wells 215-MW-11 and 215-MW-12 were developed. DTW was measured at each monitoring well on October 14, 2016, to estimate groundwater flow directions.



PORT HEIDEN SITE FPC-029 DECOMMISSIONED WELLS, 2016		
PORT HEIDEN, ALASKA		
DATE: 5 MAY 2018	PROJECT MANAGER: Greg DuBois	FIGURE NO. 3-1

In 2013, approximately 0.65 feet of petroleum, oil, and lubricants (POL) product was encountered in monitoring well BLO-MW-01 at the former RRS site. In 2014, no free product was encountered in monitoring well BLO-MW-01. In 2016, free product thickness was measured at 0.01 feet, although when bailed, free product was not observed, and the well was sampled. POL product was not detected in any other monitoring wells during 2014 and 2016 field activities.

The groundwater sampling occurred October 14 through October 31, 2016. In accordance with the Work Plan (USAF 2016, amended 2017), APCS standard purge and sampling methodology included the use of bladder pumps with disposable or decontaminated Teflon bladders and Teflon-lined tubing under low-flow sampling procedures, except for well BLO-MW-01, which was purged and sampled with a bailer. The casing from monitoring well 215-MW-10 was at an approximate 45-degree angle (above the ground) and the DTW probe and pump could not be advanced below ground level (where the casing was bent); therefore, the well was not sampled. The protective steel well monument at monitoring well PG-1 had been removed during soil excavation activities by another contractor and the PVC casing was sticking up approximately 8 to 10 feet above the ground surface and supported by a wood plank and could not be safely sampled. Well UST-MW-02 was also bent above the surface. DTW could be measured; however, the pump could not be lowered beyond approximately 4 feet below ground surface (bgs).

Field parameters were measured during well purging using a YSI 556 multi-meter with a flow-through cell and a calibrated turbidimeter. Table 3-1 shows the field parameters that were measured and the stabilization criteria. Water quality parameters were considered stable when three successive readings, collected 3 to 5 minutes apart, were within the stabilization range.

Table 3-1. Stabilization Parameters for Groundwater Sampling

Parameter	Stabilization Range
Temperature	± 3 percent (minimum of ± 0.2 °C)
pH	± 0.1
Conductivity	± 3 percent
Redox Potential	± 10 mV
Dissolved Oxygen	± 10 percent
Turbidity	± 10 percent

Notes:

°C = degrees Celsius

mV = millivolts

Groundwater data sheets, well development forms, boring logs and field notes are presented in Appendix C.

3.3 GROUNDWATER FLOW DIRECTION

Groundwater flow direction was estimated by using the top of casing (TOC) elevation data and depth to groundwater measurements from October 14, 2016, and by calculating the vertical change per foot of horizontal distance. All groundwater flow directions are approximate and represent only estimates of the site conditions (refer to Sections 4.1, 4.2, and 4.3) at the time of the measurements.

After two new wells were installed at FPC-215, all wells at the FPC-215 site were surveyed by a State of Alaska registered surveyor for horizontal position and elevation to tie the new wells in with the previously installed wells. Groundwater flow at FPC-215 is estimated to have been to the west-southwest in 2016.

It is recommended that the wells at FPC-66 be resurveyed prior to estimating groundwater flow direction.

In October 2016, the groundwater flow at the former RRS is estimated to have been east-northeast, which is consistent with the 2014 estimated groundwater flow. Some of the well casings elevations have likely changed since the last survey and it is recommended that all the wells be re-surveyed at the RRS.

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4. RESULTS

This section summarizes analytical results from the October 2016 groundwater sampling effort. Groundwater samples were successfully collected from 24 monitoring wells at FPC-066, FPC-215, and the former RRS sites. Detailed data quality assurance review and summary tables of results are presented in Appendix B.

4.1 FPC-066 SITE

In October 2016, groundwater samples were collected from 066-MW-04, 066-MW-05, 066-MW-06, and 066-MW-07 at FPC-066 and were analyzed for DRO. The cleanup level for DRO is 1.5 milligrams per liter (mg/L). Monitoring well 066-MW-05 contained a DRO concentration of 2.4 mg/L. The results from the other FPC-066 monitoring wells were below the cleanup level. The 2016 laboratory results for the FPC-066 site are presented in Table 4-1; well locations are displayed on Figure 4-1. The complete analytical results and laboratory data deliverables are included with the DQA (Appendix B).

Table 4-1. FPC-066 Groundwater Sample Results

Location	Sample ID	Analyte	Cleanup Level ¹ (mg/L)	Results (mg/L)
066-MW-04	FPC066MW-04	DRO	1.5	0.32J
066-MW-05	FPC066MW-05	DRO	1.5	2.4
066-MW-06	FPC066MW-06	DRO	1.5	0.063J
066-MW-07	FPC066MW-07	DRO	1.5	0.056J

Notes:

¹18 AAC 75.345, Table C, Groundwater Cleanup Levels (ADEC 2017)

J = estimated sample result

Bold = Result exceeded the ADEC Table C, Groundwater Cleanup Levels

For definitions, see the Acronyms and Abbreviations section.

4.2 FPC-215 SITE

On October 5, 2016, soil boring FPC215-16SB01 was advanced and converted into groundwater monitoring well 215-MW-11 and soil boring FPC215-16SB02 was advanced and converted into groundwater monitoring well 215-MW-12. The soil borings were advanced using a hollow stem-auger drill rig. Split spoon samples were collected from each boring beginning at 5 feet bgs continuously until groundwater was encountered at approximately 9 feet bgs at FPC215-16SB01 and 10 feet bgs at FPC215-16SB02. A calibrated photoionization detector (PID) was used to

screen the soil using the headspace method. PID screening results were all 0.0 parts per million (ppm), and no odor or visual contamination impact was observed. Sample FPC215-16SB01 was collected from 7 to 9 feet bgs and sample FPC215-16SB02 was collected from 7 to 9 feet bgs. The DRO analytical results were 1.7 milligrams per kilogram (mg/kg) and 2.6 mg/kg respectively.

Each well was installed to 17 feet bgs with 10 feet of pre-packed screen. Soil boring logs, well details, and field notes are presented in Appendix C. Groundwater samples were collected from the new wells and wells 215-MW-08 and 215-MW-09. Well 215-MW-10 was damaged, and neither a depth to water meter nor a pump could not be lowered into the well; the well was not sampled. Monitoring well 215-MW-09 contained a DRO concentration of 12 mg/L, which exceeded the cleanup level of 1.5 mg/L. The remaining wells contained DRO at concentrations less than 1.5 mg/L, ranging from 0.011 mg/L to 0.048 mg/L. These results were reported below the limit of quantitation (LOQ) but above the limit of detection (LOD). Therefore, the results were qualified with a J, and were considered to be estimated. Results for the FPC-215 site are summarized in Table 4-2; analytical exceedances are displayed on Figure 4-2.

Complete analytical results and laboratory data deliverables are included with the DQA (Appendix B).

Table 4-2. FPC-215 Groundwater Sample Results

Location	Sample ID	Analyte	Cleanup Level ¹ (mg/L)	Results (mg/L)
215-MW-08	FPC215MW-08	DRO	1.5	0.048JM
	FPC215MW-28*	DRO	1.5	0.1J
215-MW-09	FPC215MW-09	DRO	1.5	12
215-MW-11	FPC215MW-11	DRO	1.5	0.11J
215-MW-12	FPC215MW-12	DRO	1.5	0.15J

Notes:

¹18 AAC 75.345, Table C, Groundwater Cleanup Levels (ADEC 2017)

* = Field duplicate

J = The result was reported between the LOQ and the LOD and should be considered as an estimated quantity.

M = manual integrated compound

Bold = Result exceeded the ADEC Table C, Groundwater Cleanup Levels

For additional definitions, see the Acronyms and Abbreviations section.

4.3 FORMER RADIO RELAY STATION

As presented in Table 1-1 all samples collected from wells at the RRS were analyzed for VOCs and MNAs and selected well samples were analyzed for GRO, DRO and RRO based on historical results. VOC analytes included benzene, ethylbenzene, toluene, M,P-xylene, O-xylene, xylenes, 1,1,-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, trans-1,2-dichloroethene, trichloroethene, vinyl chloride.

Detected sample results of COCs at the former RRS are presented in Table 4-3. Sample results above applicable cleanup levels are bolded.

Table 4-3. Former RRS Groundwater Sample Detections

Location	Method	Analyte	Cleanup Level ¹ (mg/L)	Results (mg/L)
BLO-MW-01	AK102	DRO	1.5	63
	AK103	RRO	1.1	4.2
	SW8260B	Benzene	0.0046	0.00046J-
		Toluene	1.1	0.00046J-
		Ethylbenzene	0.015	0.00083J-
		Total Xylenes	0.190	0.00085J-
	SW8260B	CIS-1,2-dichloroethylene	0.036	0.0056J-
TCE		0.0028	0.0031J-	
BLO MW 05	AK102	DRO	1.5	0.044
	SW8260	Toluene	1.1	0.00019
		Ethylbenzene	0.015	0.00016
		PCE	0.041	0.00023
BLO-MW 07	SW8260B	Toluene	1.1	0.00021J
		PCE	0.041	0.00022J
DSA-MW-01	SW8260B	TCE	0.0028	0.0073
DSA MW 02	AK102	DRO	1.5	0.07JM
	SW8260B	Toluene	1.1	0.00017J
		TCE	0.0028	0.38
DSA MW 04	AK102	DRO	1.5	0.082JM
	SW8260B	TCE	0.0028	0.34
DSA MW 05	SW8260B	TCE	0.0028	0.0022

Notes:

¹18 AAC 75.345, Table C, Groundwater Cleanup Levels (ADEC 2017); these cleanup levels were not in effect

during the initial workplan and QAPP development.

Bold results indicate concentrations exceeding the cleanup levels

J indicates an estimated value

J- Indicates that the sample result is estimated and may be biased low

M indicates a matrix affect

For definitions, see the Acronyms and Abbreviations section.

Concentrations from monitoring Well sample BLO-MW-01 exceeded cleanup levels for DRO, RRO, and TCE at 63 mg/L, 4.2 mg/L, and 0.0031 mg/L respectively.

TCE results for wells DSA-MW-01, DSA-MW-02, and DSA-MW-04 exceeded the cleanup level of 0.0028 mg/L at 0.0073 mg/L, 0.38 mg/L and 0.34 mg/L, respectively. All other contaminant target analytes at the former RRS were either detected at concentrations below cleanup levels or were reported as nondetect, with a laboratory LOD below the applicable cleanup levels. The laboratory results that exceeded cleanup levels are shown in Table 4-3; plumes and groundwater flow are displayed on Figure 4-3. The complete analytical results and laboratory data deliverables are included with the DQA (Appendix B).

All monitoring wells at the former RRS site were sampled for MNA parameters, which included alkalinity, iron, manganese, nitrogen (as nitrate/nitrite), and sulfate. Sample results for MNA parameters are used to assess the potential for biodegradation and natural attenuation of contaminants in the groundwater, primarily TCE.

Chlorinated solvents biodegrade primarily via reductive dechlorination, which occurs under anaerobic conditions. The presence of the TCE degradation product of cis-1,2, dichloroethene at BLO-MW-01, indicates that some dechlorination is likely occurring; however, based on the presence of nitrate/nitrite and sulfate, as well as elevated levels of dissolved oxygen, the process of natural attenuation via reductive dechlorination is most likely impeded in groundwater at the former RRS. The presence of DRO (an anthropogenic carbon source critical to the biodegradation of chlorinated solvents, such as TCE) would aid in natural attenuation at monitoring well BLO-MW-01 resulting in anaerobic conditions conducive to reductive dechlorination. Due to pump problems, DO was not measured at BLO-MW-01.

Although the potential for biodegradation exists, the data do not show a significant decreasing trend in TCE concentrations over time. According to the RI/FS, the timeframe required for TCE concentrations to fall below 0.005 mg/L was estimated at 25.7 years (i.e., in the year 2032) (USAF 2006). In addition, the TCE cleanup level was lowered to 0.0028 mg/L in October 2016.

An additional discussion regarding contaminant concentration trends is presented in Section 5.3.

Table 4-4 presents MNA results for wells at the former RRS.

Table 4-4. Former RRS Monitored Natural Attenuation Results

Sample ID	Well ID	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Total Alkalinity (mg/L)	Iron (mg/L)	Manganese (mg/L)	Nitrogen, Total (mg/L)	Sulfate (mg/L)
BLO-MW-01	BLO-MW-01	N/T	NM	NM	850	56	97	0.33J	6.5
BLO-MW-05	BLO-MW-05	11.18	5.32	155.5	64	0.59	0.013	0.33	1.9
BLO-MW-06	BLO-MW-06	9.06	6.08	150.7	53	1.7	0.031	0.32	4.1
BLO-MW-26*	BLO-MW-06	9.06	6.08	150.7	48	1.7	0.03	0.56	4.5
BLO-MW-07	BLO-MW-07	10.07	4.96	196.6	42	1.4	0.026	0.33	3.8J
DSA-MW-01	DSA-MW-01	11.40	6.13	151.8	800	0.065	0.0023	1.7	12
DSA-MW-02	DSA-MW-02	8.00	6.04	88.1	120	1.9	0.032	1.4	9.0
DSA-MW-04	DSA-MW-04	0.76	5.51	64	78	5.2	0.31	0.51J	8.8
DSA-MW-05	DSA-MW-05	0.87	5.89	45.1	67	3.2	0.15	0.24J	8.1
DSA-MW-06	DSA-MW-06	0.98	5.83	23.4	66	2.5	0.40	0.54J	4.4
DSA-MW-26*	DSA-MW-26	NS	NS	NS	67	2.7	0.42	0.45J	4.4J
DSA-MW-07	DSA-MW-07	9.70	6.05	134.2	93	1.5	0.026	0.48J	4.1J
GLO-MW-03	GLO-MW-03	11.03	5.86	156.8	110	0.059	0.0015	1.1J	5.6
GLO-MW-04	GLO-MW-04	8.28	5.86	153.1	47	1.3	0.049	0.41J	3.4J
PG-1-MW-01	PG-1-MW-01	NS	NS	NS	NS	NS	NS	NS	NS
RRS-MW-05	RRS-MW-05	10.56	5.70	155.5	52	0.36	0.039	0.38J	3.2J
RRS-MW-06	RRS-MW-06	9.98	5.46	160.2	140	0.71	0.14	1.4J	4.2J
UST-MW-02	UST-MW-02	NS	NS	NS	NS	NS	NS	NS	NS

Notes:

* Field duplicate sample

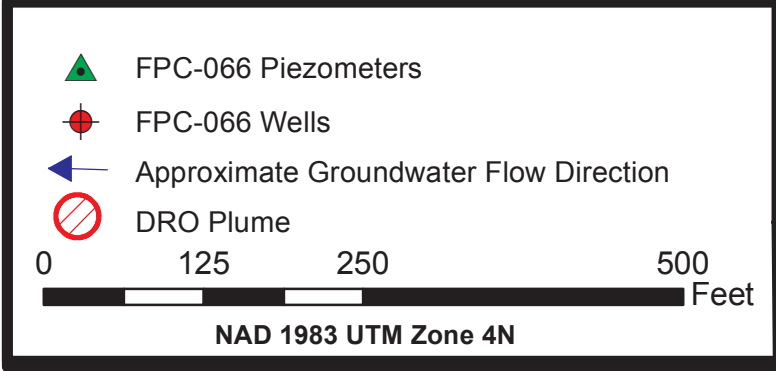
N/A = Not applicable; the well was purged dry and dissolved oxygen readings were not collected after recharge and prior to sampling.

NS = not sampled

N/T = Not taken, readings for this well were not taken because heavy contamination was encountered in the well.

For additional definitions, see the Acronyms and Abbreviations section.

J = indicates that the sample result is estimated



**Groundwater Plume
Fuel Pipeline Corridor Site FPC-066
October 2016
Port Heiden, Alaska**

DATE:
23 October 2018

PROJECT MANAGER:
Greg DuBois







FIGURE NO.
4-1

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FPC Site 215

-  Groundwater Monitoring Well with Exceedance
-  Groundwater Monitoring Well with No Exceedance
-  FPC 03
-  UN-KNOWN
-  Interpolated DRO Groundwater Plume
-  Approximate Groundwater Flow Direction

0 112.5 225 450
 Feet

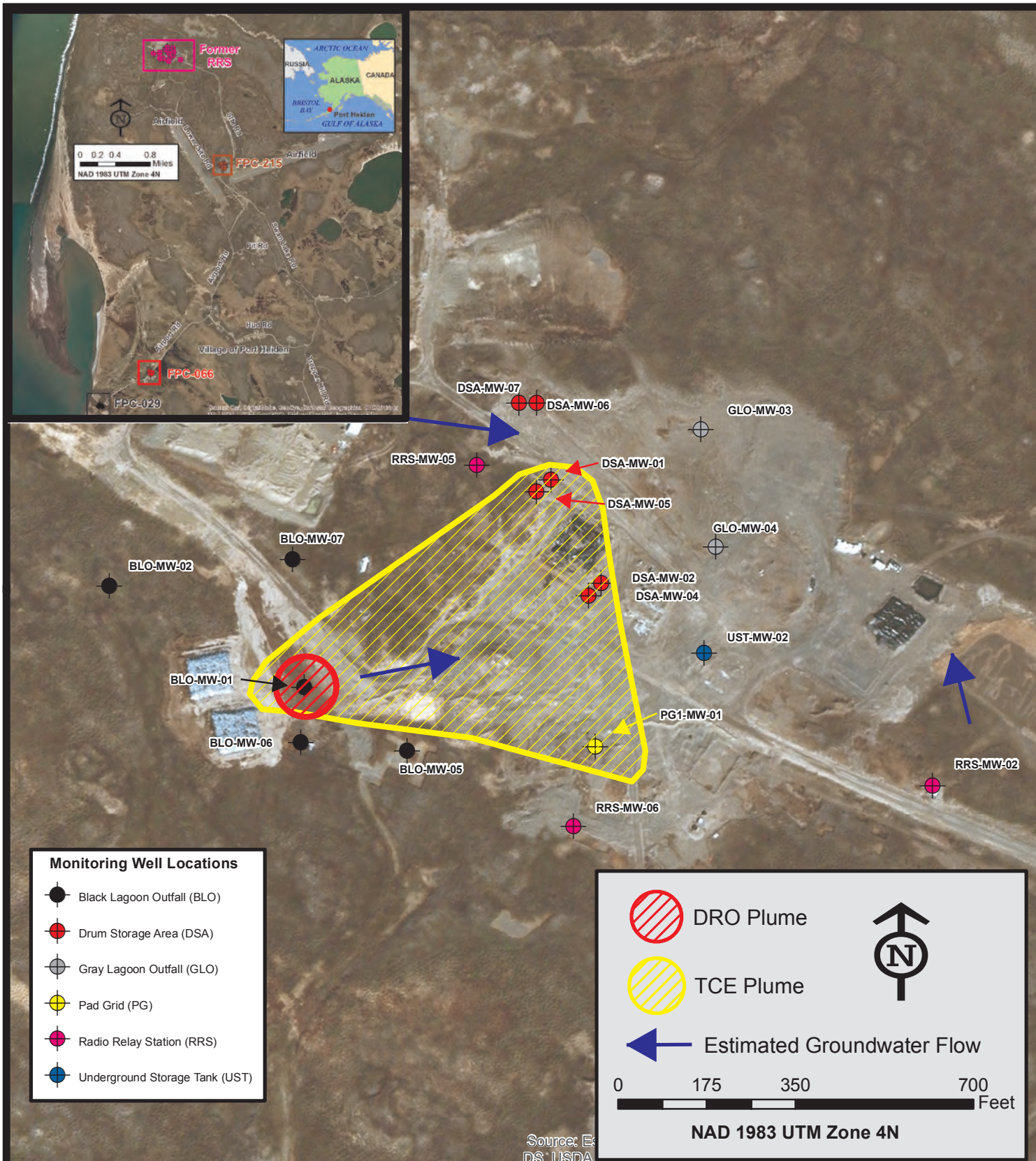
NAD 1983 UTM Zone 4N



A Subsidiary of Alaska Peninsula Corporation

Site Detail Map		
Fuel Pipeline Corridor Site 215, 2016		
PORT HEIDEN, ALASKA		
DATE:	PROJECT MANAGER:	FIGURE NUMBER:
2 MAY 2018	Greg DuBois	4-2

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Groundwater Plumes and Estimated Groundwater Flow at the Former Radio Relay Station, 2016
PORT HEIDEN, ALASKA



DATE:
2 MAY 2018

PROJECT MANAGER:
Greg DuBois

FIGURE NUMBER:
4-3

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5. HISTORICAL RESULTS

This section presents a comparison between the 2016 groundwater sampling results and historical sampling data at sites FPC-066, FPC-215, and the former RRS.

5.1 FPC-066 SITE

This was the site of a fuel release that occurred in the late 1980's to early 1990's. In 2004 a surface soil sample and five soil borings were drilled, and samples collected in soil and groundwater with DRO levels detected above the cleanup level. In 2008 soil was excavated at FPC-066 and in 2009 a groundwater investigation was conducted indicating that DRO was the only contaminant of concern. DRO is currently the only COC monitored at this site. Table 5-1 provides a comparison of the DRO concentrations over time. Groundwater samples were collected from the four monitoring wells at the FPC-066 site in 2009, 2010, 2012, 2013, and 2014 (NVPH 2010, 2011, 2012, 2013; USAF 2015, respectively). Groundwater samples were collected from FPC-066 wells in 2011; however, the samples were not analyzed for DRO.

Table 5-1. Comparison of DRO Concentrations at FPC-066

Well ID	DRO Concentrations (mg/L)						
	2009	2010	2011	2012	2013	2014	2016
ADEC Cleanup Level¹	1.5	1.5	1.5	1.5	1.5	1.5	1.5
066-MW-04	0.504 J	ND [0.851]	NS	ND [0.360]	0.018 J	NS	0.32J
066-MW-05	2.25	4.5	NS	2.02	1.6	1.3	2.4
066-MW-06	ND [0.8]	ND [0.800]	NS	ND [0.360]	0.019 J	0.032 J	0.063J
066-MW-07	ND [0.8]	ND [0.899]	NS	ND [0.360]	0.024 J	NS	0.056J

Notes:

¹ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2017)

J = analyte was positively identified, but associated result was less than the LOQ and greater than or equal to the DL.

ND = nondetect

NS = not sampled

Bold = Laboratory-reported concentration exceeds ADEC cleanup level.

The LOQs are provided in brackets following ND.

For additional definitions, see Acronyms and Abbreviations section.

Historically, DRO has exceeded cleanup levels in only one of the four wells at this site. In 2011, analysis for DRO was scheduled for all wells; however, laboratory samples were not collected for this analyte. The concentration of DRO in monitoring well 066-MW-05 experienced a net decreasing trend from 2009–2014, with concentrations from 4.5 mg/L in 2010 to 1.3 mg/L in

2014. However, the 2016 result for well 066-MW-05 was higher and exceeded the DRO cleanup level with a concentration of 2.4 mg/L.

5.2 FPC-215 SITE

FPC-215 is the site of a fuel release at a junction with the former RRS fuel pipeline with a spur that went to former Reeve Aleutian Airways facilities. In 2004 an investigation included advancement of soil borings and installation of two wells. The release was observed by surface staining and the presence of absorbent pads. Contaminants included DRO and GRO in soil and groundwater. In 2008 soil was excavated from the site to the extent practicable and in September 2009 soil borings were advanced and sampled and groundwater wells were installed, developed and sampled. Well 215-MW-09 was installed within the former 2008 excavation. Since that time, sampling has occurred in the September/October time frame. DRO is currently the only COC monitored at this site. Table 5-2 provides a comparison of DRO concentrations over time. Groundwater samples were collected from the three monitoring wells at the FPC-215 site in 2009, 2010, 2011, 2012, 2013 and 2014 (NVPH 2010, 2011, 2012, 2013; USAF 2015).

Table 5-2. Comparison of DRO Concentrations at FPC-215

Well ID	DRO Concentrations (mg/L)						
	2009	2010	2011	2012	2013	2014	2016
ADEC Cleanup Level¹	1.5	1.5	1.5	1.5	1.5	1.5	1.5
215-MW-08	4.18	ND [0.879]	1.17	ND [0.360]	0.019 J	0.036 J	.048J
215-MW-09	3.99	9.68	14	8.85	11	12	12
215-MW-10	ND [0.8]	ND [0.856]	0.524 J	0.853	0.032 J	0.022 J	NS
215- MW-11	NA	NA	NA	NA	NA	NA	0.11J
215-MW-12	NA	NA	NA	NA	NA	NA	0.15J

Notes:

¹ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2017)

J = analyte was positively identified, but associated result was less than the LOQ and greater than or equal to the DL.

ND = nondetect

NS = Not Sampled

NA = Not Applicable because the wells were not installed until 2016

Bold = laboratory reported concentration exceeds ADEC cleanup level.

The LOQs are provided in brackets following ND.

For additional definitions, see Acronyms and Abbreviations section.

During the 2016 season, two new wells were installed, developed, and sampled for DRO concentrations. No previous data are available for use in comparing concentrations over time for those two wells. The two new wells were installed to better define the area of the DRO concentration plume at the FPC-215 site. The 2016 concentration results from the two well were below the ADEC cleanup level. Because 215-MW-10 was damaged, it was not sampled. Sampling concentrations from this well have historically been less than the cleanup level. Based on results of the new wells and historical results from the other wells, the plume is likely relegated to the vicinity of 215-MW-09.

DRO has been historically detected above the cleanup level in two of the three monitoring wells at the FPC-215 site. In 2009, monitoring wells 215-MW-08 and 215-MW-09 contained DRO concentrations of 4.18 mg/L and 3.99 mg/L, respectively. Since 2009, DRO has been reported below the cleanup level in monitoring well 215-MW-08. DRO concentrations in monitoring well 215- MW-09 have increased significantly, from 3.99 mg/L in 2009 to 12 mg/L in 2014 and 2016; the maximum detected concentration (14 mg/L) was reported in 2011. Reported levels of DRO have never exceeded the cleanup level in monitoring well 215-MW-10, although it was damaged and not sampled in 2016.

5.3 FORMER RADIO RELAY STATION

In 2004, 2009, 2010, 2011, 2012, 2013, and 2014, samples were collected from wells located in the former RRS (USAF 2006; NVPH 2010, 2011, 2012, 2013; USAF 2015). Concentrations from the following wells sampled in 2016 have historically exceeded cleanup levels:

- BLO-MW-01
- DSA-MW-01
- DSA-MW-02
- DSA-MW-04
- DSA-MW-05
- DSA-MW-07
- PG1-MW-01

The 2014 ROD five-year review, identified TCE and benzene as groundwater COCs at the former RRS. However, TCE, DRO, and RRO exceeded cleanup levels in 2016 while benzene analytical results did not exceed cleanup levels. In 2014, 1,1,2,2- tetrachloroethane, TCE, DRO, and RRO were detected above cleanup levels in monitoring well BLO-MW-01. TCE was detected above the cleanup level in the four remaining wells that have had current and/or historical TCE exceedances. TCE contamination is further discussed in Section 5.3.2.

5.3.1 DRO and RRO Contamination

Concentrations of DRO in monitoring well BLO-MW-01 have ranged from 17 mg/L to 15,600 mg/L. Free product was detected at a thickness of 0.65 foot in 2013 (USAF 2014) and 0.01 feet in 2016. Historically, DRO and RRO have exceeded cleanup levels in monitoring well BLO-MW-01; RRO concentrations have ranged from 2.3 mg/L in 2004 to 1,890 mg/L in 2010. In 2016 the RRO concentration was 4.2 mg/L. Table 5-3 provides a comparison of DRO concentrations, and Table 5-4 provides a comparison of RRO concentrations over time.

Table 5-3. Comparison of DRO Concentrations for Wells Sampled in 2016 at Former RRS

Well ID	DRO Concentrations (mg/L)							
	2004	2009	2010	2011	2012	2013	2014	2016
ADEC CleanupLevel¹	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
BLO-MW-01	17	NS	15,600²	70.5	26.5	1,300²	1,600	63
BLO-MW-05	2 ³	NS	ND [0.860]	0.242 J	ND [0.360]	0.075	0.032 J	0.044
BLO-MW-06	NS	NS	ND [0.889]	0.883	ND [0.360]	0.074	0.042 J	ND [0.12]
BLO-MW-07	-	-	-	-	Installed dry	Dry	0.084 J	ND [0.12]
DSA-MW02	0.086	NS	NS	0.479 J	ND [0.360]	0.031	0.031 J	0.070 JM
DSA-MW04	NS	NS	NS	NS	ND [0.360]	0.097	0.08 J	0.082 JM

Notes:

¹ ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2017)

² Elevated concentration indicative of free product

³ The result was reported as total petroleum hydrocarbons.

J = analyte was positively identified, but the associated result was less than the LOQ and greater than or equal to the DL.

M = manual integrated compound

NS = not sampled

Bold = laboratory reported concentration exceeds ADEC cleanup level.
The LOQs are provided in brackets following ND.
For additional definitions, see Acronyms and Abbreviations section.

**Table 5-4. Comparison of RRO Concentrations
for Wells Sampled in 2016 at Former RRS**

Well ID	RRO Concentrations (mg/L)						
	2004	2010	2011	2012	2013	2014	2016
ADEC Cleanup Level¹	1.1	1.1	1.1	1.1	1.1	1.1	1.1
BLO-MW-01	2.3 J	1,890	8.14	2.8	78.0 J	150 J	4.2 J
BLO-MW-05	NS	ND [0.860]	ND [0.306]	ND [0.3]	0.18 J	0.19 J	ND [0.13]
BLO-MW-06	NS	ND [0.889]	0.223 J	ND [0.3]	0.360 J	0.15 J	ND [0.13]
BLO-MW-07	-	-	-	Installed Dry	Dry	0.36 J	ND [0.13]
DSA-MW-02	ND [0.039]	NS	ND [0.340]	0.252	0.062 J	0.073 J	ND [0.13]
DSA-MW-04	NS	NS	NS	ND [0.31]	0.082 J	0.059 J	ND [0.13]
UST-MW-02	NS	ND [0.526]	ND [0.316]	0.372	0.140 J	0.23 J	NS

Notes:

¹ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2017)

J = the analytical result is estimated

NS = not sampled

Bold = laboratory reported concentration exceeds ADEC cleanup level

The LOQs are provided in brackets following ND.

For additional definitions, see Acronyms and Abbreviations section.

5.3.2 TCE Contamination

Four of the 15 wells sampled in 2016 at the former RRS have a current and historically reported TCE concentration above the cleanup level of 0.0028 mg/L. Table 5-5 provides a comparison of TCE concentrations over time in wells at the former RRS.

The highest historical TCE concentration at this site (0.690 mg/L) was a 2004 result from monitoring well DSA-MW-02. The highest detected concentration in 2016 was 0.38 mg/L in well DSA-MW-02.

As part of the 2004 RI/FS, Pad Grids were established between former antenna locations. The grid established in the area between Antennas 1 and 2 was designated as Pad Grid 1 and the well that was installed in that location was identified as PG1-MW-01. In 2016, well PG1-MW-01 was not sampled because soil had been excavated around the well and the PVC casing was sticking up approximately 8 feet out of the ground supported with a wood plank. The well was determined to be not safe to sample. TCE results from well PG1-MW-01 have historically exceeded the cleanup levels, ranging from the lowest concentration of 0.0078 mg/L in 2004 to the highest concentration of 0.0447 mg/L in 2012. All results reported between 2010 and 2014 were significantly higher than the 2004 reported concentration of 0.0078 mg/L.

Table 5-5. Comparison of TCE Concentrations for Wells Sampled in 2016 at Former RRS

Well ID	TCE Concentrations (mg/L)						
	2004	2010	2011	2012	2013	2014	2016
ADEC Cleanup Level¹	0.005	0.005	0.005	0.005	0.005	0.005	0.0028
BLO-MW-01	0.0056	ND [0.020]	0.0036 J	0.0053	0.0035	0.005	0.0031J-
BLO-MW-02	ND [0.00021]	ND [0.001]	NS	ND [0.00062]	ND [0.0001]	NS	NS
BLO-MW-05	0.00019	ND [0.001]	ND [0.00062]	ND [0.00062]	ND [0.0001]	0.00015 J	ND [0.001]
BLO-MW-06	ND [0.00018]	ND [0.001]	ND [0.00062]	ND [0.00062]	0.00088	0.00014 J	ND [0.001]
BLO-MW-07	Installed in 2012			DRY	DRY	ND [0.0001]	ND [0.001]
DSA-MW-01	0.017	0.0117	0.479 J	0.00047	0.0062	0.0077	0.0073
DSA-MW-02	0.690 J	0.508	0.499	0.506	0.5²	0.49	0.38
DSA-MW-04	Installed in 2012			0.0717	0.12	0.09	0.34
DSA-MW-05	Installed in 2012			0.00525	0.0028	0.0029	0.0022
DSA-MW-06	Installed in 2012			0.00054	ND [0.0001]	0.00015 J	ND [0.001]
DSA-MW-07	Installed in 2012			0.0447	ND [0.0001]	ND [0.0001]	ND [0.001]
GLO-MW-03	NS	NS	ND [0.00062]	ND [0.00062]	ND [0.0001]	ND [0.0001]	ND [0.001]
GLO-MW-04	Installed in 2012			ND [0.00062]	ND [0.0001]	ND [0.0001]	ND [0.001]
PG1-MW-01	0.0078	0.0423	0.0325	0.0447	0.021	0.039	NS
RRS-MW-02	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	ND [0.0001]	NS	ND [0.001]
RRS-MW-05	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	0.00011 J	ND [0.0001]	ND [0.001]
RRS-MW-06	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	ND [0.0001]	ND [0.0001]	ND [0.001]
UST-MW-02	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	0.00010 J	ND [0.0001]	NS

Notes:

¹ ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2017).

² Sample collected 1 to 2 feet below groundwater interface but 23.5 to 28.5 feet above screened interval; TCE results are biased low. It should be noted that this error was corrected during the 2014 field activities; however, laboratory results were very similar between the two sampling events.

J = analyte was positively identified, but the associated result was less than the LOQ and greater than or equal to the DL.

J- = analytical result may be biased low due to sample collection method using a bailer.

NS = not sampled

Bold = laboratory reported concentration exceeds ADEC cleanup level

Italics = The LOQ exceeded ADEC cleanup levels.

The LOQs are provided in brackets following ND.

The highest historical TCE concentration at this site (0.690 mg/L) was a 2004 result from monitoring well DSA-MW-02. This concentration is approximately two orders of magnitude above the cleanup level. The TCE concentrations reported between 2010 and 2013\4 were relatively consistent, ranging from 0.490 to 0.508 mg/L.

For additional definitions, see Acronyms and Abbreviations section.

In monitoring well DSA-MW-01, elevated concentrations of TCE were found to be present in six of the seven sampling events from 2004 through 2016. The maximum detected concentration (0.479J mg/L) was reported in 2011. The detected concentration of TCE from DSA-MW-01 remains above the cleanup level at 0.0073 mg/L.

Previously, TCE concentrations in monitoring well BLO-MW-01 have only slightly exceeded or were less than the former cleanup level of 0.005 mg/L. The analytical result in 2016 was 0.0031J- mg/L, which is below the former cleanup level but exceeds the revised 2016 cleanup level of 0.0028 mg/L. It is flagged as being biased low due to the sample being collected using a bailer. In 2010, TCE was not detected; however, the laboratory DL exceeded the cleanup level, meaning that TCE could have been present at levels above the cleanup level, yet still not detectable during laboratory analysis. During the 2013 site inspection activities, TCE-contaminated soil was identified near this well. In 2014 approximately 3,500 cubic yards of TCE-contaminated soil was excavated adjacent to well BLO-MW-01, as stated in the *2014 Draft Black Lagoon Biopile Treatability Study Report* (USAF 2015).

The following six wells presented in Table 5-5 were installed in 2012:

- GLO-MW-04
- DSA-MW-04
- DSA-MW-05
- DSA-MW-06
- DSA-MW-07
- BLO-MW-07

Between 2012 and 2016, the TCE concentrations in monitoring well DSA-MW-04 have remained above cleanup levels. The 2016 result of 0.34 mg/L is the highest detected analytical result to date. This well is close to monitoring well DSA-MW-02, which has exhibited the greatest TCE concentration at this site. For the other wells installed in 2012, TCE concentrations appear to be decreasing; however, four sample results are not generally accepted as statistically valid for trend analysis.

Based on the available data, TCE concentrations are not naturally attenuating at a rate that will likely achieve the proposed RI/FS timeframe of 25.7 years (USAF 2006) in the areas surrounding monitoring wells DSA-MW-01, DSA-MW-02, DSA-MW-04, and PG1-MW-01. In wells containing lower TCE concentrations, such as BLO-MW-01, natural attenuation may be successful in reducing concentrations to below the cleanup level within the proposed timeframe.

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6. WASTE MANAGEMENT

With one exception, all purge water and wastewater generated during 2016 was combined into two 55-gallon drums. One drum contains water that was treated by being filtered through a granular activated carbon (GAC) System. The other drum contains contaminated water that will be treated through a GAC system in 2017. Solid waste such as spent tubing and the well materials removed from FPC-029 were placed into the Port Heiden landfill with approval from the NVPH.

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7. CONCLUSIONS AND RECOMMENDATIONS

This section provides conclusions and recommendations that support the primary objectives from both the 2016 annual groundwater sampling effort and the Record of Decision (USAF 2009).

7.1 FPC-066 SITE

DRO is the only COC currently monitored at the FPC-066 site. Historically, well 066-MW-05 exceeded the DRO cleanup level, however, during the 2014 monitoring event, the results from the well 066-MW-05 were below the cleanup level. It was determined that the wells at FPC-066 would be decommissioned if an additional sample result from 066-MW-05 was below the cleanup level. In June 2016, another consulting firm collected a groundwater sample from 066-MW-05 to confirm the 2014 result, however, the June 2016 concentration exceeded the DRO cleanup level. Based on the exceedance, all four of the FPC-066 wells were added back into the ground water monitoring program. In October 2016, APCS collected samples from the four wells on site and the analytical result from well 066-MW-05 exceeded the cleanup level again; therefore, monitoring of the four wells at FPC-066 will continue. Re-surveying of these wells is recommended.

7.2 FPC-215 SITE

The only COC currently monitored at the FPC-215 site is DRO. The DRO concentration at well 215-MW-09 appears to have been increasing the past few years and there was concern that the plume may be migrating or have an additional source not previously identified. Two new wells—FPC-215-MW11 and FPC-215-MW12—were installed in 2016 in locations around 215-MW-09 to assess the potential for a larger source or migration of the contaminant plume. The 2016 result from well 215-MW-09 was 12 mg/L, consistent with the 2014 result; however, the other wells, including the two newly installed wells, had concentrations well below the cleanup level. Monitoring well 215-MW-10 has had DRO detections below cleanup levels in the past but was damaged and not sampled in 2016. Consideration should be given to repair of well 215-MW-10 in coordination with ADEC for possible future monitoring.

7.3 FORMER RADIO RELAY STATION

Two contaminant plumes are present at the former RRS site: a fuel contamination plume in the BLO area and a TCE plume near the former DSA, BLO, and surrounding areas. Of the 16 wells sampled at this site, four contained concentrations of COCs above cleanup levels in 2016.

Historically, seven wells have exhibited concentrations of COCs above the cleanup levels. Of these wells, DSA-MW-05 and DSA-MW-07 are the only two that have had concentrations below cleanup levels during the previous two sampling events. Based on the 2014 and 2016 concentrations of TCE, DRO, and RRO, and lack of historical natural attenuation, MNA may not meet the timeframe proposed in the RI/FS (USAF 2006).

Nine monitoring wells at the RRS have exhibited reported concentrations of COCs below ADEC cleanup levels in all previous sampling events:

- BLO-MW-05
- BLO-MW-06
- BLO-MW-07
- DSA-MW-06
- GLO-MW-03
- GLO-MW-04
- UST-MW-02
- RRS-MW-05
- RRS-MW-06

If the 2017 results are consistent with the previous results in these wells, the USAF recommends that the frequency of long-term monitoring at these nine monitoring wells be changed to once every five years to coincide with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) five-year reviews.

8. REFERENCES

- ADEC (Alaska Department of Environmental Conservation). 2017. *Alaska Administrative Code*, Title 18, Chapter 75, Part 345, Table C, Groundwater Cleanup Levels. As amended November 7, 2017.
- ADEC. 2016 (May). *Field Sampling Guidance*.
- Anderson, R. H., J.K. Anderson, and P.A. Bower. 2012 (May). "Co-occurrence of 1,4-Dioxane with Trichloroethylene in Chlorinated Solvent Groundwater Plumes at US Air Force Installations: Fact or Fiction." *Integrated Environmental Assessment and Management*.
- NVPH (Native Village of Port Heiden). 2013 (June). *Draft Groundwater Monitoring Report at the Former Port Heiden Radio Relay Station, Port Heiden, Alaska*.
- NVPH. 2012 (March). *Final Groundwater Monitoring Report, Former Port Heiden Radio Relay Station, Port Heiden, Alaska*.
- NVPH. 2011 (May). *Final Groundwater Monitoring Report. Former Port Heiden Radio Relay Station, Port Heiden, Alaska*.
- NVPH. 2010 (September). *Final Report, 2009 Groundwater Investigation, Former Pipeline Corridor, Port Heiden, Alaska*.
- USAF (U.S. Air Force). 2016, amended April 2017. *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Port Heiden, Alaska*.
- USAF. 2015 (May). *2014 Annual Groundwater Monitoring Report, Former Radio Relay Station, Port Heiden, Alaska*.
- USAF. 2014 (March). *2013 Annual Groundwater Monitoring Report, Former Radio Relay Station, Port Heiden, Alaska*.
- USAF. 2013 (July). *Groundwater Monitoring 2013 Work Plan. Former Radio Relay Station, Port Heiden, Alaska*.
- USAF. 2010 (July). *Final Remediation Project Work Plan, Port Heiden Radio Relay Station, Port Heiden, Alaska*.

USAF. 2009 (February). *Record of Decision for Port Heiden Radio Relay Station, Port Heiden, Alaska.*

USAF. 2006 (April). *Final Remedial Investigation/Feasibility Study, Port Heiden Radio Relay Station.*

Appendix A Photograph Log

Photograph Log



Photographs 1 and 2. Well decommissioning at FPC-029, October 5, 2016; view to the south.



Photograph 3. New wells at site FPC-215 in yellow, October 5, 2016; view to the north. FPC215-MW-12 in foreground and FPC215-MW-11 in background.

Photograph Log



Photograph 4. Low-flow sampling at well 066-MW-05; October 13, 2016; view to the northwest.



Photograph 5. Monitoring well PG-1 at the former RRS. October 14, 2016; view to the north.

Photograph Log



Photograph 6. Use of an ice fishing shelter during sampling at 215-MW-08. October 17, 2016; view to the north.

Photograph Log

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Appendix B

Data Quality Assessment



Pacific Air Forces Regional Support Center

Joint Base Elmendorf-Richardson, Alaska

2016 ANNUAL GROUNDWATER MONITORING REPORT

**FORMER RADIO RELAY STATION
PORT HEIDEN, ALASKA**

Appendix B Data Quality Assessment

**Final
February 2019**

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ATTACHMENTS

Attachment B-1	Sample Summary Tables
Attachment B-2	Qualified Sample Results Tables
Attachment B-3	Data Validation Reports and ADEC Laboratory Data Review Checklists
Attachment B-4	Laboratory Deliverables (available on CD)

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
APCS	APC Services, LLC
BTEX	benzene, toluene, ethylbenzene, and xylenes
COC	chain-of-custody
DL	detection limit
DoD	U.S. Department of Defense
DQA	Data Quality Assessment
DQO	data quality objective
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
GRO	gasoline range organics
HCl	hydrochloric acid
ID	identification
LOD	limit of detection
LOQ	Limit of quantitation
MS	matrix spike
MSD	matrix spike duplicate
MNA	monitored natural attenuation
QC	quality control
RPD	relative percent difference
RRO	residual range organics
TB	trip blank
USAF	U.S. States Air Force

Versar Versar, Inc.
VOC volatile organic compound

1. INTRODUCTION

The purpose of this Data Quality Assessment (DQA) and attached Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklists is to assess the overall quality and usability of data from the 2016 annual groundwater monitoring at Port Heiden, Alaska.

As part of the 2016 groundwater monitoring effort, 24 of 27 groundwater wells were sampled. Table 3-2 in the report Section 3.1 lists details of each well and the analyses. Well samples were submitted to the analytical laboratory, TestAmerica in Denver, Colorado (TAD), for analysis. Analyses and field quality control sample quantities are summarized in Table B-1; the specific list of methods/analytes for each well is provided in Table 3-2 of the report.

Table B-1. Field Quality Control Sample Quantities, Groundwater Samples

Method	Analyte(s)	Primary Samples	Field Duplicates	MS/MSD	Trip Blanks
AK101	GRO	6	1	1	-
AK102	DRO	14	2	2	-
AK103	RRO	6	1	1	-
SW8260C	VOC	15	2	1	3
ASTM2320B, E200.7, E300.0, E351.2, E353.2, SW6010C	For MNA: total iron, total manganese, total sulfate, alkalinity, total nitrogen as nitrate-nitrite, and Kjeldahl nitrogen	15	2	2	-

Note:

For definitions, see Acronyms and Abbreviations section.

The attachments to this DQA contain the sample summary table (Attachment B-1); qualified sample results tables (Attachment B-2); data validation reports and ADEC Laboratory Data Review Checklists (Attachment B-3); and the complete laboratory deliverables (Attachment B-4, available on CD).

1.1 QUALITY CONTROL CRITERIA

APC Services, LLC (APCS) subcontracted Versar, Inc. (Versar) to conduct the DQA and complete the ADEC Laboratory Data Review Checklists for the records associated with the 2016 annual groundwater monitoring event, in accordance with the *Groundwater Monitoring*

Work Plan, Port Heiden Radio Relay Station, Port Heiden, Alaska (U.S. Air Force [USAF] 2016). Data quality was evaluated against the following requirements: *Quality Systems Manual for Environmental Laboratories* (U.S. Department of Defense [DoD] 2013); *U.S. EPA National Functional Guidelines for Superfund Inorganic Methods Data Review* (U.S. Environmental Protection Agency [EPA] 2016a); *U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review* (EPA 2016b); and the project-specific Quality Assurance Project Plan (USAF 2016, amended in 2017), prepared in accordance with the *Uniform Federal Policy for Quality Assurance Project Plans* (EPA, DoD, and U.S. Department of Energy, 2012). The method-specific criteria set forth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste* (SW-846; EPA 2008) were also evaluated during the validation process.

The project chemist performed a completeness check of the laboratory deliverables to verify that data packages and electronic files included all requested information. All analytical data were reviewed, including the chain-of-custody (COC) and sample receipt records, laboratory case narratives, and laboratory data. Analytical data were reviewed for the following information:

- Methodology
- Sample holding times
- Laboratory blanks and trip blanks
- Limit of quantitation, limit of detection, and detection limits (DLs)
- Surrogate recoveries, laboratory control sample recoveries, and laboratory control sample duplicate recoveries
- Matrix spike (MS) and matrix spike duplicate (MSD) recoveries and precision

Analytical data quality objectives were considered to have been met when the quality of the sample data met precision, accuracy, representativeness, completeness, comparability, and sensitivity requirements. Qualified data are considered usable but estimated for the purposes of this monitoring event.

There are five levels of analytical data verification and validation:

- Level One (I) – validation based ONLY on completeness and compliance checks of sample receipt conditions.
- Level Two (II) – validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related quality control (QC) results.
- Level Two (b) (IIB) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, AND recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms.
- Level Three (III) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, AND recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms.
- Level Four (IV) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, recalculations of a representative portion of the QC checks/calibration based on the information provided in the summary forms, AND the review of actual instrument outputs/raw data.

The following data qualifiers are applicable for the 2016 groundwater monitoring analytical data:

- J The analyte was positively identified; the quantitation is an estimation.
- J- The analyte was positively identified; the quantitation is an estimation and may be biased low
- B The analyte was detected in the method blank or trip blank as well as the sample.
- F The analyte was positively identified, but the associated numerical value is below the reporting limit.
- JC The continuing calibration percent recovery was outside acceptable limits (< 80%); results were qualified as estimated and may be biased low.
- M A matrix effect was present.

- Q One or more QC criteria failed. The usability of this data point should be carefully evaluated.
- QJ- Values “Q” and “J-“ combined.
- R The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- S To be applied to all field screening data
- T Tentatively identified compound (using gas chromatography/mass spectrometry)
- U The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit (LOD).
- UJ Values “U” and “J” combined.
- UJ- Values “U” and “J-” combined.

2. DATA QUALITY SUMMARY

A review of the analytical results and associated QC samples determined that the overall quality of the project data is acceptable for the purposes of this monitoring event. The data are considered usable within the limitations discussed in this DQA and the ADEC checklists (Attachment B-3). The details of the data evaluation are presented in Sections 2.1 to 2.5. Sample results that did not meet project data quality objectives (DQOs) are qualified according to Section 1.1. All qualified results can be found in the tables of Attachment B-2; all associated data validation reports and ADEC checklists can be found in Attachment B-3.

2.1 SAMPLE HOLDING TIME

The diesel-range organics (DRO) and residual-range organics (RRO) reanalysis (method AK102 and AK103) was completed outside the holding time for sample BLO-MW-07. The DRO and RRO results were non-detect and flagged “UJ”. The data quality or usability was not affected and the data are usable.

All other sampling holding times were met for the other samples.

2.2 CONTINUING CALIBRATION

All criteria for continuing calibration verification were met. All data are usable.

2.3 MATRIX SPIKES

The analytical result of sample MSD 280-90492-3 for Kjeldahl nitrogen was below acceptance criteria for percent recovery. The associated sample, BLO-MW-01, had a detection and was already flagged “J” as estimated; therefore, no additional flag was applied.

