PACIFIC AIR FORCES
REGIONAL SUPPORT CENTER

JOINT BASE ELMENDORF-RICHARDSON, ALASKA

2014 ANNUAL GROUNDWATER MONITORING REPORT

FORMER RADIO RELAY STATION
PORT HEIDEN, ALASKA

FINAL
MAY 2015

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
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
GLO	Gray Lagoon Outfall
GPS	global positioning system
GRO	gasoline-range organics
LOQ	limit of quantitation
mg/L	milligrams per liter
MNA	monitored natural attenuation
ND	nondetect
NVPH	Native Village of Port Heiden
PID	photoionization detector
POL	petroleum, oil, and lubricants
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
VOC	volatile organic compound

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1.0 INTRODUCTION

This Annual Groundwater Monitoring Report describes the groundwater monitoring activities conducted September 2014 at the former Port Heiden Radio Relay Station (RRS) and former pipeline corridor (FPC) sites. Jacobs Engineering Group Inc. performed this work for the Air Force Civil Engineer Center under U.S. Army Corps of Engineers (USACE), Alaska District Hazardous, Toxic, and Radioactive Waste Contract No. W911KB-11-D-0005, Task Order No. 0006.

Activities were conducted in accordance with the plans and procedures outlined in the *Groundwater Monitoring 2013 Work Plan* (U.S. Air Force [USAF] 2013). Deviations to 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 a log of project photographs.
- **Appendix B** contains the Data Quality Assessment (DQA), analytical data, and laboratory documentation associated with sampling.
- **Appendix C** contains the field documentation, including groundwater sampling forms, well development forms, and field logbooks.
- **Appendix D** contains a list of the key project personnel, roles, and qualifications.
- **Appendix E** presents the responses to comments on the *Draft 2014 Annual Groundwater Monitoring Report*.

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 reaches the Port Heiden Lagoon) and the 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 611th Civil Engineer Squadron that characterized the condition of groundwater throughout Port Heiden (USAF 2006). NVPH, under the *Remediate Former Port Heiden RRS Cooperative Agreement* administered by 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 (NVPH 2010).

In 2008, the fuel pipeline was removed from the Marine Terminal to the former composite building located at the former RRS (Native Village of Port Heiden [NVPH] 2010). Two diesel-range organics (DRO)-contaminated sites 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. At the former RRS, historical effluent discharged via a garage floor drain in the composite building was piped downslope and discharged into the Black Lagoon Outfall (BLO) berm-reinforced ponding area, which 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, septic system and septic system outfall, and various landfills and debris burial areas.

Based on previous investigations, contamination plumes have been identified 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 the 2014 groundwater sampling event were to:

- Conduct groundwater sampling and analysis to provide data for the evaluation of the current contamination levels.
- Evaluate trends in the groundwater at the former RRS site and FPC sites to support management decisions.

1.4 SCOPE OF WORK

The definable features of work for the 2014 groundwater monitoring field activities included the following:

- **Biopile Treatability Study:** Excavation of tetrachloroethylene contaminated soil (approximately 3,800 cubic yards) and the construction of two passively vented biopile treatment systems at the BLO (USAF 2015)
- **Site setup, including site controls and integrated data management facilities**: Site controls were used to mitigate potential migration of contaminants of concern (COC), while data management procedures were used to organize and protect data generated by field activities.
- **Annual Groundwater Monitoring**: Field monitoring included 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 (VOC), and monitored natural attenuation (MNA) parameters.
- **Waste Management and Decontamination**: Investigation-derived waste generated during the field activities were managed as contaminated wastes.