Sample BLO-MW-06 was supposed to be analyzed for MS/MSD, but the laboratory indicated it only received five volatile organic analyte vials preserved with hydrochloric acid (HCl), an insufficient volume to perform the MS/MSD analysis that was requested.

Table B-2-2 (Attachment B-2) provides a summary of the MS and MSD recovery outliers and the affected parent sample result.

2.4 FIELD DUPLICATES

Field duplicates were collected at a rate of at least 10% for each analyte.

BLO-MW-26 was a duplicate of sample BLO-MW-06. The duplicate result was above the relative percent difference (RPD) acceptance criteria for Kjeldahl nitrogen, iron, and total

nitrogen. Both BLO-MW-06 and BLO-MW-26 had detections and were flagged “J.” The data were not affected and are considered usable.

FPC-MW-28 was a duplicate of FPC-MW-08 and was above RPD acceptance criteria for DRO. FPC-MW-08 and FPC-MW-28 both had detections and were flagged “J.” The data were not affected and are considered usable.

DSA-MW-06 and DSA-MW-26 were both accepted and met RPD acceptance criteria. Data were usable.

2.5 DETECTION LIMIT ASSESSMENT

All limits of quantitation (LOQs) were less than the cleanup level or the minimum required detection level for the project. Therefore, the data are usable.

2.6 METHOD BLANKS/TRIP BLANKS

Trip blanks were used for volatile organic compounds (VOCs), and all results were less than the LOQs. Data are not affected and are accepted. Trip blanks were not requested for GRO analysis. One sample had detected GRO below the cleanup level. Other samples analyzed for GRO did not have detections and all detection limits were below the cleanup level. The data usability is not affected and no flags were applied.

Method blank MB 280-350511/1-A contained DRO above the LOD but below the LOQ (LOQ). FPC 215-MW-11 and FPC-215-MW-12 had detections between the LOD and LOQ and were already flagged “J.” The results indicate that the reported data may be biased high because the method blanks showed a detection higher than the LOQ. The data are considered usable.

Method blank MB 280-348710/1-A contained a DRO concentration above the LOD but below the LOQ. Samples from FPC-066-MW-06, FPC-066-MW07, and FPC-066-MW08 had detections less than ten times the concentration in the blank and were already flagged “J.” No additional flags were applied, and the data are considered usable.

Analytical results for method blanks MB 280-349179/31, MB 280-349355/57, MB 280-349636/5, MB 280-349636/57, and MB 280-350322/67 were above the LOQ. Samples BLO-MW-06 and BLO-MW-26, tested for nitrate-nitrite; BLO-MW-06, BLO-MW-07, BLO-MW-26, RRS-MW-02, DSA-MW-02, and DSA-MW-04, tested for alkalinity; and DSA MW-02, DSA-

MW-04, and FPC 215-MW-28, tested for DRO, were affected and flagged “J.” The data are considered usable.

U.S. Environmental Protection Agency (EPA) Method SM 2320B was used to test for alkalinity. Method blank MB 280-349636/57 contained total alkalinity above the LOD but below the LOQ. Sample results from BLO-MW-05 had a detection more than ten times the concentration in the blank; no flag was applied. Method blank MB280-349858/5 contained total alkalinity above the LOD but below the LOQ. Sample DSA-MW-07 had a detection more than ten times the concentration in the blank. No flag was applied. Overall, all acceptance criteria were met, except as noted.

Trace DRO was detected in the method blank for laboratory report 280-89568-1; however, the DRO concentration was well below the LOQ and just slightly above the LOD. The data are considered usable.

EPA Method 300.0 (EPA 1983) was used to test for sulfate anions. The result from sample MB 280-352124/6 was above the LOD but below the LOQ. Samples BLO-MW-06 and BLO-MW-26 had detections more than ten times the concentration found in the blank; no flags were applied. Samples BLO-MW-05 and BLO-MW-07 had detections between the LOD and LOQ and were already flagged “J”; no additional flags were applied.

Detections of the following analytes (listed with the methods used) above the DL in method blanks or trip blanks resulted in the qualification of sample results:

- AK102: DRO
- AK103: RRO
- SW8260B: methylene chloride, naphthalene, chloromethane, and 1,2,4-trichlorobenzene

Sample results were qualified “B” when the sample concentration was within a factor of five (factor of ten for methylene chloride) from the blank concentration. Sample results qualified “B” are estimated and considered biased high. All project sample results qualified “B” were less than the corresponding ADEC Table C cleanup levels (ADEC 2017); therefore, the impact from the possible high bias is negligible

Three trip blanks were submitted with coolers containing samples for volatile analyses; all three were analyzed with Method SW8260B. Results for all samples came back nondetect for all

analytes, indicating there was no cross-contamination during transport and the data quality was not affected.

Table B-2 provides a summary of trip blanks (TB), sample identifications (IDs), chain-of-custody (COC) IDs, and analyses performed by the laboratory.

Table B-2. Trip Blank Analyses

Sample ID	COC ID	Analysis
TB PH 016-01	TB PH016091	SW8260B
TB PH016-02	TB PH016-016-02	SW8260B
TBPH016-03	TBPH16-03	SW8260B

3. CONCLUSION

The overall quality of project data was acceptable. The completeness goal of 95 percent for all parameters was met. No sample results were rejected. All reported data were considered usable for the 2016 Annual Groundwater Monitoring at Port Heiden; any qualifications applied during data validation did not adversely affect data usability. Limitations are discussed in this DQA and in the data validation reports and ADEC Laboratory Data Review Checklists (Attachment B-3).

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4. REFERENCES

- ADEC (Alaska Department of Environmental Conservation). 2017. *Alaska Administrative Code*, Title 18, Chapter 75, Part 345, Table C, Groundwater Cleanup Levels. As amended November 7, 2017.
- ADEC. 2009 (March). *Environmental Laboratory Data and Quality Assurance Requirements; Technical Memorandum*. Division of Spill Prevention and Response, Contaminated Sites Program.
- ADEC. 2002. *Underground Storage Tanks Procedures Manual*. Division of Spill Prevention and Response, Contaminated Sites Program.
- DoD (U.S. Department of Defense). 2013 (July). *Quality Systems Manual for Environmental Laboratories*. DoD Environmental Quality Workgroup, Department of the Navy, Lead Service. Version 5.0.
- EPA (U.S. Environmental Protection Agency). 2016a (September). *U.S. EPA National Functional Guidelines for Superfund Inorganic Methods Data Review*.
- EPA. 2016b (September). *U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review*.
- EPA. 2008 (January). *Test Methods for Evaluating Solid Waste*. SW-846. Third Edition, Update IVB.
- EPA. 1983 (March). *Methods of Chemical Analysis of Water and Waste*. EPA/600/4-79/020.
- EPA, DoD, and U.S. Department of Energy, Intergovernmental Data Quality Task Force. 2012 (March). *Uniform Federal Policy for Quality Assurance Project Plans: Optimized UFP-QAPP Worksheets*.
- USAF (U.S. Air Force). 2016, amended April 2017. *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Port Heiden, Alaska*.
- USAF. 2009 (February). *Record of Decision for Port Heiden Radio Relay Station, Port Heiden, Alaska*.

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Attachment B-1
Sample Summary Tables

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Table B-1-1. 2016 Port Heiden Groundwater Monitoring Program Sample Summary

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	Lab	SDG
FPC 215-MW08	215-MW-08	17-Oct-2016	1655	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102		30 days		TAD	280-89767-1
FPC 215 MW28	215-MW-08	17-Oct-2016	1730	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102	dup	30 Day		TAD	280-90005-1
FPC 215 MW09	215-MW-09	29-Oct-2016	1430	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102		30 day		TAD	280-90492-1
FPC 215 MW11	215-MW-11	26-Oct-2016	1725	GD/SW	2	Amber	1 L	HCl 4C	GW	AK102		30 day		TAD	280-90492-1
FPC 215 MW12	215-MW-12	26-Oct-2016	1913	GD/SW	2	Amber	1 L	HCl 4C	GW	AK102		30 day		TAD	280-90492-1
FPC 066-MW-04	066-MW-04	16-Oct-2016	1255	GD/SW	2	Amber	1 L	HCL, 4C	GW	AK102		30 day		TAD	280-89767-1
FPC 066-MW-05	066-MW-05	16-Oct-2016	1845	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102		30 day		TAD	280-89767-1
FPC 066-MW-06	066-MW-06	15-Oct-2016	1750	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102		30 day		TAD	280-89767-1
FPC 066-MW-07	066-MW-07	15-Oct-2016	1530	GD/SW	2	Amber	1 L	HCl 4C	GW	AK102		30 day		TAD	280-89767-1
RRS MW 006	RRS-MW-06	26-Oct-2016	1230	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90492-1
RRS MW 006	RRS-MW-06	26-Oct-2016	1230	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 0610C		30 day		TAD	280-90492-1
RRS MW 006	RRS-MW-06	26-Oct-2016	1230	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90492-1
RRS MW 006	RRS-MW-06	26-Oct-2016	1230	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90492-1
DSA MW 06	DSA-MW-06	24-Oct-2016	1700	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90312-1
DSA MW 06	DSA-MW-06	24-Oct-2016	1700	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90312-1
DSA MW 06	DSA-MW-06	24-Oct-2016	1700	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90312-1
DSA MW 06	DSA-MW-06	24-Oct-2016	1700	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90312-1
DSA MW 26	DSA-MW-06	24-Oct-2016	1300	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b	dup	30 day		TAD	280-90312-1
DSA MW 26	DSA-MW-06	24-Oct-2016	1300	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 0610C	dup	30 day		TAD	280-90312-1
DSA MW 26	DSA-MW-06	24-Oct-2016	1300	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B	dup	30 day		TAD	280-90312-1
DSA MW 26	DSA-MW-06	24-Oct-2016	1300	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2	dup	30 day		TAD	280-90312-1
DSA MW 07	DSA-MW-07	25-Oct-2016	0930	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90312-1
DSA MW 07	DSA-MW-07	25-Oct-2016	0930	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90312-1
DSA MW 07	DSA-MW-07	25-Oct-2016	0930	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90312-1
DSA MW 07	DSA-MW-07	25-Oct-2016	0930	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90312-1
RRS MW 05	RRS-MW-05	27-Oct-2016	1324	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90492-1
RRS MW 05	RRS-MW-05	27-Oct-2016	1324	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90492-1
RRS MW 05	RRS-MW-05	27-Oct-2016	1324	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90492-1
RRS MW 05	RRS-MW-05	27-Oct-2016	1324	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90492-1
RRSMW02	RRS-MW-02	28-Oct-2016	1300	GD/SW	3	VOA Vials	40 mL	HCL, 4C	GW	SW8260b		30 day		TAD	280-90005-1
RRSMW02	RRS-MW-02	28-Oct-2016	1300	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90005-1
RRSMW02	RRS-MW-02	28-Oct-2016	1300	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, 351.2 2320B		30 day		TAD	280-90005-1
RRSMW02	RRS-MW-02	28-Oct-2016	1300	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90005-1
DSA MW 05	DSA-MW-05	27-Oct-2016	1935	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b	MS/MSD	30 day		ALS	280-90492-1
DSA MW 05	DSA-MW-05	27-Oct-2016	1935	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C	MS/MSD	30 day		ALS	280-90492-1
DSA MW 05	DSA-MW-05	27-Oct-2016	1935	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B	MS/MSD	30 day		ALS	280-90492-1
DSA MW 05	DSA-MW-05	27-Oct-2016	1935	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2	MS/MSD	30 day		ALS	280-90492-1
DSA MW 01	DSA-MW-01	27-Oct-2016	1830	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90492-1
DSA MW 01	DSA-MW-01	27-Oct-2016	1830	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90492-1
DSA MW 01	DSA-MW-01	27-Oct-2016	1830	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90492-1
DSA MW 01	DSA-MW-01	27-Oct-2016	1830	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90492-1
DSA MW 02	DSA-MW-02	19-Oct-2016	1745	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90005-1
DSA MW 02	DSA-MW-02	19-Oct-2016	1745	GD/SW	3	VOA vial	40 mL	HCL, 4C	GW	AK101		30 day		TAD	280-90005-1
DSA MW 02	DSA-MW-02	19-Oct-2016	1745	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	6010C		30 day		TAD	280-90005-1

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	Lab	SDG
DSA MW 02	DSA-MW-02	19-Oct-2016	1745	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, 351.2 2320B		30 day		TAD	280-90005-1
DSA MW 02	DSA-MW-02	19-Oct-2016	1745	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90005-1
DSA MW 02	DSA-MW-02	19-Oct-2016	1745	GD/SW	2	Amber	1 L	HCL,	GW	AK102/AK103		30 day		TAD	280-90005-1
GLO MW 03	GLO-MW-03	25-Oct-2016	1730	GD/SW	3	VOA Vials	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90492-1
GLO MW 03	GLO-MW-03	25-Oct-2016	1730	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90492-1
GLO MW 03	GLO-MW-03	25-Oct-2016	1730	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90492-1
GLO MW 03	GLO-MW-03	25-Oct-2016	1730	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90492-1
DSA MW 04	DSA-MW-04	19-Oct-2016	1430	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90005-1
DSA MW 04	DSA-MW-04	19-Oct-2016	1430	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	AK101		30 day		TAD	280-90005-1
DSA MW 04	DSA-MW-04	19-Oct-2016	1430	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		TAD	280-90005-1
DSA MW 04	DSA-MW-04	19-Oct-2016	1430	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	6010C		30 day		TAD	280-90005-1
DSA MW 04	DSA-MW-04	19-Oct-2016	1430	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90005-1
DSA MW 04	DSA-MW-04	19-Oct-2016	1430	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90005-1
GLO MW 04	GLO-MW-04	25-Oct-2016	1935	GD/SW	3	VOA Vials	40 mL	HCl, 4C	GW	SW8260b		30 day		TAD	280-90492-1
GLO MW 04	GLO-MW-04	25-Oct-2016	1935	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90492-1
GLO MW 04	GLO-MW-04	25-Oct-2016	1935	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90492-1
GLO MW 04	GLO-MW-04	25-Oct-2016	1935	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90492-1
BLO MW 07	BLO-MW-07	22-Oct-2016	1330	GD/SW	3	VOA Vial	40 mL	HCl, 4C	GW	AK101		30 day		TAD	280-90492-1
BLO MW 07	BLO-MW-07	22-Oct-2016	1330	GD/SW	3	VOA Vial	40 mL	HCL, 4C	GW	SW8260b		30 day		TAD	280-90005-1
BLO MW 07	BLO-MW-07	22-Oct-2016	1330	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		TAD	280-90005-1
BLO MW 07	BLO-MW-07	22-Oct-2016	1330	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90005-1
BLO MW 07	BLO-MW-07	22-Oct-2016	1330	GD/SW	0	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90005-1
BLO MW 07	BLO-MW-07	22-Oct-2016	1330	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90005-1
BLO MW 06	BLO-MW-06	21-Oct-2016	1400	GD/SW	6	VOA Vials	40 mL	HCl, 4C	GW	AK101	Includes MS/MSD	30 day		TAD	280-90005-1
BLO MW 06	BLO-MW-06	21-Oct-2016	1400	GD/SW	6	VOA Vials	40 mL	HCL, 4C	GW	SW8260b	Includes MS/MSD	30 day		TAD	280-90005-1
BLO MW 06	BLO-MW-06	21-Oct-2016	1400	GD/SW	6	Amber	1 L	HCl, 4C	GW	AK102/103	Includes MS/MSD	30 day		TAD	280-90005-1
BLO MW 06	BLO-MW-06	21-Oct-2016	1400	GD/SW	3	Poly	500 mL	HNO3, 4C	GW	EPA 6010C	Includes MS/MSD	30 day		TAD	280-90005-1
BLO MW 06	BLO-MW-06	21-Oct-2016	1400	GD/SW	3	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B	Includes MS/MSD	30 day		TAD	280-90005-1
BLO MW 06	BLO-MW-06	21-Oct-2016	1400	GD/SW	3	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2	Includes MS/MSD	30 day		TAD	280-90005-1
BLO MW 26	BLO-MW-06	21-Oct-2016	1700	GD/SW	3	VOA Vials	40 mL	HCl, 4C	GW	AK101	dup	30 day		TAD	280-90005-1
BLO MW 26	BLO-MW-06	21-Oct-2016	1700	GD/SW	3	VOA Vials	40 mL	HCL, 4C	GW	SW8260b	dup	30 day		TAD	280-90005-1
BLO MW 26	BLO-MW-06	21-Oct-2016	1700	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102/103	dup	30 day		TAD	280-90005-1
BLO MW 26	BLO-MW-06	21-Oct-2016	1700	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C	dup	30 day		TAD	280-90005-1
BLO MW 26	BLO-MW-06	21-Oct-2016	1700	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B	dup	30 day		TAD	280-90005-1
BLO MW 26	BLO-MW-06	21-Oct-2016	1700	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2	dup	30 day		TAD	280-90005-1
BLO MW 05	BLO-MW-05	22-Oct-2016	1830	GD/SW	3	VOA Vials	40 mL	HCl, 4C	GW	SW8260		30 day		TAD	280-90312-1
BLO MW 05	BLO-MW-05	22-Oct-2016	1830	GD/SW	3	VOA Vials	40 mL	HCl, 4C	GW	AK101		30 day		TAD	280-90312-1
BLO MW 05	BLO-MW-05	22-Oct-2016	1830	GD/SW	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		TAD	280-90312-1
BLO MW 05	BLO-MW-05	22-Oct-2016	1830	GD/SW	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90312-1
BLO MW 05	BLO-MW-05	22-Oct-2016	1830	GD/SW	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90312-1

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	Lab	SDG
BLO MW 05	BLO-MW-05	22-Oct-2016	1830	GD/SW	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90312-1
BLO MW 01	BLO-MW-01	31-Oct-2016	1100	GD	3	VOA Vials	40 mL	HCl, 4C	GW	SW8260		30 day		TAD	280-90492-1
BLO MW 01	BLO-MW-01	31-Oct-2016	1100	GD	3	VOA Vials	40 mL	HCL, 4C	GW	AK101		30 day		TAD	280-90492-1
BLO MW 01	BLO-MW-01	31-Oct-2016	1100	GD	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		TAD	280-90492-1
BLO MW 01	BLO-MW-01	31-Oct-2016	1100	GD	1	Poly	500 mL	HNO3, 4C	GW	EPA 6010C		30 day		TAD	280-90492-1
BLO MW 01	BLO-MW-01	31-Oct-2016	1100	GD	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		TAD	280-90492-1
BLO MW 01	BLO-MW-01	31-Oct-2016	1100	GD	1	Amber	500 mL	H2SO4, 4C	GW	EPA 353.2		30 day		TAD	280-90492-1
FPC-215-16SB01	215-MW-11	05-Oct-2016	1450	GD	1	Amber	4 oz	4C	S	AK102		30 day	Soil boring	TAD	280-89568-1
FPC-215-16SB02	215-MW-12	05-Oct-2016	1630	GD	1	Amber	4 oz	4C	S	AK102		30 day	Soil boring	TAD	280-89568-1
TB PH016-01		10-Oct-2016	1300	GD/SW	3	Amber	40 mL	HCl, 4C	TB	SW8260b		30 day		TAD	280-90005-1
TB PH016-02		22-Oct-2016	1830	GD/SW	3	Amber	40 mL	HCl, 4C	TB	SW8260b		30 day		TAD	280-90312-1
TB PH16-03		25-Oct-2016	1730	GD	3	Amber	40 mL	HCl, 4C	TB	SW8260b		30 day		TAD	280-90492-1
PH16Drum1		01-Nov-2016	1730	GD	3	Amber	40 mL	HCl, 4C	TB	TAqH		30 day		TAD	280-90492-1

Acronyms and abbreviations:

AK = Alaska
C = degrees Centigrade
dup = duplicate
EPA = U.S. Environmental Protection Agency
GD = Greg DuBois
GW = groundwater
H2SO4 = sulfuric acid
HCl = hydrochloric acid
HNO3 = nitric acid
ID = identification
L = liter
mL = milliliter
QC = quality control
S = soil
SDG = sample delivery group
TAD = TestAmerica in Denver, Colorado
TAqH = total aqueous hydrocarbon
TB = trip blank
VOA = volatile organic analysis

Table B-1-2. 2016 Port Heiden Groundwater Monitoring Summary Sample Results

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
FPC-066	066-MW-04	AK102	DRO	1.5	0.32J
	066-MW-05	AK102	DRO	1.5	2.4
	066-MW-06	AK102	DRO	1.5	0.063J
	066-MW-07	AK102	DRO	1.5	0.056J
FPC-215	215-MW-08	AK102	DRO	1.5	0.048J
	215-MW-09	AK102	DRO	1.5	12
	215-MW11	AK102	DRO	1.5	0.11J
	215-MW12	AK102	DRO	1.5	0.15J
RRS	BLO-MW01	SW8260B	BENZENE	0.0046	0.00046J-
		SW8260B	TOLUENE	1.1	0.00046J-
		SW8260B	ETHYLBENZENE	0.015	0.00083J-
		SW8260B	M,P-XYLENES	0.190	0.00085J-
		SW8260B	O-XYLENES	0.190	0.0 [0.001]J-
		SW8260B	TOTAL XYLENES	0.190	0.00085J-
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]J-
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0056J-
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]J-
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]J-
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0031J-
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]J-
		AK101	GRO	2.2	0.170J-
	AK102	DRO	1.5	63J	
	AK103	RRO	1.1	4.2J	
	SW6010C	IRON	NA	5.600	
	SW6010C	MANGANESE	NA	9.700	
	E300	SULFATE (AS SO4)	NA	6.5	
	E353.2	NITRATE-NITRITE	NA	0.0 [0.05]	
	E351.2	NITROGEN, KJELDAHL	NA	0.33J	
	CALC	TOTAL NITROGEN CALCULATED	NA	0.33J	
	A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	850	
	BLO MW 05	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.00019
		SW8260B	ETHYLBENZENE	0.015	0.00016
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
SW8260B		O-XYLENES	0.190	0.0 [0.001]	

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.00023
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]
		AK101	GRO	2.2	0.0 [0.025]
		AK102	DRO	1.5	0.044
		AK103	RRO	1.1	0.0 [0.13]
		SW6010C	IRON	NA	0.59
		SW6010C	MANGANESE	NA	0.013
		E300	SULFATE (AS SO4)	NA	1.9
		E353.2	NITRATE-NITRITE	NA	0.33
		E351.2	NITROGEN, KJELDAHL	NA	0.0 [1.0]
		CALC	TOTAL NITROGEN CALCULATED	NA	0.33
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	67
		BLO MW 06	SW8260B	BENZENE	0.0046
	SW8260B		TOLUENE	1.1	0.0 [0.001]
	SW8260B		ETHYLBENZENE	0.015	0.0 [0.001]
	SW8260B		M,P-XYLENES	0.190	0.0 [0.002]
	SW8260B		O-XYLENES	0.190	0.0 [0.001]
	SW8260B		TOTAL XYLENES	0.190	0.0 [0.001]
	SW8260B		1,1-DICHLOROETHENE	0.280	0.0 [0.001]
	SW8260B		CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.0008]
	SW8260B		TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
	SW8260B		TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]]
	SW8260B		TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
	SW8260B		VINYL CHLORIDE	0.00019	0.0 [0.001]
	AK101		GRO	2.2	0.0 [0.015]
	AK102		DRO	1.5	0.0 [0.12]
	AK103		RRO	1.1	0.0 [0.13]
	SW6010C	IRON	NA	1.3	
SW6010C	MANGANESE	NA	0.031		
E300	SULFATE (AS SO4)	NA	30.6		
E353.2	NITRATE-NITRITE	NA	0.057		
E351.2	NITROGEN, KJELDAHL	NA	0.26		

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
		CALC	TOTAL NITROGEN CALCULATED	NA	0.32
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	53
	BLO MW 26 Duplicate of BLO MW 06	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.0 [0.001]
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.001]
		AK101	GRO	2.2	0.0 [0.015]
		AK102	DRO	1.5	0.0 [0.12]
		AK103	RRO	1.1	0.0 [0.13]
		SW6010C	IRON	NA	1.7
		SW6010C	MANGANESE	NA	0.030
		E300	SULFATE (AS SO4)	NA	4.5
		E353.2	NITRATE-NITRITE	NA	0.12
		E351.2	NITROGEN, KJELDAHL	NA	0.44
	CALC	TOTAL NITROGEN CALCULATED	NA	0.56	
	A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	48	
	BLO MW 07	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.00021J
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
SW8260B		TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]	
SW8260B		TETRACHLOROETHYLENE (PCE)	0.041	0.00022J	
SW8260B		TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]	
SW8260B		VINYL CHLORIDE	0.00019	0.0 [0.002]	
AK101	GRO	2.2	0.0 [0.025]Q		

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
		AK102	DRO	1.5	0.0 [0.012]
		AK103	RRO	1.1	0.0 [0.52] HM
		SW6010C	IRON	NA	1.4
		SW6010C	MANGANESE	NA	0.026
		E300	SULFATE (AS SO4)	NA	3.8J
		E353.2	NITRATE-NITRITE	NA	0.14
		E351.2	NITROGEN, KJELDAHL	NA	0.19J
		CALC	TOTAL NITROGEN CALCULATED	NA	0.33
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	42
	DSA MW 01	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.0 [0.001]
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0073
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.002]
		SW6010C	IRON	NA	0.065
		SW6010C	MANGANESE	NA	0.0023
		E300	SULFATE (AS SO4)	NA	12
		E353.2	NITRATE-NITRITE	NA	0.89
		E351.2	NITROGEN, KJELDAHL	NA	0.76
		CALC	TOTAL NITROGEN CALCULATED	NA	1.7
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	80
	DSA MW 02	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.00017J
SW8260B		ETHYLBENZENE	0.015	0.0 [0.001]	
SW8260B		M,P-XYLENES	0.190	0.0 [0.002]	
SW8260B		O-XYLENES	0.190	0.0 [0.001]	
SW8260B		TOTAL XYLENES	0.190	0.0 [0.002]	
SW8260B		1,1-DICHLOROETHENE	0.280	0.0 [0.001]	
SW8260B		CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]	
SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]		

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.380
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]
		AK101	GRO	2.2	0.0 [0.025]Q
		AK102	DRO	1.5	0.07JM
		AK103	RRO	1.1	0.0 [0.51]MQ
		SW6010C	IRON	NA	1.9
		SW6010C	MANGANESE	NA	0.032
		E300	SULFATE (AS SO4)	NA	9
		E353.2	NITRATE-NITRITE	NA	1.4
		E351.2	NITROGEN, KJELDAHL	NA	0.0 [0.5]
		CALC	TOTAL NITROGEN CALCULATED	NA	1.4
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	120
		DSA MW 04	SW8260B	BENZENE	0.0046
		SW8260B	TOLUENE	1.1	0.0 [0.002]
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.002]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.004]
		SW8260B	O-XYLENES	0.190	0.0 [0.002]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.004]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.002]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.002]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.002]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.002]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.340
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.003]
		AK101	GRO	2.2	0.0 [0.25]Q
		AK102	DRO	1.5	0.082JM
		AK103	RRO	1.1	0.0 [0.13]MQ
		SW6010C	IRON	NA	5.2
		SW6010C	MANGANESE	NA	0.310
		E300	SULFATE (AS SO4)	NA	8.8
		E353.2	NITRATE-NITRITE	NA	0.0 [0.05]
		E351.2	NITROGEN, KJELDAHL	NA	0.51J
		CALC	TOTAL NITROGEN CALCULATED	NA	0.51
	A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	78	
	DSA MW 05	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.0 [0.001]

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0022
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]
		SW6010C	IRON	NA	3.2
		SW6010C	MANGANESE	NA	0.150
		E300	SULFATE (AS SO4)	NA	8.1
		E353.2	NITRATE-NITRITE	NA	0.0 [0.0001]
		E351.2	NITROGEN, KJELDAHL	NA	0.24J
		CALC	TOTAL NITROGEN CALCULATED	NA	0.24
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	67
		DSA MW 06	SW8260B	BENZENE	0.0046
	SW8260B		TOLUENE	1.1	0.0 [0.001]
	SW8260B		ETHYLBENZENE	0.015	0.0 [0.001]
	SW8260B		M,P-XYLENES	0.190	0.0 [0.002]
	SW8260B		O-XYLENES	0.190	0.0 [0.001]
	SW8260B		TOTAL XYLENES	0.190	0.0 [0.002]
	SW8260B		1,1-DICHLOROETHENE	0.280	0.0 [0.001]
	SW8260B		CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
	SW8260B		TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
	SW8260B		TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
	SW8260B		TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
	SW8260B		VINYL CHLORIDE	0.00019	0.0 [0.0015]
	SW6010C		IRON	NA	2.5
	SW6010C		MANGANESE	NA	0.4
	E300		SULFATE (AS SO4)	NA	4.4
	E353.2		NITRATE-NITRITE	NA	0.0 [0.1]
E351.2	NITROGEN, KJELDAHL		NA	0.54J	
CALC	TOTAL NITROGEN CALCULATED		NA	0.54	
A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	66		
DSA MW 26	SW8260B	BENZENE	0.0046	0.0 [0.001]	

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
	Duplicate of DSA MW 06	SW8260B	TOLUENE	1.1	0.0 [0.001]
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]
		SW6010C	IRON	NA	2.7
		SW6010C	MANGANESE	NA	0.42
		E300	SULFATE (AS SO4)	NA	4.4J
		E353.2	NITRATE-NITRITE	NA	0.0 [0.0001]
		E351.2	NITROGEN, KJELDAHL	NA	0.45J
		CALC	TOTAL NITROGEN CALCULATED	NA	0.45
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	67
		DSA MW 07	SW8260B	BENZENE	0.0046
	SW8260B		TOLUENE	1.1	0.0 [0.001]
	SW8260B		ETHYLBENZENE	0.015	0.0 [0.001]
	SW8260B		M,P-XYLENES	0.190	0.0 [0.002]
	SW8260B		O-XYLENES	0.190	0.0 [0.001]
	SW8260B		TOTAL XYLENES	0.190	0.0 [0.002]
	SW8260B		1,1-DICHLOROETHENE	0.280	0.0 [0.001]
	SW8260B		CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
	SW8260B		TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
	SW8260B		TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
	SW8260B		TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
	SW8260B		VINYL CHLORIDE	0.00019	0.0 [0.0015]
	SW6010C		IRON	NA	1.5
	SW6010C		MANGANESE	NA	0.026
	E300	SULFATE (AS SO4)	NA	4.1J	
E353.2	NITRATE-NITRITE	NA	0.093J		
E351.2	NITROGEN, KJELDAHL	NA	0.39J		
CALC	TOTAL NITROGEN CALCULATED	NA	0.48		
A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	93		

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
	GLO MW 03	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.0 [0.001]
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]
		SW6010C	IRON	NA	0.059J
		SW6010C	MANGANESE	NA	0.0015J
		E300	SULFATE (AS SO4)	NA	5.6
		E353.2	NITRATE-NITRITE	NA	0.3
		E351.2	NITROGEN, KJELDAHL	NA	0.78J
		CALC	TOTAL NITROGEN CALCULATED	NA	1.1
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	110
		GLO MW 04	SW8260B	BENZENE	0.0046
	SW8260B		TOLUENE	1.1	0.0 [0.001]
	SW8260B		ETHYLBENZENE	0.015	0.0 [0.001]
	SW8260B		M,P-XYLENES	0.190	0.0 [0.002]
	SW8260B		O-XYLENES	0.190	0.0 [0.001]
	SW8260B		TOTAL XYLENES	0.190	0.0 [0.002]
	SW8260B		1,1-DICHLOROETHENE	0.280	0.0 [0.001]
	SW8260B		CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
	SW8260B		TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
	SW8260B		TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
	SW8260B		TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
	SW8260B		VINYL CHLORIDE	0.00019	0.0 [0.0015]
	SW6010C		IRON	NA	1.3
	SW6010C	MANGANESE	NA	0.049	
E300	SULFATE (AS SO4)	NA	3.4J		
E353.2	NITRATE-NITRITE	NA	0.099J		
E351.2	NITROGEN, KJELDAHL	NA	0.31J		
CALC	TOTAL NITROGEN CALCULATED	NA	0.41		

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
	RRS MW 05	A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	47
		SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.0 [0.001]
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]
		SW6010C	IRON	NA	0.360
		SW6010C	MANGANESE	NA	0.0039J
		E300	SULFATE (AS SO4)	NA	3.2J
		E353.2	NITRATE-NITRITE	NA	0.074
		E351.2	NITROGEN, KJELDAHL	NA	0.074J
		CALC	TOTAL NITROGEN CALCULATED	NA	0.38
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	55
	RRS MW 06	SW8260B	BENZENE	0.0046	0.0 [0.001]
		SW8260B	TOLUENE	1.1	0.0 [0.001]
		SW8260B	ETHYLBENZENE	0.015	0.0 [0.001]
		SW8260B	M,P-XYLENES	0.190	0.0 [0.002]
		SW8260B	O-XYLENES	0.190	0.0 [0.001]
		SW8260B	TOTAL XYLENES	0.190	0.0 [0.002]
		SW8260B	1,1-DICHLOROETHENE	0.280	0.0 [0.001]
		SW8260B	CIS-1,2-DICHLOROETHYLENE	0.036	0.0 [0.001]
		SW8260B	TRANS-1,2-DICHLOROETHENE	0.360	0.0 [0.001]
		SW8260B	TETRACHLOROETHYLENE (PCE)	0.041	0.0 [0.001]
		SW8260B	TRICHLOROETHYLENE (TCE)	0.0028	0.0 [0.001]
		SW8260B	VINYL CHLORIDE	0.00019	0.0 [0.0015]
		SW6010C	IRON	NA	0.71
SW6010C	MANGANESE	NA	0.014		
E300	SULFATE (AS SO4)	NA	4.2J		
E353.2	NITRATE-NITRITE	NA	0.64		
E351.2	NITROGEN, KJELDAHL	NA	0.74J		

Site	Monitoring Well	Lab Method	Parameter Name	Cleanup Level	Report Result (mg/L)
		CALC	TOTAL NITROGEN CALCULATED	NA	1.4
		A2320B	ALKALINITY, TOTAL (AS CaCO3)	NA	140

Acronyms:

mg/L = milligrams per liter

0.0 [0.001] = the limit of detection is shown in brackets for analyte results of 0.0 mg/L

Methods:

AK101 = Alaska Department of Environmental Conservation Method 101,

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

E300.0 = Environmental Protection Agency Method 300.0

E351.2 = Environmental Protection Agency Method 351.2

E353.2 = Environmental Protection Agency Method 353.2

SM2320B = Standard Method 2320B

SW8260B = Solid Waste Method 8260B

Qualifiers (see Appendix B for details):

J = estimated value

J- = estimated value with a possible low bias

Q = one or more quality control criteria failed; data usability should be carefully evaluated

H = quality control result exceeded criteria

M = A matrix effect was present

Attachment B-2
Qualified Sample Results Tables

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Table B-2-1. 2016 Port Heiden Groundwater Monitoring Program Validated Groundwater Sample Results – SDG 280-90312-1

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
BLO MW 05	280-90312-1	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	64		0	MG/L			
BLO MW 05	280-90312-1	280-90312-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TOLUENE	0.19	0.17	1.0	UG/L	J	J	TR
BLO MW 05	280-90312-1	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	ETHYLBENZENE	0.16	0.16	1.0	UG/L	J	J	TR
BLO MW 05	280-90312-1	280-90312-1	SW6010C	IRON	590	22.0	100.0	UG/L			
BLO MW 05	280-90312-1	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0	0.5	1.0	MG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW6010C	MANGANESE	13	0.25	10.0	UG/L			
BLO MW 05	280-90312-1	280-90312-1	AK103	RESIDUAL RANGE ORGANICS	0	0.13	0.52	MG/L	U M	U	
BLO MW 05	280-90312-1	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0.33	0.019	0.1	MG/L			
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0.23	0.2	1.0	UG/L	J	J	TR
BLO MW 05	280-90312-1	280-90312-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.044	0.034	0.26	MG/L	J M	J	TR
BLO MW 05	280-90312-1	280-90312-1	AK101	PETROLEUM HYDROCARBONS C6-C10	0	0.015	25	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	E300	SULFATE (AS SO4)	1.9	0.23	5.0	MG/L	J	J	TR
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1		TOTAL NITROGEN	0.33		0	MG/L			
BLO MW 05	280-90312-1	280-90312-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	67		0	MG/L			
DSA MW 26	280-90312-3	280-90312-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW6010C	IRON	2700	22.0	100.0	UG/L			
DSA MW 26	280-90312-3	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.45	0.18	1.0	MG/L	J	J	TR
DSA MW 26	280-90312-3	280-90312-1	SW6010C	MANGANESE	420	0.25	10.0	UG/L			
DSA MW 26	280-90312-3	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.05	0.1	MG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TETRACHLOROETHYLENE (PCE)	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	E300	SULFATE (AS SO4)	4.4	0.23	5.0	MG/L	J	J	TR
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1		TOTAL NITROGEN	0.45		0	MG/L			
DSA MW 26	280-90312-3	280-90312-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	66		0	MG/L			

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW 06	280-90312-4	280-90312-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW6010C	IRON	2500	22.0	100.0	UG/L			
DSA MW 06	280-90312-4	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.54	0.18	1.0	MG/L	J	J	TR
DSA MW 06	280-90312-4	280-90312-1	SW6010C	MANGANESE	400	0.25	10.0	UG/L			
DSA MW 06	280-90312-4	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.05	0.1	MG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	E300	SULFATE (AS SO4)	4.4	0.23	5.0	MG/L	J	J	TR
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.54		0	MG/L			
DSA MW 06	280-90312-4	280-90312-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	93		0	MG/L	B	B	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW6010C	IRON	1500	22.0	100.0	UG/L			
DSA MW 07	280-90312-2	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.39	0.18	1.0	MG/L	J	J	TR
DSA MW 07	280-90312-2	280-90312-1	SW6010C	MANGANESE	26	0.25	10.0	UG/L			
DSA MW 07	280-90312-2	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0.093	0.019	0.1	MG/L	J	J	TR
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	E300	SULFATE (AS SO4)	4.1	0.23	5.0	MG/L	J	J	TR
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.48		0	MG/L			
DSA MW 07	280-90312-2	280-90312-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	

Notes:

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

LOD = limit of detection

MG/L = milligrams per liter

LOD = limit of detection

SDG = sample delivery group

UG/L = micrograms per liter

Methods:

AK101 = Alaska Department of Environmental Conservation Method 101,

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

E300.0 = Environmental Protection Agency Method 300.0

E351.2 = Environmental Protection Agency Method 351.2

E353.2 = Environmental Protection Agency Method 353.2

SM2320B = Standard Method 2320B

SW8260B = Solid Waste Method 8260B

Qualifiers:

J = estimated value

U = nondetect; result less than the LOD

Validation Reason Codes:

TR = result between the LOQ and LOD

Table B-2-2. 2016 Port Heiden Groundwater Monitoring Program Validated Groundwater Sample Results – SDG 280-90492-1

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
FPC 215 MW09	280-90492-9	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	12	0.033	0.25	MG/L	M		
FPC 215 MW11	280-90492-8	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.11	0.033	0.25	MG/L	J M	J	TR
FPC-215-MW-12-100117	280-90492-7	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.15	0.033	0.25	MG/L	J M	J	TR
BLO MW01	280-90492-10	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	850		0	MG/L			
BLO MW01	280-90492-10	280-90492-1	SW8260B	BENZENE	0.46	0.16	1.0	UG/L	J Q	J	SGH
BLO MW01	280-90492-10	280-90492-1	SW8260B	TOLUENE	0.46	0.17	1.0	UG/L	J Q	J	SGH
BLO MW01	280-90492-10	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U J-	
BLO MW01	280-90492-10	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	5.6	0.15	1.0	UG/L		J-	
BLO MW01	280-90492-10	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U J-	
BLO MW01	280-90492-10	280-90492-1	SW8260B	ETHYLBENZENE	0.83	0.16	1.0	UG/L	J	J-	
BLO MW01	280-90492-10	280-90492-1	SW6010C	IRON	5600	22.0	100.0	UG/L			
BLO MW01	280-90492-10	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.33	0.18	1.0	MG/L	J	J	TR,MSL
BLO MW01	280-90492-10	280-90492-1	SW6010C	MANGANESE	9700	0.25	10.0	UG/L			
BLO MW01	280-90492-10	280-90492-1	AK103	RESIDUAL RANGE ORGANICS	4.2	0.28	2.5	MG/L	D M Q	J	SGH
BLO MW01	280-90492-10	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.05	0.1	MG/L	U	U	
BLO MW01	280-90492-10	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U J-	
BLO MW01	280-90492-10	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	63	0.17	1.3	MG/L	D M Q	J	SGH
BLO MW01	280-90492-10	280-90492-1	AK101	PETROLEUM HYDROCARBONS C6-C10	170	0.0049	25	UG/L	M		
BLO MW01	280-90492-10	280-90492-1	E300	SULFATE (AS SO4)	6.5	0.23	5.0	MG/L			
BLO MW01	280-90492-10	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	3.1	0.16	1.0	UG/L	Q	J-	SGH
BLO MW01	280-90492-10	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.33		0	MG/L			
BLO MW01	280-90492-10	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U J-	
BLO MW01	280-90492-10	280-90492-1	SW8260B	XYLENES, TOTAL	0.85	0.19	2.0	UG/L	J	J-	
BLO MW01	280-90492-10	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0.85	0.34	2.0	UG/L	J	J-	
BLO MW01	280-90492-10	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U J-	
DSA MW01	280-90492-1	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	80		0	MG/L			
DSA MW01	280-90492-1	280-90492-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW6010C	IRON	65	22.0	100.0	UG/L	J	J	TR
DSA MW01	280-90492-1	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.76	0.18	1.0	MG/L	J	J	TR
DSA MW01	280-90492-1	280-90492-1	SW6010C	MANGANESE	2.3	0.25	10.0	UG/L	J	J	TR

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW01	280-90492-1	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.89	0.019	0.1	MG/L			
DSA MW01	280-90492-1	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	E300	SULFATE (AS SO4)	12	0.23	5.0	MG/L			
DSA MW01	280-90492-1	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	7.3	0.16	1.0	UG/L			
DSA MW01	280-90492-1	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	1.7		0	MG/L			
DSA MW01	280-90492-1	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	67		0	MG/L			
DSA MW05	280-90492-2	280-90492-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW6010C	IRON	3200	22.0	100.0	UG/L			
DSA MW05	280-90492-2	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.24	0.18	1.0	MG/L	J	J	TR
DSA MW05	280-90492-2	280-90492-1	SW6010C	MANGANESE	150	0.25	10.0	UG/L			
DSA MW05	280-90492-2	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.05	0.1	MG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	E300	SULFATE (AS SO4)	8.1	0.23	5.0	MG/L			
DSA MW05	280-90492-2	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	2.2	0.16	1.0	UG/L			
DSA MW05	280-90492-2	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.24		0	MG/L			
DSA MW05	280-90492-2	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
TBPH16-03	280-90492-12	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	110		0	MG/L			
GLO MW03	280-90492-5	280-90492-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW6010C	IRON	59	22.0	100.0	UG/L	J	J	TR
GLO MW03	280-90492-5	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.78	0.18	1.0	MG/L	J	J	TR
GLO MW03	280-90492-5	280-90492-1	SW6010C	MANGANESE	1.5	0.25	10.0	UG/L	J	J	TR
GLO MW03	280-90492-5	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.3	0.019	0.1	MG/L			
GLO MW03	280-90492-5	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	E300	SULFATE (AS SO4)	5.6	0.23	5.0	MG/L			
GLO MW03	280-90492-5	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS, CALCULATED	1.1		0	MG/L			
GLO MW03	280-90492-5	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	47		0	MG/L			
GLO MW04	280-90492-6	280-90492-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW6010C	IRON	1300	22.0	100.0	UG/L			
GLO MW04	280-90492-6	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.31	0.18	1.0	MG/L	J	J	TR
GLO MW04	280-90492-6	280-90492-1	SW6010C	MANGANESE	49	0.25	10.0	UG/L			
GLO MW04	280-90492-6	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.099	0.019	0.1	MG/L	J	J	TR
GLO MW04	280-90492-6	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	E300	SULFATE (AS SO4)	3.4	0.23	5.0	MG/L	J	J	TR
GLO MW04	280-90492-6	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
GLO MW04	280-90492-6	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.41		0	MG/L			
GLO MW04	280-90492-6	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	52		0	MG/L			
RRS MW05	280-90492-4	280-90492-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW6010C	IRON	360	22.0	100.0	UG/L			
RRS MW05	280-90492-4	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.31	0.18	1.0	MG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	SW6010C	MANGANESE	3.9	0.25	10.0	UG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.074	0.019	0.1	MG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	E300	SULFATE (AS SO4)	3.2	0.23	5.0	MG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.38		0	MG/L			
RRS MW05	280-90492-4	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	140		0	MG/L			
RRS MW006	280-90492-3	280-90492-1	SW8260B	BENZENE	0	0.4	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	TOLUENE	0	0.4	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	0.4	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	ETHYLBENZENE	0	0.4	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW6010C	IRON	710	22.0	100.0	UG/L			
RRS MW006	280-90492-3	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.74	0.18	1.0	MG/L	J	J	TR
RRS MW006	280-90492-3	280-90492-1	SW6010C	MANGANESE	14	0.25	10.0	UG/L			
RRS MW006	280-90492-3	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.64	0.019	0.1	MG/L			
RRS MW006	280-90492-3	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	0.4	1.0	UG/L	U	U	

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
RRS MW006	280-90492-3	280-90492-1	E300	SULFATE (AS SO4)	4.2	0.23	5.0	MG/L	J	J	TR
RRS MW006	280-90492-3	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	0.4	1.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS, CALCULATED	1.4		0	MG/L			
RRS MW006	280-90492-3	280-90492-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	XYLENES, TOTAL	0	0.8	2.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2.0	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1.0	UG/L	U	U	

Notes:

Reason codes are defined in the Qualification Code Reference Table at the end of the report.

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

LOD = limit of detection

MG/L = milligrams per liter

LOD = Limit of detection

RPD = relative percent difference

SDG = sample delivery group

UG/L = micrograms per liter

Methods:

AK101 = Alaska Department of Environmental Conservation Method 101,

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

E300.0 = Environmental Protection Agency Method 300.0

E351.2 = Environmental Protection Agency Method 351.2

E353.2 = Environmental Protection Agency Method 353.2

SM2320B = Standard Method 2320B

SW6010C = Solid Waste Method 6010C

SW8260B = Solid Waste Method 8260B

Qualifiers:

J = estimated value

J- = estimated value that may be biased low

U = non-detect; result less than the LOD

Validation Reason Codes:

SGH = surrogate recovery exceeds upper control limit

TR = result between the LOD and LOQ

Table B-2-3. 2016 Port Heiden Groundwater Monitoring Program Validated Groundwater Sample Results – SDG 280-90005-1

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW 02	280-90005-1	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	BENZENE	0	0.4	1	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	ETHYLBENZENE	0	0.4	1	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	TETRACHLOROETHENE	0	0.4	1	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	TOLUENE	0.17	0.17	1	UG/L	J	J	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	TRICHLOROETHENE	380	1.6	10	UG/L			
DSA MW 02	280-90005-1	280-90005-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	SW8260B	XYLENES	0	0.8	2	UG/L	U	U	
DSA MW 02	280-90005-1	280-90005-1	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.015	0.025	MG/L	UJ	UQ	LDH
DSA MW 02	280-90005-1	280-90005-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.07	0.033	0.26	MG/L	J	JM	TR,LBM
DSA MW 02	280-90005-1	280-90005-1	AK103	RESIDUAL RANGE ORGANICS	0	0.13	0.51	MG/L	UJ	UMQ	LCD
DSA MW 02	280-90005-1	280-90005-1	SW6010C	IRON	1900	22	100	UG/L			
DSA MW 02	280-90005-1	280-90005-1	SW6010C	MANGANESE	32	0.25	10	UG/L			
DSA MW 02	280-90005-1	280-90005-1	SM2320B	ALKALINITY	120		0	MG/L			
DSA MW 02	280-90005-1	280-90005-1	E353.2	NITROGEN, NITRATE-NITRITE	1.4	0.019	0.1	MG/L			
DSA MW 02	280-90005-1	280-90005-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	1.4		0	MG/L			
DSA MW 02	280-90005-1	280-90005-1	E300.0	SULFATE (AS SO4)	9	0.23	5	MG/L			
DSA MW 02	280-90005-1	280-90005-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0	0.5	1	MG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	1.6	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	BENZENE	0	0.8	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	0.8	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	ETHYLBENZENE	0	0.8	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	1.6	4	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.8	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	TETRACHLOROETHENE	0	0.8	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	TOLUENE	0	0.8	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.8	2	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	TRICHLOROETHENE	340	3.2	20	UG/L			
DSA MW 04	280-90005-2	280-90005-1	SW8260B	VINYL CHLORIDE	0	0.4	3	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	SW8260B	XYLENES	0	1.6	4	UG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.015	0.025	MG/L	UJ	UQ	LDH
DSA MW 04	280-90005-2	280-90005-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.082	0.035	0.27	MG/L	J	JM	TR,LBM
DSA MW 04	280-90005-2	280-90005-1	AK103	RESIDUAL RANGE ORGANICS	0	0.13	0.54	MG/L	UJ	UMQ	LCD

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW 04	280-90005-2	280-90005-1	SW6010C	IRON	5200	22	100	UG/L			
DSA MW 04	280-90005-2	280-90005-1	SW6010C	MANGANESE	310	0.25	10	UG/L			
DSA MW 04	280-90005-2	280-90005-1	SM2320B	ALKALINITY	78		0	MG/L			
DSA MW 04	280-90005-2	280-90005-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.05	0.1	MG/L	U	U	
DSA MW 04	280-90005-2	280-90005-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.51		0	MG/L			
DSA MW 04	280-90005-2	280-90005-1	E300.0	SULFATE (AS SO4)	8.8	0.23	5	MG/L			
DSA MW 04	280-90005-2	280-90005-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.51	0.18	1	MG/L	J	J	
FPC MW 28	280-90005-3	280-90005-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.1	0.034	0.26	MG/L	J	JM	TR,LBM
RRS MW 02	280-90005-4	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	BENZENE	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	ETHYLBENZENE	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	TETRACHLOROETHENE	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	TOLUENE	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	TRICHLOROETHENE	0	0.4	1	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SW8260B	XYLENES	0	0.8	2	UG/L	U	U	
RRS MW 02	280-90005-4	280-90005-1	SM2320B	ALKALINITY	50		0	MG/L			
RRS MW 02	280-90005-4	280-90005-1	E353.2	NITROGEN, NITRATE-NITRITE	0.25	0.019	0.1	MG/L			
RRS MW 02	280-90005-4	280-90005-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.57		0	MG/L			
RRS MW 02	280-90005-4	280-90005-1	E300.0	SULFATE (AS SO4)	4.1	0.23	5	MG/L	J	J	
RRS MW 02	280-90005-4	280-90005-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.32	0.18	1	MG/L	J	J	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	BENZENE	0	0.4	1	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	ETHYLBENZENE	0	0.4	1	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	TETRACHLOROETHENE	0.22	0.2	1	UG/L	J	J	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	TOLUENE	0.21	0.17	1	UG/L	J	J	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	TRICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
BLO MW 07	280-90005-5	280-90005-1	SW8260B	XYLENES	0	0.8	2	UG/L	U	U	
BLO MW 07	280-90005-5	280-90005-1	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.015	0.025	MG/L	UJ	UQ	LDH
BLO MW 07	280-90005-5	280-90005-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0	0.12	0.26	MG/L	UJ	UHM	HHL
BLO MW 07	280-90005-5	280-90005-1	AK103	RESIDUAL RANGE ORGANICS	0	0.13	0.52	MG/L	UJ	UHM	HHL
BLO MW 07	280-90005-5	280-90005-1	SW6010C	IRON	1400	22	100	UG/L			
BLO MW 07	280-90005-5	280-90005-1	SW6010C	MANGANESE	26	0.25	10	UG/L			
BLO MW 07	280-90005-5	280-90005-1	SM2320B	ALKALINITY	42		0	MG/L			
BLO MW 07	280-90005-5	280-90005-1	E353.2	NITROGEN, NITRATE-NITRITE	0.14	0.019	0.1	MG/L			
BLO MW 07	280-90005-5	280-90005-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.33		0	MG/L			
BLO MW 07	280-90005-5	280-90005-1	E300.0	SULFATE (AS SO4)	3.8	0.23	5	MG/L	J	J	
BLO MW 07	280-90005-5	280-90005-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.19	0.18	1	MG/L	J	J	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	BENZENE	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	ETHYLBENZENE	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	TETRACHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	TOLUENE	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	TRICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	SW8260B	XYLENES	0	0.8	2	UG/L	U	U	
BLO MW 06	280-90005-6	280-90005-1	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.015	0.025	MG/L	UJ	UQ	LDH
BLO MW 06	280-90005-6	280-90005-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0	0.12	0.25	MG/L	U	UM	
BLO MW 06	280-90005-6	280-90005-1	AK103	RESIDUAL RANGE ORGANICS	0	0.13	0.51	MG/L	U	UM	
BLO MW 06	280-90005-6	280-90005-1	SW6010C	IRON	1300	22	100	UG/L	J		FDD
BLO MW 06	280-90005-6	280-90005-1	SW6010C	MANGANESE	31	0.25	10	UG/L			
BLO MW 06	280-90005-6	280-90005-1	SM2320B	ALKALINITY	53		0	MG/L			
BLO MW 06	280-90005-6	280-90005-1	E353.2	NITROGEN, NITRATE-NITRITE	0.057	0.019	0.1	MG/L	J	J	TR,LBM
BLO MW 06	280-90005-6	280-90005-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.32		0	MG/L		J	FDD
BLO MW 06	280-90005-6	280-90005-1	E300.0	SULFATE (AS SO4)	4.1	0.23	5	MG/L	J	J	TR
BLO MW 06	280-90005-6	280-90005-1	E300.0	SULFATE (AS SO4)	30.6	0.23	5	MG/L			
BLO MW 06	280-90005-6	280-90005-1	E300.0	SULFATE (AS SO4)	30.6	0.23	5	MG/L			
BLO MW 06	280-90005-6	280-90005-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.26	0.18	1	MG/L	J	J	FDD
BLO MW 26	280-90005-7	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1	UG/L	U	U	

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
BLO MW 26	280-90005-7	280-90005-1	SW8260B	BENZENE	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	ETHYLBENZENE	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	TETRACHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	TOLUENE	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	TRICHLOROETHENE	0	0.4	1	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	SW8260B	XYLENES	0	0.8	2	UG/L	U	U	
BLO MW 26	280-90005-7	280-90005-1	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.015	0.025	MG/L	UJ	UQ	LDH
BLO MW 26	280-90005-7	280-90005-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0	0.12	0.26	MG/L	U	UM	
BLO MW 26	280-90005-7	280-90005-1	AK103	RESIDUAL RANGE ORGANICS	0	0.13	0.52	MG/L	U	UM	
BLO MW 26	280-90005-7	280-90005-1	SW6010C	IRON	1700	22	100	UG/L	J		FDD
BLO MW 26	280-90005-7	280-90005-1	SW6010C	MANGANESE	30	0.25	10	UG/L			
BLO MW 26	280-90005-7	280-90005-1	SM2320B	ALKALINITY	48		0	MG/L			
BLO MW 26	280-90005-7	280-90005-1	E353.2	NITROGEN, NITRATE-NITRITE	0.12	0.019	0.1	MG/L	J		LBM
BLO MW 26	280-90005-7	280-90005-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.56		0	MG/L		J	FDD
BLO MW 26	280-90005-7	280-90005-1	E300.0	SULFATE (AS SO4)	4.5	0.23	5	MG/L	J	J	TR
BLO MW 26	280-90005-7	280-90005-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.44	0.18	1	MG/L	J	J	FDD
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	0.8	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	BENZENE	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	ETHYLBENZENE	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	0.8	2	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	TETRACHLOROETHENE	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	TOLUENE	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	TRICHLOROETHENE	0	0.4	1	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	VINYL CHLORIDE	0	0.2	1.5	UG/L	U	U	
TB PH016-01	TB PH016-01	280-90005-1	SW8260B	XYLENES	0	0.8	2	UG/L	U	U	

Notes:

Data qualifier flags are defined in the Data Qualifier Reference Table at the end of the report.

Reason codes are defined in the Qualification Code Reference Table at the end of the report.

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

MG/L = milligrams per liter
LOD = limit of detection
RPD = relative percent difference
SDG = sample delivery group
UG/L = micrograms per liter

Methods:

AK101 = Alaska Department of Environmental Conservation Method 101,
AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;
E300.0 = Environmental Protection Agency Method 300.0
E351.2 = Environmental Protection Agency Method 351.2
E353.2 = Environmental Protection Agency Method 353.2
SM2320B = Standard Method 2320B
SW8260B = Solid Waste Method 8260B

Qualifiers:

J = estimated value
U = non-detect; result less than the LOD

Validation Reason Codes:

FDD = field duplicate exceeded the RPD
HHL = holding time exceeded
LBL = lab blank less than the LOD
LBM = lab blank contamination above the LOD
LCD = lab control spike exceeded the RPD
LDH = lab control spike duplicate exceeded the RPD
TR = result between the LOD and LOQ

Table B-2-4. 2016 Port Heiden Groundwater Monitoring Program Validated Groundwater Sample Results – SDG 280-89767-1

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
FPC 066-MW-04	280-89767-3	280-89767-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.32	0.035	0.27	MG/L	M	J	LBL
FPC 066-MW-05	280-89767-4	280-89767-1	AK102	C10-C25 DIESEL RANGE ORGANICS	2.4	0.033	0.25	MG/L	M		
FPC 066-MW-06	280-89767-2	280-89767-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.063	0.033	0.26	MG/L	J M	J	TR
FPC 066-MW-07	280-89767-1	280-89767-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.056	0.032	0.25	MG/L	J M	J	TR
FPC 215-MW08	280-89767-5	280-89767-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.048	0.032	0.25	MG/L	J M	J	TR

Notes:

Reason codes are defined in the Qualification Code Reference Table at the end of the report.

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

SDG = sample delivery group

LOQ = limit of quantitation

LOD = limit of detection

MG/L = milligrams per liter

UG/L = micrograms per liter

Methods:

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

Qualifiers:

J = estimated value

Validation Reason Codes:

LBL = lab blank less than the LOD

TR = result between the LOQ and LOD

Table B-2-5. 2016 Port Heiden Groundwater Monitoring Program Validated Soil Sample Results – SDG 280-89568-1

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
FPC-215-16SB01	280-89568-1	280-89568-1	AK102	C10-C25 DIESEL RANGE ORGANICS	1.7	1.4	5.6	MG/KG	J M	J	TR
FPC-215-16SB02	280-89568-2	280-89568-1	AK102	C10-C25 DIESEL RANGE ORGANICS	2.6	1.3	5.3	MG/KG	J M	J	TR

Notes:

Reason codes are defined in the Qualification Code Reference Table at the end of the report.

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

MG/KG = milligrams per kilogram

LOD = limit of detection

SDG = sample delivery group

Methods:

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103

Qualifiers:

J = estimated value

Validation Reason Codes:

TR = result between the LOD and LOQ

Attachment B-3
Data Validation Reports and ADEC Checklists

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Versar, Inc.

Data Review Report

Data Verification / Validation

for:

Port Heiden Radio Station
Port Heiden, Alaska

March 9, 2017

Sample Delivery Group:

280-90492-1

Laboratory Name:

Accutest Laboratories

Data Assessment Report

The data assessment is a systematic process for reviewing data against a predefined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and handling procedures affect the usability of the analytical data. Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The data acceptance criteria are established according to Standard Operating Procedures (SOPs) and/or Statements of Work (SOWs) provided to the contracted analytical laboratory or the United States Environmental Protection Agency (USEPA) guidance documents (e.g., SW-846). The assessment of data quality and usability involves four components, as described below:

- 1) **Data Verification** – is a process for determining completeness, correctness, consistency, and compliance of a data package in accordance with requirements contained in the SOW and/or contract-specific requirements. This is a review of the data package, electronic data deliverable (EDD), and invoice received from the contract laboratory to insure that the contract required information is present and complete prior to data validation.
- 2) **Data Review** – is a process of reviewing the primary quality control (QC) data provided by the laboratory and the results of any internal quality assurance (QA)/QC samples, such as field, trip, equipment, or ambient blanks, and/or field split samples and duplicate samples, to ascertain any effect on the analytical data based on laboratory procedures or sample collection activities.
- 3) **Data Evaluation** – is a process to determine if the data meets project-specific DQOs and contract requirements. The evaluation may involve a review of field sampling and sample management procedures, laboratory audits, performance evaluation sample results, and any other data quality indicators that are available.
- 4) **Data Validation** – is a process to determine the accuracy and precision of the analytical data generated and to identify any anomalies encountered. The validation process is performed in accordance with guidelines defined by the client. Typically, one or more of the following are utilized: USEPA regional or nation functional guidelines, project-specific guidelines (e.g., SOW/Quality Assurance Project Plan [QAPP]). Two major components of data validation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance for each analytical method to determine if the samples were analyzed within the prescribed acceptance criteria of the method. Evaluation of matrix interferences involves the analysis of surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Data not meeting project-specific DQOs or the requirements of the analytical method are identified and qualified in accordance with the project criteria requested by the client.

Data Validation Procedures

Analytical Data Verification and Validation Levels

- Level One (I) – validation based ONLY on completeness and compliance checks of sample receipt conditions.
- Level Two (II) – validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results.
- Level Two (b) (IIb) – validation based on completeness and compliance checks of sample receipt conditions and BOTH sample- and instrument-related QC results.
- Level Three (III) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, AND recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms.
- Level Four (IV) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms, AND the review of actual instrument outputs/raw data.

The steps and guidelines followed during the data verification and validation process are modeled on the USEPA's *National Functional Guidelines for Superfund Organic Methods Data Review (September 2016)*, the *National Functional Guidelines for Inorganic Superfund Methods Data Review (September 2016)*, the Department of Defense (DOD) Quality System Manual (QSM) Version 5.0 (July 2013), and the project-specific criteria QAPP, *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Alaska (April 2017)*. The method-specific criteria set forth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste (SW-846)* are also evaluated during the validation process.

References used for Data Verification/Validation for this Report

Draft United States Air Force 611th Air Support Group 611th Civil Engineer Squadron, Joint Base Elmendorf-Richardson, Alaska, Groundwater Monitoring 2016 and 2017 Work Plan, Former Radio Relay Station, Port Heiden Alaska, August 2016

Department of Defense (DOD) Quality Systems Manual (QSM) Version 5.0, July 2013.

Data Verification Results

Receipt

A total of **twelve** samples, collected by APC Services, LLC were submitted for analysis to TestAmerica Buffalo in Amherst, New York. The twelve samples included one trip blank (TB) and eleven normal environmental samples. The samples are reported in Sample Delivery Group (SDG) **280-90492-1**. Data analyzed by methods SW8260B, SW8270D SIM, AK101, and AK102/AK103 are verified to Level IV according to the data validation procedures outline. Natural attenuation parameters analyzed by methods SW6010C, SM2320B, E300.0, and E353.2 were verified to Level IIb according to the data validation procedures outline. The discussion below applies to these samples, shown in Table 1, which were collected from 10/25/16 through 10/29/16 at Former Port Heiden Radio Relay Station (RRS) during the 2016 annual long-term monitoring event.

TABLE 1
SAMPLE SUMMARY TABLE

Field Sample ID	Lab Sample ID	Matrix	Method	Collection Date	Collection Time
DSA MW01	280-90492-1	WG	SW8260B (VOCs), SW8270D SIM (SVOCs), SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), Total Nitrogen (Nitrogen), E353.2 (Nitrate-Nitrite)	10/27/16	18:30
DSA MW05	280-90492-2	WG	SW8260B (VOCs), SW8270D SIM (SVOCs), SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), Total Nitrogen (Nitrogen), E353.2 (Nitrate-Nitrite)	10/27/16	19:35
RRS MW006	280-90492-3	WG	SW8260B (VOCs), SW8270D SIM (SVOCs), SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), Total Nitrogen (Nitrogen), E353.2 (Nitrate-Nitrite)	10/26/16	12:30
RRS MW05	280-90492-4	WG	SW8260B (VOCs), SW8270D SIM (SVOCs), SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), Total Nitrogen (Nitrogen), E353.2 (Nitrate-Nitrite)	10/27/16	13:24

Field Sample ID	Lab Sample ID	Matrix	Method	Collection Date	Collection Time
GLO MW03	280-90492-5	WG	SW8260B (VOCs), SW8270D SIM (SVOCs), SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), Total Nitrogen (Nitrogen), E353.2 (Nitrate-Nitrite)	10/25/16	17:30
GLO MW04	280-90492-6	WG	SW8260B (VOCs), SW8270D SIM (SVOCs), SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), Total Nitrogen (Nitrogen), E353.2 (Nitrate-Nitrite)	10/25/16	19:35
FPC 215 MW12	280-90492-7	WG	AK102/103 (DRO)	10/26/16	19:13
FPC 215 MW11	280-90492-8	WG	AK102/103 (DRO)	10/26/16	17:25
FPC 215 MW09	280-90492-9	WG	AK102/103 (DRO)	10/29/16	14:30
BLO MW01	280-90492-10	WG	SW8260B (VOCs), SW8270D SIM (SVOCs), AK101 (GRO), AK102/103 (DRO & RRO), SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), Total Nitrogen (Nitrogen), E353.2 (Nitrate-Nitrite)	10/31/16	11:00
*PH16 DRUM 1	280-90492-11	WG	TAqH SIM (Total Aqueous Hydrocarbons)	11/1/16	17:30
TBPH16-03	280-90492-12	WQ	SW8260B (VOCs)	10/25/16	17:30

DRO = diesel range organics; GRO = gasoline range organics; RRO = residual range organics; SDG = sample delivery group; SVOC = semi-volatile organic compound; VOC = volatile organic compound; WG = groundwater; WQ = water quality

AK101 = Alaska Department of Environmental Conservation Method 101, GRO; AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103; E300.0 = Environmental Protection Agency Method 300.0; E353.2 = Environmental Protection Agency Method 353.2; SM2320B = Standard Method 2320B; SW8260B = Solid Waste Method 8260B, SW8270D SIM = Solid Waste Method 8270D

*This sample is not qualified as a part of this Data Review Report. Sample is treated purge water from holding drum. For waste characterization only. Note: one analysis (TAH) was included on the COC but missed in error by the lab for this sample.

The chain-of-custody (COC) record(s) from the field to the laboratory were complete, and the custody was maintained as evidenced by field and laboratory signatures, dates, and times of receipt. All requested analyses are accounted for in the data report.

The laboratory logged the collection date/time of the trip blank (TB) TBPH16-03 equivalent to the earliest collected field sample listed on the COC per standard laboratory practice. The COC logged the TB as collected on 9/9/2016 with no collection time. This report identifies the date/time as logged by the laboratory.

There is no indication of issues associated with the sample(s) receipt, and/or condition of the sample(s), affecting the quality of the data.

The Laboratory Data Review Checklist is a summary of the Data Review findings and can be found in **Appendix A**. Detailed findings are provided in this Data Review report.

Method: SW846 8260B Volatile Organic Compounds (VOCs)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

a. Calibration:

- i. **Initial** – All acceptance criteria were met for STD 280-349328/10-16 and STD 280-349328/19-24.
- ii. **Continuing** – All acceptance criteria were met for ICV 280-349328/17, ICV 280-349328/25, and CCV 280-350364/2, CCV 280-350364/10, and CCV 280-350364/37.

b. Blanks:

- i. **Method blanks** – All acceptance criteria were met for MB 280-350364/6.
- ii. **Field blanks** – All acceptance criteria were met for Trip blank TBPH16-03.

c. Surrogates: All acceptance criteria were met except as noted.

Surrogate percent recovery was above acceptance criteria for 1,2-dichloroethane-d4.

- Associated analytes trichloroethene, benzene, and toluene had detections and were flagged “JS+” for sample BLO MW01.

Surrogate percent recovery was above acceptance criteria for 1-bromo-4-fluorobenzene (4-bromofluorobenzene). No analytes were associated with the surrogate so no flags were added for affected sample BLO MW01.

d. Internal Standards: All acceptance criteria were met.

e. Spikes:

- i. **Laboratory Control Spike (LCS)** – All acceptance criteria were met for LCS 280-350364/4.
- ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – No MS/MSD was performed for this method. Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. There is not enough information to evaluate matrix impact on precision or accuracy of the laboratory measurements. Uncertainty of results is increased.

f. Duplicates: No duplicates are associated with this SDG.

g. Samples: Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: SW846 8270D SIM Semi-volatile Organic Compounds (SVOCs)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

a. Calibration:

- i. **Initial** – All acceptance criteria were met for STD 280-344978/2-9.

- ii. **Continuing** – All acceptance criteria were met for ICV 280-344978/10, CCV 351994/2, and CCV 351994/26.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-350486/1-A.
 - ii. **Field blanks** – No field blanks were associated with this method.
- c. **Surrogates:** All acceptance criteria were met.
- d. **Internal Standards:** All acceptance criteria were met.
- e. **Spikes:**
 - i. **Laboratory Control Spikes (LCSs) and Laboratory Control Spike Duplicates (LCSDs)** – All acceptance criteria were met for LCS 280-350486/2-A and LCSD 280-350486/3-A.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – No MS/MSD is associated with this method. Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. There is not enough information to evaluate matrix impact on precision or accuracy of the laboratory measurements. Uncertainty of results is increased.
- f. **Duplicates:** No duplicates are associated with this SDG.
- g. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: AK101 Gasoline Range Organics (GRO)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for STD 280-351308/2-7.
 - ii. **Continuing** – All acceptance criteria were met for ICV 280-351308/9 and CCV 280-351308/15.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-351308/9.
 - ii. **Field blanks** – No field blanks were associated with this method.
- c. **Surrogates:** All acceptance criteria were met except as noted.
- d. **Internal Standards:** All acceptance criteria were met.
- e. **Spikes:**
 - i. **Laboratory Control Spikes (LCSs) and Laboratory Control Spike Duplicates (LCSDs)** – All acceptance criteria were met for LCS 280-351308/10 and LCSD 280-351308/11.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – All acceptance criteria were met for 280-90492-10 MS and 280-90492-10 MSD.
- f. **Duplicates:** No duplicates were associated with this SDG.
- g. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

No trip blank sample was submitted for gasoline range organics (GRO) analysis. Trip blanks are used to measure potential cross contamination or potential artifacts present that might cause false positive identifications in associated samples. The lack of trip blank evaluations does not have any impact on the groundwater samples found to be non-detect for GRO. Samples where GRO was detected may have been impacted by background contamination; it is possible that a high bias may exist in the case of the positive result reported for this sample. Only sample BLO MW 01 was submitted for GRO analysis; GRO was detected in this sample.

Method: AK102 & 103 Diesel and Extended Range Organics (DRO)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for STD 280-351711/4-10 and STD 280-351711/12-18.
 - ii. **Continuing** – All acceptance criteria were met for ICV 280-351711/11, CCVRT 280-352507/4, CCVRT 280-352507/19, CCVRT 280-352507/20, CCVRT 280-352507/34, CCVRT 280-352507/35, CCVRT 280-352509/3, CCVRT 280-352509/33, CCVRT 280-352509/47, CCVRT 280-352521/4, CCVRT 280-352521/5, CCVRT 280-352521/11, CCVRT 280-352521/12, CCVRT 280-353381/4, CCVRT 280-353381/5, CCVRT 280-353381/7, and CCVRT 280-353381/8.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-351505/1-A and MB 280-350511/1-A except as noted.
Method blank MB 280-350511/1-A contained DRO above the MDL but below the RL.
 - Associated samples FPC 215 MW-11 & FPC 215 MW-12 had detections between the MDL and RL and were flagged “B.”
 - ii. **Field blanks** – No field blanks were associated with this method.
- c. **Surrogates:** All acceptance criteria were met except as noted.
Surrogate n-octacosane percent recovery was above acceptance criteria.
 - Associated analytes DRO and RRO had detections and were flagged “J” for sample BLO MW01.
- d. **Internal Standards:** All acceptance criteria were met.
- e. **Spikes:**
 - i. **Laboratory Control Spikes (LCSs) and Laboratory Spike Duplicates (LCSDs)**
– All acceptance criteria were met for
LCS 280-350511/2-A and LCS 280-351505/4-A, LCSD 280-351505/3-A, and LCSD 280-351505/5-A.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples:** No MS/MSDs were associated with this method. Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. There is not enough information to evaluate matrix impact on precision or accuracy of the laboratory measurements. Uncertainty of results is increased.

- iii. **Duplicates:** No duplicates were associated with this SDG.
- f. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

Sample BLO MW01 required dilution prior to analysis. The reporting limits were adjusted accordingly.

The following sample formed emulsions during the extraction procedure: FPC 215 MW11 (280-90492-8), FPC 215 MW09 and BLO MW01. The emulsions were broken up using a series of pour backs.

Method: SW846 6010C Manganese & Iron

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-350908/1-A.
 - ii. **Field blanks** – No field blanks were associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **Laboratory Control Spikes (LCS)** – All acceptance criteria were met for LCS 280-350908/2-A.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples:** No MS/MSDs were associated with this method. MS/MSD does not have a minimum frequency in the WP for monitored natural attenuation (MNA) parameters.
 - iii. **Duplicates:** No duplicates were associated with this SDG.
- e. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: SM 2320B Alkalinity

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-350378/31 and MB 280-350556/5 except as noted.
Method blank MB 280-350378/31 contained total alkalinity above the method

detection limit (MDL) but below the reporting limit (RL).

- Associated sample RRS MW006 had a detection in excess of five times found in the blank; no flag was applied.
- ii. **Field blanks** – No field blanks were associated with this method.
- iii. **Instrument blank** – Prep blank for batch 280-350378 contained alkalinity above acceptance criteria.
Associated sample RRS MW006 had a detection in excess of ten times the concentration in the blank; no flag was applied.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **Laboratory Control Spikes (LCS)** – All acceptance criteria were met for LCS 280-350556/4.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples:** No MS/MSDs were associated with this method. MS/MSD does not have a minimum frequency in the WP for MNA parameters.
 - iii. **Duplicates:** No duplicates were associated with this SDG.
- e. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: EPA 351.2 Kjeldahl Nitrogen

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-352543/3-A and MB 280-352546/2-A.
 - ii. **Field blanks** – No field blanks were associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **Laboratory Control Spikes (LCS)** – All acceptance criteria were met for LCS 280-352543/1-A, LCSD 280-352543/2-A, and LCS 280-352546/1-A.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples:** All acceptance criteria were met for 280-90492-3 MS and 280-90492-3 MSD except as noted.
Note: MS/MSD does not have a minimum frequency in the WP for MNA parameters. 280-90492-3 MSD was below acceptance criteria for percent recovery.
 - Associated sample BLO MW01 had a detection and was flagged “JM-“.
 - iii. **Duplicates:** No duplicates were associated with this method.
- e. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: MCAWW 300.0 Anions (Sulfate)

- 1) **Holding Times**
 - a. **Sample Preparation:** All holding times were met.
 - b. **Sample Analysis:** All holding times were met.

- 2) **Analysis**
 - a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
 - b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-352392/6.
 - ii. **Field blanks** – No field blanks were associated with this method.
 - c. **Internal Standards:** All acceptance criteria were met.
 - d. **Spikes:**
 - i. **Laboratory Control Spikes (LCSs) and Laboratory Control Spike Duplicates (LCSDs)** – All acceptance criteria were met for LCS 280-352392/4 and LCSD 280-352392/5.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples:** All acceptance criteria were met for 280-90492-3 MS and 280-90492-3 MSD. Note: MS/MSD does not have a minimum frequency in the WP for MNA parameters.
 - iii. **Duplicates:** All acceptance criteria were met for lab duplicate 280-90492-3 DU.
 - e. **Samples:** Overall, all acceptance criteria were met except as noted.

- 3) **Additional Comments**

None

Method: MCAWW 353.2 Nitrate-Nitrite

- 1) **Holding Times**
 - a. **Sample Preparation:** All holding times were met.
 - b. **Sample Analysis:** All holding times were met.

- 2) **Analysis**
 - a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
 - b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-351660/23.
 - ii. **Field blanks** – No field blanks were associated with this method.
 - c. **Internal Standards:** All acceptance criteria were met.
 - d. **Spikes:**
 - i. **Laboratory Control Spikes (LCS)** – All acceptance criteria were met for LCS 280-351660/22 and MRL 280-351660/21.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples:** No MS/MSDs were associated with this method. MS/MSD does not have a minimum frequency in the WP for MNA parameters.
 - iii. **Duplicates:** No duplicates were associated with this method.
 - e. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: Total Nitrogen

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-353010/1
 - ii. **Field blanks** – No field blanks were associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **LCSs** – No LCSs are associated with this method.
 - ii. **MS/MSD Samples:** No MS/MSD samples are associated with this method.
MS/MSD does not have a minimum frequency in the WP for MNA parameters.
 - iii. **Duplicates:** No duplicates were associated with this method.
- e. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Data Summary and Usability

Versar performed a Level IV validation review and assessment of laboratory procedures used in analyzing the associated analytical data. The guidelines were to verify the methodology requested on the COC and the reporting requirements as defined by the site-specific QAPP and the laboratory. The requested analytical methods were in compliance with the project-specific requirements noted.

Data Quality Indicators

- 1) Accuracy is evaluated by comparison of an analytical concentration to a known (true) value. Accuracy was monitored through the use of surrogate compounds in each sample, MS/MSD, and LCS analyses. Surrogates and MS/MSD provide a measure of the matrix effects on the analytical accuracy. LCS demonstrates accuracy of the method and the laboratory's ability to meet the method criteria. Each QC element was evaluated. Overall, accuracy was acceptable.
- 2) Precision is defined as the agreement between duplicate results, and was assessed by comparing duplicate MS recoveries and laboratory replicates. A laboratory duplicate was analyzed with each analytical batch. Overall, precision was acceptable.
- 3) Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition (in this case,

nature and extent of contamination). In terms of data quality, it is assumed that the sampling team followed approved SOPs for sample collection and handling, and it is assured that the laboratory followed approved SOPs for sample handling, preparation, and analysis. Overall, representativeness was acceptable.

- 4) Completeness is a measure of valid data compared with the amount of data that was expected to be obtained. The laboratory submitted all required deliverables; all requested analyses were performed, met required QC criteria (except where previously noted), and followed adequate corrective action processes. All anomalies were discussed in the subsequent pages. The data is 100 percent complete.

**TABLE 2
 COMPLETENESS SUMMARY TABLE**

Method	Matrix	Acceptable	Rejected	All Results
SW8260C	Water	96	0	96
SW8270D SIM	Water	18	0	18
AK101	Water	1	0	1
AK102/103	Water	8	0	8
SW6010C	Water	14	0	14
SM2320B	Water	7	0	7
MCAWW 300.0	Water	7	0	7
E351.2	Water	7	0	7
MCAWW 353.2	Water	7	0	7
Sum of All Results		165	0	165
Percent Complete		100.00%		100%

- 5) Comparability is a qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix, and analytical methods. It is assumed SOPs were used for sample collection and handling, common sample matrices were evaluated, and the proper methods were utilized. Additionally, precision and accuracy were demonstrated to be acceptable. Overall, this data set is comparable to others of acceptable data quality.

The following Validation Qualifiers are applied to the final data:

**TABLE 3
 VALIDATED SAMPLE RESULTS FORM**

See Appendix B.

Summary

In terms of data quality, all data associated with SDG 480-90492-1 met requested validation DQOs, except as noted in this report, and are therefore considered compliant and adequate for use.

List of Acronyms

COC	chain-of-custody
DOD	Department of Defense
DQO	Data Quality Objective
DRO	diesel range organics
EDD	electronic data deliverable
FD	field duplicate
GRO	gasoline range organics
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
PQL	practical quantitation limit
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RL	reporting limit
RPD	relative percent difference
RRO	residual range organics
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOC	semi-volatile organic compound
TB	trip blank
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WG	groundwater
WQ	water quality

Data Qualifier Reference Table

Qualifier	Description
no qualifier	Confirmed identification. The analyte was positively identified at the reported concentration. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated QC criteria.
+	The result is biased high.
-	The result is biased low.
B	The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).
E	The analyte was non-detect but the limit of LOD exceeded the project action limit.
J	The reported result is an estimated value.*
JL(+/-)	The result was an estimated value because the analyte failed recovery criteria in the LCS or LCSD sample or both. The result was either biased low because the LCS and LCSD recovery was less than the lower control limit, or the result was biased high because the recovery exceeded the upper control limit.
JM(+/-)	The result was an estimated value because the analyte failed recovery criteria in the MS or MSD sample, or both. The MS sample recoveries were only evaluated if the spike concentration exceeded the native sample concentration.
JS(+/-)	The result was an estimated value because at least one surrogate failed recovery criteria for that sample.
JH	The numerical result was considered an estimate because the analysis was performed at greater than the method holding time and less than twice the method holding time.
JI(+/-)	The numerical result was considered an estimate because the internal standard failed QC limits. The result was either biased low because the internal standard failed high or the result was biased high because the recovery failed low.
JP	The result was considered an estimated value because incorrect or inadequate preservation methods were used.
JC(+/-)	The result was an estimated value because the analyte failed recovery criteria in the CCV. The result was either biased low because the CCV recovery was less than the lower control limit or biased high because the recovery exceeded the upper control limit.
R	The result was rejected. A rejected result was not usable and therefore was deleted from the report.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.**
UJ	Values "U" and "J" combined.**

*The definition was changed from the WP to the standard data qualifiers definition listed in the DOD QSM 5.0, as the qualifiers in the WP did not account for data qualifiers for precision issues (e.g. MS/MSD and field duplicate issues).

** This qualifier was added to indicate non-detects, as no similar WP qualifier exists. The qualifier flag is as defined in the DOD QSM 5.0 standard data qualifiers.

Laboratory Data Qualifiers

Data qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory.

Qualification Code Reference Table

Qualifier	Description
ABG	BLANK: AMBIENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
ABL	BLANK: AMBIENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CBH	CALIBRATION: CONTINUING CALIBRATION BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
CBL	BLANK: CONTINUING CALIBRATION BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CCA	MISCELLANEOUS: COMPOUNDS WERE REPORTED COMBINED ON ONE COLUMN

Qualifier	Description
CCL	CALIBRATION: CONTINUING CALIBRATION RECOVERY LESS THAN THE LOWER CONTROL LIMIT
CF	CONFIRMATION: CONFIRMATION RESULT
CFD	CONFIRMATION: CONFIRMATION PRECISION EXCEEDED
CFHD	CONFIRMATION: CONFIRMATION RESULT RPD GREATER THAN THE UPPER CONTROL LIMIT
CLS	CALIBRATION: NO CALIBRATION ANALYZED IN THE ANALYTICAL BATCH
CRL	CALIBRATION: RESULT BELOW THE CALIBRATION RANGE
CRR	CALIBRATION: LAB R FLAG REMOVED - CALIBRATION RANGE EXCEEDED
CVES	CALIBRATION: CALIBRATION VERIFICATION ENDING STANDARD EXCEEDED %D CRITERIA
CVHL	CALIBRATION: CONTINUING CALIBRATION RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
D	DUPLICATES: DUPLICATE RUN
DL	DILUTION: DILUTION
DS	DILUTION: SERIAL DILUTION %D EXCEEDED CONTROL LIMIT
EBG	BLANK: EQUIPMENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
EBL	BLANK: EQUIPMENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
EMPC	MATRIX: ESTIMATED MAXIMUM POSSIBLE CONCENTRATION
EXC	MISCELLANEOUS: DATA NOT USED; ANOTHER VALUE IS APPROPRIATE OR DATA WAS NOT REQUESTED
FBG	BLANK: FIELD BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
FBL	BLANK: FIELD BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
FDD	DUPLICATES: FIELD DUPLICATE RPD CRITERIA EXCEEDED
HAHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HPHL	HOLDINGTIME: HOLDING TIME EXCEEDED
IC2	CALIBRATION: EXCEEDS RSD CRITERIA AND INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICD	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED
ICE	CALIBRATION: RESULT GREATER THAN LINEAR CALIBRATION RANGE
ICL	CALIBRATION: INITIAL CALIBRATION LOW STD. GREATER THAN THE REPORTING LIMIT
ICP	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED FOR CONFIRMATION COLUMN
ICR2	CALIBRATION: INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICS	CALIBRATION: INDUCTIVELY COUPLED PLASMA (ICP) INTERFERENCE CHECK SAMPLE (ICS) SOLUTIONS A AND B (ICSA/B) RECOVERIES ARE OUTSIDE CONTROL LIMITS
IRF	CALIBRATION: INITIAL CALIBRATION RELATIVE RESPONSE FACTOR BELOW THE LOWER CONTROL LIMIT
ISH	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE GREATER THAN THE UPPER CONTROL LIMIT
ISL	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE LESS THAN THE LOWER CONTROL LIMIT
IVD	CALIBRATION: EXCEEDS ICVS %D CRITERIA
IVS	CALIBRATION: INITIAL CALIBRATION VERIFICATION STANDARD WAS NOT ANALYZED
LBG	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE REPORTING LIMIT
LBL	BLANK: LABORATORY BLANK CONTAMINATION LESS THAN THE REPORTING LIMIT
LBM	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE METHOD DETECTION LIMIT
LCD	LABORATORYCONTROLSAMPLE: LCS RPD CRITERIA EXCEEDED
LCH	LABORATORYCONTROLSAMPLE: LCS RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
LCL	LABORATORYCONTROLSAMPLE: LCS RECOVERY LESS THAN THE LOWER CONTROL LIMIT
LCS	LABORATORYCONTROLSAMPLE: NO LCS IN THE ANALYTICAL BATCH
LDD	DUPLICATES: LAB DUPLICATE RPD CRITERIA EXCEEDED
LDH	LABORATORYCONTROLSAMPLE: LCSD RPD CRITERIA EXCEEDED

Qualifier	Description
LDS	LABORATORYCONTROLSAMPLE: LCSD NOT REQUIRED - NO FLAGS APPLIED
LRL	RL: RESULT LESS THAN THE REPORTING LIMIT
MIF	MATRIX: MATRIX INAPPROPRIATELY FLAGGED
MS	MATRIX: GLOBAL MATRIX SPIKE FLAGGING
MSD	MATRIX: MATRIX SPIKE RPD CRITERIA EXCEEDED
MSH	MATRIX: MATRIX SPIKE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
MSL	MATRIX: MATRIX SPIKE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
RE	RE-ANALYSIS: RE-EXTRACTION AND/OR REANALYSIS
RFJ	MISCELLANEOUS: LAB F FLAG REPLACED WITH J - FLAGGING NOT VALID
RFL	LABORATORYCONTROLSAMPLE: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RHT	HOLDINGTIME: LAB R FLAG REMOVED - HOLDING TIME EXCEEDED BY LESS THAN 24 HOURS
RIS	INTERNALSTANDARD: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON IS
RLM	RL: REPORTING LIMIT LESS THAN THE METHOD DETECTION LIMIT
RML	MATRIX: LAB M FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RMQ	MATRIX: LAB M FLAG REMOVED - MATRIX SPIKE/DUPLICATE NOT REQUESTED IN THIS ANALYTICAL BATCH
RPE	HOLDINGTIME: LAB R FLAG REMOVED - PE SAMPLE
RRA	BLANK: LAB B FLAG REMOVED - ANALYTE NOT DETECTED IN SAMPLE
RSG	SURROGATERECOVERY: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON SURROGATE
RSGQ	SURROGATERECOVERY: LAB R FLAG REMOVED - SURROGATE NOT MONITORED IN QAPP
RTO	CONFIRMATION: RESULT IS OUTSIDE THE METHOD SPECIFIED RETENTION TIME WINDOW
RXL	LABCONTROLLIMITS: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
SCN	SCREENING: SCREENING METHOD
SDH	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA GREATER THAN THE UPPER CONTROL LIMIT
SDL	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA LESS THAN THE LOWER CONTROL LIMIT
SGH	SURROGATERECOVERY: SURROGATE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SGL	SURROGATERECOVERY: SURROGATE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
SPRF	CALIBRATION: SPCC EXCEEDS RF > 0.300 CRITERIA
SVHL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SVLL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY LESS THAN THE LOWER CONTROL LIMIT
TB	BLANK: TRIP BLANK
TBG	BLANK: TRIP BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
TBL	BLANK: TRIP BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
TH	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF HIGH BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TH8	BLANK: TEMPERATURE BLANK > 8 DEGREES C
TIC	TENTATIVELYIDENTIFIEDCOMPOUND: TENTATIVELY IDENTIFIED COMPOUND
TL	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF LOW BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TR	RL: RESULT BETWEEN THE METHOD DETECTION LIMIT AND REPORTING LIMIT

APPENDIX A

Laboratory Data Review Checklist

Laboratory Data Review Checklist

Completed by:	Oscar Martinez		
Title:	Chemist	Date:	2/7/2017
CS Report Name:	Job No.: 280-90492-1, Port Heiden, AK	Report Date:	11/30/2016
Consultant Firm:	Versar, Inc.		
Laboratory Name:	TestAmerica - Denver	Laboratory Report Number:	280-90492-1
ADEC File Number:		ADEC RecKey Number:	

1. Laboratory

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

Yes No NA (Please explain.) Comments:

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

Yes No NA (Please explain) Comments:

Samples analyzed by lab as listed in project QAPP.

2. Chain of Custody (COC)

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

Yes No NA (Please explain) Comments:

b. Correct analyses requested?

Yes No NA (Please explain) Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt ($4^{\circ} \pm 2^{\circ} \text{C}$)?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

All bottles arrived unbroken and with labels in good condition.

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

Yes No NA (Please explain) Comments:

No custody seals on coolers.

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

Comments:

Data review and verification did not identify any quality issues to affect usability of this data set.

4. Case Narrative

a. Present and understandable?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

c. Were all corrective actions documented?

Yes No NA (Please explain) Comments:

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

Comments:

Data quality is good and data is usable.

5. Samples Results

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

Yes No NA (Please explain)

Comments:

b. All applicable holding times met?

Yes No NA (Please explain)

Comments:

Reanalysis was performed out of holding time for AK 102 & 103.

c. All soils reported on a dry weight basis?

Yes No NA (Please explain)

Comments:

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

Yes No NA (Please explain)

Comments:

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

Comments:

Data is usable.

6. QC Samples

a. Method Blank

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

Yes No NA (Please explain)

Comments:

ii. All method blank results less than PQL?

Yes No NA (Please explain)

Comments:

iii. If above PQL, what samples are affected?

Comments:

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

Yes No NA (Please explain) Comments:

Method blank MB 280-351036/1-A had a detection of GRO above the MDL but below the RL. See full Data Review Report for affected samples and flags.

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

Data quality is good and data is usable.

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

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

No metals analysis.

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

Yes No NA (Please explain) Comments:

No MS/MSD was performed for SW8260B or AK101. AK102 & 103: MS/MSD pair associated with sample 16BSB-02-3' was below acceptance criteria for percent recovery for RRO.

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/DMSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No NA (Please explain) Comments:

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

Comments:

N/A

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

Yes No NA (Please explain) Comments:

Associated samples 16BSB-06-2', 16BSB-05-3' ,16BSB-04-4' ,16BSB-03-4' ,16BSB-01-1', 16BSB-21-1', 16BSB-02-3', 16BSB-07-3' had detections and were flagged "J" for RRO.

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

Data is usable.

c. Surrogates - Organics Only

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

Surrogate n-octacosane percent recovery was below acceptance criteria. Surrogate o-terphenyl percent recovery was above acceptance criteria.

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

Yes No NA (Please explain) Comments:

Associated samples had detections and were flagged "J." Refer to the full Data Review Report.

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

Data is usable.

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

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

Yes No NA (Please explain.) Comments:

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

Yes No NA (Please explain.) Comments:

iii. All results less than PQL?

Yes No NA (Please explain.)

Comments:

iv. If above PQL, what samples are affected?

Comments:

All acceptance criteria were met for Trip blank TBPH16-04.

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

Comments:

Data is usable.

e. Field Duplicate

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

Yes No NA (Please explain)

Comments:

ii. Submitted blind to lab?

Yes No NA (Please explain.)

Comments:

16BSA-05-4' & 16BSA-025-4' pair and 16BSB-01-1' & 16BSB-21-1' pair

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

Yes No NA (Please explain)

Comments:

Field duplicate pair 16BSB-01-1 & 16BSB-21-1 was above the acceptance criteria for relative percent difference (RPD) for toluene.

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

Yes No NA (Please explain) Comments:

Data is usable. Detects were flagged "J" and non-detects were flagged "UJ." Refer to full Data Review Report.

f. Decontamination or Equipment Blank (if applicable)

Yes No NA (Please explain) Comments:

Grab samples using disposable collection tools.

i. All results less than PQL?

Yes No NA (Please explain) Comments:

No equipment blank for this SDG.

ii. If above PQL, what samples are affected?

Comments:

N/A

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

Comments:

N/A

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

a. Defined and appropriate?

Yes No NA (Please explain) Comments:

Reset Form

APPENDIX B

Table 3 – Validated Sample Results Form

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOQ	LOD	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
BLO MW01	280-90492-10	280-90492-1	SW8260B	BENZENE	0.46	1.0	0.16	UG/L	J Q	JS+	SGH
BLO MW01	280-90492-10	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
BLO MW01	280-90492-10	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	5.6	1.0	0.15	UG/L			
BLO MW01	280-90492-10	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW01	280-90492-10	280-90492-1	SW8260B	ETHYLBENZENE	0.83	1.0	0.16	UG/L	J		
BLO MW01	280-90492-10	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
BLO MW01	280-90492-10	280-90492-1	SW8260B	TOLUENE	0.46	1.0	0.17	UG/L	J Q	JS+	SGH
BLO MW01	280-90492-10	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	3.1	1.0	0.16	UG/L	Q	JS+	SGH
BLO MW01	280-90492-10	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
BLO MW01	280-90492-10	280-90492-1	SW8260B	XYLENES, TOTAL	0.85	2.0	0.19	UG/L	J		
BLO MW01	280-90492-10	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
BLO MW01	280-90492-10	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0.85	2.0	0.34	UG/L	J		
BLO MW01	280-90492-10	280-90492-1	SW6010C	IRON	5600	100	22	UG/L			
BLO MW01	280-90492-10	280-90492-1	SW6010C	MANGANESE	9700	10	0.25	UG/L			
BLO MW01	280-90492-10	280-90492-1	AK101	PETROLEUM HYDROCARBONS C6-C10	0.17	0.025	0.0049	UG/L	M		
BLO MW01	280-90492-10	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	63	1.3	0.17	MG/L	D M Q	JS+	SGH
BLO MW01	280-90492-10	280-90492-1	AK102	RESIDUAL RANGE ORGANICSS	4.2	2.5	0.28	MG/L	D M Q	JS+	SGH
BLO MW01	280-90492-10	280-90492-1	E300	SULFATE (AS SO4)	6.5	5.0	0.23	MG/L		JS+	
BLO MW01	280-90492-10	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.33	1.0	0.18	MG/L	J	JM-	TR,MSL
BLO MW01	280-90492-10	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.10	0.019	MG/L	U	U	
BLO MW01	280-90492-10	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	850	5.0	1.1	MG/L			
BLO MW01	280-90492-10	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.33	0.10	0.10	MG/L			
DSA MW01	280-90492-1	280-90492-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	7.3	1.0	0.16	UG/L			
DSA MW01	280-90492-1	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
DSA MW01	280-90492-1	280-90492-1	SW6010C	IRON	65	100	22	UG/L	J	J	TR
DSA MW01	280-90492-1	280-90492-1	SW6010C	MANGANESE	2.3	10	0.25	UG/L	J	J	TR
DSA MW01	280-90492-1	280-90492-1	E300	SULFATE (AS SO4)	12	5.0	0.23	MG/L			
DSA MW01	280-90492-1	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.76	1.0	0.18	MG/L	J	J	TR
DSA MW01	280-90492-1	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.89	0.10	0.019	MG/L			
DSA MW01	280-90492-1	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	80	5.0	1.1	MG/L			
DSA MW01	280-90492-1	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	1.7	0.10	0.10	MG/L			
DSA MW05	280-90492-2	280-90492-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	

PORT HEIDEN RRS
LABORATORY SDG: 280-90492-1
TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOQ	LOD	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW05	280-90492-2	280-90492-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	2.2	1.0	0.16	UG/L			
DSA MW05	280-90492-2	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	SW6010C	IRON	3200	100	22	UG/L			
DSA MW05	280-90492-2	280-90492-1	SW6010C	MANGANESE	150	10	0.25	UG/L			
DSA MW05	280-90492-2	280-90492-1	E300	SULFATE (AS SO4)	8.1	5.0	0.23	MG/L			
DSA MW05	280-90492-2	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.24	1.0	0.18	MG/L	J	J	TR
DSA MW05	280-90492-2	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.10	0.019	MG/L	U	U	
DSA MW05	280-90492-2	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	67	5.0	1.1	MG/L			
DSA MW05	280-90492-2	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.24	0.10	0.10	MG/L			
FPC 215 MW09	280-90492-9	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	12	0.25	0.033	MG/L	M		
FPC 215 MW11	280-90492-8	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.11	0.25	0.033	MG/L	J M	B	TR,LBM
FPC 215 MW12	280-90492-7	280-90492-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.15	0.25	0.033	MG/L	J M	B	TR,LBM
GLO MW03	280-90492-5	280-90492-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
GLO MW03	280-90492-5	280-90492-1	SW6010C	IRON	59	100	22	UG/L	J	J	TR
GLO MW03	280-90492-5	280-90492-1	SW6010C	MANGANESE	1.5	10	0.25	UG/L	J	J	TR
GLO MW03	280-90492-5	280-90492-1	E300	SULFATE (AS SO4)	5.6	5.0	0.23	MG/L			
GLO MW03	280-90492-5	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.78	1.0	0.18	MG/L	J	J	TR
GLO MW03	280-90492-5	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.3	0.10	0.019	MG/L			
GLO MW03	280-90492-5	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	110	5.0	1.1	MG/L			
GLO MW03	280-90492-5	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	1.1	0.10	0.10	MG/L			
GLO MW04	280-90492-6	280-90492-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	

PORT HEIDEN RRS
LABORATORY SDG: 280-90492-1
TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOQ	LOD	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
GLO MW04	280-90492-6	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
GLO MW04	280-90492-6	280-90492-1	SW6010C	IRON	1300	100	22	UG/L			
GLO MW04	280-90492-6	280-90492-1	SW6010C	MANGANESE	49	10	0.25	UG/L			
GLO MW04	280-90492-6	280-90492-1	E300	SULFATE (AS SO4)	3.4	5.0	0.23	MG/L	J	J	TR
GLO MW04	280-90492-6	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.31	1.0	0.18	MG/L	J	J	TR
GLO MW04	280-90492-6	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.099	0.10	0.019	MG/L	J	J	TR
GLO MW04	280-90492-6	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	47	5.0	1.1	MG/L			
GLO MW04	280-90492-6	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.41	0.10	0.10	MG/L			
RRS MW006	280-90492-3	280-90492-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
RRS MW006	280-90492-3	280-90492-1	SW6010C	IRON	710	100	22	UG/L			
RRS MW006	280-90492-3	280-90492-1	SW6010C	MANGANESE	14	10	0.25	UG/L			
RRS MW006	280-90492-3	280-90492-1	E300	SULFATE (AS SO4)	4.2	5.0	0.23	MG/L	J	J	TR
RRS MW006	280-90492-3	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.74	1.0	0.18	MG/L	J	J	TR
RRS MW006	280-90492-3	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.64	0.10	0.019	MG/L			
RRS MW006	280-90492-3	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	140	5.0	1.1	MG/L			
RRS MW006	280-90492-3	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	1.4	0.10	0.10	MG/L			
RRS MW05	280-90492-4	280-90492-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
RRS MW05	280-90492-4	280-90492-1	SW6010C	IRON	360	100	22	UG/L			
RRS MW05	280-90492-4	280-90492-1	SW6010C	MANGANESE	3.9	10	0.25	UG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	E300	SULFATE (AS SO4)	3.2	5.0	0.23	MG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.31	1.0	0.18	MG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	E353.2	NITROGEN, NITRATE-NITRITE	0.074	0.10	0.019	MG/L	J	J	TR
RRS MW05	280-90492-4	280-90492-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	52	5.0	1.1	MG/L			
RRS MW05	280-90492-4	280-90492-1	CALC	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.38	0.10	0.10	MG/L			

PORT HEIDEN RRS
 LABORATORY SDG: 280-90492-1
 TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOQ	LOD	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
TBPH16-03	280-90492-12	280-90492-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
TBPH16-03	280-90492-12	280-90492-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	

Notes:

Reason codes are defined in the Qualificaion Code Reference Table at the end of the report.