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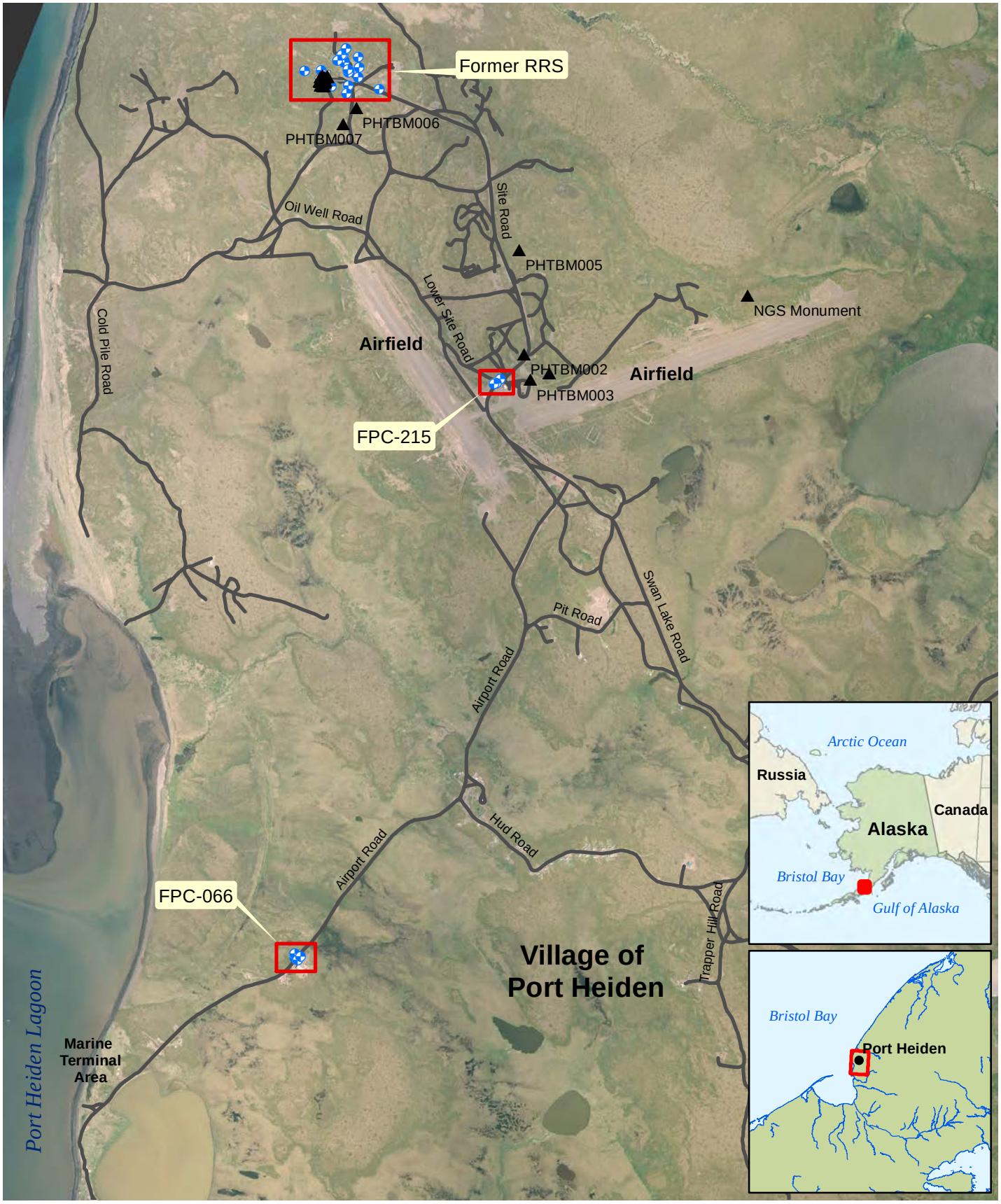

N

0 1,250 2,500 3,750 5,000

Feet

WGS 1984 UTM Zone 4N Imagery: Aerometric 2002

▲ Survey Control Point

Monitoring Well

SITE LOCATION AND VICINITY FOR PORT HEIDEN HTRW GROUNDWATER MONITORING

PORT HEIDEN, ALASKA

JACOBS	DATE: 11 Dec 2014	PROJECT MANAGER: G. Rutkowski	FIGURE NO: 1-1

\\ancfil03\GIS_Data\PortHeiden\GIS\MXD\HTRW_TO06\14GW_Mon_Report\Fig A-1 Location&Vicinity.mxd delanelj

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2.0 WORK PLAN DEVIATIONS

This section describes deviations from the *Groundwater Monitoring 2013 Work Plan* (USAF 2013) during the 2014 groundwater sampling effort:

- Monitoring wells DSA-MW-03 and RRS-MW-04 could not be located during the 2013 field effort and appear to have been removed. Global positioning system (GPS) coordinates were used in 2013 to confirm that both wells are no longer present at the site.
- A photoionization detector (PID) was not present onsite at the time of 2014 groundwater monitoring. Therefore, PID readings were not collected from monitoring wells prior to sampling.
- Well BLO-MW-07 was purged dry during 2014 sampling activities, and only limited sample quantities could be recovered from the well. As a result, the sample for MNA parameters total alkalinity and sulfate was not collected.
- Well 215-MW-10 was found to be damaged during the 2014 field activities. This well was repaired and developed prior to sampling.