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

MDL = method detection limit

MG/L = milligrams per liter

RL = reporting limit

RPD = relative percent difference

SDG = sample delivery group

UG/L = micrograms per liter

Methods:

AK101 = Alaska Department of Environmental Conservation Method 101,

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

E300.0 = Environmental Protection Agency Method 300.0

E351.2 = Environmental Protection Agency Method 351.2

E353.2 = Environmental Protection Agency Method 353.2

SM2320B = Standard Method 2320B

SW6010C = Solid Waste Method 6010C

SW8260B = Solid Waste Method 8260B

Validation Reason Codes:

LBM = laboartory blank contamination less than the reporting limit

MSL = matrix spike recovery less than the lower control limit.

SGH = surrogate recovery exceeds upper control limit

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOQ	LOD	Report Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
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TR = result between the MDL and RL

Qualifiers:

+ = The result is biased high.

- = The result is biased low.

B = The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).

J = The analyte was positively identified, but the associated result was less than the limit of quantitation but greater than or equal to the MDL

JM = The result was an estimated value because the analyte failed recovery criteria in the matrix spike or matrix spike duplicate sample, or both. The matrix spike sample recoveries were only evaluated in the spike concentration exceeded the native sample concentration.

JS = The result was an estimated value because at least one surrogate failed recovery criteria for that sample.

U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.



Versar, Inc.

Data Review Report

*Data Verification / **Validation***

for:

Port Heiden Radio Relay Station (RRS)
Port Heiden, Alaska

March 17, 2017

Sample Delivery Group:

280-90312-1

Laboratory Name:

TestAmerica, Inc.

Data Assessment Report

The data assessment is a systematic process for reviewing data against a predefined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and handling procedures affect the usability of the analytical data. Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The data acceptance criteria are established according to Standard Operating Procedures (SOPs) and/or Statements of Work (SOWs) provided to the contracted analytical laboratory or the United States Environmental Protection Agency (USEPA) guidance documents (e.g., SW-846). The assessment of data quality and usability involves four components, as described below:

- 1) **Data Verification** – is a process for determining completeness, correctness, consistency, and compliance of a data package in accordance with requirements contained in the SOW and/or contract-specific requirements. This is a review of the data package, electronic data deliverable (EDD), and invoice received from the contract laboratory to insure that the contract required information is present and complete prior to data validation.
- 2) **Data Review** – is a process of reviewing the primary quality control (QC) data provided by the laboratory and the results of any internal quality assurance (QA)/QC samples, such as field, trip, equipment, or ambient blanks, and/or field split samples and duplicate samples, to ascertain any effect on the analytical data based on laboratory procedures or sample collection activities.
- 3) **Data Evaluation** – is a process to determine if the data meets project-specific DQOs and contract requirements. The evaluation may involve a review of field sampling and sample management procedures, laboratory audits, performance evaluation sample results, and any other data quality indicators that are available.
- 4) **Data Validation** – is a process to determine the accuracy and precision of the analytical data generated and to identify any anomalies encountered. The validation process is performed in accordance with guidelines defined by the client. Typically, one or more of the following are utilized: USEPA regional or nation functional guidelines, project-specific guidelines (e.g., SOW/Quality Assurance Project Plan [QAPP]). Two major components of data validation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance for each analytical method to determine if the samples were analyzed within the prescribed acceptance criteria of the method. Evaluation of matrix interferences involves the analysis of surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Data not meeting project-specific DQOs or the requirements of the analytical method are identified and qualified in accordance with the project criteria requested by the client.

Data Validation Procedures

Analytical Data Verification and Validation Levels

- Level One (I) – validation based ONLY on completeness and compliance checks of sample receipt conditions.
- Level Two (II) – validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results.
- Level Two (b) (IIb) – validation based on completeness and compliance checks of sample receipt conditions and BOTH sample- and instrument-related QC results.
- Level Three (III) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, AND recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms.
- Level Four (IV) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms, AND the review of actual instrument outputs/raw data.

The steps and guidelines followed during the data verification and validation process are modeled on the USEPA's *National Functional Guidelines for Superfund Organic Methods Data Review (September 2016)*, the *National Functional Guidelines for Inorganic Superfund Methods Data Review (September 2016)*, the Department of Defense (DOD) Quality System Manual (QSM) Version 5.0 (July 2013), and the project-specific criteria QAPP, *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Alaska (April 2017)*. The method-specific criteria set forth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste (SW-846)* are also evaluated during the validation process.

References used for Data Verification/Validation for this Report

Draft United States Air Force 611th Air Support Group 611th Civil Engineer Squadron, Joint Base Elmendorf-Richardson, Alaska, Groundwater Monitoring 2016 and 2017 Work Plan, Former Radio Relay Station, Port Heiden Alaska, August 2016.

Department of Defense (DOD) Quality Systems Manual (QSM) Version 5.0, July 2013.

Data Verification Results

Receipt

A total of **five (5)** samples, collected by APC Services, LLC were submitted for analysis to Test America Denver in Arvada, Colorado. The five (5) samples included three (3) normal samples, one (1) field duplicate sample, and one (1) trip blank sample; no equipment blanks were submitted. The samples are reported in Sample Delivery Group (SDG) **280-90312-1**. Data analyzed by methods SW8260B, AK101, and AK102/AK103 are verified to Level IV according to the data validation procedures outline. Natural attenuation parameters analyzed by methods SW6010C, SM2320B, E300.0, and E353.2 were verified to Level IIb according to the data validation procedures outline. The discussion below applies to these groundwater samples, shown in Table 1, which were collected between 10/22/2016 and 10/25/2016 at the Former Port Heiden Radio Relay Station (RRS) during the 2016 Annual Long-term Monitoring Event.

Field Sample ID	Lab Sample ID	Matrix	Method	Collection Date	Collection Time
BLO MW 05	280-90312-1	WG	SW8260B (VOCs), AK101 (GRO), AK102/AK103 (DRO & RRO) SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/22/2016	18:30
DSA MW 07	280-90312-2	WG	SW8260B (VOCs), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/25/2016	09:30
DSA MW 26	280-90312-3	WG	SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/24/2016	13:00
DSA MW 06	280-90312-4	WG	SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/24/2016	17:00
TBPH016-02	280-90312-5	WQ	SW8260B (VOCs)	10/22/2016	18:30

DRO = diesel range organics; GRO = gasoline range organics; RRO = residual range organics; SDG = sample delivery group; VOC = volatile organic compound; WG = groundwater; WQ = water quality

AK101 = Alaska Department of Environmental Conservation Method 101; AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103; E300.0 = Environmental Protection Agency Method 300.0; E353.2 = Environmental Protection Agency Method 353.2; SM2320B = Standard Method 2320B; SW8260B = Solid Waste Method 8260B

The chain-of-custody (COC) record and samples were maintained from the field to the laboratory as evidenced by field and laboratory signatures, dates, and times of receipt. However, corrections were made on the COC upon check in of samples. Three additional 500 ml labeled and nitric acid preserved sample bottles were sent to laboratory for SW6010C (manganese and iron) but were not included on the COC. The laboratory confirmed the analyses and adjusted the COC. All requested analyses are accounted for in the data report.

There is no indication of other issues associated with the sample(s) receipt, and/or condition of the sample(s), affecting the quality of the data.

The Laboratory Data Review Checklist is a summary of the Data Review findings and can be found in **Appendix A**. Detailed findings are provided in this Data Review report.

Method: SW846 8260B Volatile Organic Compounds (VOCs)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for STD 280-34500/10-16, STD 280-34500/18-23, STD 280-348747/9-14.
 - ii. **Continuing** – All acceptance criteria were met for ICV 280-342500/17, ICV 280-342500/24, ICV 280-34721/10, ICV 280-34721/15, CCV 280-349808/2, and CCV 280-349808/18.
- b. **Blanks:**
 - i. **Method Blank:** All acceptance criteria were met for MB 280-349808/6.
 - ii. **Field Blanks:** – All acceptance criteria were met for trip blank TBPH016-02.
- c. **Surrogates:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **Laboratory Control Spikes (LCS)** – All acceptance criteria were met for LCS 280-349808/4.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – No MS/MSD is associated with this method. Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. There is not enough information to evaluate matrix impact on precision or accuracy of the laboratory measurements. Uncertainty of results is increased.
- e. **Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.
- f. **Samples:** Overall, all acceptance criteria were met, except as noted.

3) Additional Comments

Sample DSA MW 06 preserved vials for the requested 8260B VOCs analysis were received with a head space bubble greater than 6mm in diameter. Sufficient non-biased sample volume was received to perform the requested analyses. Analytical results were not impacted by improper preservation of several sample containers.

Method: AK101 Gasoline Range Organics (GRO)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for 280-348586/2-7.

- ii. **Continuing** – All acceptance criteria were met for ICV 280-348586/8.
- b. **Surrogates:** All acceptance criteria were met.
- c. **Blanks:**
 - i. **Method Blank** – All acceptance criteria were met for MB 280-350062/3.
 - ii. **Field blanks** – The field blank was not associated with this method.
- d. **Spikes:**
 - i. **LCS and Laboratory Control Spike Duplicates (LCSDs)** – All acceptance criteria were met for LCS 280-350062/4 and LCSD 280-350062/5.
 - ii. **MS/MSD Samples** – All acceptance criteria were met for 280-90312-1 MS and 280-90312-1 MSD.
- e. **Duplicates:** No lab duplicates were performed for this method.
- f. **Samples:** Overall, all acceptance criteria were met.

3) Additional Comments

No trip blank sample was submitted for gasoline range organics (GRO) analysis. Trip blanks are used to measure potential cross contamination or potential artifacts present that might cause false positive identifications in associated samples. The lack of trip blank evaluations does not have any impact on the groundwater samples found to be non-detect for GRO. Samples where GRO was detected may have been impacted by background contamination; it is possible that a high bias may exist in the case of the positive result reported for this sample. Only BLO MW 05 was analyzed for GRO; the sample was non-detect for GRO.

Method: AK102 & AK103 Diesel and Extended Range Organics (DRO & RRO)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for 280-351711/4-10, 280-351711/12-18.
 - ii. **Continuing** – All acceptance criteria were met for ICV 280-351711/11, ICV 280-351711/19, CCVRT 280-352276/4, CCVRT 280-352276/5, and CCV 280-352276/19, and CCV 280-352276/20.
- b. **Blanks:**
 - i. **Method Blank** – All acceptance criteria were met for MB 280-349880/1-A.
 - ii. **Field Blank** – The field blank was not associated with this method.
- c. **Surrogates: All acceptance criteria were met.**
- d. **Spikes:**
 - i. **LCS** – All acceptance criteria were met for LCS 280-349880/2-A, LCS 280-349880/4-A, LCSD 280-349880/3-A, and LCSD 280-349880/5-A.
 - ii. **MS/MSD Samples** – No MS/MSD is associated with this method. Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. There is not enough information to evaluate matrix impact on precision or accuracy of the laboratory measurements. Uncertainty of results is increased.
- e. **Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.

f. **Samples:** Overall, all acceptance criteria were met for AK 101, AK102, and AK103.

3) **Additional Comments**

None

Method: SW846 6010C Manganese & Iron

1) **Holding Times**

- a. **Sample Preparation:** All holding times were met. Three 500ml containers were shipped that were not on COC but lab called and confirmed analysis.
- b. **Sample Analysis:** All holding times were met.

2) **Analysis**

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method Blank** – All acceptance criteria were met for MB 280-350312/1-A.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Spikes:**
 - i. **LCS** – All acceptance criteria were met for LCS 280-350312/2-A.
 - ii. **MS/MSD Samples** – No MS/MSDs were associated with this method. MS/MSD frequencies were not included in the WP for monitored natural attenuation (MNA) parameters.
- d. **Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.
- e. **Samples:** Overall, all acceptance criteria were met for 6010C.

3) **Additional Comments**

None

Method: SM 2320B Alkalinity

1) **Holding Times**

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) **Analysis**

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blank** – All acceptance criteria were met for MB 280-349636/57, MB 280-349857/31, and MB 280-349858/5 except as noted. MB 280-349636/57 contained total alkalinity above the method detection limit (MDL) but below the reporting limit (RL).
 - Associated sample BLO MW 05 had a detection in excess of five times the concentration in the blank; no flag was applied.MB 280-349857/31 contained total alkalinity above the MDL but below the RL.
 - Associated samples DSA MW 06 and DSA MW 26 had detections in excess

of five times the concentration in the blank; no flags were applied.
MB 280-349858/5 contained total alkalinity above the MDL but below the RL.

- Associated sample DSA MW 07 had a detection in excess of five times the concentration in the blank; no flag was applied.
- ii. **Field blanks** – The field blank was not associated with this method.
- c. **Spikes:**
 - i. **LCS** – All acceptance criteria were met for LCS 280-349636/56, LCS 280-349857/30, and LCS 280-349858/4.
 - ii. **MS/MSD Samples** – No MS/MSD was associated with this method. MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- d. **Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.
- e. **Samples:** Overall, all acceptance criteria were met, except as noted.

3) Additional Comments

None

Method: EPA 351.2 Nitrate-Nitrite

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blank** – All acceptance criteria were met for MB 280-350515/111 and MB 280-350515/67.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-350515/110, LCS 280-350515/66, and MRL 280-350515/21.
 - ii. **MS/MSD Samples** – All acceptance criteria were met for 280-90312-4 MS and 280-90312-4 MSD. Note: MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- d. **Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.
- e. **Samples:** Overall, all acceptance criteria were met.

3) Additional Comments

None

Method: EPA 351.2 Kjeldahl Nitrogen

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blank** – All acceptance criteria were met for MB 280-351107/2-A
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-351107/1-A.
 - ii. **MS/MSD Samples** – No MS/MSDs were associated with this method. MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- d. **Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.
- e. **Samples:** Overall, all acceptance criteria were met.

3) Additional Comments

None

Method: Total Nitrogen

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blank** – All acceptance criteria were met for MB 280-351802/1.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Spikes:**
 - i. **LCSs and LCSDs** – No LCSs or LCSDs are associated with this method.
 - ii. **MS/MSD Samples** – No MS/MSD is associated with this method. MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- d. **Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.
- e. **Samples:** Overall, all acceptance criteria were met.

3) Additional Comments

None

Method: MCAWW 300.0 Anions (Sulfate)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.

b. Blanks:

- i. **Method blank** – All acceptance criteria were met for MB 280-352124/6 except as noted.
MB 280-352124/6 was above the MDL but below the RL.
 - Associated samples BLO MW 06 and BLO MW 26 had detections in excess of five times the concentration found in the blank; no flags were applied.
 - Associated samples BLO MW 05 and BLO MW 07 had detections between the MDL and RL and were flagged “B+”.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. Spikes:**
- i. **LCS** – All acceptance criteria were met for LCS 280-352124/4, LCSD 280-352124/5, and MRL 280-352124/3.
 - ii. **MS/MSD Samples** – All acceptance criteria were met for 280-90312-1 MS. Note: MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- d. Duplicates:** All acceptance criteria were met for field duplicate pair DSA MW 06 and DSA MW 26. No lab duplicates were performed for this method.
- e. Samples:** Overall, all acceptance criteria were met for alkalinity, Total Nitrogen, and sulfate.

3) Additional Comments

None

Data Summary and Usability

Versar performed a Level IV validation review and assessment of laboratory procedures used in analyzing the associated analytical data. The guidelines were to verify the methodology requested on the COC and the reporting requirements as defined by the site-specific QAPP and the laboratory. The requested analytical methods were in compliance with the project-specific requirements noted.

Data Quality Indicators

- 1) Accuracy is evaluated by comparison of an analytical concentration to a known (true) value. Accuracy was monitored through the use of surrogate compounds in each sample, MS/MSD, and spike of Method Blank (MB) and Laboratory Control Sample (LCS) Blank analyses. Surrogates and MS/MSD provide a measure of the matrix effects on the analytical accuracy. MB and LCS demonstrates accuracy of the method and the laboratory’s ability to meet the method criteria. Each QC element was evaluated. Overall, accuracy was acceptable for all analyses performed for this SDG.
- 2) Precision is defined as the agreement between duplicate results, and was assessed by comparing duplicate MS recoveries, laboratory replicates, and field duplicate sample results. A laboratory duplicate was analyzed with each analytical batch. And RPDs of laboratory duplicates were well within quality criteria. A field duplicate was not collected. Overall, precision was acceptable.
- 3) Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition (in this case, nature and extent of contamination). In terms of data quality, it is assumed that the sampling team followed approved SOPs for sample collection and handling, and it is assured that the laboratory followed approved SOPs for sample handling, preparation, and analysis. Overall, representativeness was acceptable.

- 4) Completeness is a measure of valid data compared with the amount of data that was expected to be obtained. The laboratory submitted all required deliverables; all requested analyses were performed and met required QC criteria. No data results were rejected for this SDG. The data is 100.00 percent complete.

**TABLE 2
 COMPLETENESS SUMMARY TABLE**

Method	Matrix	Acceptable	Rejected	All Results
SW8260B	Water	48	0	48
AK101	Water	1	0	1
AK 102/103	Water	2	0	2
SW6010C	Water	2	0	2
SM2320B	Water	4	0	4
E300.0	Water	4	0	4
E351.2	Water	4	0	4
E353.2	Water	4	0	4
Total Nitrogen	Water	4	0	4
Sum of All Results		73	0	73
Percent Complete		100.00%		100.00%

- 5) Comparability is a qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix, and analytical methods. It is assumed SOPs were used for sample collection and handling, common sample matrices were evaluated, and the proper methods were utilized. Additionally, precision and accuracy were demonstrated to be acceptable. Overall, this data set is comparable to others of acceptable data quality.

The following Validation Qualifiers are applied to the final data:

**TABLE 3
 VALIDATED SAMPLE RESULTS FORM**

See **Appendix B**.

Summary

In terms of data quality, all data associated with SDG 280-90312-1 met requested validation DQOs, except as noted in this report, and are therefore considered compliant and adequate for use.

List of Acronyms

COC	chain-of-custody
DOD	Department of Defense
DQO	Data Quality Objective
DRO	diesel range organics
EDD	electronic data deliverable
FD	field duplicate
GRO	gasoline range organics
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
PQL	practical quantitation limit
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RL	reporting limit
RPD	relative percent difference
RRO	residual range organics
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SOW	Statement of Work
TB	trip blank
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WG	groundwater
WQ	water quality

Data Qualifier Reference Table

Qualifier	Description
no qualifier	Confirmed identification. The analyte was positively identified at the reported concentration. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated QC criteria.
+	The result is biased high.
-	The result is biased low.
B	The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).
E	The analyte was non-detect but the limit of LOD exceeded the project action limit.
J	The reported result is an estimated value.*
JL(+/-)	The result was an estimated value because the analyte failed recovery criteria in the LCS or LCSD sample or both. The result was either biased low because the LCS and LCSD recovery was less than the lower control limit, or the result was biased high because the recovery exceeded the upper control limit.
JM(+/-)	The result was an estimated value because the analyte failed recovery criteria in the MS or MSD sample, or both. The MS sample recoveries were only evaluated if the spike concentration exceeded the native sample concentration.
JS(+/-)	The result was an estimated value because at least one surrogate failed recovery criteria for that sample.
JH	The numerical result was considered an estimate because the analysis was performed at greater than the method holding time and less than twice the method holding time.
JI(+/-)	The numerical result was considered an estimate because the internal standard failed QC limits. The result was either biased low because the internal standard failed high or the result was biased high because the recovery failed low.
JP	The result was considered an estimated value because incorrect or inadequate preservation methods were used.
JC(+/-)	The result was an estimated value because the analyte failed recovery criteria in the CCV. The result was either biased low because the CCV recovery was less than the lower control limit or biased high because the recovery exceeded the upper control limit.
R	The result was rejected. A rejected result was not usable and therefore was deleted from the report.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.**
UJ	Values "U" and "J" combined.**

*The definition was changed from the WP to the standard data qualifiers definition listed in the DOD QSM 5.0, as the qualifiers in the WP did not account for data qualifiers for precision issues (e.g. MS/MSD and field duplicate issues).

** This qualifier was added to indicate non-detects, as no similar WP qualifier exists. The qualifier flag is as defined in the DOD QSM 5.0 standard data qualifiers.

Laboratory Data Qualifiers

Data qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory.

Qualification Code Reference Table

Qualifier	Description
ABG	BLANK: AMBIENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
ABL	BLANK: AMBIENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CBH	CALIBRATION: CONTINUING CALIBRATION BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
CBL	BLANK: CONTINUING CALIBRATION BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CCA	MISCELLANEOUS: COMPOUNDS WERE REPORTED COMBINED ON ONE COLUMN

Qualifier	Description
CCL	CALIBRATION: CONTINUING CALIBRATION RECOVERY LESS THAN THE LOWER CONTROL LIMIT
CF	CONFIRMATION: CONFIRMATION RESULT
CFD	CONFIRMATION: CONFIRMATION PRECISION EXCEEDED
CFHD	CONFIRMATION: CONFIRMATION RESULT RPD GREATER THAN THE UPPER CONTROL LIMIT
CLS	CALIBRATION: NO CALIBRATION ANALYZED IN THE ANALYTICAL BATCH
CRL	CALIBRATION: RESULT BELOW THE CALIBRATION RANGE
CRR	CALIBRATION: LAB R FLAG REMOVED - CALIBRATION RANGE EXCEEDED
CVES	CALIBRATION: CALIBRATION VERIFICATION ENDING STANDARD EXCEEDED %D CRITERIA
CVHL	CALIBRATION: CONTINUING CALIBRATION RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
D	DUPLICATES: DUPLICATE RUN
DL	DILUTION: DILUTION
DS	DILUTION: SERIAL DILUTION %D EXCEEDED CONTROL LIMIT
EBG	BLANK: EQUIPMENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
EBL	BLANK: EQUIPMENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
EMPC	MATRIX: ESTIMATED MAXIMUM POSSIBLE CONCENTRATION
EXC	MISCELLANEOUS: DATA NOT USED; ANOTHER VALUE IS APPROPRIATE OR DATA WAS NOT REQUESTED
FBG	BLANK: FIELD BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
FBL	BLANK: FIELD BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
FDD	DUPLICATES: FIELD DUPLICATE RPD CRITERIA EXCEEDED
HAHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HPHL	HOLDINGTIME: HOLDING TIME EXCEEDED
IC2	CALIBRATION: EXCEEDS RSD CRITERIA AND INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICD	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED
ICE	CALIBRATION: RESULT GREATER THAN LINEAR CALIBRATION RANGE
ICL	CALIBRATION: INITIAL CALIBRATION LOW STD. GREATER THAN THE REPORTING LIMIT
ICP	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED FOR CONFIRMATION COLUMN
ICR2	CALIBRATION: INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICS	CALIBRATION: INDUCTIVELY COUPLED PLASMA (ICP) INTERFERENCE CHECK SAMPLE (ICS) SOLUTIONS A AND B (ICSA/B) RECOVERIES ARE OUTSIDE CONTROL LIMITS
IRF	CALIBRATION: INITIAL CALIBRATION RELATIVE RESPONSE FACTOR BELOW THE LOWER CONTROL LIMIT
ISH	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE GREATER THAN THE UPPER CONTROL LIMIT
ISL	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE LESS THAN THE LOWER CONTROL LIMIT
IVD	CALIBRATION: EXCEEDS ICVS %D CRITERIA
IVS	CALIBRATION: INITIAL CALIBRATION VERIFICATION STANDARD WAS NOT ANALYZED
LBG	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE REPORTING LIMIT
LBL	BLANK: LABORATORY BLANK CONTAMINATION LESS THAN THE REPORTING LIMIT
LBM	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE METHOD DETECTION LIMIT
LCD	LABORATORYCONTROLSAMPLE: LCS RPD CRITERIA EXCEEDED
LCH	LABORATORYCONTROLSAMPLE: LCS RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
LCL	LABORATORYCONTROLSAMPLE: LCS RECOVERY LESS THAN THE LOWER CONTROL LIMIT
LCS	LABORATORYCONTROLSAMPLE: NO LCS IN THE ANALYTICAL BATCH
LDD	DUPLICATES: LAB DUPLICATE RPD CRITERIA EXCEEDED
LDH	LABORATORYCONTROLSAMPLE: LCSD RPD CRITERIA EXCEEDED

Qualifier	Description
LDS	LABORATORYCONTROLSAMPLE: LCSD NOT REQUIRED - NO FLAGS APPLIED
LRL	RL: RESULT LESS THAN THE REPORTING LIMIT
MIF	MATRIX: MATRIX INAPPROPRIATELY FLAGGED
MS	MATRIX: GLOBAL MATRIX SPIKE FLAGGING
MSD	MATRIX: MATRIX SPIKE RPD CRITERIA EXCEEDED
MSH	MATRIX: MATRIX SPIKE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
MSL	MATRIX: MATRIX SPIKE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
RE	RE-ANALYSIS: RE-EXTRACTION AND/OR REANALYSIS
RFJ	MISCELLANEOUS: LAB F FLAG REPLACED WITH J - FLAGGING NOT VALID
RFL	LABORATORYCONTROLSAMPLE: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RHT	HOLDINGTIME: LAB R FLAG REMOVED - HOLDING TIME EXCEEDED BY LESS THAN 24 HOURS
RIS	INTERNALSTANDARD: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON IS
RLM	RL: REPORTING LIMIT LESS THAN THE METHOD DETECTION LIMIT
RML	MATRIX: LAB M FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RMQ	MATRIX: LAB M FLAG REMOVED - MATRIX SPIKE/DUPLICATE NOT REQUESTED IN THIS ANALYTICAL BATCH
RPE	HOLDINGTIME: LAB R FLAG REMOVED - PE SAMPLE
RRA	BLANK: LAB B FLAG REMOVED - ANALYTE NOT DETECTED IN SAMPLE
RSG	SURROGATERECOVERY: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON SURROGATE
RSGQ	SURROGATERECOVERY: LAB R FLAG REMOVED - SURROGATE NOT MONITORED IN QAPP
RTO	CONFIRMATION: RESULT IS OUTSIDE THE METHOD SPECIFIED RETENTION TIME WINDOW
RXL	LABCONTROLLIMITS: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
SCN	SCREENING: SCREENING METHOD
SDH	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA GREATER THAN THE UPPER CONTROL LIMIT
SDL	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA LESS THAN THE LOWER CONTROL LIMIT
SGH	SURROGATERECOVERY: SURROGATE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SGL	SURROGATERECOVERY: SURROGATE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
SPRF	CALIBRATION: SPCC EXCEEDS RF > 0.300 CRITERIA
SVHL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SVLL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY LESS THAN THE LOWER CONTROL LIMIT
TB	BLANK: TRIP BLANK
TBG	BLANK: TRIP BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
TBL	BLANK: TRIP BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
TH	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF HIGH BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TH8	BLANK: TEMPERATURE BLANK > 8 DEGREES C
TIC	TENTATIVELYIDENTIFIEDCOMPOUND: TENTATIVELY IDENTIFIED COMPOUND
TL	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF LOW BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TR	RL: RESULT BETWEEN THE METHOD DETECTION LIMIT AND REPORTING LIMIT

APPENDIX A

Laboratory Data Review Checklist

Laboratory Data Review Checklist

Completed by:	Terence Chuhay		
Title:	Chemist	Date:	01/23/2017
CS Report Name:	Job No.: 280-90312-1, Port Heiden, AK	Report Date:	11/23/2016
Consultant Firm:	Versar, Inc.		
Laboratory Name:	Test America	Laboratory Report Number:	280-90312-1
ADEC File Number:		ADEC RecKey Number:	

1. Laboratory

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

Yes No NA (Please explain.) Comments:

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

Yes No NA (Please explain) Comments:

2. Chain of Custody (COC)

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

Yes No NA (Please explain) Comments:

b. Correct analyses requested?

Yes No NA (Please explain) Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt ($4^{\circ} \pm 2^{\circ} \text{C}$)?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

Lab noted one VOC vial with >6 mm headspace bubble, sufficient volume available for non-biased analysis.

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

Yes No NA (Please explain) Comments:

3 each 500 ml containers not on COC, lab confirmed these were for 6010C analyses and added to COC.

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

Comments:

Analyses performed as requested.

4. Case Narrative

a. Present and understandable?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

c. Were all corrective actions documented?

Yes No NA (Please explain) Comments:

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

Comments:

Data quality was acceptable and all data is usable.

5. Samples Results

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

Yes No NA (Please explain)

Comments:

b. All applicable holding times met?

Yes No NA (Please explain)

Comments:

c. All soils reported on a dry weight basis?

Yes No NA (Please explain)

Comments:

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

Yes No NA (Please explain)

Comments:

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

Comments:

Data quality was acceptable and all data is usable.

6. QC Samples

a. Method Blank

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

Yes No NA (Please explain)

Comments:

ii. All method blank results less than PQL?

Yes No NA (Please explain)

Comments:

iii. If above PQL, what samples are affected?

Comments:

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

Yes No NA (Please explain) Comments:

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

Comments:

Data quality was acceptable and all data is usable.

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

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

All LCS/LCSD and MS/MSD RPDs were well within criteria.

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

Comments:

No samples affected.

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

Yes No NA (Please explain) Comments:

No affected samples.

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

Data quality was acceptable and all data is usable.

c. Surrogates - Organics Only

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

No affected samples.

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

Comments:

Data quality was acceptable and all data is usable.

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

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

Yes No NA (Please explain.) Comments:

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

Yes No NA (Please explain.) Comments:

iii. All results less than PQL?

Yes No NA (Please explain.)

Comments:

iv. If above PQL, what samples are affected?

Comments:

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

Comments:

Data quality was acceptable and all data is usable.

e. Field Duplicate

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

Yes No NA (Please explain)

Comments:

Field duplicate pair for this SDG is DSA MW 06 and DSA MW 26.

ii. Submitted blind to lab?

Yes No NA (Please explain.)

Comments:

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

Yes No NA (Please explain)

Comments:

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

Yes No NA (Please explain)

Comments:

Data quality was acceptable and all data is usable.

f. Decontamination or Equipment Blank (if applicable)

Yes No NA (Please explain)

Comments:

No equipment blanks were submitted.

i. All results less than PQL?

Yes No NA (Please explain)

Comments:

N/A

ii. If above PQL, what samples are affected?

Comments:

N/A

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

Comments:

N/A

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

a. Defined and appropriate?

Yes No NA (Please explain)

Comments:

Reset Form

APPENDIX B

Table 3 – Validated Sample Results Form

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
BLO MW 05	280-90312-1	280-90312-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	ETHYLBENZENE	0.16	1.0	0.16	UG/L	J	J	TR
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0.23	1.0	0.20	UG/L	J	J	TR
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TOLUENE	0.19	1.0	0.17	UG/L	J	J	TR
BLO MW 05	280-90312-1	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	SW6010C	IRON	590	100	22	UG/L			
BLO MW 05	280-90312-1	280-90312-1	SW6010C	MANGANESE	13	10	0.25	UG/L			
BLO MW 05	280-90312-1	280-90312-1	AK101	PETROLEUM HYDROCARBONS C6-C10	0	0.025	0.0049	UG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.044	0.26	0.034	MG/L	J M	J	TR
BLO MW 05	280-90312-1	280-90312-1	AK102	RESIDUAL RANGE ORGANICS	0	0.52	0.058	MG/L	U M	U	
BLO MW 05	280-90312-1	280-90312-1	E300	SULFATE (AS SO4)	1.9	5.0	0.23	MG/L	J	B	TR,LBM
BLO MW 05	280-90312-1	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0	1.0	0.18	MG/L	U	U	
BLO MW 05	280-90312-1	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0.33	0.10	0.019	MG/L			
BLO MW 05	280-90312-1	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	64	5.0	1.1	MG/L			
BLO MW 05	280-90312-1	280-90312-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.33	0.10	0.10	MG/L			
DSA MW 06	280-90312-4	280-90312-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	SW6010C	IRON	2500	100	22	UG/L			
DSA MW 06	280-90312-4	280-90312-1	SW6010C	MANGANESE	400	10	0.25	UG/L			

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW 06	280-90312-4	280-90312-1	E300	SULFATE (AS SO4)	4.4	5.0	0.23	MG/L	J	J	TR
DSA MW 06	280-90312-4	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.54	1.0	0.18	MG/L	J	J	TR
DSA MW 06	280-90312-4	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.10	0.019	MG/L	U	U	
DSA MW 06	280-90312-4	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	66	5.0	1.1	MG/L			
DSA MW 06	280-90312-4	280-90312-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.54	0.10	0.10	MG/L			
DSA MW 07	280-90312-2	280-90312-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.2	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	VINYL CHLORIDE	0	1.5	1.0	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
DSA MW 07	280-90312-2	280-90312-1	SW6010C	IRON	1500	100	22	UG/L			
DSA MW 07	280-90312-2	280-90312-1	SW6010C	MANGANESE	26	10	0.25	UG/L			
DSA MW 07	280-90312-2	280-90312-1	E300	SULFATE (AS SO4)	4.1	5.0	0.23	MG/L	J	B	TR,LBM
DSA MW 07	280-90312-2	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.39	1.0	0.18	MG/L	J	J	TR
DSA MW 07	280-90312-2	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0.093	0.10	0.019	MG/L	J	J	TR
DSA MW 07	280-90312-2	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	93	5.0	1.1	MG/L	B		
DSA MW 07	280-90312-2	280-90312-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS,CALCULATED	0.48	0.10	0.10	MG/L			
DSA MW 26	280-90312-3	280-90312-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW 26	280-90312-3	280-90312-1	SW6010C	IRON	2700	100	22	UG/L			
DSA MW 26	280-90312-3	280-90312-1	SW6010C	MANGANESE	420	10	0.25	UG/L			
DSA MW 26	280-90312-3	280-90312-1	E300	SULFATE (AS SO4)	4.4	5.0	0.23	MG/L	J	J	TR
DSA MW 26	280-90312-3	280-90312-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0.45	1.0	0.18	MG/L	J	J	TR
DSA MW 26	280-90312-3	280-90312-1	E353.2	NITROGEN, NITRATE-NITRITE	0	0.10	0.019	MG/L	U	U	
DSA MW 26	280-90312-3	280-90312-1	A2320B	ALKALINITY, TOTAL (AS CaCO3)	67	5.0	1.1	MG/L			
DSA MW 26	280-90312-3	280-90312-1	TOTAL NITROGEN, ALL FORMS, CALCULATED		0.45	0.10	0.10	MG/L			
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	CIS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TRANS-1,2-DICHLOROETHYLENE	0	1.0	0.15	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TETRACHLOROETHYLENE(PCE)	0	1.0	0.20	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	TRICHLOROETHYLENE (TCE)	0	1.0	0.16	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	XYLENES, TOTAL	0	2.0	0.19	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
TB PH 016-02	280-90312-5	280-90312-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	

Notes:

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

MDL = method detection limit

MG/L = milligrams per liter

RL = reporting limit

SDG = sample delivery group

UG/L = micrograms per liter

Methods:

AK101 = Alaska Department of Environmental Conservation Method 101,

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

E300.0 = Environmental Protection Agency Method 300.0

E351.2 = Environmental Protection Agency Method 351.2

E353.2 = Environmental Protection Agency Method 353.2

SM2320B = Standard Method 2320B

SW8260B = Solid Waste Method 8260B

PORT HEIDEN RRS

LABORATORY SDG: 280-90312-1

TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOD	LOQ	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
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Qualifiers:

B = The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).

J = The analyte was positively identified, but the associated result was less than the limit of quantitation but greater than or equal to the MDL.

U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.

Validation Reason Codes:

LBM = laboratory blank contamination less than the reporting limit

TR = result between the MDL and RL



Versar, Inc.

Data Review Report

Data Verification / Validation

for:

Port Heiden Radio Station
Port Heiden, Alaska

March 9, 2017

Sample Delivery Group:
280-89767-1 and 280-90005-1
Laboratory Name:
TestAmerica Laboratories

Data Assessment Report

The data assessment is a systematic process for reviewing data against a predefined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and handling procedures affect the usability of the analytical data. Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The data acceptance criteria are established according to Standard Operating Procedures (SOPs) and/or Statements of Work (SOWs) provided to the contracted analytical laboratory or the United States Environmental Protection Agency (USEPA) guidance documents (e.g., SW-846). The assessment of data quality and usability involves four components, as described below:

- 1) **Data Verification** – is a process for determining completeness, correctness, consistency, and compliance of a data package in accordance with requirements contained in the SOW and/or contract-specific requirements. This is a review of the data package, electronic data deliverable (EDD), and invoice received from the contract laboratory to insure that the contract required information is present and complete prior to data validation.
- 2) **Data Review** – is a process of reviewing the primary quality control (QC) data provided by the laboratory and the results of any internal quality assurance (QA)/QC samples, such as field, trip, equipment, or ambient blanks, and/or field split samples and duplicate samples, to ascertain any effect on the analytical data based on laboratory procedures or sample collection activities.
- 3) **Data Evaluation** – is a process to determine if the data meets project-specific DQOs and contract requirements. The evaluation may involve a review of field sampling and sample management procedures, laboratory audits, performance evaluation sample results, and any other data quality indicators that are available.
- 4) **Data Validation** – is a process to determine the accuracy and precision of the analytical data generated and to identify any anomalies encountered. The validation process is performed in accordance with guidelines defined by the client. Typically, one or more of the following are utilized: USEPA regional or nation functional guidelines, project-specific guidelines (e.g., SOW/Quality Assurance Project Plan [QAPP]). Two major components of data validation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance for each analytical method to determine if the samples were analyzed within the prescribed acceptance criteria of the method. Evaluation of matrix interferences involves the analysis of surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Data not meeting project-specific DQOs or the requirements of the analytical method are identified and qualified in accordance with the project criteria requested by the client.

Data Validation Procedures

Analytical Data Verification and Validation Levels

- Level One (I) – validation based ONLY on completeness and compliance checks of sample receipt conditions.
- Level Two (II) – validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results.
- Level Two (b) (IIb) – validation based on completeness and compliance checks of sample receipt conditions and BOTH sample- and instrument-related QC results.
- Level Three (III) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, AND recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms.
- Level Four (IV) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms, AND the review of actual instrument outputs/raw data.

The steps and guidelines followed during the data verification and validation process are modeled on the USEPA's *National Functional Guidelines for Superfund Organic Methods Data Review (September 2016)*, the *National Functional Guidelines for Inorganic Superfund Methods Data Review (September 2016)*, the Department of Defense (DOD) Quality System Manual (QSM) Version 5.0 (July 2013), and the project-specific criteria QAPP, *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Alaska (April 2017)*. The method-specific criteria set forth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste (SW-846)* are also evaluated during the validation process.

References used for Data Verification/Validation for this Report

Draft United States Air Force 611th Air Support Group 611th Civil Engineer Squadron, Joint Base Elmendorf-Richardson, Alaska, Groundwater Monitoring 2016 and 2017 Work Plan, Former Radio Relay Station, Port Heiden Alaska, August 2016.

Department of Defense (DOD) Quality Systems Manual (QSM) Version 5.0, July 2013.

Data Verification Results

Receipt

A total of **thirteen (13)** samples, collected by APC Services, LLC were submitted for analysis to TestAmerica Denver in Arvada, Colorado. The thirteen (13) samples included one (1) trip blank (TB), eleven (11) normal environmental samples, and one (1) field duplicate (FD) sample; no equipment blanks were submitted. The samples are reported in Sample Delivery Groups (SDGs) **280-89767-1** and **280-90005-1**. Data analyzed by methods SW8260B, AK101, and AK102/AK103 are verified to Level IV according to the data validation procedures outline. Natural attenuation parameters analyzed by methods SW6010C, SM2320B, E300.0, and E353.2 were verified to Level IIb according to the data validation procedures outline. The discussion below applies to these samples, shown in Table 1, which were collected from 10/15/16 through 10/22/16 at the Former Port Heiden Radio Relay Station (RRS) during the 2016 Annual Long-term Monitoring Event.

TABLE 1
SAMPLE SUMMARY TABLE

Field Sample ID	Lab Sample ID	Matrix	Method	Collection Date	Collection Time
SDG 280-89767-1					
FPC 066-MW-07	280-89767-1	WG	AK102 (DRO)	10/15/2016	15:30
FPC 066-MW-06	280-89767-2	WG	AK102 (DRO)	10/15/2016	17:50
FPC 066-MW-04	280-89767-3	WG	AK102 (DRO)	10/16/2016	12:55
FPC 066-MW-05	280-89767-4	WG	AK102 (DRO)	10/16/2016	18:45
FPC 215-MW08	280-89767-5	WG	AK102 (DRO)	10/17/2016	16:55
SDG 280-90005-1					
DSA MW 02	280-90005-1	WG	SW8260B (VOCs), AK101 (GRO) AK102/AK103 (DRO & RRO) SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/19/2016	17:45
DSA MW 04	280-90005-2	WG	SW8260B (VOCs), AK101 (GRO) AK102/AK103 (DRO & RRO) SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/19/2016	14:30
FPC MW 28	280-90005-3	WG	AK102 (DRO)	10/17/2016	17:30
RRS MW 02	280-90005-4	WG	SW8260B (VOCs), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/18/2016	13:00

Field Sample ID	Lab Sample ID	Matrix	Method	Collection Date	Collection Time
BLO MW 07	280-90005-5	WG	SW8260B (VOCs), AK101 (GRO) AK102/AK103 (DRO & RRO) SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/22/2016	13:30
BLO MW 06	280-90005-6	WG	SW8260B (VOCs), AK101 (GRO) AK102/AK103 (DRO & RRO) SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/21/2016	14:00
BLO MW 26	280-90005-7	WG	8260B (VOCs), AK101 (GRO) AK102/AK103 (DRO & RRO) SW6010C (Manganese & Iron), SM2320B (Alkalinity), E300.0 (Sulfate), E351.2 (Kjeldahl Nitrogen), E353.2 (Nitrate-Nitrite), Total Nitrogen (Nitrogen)	10/22/2016	17:00
TB PH016-01	280-90005-8	WQ	8260B (VOCs)	10/18/2016	13:00

DRO = diesel range organics; GRO = gasoline range organics; RRO = residual range organics; SDG = sample delivery group; VOC = volatile organic compound; WG = groundwater; WQ = water quality

AK101 = Alaska Department of Environmental Conservation Method 101; AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103; E300.0 = Environmental Protection Agency Method 300.0; E353.2 = Environmental Protection Agency Method 353.2; SM2320B = Standard Method 2320B; SW8260B = Solid Waste Method 8260B

The chain-of-custody (COC) record(s) from the field to the laboratory were incomplete for SDG 280-90005-1; diesel range organics (DRO) was not initially logged for samples DSA MW 02, DSA MW 04, BLO MW 07, BLO MW 06, and BLO MW 26. Client requested to add DRO to those samples. The custody was maintained as evidenced by field and laboratory signatures, dates, and times of receipt. All requested analyses are accounted for in the data report.

The laboratory logged the collection date/time of TB PH016-01 equivalent to the earliest collected field sample listed on the COC per standard laboratory practice. The COC logged the TB as collected on 9/9/2016 with no collection time. This report identifies the date/time as logged by the laboratory and considers holding times for this sample based on this time.

There is no indication of issues associated with the sample(s) receipt, and/or condition of the sample(s), affecting the quality of the data.

The Laboratory Data Review Checklist is a summary of the Data Review findings and can be found in **Appendix A**. Detailed findings are provided in this Data Review report.

SDG 280-89767-1

Method: AK102 Diesel Range Organics (DRO)

1) **Holding Times**

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) **Analysis**

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for STD 280-338458/4-10 and ICV 280-338458/11.
 - ii. **Continuing** – All acceptance criteria were met for CCVRT 280-349408/3, CCV 280 349408/15 & 27, CCVRT 349781/4, and CCV 280-349781/44 & 55.
- b. **Method Blank:** All acceptance criteria were met except as noted.
Method blank MB 280-348710/1-A contained DRO above the method detection limit (MDL) but below the reporting limit (RL).
 - Associated samples FPC 066-MW-06, FPC 066-MW-07, and FPC 215-MW08 had detections less than five times the concentration in the blank and were flagged “B”.
 - Associated sample FPC 066-MW-04 had a detection less than five times the concentration in the blank and was flagged “B”.
 - Associated samples, FPC 066-MW-05 had a detection in excess of five times the concentration in the blank; no flag was applied.
- c. **Surrogates:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **Laboratory Control Spikes (LCSs) and Laboratory Control Spike Duplicates (LCSDs)** – All acceptance criteria were met for LCS 280-348710/2-A and LCSD 280-348710/3-A.
 - ii. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – No MS/MSD was associated with this method. Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/ MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. There is not enough information to evaluate matrix impact on precision or accuracy of the laboratory measurements. Uncertainty of results is increased.
- e. **Duplicates:**
 - i. **Field duplicates** – FPC-215-MW08 field duplicate for FPC MW 28 was submitted on a separate COC (see SDG 280-90005-1). All acceptance criteria were met except as noted.
FPC MW 28 was above acceptance criteria for relative percent difference (RPD).
 - Associated samples FPC-215-MW08 and FPC MW 28 had detections and were flagged “J”.
 - ii. **Lab duplicates** – No lab duplicates were associated with this method.
- f. **Samples:** Overall, all acceptance criteria were met, except as noted.

3) **Additional Comments**

None

SDG 280-90005-1

Method: SW846 8260B Volatile Organic Compounds (VOCs)

4) **Holding Times**

- a. **Sample Preparation:** All holding times were met.

b. **Sample Analysis:** All holding times were met.

5) **Analysis**

a. **Calibration:**

- i. **Initial** – All acceptance criteria were met for STD 280-347984/61-67, 280-348972/10-16, STD-349100/10-16 and STD 349100/19-24, 280-346952/18-23, 280-348924/10-14, and 280-349186/10-16.
- ii. **Continuing** – All acceptance criteria were met for ICV 280-347984/68, 280-348972/17, CCV 280-349125/2, CCV 280-349125/3, CCV 280-349125/20, ICV 349100/17, 280-349128/10, CCV 280-349190/2, CCV 280-349190/3, CCV 280-349190/33, ICV 280-346952/24, ICV 280-346952/15, 280-348924/2, 280-348924/3, 280-348924/34, and ICV 280-349186/17.

b. **Blanks:**

- i. **Method blanks** – All acceptance criteria were met for MB 280-349125/6, MB 280-349190/6, and MB 280-349324/6.
- ii. **Field blanks** – All acceptance criteria were met for trip blank TB PH 16-01.

c. **Surrogates:** All acceptance criteria were met except as noted.

Surrogate percent recovery was below acceptance criteria for 1-bromo-4-fluorobenzene (4-bromofluorobenzene). No analytes are associated with this surrogate for affected samples DSA MW 02, DSA MW 04, BLO MW 06, BLO MW 26. No flags were applied.

The MB had Toluene d-8 surrogate above acceptance criteria no associated compounds. No flags were required.

d. **Internal Standards:** All acceptance criteria were met.

e. **Spikes:**

- i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-349125/4, LCS 280-349190/4, and LCS 280-349324/4.
- ii. **MS/MSD Samples** – No MS/MSD was performed for this method. The laboratory only received a total of five HCl preserved VOA vials for sample BLO MW 06. Insufficient sample volume was received to perform the requested MS/MSD analyses.

Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. There is not enough information to evaluate matrix impact on precision or accuracy of the laboratory measurements. Uncertainty of results is increased.

f. **Duplicates:**

- i. **Field duplicates** – All acceptance criteria were met for duplicate pair BLO MW 06 and BLO MW 26.
- ii. **Lab duplicates** – No lab duplicates are associated with this method.

g. **Samples:** Overall, all acceptance criteria were met except as noted.

6) **Additional Comments**

Several (DSA MW 04, BLO MW 06, BLO MW 07, TP PH016-01, DSA MW 02, and RRS MW 02) preserved vials for the requested 8260B VOCs analysis were received with a head space bubble greater than 6mm in diameter. Sufficient non-biased sample volume was received to perform the requested analyses. Analytical results were not impacted by improper preservation of several sample containers.

Method: AK101 Gasoline Range Organics (GRO)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for STD 280-348586/2-7.
 - ii. **Continuing** – All acceptance criteria were met for ICV 280-348586/8, CCV 280-348586/23, and CCV 280-348586/31.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-348586/9.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Surrogates:** All acceptance criteria were met except as noted.

Surrogate percent recovery for 1,1,1-trifluorotoluene was above acceptance criteria.

 - Associated samples DSA MW 02 and DSA MW 04 were non-detect; no flags were applied.
 - 4-Bromofluorobenzene was above the acceptance criteria in LCS 280-348586. No analytes were associated with this surrogate, so no flags were applied.
- d. **Internal Standards:** All acceptance criteria were met.
- e. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-348586/10 and LCSD 280-348586/11 except as noted.

LCSD 280-348586/11 was above acceptance criteria for relative percent difference (RPD) but within percent recovery acceptance criteria for GRO.

 - Associated samples DSA MW 02, DSA MW 04, BLO MW 07, BLO MW 06, and BLO WM 26 were non-detect and flagged “UJ”.
 - ii. **MS/MSD Samples** – All acceptance criteria were met for 280-90005-6 MS and 280-90005-6 MSD.
- f. **Duplicates:**
 - i. **Field duplicates** – All acceptance criteria were met for field duplicate pair BLO MW 06 and BLO MW 26.
 - ii. **Lab duplicates** – No lab duplicates were associated with this method.
- g. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

Several (BLO MW 06 and BLO MW 07) vials for the requested AK101 GRO analysis were received partially frozen with a head space bubble greater than six millimeters in diameter. Sufficient non-biased sample volume was received to perform the requested analyses.

No trip blank sample was submitted for gasoline range organics (GRO) analysis. Trip blanks are used to measure potential cross contamination or potential artifacts present that might cause false positive identifications in associated samples. The lack of trip blank evaluations does not have any impact on the groundwater samples found to be non-detect for GRO. Samples where GRO was detected may have been impacted by background contamination; it is possible that a high bias may exist in the case of the positive result reported for this sample. All samples submitted for GRO analysis were non-detect.

Method: AK102 & AK103 Diesel and Extended Range Organics (DRO & RRO)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met except as noted.
Sample BLO MW 07 reanalysis was completed outside the holding time.
 - Associated analytes DRO and RRO were non-detect and flagged "UJ."

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met and STD 280-338458/4-10, STD 280-338458/12-18, STD 280-351711/4-10, and STD 280-351711/12-18.
 - ii. **Continuing** – All acceptance criteria were met for ICV 280-338458/11, ICV 280-338458/19, CCVRT 280-349408/3, CCV 280-349408/4, CCV 280-349408/15, CCV 280-349408/16, CCV 280-349408/27, CCV 280-349408/28, CCVRT 280-349781/4, CCVRT 280-349781/44, CCVRT 280-349781/45, CCVRT 280-349781/55, CCVRT 280-349781/56, ICV 280-351711/11, ICV 280-351711/19, CCVRT 280-352276/4, 280-352507/4, CCV 280-32276/5, 280-352507/19, 280-352507/20, and 280-352507/34,35.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-348710/1-A and MB 280-349880/1-A, MB 280-352210/1-A except as noted.
MB 280-348710/1-A contained DRO above the RL.
 - Associated samples DSA MW 02, DSA MW 04, and FPC MW 28 had detections between the MDL and RL and was flagged "B."
 - iii. **Field blanks** – The field blank was not associated with this method.
- c. **Surrogates:** All acceptance criteria were met.
- d. **Internal Standards:** All acceptance criteria were met.
- e. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-348710/2-A, LCS 280-348710/4-A, LCSD 280-348710/3-A, LCSD 280-348710/5-A, LCS 280-349880/2-A, LCS 280-349880/4-A, LCSD 280-349880/3-A, LCSD 280-349880/5-A, LCS 280-352210/2-A, LCS 280-352210/5-A, LCSD 280-352210/3-A, and LCSD 280-352210/6-A except as noted.
Spike LCSD 280-348710/5-A was outside acceptance criteria for RPD but within percent recovery acceptance criteria for RRO.
 - Associated samples DSA MW02 and DSA MW04 were non-detect and flagged "UJ".
 - ii. **MS/MSD Samples** – All acceptance criteria were met for 280-90005-6 MS and 280-90005-6 MSD except as noted.
 - Per the Work Plan (WP), MS/MSD were required at one per batch (20 samples). The MS/ MSD analyses serve to demonstrate matrix specific precision and accuracy achieved during sample analysis. Since the MS/MSD met the minimum of 1 in 20 samples overall and were evaluated as an MS/MSD pair, sufficient information was provided to assess matrix related precision and accuracy and data usability.
- f. **Duplicates:**
 - i. **Field duplicates** – All acceptance criteria were met for field duplicate pair BLO MW 06 and BLO MW 26. FPC-215-MW08 and FPC MW 28 field duplicate pair is reported under SDG 280-89767, Method AK102 (DRO).

- ii. **Lab duplicates** – No lab duplicate was associated with this method.
- g. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

Samples DSA MW 02, DSA MW 04, and FPC MW 28 were spiked, surrogated with the addition of solvent and acid to start the extraction process to ensure analytical holding times were met. The extraction was performed in half gallon TCLP jars instead of Sep Funnel glassware z.

Method: SW846 6010C Manganese & Iron

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-350312/1-A.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-350312/2-A
 - ii. **MS/MSD Samples:** All acceptance criteria were met for 280-90005-6 MS and 280-90005-6 MSD. Note: MS/MSD does not have a minimum frequency in the WP for monitored natural attenuation (MNA) parameters.
- e. **Duplicates:**
 - i. **Field duplicates** – All acceptance criteria were met for BLO MW 06 and BLO MW 26 except as noted.
Field duplicate BLO MW26 was above acceptance criteria for RPD for iron.
 - Associated samples BLO MW 06 and BLO MW 26 had detections and were flagged “J”.
 - ii. **Lab duplicates** – No lab duplicates were associated with this method.
- f. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: SM 2320B Alkalinity

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**

- i. **Method blanks** – All acceptance criteria were met for MB 280-349179/31, MB 280-349355/57, MB 280-349636/5, and MB 280-349636/57 except as noted. MB 280-349179/31 contained total alkalinity above the MDL but below the RL.
 - Associated samples DSA MW 02 and DSA MW 04 had a detections in excess of five times the concentration in the blank; no flags were applied.MB 280-349355/57 contained total alkalinity above the MDL but below the RL.
 - Associated sample RRS MW 02 had a detection in excess of five times the concentration in the blank; no flags were applied.MB 280-349636/5 and MB 280-349636/57 contained total alkalinity above the MDL but below the RL.
 - Associated samples BLO WM 06, BLO MW 07, and BLO MW 26 had detections in excess of five times the concentration in the blank; no flags were applied.
- ii. **Field blanks** – The field blank was not associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-349179/30, LCS 280-349355/56, LCS 280-349636/4, and LCS 280-349636/56.
 - ii. **MS/MSD Samples** – No MS/MSD was associated with this method. MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- e. **Duplicates:**
 - i. **Field duplicates** – All acceptance criteria were met for field duplicate pairs BLO MW 06 and BLO MW 26.
 - ii. **Lab duplicates** – No lab duplicates were associated with this method.
- f. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: EPA 351.2 Kjeldahl Nitrogen

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-351107/2-A.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-351107/1-A.
 - ii. **MS/MSD Samples:** All acceptance criteria were met for 280-90005-1 MS and 280-90005-1 MSD. Note: MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- e. **Duplicates:**
 - i. **Field duplicates** – All acceptance criteria were met for field duplicate pair BLO MW 06 and BLO MW 26 except a noted.

BLO MW 26 was above acceptance criteria for RPD.

- Associated samples BLO MW 06 and BLO MW 26 had detections and were flagged "J".
- ii. **Lab duplicates** – No lab duplicates were associated with this method.
- f. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: MCAWW 300.0 Anions (Sulfate)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-351269/6.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-351269/4, LCSD 280-351269/5, and MRL 280-351269/3.
 - ii. **MS/MSD Samples:** All acceptance criteria were met for 280-90005-6 MS and 280-90005-6 MSD. Note: MS/MSD does not have a minimum frequency in the WP for monitored MNA parameters.
- e. **Duplicates:**
 - i. **Field duplicates** – All acceptance criteria were met for field duplicate pair BLO MW 06 and BLO MW 26.
 - ii. **Lab duplicates** – All acceptance criteria were met for lab duplicate 280-90005-6 DU.
- f. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: MCAWW 353.2 Nitrate-Nitrite

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-350322/67 and

- MB 280-350515/67 except as noted.
MB 280-350322/67 was above acceptance criteria for nitrate-nitrite.
- Associated samples BLO MW 06 was above the MDL but below the RL and was flagged “B.”
 - Associated sample BLO MW 26 had a detection that was less than five times the concentration found in the blank and was flagged “B”.
- ii. **Field blanks** – The field blank was not associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
- i. **LCSs and LCSDs** – All acceptance criteria were met for LCS 280-350322/66, MRL 280-350322/21, LCS 280-350515/66, and MRL 280-350515/21.
 - ii. **MS/MSD Samples** – All acceptance criteria were met for 280-90005-7 MS and 280-90005-7 MSD. Note: MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- e. **Duplicates:**
- i. **Field duplicates** – All acceptance criteria were met for field duplicate pair BLO MW 06 and BLO MW 26.
 - ii. **Lab duplicates** – No lab duplicates were associated with this method.
- f. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Method: Total Nitrogen

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met.
 - ii. **Continuing** – All acceptance criteria were met.
- b. **Blanks:**
 - i. **Method blanks** – All acceptance criteria were met for MB 280-351766/1.
 - ii. **Field blanks** – The field blank was not associated with this method.
- c. **Internal Standards:** All acceptance criteria were met.
- d. **Spikes:**
 - i. **LCSs and LCSDs** – No LCSs or LCSDs were associated with this method.
 - ii. **MS/MSD Samples** – No MS/MSDs were associated with this method. MS/MSD does not have a minimum frequency in the WP for MNA parameters.
- e. **Duplicates:**
 - i. **Field duplicates** – All acceptance criteria were met for field duplicate pair BLO MW 06 and BLO MW 26 except as noted.
Field duplicate BLO MW 26 was above acceptance criteria for RPD.
 - Associated samples BLO MW 06 and BLO MW 26 had detections and were flagged “J”.
 - ii. **Lab duplicates** – No lab duplicates were associated with this method.
- f. **Samples:** Overall, all acceptance criteria were met except as noted.

3) Additional Comments

None

Data Summary and Usability

Versar performed a Level IV validation review and assessment of laboratory procedures used in analyzing the associated analytical data. The guidelines were to verify the methodology requested on the COC and the reporting requirements as defined by the site-specific QAPP and the laboratory. The requested analytical methods were in compliance with the project-specific requirements noted.

Data Quality Indicators

- 1) Accuracy is evaluated by comparison of an analytical concentration to a known (true) value. Accuracy was monitored through the use of surrogate compounds in each sample, MS/MSD, and LCS analyses. Surrogates and MS/MSD provide a measure of the matrix effects on the analytical accuracy. LCS demonstrates accuracy of the method and the laboratory’s ability to meet the method criteria. Each QC element was evaluated. Overall, accuracy was acceptable.
- 2) Precision is defined as the agreement between duplicate results, and was assessed by comparing duplicate MS recoveries and laboratory replicates. A laboratory duplicate was analyzed with each analytical batch. Overall, precision was acceptable.
- 3) Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition (in this case, nature and extent of contamination). In terms of data quality, it is assumed that the sampling team followed approved SOPs for sample collection and handling, and it is assured that the laboratory followed approved SOPs for sample handling, preparation, and analysis. Overall, representativeness was acceptable.
- 4) Completeness is a measure of valid data compared with the amount of data that was expected to be obtained. The laboratory submitted all required deliverables; all requested analyses were performed, met required QC criteria (except where previously noted), and followed adequate corrective action processes. All anomalies were discussed in the subsequent pages. The data is 100 percent complete.

**TABLE 2
 COMPLETENESS SUMMARY TABLE**

Method	Matrix	Acceptable	Rejected	All Results
SDG 280-89767-1				
AK102	Water	5	0	5
SDG 280-90005-1				
SW8260C	Water	84	0	84
AK101	Water	5	0	5
AK102/103	Water	13	0	13
SW6010C	Water	10	0	10
SM2320B	Water	6	0	6
E300.0	Water	6	0	6
E351.2	Water	6	0	6
E353.2	Water	6	0	6
Total Nitrogen	Water	6	0	6
Sum of All Results		147	0	147

Percent Complete	100.00%		100%
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- 5) Comparability is a qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix, and analytical methods. It is assumed SOPs were used for sample collection and handling, common sample matrices were evaluated, and the proper methods were utilized. Additionally, precision and accuracy were demonstrated to be acceptable. Overall, this data set is comparable to others of acceptable data quality.

The following Validation Qualifiers are applied to the final data:

TABLE 3
VALIDATED SAMPLE RESULTS FORM

See **Appendix B**.

Summary

In terms of data quality, all data associated with SDG 280-89767-1 and 280-90005-1 met requested validation DQOs, except as noted in this report, and are therefore considered compliant and adequate for use.

List of Acronyms

COC	chain-of-custody
DOD	Department of Defense
DQO	Data Quality Objective
DRO	diesel range organics
EDD	electronic data deliverable
FD	field duplicate
GRO	gasoline range organics
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
PQL	practical quantitation limit
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RL	reporting limit
RPD	relative percent difference
RRO	residual range organics
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOC	semi-volatile organic compound
TB	trip blank
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WG	groundwater
WQ	water quality

Data Qualifier Reference Table

Qualifier	Description
no qualifier	Confirmed identification. The analyte was positively identified at the reported concentration. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated QC criteria.
+	The result is biased high.
-	The result is biased low.
B	The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).
E	The analyte was non-detect but the limit of LOD exceeded the project action limit.
J	The reported result is an estimated value.*
JL(+/-)	The result was an estimated value because the analyte failed recovery criteria in the LCS or LCSD sample or both. The result was either biased low because the LCS and LCSD recovery was less than the lower control limit, or the result was biased high because the recovery exceeded the upper control limit.
JM(+/-)	The result was an estimated value because the analyte failed recovery criteria in the MS or MSD sample, or both. The MS sample recoveries were only evaluated if the spike concentration exceeded the native sample concentration.
JS(+/-)	The result was an estimated value because at least one surrogate failed recovery criteria for that sample.
JH	The numerical result was considered an estimate because the analysis was performed at greater than the method holding time and less than twice the method holding time.
JI(+/-)	The numerical result was considered an estimate because the internal standard failed QC limits. The result was either biased low because the internal standard failed high or the result was biased high because the recovery failed low.
JP	The result was considered an estimated value because incorrect or inadequate preservation methods were used.
JC(+/-)	The result was an estimated value because the analyte failed recovery criteria in the CCV. The result was either biased low because the CCV recovery was less than the lower control limit or biased high because the recovery exceeded the upper control limit.
R	The result was rejected. A rejected result was not usable and therefore was deleted from the report.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.**
UJ	Values "U" and "J" combined.**

*The definition was changed from the WP to the standard data qualifiers definition listed in the DOD QSM 5.0, as the qualifiers in the WP did not account for data qualifiers for precision issues (e.g. MS/MSD and field duplicate issues).

** This qualifier was added to indicate non-detects, as no similar WP qualifier exists. The qualifier flag is as defined in the DOD QSM 5.0 standard data qualifiers.

Laboratory Data Qualifiers

Data qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory.

Qualification Code Reference Table

Qualifier	Description
ABG	BLANK: AMBIENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
ABL	BLANK: AMBIENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CBH	CALIBRATION: CONTINUING CALIBRATION BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
CBL	BLANK: CONTINUING CALIBRATION BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CCA	MISCELLANEOUS: COMPOUNDS WERE REPORTED COMBINED ON ONE COLUMN

Qualifier	Description
CCL	CALIBRATION: CONTINUING CALIBRATION RECOVERY LESS THAN THE LOWER CONTROL LIMIT
CF	CONFIRMATION: CONFIRMATION RESULT
CFD	CONFIRMATION: CONFIRMATION PRECISION EXCEEDED
CFHD	CONFIRMATION: CONFIRMATION RESULT RPD GREATER THAN THE UPPER CONTROL LIMIT
CLS	CALIBRATION: NO CALIBRATION ANALYZED IN THE ANALYTICAL BATCH
CRL	CALIBRATION: RESULT BELOW THE CALIBRATION RANGE
CRR	CALIBRATION: LAB R FLAG REMOVED - CALIBRATION RANGE EXCEEDED
CVES	CALIBRATION: CALIBRATION VERIFICATION ENDING STANDARD EXCEEDED %D CRITERIA
CVHL	CALIBRATION: CONTINUING CALIBRATION RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
D	DUPLICATES: DUPLICATE RUN
DL	DILUTION: DILUTION
DS	DILUTION: SERIAL DILUTION %D EXCEEDED CONTROL LIMIT
EBG	BLANK: EQUIPMENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
EBL	BLANK: EQUIPMENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
EMPC	MATRIX: ESTIMATED MAXIMUM POSSIBLE CONCENTRATION
EXC	MISCELLANEOUS: DATA NOT USED; ANOTHER VALUE IS APPROPRIATE OR DATA WAS NOT REQUESTED
FBG	BLANK: FIELD BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
FBL	BLANK: FIELD BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
FDD	DUPLICATES: FIELD DUPLICATE RPD CRITERIA EXCEEDED
HAHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HPHL	HOLDINGTIME: HOLDING TIME EXCEEDED
IC2	CALIBRATION: EXCEEDS RSD CRITERIA AND INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICD	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED
ICE	CALIBRATION: RESULT GREATER THAN LINEAR CALIBRATION RANGE
ICL	CALIBRATION: INITIAL CALIBRATION LOW STD. GREATER THAN THE REPORTING LIMIT
ICP	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED FOR CONFIRMATION COLUMN
ICR2	CALIBRATION: INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICS	CALIBRATION: INDUCTIVELY COUPLED PLASMA (ICP) INTERFERENCE CHECK SAMPLE (ICS) SOLUTIONS A AND B (ICSA/B) RECOVERIES ARE OUTSIDE CONTROL LIMITS
IRF	CALIBRATION: INITIAL CALIBRATION RELATIVE RESPONSE FACTOR BELOW THE LOWER CONTROL LIMIT
ISH	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE GREATER THAN THE UPPER CONTROL LIMIT
ISL	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE LESS THAN THE LOWER CONTROL LIMIT
IVD	CALIBRATION: EXCEEDS ICVS %D CRITERIA
IVS	CALIBRATION: INITIAL CALIBRATION VERIFICATION STANDARD WAS NOT ANALYZED
LBG	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE REPORTING LIMIT
LBL	BLANK: LABORATORY BLANK CONTAMINATION LESS THAN THE REPORTING LIMIT
LBM	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE METHOD DETECTION LIMIT
LCD	LABORATORYCONTROLSAMPLE: LCS RPD CRITERIA EXCEEDED
LCH	LABORATORYCONTROLSAMPLE: LCS RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
LCL	LABORATORYCONTROLSAMPLE: LCS RECOVERY LESS THAN THE LOWER CONTROL LIMIT
LCS	LABORATORYCONTROLSAMPLE: NO LCS IN THE ANALYTICAL BATCH
LDD	DUPLICATES: LAB DUPLICATE RPD CRITERIA EXCEEDED
LDH	LABORATORYCONTROLSAMPLE: LCSD RPD CRITERIA EXCEEDED

Qualifier	Description
LDS	LABORATORYCONTROLSAMPLE: LCSD NOT REQUIRED - NO FLAGS APPLIED
LRL	RL: RESULT LESS THAN THE REPORTING LIMIT
MIF	MATRIX: MATRIX INAPPROPRIATELY FLAGGED
MS	MATRIX: GLOBAL MATRIX SPIKE FLAGGING
MSD	MATRIX: MATRIX SPIKE RPD CRITERIA EXCEEDED
MSH	MATRIX: MATRIX SPIKE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
MSL	MATRIX: MATRIX SPIKE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
RE	RE-ANALYSIS: RE-EXTRACTION AND/OR REANALYSIS
RFJ	MISCELLANEOUS: LAB F FLAG REPLACED WITH J - FLAGGING NOT VALID
RFL	LABORATORYCONTROLSAMPLE: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RHT	HOLDINGTIME: LAB R FLAG REMOVED - HOLDING TIME EXCEEDED BY LESS THAN 24 HOURS
RIS	INTERNALSTANDARD: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON IS
RLM	RL: REPORTING LIMIT LESS THAN THE METHOD DETECTION LIMIT
RML	MATRIX: LAB M FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RMQ	MATRIX: LAB M FLAG REMOVED - MATRIX SPIKE/DUPLICATE NOT REQUESTED IN THIS ANALYTICAL BATCH
RPE	HOLDINGTIME: LAB R FLAG REMOVED - PE SAMPLE
RRA	BLANK: LAB B FLAG REMOVED - ANALYTE NOT DETECTED IN SAMPLE
RSG	SURROGATERECOVERY: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON SURROGATE
RSGQ	SURROGATERECOVERY: LAB R FLAG REMOVED - SURROGATE NOT MONITORED IN QAPP
RTO	CONFIRMATION: RESULT IS OUTSIDE THE METHOD SPECIFIED RETENTION TIME WINDOW
RXL	LABCONTROLLIMITS: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
SCN	SCREENING: SCREENING METHOD
SDH	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA GREATER THAN THE UPPER CONTROL LIMIT
SDL	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA LESS THAN THE LOWER CONTROL LIMIT
SGH	SURROGATERECOVERY: SURROGATE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SGL	SURROGATERECOVERY: SURROGATE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
SPRF	CALIBRATION: SPCC EXCEEDS RF > 0.300 CRITERIA
SVHL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SVLL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY LESS THAN THE LOWER CONTROL LIMIT
TB	BLANK: TRIP BLANK
TBG	BLANK: TRIP BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
TBL	BLANK: TRIP BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
TH	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF HIGH BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TH8	BLANK: TEMPERATURE BLANK > 8 DEGREES C
TIC	TENTATIVELYIDENTIFIEDCOMPOUND: TENTATIVELY IDENTIFIED COMPOUND
TL	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF LOW BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TR	RL: RESULT BETWEEN THE METHOD DETECTION LIMIT AND REPORTING LIMIT

APPENDIX A

Laboratory Data Review Checklist

Laboratory Data Review Checklist

Completed by:	Terence Chuhay		
Title:	Chemist	Date:	Jan 11, 2017
CS Report Name:	Job No.: 280-89767-1, Port Heiden, AK	Report Date:	Nov. 9, 2016
Consultant Firm:	Versar, Inc.		
Laboratory Name:	Test America	Laboratory Report Number:	280-89568-1
ADEC File Number:		ADEC RecKey Number:	

1. Laboratory

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

Yes No NA (Please explain.) Comments:

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

Yes No NA (Please explain) Comments:

2. Chain of Custody (COC)

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

Yes No NA (Please explain) Comments:

b. Correct analyses requested?

Yes No NA (Please explain) Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt ($4^{\circ} \pm 2^{\circ} \text{C}$)?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Comments:

Data review and verification did not identify any quality issues to affect usability of this data set.

4. Case Narrative

a. Present and understandable?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

c. Were all corrective actions documented?

Yes No NA (Please explain) Comments:

No issues or discrepancies were identified requiring Corrective Actions.

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

Comments:

Data is Usable.

5. Samples Results

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

Yes No NA (Please explain)

Comments:

b. All applicable holding times met?

Yes No NA (Please explain)

Comments:

c. All soils reported on a dry weight basis?

Yes No NA (Please explain)

Comments:

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

Yes No NA (Please explain)

Comments:

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

Comments:

Data quality is good and data is usable.

6. QC Samples

a. Method Blank

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

Yes No NA (Please explain)

Comments:

ii. All method blank results less than PQL?

Yes No NA (Please explain)

Comments:

iii. If above PQL, what samples are affected?

Comments:

Trace DRO detected in Method Blank well below PQL and just slightly above the Detection limit.

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

Yes No NA (Please explain) Comments:

Data is usable.

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

Data is usable.

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

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

No metals or other inorganic analyses required on this small sample set.

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Comments:

All %R and RPDs were within criteria for this SDG.

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

Yes No NA (Please explain) Comments:

No data flags needed for this SDG.

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

Data is usable.

c. Surrogates - Organics Only

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

All surrogate recoveries acceptable so, no data flags applied.

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

Comments:

Data usable.

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

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

Yes No NA (Please explain.) Comments:

AK102 does not require Trip Blanks

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

Yes No NA (Please explain.) Comments:

One cooler for this SDG.

iii. All results less than PQL?

Yes No NA (Please explain.)

Comments:

AK102 does not require Trip Blanks.

iv. If above PQL, what samples are affected?

Comments:

No Trip blanks.

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

Comments:

Data not affected.

e. Field Duplicate

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

Yes No NA (Please explain)

Comments:

Field duplicate was submitted on another COC. See SDG 280-90005-1.

ii. Submitted blind to lab?

Yes No NA (Please explain.)

Comments:

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

Yes No NA (Please explain)

Comments:

RPD above acceptance criteria for several methods. See Data Review for details.

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

Yes No NA (Please explain)

Comments:

Data is usable.

f. Decontamination or Equipment Blank (if applicable)

Yes No NA (Please explain)

Comments:

No equipment blank submitted.

i. All results less than PQL?

Yes No NA (Please explain)

Comments:

No equipment blank submitted.

ii. If above PQL, what samples are affected?

Comments:

No equipment blank submitted.

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

Comments:

Data usable.

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

a. Defined and appropriate?

Yes No NA (Please explain)

Comments:

M for manual integration of multiple peak DRO chromatographic scan.

Reset Form

Laboratory Data Review Checklist

Completed by:	Oscar Martinez		
Title:	Chemist	Date:	Feb 10, 2017
CS Report Name:	Job No.: 280-90005-1, Port Heiden, AK	Report Date:	Dec 8, 2016
Consultant Firm:	Versar, Inc.		
Laboratory Name:	TestAmerica - Denver	Laboratory Report Number:	280-90005-1
ADEC File Number:		ADEC RecKey Number:	

1. Laboratory

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

Yes No NA (Please explain.) Comments:

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

Yes No NA (Please explain) Comments:

2. Chain of Custody (COC)

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

Yes No NA (Please explain) Comments:

b. Correct analyses requested?

Yes No NA (Please explain) Comments:

COC was missing GRO request for some samples (See Data Review Report). Lab added GRO per client instruction.

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt ($4^{\circ} \pm 2^{\circ} \text{C}$)?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

Lab noted broken VOCs/GRO VOA vials and vials with headspace >6mm; enough unaffected vials remained to perform analysis except VOCs MS/MSD analysis.

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

Yes No NA (Please explain) Comments:

BLO MW 06 only contained 6 VOA vials for MS/MSD for VOCs and GRO analysis. Lab noted this was insufficient for MS/MSD analysis; no MS/MSD analysis was performed.

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

Comments:

Data is usable.

4. Case Narrative

a. Present and understandable?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

c. Were all corrective actions documented?

Yes No NA (Please explain) Comments:

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

Comments:

Data is usable.

5. Samples Results

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

Yes No NA (Please explain)

Comments:

COC was missing GRO request for some samples (See Data Review Report). Lab added GRO per client instruction.

b. All applicable holding times met?

Yes No NA (Please explain)

Comments:

Reanalysis for DRO/GRO was outside the holding time for method AK102/AK103. Associated samples were flagged "J".

c. All soils reported on a dry weight basis?

Yes No NA (Please explain)

Comments:

No soil samples.

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

Yes No NA (Please explain)

Comments:

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

Comments:

Data is usable.

6. QC Samples

a. Method Blank

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

Yes No NA (Please explain)

Comments:

ii. All method blank results less than PQL?

Yes No NA (Please explain)

Comments:

MB 280-348710/1-A, MB 280-349179/31, MB 280-349355/57, MB 280-349636/5 and MB 280-349636/57, and MB 280-350322/67 were above the PQL.

iii. If above PQL, what samples are affected?

Comments:

BLO MW 06, BLO MW 26 (Nitrate-Nitrite); BLO WM 06, BLO MW 07, and BLO MW 26, RRS MW 02, DSA MW 02 and DSA MW 04 (Alkalinity); and DSA MW 02, DSA, MW 04 and FPC MW 28 (DRO) were affected. See Data Review Report for details.

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

Yes No NA (Please explain)

Comments:

Flags added to associated samples as per the Data Review report.

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

Comments:

Data is usable.

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

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

Yes No NA (Please explain)

Comments:

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

Yes No NA (Please explain)

Comments:

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

Yes No NA (Please explain)

Comments:

LCSD 280-348586/11

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/DMSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No NA (Please explain)

Comments:

LCSD 280-348710/5-A

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

Comments:

DSA MW 02, DSA MW 04, BLO MW 07, BLO MW 06, and BLO WM 26 (GRO); DSA MW02 and DSA MW04 (RRO). See Data Review Report for details.

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

Yes No NA (Please explain) Comments:

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

Comments:

Data is usable.

c. Surrogates - Organics Only

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

1-bromo-4-fluorobenzene (4-bromofluorobenzene) and 1,1,1-trifluorotoluene

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

Yes No NA (Please explain) Comments:

Either no analytes were associated with that surrogate or sample was non-detect for associated analyte. See Data Review Report for details.

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

Comments:

Data is usable.

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

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

Yes No NA (Please explain.) Comments:

TB was only selected for VOCs analysis per the COC.

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

Yes No NA (Please explain.) Comments:

iii. All results less than PQL?

Yes No NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

N/A

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

Comments:

Data is usable.

e. Field Duplicate

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

Yes No NA (Please explain.) Comments:

ii. Submitted blind to lab?

Yes No NA (Please explain.) Comments:

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

Yes No NA (Please explain.) Comments:

FD sample BLO MW 26 was above RPD acceptance criteria.

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

Yes No NA (Please explain) Comments:

Data is usable.

f. Decontamination or Equipment Blank (if applicable)

Yes No NA (Please explain) Comments:

No equipment blank was submitted for analysis.

i. All results less than PQL?

Yes No NA (Please explain) Comments:

N/A

ii. If above PQL, what samples are affected?

Comments:

N/A

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

Comments:

N/A

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

a. Defined and appropriate?

Yes No NA (Please explain) Comments:

Reset Form

APPENDIX B

Table 3 – Validated Sample Results Form

PORT HEIDEN RRS

LABORATORY SDG: 280-89767-1

TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	Lab Method	Parameter Name	Report Result	LOQ	LOD	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
FPC 066-MW-04	280-89767-3	AK102	C10-C25 DIESEL RANGE ORGANICS	0.32	0.27	0.035	MG/L	M	B	LBL
FPC 066-MW-05	280-89767-4	AK102	C10-C25 DIESEL RANGE ORGANICS	2.4	0.25	0.033	MG/L	M		
FPC 066-MW-06	280-89767-2	AK102	C10-C25 DIESEL RANGE ORGANICS	0.063	0.26	0.033	MG/L	J M	B	TR,LBL
FPC 066-MW-07	280-89767-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.056	0.25	0.032	MG/L	J M	B	TR,LBL
FPC 215-MW08	280-89767-5	AK102	C10-C25 DIESEL RANGE ORGANICS	0.048	0.25	0.032	MG/L	J M	J B	TR,LBL,FDD

Notes:

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

SDG = sample delivery group

MDL = method detection limit

RL = reporting limit

MG/L = milligrams per liter

UG/L = micrograms per liter

Methods:

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

Qualifiers:

J = The analyte was positively identified, but the associated result was less than the limit of quantitation but greater than or equal to the MDL.

B = The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).

Validation Reason Codes:

LBL = lab blank less than the RL

TR = result between the MDL and RL

PORT HEIDEN RRS

LABORATORY SDG: 280-90005-1

TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	Lab Method	Parameter Name	Report Result	LOQ	LOD	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
BLO MW 06	280-90005-6	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	CIS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	TETRACHLOROETHENE	0	1.0	0.20	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	XYLENES	0	2.0	0.19	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.191	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
BLO MW 06	280-90005-6	SW8260B	TRICHLOROETHENE	0	1.0	0.16	UG/L	U	U	
BLO MW 06	280-90005-6	SW6010C	IRON	1300	100	22	UG/L		J	FDD
BLO MW 06	280-90005-6	SW6010C	MANGANESE	31	10	0.25	UG/L			
BLO MW 06	280-90005-6	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.025	0.0049	MG/L	UQ	UJ	LDH
BLO MW 06	280-90005-6	AK102	C10-C25 DIESEL RANGE ORGANICS	0	0.25	0.033	MG/L	UM	U	
BLO MW 06	280-90005-6	AK102	RESIDUAL RANGE ORGANICS	0	0.51	0.057	MG/L	UM	U	
BLO MW 06	280-90005-6	E351.2	NITROGEN, KJELDAHL, TOTAL	0.26	1.0	0.18	MG/L	J	J	FDD
BLO MW 06	280-90005-6	E353.2	NITROGEN, NITRATE-NITRITE	0.057	0.10	0.019	MG/L	J	J B	TR,LBM
BLO MW 06	280-90005-6	E300.0	SULFATE (AS SO4)	4.1	5.0	0.23	MG/L	J	J	TR
BLO MW 06	280-90005-6	SM2320B	ALKALINITY	53	5.0	1.1	MG/L			
BLO MW 06	280-90005-6	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.32	0.10	0.10	MG/L		J	FDD
BLO MW 07	280-90005-5	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	CIS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	TETRACHLOROETHENE	0.22	1.0	0.20	UG/L	J	J	TR
BLO MW 07	280-90005-5	SW8260B	TOLUENE	0.21	1.5	0.17	UG/L	J	J	TR
BLO MW 07	280-90005-5	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	XYLENES	0	2.0	0.19	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
BLO MW 07	280-90005-5	SW8260B	TRICHLOROETHENE	0	1.0	0.16	UG/L	U	U	
BLO MW 07	280-90005-5	SW6010C	IRON	1400	100	22	UG/L			
BLO MW 07	280-90005-5	SW6010C	MANGANESE	26	10	0.25	UG/L			
BLO MW 07	280-90005-5	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.025	0.0049	MG/L	UQ	UJ	LDH
BLO MW 07	280-90005-5	AK102	C10-C25 DIESEL RANGE ORGANICS	0	0.26	0.034	MG/L	UHM	UJ	HHL

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LABORATORY SDG: 280-90005-1

TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	Lab Method	Parameter Name	Report Result	LOQ	LOD	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
BLO MW 07	280-90005-5	AK102	RESIDUAL RANGE ORGANICS	0	0.52	0.058	MG/L	UHM	UJ	HHL
BLO MW 07	280-90005-5	E351.2	NITROGEN, KJELDAHL, TOTAL	0.19	1.0	0.18	MG/L	J	J	TR
BLO MW 07	280-90005-5	E353.2	NITROGEN, NITRATE-NITRITE	0.14	0.10	0.019	MG/L			
BLO MW 07	280-90005-5	E300.0	SULFATE (AS SO4)	3.8	5.0	0.23	MG/L	J	J	TR
BLO MW 07	280-90005-5	SM2320B	ALKALINITY	42	5.0	1.1	MG/L			
BLO MW 07	280-90005-5	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.33	0.10	0.10	MG/L			
BLO MW 26	280-90005-7	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	CIS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	TETRACHLOROETHENE	0	1.0	0.20	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	XYLENES	0	2.0	0.19	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
BLO MW 26	280-90005-7	SW8260B	TRICHLOROETHENE	0	1.0	0.16	UG/L	U	U	
BLO MW 26	280-90005-7	SW6010C	IRON	1700	100	22	UG/L		J	FDD
BLO MW 26	280-90005-7	SW6010C	MANGANESE	30	10	0.25	UG/L			
BLO MW 26	280-90005-7	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.025	0.0049	MG/L	UQ	UJ	LDH
BLO MW 26	280-90005-7	AK102	C10-C25 DIESEL RANGE ORGANICS	0	0.26	0.034	MG/L	UM	U	
BLO MW 26	280-90005-7	AK102	RESIDUAL RANGE ORGANICS	0	0.52	0.058	MG/L	UM	U	
BLO MW 26	280-90005-7	E351.2	NITROGEN, KJELDAHL, TOTAL	0.44	1.0	0.18	MG/L	J	J	FDD
BLO MW 26	280-90005-7	E353.2	NITROGEN, NITRATE-NITRITE	0.12	0.10	0.019	MG/L		B	LBM
BLO MW 26	280-90005-7	E300.0	SULFATE (AS SO4)	4.5	5.0	0.23	MG/L	J	J	TR
BLO MW 26	280-90005-7	SM2320B	ALKALINITY	48	5.0	1.1	MG/L			
BLO MW 26	280-90005-7	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.56	0.10	0.10	MG/L	J	J	FDD
DSA MW 02	280-90005-1	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	CIS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	TETRACHLOROETHENE	0	1.0	0.20	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	TOLUENE	0.17	1.0	0.17	UG/L	J	J	TR
DSA MW 02	280-90005-1	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	XYLENES	0	2.0	0.19	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	

PORT HEIDEN RRS

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TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	Lab Method	Parameter Name	Report Result	LOQ	LOD	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
DSA MW 02	280-90005-1	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
DSA MW 02	280-90005-1	SW8260B	TRICHLOROETHENE	380	10	1.6	UG/L			
DSA MW 02	280-90005-1	SW6010C	IRON	1900	100	22	UG/L			
DSA MW 02	280-90005-1	SW6010C	MANGANESE	32	10	0.25	UG/L			
DSA MW 02	280-90005-1	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.025	0.0049	MG/L	UQ	UJ	LDH
DSA MW 02	280-90005-1	AK102	C10-C25 DIESEL RANGE ORGANICS	0.07	0.26	0.033	MG/L	JM	J B	TR,LBM
DSA MW 02	280-90005-1	AK102	RESIDUAL RANGE ORGANICS	0	0.51	0.057	MG/L	UMQ	UJ	LCD
DSA MW 02	280-90005-1	E351.2	NITROGEN, KJELDAHL, TOTAL	0	1.0	0.18	MG/L	U	U	
DSA MW 02	280-90005-1	E353.2	NITROGEN, NITRATE-NITRITE	1.4	0.10	0.019	MG/L			
DSA MW 02	280-90005-1	E300.0	SULFATE (AS SO4)	9	5.0	0.23	MG/L			
DSA MW 02	280-90005-1	SM2320B	ALKALINITY	120	5.0	1.1	MG/L			
DSA MW 02	280-90005-1	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	1.4	0.10	0.10	MG/L			
DSA MW 04	280-90005-2	SW8260B	BENZENE	0	2.0	0.32	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	1,1-DICHLOROETHENE	0	2.0	0.28	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	CIS-1,2-DICHLOROETHENE	0	2.0	0.30	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	TRANS-1,2-DICHLOROETHENE	0	2.0	0.30	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	ETHYLBENZENE	0	2.0	0.32	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	TETRACHLOROETHENE	0	2.0	0.40	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	TOLUENE	0	2.0	0.34	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	VINYL CHLORIDE	0	3.0	0.20	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	XYLENES	0	4.0	0.38	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	2.0	0.38	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	4.0	0.68	UG/L	U	U	
DSA MW 04	280-90005-2	SW8260B	TRICHLOROETHENE	340	20	3.2	UG/L			
DSA MW 04	280-90005-2	SW6010C	IRON	5200	100	22	UG/L			
DSA MW 04	280-90005-2	SW6010C	MANGANESE	310	10	0.25	UG/L			
DSA MW 04	280-90005-2	AK101	C6-C10 GASOLINE RANGE ORGANICS	0	0.025	0.0049	MG/L	UQ	UJ	LDH
DSA MW 04	280-90005-2	AK102	C10-C25 DIESEL RANGE ORGANICS	0.082	0.28	0.035	MG/L	JM	J B	TR,LBM
DSA MW 04	280-90005-2	AK102	RESIDUAL RANGE ORGANICS	0	0.54	0.061	MG/L	UMQ	UJ	LCD
DSA MW 04	280-90005-2	E351.2	NITROGEN, KJELDAHL, TOTAL	0.51	1.0	0.18	MG/L	J	J	TR
DSA MW 04	280-90005-2	E353.2	NITROGEN, NITRATE-NITRITE	0	0.10	0.019	MG/L	U	U	
DSA MW 04	280-90005-2	E300.0	SULFATE (AS SO4)	8.8	5.0	0.23	MG/L			
DSA MW 04	280-90005-2	SM2320B	ALKALINITY	78	5.0	1.1	MG/L			
DSA MW 04	280-90005-2	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.51	0.10	0.10	MG/L			
FPC MW 28	280-90005-3	AK102	C10-C25 DIESEL RANGE ORGANICS	0.1	0.26	0.034	MG/L	JM	J B	TR,LBM,FDD
RRS MW 02	280-90005-4	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	

PORT HEIDEN RRS

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TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	Lab Method	Parameter Name	Report Result	LOQ	LOD	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
RRS MW 02	280-90005-4	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	CIS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	TETRACHLOROETHENE	0	1.0	0.20	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	VINYL CHLORIDE	0	1.0	0.16	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	XYLENES	0	1.5	0.10	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	2.0	0.19	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	1.0	0.19	UG/L	U	U	
RRS MW 02	280-90005-4	SW8260B	TRICHLOROETHENE	0	2.0	0.34	UG/L	U	U	
RRS MW 02	280-90005-4	E351.2	NITROGEN, KJELDAHL, TOTAL	0.32	1.0	0.18	MG/L	J	J	TR
RRS MW 02	280-90005-4	E353.2	NITROGEN, NITRATE-NITRITE	0.25	0.10	0.019	MG/L			
RRS MW 02	280-90005-4	E300.0	SULFATE (AS SO4)	4.1	5.0	0.23	MG/L	J	J	TR
RRS MW 02	280-90005-4	SM2320B	ALKALINITY	50	5.0	1.1	MG/L			
RRS MW 02	280-90005-4	TOTAL NITROGEN	TOTAL NITROGEN, ALL FORMS, CALCULATED	0.57	0.10	0.10	MG/L			
TB PH016-01	TB PH016-01	SW8260B	BENZENE	0	1.0	0.16	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	1,1-DICHLOROETHENE	0	1.0	0.14	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	CIS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	TRANS-1,2-DICHLOROETHENE	0	1.0	0.15	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	ETHYLBENZENE	0	1.0	0.16	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	TETRACHLOROETHENE	0	1.0	0.20	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	TOLUENE	0	1.0	0.17	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	VINYL CHLORIDE	0	1.5	0.10	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	XYLENES	0	2.0	0.19	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	0	1.0	0.19	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	0	2.0	0.34	UG/L	U	U	
TB PH016-01	TB PH016-01	SW8260B	TRICHLOROETHENE	0	1.0	0.16	UG/L	U	U	

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LABORATORY SDG: 280-90005-1

TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	Lab Method	Parameter Name	Report Result	LOQ	LOD	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
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Notes:

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

MDL = method detection limit

MG/L = milligrams per liter

RL = reporting limit

RPD = relative percent difference

SDG = sample delivery group

UG/L = micrograms per liter

Methods:

AK101 = Alaska Department of Environmental Conservation Method 101,

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103;

E300.0 = Environmental Protection Agency Method 300.0

E351.2 = Environmental Protection Agency Method 351.2

E353.2 = Environmental Protection Agency Method 353.2

SM2320B = Standard Method 2320B

SW8260B = Solid Waste Method 8260B

Qualifiers:

B = The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).

J = The analyte was positively identified, but the associated result was less than the limit of quantitation but greater than or equal to the MDL.

U = The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.

UJ = Values "U" and "J" combined.

Validation Reason Codes:

FDD = field duplicate exceeded the RPD

HHL = holding time exceeded

LBL = lab blank less than the RL

LBM = lab blank contamination above the MDL

LCD = lab control spike exceeded the RPD

LDH = lab control spike duplicate exceeded the RPD

TR = result between the MDL and RL



Versar, Inc.

Data Review Report

*Data Verification / **Validation***

for:

Former Port Heiden Radio Relay Station (RRS)
Port Heiden
Port Heiden, Alaska

March 9, 2017

Sample Delivery Group:

280-89568-1

Laboratory Name:

TestAmerica, Inc.

Data Assessment Report

The data assessment is a systematic process for reviewing data against a predefined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and handling procedures affect the usability of the analytical data. Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The data acceptance criteria are established according to Standard Operating Procedures (SOPs) and/or Statements of Work (SOWs) provided to the contracted analytical laboratory or the United States Environmental Protection Agency (USEPA) guidance documents (e.g., SW-846). The assessment of data quality and usability involves four components, as described below:

- 1) **Data Verification** – is a process for determining completeness, correctness, consistency, and compliance of a data package in accordance with requirements contained in the SOW and/or contract-specific requirements. This is a review of the data package, electronic data deliverable (EDD), and invoice received from the contract laboratory to insure that the contract required information is present and complete prior to data validation.
- 2) **Data Review** – is a process of reviewing the primary quality control (QC) data provided by the laboratory and the results of any internal quality assurance (QA)/QC samples, such as field, trip, equipment, or ambient blanks, and/or field split samples and duplicate samples, to ascertain any effect on the analytical data based on laboratory procedures or sample collection activities.
- 3) **Data Evaluation** – is a process to determine if the data meets project-specific DQOs and contract requirements. The evaluation may involve a review of field sampling and sample management procedures, laboratory audits, performance evaluation sample results, and any other data quality indicators that are available.
- 4) **Data Validation** – is a process to determine the accuracy and precision of the analytical data generated and to identify any anomalies encountered. The validation process is performed in accordance with guidelines defined by the client. Typically, one or more of the following are utilized: USEPA regional or nation functional guidelines, project-specific guidelines (e.g., SOW/Quality Assurance Project Plan [QAPP]). Two major components of data validation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance for each analytical method to determine if the samples were analyzed within the prescribed acceptance criteria of the method. Evaluation of matrix interferences involves the analysis of surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Data not meeting project-specific DQOs or the requirements of the analytical method are identified and qualified in accordance with the project criteria requested by the client.

Data Validation Procedures

Analytical Data Verification and Validation Levels

- Level One (I) – validation based ONLY on completeness and compliance checks of sample receipt conditions.
- Level Two (II) – validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results.
- Level Two (b) (IIb) – validation based on completeness and compliance checks of sample receipt conditions and BOTH sample- and instrument-related QC results.
- Level Three (III) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, AND recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms.
- Level Four (IV) – validation based on completeness and compliance checks of sample receipt conditions, both sample- and instrument-related QC results, recalculation of a representative portion of the QC checks/calibration based on the information provided in the summary forms, AND the review of actual instrument outputs/raw data.

The steps and guidelines followed during the data verification and validation process are modeled on the USEPA's *National Functional Guidelines for Superfund Organic Methods Data Review (September 2016)*, the *National Functional Guidelines for Inorganic Superfund Methods Data Review (September 2016)*, the Department of Defense (DOD) Quality System Manual (QSM) Version 5.0 (July 2013), and the project-specific criteria QAPP, *Groundwater Monitoring 2016 and 2017 Work Plan, Port Heiden Radio Relay Station, Alaska (April 2017)*. The method-specific criteria set forth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste (SW-846)* are also evaluated during the validation process.

References used for Data Verification/Validation for this Report

Draft United States Air Force 611th Air Support Group 611th Civil Engineer Squadron, Joint Base Elmendorf-Richardson, Alaska, *Groundwater Monitoring 2016 and 2017 Work Plan, Former Radio Relay Station, Port Heiden Alaska, August 2016*.

Department of Defense (DOD) Quality Systems Manual (QSM) Version 5.0, July 2013.

Data Verification Results

Receipt

A total of 2 samples, collected by APC Services, LLC. were submitted for analysis to Test America Laboratories, Inc. in Arvada, Colorado. The 2 samples were normal samples; no quality control (QC) samples were submitted. The samples are reported in Sample Delivery Group (SDG) **280-89568-1**, and the data are verified to Level IV according to the data validation procedures outline. The discussion below applies to these samples, shown in Table 1, which were collected on **10/5/2016** at the Former Port Heiden Radio Relay Station (RRS) during the 2016 Annual Long-term Monitoring Event..

TABLE 1
SAMPLE SUMMARY TABLE

Field Sample ID	Lab Sample ID	Matrix	Method	Collection Date	Collection Time
FPC-215-16SB01	280-89568-1	S	AK102/AK103 (DRO)	10/5/2016	14:50
FPC-215-16SB02	280-89568-2	S	AK102/AK103 (DRO)	10/5/2016	16:30

DRO = diesel range organics; S = Soil matrix

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103

The chain-of-custody (COC) record(s) from the field to the laboratory were complete, and custody was maintained as evidenced by field and laboratory signatures, dates, and times of receipt. All requested analyses are accounted for in the data report. There is no indication of issues associated with the sample(s) receipt, and/or condition of the sample(s), affecting the quality of the data.

The Laboratory Data Review Checklist is a summary of the Data Review findings and can be found in **Appendix A**. Detailed findings are provided in this Data Review report.

Method: AK102 Diesel Range Organics (DRO)

1) Holding Times

- a. **Sample Preparation:** All holding times were met.
- b. **Sample Analysis:** All holding times were met.

2) Analysis

- a. **Calibration:** All acceptance criteria were met.
 - i. **Initial** – All acceptance criteria were met for 280-338458/4-10 and ICV 280-338458/11.
 - ii. **Continuing** – All acceptance criteria were met for CCVRT 280-348778/3 and CCV 280-348778/32 and 45.
- b. **Method Blank:** All acceptance criteria were met for MB 280-347079/1A.
- c. **Spikes:**
 - d. **Laboratory Control Spikes (LCS) and Laboratory Control Spike Duplicates (LCSDs)** – All acceptance criteria were met for LCS 280-347079/2-A, LCSD 280-347079/3-A, LCS 280-347079/2-A, and LCSD 280-347079/3-A.
 - i. **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – All acceptance criteria were met for 280-89568-1 MS and 280-89568-1 MSD.

- e. **Duplicates:** No field duplicates were submitted with this data set and no lab duplicates were performed.
- f. **Samples:** Overall, all acceptance criteria were met, except as noted.

3) Additional Comments

Data Summary and Usability

Versar performed a Level IV validation review and assessment of laboratory procedures used in analyzing the associated analytical data. The guidelines were to verify the methodology requested on the COC and the reporting requirements as defined by the site-specific QAPP and the laboratory. The requested analytical methods were in compliance with the project-specific requirements noted.