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3.0 PROJECT EXECUTION APPROACH

In September 2014, groundwater monitoring was conducted at the FPC-066, FPC-215, and the former RRS sites as part of the annual sampling program required by the *Record of Decision for Port Heiden Radio Relay Station* (USAF 2009). Twenty-one monitoring wells were scheduled for sampling; results were compared to cleanup levels from the Alaska Department of Environmental Conservation (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 2014). Sampling was conducted by personnel who meet the ADEC definition of a "qualified person," 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 2014 GROUNDWATER MONITORING

Depth to water (DTW) was measured at each monitoring well on 5 June 2014 and prior to sampling using an electronic oil-water interface probe. These measurements were recorded in order to determine whether any petroleum, oil, and lubricants (POL) product was present; to determine the DTW relative to the top of casing (TOC); and to investigate seasonal fluctuations in groundwater elevation. In 2013 approximately 0.65 feet of POL product was encountered in monitoring well BLO-MW-01 at the former RRS site. The product was bailed and disposed of during the 2013 field activities. Groundwater elevations recorded in 2014 were slightly higher than what was observed in 2013. However, no free product was encountered in monitoring well BLO-MW-01. POL product was not detected in any of the other monitoring wells during 2014 field activities.

The groundwater sampling event occurred in September 2014. In accordance with the Work Plan (USAF 2013), samples were collected from each well using dedicated Teflon-lined tubing under low-flow sampling procedures. Only DRO samples were collected from wells located at the FPC-066 and FPC-215 sites. A peristaltic pump was used at these sites because

VOCs were not scheduled for analysis, and because the inner well casings were only 1.5 inches in diameter. A submersible pump was used to collect samples from monitoring wells at the former RRS.

Monitoring well 215-MW-10 was found to be damaged during well sampling activities. The bollards and well casing were found lying on the ground. The well casing was reattached and the bollards and protective surround were reinstalled on 2 September 2014. Well 215-MW-10 was developed on 19 September 2014 in accordance with *ADEC Draft Field Sampling Guidance* (ADEC 2010). A 24-hour period elapsed after development and prior to sampling of 215-MW-10 on 20 September 2014.

While purging all of the monitoring wells, the parameters listed in Table 3-1 were recorded and monitored in accordance with the Work Plan until either stabilization criteria were met, or a minimum of three well casing volumes had been extracted (USAF 2013). 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 ºC)
pH	± 0.1
Conductivity	± 3 percent
Redox Potential	± 10 mV
Dissolved Oxygen	± 10 percent
Turbidity	± 10 percent

Notes:
ºC = degrees Celsius
mV = millivolts

Groundwater sampling data sheets, well development forms, and associated logbook notes are presented in Appendix C.

Table 3-2 summarizes the monitoring wells sampled in 2014 with their respective screened intervals, DTW, TOC elevations, coordinates, and targeted analytes.