Data Quality Indicators

- 1) Accuracy is evaluated by comparison of an analytical concentration to a known (true) value. Accuracy was monitored through the use of surrogate compounds in each sample, MS/MSD, and BS analyses. Surrogates and MS/MSD provide a measure of the matrix effects on the analytical accuracy. BS demonstrates accuracy of the method and the laboratory's ability to meet the method criteria. Each QC element was evaluated. Overall, accuracy was acceptable.
- 2) Precision is defined as the agreement between duplicate results, and was assessed by comparing duplicate MS recoveries, laboratory replicates, and field duplicate sample results. A laboratory duplicate was analyzed with each analytical batch. A field duplicate was not collected. Overall, precision was acceptable.
- 3) Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition (in this case, nature and extent of contamination). In terms of data quality, it is assumed that the sampling team followed approved SOPs for sample collection and handling, and it is assured that the laboratory followed approved SOPs for sample handling, preparation, and analysis. Overall, representativeness was acceptable.
- 4) Completeness is a measure of valid data compared with the amount of data that was expected to be obtained. The laboratory submitted all required deliverables; all requested analyses were performed and met required QC criteria. The data is 100.00 percent complete.

**TABLE 2
 COMPLETENESS SUMMARY TABLE**

Method	Matrix	Acceptable	Rejected	All Results
AK 102 & 103	Soil	4	0	4
Sum of All Results		4	0	
Percent Complete		100.00%		100.00%

- 5) Comparability is a qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix, and analytical methods. It is assumed SOPs were used for sample collection and handling, common sample matrices were evaluated, and the proper methods were utilized. Additionally, precision and accuracy

were demonstrated to be acceptable. Overall, this data set is comparable to others of acceptable data quality.

The following Validation Qualifiers are applied to the final data:

TABLE 3
VALIDATED SAMPLE RESULTS FORM

See **Appendix B**.

Summary

In terms of data quality, all data associated with SDG 280-89568-1 met requested validation DQOs, and are therefore considered compliant and adequate for use. Lab

List of Acronyms

COC	chain-of-custody
DOD	Department of Defense
DQO	Data Quality Objective
DRO	diesel range organics
EDD	electronic data deliverable
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
PBR	Performance-based Remediation
PQL	practical quantitation limit
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RL	reporting limit
RPD	relative percent difference
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SOW	Statement of Work
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency

Data Qualifier Reference Table

Qualifier	Description
no qualifier	Confirmed identification. The analyte was positively identified at the reported concentration. The reported concentration is within the calibrated range of the instrument and the result is not affected by any deficiencies in the associated QC criteria.
+	The result is biased high.
-	The result is biased low.
B	The analyte was detected in the method blank or the trip blank above the LOD, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).
E	The analyte was non-detect but the limit of LOD exceeded the project action limit.
J	The reported result is an estimated value.*
JL(+/-)	The result was an estimated value because the analyte failed recovery criteria in the LCS or LCSD sample or both. The result was either biased low because the LCS and LCSD recovery was less than the lower control limit, or the result was biased high because the recovery exceeded the upper control limit.
JM(+/-)	The result was an estimated value because the analyte failed recovery criteria in the MS or MSD sample, or both. The MS sample recoveries were only evaluated if the spike concentration exceeded the native sample concentration.
JS(+/-)	The result was an estimated value because at least one surrogate failed recovery criteria for that sample.
JH	The numerical result was considered an estimate because the analysis was performed at greater than the method holding time and less than twice the method holding time.
JI(+/-)	The numerical result was considered an estimate because the internal standard failed QC limits. The result was either biased low because the internal standard failed high or the result was biased high because the recovery failed low.
JP	The result was considered an estimated value because incorrect or inadequate preservation methods were used.
JC(+/-)	The result was an estimated value because the analyte failed recovery criteria in the CCV. The result was either biased low because the CCV recovery was less than the lower control limit or biased high because the recovery exceeded the upper control limit.
R	The result was rejected. A rejected result was not usable and therefore was deleted from the report.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.**
UJ	Values "U" and "J" combined.**

*The definition was changed from the WP to the standard data qualifiers definition listed in the DOD QSM 5.0, as the qualifiers in the WP did not account for data qualifiers for precision issues (e.g. MS/MSD and field duplicate issues).

** This qualifier was added to indicate non-detects, as no similar WP qualifier exists. The qualifier flag is as defined in the DOD QSM 5.0 standard data qualifiers.

Laboratory Data Qualifiers

Data qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory.

Qualification Code Reference Table

Qualifier	Description
ABG	BLANK: AMBIENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
ABL	BLANK: AMBIENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CBH	CALIBRATION: CONTINUING CALIBRATION BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
CBL	BLANK: CONTINUING CALIBRATION BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
CCA	MISCELLANEOUS: COMPOUNDS WERE REPORTED COMBINED ON ONE COLUMN

Qualifier	Description
CCL	CALIBRATION: CONTINUING CALIBRATION RECOVERY LESS THAN THE LOWER CONTROL LIMIT
CF	CONFIRMATION: CONFIRMATION RESULT
CFD	CONFIRMATION: CONFIRMATION PRECISION EXCEEDED
CFHD	CONFIRMATION: CONFIRMATION RESULT RPD GREATER THAN THE UPPER CONTROL LIMIT
CLS	CALIBRATION: NO CALIBRATION ANALYZED IN THE ANALYTICAL BATCH
CRL	CALIBRATION: RESULT BELOW THE CALIBRATION RANGE
CRR	CALIBRATION: LAB R FLAG REMOVED - CALIBRATION RANGE EXCEEDED
CVES	CALIBRATION: CALIBRATION VERIFICATION ENDING STANDARD EXCEEDED %D CRITERIA
CVHL	CALIBRATION: CONTINUING CALIBRATION RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
D	DUPLICATES: DUPLICATE RUN
DL	DILUTION: DILUTION
DS	DILUTION: SERIAL DILUTION %D EXCEEDED CONTROL LIMIT
EBG	BLANK: EQUIPMENT BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
EBL	BLANK: EQUIPMENT BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
EMPC	MATRIX: ESTIMATED MAXIMUM POSSIBLE CONCENTRATION
EXC	MISCELLANEOUS: DATA NOT USED; ANOTHER VALUE IS APPROPRIATE OR DATA WAS NOT REQUESTED
FBG	BLANK: FIELD BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
FBL	BLANK: FIELD BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
FDD	DUPLICATES: FIELD DUPLICATE RPD CRITERIA EXCEEDED
HAHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HHL	HOLDINGTIME: HOLDING TIME EXCEEDED
HPHL	HOLDINGTIME: HOLDING TIME EXCEEDED
IC2	CALIBRATION: EXCEEDS RSD CRITERIA AND INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICD	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED
ICE	CALIBRATION: RESULT GREATER THAN LINEAR CALIBRATION RANGE
ICL	CALIBRATION: INITIAL CALIBRATION LOW STD. GREATER THAN THE REPORTING LIMIT
ICP	CALIBRATION: INITIAL CALIBRATION RSD EXCEEDED FOR CONFIRMATION COLUMN
ICR2	CALIBRATION: INITIAL CALIBRATION EXCEEDED THE R2 FOR FIRST ORDER REGRESSION
ICS	CALIBRATION: INDUCTIVELY COUPLED PLASMA (ICP) INTERFERENCE CHECK SAMPLE (ICS) SOLUTIONS A AND B (ICSA/B) RECOVERIES ARE OUTSIDE CONTROL LIMITS
IRF	CALIBRATION: INITIAL CALIBRATION RELATIVE RESPONSE FACTOR BELOW THE LOWER CONTROL LIMIT
ISH	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE GREATER THAN THE UPPER CONTROL LIMIT
ISL	INTERNALSTANDARD: INTERNAL STANDARD RESPONSE LESS THAN THE LOWER CONTROL LIMIT
IVD	CALIBRATION: EXCEEDS ICVS %D CRITERIA
IVS	CALIBRATION: INITIAL CALIBRATION VERIFICATION STANDARD WAS NOT ANALYZED
LBG	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE REPORTING LIMIT
LBL	BLANK: LABORATORY BLANK CONTAMINATION LESS THAN THE REPORTING LIMIT
LBM	BLANK: LABORATORY BLANK CONTAMINATION GREATER THAN THE METHOD DETECTION LIMIT
LCD	LABORATORYCONTROLSAMPLE: LCS RPD CRITERIA EXCEEDED
LCH	LABORATORYCONTROLSAMPLE: LCS RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
LCL	LABORATORYCONTROLSAMPLE: LCS RECOVERY LESS THAN THE LOWER CONTROL LIMIT
LCS	LABORATORYCONTROLSAMPLE: NO LCS IN THE ANALYTICAL BATCH
LDD	DUPLICATES: LAB DUPLICATE RPD CRITERIA EXCEEDED
LDH	LABORATORYCONTROLSAMPLE: LCSD RPD CRITERIA EXCEEDED

Qualifier	Description
LDS	LABORATORYCONTROLSAMPLE: LCSD NOT REQUIRED - NO FLAGS APPLIED
LRL	RL: RESULT LESS THAN THE REPORTING LIMIT
MIF	MATRIX: MATRIX INAPPROPRIATELY FLAGGED
MS	MATRIX: GLOBAL MATRIX SPIKE FLAGGING
MSD	MATRIX: MATRIX SPIKE RPD CRITERIA EXCEEDED
MSH	MATRIX: MATRIX SPIKE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
MSL	MATRIX: MATRIX SPIKE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
RE	RE-ANALYSIS: RE-EXTRACTION AND/OR REANALYSIS
RFJ	MISCELLANEOUS: LAB F FLAG REPLACED WITH J - FLAGGING NOT VALID
RFL	LABORATORYCONTROLSAMPLE: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RHT	HOLDINGTIME: LAB R FLAG REMOVED - HOLDING TIME EXCEEDED BY LESS THAN 24 HOURS
RIS	INTERNALSTANDARD: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON IS
RLM	RL: REPORTING LIMIT LESS THAN THE METHOD DETECTION LIMIT
RML	MATRIX: LAB M FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
RMQ	MATRIX: LAB M FLAG REMOVED - MATRIX SPIKE/DUPLICATE NOT REQUESTED IN THIS ANALYTICAL BATCH
RPE	HOLDINGTIME: LAB R FLAG REMOVED - PE SAMPLE
RRA	BLANK: LAB B FLAG REMOVED - ANALYTE NOT DETECTED IN SAMPLE
RSG	SURROGATERECOVERY: LAB R FLAG REMOVED - REANALYSIS CONFIRMED MATRIX EFFECT ON SURROGATE
RSGQ	SURROGATERECOVERY: LAB R FLAG REMOVED - SURROGATE NOT MONITORED IN QAPP
RTO	CONFIRMATION: RESULT IS OUTSIDE THE METHOD SPECIFIED RETENTION TIME WINDOW
RXL	LABCONTROLLIMITS: LAB R FLAG REMOVED - RECOVERY WITHIN LAB CONTROL LIMITS
SCN	SCREENING: SCREENING METHOD
SDH	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA GREATER THAN THE UPPER CONTROL LIMIT
SDL	MATRIX: MATRIX SPIKE DUPLICATE RECOVERY CRITERIA LESS THAN THE LOWER CONTROL LIMIT
SGH	SURROGATERECOVERY: SURROGATE RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SGL	SURROGATERECOVERY: SURROGATE RECOVERY LESS THAN THE LOWER CONTROL LIMIT
SPRF	CALIBRATION: SPCC EXCEEDS RF > 0.300 CRITERIA
SVHL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY GREATER THAN THE UPPER CONTROL LIMIT
SVLL	CALIBRATION: SECOND SOURCE VERIFICATION STD. RECOVERY LESS THAN THE LOWER CONTROL LIMIT
TB	BLANK: TRIP BLANK
TBG	BLANK: TRIP BLANK CONCENTRATION GREATER THAN THE REPORTING LIMIT
TBL	BLANK: TRIP BLANK CONCENTRATION LESS THAN THE REPORTING LIMIT
TH	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF HIGH BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TH8	BLANK: TEMPERATURE BLANK > 8 DEGREES C
TIC	TENTATIVELYIDENTIFIEDCOMPOUND: TENTATIVELY IDENTIFIED COMPOUND
TL	THE CHROMATOGRAM OF THIS SAMPLE INDICATES THE PRESENCE OF LOW BOILING PETROLEUM HYDROCARBONS NOT CONSISTENT WITH THE QUALITATIVE STANDARDS EMPLOYED FOR THIS METHOD
TR	RL: RESULT BETWEEN THE METHOD DETECTION LIMIT AND REPORTING LIMIT

APPENDIX A

Laboratory Data Review Checklist

Laboratory Data Review Checklist

Completed by:	Terence Chuhay		
Title:	Chemist	Date:	Jan 10, 2017
CS Report Name:	Job No.: 280-89568-1, Port Heiden, AK	Report Date:	Nov. 8, 2016
Consultant Firm:	Versar, Inc.		
Laboratory Name:	Test America	Laboratory Report Number:	280-89568-1
ADEC File Number:		ADEC RecKey Number:	

1. Laboratory

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

Yes No NA (Please explain.) Comments:

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

Yes No NA (Please explain) Comments:

2. Chain of Custody (COC)

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

Yes No NA (Please explain) Comments:

b. Correct analyses requested?

Yes No NA (Please explain) Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt ($4^{\circ} \pm 2^{\circ} \text{C}$)?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Comments:

Data review and verification did not identify any quality issues to affect usability of this data set.

4. Case Narrative

a. Present and understandable?

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

c. Were all corrective actions documented?

Yes No NA (Please explain) Comments:

No issues or discrepancies were identified requiring Corrective Actions.

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

Comments:

Data is Usable.

5. Samples Results

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

Yes No NA (Please explain)

Comments:

b. All applicable holding times met?

Yes No NA (Please explain)

Comments:

c. All soils reported on a dry weight basis?

Yes No NA (Please explain)

Comments:

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

Yes No NA (Please explain)

Comments:

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

Comments:

Data quality is good and data is usable.

6. QC Samples

a. Method Blank

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

Yes No NA (Please explain)

Comments:

ii. All method blank results less than PQL?

Yes No NA (Please explain)

Comments:

iii. If above PQL, what samples are affected?

Comments:

No DRO detected in Method Blank.

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

Yes No NA (Please explain) Comments:

Sample data not affected by Method Blank.

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

No data quality or usability affected by Method Blanks

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

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

No metals or other inorganic analyses required on this small sample set.

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Comments:

All %R and RPDs were within criteria for this SDG.

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

Yes No NA (Please explain) Comments:

No data flags needed for this SDG.

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

Data is usable.

c. Surrogates - Organics Only

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

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

Yes No NA (Please explain) Comments:

All surrogate recoveries acceptable so, no data flags applied.

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

Comments:

Data usable.

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

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

Yes No NA (Please explain.) Comments:

AK102 and AK103 does not require Trip Blanks

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

Yes No NA (Please explain.) Comments:

One cooler for this SDG.

iii. All results less than PQL?

Yes No NA (Please explain.)

Comments:

AK102 and AK103 does not require Trip Blanks.

iv. If above PQL, what samples are affected?

Comments:

No Trip blanks.

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

Comments:

Data not affected.

e. Field Duplicate

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

Yes No NA (Please explain.)

Comments:

No duplicate collected for this 2 sample SDG.

ii. Submitted blind to lab?

Yes No NA (Please explain.)

Comments:

No duplicate collected for this 2 sample SDG.

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

Yes No NA (Please explain.)

Comments:

No duplicate for this 2 sample SDG.

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

Yes No NA (Please explain.)

Comments:

Surrogates, MS/MSD %R and RPDs were within criteria.

f. Decontamination or Equipment Blank (if applicable)

Yes No NA (Please explain)

Comments:

No equipment blank submitted.

i. All results less than PQL?

Yes No NA (Please explain)

Comments:

No equipment blank submitted.

ii. If above PQL, what samples are affected?

Comments:

No equipment blank submitted.

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

Comments:

Data usable.

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

a. Defined and appropriate?

Yes No NA (Please explain)

Comments:

M for manual integration of multiple peak DRO chromatographic scan.

Reset Form

APPENDIX B

Table 3 – Validated Sample Results Form

PORT HEIDEN RRS

LABORATORY SDG: 280-89568-1

TABLE 3 - VALIDATED SAMPLE RESULTS FORM

Field Sample ID	Lab Sample ID	SDG	Lab Method	Parameter Name	Report Result	LOQ	LOD	Units	Lab Qualifier	Validation Qualifier	Validation Reason Codes
FPC-215-16SB01	280-89568-1	280-89568-1	AK102	C10-C25 DIESEL RANGE ORGANICS	1.7	5.6	1.4	MG/KG	J M	J	TR
FPC-215-16SB02	280-89568-2	280-89568-1	AK102	C10-C25 DIESEL RANGE ORGANICS	2.6	5.3	1.3	MG/KG	J M	J	TR

Notes:

Reason codes are defined in the Qualificaion Code Reference Table at the end of the report.

Laboratory Data Qualifiers are laboratory-specific and are defined in the laboratory report provided by the laboratory

Acronyms:

MDL = method detection limit

MG/KG = milligrams per kilogram

RL = reporting limit

SDG = sample delivery group

Methods:

AK102/AK103 = Alaska Department of Environmental Conservation Method 102/103

Qualifiers:

J = The analyte was positively identified, but the associated result was less than the limit of quantitation but greater than or equal to the MDL.

Validation Reason Codes:

TR = result between the MDL and RL

**Attachment B-4
Laboratory Deliverables**

(Available separately on CD)

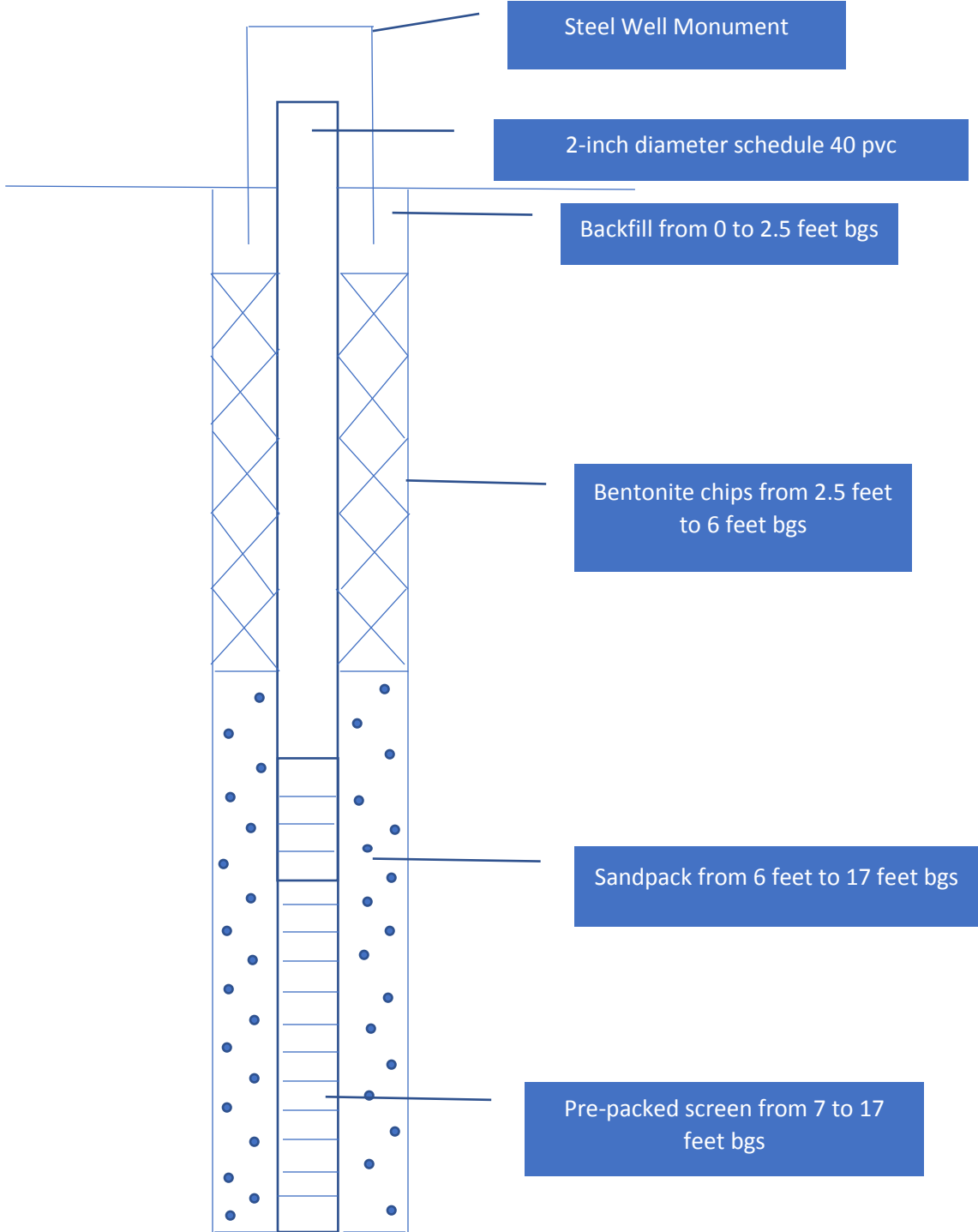
(intentionally blank)

Appendix C
Well Diagrams and Field Notes

**Attachment C-1
Well Diagram**

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Diagram 1. Well Details of 215-MW-11 and 215-MW-12



Attachment C-2 Boring Logs

Project: Port Heiden		Project Number: W911KB-C-15-0025		Client: USACE/USAF		Boring No. 215-16SB01				
Address, City, State Port Heiden, AK				Drilling Contractor: Discovery		Drill Rig Type: HSA Skid Mounted				
Logged By: Greg DuBois		Date	Started: 10/5/2016		Bit Type: HS		Diameter: 8-Inches			
Drill Crew: Gary and Tom			Completed 10/5/2016		Hammer Type: Manual		E 521900.01 N 6312871.91			
USA Ticket Number: NA			Backfilled: Well Installation		Hammer Weight: 340 lbs		Hammer Drop:			
				Groundwater Depth: 9 Feet		Elevation: Grnd-36.483 TOC-37.317		Total Depth of Boring: 17 Feet		
Depth (feet)	Sample Type	Sample locations	Recovery ft/ft	Soil Graphic Log	Lithology			Dry Density (pcf)	Moisture Content (%)	PID
					<p>Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors</p> <p>Rock Description: modifier color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.</p>					
5	SS	1.5/2	1.2/2	[Dotted Pattern]	Drilled to 5 feet prior to sampling					0.0
					Sand with Gravel (SP): 7.5YR 3/2 Dark Brown; Poorly graded sand with pumice. Dry; No Odor.					
10	SS	1.2/2	1.2/2	[Dotted Pattern]	As Above except moist at 7 feet and saturated at 9 feet At 7-9' Sample FPC215-16SB01				▽	0.0
					Boring Converted to well 215-MW-11 Screened interval from 7 to 17 feet bgs Above ground completion.					
15										
20										



- Standard Penetration Split Spoon Sampler (SPT)
- California Sampler
- Shelby Tube
- CPP Sampler
- Bulk/ Bag Sample

Boring Log: Sheet 1 of 1

- Stablized Ground water
- Groundwater At time of Drilling

Project: Port Heiden		Project Number: W911KB-C-15-0025		Client: USACE/USAF		Boring No. 215-16SB02				
Address, City, State Port Heiden, AK				Drilling Contractor: Discovery		Drill Rig Type: HSA Skid Mounted				
Logged By: Greg DuBois		Date	Started: 10/5/2016		Bit Type: HS		Diameter: 8-Inches			
Drill Crew: Gary and Tom			Completed 10/5/2016		Hammer Type: Manual		E 521918.96 N 6312830.37			
USA Ticket Number: NA			Backfilled: Well Installation		Hammer Weight: 340 lbs		Hammer Drop:			
			Groundwater Depth: 10		Elevation: Grnd -37.233 TOC - 37.975		Total Depth of Boring: 17 Feet			
Depth (feet)	Sample Type	Sample locations	Recovery ft/ft	Soil Graphic Log	Lithology			Dry Density (pcf)	Moisture Content (%)	PID
					Soil Group Name: modifier, color, moisture, density/consistency, grain size, other descriptors Rock Description: modifier color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.					
5	SS	1.0/2	1.0/2	[Dotted pattern]	Drilled to 5 feet prior to sampling					0.0
					Sand with Gravel (SP): 710YR YR 3/2 Dark Grayish ; Brown; 95% sand 5% gravel. Dry; No Odor.					
10	SS	1.0/2	1.0/2	[Dotted pattern]	Sand with Gravel (SP): 7.5YR 3/2 Dark Brown; transition to pumaceous soil. Dry. No odor.					0.0
					At 7-9' Sample FPC215-16SB02 As Above except saturated at 10 feet					
15				[Dotted pattern]	Boring Converted to well 215-MW-12					
					Screened interval from 7 to 17 feet bgs					
20				[Dotted pattern]	Above ground completion					



- Standard Penetration Split Spoon Sampler (SPT)
- California Sampler
- Shelby Tube
- CPP Sampler
- Bulk/ Bag Sample

Boring Log: Sheet 1 of 1

- Stablized Ground water
- Groundwater At time of Drilling

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**Attachment C-3
Well Monitoring Logs**

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WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/16/16 Well ID: FPC MW 20
FPC 066 MW 04
 Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation
 Samplers: Greg Dubois Cheryl Wassillie
 Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 2-12.5' bgs
 Depth to water (ft, ftop): (previous) _____ (current) 6.09 Stickup Height (ft, ags): _____
 WL meter: APCS GWL 2
 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/26/18	1025	6.91	6.8-7.2	—
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/26/18	1025	7559	7600-7970	—
ORP (mV)	240	YSI	16A2C	10/15/16	1/26/18	1025	244.6	229-267	—

Purge Start Time: 1127 Purge End Time: _____ Trip Blank: 222-252

Field Instrument Readings **Criteria for Stable Parameters:** pH ± 0.2 ; Temp $\pm 1.0^\circ\text{C}$; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1135	6.08	0.15	0.25	4.83	86.5	6.82	0.116	6.10	3.48
2	1140	6.08	0.15	0.50	4.87	90.6	6.40	0.115	5.73	2.70
3	1145	6.08	0.15	0.6	4.85	95.5	6.10	0.115	5.45	2.79
4	1150	6.08	0.10	0.75	4.87	96.3	5.99	0.119	5.11	2.59
5	1155	6.08	0.10	1.00	4.91	96.5	5.92	0.125	4.65	2.85
6	1200	6.08	0.10	1.10	5.31	75.1	6.24	0.128	4.46	2.52
7	1205	6.08	0.10	1.25	5.38	73.1	6.38	0.131	4.19	2.24
8	1210	6.09	0.10	1.4	5.24	82.9	6.38	0.134	4.01	2.21
9	1215	6.09	0.10	1.6	5.58	66.3	6.58	0.138	3.85	2.20
10	1220	6.09	0.10	1.75	5.59	67.6	6.61	0.141	3.59	1.89
11	1225	6.09	0.10	2.00	5.47	74.9	6.51	0.145	3.36	1.76
12	1230	6.09	0.10	2.20	5.59	69.0	6.71	0.147	3.23	1.84
13	1235	6.09	0.10	2.25+	5.60	69.5	6.76	0.150	3.07	1.51
14	1240	6.09	0.10	2.5	5.62	69.4	6.81	0.152	2.97	1.60
15	1245	6.09	0.10	2.7	5.62	70.1	6.82	0.154	2.89	1.38
16	1250	6.09	0.10	2.8	5.63	69.5	6.82	0.155	2.83	1.40

Field Parameters Stable: yes, no _____ Continued on Page 2: yes, no _____ Purged Dry: yes, (no) _____
 Total Actual Volume: 3.0 gal
 Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
FPC 066 MW04	✓	—	—

 = 2 x (_____ + _____)
 Sample Date/Time: 10/16/16 1255 Pump: bladder
 Sample Notes: Well in good condition.

Color: clear, amber, tan, brown, grey, milky white, other
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: none, low, medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

--	--	--	--	--	--	--	--

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	gal/ft casing	liters/ft casing	gal/ft casing	liters/ft casing
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. flop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17	1255	6.07	0.10	3.0	5.64	70.3	6.82	0.158	2.71	1.43
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1473	1173	1173	10/15/16	4/18	1178	1173	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/16/16 Well ID: FPC 066 MW-5

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Sheri Wassellio & Greg Dubois

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 2-12.5 bgs

Depth to water (ft, ftop): (previous) _____ (current) 7.78 Stickup Height (ft, ags): _____

WL meter: APCS GWL 2

Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F 101788

Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$ 20

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well 6.8-7.2									
pH	7	YSI	16A15	10/15/16	1/5/18	1430	7.04	$\pm 10\%$	—
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YI	YI	YI	YI	YI	7559	7630 7970	✓
ORP (mV)							244.6	222-252	

Purge Start Time: 1700 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1720	7.84	~0.1	0.5	6.02	20.0	6.44	0.159	2.10	12.3
2	1725	7.83	~0.1	0.7	5.91	21.6	6.41	0.159	1.27	10.8
3	1730	7.83	~0.1	0.8	6.02	5.4	6.44	0.159	0.82	10.7
4	1735	7.83	~0.1	0.9	6.13	-9.4	6.53	0.157	0.66	9.78
5	1740	7.83	~0.1	1.0	6.11	-14.3	6.51	0.157	0.69	9.22
6	1745	7.83	~0.1	1.1	6.13	-21.8	6.51	0.157	0.62	6.99
7	1750	7.83	~0.1	1.2	6.12	-26.2	6.51	0.157	0.60	5.81
8	1755	7.83	0.1	1.3	6.10	-32.6	6.10	0.157	0.58	4.13
9	1800	7.83	0.1	1.4	6.13	-38.2	6.37	0.156	0.51	3.39
10	1805	7.83	0.1	1.5	6.10	-39.9	6.52	0.155	0.45	3.39
11	1810	7.83	0.1	1.6	6.12	-44.1	6.46	0.155	0.48	3.12
12	1815	7.83	0.1	1.7	6.14	-47.1	6.13	0.154	0.48	2.74
13	1820	7.83	0.1	1.8	6.12	-47.6	6.39	0.153	0.45	2.82
14	1825	7.83	0.1	1.9	6.10	-47.8	6.34	0.153	0.45	2.82
15	1830	7.83	0.1	2.1	6.11	-49.9	6.26	0.154	0.45	2.49
16	1835	7.83	0.1	2.2	6.12	-51.9	6.29	0.153	0.44	2.48

Field Parameters Stable: yes, Continued on Page 2: yes, no Purged Dry: yes, no

Total Actual Volume: 2.25 gallons 20

Minimum Volume (use back of page): _____ Minimum-purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
FPC 066 MW-5	✓	—	—

 = 2 x (_____ + _____)

Sample Date/Time: 10/16/16 1845 Pump: Bladder

Sample Notes: Water has oily appearance. Did not notice odor while sampling but noticed odor after removing the pump. Had hole in bladder & so had to change bladder twice. Well in good condition

Color: clear amber, tan, brown, grey, milky white, other

Odor: none, low, medium high, very strong, hydrogen sulfide, petroleum chemical?, unknown

Turbidity: none, low medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

--	--	--	--	--	--	--	--

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.

Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(gal)	(gal)	(L)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37


	Time	WL (ft. top)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17	1840	7.83	0.1	2.25	6.13	-53.3	6.24	0.153	0.42	2.48
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1173	VW7	10/15/16	4/18	1178	1173	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/15/16 Well ID: FPC 066-MW06

Project: Port Heiden RRS Project # Port Heiden  APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Greg DuBois Sheryl Wassilline

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 2 → 12.5

Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) 4.38 WL meter: APCS GWL 2

Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	1639	6.8	6.8 → 7.2	—
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)	7950	YSI	16A2C	10/15/16	1/20/18	1639	7548	7600 → 7950	✓
ORP (mV)	253	YSI	"	"	"	"	262	238 → 260	

Purge Start Time: 1650 Purge End Time: _____ Trip Blank: 4.35

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% of 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1700	1650	4.35	0.45	0.8	4.65	171.4	6.52	0.101	8.08	10.40
1705	1700	4.36	0.25	1.0	4.57	173.8	6.49	0.108	7.31	7.45
	1710	4.36	0.45	1.25	4.76	163.4	6.47	0.118	6.78	5.97
	1715	4.35	0.25	1.50	5.01	151.6	6.44	0.132	6.13	4.22
	1720	4.35	0.45	1.8	5.16	143.8	6.42	0.140	5.70	3.85
	1725	4.35	0.15	2.0	5.23	139.1	6.41	0.145	5.44	3.32
	1730	4.35	0.15	2.25	5.30	134.6	6.38	0.150	5.15	3.05
	1735	4.35	0.15	2.40	5.36	130.8	6.37	0.153	5.00	2.81
	1740	4.35	0.15	2.60	5.40	128.3	6.36	0.155	4.88	2.65
	1745	4.35	0.15	2.80	5.44	125.5	6.35	0.158	4.77	2.62
	11									
	12									
	13									
	14									
	15									
	16									

Field Parameters Stable: yes no Continued on Page 2: yes no Purged Dry: yes no no

Total Actual Volume: 2.80 Minimum Volume (use back of page): _____ Minimum-purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
	✓	—	—

 = 2 x (_____ + _____)

Sample Date/Time: 10/15/16 1750 Pump: bladder

Sample Notes: clear. no odor. Well in good condition

Color: clear amber, tan, brown, grey, milky white, other

Odor: none low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown

Turbidity: none low, medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

--	--	--	--	--	--	--	--

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (Inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.

Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(ft)	(gal)	(gal)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. top)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1020		UW9	10/15/16	4/9/8	1016	1020	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/15/16 Well ID: FPC 066-MW-7

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg Durbin & Cheryl Wassilie

Depth of pump (ft, from top of port): NA Screened Interval (ft, bgs): 2.5 - 12.5
 Depth to water (ft, ftop): (previous) — Stickup Height (ft, ags): —
 (current) 5.24 WL meter: APCS GWL-2
 Filter Lot Number: NA

Field Meter Check YSI Manufacturer and Meter #: 07F 181788
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI		10/15/16	1/26/18	1200	7.28	6.8-7.2	✓ 7.0
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)	1799	YSI	16A2C	10/15/16	1/26/18	1200	7494	7630- 7970	✓
ORP (mV)	237	YSI	16A2C	10/15/16	1/26/18	1200	232	222-252	—

See page 2

7970

Purge Start Time: 1407 Purge End Time: — Trip Blank: —

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp $\pm 1.0^\circ\text{C}$; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO % (mg/L)	Turbidity
1	1411	5.25	0.25	0.25	4.07	145.5	6.54	0.137	90.6%	7.10
2	1423	5.25	~0.25	0.5	3.11	198.4	6.21	0.141	73.7%	6.36
3	1428	5.25	0.25	0.7	3.21	169.4	6.10	0.171	62.6%	5.56
4	1433	5.25	~0.25	1.0	3.43	181.6	6.09	0.190	54.6%/6.76	4.52
5	1438	5.25	~0.25	1.25	3.72	167.2	6.08	0.203	49.1/6.09	3.68
6	1443	5.25	~0.25	~1.45	3.91	157.2	6.02	0.218	44.8/5.56	3.92
7	1448	5.25	0.25	1.5	4.03	152.2	5.98	0.214	43.0/5.44	2.91
8	1453	5.25	~0.25	1.75	4.21	143.0	5.98	0.218	42.1/5.23	2.75
9	1500	5.25	~0.25	2.00	4.41	133.1	5.98	0.221	41.2/5.11	2.65
10	1505	5.25	~0.25	2.25	4.53	129.0	6.00	0.223	39.9/4.95	2.28
11	1510	5.25	~0.25	2.5	4.74	117.5	6.01	0.226	39.2/4.86	2.11
12	1515	5.25	~0.25	2.7	4.92	108.3	6.06	0.227	39.3/4.88	2.48
13	1520	5.25	~0.25	3.0	4.94	108.1	6.01	0.229	38.3/4.75	2.37
14	1525	5.25	~0.25	3.25	4.98	106.2	5.95	0.231	37.9/4.72	2.26
15										
16										

Field Parameters Stable: no Continued on Page 2: no Purged Dry: yes, no

Total Actual Volume: 5.25

Minimum Volume (use back of page): — Minimum purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
FPC066 MW07	✓	—	—

 = 2 x (— + —)

Sample Date/Time: 10/15/16 1530 Pump: bladder
 Sample Notes: clear. No odor. Well in good condition

Color: clear, amber, tan, brown, grey, milky white, other
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: none, low, medium, high, very turbid, heavy silts

FPC 060 MW07
WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.

Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(gal)	(gal)	(L)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mv)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00	4.00	16F1R	10/15	6/2/18	4.16	4.00	± 0.10
	7.00	7.00	1681S	"	1/5/18	7.08	7.00	± 0.10
	10.00	10.00	16F3T	"	6/15/18	10.04	10.00	± 0.10
Sp Cond (mS/cm)	1413	1199	MW2	10/15	4/18	1202	1199	± 10%
ORP (mv)	ORP was with range of Cert. Solution					232	232	-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/25/16 **Well ID:** GLO-MW-03
Project: Port Heiden **Project #** Port Heiden **APC SERVICES LLC**
A Subsidiary of Alaska Petroleum Corporation
Samplers: Greg Dubois & Sheryl Massillie
Depth of pump (ft. from top of port): _____ **Screened Interval (ft. bgs):** 52 -> 62
Depth to water (ft. ftop): (previous) _____ **Stickup Height (ft. ags):** _____
 (current) 59.13 **WL meter:** _____
Filter Lot Number: _____

Field Meter Check **YSI Manufacturer and Meter #:** DTF 1 0 1 788
Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	110A2C	10/15/16	1/20/18	1100	6.88	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	110A2C	10/15/16	1/20/18	1100	5791	7630-7970	✓
ORP (mV)		YSI	110A2C	10/15/16	1/20/18	1100	245.8	222-252	

Purge Start Time: 1408 **Purge End Time:** 1645 **Trip Blank:** _____

Field Instrument Readings **Criteria for Stable Parameters:** pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1415	59.35	.1	.15	4.42	196.7	5.28	0.240	15.34	15.1
2	1420	59.35	.1	.25	3.80	230.5	4.31	0.235	13.46	18.60
3	1425	59.30	.1	.45	3.73	236.4	4.36	0.230	12.10	13.1
4	1430	59.38	.1	0.6	4.15	217.1	4.04	0.230	11.50	12.6
5	1435	59.36	.1	0.8	4.08	223.2	4.00	0.229	11.37	9.90
6	1440	59.32	.1	0.95	4.33	210.9	4.13	0.229	11.33	8.33
7	1445	59.30	.1	1.15	4.68	194.4	4.13	0.230	11.27	6.17
1.258	1450	59.36	.1	1.40	4.74	193.2	3.91	0.231	11.30	5.08
9	1455	59.39	.1	1.40	4.72	196.9	3.84	0.232	11.20	4.40
10	1500	59.32	.1	1.6	4.96	184.6	4.04	0.232	11.02	3.54
11	1505	59.35	.1	1.7	5.14	178.2	3.81	0.233	11.08	4.80
12	1510	59.33	.1	1.8	5.10	180.0	3.78	0.233	10.92	4.12
13	1515	59.30	.1	2.10	5.17	181.3	3.74	0.234	11.03	4.12
14	See field	note	back							
15										
16										

Field Parameters Stable: yes, **Continued on Page 2:** yes, **Purged Dry:** yes,
Total Actual Volume: 5.1 **See field book**
Minimum Volume (use back of page): _____ **Minimum purge volume:** 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
GLO MW 03	✓		

= 2 x (_____)

Sample Date/Time: 10/25/16 1730 **Pump:** bladder
Sample Notes: See field note book for final readings. started brownish & cleared.

Color: clear, amber, tan, brown, grey, milky white, other
Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
Turbidity: none, low, medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80		Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)			(gal)	(gal)	(L)	(L)
1	0.16	0.15	0.62	0.58		16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16		17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74		18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32		19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90		20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47		21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05		22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63		23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21		24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79		25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37		26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95		27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53		28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11		29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69		30	4.89	4.59	18.51	17.37

	Time	WL (ft. fop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1173	VW 2	1/15/10	4/15	1216	1173	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/25/16 Well ID: GLO MW 04

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Craig Dubois & Cheryl Cross, LLC

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 35-745
 Depth to water (ft, ftop): (previous) _____ (current) 56.84 Stickup Height (ft, ags): _____
 Total Depth 61.42 WL meter: ADCS MWL7
 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07 F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	1100	6.88	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	1100	579.1 245.8	7639 222	5sw ✓
ORP (mV)		YSI	16ALL	10/15/16	1/20/18	1100	243.8	222-252	

Purge Start Time: 1720 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1820	56.86	0.05	Trace	6.08	144.6	6.10	0.138	11.37	51.9
2	1825	56.86	0.05	Trace	5.97	148.6	5.71	0.134	10.26	45.9
3	1830	56.86	0.05	0.2	5.81	156.4	5.39	0.132	9.50	38.8
4	1835	56.86	0.05	0.25	5.70	161.4	5.19	0.129	9.00	34.2
5	1840	56.86	0.05	0.27?	5.72	160.3	5.06	0.128	8.65	28.2
6	1845	56.86	0.05	0.4	5.75	158.6	4.95	0.128	8.47	25.2
7	1850	56.86	0.05	0.45	5.78	156.5	4.90	0.128	8.35	22.8
8	1855	56.86	0.05	0.50	5.81	154.9	4.83	0.128	8.34	21.9
9	1900	56.86	0.05	0.55	5.82	155.1	4.74	0.128	8.34	21.7
10	1905	56.86	0.05	0.60	5.81	155.2	4.67	0.128	8.26	20.1
11	1910	56.86	0.05	0.70	5.81	155.3	4.61	0.129	8.28	19.4
12	1915	56.86	0.05	0.80	5.83	154.8	4.58	0.129	8.29	18.6
13	1920	56.88	0.05	0.85	5.84	153.8	4.56	0.130	8.30	18.0
14	1925	56.88	0.05	0.95	5.86	153.1	4.53	0.130	8.29	16.6
15	1930	56.88	0.05	1.00	5.86	153.1	4.50	0.130	8.28	16.3
16										

Field Parameters Stable: yes, no Continued on Page 2: yes, no Purged Dry: yes, no

Total Actual Volume: 1.00 Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID: _____ Root: GLO MW 04 Primary: Duplicate: _____ MS/MSD: _____ = 2 x (_____ + _____)

Sample Date/Time: 10/25/16 1935 Pump: Bladder

Sample Notes: Flow rate really slow, got better w/ different pump well in good condition.

Color: clear amber, tan, brown, grey, milky white, other

Odor: none low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown

Turbidity: none low, medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (Inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(gal)	(gal)	(L)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. fop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg.C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1173	VWZ	10/15/14	4/18	1216	1173	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/27/16 Well ID: DSAMW 01

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg Dullens Sheryl Westfall

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 45 → 58
 Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) 53.32 WL meter: _____
 Total 59.77 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/14	0845	6.90	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		"	"	"	"	0845	54.29	7630 7970	✓
ORP (mV)		"	"	"	"	"	240.9	222-252	

Purge Start Time: 1555 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1705	53.32	.15	0.25	5.76	156.4	4.71	0.229	20.00	9.72
2	1710	53.32	.15	0.40	5.18	190.4	4.13	0.208	13.73	85.0
3	1715	53.32	.15	0.50	5.15	195.0	3.88	0.203	12.48	30.3
4	1720	53.35	.15	0.70	5.25	192.1	3.80	0.202	11.89	26.0
5	1725	53.35	.15	0.80	5.46	182.2	3.78	0.201	12.02	17.5
6	1730	53.34	.15	1.00	5.62	174.7	3.74	0.201	11.82	13.2
7	1735	53.35	.15	1.15	5.74	168.8	3.73	0.201	11.70	10.4
8	1740	53.35	.15	1.25	5.82	164.7	3.74	0.201	11.60	6.49
9	1745	53.35	.15	1.40	5.91	160.2	3.74	0.201	11.74	5.26
10	1750	53.35	.15	1.55	5.96	158.0	3.74	0.202	11.70	4.20
11	1755	53.36	.15	1.75	6.01	155.9	3.73	0.202	11.66	3.56
12	1800	53.35	.15	1.90	6.05	154.1	3.72	0.202	11.53	2.86
13	1805	53.35	.15	2.0	6.08	153.3	3.69	0.202	11.64	2.21
14	1810	53.36	.15	2.2	6.10	152.5	3.68	0.202	11.54	2.19
15	1815	53.34	.15	2.4	6.13	151.8	3.70	0.202	11.40	2.26
16										

Field Parameters Stable: yes, no _____ Continued on Page 2: yes, no _____ Purged Dry: yes, no _____

Total Actual Volume: 2.4 gal Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
DSAMW 01	✓		

 = 2 x (_____ + _____)

Sample Date/Time: 10/27/16 1830 Pump: bladder.

Sample Notes: Set up with pump but extremely low discharge. Tried other pump with the same result. Then realized we had likely hit a joint ~ 3' from the well bottom and thought that was the bottom. Reset & pump rate improved.

Color: clear, amber, tan, brown, grey, milky white, other _____

Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown _____

Turbidity: none, low, medium, high, very turbid, heavy silts _____

DSA MW 01

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
 Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(ft)	(gal)	(gal)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. rtop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1199	UW7	10/15/10	4/18	1260	1199	± 10%
								± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/19/16 Well ID: DSA-MW-02

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Greg DuBois + Sheryl Wassilie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 57.5 - 67.5

Depth to water (ft, ftop): (previous) — Stickup Height (ft, ags): _____
 (current) 62.88 WL meter: APCS GWL2

Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F781788
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	0900	6.98	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	0900	242.8	222-252	7630 7970
ORP (mV)		YSI	16A2C	10/15/16	1/20/18	0900	242.8	222-252	

Purge Start Time: 1624 Purge End Time: 1735 Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp $\pm 1.0^\circ\text{C}$; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1645	62.88	.1	.30	5.48	100.2	6.34	.314	9.72	25.6
2	1650	62.88	.1	.30	5.60	95.2	6.31	.313	8.66	16.6
3	1655	62.88	.1	.40	5.74	90.0	6.39	.311	8.23	11.6
4	1700	62.88	.1	.60	5.85	84.6	6.37	.311	8.23	9.85
5	1705	62.88	.1	.60	5.81	88.9	6.25	.311	8.20	10.5
6	1710	62.88	.1	.65	5.80	90.5	6.32	.311	8.14	9.65
7	1715	62.88	.1	.70	5.87	88.4	6.48	.311	8.16	8.78
8	1720	63.22	.1	.75	5.93	87.1	6.68	.311	8.09	7.83
9	1725	63.20	.1	.75	5.98	86.3	6.85	.311	8.06	7.31
10	1730	63.18	.1	0.77	6.02	86.8	7.00	0.312	8.06	6.89
11	1735	63.18	.1	0.78	6.04	88.1	7.11	0.312	8.00	6.90
12										
13										
14										
15										
16										

Field Parameters Stable: yes, no _____ Continued on Page 2: yes, no _____ Purged Dry: yes, no _____
 Total Actual Volume: 7.8 gal
 Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
DSA-MW-02	<input checked="" type="checkbox"/>		

 = 2 x (_____ + _____)

Sample Date/Time: 10/19/16 1745 Pump: _____

Sample Notes: collected VOCs, stopped due to darkness + low flow. returned 10/20/16 @ 1330 + collected rest of samples

Color: clear, amber, tan, brown, grey, milky white, other _____
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown _____
 Turbidity: none, low, medium, high, very turbid, heavy silts _____

DSA-MW02

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (Inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(ft)	(gal)	(gal)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. top)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	14163	1225	VW1	10/15/16	4/18	1221	1225	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/19/16 Well ID: DSA-MW-04

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Greg Dubois + Sheryl Wassilie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 92-97
 Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) _____ WL meter: APCS GWL 2
 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07FL02788
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/10/16	1/20/16	0900	6.98	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		1	1	1	1	0900	6164	7035 7970	
ORP (mV)		1	1	1	1	0900	242.8	222-252	

Purge Start Time: 1200 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1215	67.11	.05	.05	3.37	184.9	8.54	.224	6.47	4.99
2	1220	67.11	.05	.10	2.09	202.0	7.75	.218	5.5	50.5
3	1225	67.11	.05	.15	3.47	180.0	7.62	.217	4.28	23.9
4	1230	67.11	.05	.20	3.72	161.7	7.99	.214	2.94	24.7
5	1235	67.11	.05	.25	3.99	146.7	7.74	.213	2.55	12.4
6	1240	67.11	.05	.30	4.21	133.7	7.10	.215	2.36	11.9
7	1245	67.11	.1	.35	3.84	153.7	6.61	.214	2.10	10.3
8	1250	67.11	.1	.45	3.35	172.1	6.03	.214	1.56	9.02
9	1255	67.11	.1	0.50	3.12	192.6	5.57	0.214	1.19	6.95
10	1300	67.11	.1	0.55	3.12	194.2	5.40	0.214	1.05	5.65
11	1305	67.11	.1	0.6	3.35	184.6	5.35	0.214	1.02	5.28
12	1310	67.11	.1	0.7	3.64	168.7	5.38	0.214	0.87	4.98
13	1315	67.11	.1	0.75	3.76	152.8	5.44	0.214	0.81	4.53
14	1320	67.11	.1	0.80	4.23	140.4	5.40	0.215	0.80	3.85
15	1325	67.11	0.1	0.90	4.34	136.5	5.23	0.217	0.82	4.87
16	1330	67.11	0.1	1.00	4.38	135.7	5.13	0.218	0.78	5.01

Field Parameters Stable: yes, no Continued on Page 2: yes, no Purged Dry: yes, no
 Total Actual Volume: 1.80 Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID: _____ Root: DSA-MW-04 Primary: Duplicate: MS/MSD: _____ = 2 x (_____ + _____)

Sample Date/Time: 10/19/16 1430 Pump: _____
 Sample Notes: Well in good condition

Color: clear, amber, tan, brown, grey, milky white, other
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: none, low, medium, high, very turbid, heavy silts

DSA-MW-04

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:
Sample Order:
Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (degC)	Cond (mS/cm)	DO (mg/L)	Turbidity
17	1335	67.11	0.1	1.10	4.44	132.2	5.04	221	0.78	4.24
18	1340	67.11	0.10	1.20	4.52	128.0	4.98	223	0.75	3.95
19	1345	67.11	0.05	1.25	4.65	121.6	4.91	226	0.71	3.54
20	1350	67.11	0.05	1.30	4.75	114.1	4.95	231	0.73	3.64
21	1355	67.11	0.05	1.35	4.90	106.0	4.95	234	0.71	3.97
22	1400	67.11	0.05	1.45	5.03	97.6	4.94	237	0.67	3.94
23	1405	67.11	0.05	1.50	5.13	89.7	4.95	240	0.65	4.44
24	1410	67.11	0.05	1.55	5.24	81.4	5.09	244	0.73	4.51
25	1415	67.11	0.10	1.65	5.46	68.8	5.09	246	0.68	4.68
	1420	67.11	0	1.75	5.50	66.1	5.04	248	0.69	4.68

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)								± 10%
		1225	UVI	10/15/14	4/18	1221	1225	± 10%
ORP (mV)								-----

→ 1425 67.11 0.1 1.8 5.51 64.0 5.05 0.250 0.76 4.85

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/27/16 Well ID: DSA-MW-05

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg Dubois + Sheryl Wassilie

Depth of pump (ft, from top of port): --- Screened Interval (ft, bgs): 82-87
 Depth to water (ft, ftop): (previous) --- Stickup Height (ft, ags): ---
 (current) 58.51 WL meter: APCS GWL2

Field Meter Check YSI Manufacturer and Meter #: total 87.2 YSI 072F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	116722	10/15/14	1/20/18	0845	6.90	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		11	11	11	11	11	5409	7630 7970	✓
ORP (mV)		11	11	11	11	11	2409	222-252	

Purge Start Time: 1845 Purge End Time: --- Trip Blank: ---

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L										
	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1855	58.83	.1	Trace	6.19	57.7	4.07	0.168	10.0	41.0
2	1900	59.05	.1	.25	5.73	67.8	3.76	0.167	1.75	33.7
3	1905	59.20	.15	.40	5.73	64.1	3.70	0.167	1.27	24.5
4	1910	59.27	.15	0.5	5.77	58.1	3.61	0.166	1.01	23.9
5	1915	59.29	.15	0.6	5.81	53.0	3.56	0.167	0.89	20.8
6	1920	59.31	1.10	0.75	5.83	50.1	3.54	0.167	0.90	17.2
7	1925	59.25	1.1	0.90	5.86	47.1	3.53	0.167	0.91	17.2
8	1930	59.21	.1	1.0	5.89	45.1	3.56	0.167	0.87	15.8
9										
10										
11										
12										
13										
14										
15										
16										

Field Parameters Stable: yes, no Continued on Page 2: yes, no Purged Dry: yes, no
 Total Actual Volume: 1.0 gal
 Minimum Volume (use back of page): --- Minimum purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
DSA-MW-05	✓		

 = 2 x (--- + ---)

Sample Date/Time: 10/27/16 1935 Pump: ---

Sample Notes: well in good condition

Color: clear, amber, tan, brown, grey, milky white, other
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: none, low, medium, high, very turbid, heavy silts

DSF MW 05

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

--	--	--	--	--	--	--	--

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg.C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1199	UWI	10/15/14	4/18	1260	1199	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/24/16 Well ID: DSA MW06

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg DuBois + Sheryl Wassilie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 85 → 90 **92.48**

Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____

(current) 56.56 WL meter: APCS FNL 2

Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F 707788

Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ±10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	0835	6.91	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	0835	5979	7600 - 7970	✓
ORP (mV)		YSI	16A2C	10/15/16	1/20/18	0835	240.8	200-252	

Purge Start Time: 1508 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ±1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1515	56.58	~.1	Trace	4.94	110.7	5.49	0.219	89.02	—
2	1525	56.58	~0.05	0.5	4.64	96.6	4.73	0.166	2.86	23.1
3	1530	56.58	0.1	0.65	4.96	72.1	4.80	0.164	2.46	24.7
4	1535	56.56	0.1	0.75	5.22	55.6	4.78	0.163	2.14	23.3
5	1540	56.56	0.2	0.95	5.30	48.5	4.68	0.163	1.38	21.1
6	1545	56.58	0.2	1.1	5.29	48.2	4.69	0.163	1.09	21.2
7	1550	56.57	0.2	1.2	5.52	36.1	4.91	0.163	1.04	21.7
8	1555	56.57	0.2	1.3	5.66	28.4	4.79	0.164	0.99	21.5
9	1600	56.57	0.2	1.45	5.60	32.0	4.68	0.164	1.01	21.8
10	1605	56.57	0.2	1.65	5.56	34.9	4.55	0.164	0.98	19.6
11	1610	56.57	0.2	1.75	5.54	35.4	4.51	0.165	1.02	20.8
12	1615	56.57	0.2	1.95	5.61	33.6	4.50	0.166	0.97	18.6
13	1620	56.56	0.2	2.1	5.67	32.6	4.48	0.166	1.01	21.0
14	1625	56.55	0.2	2.25	5.75	28.2	4.46	0.167	1.00	18.1
15	1630	56.56	0.2	2.35	5.78	27.5	4.49	0.168	1.01	18.0
16	1635	56.54	0.2	2.60	5.83	23.4	4.53	0.169	0.98	16.9

Field Parameters Stable: yes no Continued on Page 2: yes no Purged Dry: yes, no

Total Actual Volume: 2.60 gal Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID: _____ = 2 x (_____ + _____)

Root	Primary	Duplicate	MS/MSD
<u>DSA-MW06</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Sample Date/Time: 10/24/16 1700 Pump: bladder

Sample Notes: Well in good condition

Color: clear, amber, tan, brown, grey, milky white, other

Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown

Turbidity: none, low, medium, high, very turbid, heavy silts

DSA - MW 06

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	gal/ft casing	liters/ft casing	gal/ft casing	liters/ft casing
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (bpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1225	UW 1	10/15/16	4/18	1228	1225	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/24/16 Well ID: DSA MW07

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Gary Durbell & Cheryl Wassillie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 45-55'

Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) 48.90 WL meter: _____

Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	1042C	10/15/16	1/20/18	0835	6.91	U.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		W	11	11	11	11	5979	7080 7970	
ORP (mV)		11	11	11	11	11	240.8	222-253	

W Purge Start Time: 1725 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1740	49.82	0.2	0.2	6.05	75.2	5.06	0.225	12.29	65.1
2	1745	50.15	0.2	0.4	5.82	99.3	4.67	0.212	11.39	59.9
3	1750	50.45	0.2	0.5	5.86	107	4.48	0.209	11.01	55.5
4	1755	50.80	0.2	0.75	5.84	115.5	4.34	0.208	10.93	46.4
5	1800	51.01	0.05	0.80	5.81	122.9	4.31	0.208	10.99	38.9
6	1805	51.40	0.1	0.95	5.84	127.2	4.20	0.209	10.88	32.5
7	1810	51.69	0.1	1.1	5.83	132.9	4.20	0.209	10.77	28.5
8	1815	52.00	0.1	1.2	5.86	134.4	4.25	0.210	10.56	22.7
9	1820	52.19	0.1	1.25	5.89	134.9	4.30	0.211	10.24	21.3
10	1825	52.29	0.05	1.30	5.94	134.9	4.54	0.211	9.75	17.5
11	1830	52.32	0.05	1.35	5.99	133.8	4.70	0.211	9.98	18.9
12	1835	52.35	0.05	1.40	6.03	133.5	4.91	0.211	9.88	15.9
13	1840	52.36	0.05	1.45	6.05	134.2	5.04	0.212	9.70	18.9
14										
15										
16										

Field Parameters Stable: yes no Continued on Page 2: yes no Purged Dry: yes no

Total Actual Volume: 1.45 Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID: _____ = 2 x (_____ + _____)

Root	Primary	Duplicate	MS/MSD
DSA-MW-07	<input checked="" type="checkbox"/>		

Sample Date/Time: 10/25/16 0930 Pump: _____

Sample Notes: Flow rate decreased very low. Returned 10/25/16 to collect samples.

Color: clear, amber, tan, brown, grey, milky white, other _____
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown _____
 Turbidity: none, low, medium, high, very turbid, heavy silts _____

DSAMW07

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
 Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(ft)	(gal)	(gal)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. flop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg.C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1225	UW7	10/15/16	4/18	1228	1225	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/19/16 Well ID: UST - MW - 02

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg DuBois + Sheryl Wassilie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 54.5 - 69.5
 Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) _____ WL meter: APCS GWL 2
 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: _____
 Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	116A2C	10/15/16	1/20/18	0900	6.98	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	116A2C	10/15/16	1/20/18	0900	6164	7030 7270	✓
ORP (mV)		YSI	116A2C	10/15/16	1/20/18	0900	242.8	222-252	

Purge Start Time: 10:24 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

Field Parameters Stable: yes, no _____ Continued on Page 2: yes, no _____ Purged Dry: yes, no _____
 Total Actual Volume: _____ Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID: _____

Root	Primary	Duplicate	MS/MSD

 = 2 x (_____ + _____)

Sample Date/Time: _____ Pump: _____
 Sample Notes: unable to get pump through casing b/c there is a bend in it.

Color: clear, amber, tan, brown, grey, milky white, other _____
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown _____
 Turbidity: none, low, medium, high, very turbid, heavy silts _____

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(gal)	(gal)	(L)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1413	1225	VW1	10/15/14	4/18	1221	1225	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg.C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17									
18									
19									
20									
21									
22									
23									
24									
25									

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1413	1020	UV1	10/15/16	4/2018	1105	1020	± 10%
ORP (mV)	ORP	ORP was	in range of	conf		241.2	241.2	-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/27/16 Well ID: RRS MW05

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg Dubois + Sheryl

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 46' - 56'
 Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) 51.49 WL meter: APCS GWL2
 total 58.50 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 7F 261 788

Criteria for Calibration Check: Confidence solution ranges or pH ± 0.1 ; Sp Cond $\pm 10\%$

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/16	0845	6.90	6.5-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/16	0845	54.09	76.80 79.70	✓
ORP (mV)		YSI	16A2C	10/15/16	1/20/16	0845	240.9	277-252	

Purge Start Time: 1:30 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ± 0.2 ; Temp ± 1.0 °C; Sp Cond $\pm 3\%$; DO $\pm 15\%$ or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1140	51.71	0.15	Trace	4.84	185.8	4.50	0.169	22.41	176
2	1145	51.88	0.15	0.25	3.71	242.5	3.71	0.133	13.16	68.1
3	1150	51.97	0.15	0.40	3.46	260.1	3.41	0.122	12.40	39.1
4	1155	52.08	0.15	0.55	3.60	253.6	3.32	0.126	11.87	36.2
5	1200	52.23	0.15	0.75	3.83	243.0	3.31	0.125	11.73	31.2
6	1205	52.31	0.15	0.85	4.14	227.0	3.35	0.125	11.52	29.0
7	1210	52.37	0.15	1.15	4.39	214.8	3.35	0.124	11.62	17.0
8	1215	52.47	0.15	1.30	4.57	205.5	3.34	0.125	11.42	12.4
9	1220	52.52	0.15	1.40	4.79	195.1	3.37	0.125	11.21	11.5
10	1225	52.64	0.15	1.50	4.95	186.7	3.37	0.125	11.08	9.40
11	1230	52.65	0.15	1.70	5.04	182.5	3.36	0.125	11.07	8.95
12	1235	52.71	0.15	1.9	5.17	176.7	3.37	0.125	11.03	9.51
13	1240	52.76	0.15	2.1	5.28	171.9	3.35	0.125	10.91	9.00
14	1245	52.82	0.15	2.30	5.33	169.7	3.34	0.125	10.85	8.78
15	1250	52.86	0.15	2.45	5.39	167.2	3.35	0.125	10.79	8.08
16	1255	52.88	0.15	2.60	5.48	163.4	3.36	0.125	10.64	8.47

Field Parameters Stable: yes no Continued on Page 2: yes no Purged Dry: yes no

Total Actual Volume: 3.5

Minimum Volume (use back of page): _____ Minimum-purge-volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
RRS MW05	✓	—	—

 = 2 x (— + —)

Sample Date/Time: 10/27/16 1324 Pump: _____

Sample Notes: Well is in the weeds/brush.

Color: clear, amber, tan, brown, grey, milky white, other _____

Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown _____

Turbidity: none, low, medium, high, very turbid, heavy silts _____

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/26/16 Well ID: RRS-MW-06

Project: Port Heiden Project # Port Heiden APC SERVICES LLC?
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg DuBuis, Sheryl Wassilie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 55 -> 56 #52

Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) 58.15 WL meter: APCS GWL 2

Field Meter Check YSI Manufacturer and Meter #: 07F 202788 Filter Lot Number: _____
total depth 67.01

Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	10A2C	10/15/16	1/20/18	0925	6.94	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	10A2C	10/15/16	1/20/18	0925	5742	7030 7970	✓
ORP (mV)		YSI	10A2C	10/15/16	1/20/18	0925	239.5	222-252	

Purge Start Time: 1108 Purge End Time: 1230 Trip Blank: _____

Field Instrument Readings											Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L
	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity	
1	1115	58.28	0.1	0.2	5.19	158.7	4.41	0.290	22.32	130	
2	1120	58.30	0.1	0.4	4.77	182.6	3.84	0.280	12.26	56.9	
3	1125	58.30	0.1	0.6	4.70	187.6	3.47	0.279	11.49	49.4	
4	1130	58.30	0.1	0.75	4.77	185.5	3.36	0.276	10.76	27.1	
5	1135	58.30	0.1	0.9	4.84	182.9	3.31	0.274	10.56	21.1	
6	1140	58.31	0.1	1.1	4.90	180.7	3.29	0.274	10.50	17.1	
7	1145	58.30	0.1	1.25	4.97	178.2	3.25	0.275	10.44	9.64	
8	1150	58.30	0.1	1.40	5.02	174.5	3.24	0.275	10.79	5.73	
9	1155	58.32	0.1	1.50	5.09	173.5	3.25	0.275	10.21	5.00	
10	1200	58.30	0.1	1.75	5.16	170.8	3.23	0.275	10.15	4.83	
11	1205	58.31	0.1	1.9	5.22	168.8	3.22	0.275	10.11	4.53	
12	1210	58.31	0.1	2.1	5.27	166.7	3.21	0.275	10.11	3.58	
13	1215	58.31	0.1	2.25	5.32	165.0	3.22	0.275	10.14	3.35	
14	1220	58.33	0.1	2.50	5.38	163.0	3.21	0.275	10.10	2.37	
15	1225	58.33	0.1	2.65	5.42	161.7	3.22	0.275	10.06	2.21	
16	1230	58.37	0.1	2.80	5.46	160.2	3.22	0.275	9.98	2.12	

Field Parameters Stable: yes no Continued on Page 2: yes no Purged Dry: yes no

Total Actual Volume: 2.8

Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
RRS MW06	✓		

 = 2 x (_____ + _____)

Sample Date/Time: 10/26/16 1230 Pump: bladder

Sample Notes: Well is in good condition.

Color: clear, amber, tan, brown, grey, milky white, other

Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown

Turbidity: none, low, medium, high, very turbid, heavy silts

RRS MW06
WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
 Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40				Length of Casing (ft)	Sch 80			
	(gal)	(gal)	(L)	(L)		(gal)	(gal)	(L)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft-ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1225	VW1	10/15/16	4/16	1241	1225	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/20/16 **Well ID:** GLO-MW-045LW
BLO-MW-01
Project: Port Heiden **Project #** Port Heiden **APC SERVICES LLC**
Samplers: Greg Dubois + Sheyl
Depth of pump (ft, from top of port): 40-50
Depth to water (ft, ftop): (previous) 45.85 **Screened Interval (ft, bgs):** 35-45 SLW
 (current) 46.27 * **Stickup Height (ft, ags):**
10/29/16 52.9 **WL meter:** APCS GWL2
Field Meter Check **YSI Manufacturer and Meter #:** **Filter Lot Number:**

Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/26/18	1215	6.93	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/26/18	1215	4809	7600-7950	✓
ORP (mV)		YSI	16A2C	10/15/16	1/26/18	1215	248.9	238-268	✓

Purge Start Time: 6:17 **Purge End Time:** 16:00 **Trip Blank:** unable to purge - strong odor - see below
Field Instrument Readings **Criteria for Stable Parameters:** pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

Field Parameters Stable: yes, no **Continued on Page 2:** yes, no **Purged Dry:** yes, no
Total Actual Volume: 3 gallons
Minimum Volume (use back of page): **Minimum purge volume:** 2 x (drawdown volume plus volume below pump)

Sample ID: BLO Root 01 Primary Duplicate MS/MSD
~~GLO-MW-045LW~~ = 2 x (+)

Sample Date/Time: 10/31/16 1100 **Pump:** bladder

Sample Notes: 10/20/16 unable to purge. Strong odor.
10/26/16 interfere probe detected free product
10/29/16 Attempted to pump well but again did not work. Bailed ~3 gallons + dry. **Depth to product = 45.97'**
Depth to water = 45.98'
feet of product = 0.01'

Color: clear, amber, tan, brown, grey, milky white, other
Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
Turbidity: none, low, medium, high, very turbid, heavy silts

BLO MW 01

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (Inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(ft)	(gal)	(gal)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg.C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		896	UV 1	10/15/16	4/18	950	896	± 10%
ORP (mV)		253	160100388	10/17/16	4/22/21	259.3	253	± 10%

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/21/16 Well ID: BLO-MW-05
 Project: Port Heiden Project # Port Heiden
 Samplers: Greg Dubois & Sheryl Wassilie APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation
 Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 42.5 → 52.5
 Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) 49.72 WL meter: APCS GWL 2
 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F201788
 Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	0900	6.91	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	0900	5046	7600 7970	✓
ORP (mV)		YSI	16A2C	10/10/16	1/20/18	0950	250.6	229-261	

Purge Start Time: 1725 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1807	50.41	<.05	Trace	4.75	140.4	4.48	0.170	13.12	—
2	1812	50.53	<.05	Trace	4.71	143.7	4.40	0.168	11.85	—
3	1817	50.50	<.05	Trace	4.69	144.1	4.34	0.167	11.82	—
4	1822	50.61	<.05	.20	4.75	141.0	4.25	0.165	11.74	—
5	1827	50.65	<.05	.25	4.80	139.1	4.19	0.164	11.45	—
6	1832	50.73	<.05	0.30	4.84	137.1	4.15	0.164	11.39	—
7	1837	50.77	<.05	0.40	4.91	134.1	4.11	0.164	11.29	—
8	1842	50.82	<.05	0.50	4.96	131.8	4.07	0.163	11.29	—
9	1847	50.86	<.05	0.50	5.03	130.0	4.05	0.162	11.24	—
10	1852	50.89	<.05	0.50	5.09	127.3	4.07	0.162	11.30	—
11	1857	50.94	<.05	0.50	5.18	123.7	4.09	0.160	11.31	—
12	1902	50.97	<.05	0.50	5.25	122.1	4.09	0.160	11.18	—
13	1907	51.01	<.05	0.50	5.29	121.6	4.07	0.159	11.17	—
14	1912	51.04	<.05	0.50	5.32	122.2	4.04	0.159	11.18	—
15										
16										

Field Parameters Stable: yes, no _____ Continued on Page 2: yes, no _____ Purged Dry: yes, no _____
 Total Actual Volume: .50
 Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
BLO-MW-05	✓		

 = 2 x (_____ + _____)

Sample Date/Time: 10/21/16 1920 Pump: 5000
 Sample Notes: Volume too low to collect turbidity per 5 min
ready. Collect VOCs & GRO. Will allow well
to recover. Returned 10/22/16 @ 1830. collected VOCs, GRO &
~ 3/4 liter Amber. Returned 10/24/16 @ 1220 + collected
all samples.

Color: clear amber, tan, brown, grey, milky white, other
 Odor: none low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: none, low medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

BLO - MW - 05

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	gal/ft casing	liters/ft casing	gal/ft casing	liters/ft casing
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(ft)	(gal)	(gal)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mv)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17									
18									
19									
20									
21									
22									
23									
24									
25									

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1090	UW-1	10/15/14	4/15/16	1050	1090	± 10%
ORP (mV)								± 10%

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/21/16 Well ID: BLO MW 06

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Carey O'Brien Sheryl Wassillie

Depth of pump (ft, from top of port): Screened Interval (ft, bgs): 38.5 → 48.5
 Depth to water (ft, ftop): (previous) Stickup Height (ft, ags):
 (current) 44.24 WL meter: APCS EWL 2
 Filter Lot Number:

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	0900	6.91	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	0900	5046	1600 7970	✓
ORP (mV)		YSI	16A2C	10/15/16	1/20/18	0900	250.6	229-261	

Purge Start Time: 1248 Purge End Time: 1355 Trip Blank:

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1255	44.24	.1	.25	5.59	158.8	3.65	0.176	3.91	23.3
2	1300	44.24	.1	.35	5.32	175.4	3.10	.158	4.39	10.7
3	1305	44.24	.1	.55	5.23	183.3	2.85	.150	7.22	4.32
4	1310	44.24	.2	.75	5.30	182.5	2.79	.147	8.19	5.69
5	1315	45.99	.2	.95	5.47	175.6	2.79	.146	9.34	12.50
6	1320	46.32	.05	1.00	5.62	169.2	2.82	.146	9.70	20.60
7	1325	46.40	.05	1.10	5.78	162.6	2.91	0.146	9.24	20.60
8	1330	46.38	.05	1.2	5.87	158.0	2.99	0.146	9.09	22.00
9	1335	46.31	.05	1.23	5.95	155.2	3.07	.146	9.18	29.2
10	1340	46.26	.05	1.24	6.00	153.3	3.12	0.147	9.09	26.7
11	1345	46.21	.05	1.25	6.04	151.8	3.19	0.147	9.01	24.7
12	1350	46.16	.05	1.25	6.06	151.3	3.22	0.147	9.12	22.6
13	1355	46.12	.05	1.30	6.08	150.7	3.27	0.147	9.06	22.4
14										
15										
16										

Field Parameters Stable: yes, no Continued on Page 2: yes, no Purged Dry: yes, no
 Total Actual Volume: 1.30
 Minimum Volume (use back of page): Minimum-purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
BLO-MW-06	✓	✓	✓

 = 2 x (+)

Sample Date/Time: 10/21/16 1400 Pump: bladder

Sample Notes: Initial purging resulted in well going dry.
10/22/16 return to MW 06 and collect remaining
sample bottles 10/23/16 Return to collect MS/MSD
volumes for AR102/103 & total Nitrogen.

Color: clear amber, tan, brown, grey, milky white, other
 Odor: none low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: none low, medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

13LO - MW - 06

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (Inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(ft)	(gal)	(gal)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1090	0W1	5/17				± 10%
ORP (mV)				10/15/16	4/18	1050	1090	± 10%

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/21/16 Well ID: BLO MW07

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Craig D. Bous + Sheryl Wassillie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 35 → 45' 46.86

Depth to water (ft, ftop): (previous) _____ (current) 41.49 Stickup Height (ft, ags): _____

WL meter: APCS GWL 2 Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07 F 2 0 1 7 8 8

Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	0900	10.91	6.5-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	0900	5046	7000 7970	✓
ORP (mV)		YSI	16A2C	10/15/16	1/20/18	0900	250.6	229-261	

Purge Start Time: 1009 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1007	42.0	0	0.0	4.95	166.5	3.24	0.179	12.65	90.6
2	1010	42.20	0.25	0.25	4.75	184.7	2.88	0.159	11.14	61.8
3	1013	42.57	0.2	0.4	4.52	200.0	2.69	0.150	10.87	58.9
4	1016	42.87	0.2	0.5	4.41	208.8	2.54	0.146	10.67	52.9
5	1019	43.15	0.2	0.6	4.41	210.9	2.46	0.144	10.59	42.9
6	1022	43.46	0.2	0.7	4.52	206.6	2.40	0.144	10.41	34.4
7	1025	43.59	0.1	0.75	4.66	201.0	2.32	0.144	9.97	30.7
8	1028	43.72	0.1	0.8	4.74	199.0	2.20	0.144	9.77	25.4
9	1031	43.79	0.05	0.84	4.77	197.9	2.12	0.144	9.66	24.3
10	1034	43.84	0.05	0.85	4.84	195.7	2.03	0.144	9.65	24.6
11	1037	43.91	0.05	0.87	4.85	196.3	1.93	0.144	9.70	23.3
12	1040	43.98	0.05	0.9	4.88	195.4	1.87	0.144	9.85	21.8
13	1045	44.00	0.05	0.95	4.93	194.4	1.73	0.144	9.95	21.9
14	1050	44.03	0.05	1.00	4.95	194.2	1.65	0.144	9.94	21.7
15	1055	44.12	0.05	1.05	5.01	192.4	1.48	0.145	10.03	21.2
16	1100	44.25	0.05	1.05	4.96	196.6	1.32	0.145	10.07	20.5

Field Parameters Stable: yes no Continued on Page 2: yes no Purged Dry: yes no

Total Actual Volume: 1.05 gal

Minimum Volume (use back of page): _____ Minimum-purge-volume: 2 x (drawdown-volume-plus-volume-below-pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
BLO MW07	✓		

 = 2x(_____ + _____)

Sample Date/Time: 10/22/16 1330 Pump: bladder

Sample Notes: Purged on 10/21/16 until dry & let it recover overnight & then sampled.

Color: clear, amber, tan, brown, grey, milky white other

Odor: none low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown

Turbidity: low none, medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1090	VW7	10/15/16	4/1/17	1050	1090	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/17/16 Well ID: ^{FPC} 215-MW-08

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Petroleum Corporation

Samplers: Greg Dubois + Sheryl Wassilic

Depth of pump (ft, from top of port): Screened Interval (ft, bgs): 90 → 19.0
 Depth to water (ft, ftop): (previous) Stickup Height (ft, ags):
 (current) 11.20 WL meter: APCS GWL2

Filter Lot Number:

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ±10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	10A2C	10/15/16	1/20/18	1016	6.91	6.8-7.2	✓
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)	7950	YSI	10A2C	10/15/16	1/20/18	1016	5787	7100 7970	✓
ORP (mV)							255.2	229-241	

Purge Start Time: ~~1355~~ Purge End Time: 1650 Trip Blank:

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ±1.0 °C; Sp Cond ±3%; DO ±15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1505	1305	11.20	.1	.20	3.59	272.5	4.15	0.888	13.44	4.09
1510	1310	11.20	.1	.30	3.72	273.0	4.53	.086	12.87	2.83
1515	1315	11.20	.1	.40	4.09	250.4	4.41	.086	12.18	3.03
1520	1320	11.20	.1	.50	4.44	241.4	4.37	.086	11.75	3.64
1525	1325	11.20	.1	.60	4.64	232.5	4.34	.087	11.66	3.54
1530	1330	11.20	.1	.70	4.85	223.7	4.32	.088	11.53	3.28
1535	1335	11.20	.1	.80	4.97	219.0	4.31	.090	11.44	8.06
1540	1340	11.20	.1	.90	5.05	214.9	4.27	.094	11.22	2.99
1545	1340	11.21	.1	1.0	5.12	211.4	4.25	.097	10.96	3.05
1550	1350	11.21	.1	1.1	5.19	207.4	4.24	.102	10.53	3.05
1555	1355	11.21	.1	1.2	5.29	196.3	4.19	.109	10.01	2.65
1600	1360	11.21	.1	1.3	5.32	193.0	4.19	.112	9.85	2.67
1605	1365	11.21	.1	1.4	5.39	186.5	4.20	.117	9.58	2.44
1610	1370	11.21	.1	1.5	5.49	178.7	4.23	.121	9.26	2.51
1615	1375	11.21	.1	1.6	5.54	174.1	4.23	.124	9.05	2.10
1620	1380	11.21	.1	1.7	5.59	170.5	4.23	.128	8.87	1.93

Field Parameters Stable: (yes) no Continued on Page 2: (yes) no Purged Dry: yes (no)
 Total Actual Volume: 2.40 Minimum-purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

215 Root	Primary	Duplicate	MS/MSD
FPC 215 MW 08	✓	✓	

 = 2 x (+)

Sample Date/Time: 10/17/16 1655 Pump: Bladder

Sample Notes: Duplicate FPC 215 MW 28
Well in good condition.

Color: clean amber, tan, brown, grey, milky white, other
 Odor: none low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: low none, low, medium, high, very turbid, heavy silts

FPC 215-MW 08

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (Inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17	1625	11.21	.1	1.8	5.61	167.8	4.20	.131	8.61	1.72
18	1630	11.21	.1	1.9	5.63	166.2	4.18	.135	8.43	1.57
19	1635	11.21	.1	2.0	5.64	164.3	4.18	.137	8.25	2.78
20	1640	11.21	.1	2.1	5.68	161.2	4.18	.139	8.08	1.57
21	1645	11.21	.1	2.25	5.72	158.8	4.19	.141	7.92	1.70
22	1650	11.21	.1	2.40	5.75	156.6	4.19	.143	7.73	1.49
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1147	1147	UW1	10/15/14	4/18	1118	1147	± 10%
ORP (mV)								± 10%

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WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

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MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
 Minimum purge volume: 2 x (drawdown volume plus volume-below-pump).

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. top)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg. C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		950	VW 1	10/15/16	4/18	913	950	± 10%
								± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/26/16 Well ID: FPC215 MW 11

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg DuBois Sheryl Wossillas

Depth of pump (ft, from top of port): Screened Interval (ft, bgs): 7 → 17'
 Depth to water (ft, ftop): (previous) Stickup Height (ft, ags):
 (current) 11.00 (watch) WL meter: APCS GWL 2
 Filter Lot Number:

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	0925	6.94	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	0925	5742	7630-7970	✓
ORP (mV)		YSI	16A2C	10/15/16	1/20/18	0925	239.5	222-252	

Purge Start Time: 10/26/16 Purge End Time: Trip Blank:

Field Instrument Readings **Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L**

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1645	11.13	.1	.90	6.48	148.7	5.14	0.084	14.70	over range
2	1650	11.14	.1	1.10	6.46	150.0	5.14	0.084	13.07	over range
3	1655	11.14	.1	1.20	6.44	150.7	5.17	0.083	11.35	over range
4	1700	11.13	.1	1.30	6.44	150.1	5.18	0.082	10.97	over range
5	1705	11.12	.1	1.40	6.44	149.5	5.20	0.081	10.64	over range
6	1710	11.12	.15	1.60	6.44	149.2	5.21	0.081	10.49	over range
7	1715	11.13	.15	1.80	6.43	149.1	5.22	0.081	10.43	over range
8	1720	11.13	0.1	1.9	6.43	148.9	5.23	0.080	10.34	over range
9										
10										
11										
12										
13										
14										
15										
16										

Field Parameters Stable: yes, no Continued on Page 2: yes no Purged Dry: yes no
 Total Actual Volume: 1.9 gallons Minimum purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
FPC215 MW 11	✓		

 = 2x(+)

Sample Date/Time: 10/26/16 1725 Pump: bladder
 Sample Notes: Water is tan & very silty. Well heaved during installation, and was pushed back down. Developed twice & went dry both times. Turbidity not used for stability criteria. New well.

Color: clear, amber, tan, brown, grey, milky white, other
 Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown
 Turbidity: none, low, medium, high, very turbid, heavy silts

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

--	--	--	--	--	--	--	--

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count:

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80	Length of Casing (ft)	Sch 40	Sch 80	Sch 40	Sch 80
	(gal)	(gal)	(L)	(L)		(gal)	(gal)	(L)	(L)
1	0.16	0.15	0.62	0.58	16	2.61	2.45	9.87	9.27
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

	Time	WL (ft. floo)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg.C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1225	VWA	10/15/16	4/18	1241	1225	± 10%
ORP (mV)								-----

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Date: 10/26/16 Well ID: FPC 215 MW 12

Project: Port Heiden Project # Port Heiden APC SERVICES LLC
A Subsidiary of Alaska Peninsula Corporation

Samplers: Greg Dubois Sheryl Warrillie

Depth of pump (ft, from top of port): _____ Screened Interval (ft, bgs): 7 → 17'
 Depth to water (ft, ftop): (previous) _____ Stickup Height (ft, ags): _____
 (current) 12.78 (notch) WL meter: APCS GWL 2
12.92 mark Filter Lot Number: _____

Field Meter Check YSI Manufacturer and Meter #: 07F101788
 Criteria for Calibration Check: Confidence solution ranges or pH ±0.1; Sp Cond ± 10%

Parameter	Standard True Value	Manufacturer	Lot #	Date Opened	Expiration Date	Time	Reading	Acceptance Criteria	Recalibration (if req'd)
Calibration check required at each well									
pH	7	YSI	16A2C	10/15/16	1/20/18	0925	6.94	6.8-7.2	
Calibration check required before each well array (at first well of array)									
Sp Cond (mS/cm)		YSI	16A2C	10/15/16	1/20/18	0925	5742	7630-7970	✓
ORP (mV)		YSI	16A2C	10/15/16	1/20/18	0925	229.5	222-252	

Purge Start Time: 1822 Purge End Time: _____ Trip Blank: _____

Field Instrument Readings Criteria for Stable Parameters: pH ±0.2; Temp ± 1.0 °C; Sp Cond ± 3%; DO ± 15% or 0.3 mg/L

	Time	WL (ft, ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Sp Cond (mS/cm)	DO (mg/L)	Turbidity
1	1830	14.11	.1	Trace	5.80	178.7	4.93	0.209	5.30	97.5
2	1835	14.80	.2	.40	5.94	174.6	4.86	0.196	4.67	66.5
3	1840	15.28	.2	0.5	6.02	171.4	4.85	0.192	5.06	52.8
4	1845	15.75	.1	0.7	6.09	168.8	4.87	0.191	5.67	46.8
5	1850	16.00	.1	0.9	6.15	167.0	4.89	0.189	5.97	41.1
6	1855	16.34	.1	1.0	6.19	165.7	4.91	0.187	10.09	32.3
7	1900	16.70	.1	1.1	6.23	164.8	4.91	0.185	6.30	30.0
8	1905	16.90	.1	1.25	6.26	158.0	4.92	0.183	6.36	27.0
9	1910	16.90	.1	1.35	6.26	160.1	4.95	0.181	5.89	23.9
10	1915	16.85	.1	1.45	6.27	159.3	4.96	0.181	5.70	23.9
11	1920	16.80	.1	1.55	6.26	158.5	4.96	0.180	5.59	24.5
12										
13										
14										
15										
16										

Field Parameters Stable: yes no Continued on Page 2: yes no Purged Dry: yes no

Total Actual Volume: 6.55

Minimum Volume (use back of page): _____ Minimum purge volume: 2 x (drawdown volume plus volume below pump)

Sample ID:

Root	Primary	Duplicate	MS/MSD
FPC 215 MW12	✓		

 = 2x(_____ + _____)

Sample Date/Time: 10/26/16 1930 Pump: bladder

Sample Notes: New Well. First sample collection. Initially a drop in water level & then recovery of oil.

Color: clear, amber, tan, brown, grey, milky white, other light grey

Odor: none, low, medium, high, very strong, hydrogen sulfide, petroleum, chemical?, unknown

Turbidity: none, low, medium, high, very turbid, heavy silts

FIC 215 MW 12

WELL PURGING AND SAMPLING FIELD CONTROL LOG

Bottle Inventory:

MS/MSD Volume:

CAS Volume:

Sample Order:

Bottle Count: _____

Casing Diameter (inches)	Schedule 40		Schedule 80	
	(gal/ft casing)	(liters/ft casing)	(gal/ft casing)	(liters/ft casing)
2	0.163	0.617	0.153	0.579
4	0.656	2.483	0.597	2.26

Casing Diameter 2 inches:

Circle water column length below pump and above pump. Also circle length of maximum drawdown.
 Minimum purge volume: 2 x (drawdown volume plus volume-below-pump)

Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)	Length of Casing (ft)	Sch 40 (gal)	Sch 80 (gal)	Sch 40 (L)	Sch 80 (L)
	1	0.16	0.15	0.62		0.58	16	2.61	2.45
2	0.33	0.31	1.23	1.16	17	2.77	2.60	10.49	9.84
3	0.49	0.46	1.85	1.74	18	2.93	2.75	11.11	10.42
4	0.65	0.61	2.47	2.32	19	3.10	2.91	11.72	11.00
5	0.82	0.77	3.08	2.90	20	3.26	3.06	12.34	11.58
6	0.98	0.92	3.70	3.47	21	3.42	3.21	12.96	12.16
7	1.14	1.07	4.32	4.05	22	3.59	3.37	13.57	12.74
8	1.30	1.22	4.94	4.63	23	3.75	3.52	14.19	13.32
9	1.47	1.38	5.55	5.21	24	3.91	3.67	14.81	13.90
10	1.63	1.53	6.17	5.79	25	4.08	3.83	15.42	14.48
11	1.79	1.68	6.79	6.37	26	4.24	3.98	16.04	15.06
12	1.96	1.84	7.40	6.95	27	4.40	4.13	16.66	15.64
13	2.12	1.99	8.02	7.53	28	4.56	4.28	17.27	16.21
14	2.28	2.14	8.64	8.11	29	4.73	4.44	17.89	16.79
15	2.45	2.30	9.25	8.69	30	4.89	4.59	18.51	17.37

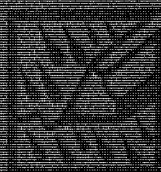
	Time	WL (ft. ftop)	Flow (lpm)	Volume (gal)	pH	ORP (mV)	Temp (deg C)	Cond (mS/cm)	DO (mg/L)	Turbidity
17										
18										
19										
20										
21										
22										
23										
24										
25										

Water Parameter Meter Calibration Log (if necessary)

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	Pre-Calibration Reading	Post-Calibration Reading	Calibration Acceptance Criteria
pH	4.00							± 0.10
	7.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)		1225	VW 1	10/15/16	4/18	1241	1225	± 10%
								± 10%
ORP (mV)								-----

**Attachment C-4
Field Notes**

(intentionally blank)



"Out in the Rain"

ALL-WEATHER

JOURNAL

No. 390F

Port +
Heiden RRS
W911KB-15-
C-0025

NIR #390F



Bound Herz. field book form



TTT Environmental (907) 770-9041

(41)

10/4/16

0700 Arrive @ Lake Clark
Air. Greg DuBois-APCS
and Discovery Drilling -
Gary + Tom.

0845 Leave to Port Alsworth
& then to Port Heiden.

1100 Arrive in Port Heiden.
Get vehicles. Some of
the drilling materials
were placed @ fish
processing building.

1200 Find silica @ fish
processing plant. Looking
for other materials.
Go to Roy's for
coordination with Aniakchik
regarding equipment &
personnel.

1245 Break & check emails.

(42)

10/4/16

1330 Pick up Shannon
Mattson + then go
with drillers to
FPC-029 site. View
wells for decommissioning.

Return and unload
materials @ the red
building @ airport.

Drillers indicate they
may be able to
remove wells & decommission
by manual methods.

Health & Safety meeting.

1500 Go to FPC-29 - MW02
Remove bollards &
monument. Unable to
manually remove the
casing. Try using pipe
wrenches etc.

1630 Remove bollards & ~~NO~~
monument from FPC-29 ~~MW02~~
- MW01

(43)

10/4/16

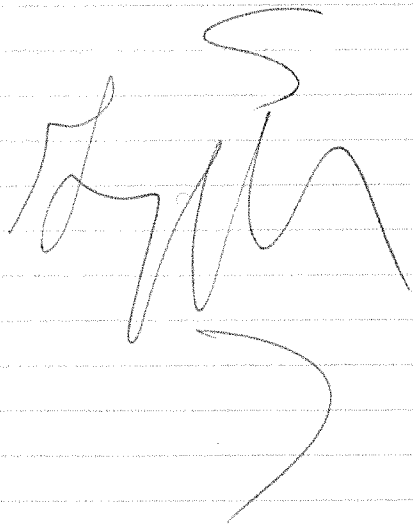
1700 FPC-029-MW03

Remove well monument
and bollards.

Take metal debris
to ~~landfill~~ dump.

Drillers will need the
loader to put skid
drill rig together.

1800 End of day.



(44)

10/5/16

0800 Pick up Shannon
and mobilize to the
~~airport red building~~ ~~RD~~
bunkhouse + then drillers
follow us to the loader
@ Jimmy Christensen's
place. Fuel arrives +
drillers go to the
red building/airport
to assemble the drill
rig.

APCS goes to Roy's
and coordinate regarding
access to water treatment
system. It is in the
connex @ the RR S.
Need to find Key to
pad locks.

1200 Go to FPC-29
Drillers are there with
rig. The rig is moved
via loader.

(45)

10/5/16

1215 Drill rig attaches to the pvc casing @ FPC-029-MW-03 and it pulls out completely. Has 1 bag of bentonite chips into the open borehole.

1230 FPC-029-MW-02. Line up rig and begin to pull it out & only the top part ~5' comes out. The 10' screen is left in the ground from 5' to 15' bgs. Backfill with bentonite and then cement the hole with soil.

1245 FPC-029-MW01
Drill rig removes the entire 15' of hole. The pvc casing. Backfill with one bag of bentonite chips.

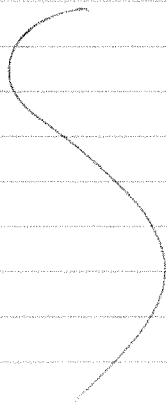
(46)

10/5/16

1300 Go to red building at airport and prepare for soil sampling at soil borings @ FPC-215.

Gloves, do can, sample bottles
PID, baggie

1400 Drillers arrive @ borehole with drill rig and start to set up with materials.



10/5/16

FPC-215-16SBØ1



Drill to 5' + sample

2.5' - chips

7.5 YR 3/2 Pumice Ds 1.5/2 Coarse sand no odor gravel ~ 10% to 1/4" PID=0.0

as above except moist and saturated at bottom of split spoon. PID = 0.0 1.2/2

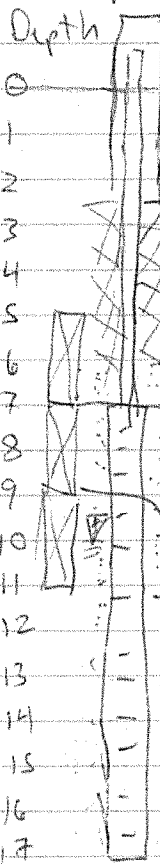
Sample FPC 215-16SBØ1 collect from 7-9' bgs.

Well set to 17' w/ 10' of pre-packed screen sand to 6' Then soil backfill will well monument - yellow

Arabin chips to base

10/5/16

FPC-215-16SBØ2



Drill to 5' + sample

1/2 recovery PID = 0.0

10 YR 3/2 v. Dark Grayish brown 95% sand w/ 5% 1/4 to 1/2 gravel

No odor Dry. Not pumaceous

1/2 PID = 0.0 Trace fines

Transition to pumaceous soil

7.5 YR 3/2 No odor Dry

Sample FPC215-16SBØ2 @ 1630 7-9' bgs

Saturated ~ 9 to 10'

as above soil type No odor

Pi

(49)

10/5/16

Go to red building
and sort through more
gear. Place more gel
ice in the freezer.

Drillers begin to
dismantle drill rig and
prepare for shipment
out.

1730 Done for the day.

Log M.

(50)

10/6/16

Most of the day is
spent indoors. Weather
is very windy.
1300 Go to the drill rig
and place 5 unused
drums inside the
red building so they
do not blow away
from the high winds
and to make sure
they are not shipped
out.

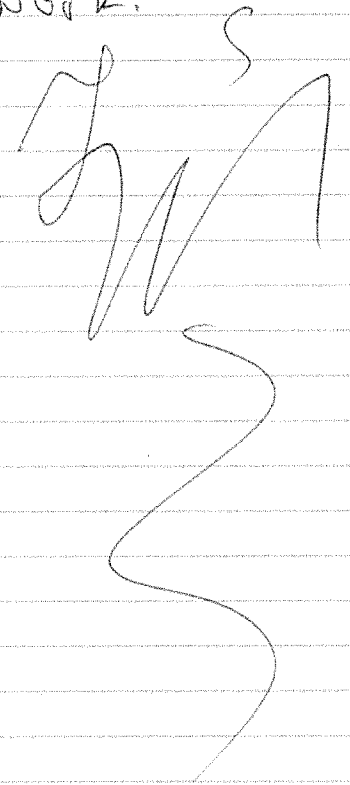
1500 finish fieldwork
outside for the day.

Log M.

(S1)

10/7/16

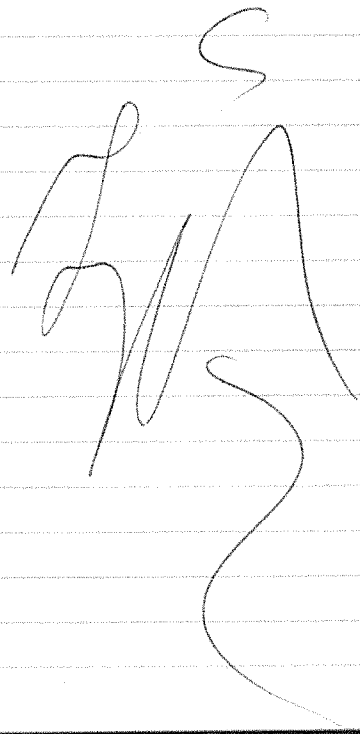
Weather day. Some
Coordination via
email. No field
work.



(S2)

10/8/16 → 10/12/16

Weather was poor
and no field work
was conducted
during this time
frame other than
some coordination
with surveyors &
laboratory ~~at~~
TII environmental.



(53)

10/13/16

1100 Pick up Shannon +
Go to Red/office
building.

Health + Safety meeting.

1130 Sheryl Wassilie arrives
on Grant Air, and
equipment arrives
Talk Sheryl to lodging.

1300 Return to field office.
Review procedures for
well development +
sampling.

1400 Turbidimeter Calibration
check.

Standard	Reading
S/N 23529 Cal. 9/20/16	
5.32	5.37
54.8	55.1
499	500

(54)

10/13/16

Prepare soil samples
for shipment.

1500 ~~Put~~ Hand carry
cooler with soil
samples to Grant
Atr.

Gather equipment to
complete well development.

FPC 215 - MW11

DTW = 11.35 ft

Total depth = 19.80 ft 8.45'

Well volume = $8.45 \times 0.163 = 1.4 \text{ gal}$

5 well volumes = 6.9 gallons

Time	Volume	NTU
1615	1 gal	Over range
1655	3.5 gal	1000

1710 Well is dry @ ~5 gallons.

(55)

10/13/16

1720

FPC 215-MW-12

Total Depth = 19.81

DTW = 13.17

Water column = 6.64'

1 well volume = 1.14 gal.

5 well vols = 5.7 gallons

Time	Volume	NTU
1755	1.0 gal	194

1803 Well is dry @ 1.5 gallons. Water was light gray and translucent.

Stopped for the day. Unpacked truck.

1830 Done for the day.

(56)

10/14/16

0830

Pickup crew

0900

Health & Safety Meeting. Review plans for the day; workplan review.

0945

FPC 215-MW11

Decide to complete additional development due to high turbidity primarily in the upper zone near water table. Surge 10 minutes DTW = 11.31

Time	Vol.	Color/NTU
1020	1 gal	brown Overrange
1030	3 gal	gray 899 gray

1100 Dry @ ~3.2 gallons. Stop Shannon off at home.
1230 Mobilize to RRS site to measure groundwater depth in wells

10/14/16

Well	DTW	Comments
RRS-MW-02	57.95	
UST-MW-02	64.93	No PVC cap
GLO-MW-04	56.81	
GLO-MW-03	59.10	
DSA-MW-04	67.20	
DSA-MW-02	62.85	
DSA-MW-01	53.25	
DSA-MW-05	58.01	
RRS-MW-05	56.28	
DSA-MW-06	56.66	
DSA-MW-07	48.60	
RRS-MW-06	58.15	
BLO-MW-07	41.29	
BLO-MW-02	32.26	
BLO-MW-01	45.87	
BLO-MW-06	43.11	
BLO-MW-05	49.63	

DSA-MW-03 is ~~not~~ located in excavated PCB area, however it was not present. It may have been decommissioned.

ASR

RRS-MW-04 was not

10/14/16

located. Will review to see if it was decommissioned. PGI-MW01 → ~8' high above ground. 1730 Review plans for tomorrow. Inspect water treatment system. Two 5-gallon buckets with GAC. Small pump with hoses w/ ~~for~~ in-line filter between pump and GAC. Concern about freezing temperatures

Done for the day.

10/16/16
 Previous 2014 GW report indicates DSA MW03 & RRS MW04 were not found & assumed to be decommissioned.

[Handwritten signature]

(59)

10/15/16

0830 Pick up Sheryl
and go to office.
Health and Safety
meeting.

Put together water
treatment system and
go to RRS. at
former CA Connexes
@ the lands mending
area; construct a
28'x10' containment & place
drum inside.

Pump ~10 gallons of
water from buckets
of development water
through the GAC system
and into drum.

1100 Calibration of field
YS I meter. Mobilize
gear for water sampling
@ FPC-066 near school

1215 Lunch

(60)

10/15/16

1300 Pick up Sheryl &
go to FPC-066.

Well	DTW
FPC 066-MW-05	7.75
FPC 066-MW-04	6.05
FPC 066-MW-06	4.38
FPC 066-MW-07	5.24

1400 Set up to sample @
FPC 066 MW 07

1411 Start purging.
See Field form.

1530 Collect FPC 066 MW 07, DFO

1600 Move to FPC 066 MW 06
Decon pump & prep

1700 Begin purging - see field
form.

1745 Sample FPC 066-MW 06; DFO
Demobilize.

(61)

10/15/16

1815 Beck @ field office.
Place samples in
sample refrigerator.

1845 Leave office

(62)

10/16/16

0900 At office - Greg
DuBois & Sheryl Wassillie.
Health & safety.
Temperature ~ 32°F

Go to RRS & treat
water through GACs

Calibration checks &
calibrate Sp. Cond. & DO?

1055 Leave for FPC 066
Showing gravel

1110 arrive @ FPC 066 MW04
See field form for
details.

1255 collect sample FPC 066 MW04.
Break

1400 Go to FPC 066 MW05
Set up. See field form.
Various issues with bladders and
batteries.

1845 collect FPC 066 MW05
Odor, oily appearance,

(63)

10/16/16

1930 Drop off gear +
samples @ the field
office. Done for the
day.

[Large handwritten signature]

(64)

10/17/16

0830 Pickup Sheryl. Snow
of ~2-3" on ground &
continuing to snow.

Need fuel for truck and
so waiting for person to
fuel.

~1000 Fueled and go to field
office to prepare gear.

1030 Prep for field. Calibrations,
bottles, etc.

1100 Take purge water to
CA connexes + put through
GAC.

1245 Lunch

1330 Back @ office

1355 Start purge @
FPC 215-MW08

See field form for details

1655 Collect FPC 215-MW08

1730 Duplicate FPC 215-MW28

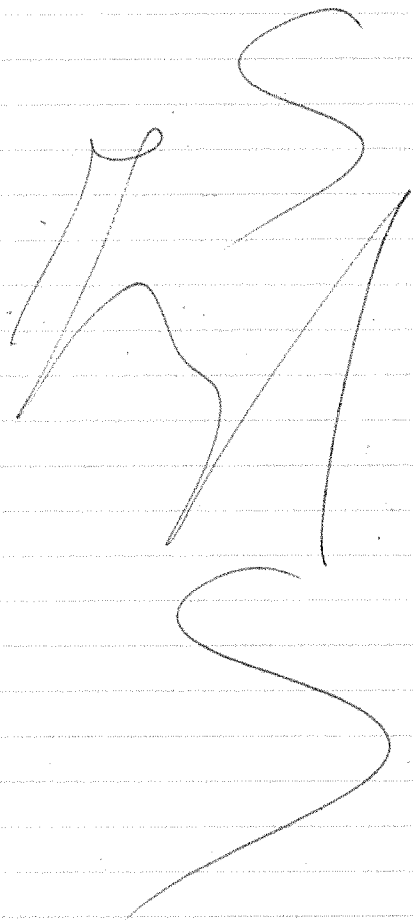
65

10/17/16

1800 Return to office &
update paperwork.

Prep for tomorrow

1900 Done for the day



66

10/18/16

0845 Picked up Sheryl

to office

18°F ~10mph wind 4° windchill

0900 Prep for field, calibration,
Health & Safety

1030 RRS MWO2

Using test for wind
control.

Bladder has leak so
change out the pumps.

1145 Take 1st readings

1300 Collect sample RRS MWO2

- VOCs

- MNAs

1400 Drop off materials &
sample @ office & go for
lunch. Snow & wind as
we drive into town.

(67)

10/18/16

1500 Return to office.
Decide to prep for tomorrow as weather deteriorates and it is getting late for a second sample.

1700 Down for day.

~1800 Surveyors arrive on Grant Air. Pick up @ airport.
Coastal Surveyors. They drop off gear @ Red Building / office.

(68)

10/19/16

0800 Bring surveyors to office. Pick up Sheryl. Health & Safety meeting. Surveyors setting up their base station.

240° F; light breeze, partly cloudy.

Calibrate check
Work with surveyors to designate well locations & numbers.

1000 UST MW 02

Check DTW. At ~ 6' the pump stops. There is old ~ 1/2" tubing in the casing & we fish out the tubing & attempt to put pump down casing but it is still refused. The casing above ground is @ an angle and so we believe there is a bend where the

(69)

10/19/16

pump cannot get beyond
it.

1100 DSA MW04 - Set up

1200 Begin purging.

1430 Sample DSA MW04.

1545 Move to
DSA MW02

1624 Begin purging.

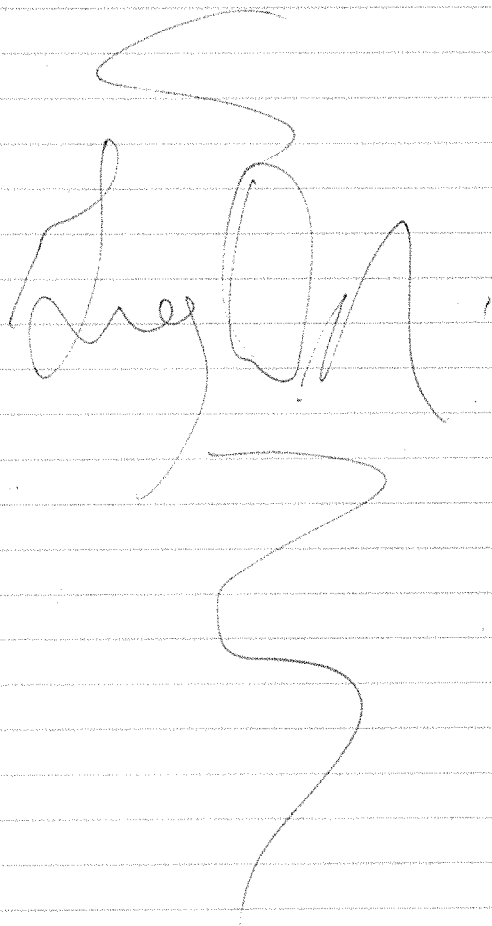
1745 Sample DSA MW02

1918
~~1918~~ Stopped sampling due
to darkness and water
volume being pumped
decreased to very low
rate, and estimated
 $\sim 1.5 \Rightarrow 2$ hours to collect
remaining bottles

(70)

10/19/16

2000 Drop off gear @
office building.



(71)

10/20/16

0800 Mobilize to office
H & S meeting. Prep
and coordinate sample
shipping today.

No heat in office.
Call for heating oil fuel or
repair?

1000 Time sheets & office coordination
Temperature ~ 40°F with
north breeze @ ~ 5-10 mph.

1130 Go to water treatment
& run purge water through
GAC, and into drums.

1210 Return to office &
prepare cooler to ship
samples.

1230 Put cooler on to
Lake Clark air.
Call TestAmerica and
Lake Clark Air to
determine timing

(72)

10/20/16

1330 Return to RRS &
complete sampling @
PSA MW 02.

1450 Label bottles for
BLO MW 01 & decon
pumps.

1630 BLO MW 01

Set up pump and
sample/purging with
XSI. Strong odor.

Difficulty with
pumping. Adjust
Settings. Change out
tubing and bladders.

1845 Barely obtaining any
water @ maybe 5 ml
per cycle. Decide
to stop for the day.

Return to office &
decon pumps.

(73)

1930

10/20/16
Done for the day.

[Large handwritten scribble]

(74)

10/21/16

0810 Pick up Shuryl
0820 Health + Safety
Cloudy ~32°F
light snow

0945 Prep and go to R.R.S.

BLO MW-07

1000 Start purge @ 1000

1100 Water level has decreased
by ~2.76' and pumping
is ineffective. Will
let water level recover
and then sample.

Return to office and
prepare for next location.

BLO - MW-06

Begin pumping. Pump
rate slows down to ~1/3 of
initial rate.

(75)

10/21/16

+5:10:20

1400 Begin sampling. Collect
VOC's + GRO samples
& water.

Then begin sampling for
AK 102/103. 1-liter Amber.

1510 Finish 1st 1-liter amber
& decide to let the
well recharge and try
to fill tomorrow.

1700 BLOM W-05

1725 Begin pumping/purging.
Extremely low purge rate.

1807 Able to take first field
measurements when there
is enough water to drizzle
out of the flow through
cell.

1920 Collect VOC + GRO

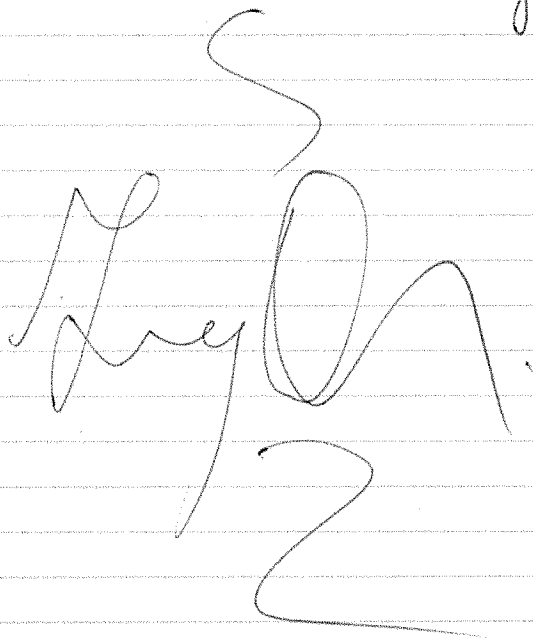
10/21/16

(76)

samples over the
course of ~ 1/2 hour.

Decide to allow the
well to recover and
attempt to collect more
sample tomorrow.
Return to office.

2000 Leave for the day.

A large, stylized handwritten signature in black ink, appearing to read 'Meylon'.

(77)

10/22/16

0815 Health & Safety.
clear, calm, 32°F

0845 Decon both pumps

0915 Prepare sample bottles

0930 calibration w/ ~~on~~ SLW

YSI 114AZC | 10/15/16 | 11/20/18 | 0940

Readings | Acceptance

PH = 6.79 | 6.8 - 7.2

ORP = 260.6 | 229 - 261

SP COND = 5180 | 1600 - 7970

recalibration of SP COND

YSI UW2 | 10/5/16 | 4/1/17

Ti: 4 valve = 1045

pre calibration reading = 1059

post calibration reading = 1045

Opened sample refrigerator
& some vial had
frozen and broken.

Resampled vial for
R&S MW02, DSA MW04,
DSA MW02.
Decon equipment

(78)

10/22/16

1330 BLO MW07

Collected for all
analytes without
additional purge after
purging 'dry' yesterday.
Took ~ 1.0 → 1.5 hours
to collect all of the sample.

~1500 Break

1600 Prep to sample BLO MW06
& BLO MW05 which
purged 'dry' yesterday

1645 BLO MW06
Complete sample set

1700 Collect Duplicate:
BLO MW26

1815 BLO MW05
Very low purge rate
similar ^{sample}
to yesterday.

1830 designated sample time

(79)

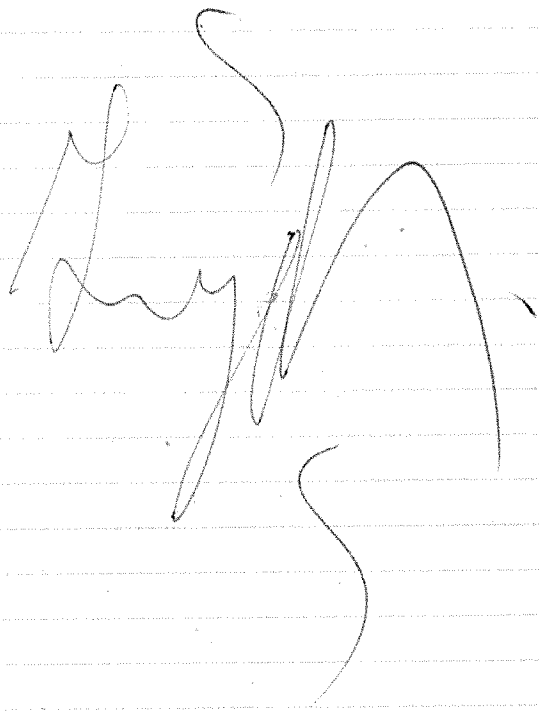
10/22/16

1945

~~is 1920~~
Continue until getting dark. Collected all VOC's + GAO vials and ~ 3/4 of 1-liter Amber.

2000

at red building.
Done for the day.



(80)

10/23/16

1300

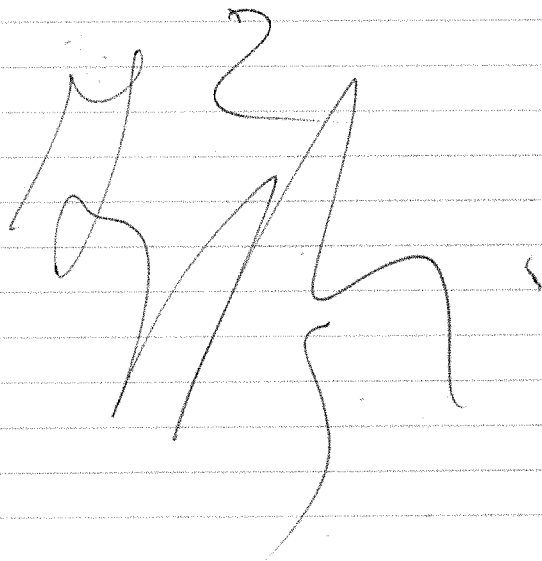
At office. Go to B60 MW 06 to collect extra volume for MS/MSD.

1430

clean/organize office area. Pipped for tomorrow.

1600

Done for the day.



(81)

10/24/16

0800

Go to office
Health & Safety
~40°F partly cloudy,
calm. Dark.

Prepare samples for
shipping + calibration checks
+ calibrations as needed.

0915 Go to BLO MWOS
to continue sample
collection.

Able to finish the
first 1-Liter Amber &
then collected the
remaining sample
by ~1220.

HAD

1230 Packing samples for
shipment.
Grant Air arrives
~30 minutes early.

(82)

10/24/16

4 Coolers sent on
Grant Air to King
Salmon. Contact
Pen Air to let them
know the coolers
are coming to ship
out to AUC this
evening. Coordinated
with Versar & TestAmerica.

1315 Break

1430 Go to DSAMW06

1700 Collect primary sample
& duplicate sample
designated
DSAMW06.

1720 DSAMW07

1840 Purged for ~~all~~ but
rate decreased to very
low rate, + decrease
of 3.46' in well.

Will test well

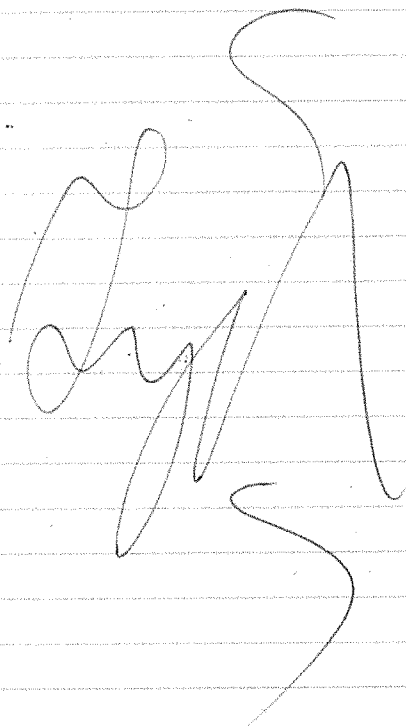
(83)

10/24/16

recover overnight and
sample in the morning

1900 Return to office.
Place samples in the
fridge. Prep for
tomorrow.

1930 Leave office.



(84)

10/25/16

0830 Pick up Sheryl.
Go to Office.

0900 Prep. Health &
Safety meeting.
Windy day; Estimate
Winds up to 20 mph.
gusts; temp 44°F.

0930 Sample ~~AWC~~ 20
DSA MW 07

1000 Put water through
GAC system.
Contact Pen Air & verify
samples went to AWC
last night. Leave message
for Test America Anchorage.

1100 Back to office & prep
a cooler for shipment.
Confirm Grant Air scheduled
for ~3 pm

1200 Break

(85)

10/25/16

GLO M.W. 03

* D.W. = 59.32 ft ¹⁴⁷⁰ - Turb = 3.82

Vol =

Time	Vol	D.W.	PH	ppm	Temp	mS	D6	Turb
1525	2.25	59.32	5.33	170.7	3.69	0.234	11.05	3.82
1525	2.45	59.39	5.24	177.3	3.56	0.234	11.08	2.52
1530	2.50	59.35	5.30	174.6	3.59	0.234	10.98	
1535	2.7	59.33	5.45	167.8	3.73	0.234	11.06	5.02
1540	2.9	59.35	5.49	166.9	3.51	0.235	11.03	6.53
1545	3.1	59.38	5.42	172.0	3.43	0.235	11.09	5.12
1550	3.25	59.35	5.46	170.5	3.45	0.234	11.05	3.30
1555	3.45	59.35	5.53	169.4	3.43	0.234	11.03	3.50
1600	3.60	59.36	5.57	166.2	3.41	0.234	11.00	2.82
1605	3.7	59.36	5.61	165.3	3.39	0.235	11.01	3.32
1610	4.0	59.36	5.64	164.2	3.38	0.235	10.92	4.21
1615	4.2	59.36	5.73	159.8	3.51	0.235	10.92	2.01
1620	4.3	59.34	5.73	160.3	3.59	0.234	10.98	5.55
1625	4.4	59.34	5.80	154.7	3.52	0.235	10.84	7.00
1630	4.5	59.36	5.80	158.4	3.42	0.235	10.96	4.44
1635	4.7	59.35	5.80	159.5	3.40	0.234	11.00	2.96
1640	4.9	57.34	5.82	158.8	3.39	0.234	11.00	2.68
1645	5.1	59.35	5.86	156.8	3.44	0.234	11.01	1.65

* Field form became soaked
and changed to fieldbook

(86)

10/25/16

(87)

10/25/16

Notes: From 1300 → 1400
we put cooler with
samples on Lake Clark
Aur and Mobilized to
GLO MW 03 and began
purging @ 1408 → see
field form. Then due
to rain soaked conditions
we switched to this field
book on the previous
page.

1730 Collect GLO MW 03
~~1700~~ VOCs MNA

Go to GLO MW 04

Purging going extremely
slow so change pumps.
Purge ~~rate~~ improves to
~ 0.05 liters per minute

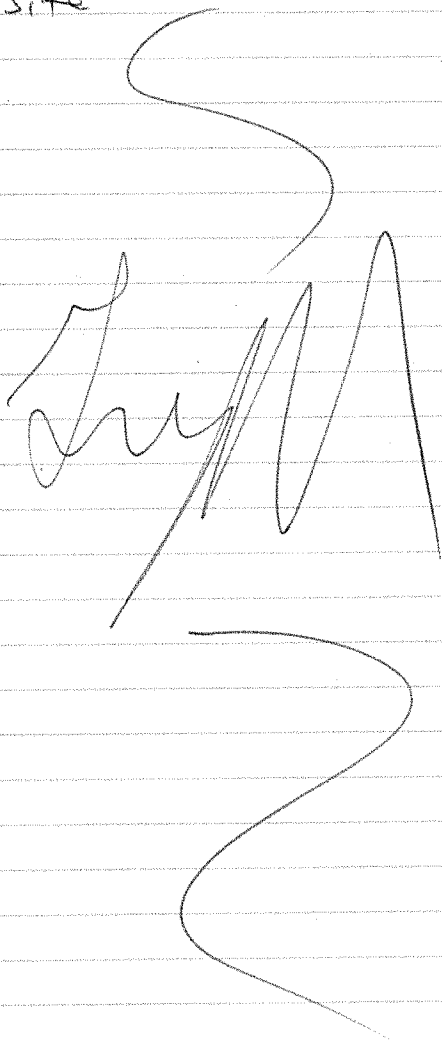
1935 Collect GLO MW 04

2010 Leave site & go to
office.

(88)

10/25/16

2020 place samples in the
refrigerator & leave
site



(89)

10/26/16

0830

pick up Sheryl. Go to office.

Health & Safety.
Drizzling rain; 40°F;
calm.

Prepare for sampling →
calibration checks &
sample bottles.

1045 RRS MW06

1108 Begin purging

1230 Collect RRS MW06 for
VOEs & MNAs

1300 Break

1400 Return to office &
get more bottles &
interface probe.1430 Run water through
GAC

(90)

10/26/16

1445 BLO MW 01

Depth to product = 45.97'
Depth to water = 45.98'

Return to office.

Prepare to sample @
FPC 215 site. 1st
take depth to water
measurements @ all
wells on site.

Well ID	DTW
FPC 215 MW08	11.02 ft
MW09	12.49 ft
MW10	4.2 ft
mark - MW11	10.9 ft 11.00 notch
MW12	12.92 ft 12.78 ft
MW03	12.92
Unknown	9.98

↑
notch

(91)

10/26/16

~~1630~~ ~~AK FPC MW~~
 1630 FPC 215 MW 11

1646 Begin purging. Very turbid + sediment laden. Poured out initial water in flow through cell + re-connected, but the water remained high in turbidity, and over range of the turbidimeter.

1725 Collect sample for FPC 215 MW 11.
 ↳ DRO

1800 FPC 215 MW 12

Purge. Water level drops + then recovers somewhat during purging.

1930 Collect sample FPC 215 MW 12

2000 Return to office

2030 Done for the day.

(92)

10/27/16

0800 Go to office

0830 Health & Safety

Review notes of forms from yesterday. Calibration checks + field prep.
 ~40°F; partly sunny; light wind

1100 RRS MW 05

Go to well by hand carry as location is amongst brush.

1130 begin purging; 3.5 gallon purge.

1324 Sample RRS MW 05.

1400 Break

1500 Pump water through GAC treatment system.

1530 Go to DSA MW 01

Initially ~~discovered~~ pump rate was extremely low. Realized pump was too high + probably caught on a joint in the screen interval.

(93)

10/27/16

Reset with new tubing
at a greater depth, and
purge rate was acceptable.

1830 Collect DSA MW01
VOCs & MNA's.

1845 Move equipment to
DSA MW05

1935 Collect DSA MW05
VOCs & MNAs

2000 Return to office

~~2000~~

2030 Done for the day.

Dryden

(94)

10/28/16

0810 Pick up Sheryl & go
to office.

0900 Health & Safety.
~40°F; Wind gusts to 40+
mph. Cloudy. Do not
plan to sample outside
unless the wind decreases,
due to safety concerns.

Work in the office
to prepare for tomorrow
if winds die down.
Take solid waste to the
dump.

1210 Leave office.

AS

(95)

10/29/16

0800 Mobilize to office.

Calibration check.

	Reading	Standard
pH	7.16.8	6.8 → 7.2
ORP	250.7	238 → 268
sp. cond.	6292	7600 → 7950

Calibrate ~~specific~~ conductance to 1413 solution @ 950 based on temperature chart.

Initial 913

Calibration 950

Prep bottles and sampling equipment.

1115 Pick up Sheryl to ~~drop off~~ and take to airport for 1140 departure.

1230 Flight arrives late. Drop off Sheryl on Lake Clark Air.

(96)

10/29/16

1250 FPC 215 MW09

1415 Parameters stable & collect sample for FPC 215 MW09 @ 1420. DR0.

Sample is oily in appearance. Clear. No odor noticed.

1530 BLO MW01

Set up pump & tubing but once again, it is not bringing the water to the surface. Suspect it is due to contaminants affecting the pump efficiency.

Decide to use bailers. Strong odor. ~3 gallons bailed

1630 Well is dry with < 1 of water.

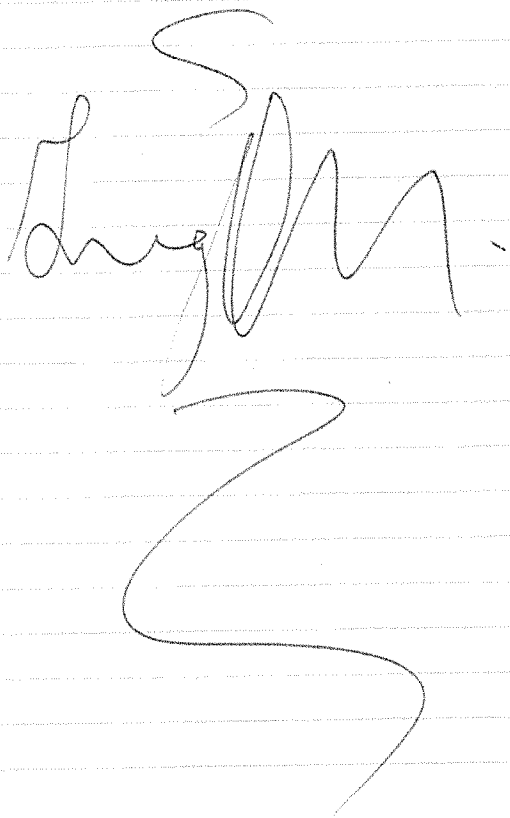
1700 Demobilize for the day.

(97)

10/30/16

0800

High winds & rain.
Decide not to attempt
to sample today.
Wind gusts up to 50 mph.
Also no flights
expected to take
samples.



(98)

10/31/16

0800

Review of plans and
weather is ~40°F &
calm. Still dark & so
will go to office
~0900 + prep to sample.
H&S meeting.

1030 Go to BLO MW-01

1100 Collect sample
BLO MW01 without
purging (purged dry ~~with~~ (1/25))

Strong POK odor.
Collected with bailer &
no field parameters measured.

1130 Take contaminated
water to a drum storage
area & samples to
the field office.

~1200 Lunch @ B&B

Check on available flights
for the water samples
& I was not able to

Appendix D
Port Heiden Key Personnel and Qualifications

TASK ORDERS 5 & 6 PORT HEIDEN SITE INSPECTION KEY PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS

The following table identifies project personnel, the organization with which the person is associated, title, responsibilities, and qualifications.

Name	Organization Affiliation	Title	Responsibilities	Education and Experience Qualifications
Julie Sharp-Dahl	USACE	Project Manager	Project management for contracting agency	On file with agency
Richard Mauser	USAF	Project Manager	Project management for Responsible Party	On file with agency
Aldone Graham	USACE	Contracting Officer	Contract management	On file with agency
Greg DuBois	APCS	Project Manager/ Project Scientist	Management and coordination of project activities including field operations, subcontractor coordination, and health and safety oversight.	B.S., Earth Science – 1982 PMP #1842366; CQM #784 34 years of AK geologic experience 26 years environmental project management
Craig Scola	USACE	Technical Lead	Technical lead for contracting agency	Certified Professional Geologist
Emily Underwood	Versar	Chemistry Manager	Laboratory coordination	On file with agency
Louis Howard	ADEC	Regulatory Manager	Regulatory oversight	On file with agency
Greg DuBois Sheryl Wassillie	APC Services, LLC	ADEC Qualified Person On Site	Supervision or performance of perform onsite monitoring tasks	All persons meet ADEC Qualified Person criteria under 18 AAC 75.900 (100).

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Appendix E

Responses to Comments

**REVIEW
COMMENTS**

**PROJECT: Port Heiden Yearly Groundwater Monitoring
DOCUMENT: draft 2016 Groundwater Monitoring Report**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 7 February 2018 REVIEWER: Julie Sharp-Dahl PHONE: 753-2720	Action taken on comment by: Greg DuBois APC Services, LLC
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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USACE/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
----------	--------------------------------	----------	---	---------------------	---

1.	Cover	On the second cover page please put this work done by APSC under USACE Contract XXXXX	--	Based on other comments received, APCS remove the second cover sheet.	
2.	Page bottoms	Please add "Port Heiden" before 2016.	A	Added to the footer.	
3.	Sec 1.2	Doesn't mention FPC-029, although work done in that area. Need to call out a fig for BLO, GLO, DSA, etc. where ever you sampled and talk about in results. Include wells on the figures.	A	Sentence added regarding FPC-029.	
4.	Sec 1.3	Talks about well decommissioning, but no details on this activity later in report, other than it was done.	A	Modified to include greater detail in section _.	
5.	Sec 1.4	First bullet add lab Second bullet add depth to water (confirm MNA all wells) Third bullet add disposal Fourth bullet how many wells?	A	First bullet included laboratory comment. Second bullet added comment related to RRS. Third bullet included disposal. Fourth bullet indicated two wells.	
6.	Figs	After Fig 1 need figure showing all the wells.	A	We added wells to Figure 1 and changed the figure number to 1-1.	
7.	Sec 2	At this point in the doc the reader hasn't been told the SOW. Please briefly present the WP SOW before detailing the WP deviations. Table 3-2 may be ideal. And a fig before this section will help the reader identify where these wells were. First bullet: Table 3-2 states both decommissioned in 2011. Please confirm with reports. Second bullet, Well 215-MW-10: Table 3-2 lists this well as repaired, and only the DTW is inaccurate; it appears as though it was sampled. Please confirm.	A	APCS updated the SOW described in section 1 with a table from the original groundwater monitoring plan.	

**REVIEW
COMMENTS**

**PROJECT: Port Heiden Yearly Groundwater Monitoring
DOCUMENT: draft 2016 Groundwater Monitoring Report**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 7 February 2018 REVIEWER: Julie Sharp-Dahl PHONE: 753-2720	Action taken on comment by: Greg DuBois APC Services, LLC
-------------------------------------	---	--

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USACE/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
-----------------	---------------------------------------	-----------------	---	----------------------------	--

8.	Sec 3	Confirm “qualified person” is still the term ADEC uses. I think it may have changed when the cleanup levels were redone.	A	The updated terms are qualified environmental professional and qualified samplers. The text was updated with these terms.	
9.	Text above Table 3-1	Add turbidimeter	A	Turbidimeter added.	
10.	Table 3-2	DTW 2016 has Oct 2016; Table note say 31 August 2014 prior to Sept sampling. Please resolve.	A	Removed notation regarding ‘prior to September sampling’.	
11.	Sec 4.2	Sample PFC215-16SB01- state this became MW-11, and sample –SB02 became MW2. Confirm MW215-MW-10 wasn’t repaired or sampled.	A	Text was re-written to provide clarification as requested.	
12.	Sec 4.2, page 4-3	Last paragraph p 4-3 TCE breakdown: are there biotic or abiotic degradation products; or both? Last sentence of this paragraph, consider revising to read: “The presence of DRO..... (...such as TCE) would aid in natural attenuation at monitoring well BLO-MW-01. ” Just because DRO is present doesn’t mean degradation is occurring.	A	PCE and TCE were detected in 7 wells and only 1 degradation product was detected, cis 1,2, dichloroethene, was detected in well BLO-MW-01. This is consistent with biotic dechlorination. The text was adjusted as requested.	
13.	Table 4-4	pH and redox would be useful info here. Table note * please add this is a field dup of the above sample. If no DO for the Dup please put NS.	A	ORP and pH were added to the table.	
14.	Figs	Figs 4-1 thru 4-3 use the site map as the inset. Fig 4-2, what is below well id in brackets? Define or remove. If needed, add to fig 1 also.	A	Added the location figure as an inset to the other figures. Removed the numbers in the brackets.	
15.	Table 5-2	Define NS, NA	A	Completed.	

**REVIEW
COMMENTS**

**PROJECT: Port Heiden Yearly Groundwater Monitoring
DOCUMENT: draft 2016 Groundwater Monitoring Report**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 7 February 2018 REVIEWER: Julie Sharp-Dahl PHONE: 753-2720	Action taken on comment by: Greg DuBois APC Services, LLC
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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USACE/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
----------	--------------------------------	----------	---	---------------------	---

16.	Sec 5.3	<p>“Current COCs” – from ROD? 5-Year review?</p> <p>What VOCs? All or short list? If short list please add them VOCs (benzene, toluene, etc).</p>	A	Modified the text to indicate both the ROD COCs and the exceedences of DRO and RRO.	
17.	Table 5-3	Intro Sec 5.3 states BLO-MW-07, DSA-MW02, and DSA-MW04 sampled in 2004, 2009, 2010, and 2011.	A	The introductory text was modified.	
18.	Table 5-4	<p>BLO-MW-01 RRO exceeds criteria all years. Please bold results.</p> <p>Check J definition: doesn't fit the 78 mg/L and 150 mg/L result for BLO-MW-01.</p>	A	<p>Bolding added.</p> <p>Change the J note to indicate the results were estimated.</p>	
19.	Table 5-5 footnote	See last note before the reference to the Acronyms and Abbreviations section: dates are 2010-2014. Conc ranged from 0.508 to 0.499 mg/L.	A	Changed the note to match the dates and results.	
20.	Sec 6	<p>Where will GAC go?</p> <p>Did decommissioned well materials go into landfill too?</p>	A	<p>The GAC remained in a drum over the winter planned to be used in 2017.</p> <p>The well materials from site FPC-029 were placed in the Port Heiden Landfill.</p>	
21.	Sec 7	First sentence 2016, not 2014.	A	Changed to 2016.	
22.	Sec 7.1	Which 4 wells were added back in, and when? It isn't clear if the confirmation sample from 066-MW-05 was from summer 2014, or if you sampled 2x in 2016 – summer and October – which is not indicated in this report.	A	The paragraph was -rewritten to clarify the sampling and results that occurred at the site. Another firm had sampled 066-MW-05 in June 2016 and the result exceeded the cleanup level. Therefore all four wells were sampled as part of the annual fall 2016 sampling event.	

**REVIEW
COMMENTS**

**PROJECT: Port Heiden Yearly Groundwater Monitoring
DOCUMENT: draft 2016 Groundwater Monitoring Report**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 7 February 2018 REVIEWER: Julie Sharp-Dahl PHONE: 753-2720	Action taken on comment by: Greg DuBois APC Services, LLC
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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USACE/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
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23.	Sec 7.3	1,1,2,2-TCA is not in the data tables –first mention of this COC.	A	This sentence was a remnant from a previous report and removed.	
24.		I looked at a couple of GW monitoring forms, but did not review anything else besides the text and figures	A	Noted. Mr. Craig Scola also provided review comments which included other parts of the report.	
		----- End of Comments -----			

**REVIEW
COMMENTS**

**PROJECT: Port Heiden Yearly Groundwater Monitoring
DOCUMENT: draft 2016 Groundwater Monitoring Report**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 14 February 2018 REVIEWER: Craig Scola PHONE: 753-5769	Action taken on comment by: Greg DuBois, APC Services, LLC
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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USACE/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
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1.	Cover	Two cover pages?	A	Two cover pages are common for printing and placement into 3-ring binders (a cover on the outside of the binder and another one inside). This will be removed from the digital copy.	
2.	General	If this is a report addressing 2016 GW sampling, will there still be a report to address 2017 GW sampling as per the SOW?	A	Yes; the 2017 report is in progress.	
3.	Appendix A Photo Log	From SOW: All photographs shall be labeled with the location/direction of view, date, time, and description.	A	Photographs have been updated to include location/direction of view, date, time and description.	
4.	Table 3-2	Suggest adding superscript number wherever there's N/A to explain as you did with N/A ⁵ For well PG-MW-01 DTW for Oct 2016, and 215-MW-10 DTW for Oct 2016.	A	Added as suggested.	
5.	4.1 FPC-066 SITE, 4 th sentence	“f” Misplaced?	A	Removed.	
6.	Table 4-3	Exceedances should be bold. Plus add a note to explain beneath table.	A	The results were bolded and a comment added below the table.	
7.	General:	Have wells been sampled again in 2017? Will there be another GW monitoring report this calendar yr addressing those results? Based on the number of wells that couldn't be sampled due to damage for 2016, seems if we were aware of those, we should have made arrangements to repair those wells so they could be sampled the subsequent sampling event.	A	The wells were sampled again in 2017 and reporting is in progress. APCS acknowledges concerns for well repair relative to a formal report although APCS did provide damaged well information via email in the fall of 2016 during the field event and when	

**REVIEW
COMMENTS**

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DOCUMENT: draft 2016 Groundwater Monitoring Report**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 14 February 2018 REVIEWER: Craig Scola PHONE: 753-5769	Action taken on comment by: Greg DuBois, APC Services, LLC
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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USACE/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
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				the Workplan was updated in April 2017.	
8.	Table 4-4	How do existing concentrations of metals compare against ADEC cleanup levels? If all are below maybe add a note at bottom stating so. If some exceed, then maybe add a column listing cleanup level, and bold exceedances.	--	Groundwater cleanup levels under 18 AAC 75 do not include iron or manganese. According to the 2009 Record of Decision, there is no evidence of metals contamination at the RRS. No changes were made to the report.	
9.	Figure 4-1	Please add what kind of plume it is to make figure more stand alone. (E.g. DRO Plume)	A	Added DRO to the explanation.	
10.	Fig 4-2	Needs a North arrow.	A	Added a North arrow.	
11.	Fig 4-3	In the Monitoring Well Type box Suggest adding (BLO) after the Black Lagoon Outfall label, please apply this to each well type. Also spell out what PG stands for if known.	A	Acronyms added to the explanation. PG stands for Pad Grid. as part of the RIFS conducted in 2004 and reported in April 2006 a grid was established between Antennas 1 and 2 and designated as Pad Grid 1 and the well was placed in that area.	
12.	Section 5.1 FPC-066 Site	The Historic DRO concentrations in MW 066-MW-05 should have their sampling dates compared. Are some events in the spring Vs. the fall? This could be addressed in the 2017 GW Monitoring Results Report.	A	This review will be included in the 2017 report.	
13.	Sect 5.2 FPC-215 Site	See comment 12 above. This comparison could be made across the site at all wells containing contamination and free product.	A	This review will be included in the 2017 report.	
		----- End of Comments -----			

**REVIEW
COMMENTS**

**PROJECT: Former RRS 2016 Groundwater Monitoring W911KB-15-C-0025
DOCUMENT: Draft 2016 Annual GW Monitoring Report (May 2018)**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS		DATE: May 2018 REVIEWER: Jordan PHONE: 907-753-2647	Action taken on comment by:		
Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)

		Please change the analytical suite for 215-MW-10 to "not sampled" Footnote 5- weren't all wells at FPC-215 resurveyed in 2016? Please verify and add the TOC elevation.	A --	that had been decommissioned including this well. Table and text has been updated to reflect historical changes. Monitoring well 215-MW-10 TOC was added.	215-MW-10 still says it was sampled for DRO but the WP deviations section states that this well was not sampled. TOC information was not added for this well.
6.	Sec 3.3	"Calculations indicate that groundwater flow at FPC-066 is to the south-southwest." But Figure 4-1 shows GW direction to the south east.	A	Groundwater flow direction was removed from this diagram and a recommendation for the wells to be re-surveyed.	
7.	Sec 4.0	"...24 of the 27 scheduled monitoring wells..." Should this be 23 of the 28 scheduled monitoring wells? Table B-1-1 shows 23 GW monitoring wells that were sampled and Table 1-1 shows 28 proposed monitoring wells.	A	The number of wells sampled and planned are updated.	Text was changed to "collected from 24 MWs"
8.	Sec 4.2	"Sample FPC215-16SB01 was collected from 7 to 9 feet bgs and sample FPC215-16SB02 was collected from 7 to 9 feet bgs. The analytical results were 1.7 milligrams per kilogram (mg/kg) and 2.6 mg/kg respectively." Please state what analyte the analytical results were for.	A	DRO was added as the analyte.	
9.	Sec 4.3, 3 rd paragraph	The period at the end of the first sentence is red, please change it to black.	A		
10.	Figure 4-1 and 4-3	Can you please differentiate the wells with/without exceedances in these Figures?	A	Wells that exceed cleanup levels are part of the plumes shown in the figures. A comment was added to the explanation indicating that the plumes exceed the cleanup levels.	
11.	Figure 4-3	Table 4-3 does not show an exceedance for DSA-MW-05 but this well is inside the boundary of the TCE plume. Is this correct?	--	The plume maps are estimated extents of groundwater contamination and APCS considers the extent of the plume may include contaminated groundwater at a greater or lesser	Figure 4-3 does not show a dashed plume extent for DSA-MW-05.

**REVIEW
COMMENTS**

**PROJECT: Former RRS 2016 Groundwater Monitoring W911KB-15-C-0025
DOCUMENT: Draft 2016 Annual GW Monitoring Report (May 2018)**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS		DATE: May 2018 REVIEWER: Jordan PHONE: 907-753-2647	Action taken on comment by:		
Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)

				elevation than from the screened interval of DSA-MW-05. Figures have been modified with dashed plume extent and the text was modified to include this potential.	
12.	Sec 5.2, 1 st paragraph	Last sentence of the first paragraph - shouldn't 2014 also be included in the list of years that the wells were sampled?	A	2014 was added to the list of years it was sampled.	
13.	Sec 5.3, 1 st paragraph	First sentence – shouldn't 2009 also be included?	A	2009 was added to the sentence.	
14.	Table 5-3 & 5-5	Please double check to see if the values in the brackets for 2016 are the LOQ instead of the LOD.	A	Changed to LOQ.	
15.	Sec 5.3.2	1 st paragraph on PDF Page 40 - "Four of the 16-15 wells sampled in 2016..." 1 st paragraph on PDF Page 43 – please include data qualifiers whenever the result is reported. The concentration of 0.479 mg/L should be flagged with a "J"	A	Completed.	
16.	DQA	Please include a table (similar to B-1) for soil samples collected. Please include a data table that shows all results. PQL and RL are old terminology. Please use DL, LOD, LOQ instead.	-- -- A	The soil samples are included in table B-1. All results are presented in the tables in B-2 based on the SDGs so that the tables and qualifiers can be correlated to the laboratory analytical reports and data quality assurance reports. Updated with current terminology	The title for the table B-1 specifies that it is for groundwater samples (Table B-1. Field Quality Control Sample Quantities, Groundwater Samples) Table B-2-1 does show results based on SDGs but these tables are not useful in determining where contaminated locations are. Cleanup levels are not even included.
17.	DQA Sec 1.1	Please use the updated QSM. These data qualifiers are not consistent with what was provided in the WP (QAPP WS #37). Additionally, it	A	The current QSM has been referenced and was used for this data. Bias qualifiers (+/-) were applied when there was evidence of bias – for example if there was	There are no bias qualifiers in Table B-2-1. There is a data review for SDG 280-102540 and 280-102019 but these SDGs are not discussed anywhere in the report and data was not provided. Please explain. ADEC checklists are only provided for 89568 and 90005 with no data validation reports. SDG 89568 is included twice. There are no checklists/ data validation reports for the other SDGs included in this report.

**REVIEW
COMMENTS**

**PROJECT: Former RRS 2016 Groundwater Monitoring W911KB-15-C-0025
DOCUMENT: Draft 2016 Annual GW Monitoring Report (May 2018)**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS		DATE: May 2018 REVIEWER: Jordan PHONE: 907-753-2647	Action taken on comment by:		
Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)

		appears that a lot of flags weren't added to estimated (J flagged) results. Even though the result is estimated, it is helpful to know if is biased in a certain direction.		spike recovery that was above or below QC criteria. If there was a sample detection below the LOQ and above the LOD, that is not evidence of a biased result -- the result would be J-flagged but no bias was applied.	
18.	DQA Table B-1	There weren't any trip blanks for GRO? This table shows 2 MS/MSDs for DRO and MNA but table B-1-1 only shows 1 MS/MSD. There were five SDGs associated with this project so there should have been a minimum of 5 MS/MSDs. It is a QSM requirement that MS/MSDs be analyzed per prep batch.	A	Trip blanks were provided to the laboratory however GRO analyses were not requested on the COC. This was an oversight. Table B-1-1 has been updated to include 2 MS/MSD.	
19.	DQA Sec 2.6	First sentence of this section, please remove GRO and BTEX since a TB was only analyzed for VOCs. Please explain why a trip blank was not analyzed for GRO and how it affects data quality/usability. It states that results were qualified B when the concentration was within a factor of 5 (or 10 for methylene chloride), however, the text in this section also states that flags were not applied when there were detections in excess of 10 times only.	A	Trip blanks were provided to the laboratory however GRO analyses were not requested on the COC. This was oversight. GRO data quality/usability is not affected since all LOQs were less than the cleanup level and all sample results were below the cleanup level.	
20.	B-2 Tables	Please change "motor oils" to Residual Range Organics and make sure the method is AK103. "MDL" should no longer be used, please use LOD instead. "RL" should be LOQ	A	Changes were made to the tables.	
21.	Data Review Report	Please remove "AK103" since the two soil samples were only analyzed for DRO.	A	The laboratory still used AK103 in its method name. It has been removed from the table.	

**REVIEW
COMMENTS**

**PROJECT: Former RRS 2016 Groundwater Monitoring W911KB-15-C-0025
DOCUMENT: Draft 2016 Annual GW Monitoring Report (May 2018)**

Location: Port Heiden, Alaska

U.S. ARMY CORPS OF ENGINEERS		DATE: May 2018 REVIEWER: Jordan PHONE: 907-753-2647	Action taken on comment by:		
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Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
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	280-89568	How does Table 2 have 4 results?	--	It has been changed to indicate 2 results.	
		--- End of Comments ---			

Alaska Department of Environmental Conservation
Comments on the Draft 2016 GW Report for Port Heiden RRS at Port Heiden, Alaska dated January 2018
Commenter: Louis Howard (ADEC) Comments Developed: August 27, 2018

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
1.	2-1	2	<p>Work Plan Deviations</p> <p>The text states: “Well 215-MW-10 was damaged and depth-to-water (DTW) measurements, and sample collection could not be completed.</p> <p>Well UST-MW-02 was not sampled because the polyvinyl chloride (PVC) pipe was bent and a pump was not able to be lowered for sample collection. The field team was able to get a DTW reading, which was 64.93 feet and found that there was no PVC cap. An approximately 1/2-inch-diameter tube was also removed from the casing.”</p> <p>ADEC requests that these wells be decommissioned if they are not able to be repaired for sampling and replaced with new wells in the same location, at the same depth and with the same length of well screen material.</p> <p>The text states: “Well PG1-MW-01 was in the middle of an excavation, and the outer protective steel casing had been removed. The top of the PVC casing was about 8 feet above the ground. Because of concern about the potential to break the PVC casing, the well was not sampled.”</p> <p>This well needs to be backfilled and resurveyed prior to sampling. In addition, the remaining wells all need to be resurveyed if they have not had been resurveyed within the last two years (i.e. 2016 or 2017).</p> <p>The text states: “Well BLO-MW-01 was not successfully purged using the low-flow sample method after two attempts. On October 26, 2016, an interface probe detected approximately 0.01 inch of product, which was interpreted to be the equivalent of a sheen. On October 29, 2016, a bailer was used to purge the well, and no visible layer of product was observed. The field team bailed water until the well was dry. The well</p>	<p>Agreed. The USAF is in the process of planning to repair or decommission and install new wells.</p>

Alaska Department of Environmental Conservation
Comments on the Draft 2016 GW Report for Port Heiden RRS at Port Heiden, Alaska dated January 2018
Commenter: Louis Howard (ADEC) Comments Developed: August 27, 2018

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			<p>was allowed to recover until October 31, 2016, and then was sampled immediately without measuring field parameters.”</p> <p>The sample results for volatile organic compounds (e.g. TCE) and gasoline range organics from BLO-MW-01 shall be flagged “biased low” due to use of a bailer to sample the monitoring well.</p>	Agreed. Sample results were flagged with J- indicating a possible low bias.
2.	3-3	Table 3-2	<p>Port Heiden Monitoring Wells – 2016</p> <p>Well ID</p> <p>BLO-MW-01</p> <p>Analytical Suites</p> <p>GRO, DRO, RRO, VOCs, MNA</p> <p>State in text on page 4-3 that gasoline range organics (GRO) did not exceed cleanup levels since they were analyzed for in groundwater. However, the GRO results will be considered biased low since the samples were collected with a bailer.</p>	Agreed. GRO have been flagged with a J- flag due to sampling with a bailer.
3.			7. Conclusions and Recommendations	
4.	7-1	7.1	<p>FPC-066 Site</p> <p>ADEC concurs with the recommendations to monitor the four wells at this site.</p>	Agreed.
5.	7-1	7.2	<p>FPC-215 Site</p> <p>The text states: “Monitoring well 215-MW-10 has had DRO detections in the past but was damaged and not sampled in 2016. Consideration should be given to repair of well 215-MW-10 for future monitoring.”</p>	

Alaska Department of Environmental Conservation
Comments on the Draft 2016 GW Report for Port Heiden RRS at Port Heiden, Alaska dated January 2018
Commenter: Louis Howard (ADEC) Comments Developed: August 27, 2018

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			ADEC concurs, however, if well 215-MW-10 cannot be repaired, it should be decommissioned and abandoned. If the well is decommissioned, then a new monitoring well should be installed next to well 215-MW-10's location, at the same depth and with the same well screen length.	Agreed. Repair or decommissioning and new installations are under evaluation by USAF.
6.	7-2	7.3	<p>Former Radio Relay Station</p> <p>The text states: “ If the 2017 results are consistent with the previous results in these wells, the USAF recommends that the frequency of long-term monitoring at these nine monitoring wells be changed to once every five years to coincide with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) five-year reviews.”</p> <p>ADEC concurs. However, ADEC requests the full suite of volatile organic compounds (VOCs) from Method 8260 be reported and not limit results to TCE and 1,1,2,2-tetrachloroethane. Rationale being that there are daughter products that may be produced as part of natural attenuation which need to be evaluated as well (e.g. vinyl chloride, 1,1,1-TCA, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE and 1,2-DCA).</p>	Agreed. In Section 4 Results all of the analytes were listed and detected results reported in the table. In addition, in Appendix B Table B-1-2 - a summary of results was added that provided the wells in accordance to sites and in alphabetical order.



THE STATE
of **ALASKA**
GOVERNOR MIKE DUNLEAVY

**Department of
Environmental Conservation**

DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites Program

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File No: 2637.38.002

December 11, 2018

Robert Johnston
AFCEC/CZOP
10471 - 20th Street, Suite 347
JBER, AK 99506-2201

Re: **Draft Final Versions of the 2017 Landfarming Report and 2016 Annual Groundwater Monitoring Report for Port Heiden RRS at Port Heiden, Alaska Dated: November 2018**

Dear Mr. Johnston:

The Alaska Department of Environmental Conservation (ADEC) has received the above documents for review and comment. After reviewing the documents, ADEC will approve the draft-final versions of the documents. Please finalize the documents.

Sincerely,

A handwritten signature in blue ink that reads "Louis Howard".

Louis Howard
Environmental Program Specialist