Table 3-2
Detailed Breakdown of Port Heiden Monitoring Wells

Well ID	Screened Interval (feet)	Depth to Water (feet) June 2014	Depth to Water[1] (feet) Sept. 2014	TOC Elevation (feet)	Easting (meters)	Northing (meters)	Analytical Suites
	Former RRS Monitoring Wells[2]						
GLO-MW-03	52.0 to 62.0	58.43	59.56	143.142	520997.61	6315008.07	VOCs, MNA
GLO-MW-04	35.0 to 45.0*	56.18	57.15	140.914	521005.26	6314937.55	VOCs, MNA
DSA-MW-01	45.0 to 58.0	52.55	53.52	137.145	520907.40	6314977.64	VOCs, MNA
DSA-MW-02	57.5 to 67.5	62.33	63.33	146.200	520937.64	6314915.38	GRO, DRO, RRO, VOCs, MNA
DSA-MW-03	This well was damaged and removed from the ground in 2011.						
DSA-MW-04	92.0 to 97.0	66.80	67.53	146.030	520931.73	6314906.31	GRO, DRO, RRO, VOCs, MNA
DSA-MW-05	82.0 to 87.0	57.96	59.55	137.366	520904.89	6314968.99	VOCs, MNA
DSA-MW-06	85.0 to 90.0	56.30	57.01	134.708	520898.70	6315022.41	VOCs, MNA
DSA-MW-07	45.0 to 55.0	43.87	48.67	133.763	520888.41	6315021.82	VOCs, MNA
UST-MW-02	54.5 to 69.5	64.95	65.87	148.311	520999.27	6314873.83	GRO, DRO, RRO, VOCs, MNA
RRS-MW-02	52.5 to 62.5	57.26	58.24	143.899	521136.69	6314793.94	Removed from the Sampling Program in 2014
RRS-MW-04	This well was damaged and removed from the ground in 2011.						
RRS-MW-05	46.0 to 56.0	49.48	50.92	136.851	520863.08	6314986.41	VOCs, MNA
RRS-MW-06	55.0 to 56.0	56.80	58.27	142.373	520921.19	6314769.31	VOCs, MNA
PG1-MW-01	51.9 to 61.9	56.60	58.42	142.431	520934.06	6314817.47	VOCs, MNA
BLO-MW-01	40.0 to 50.0	43.75	45.57	131.505	520759.35	6314853.20	GRO, DRO, RRO, VOCs, MNA
BLO-MW-02	36.0 to 46.0	30.49	32.75	125.136	520642.33	6314914.04	Removed from the Sampling Program in 2014
BLO-MW-05	42.5 to 52.5	47.18	49.37	135.602	520821.00	6314815.05	GRO, DRO, RRO, VOCs, MNA
BLO-MW-06	38.5 to 48.5	41.16	43.05	131.499	520757.29	6314820.13	GRO, DRO, RRO, VOCs, MNA

Table 3-2
2014 Groundwater Monitoring Sampling Plan (Continued)

Well ID	Screened Interval (feet)	Depth to Water (feet) June 2014	Depth to Water[1] (feet) Sept. 2014	TOC Elevation (feet)	Easting (meters)	Northing (meters)	Analytical Suites
BLO-MW-07	35.0 to 45.0	38.30	42.07	128.549	520753.59	6314922.47	GRO, DRO, RRO, VOCs, MNA
	FPC-066 Monitoring Wells[3]						
066-MW-04	2.5 to 12.5	6.65	6.39	37.10	520576.19	6309052.99	Removed from the Sampling Program in 2014
066-MW-05	2.5 to 12.5	8.40	8.15	39.09	520576.29	6309074.67	DRO
066-MW-06	2.5 to 12.5	5.00	4.72	35.44	520595.92	6309034.14	DRO
066-MW-07	2.5 to 12.5	5.81	5.54	36.13	520617.20	6309058.55	Removed from the Sampling Program in 2014
	FPC-215 Monitoring Wells[3]						
215-MW-08	9.0 to 150.0	11.32	12.27	82.45	521937.88	6312877.23	DRO
215-MW-09	9.0 to 18.0	12.89	13.72	83.79	521910.45	6312852.43	DRO
215-MW-10	12.0 to 22.0	13.79	15.07	N/A[4]	521897.05	6312848.65	DRO

Notes:
PVC = polyvinyl chloride
*The screened interval is not consistent with DTW field measurements.
[1]Depth to Water measurements shown above were collected on August 31, 2014 prior to September sampling.
[2]Wells at the RRS are 2 inch PVC.
[3]Wells at Sites FPC-006 and FPC-215 are 1.5 inch PVC.
[4]This monitoring well was damaged and had to be repaired. As a result TOC elevations are no longer accurate.
For additional definitions, see the Acronyms and Abbreviations section.

3.2 GROUNDWATER FLOW MODELING

Groundwater flow direction was modeled using RockWare Surfer 11 software. GPS easting and northing coordinates, DTW measurements, and TOC elevations were input into this software, and gridded using a radial base function and thin plate spline.

Groundwater flow at FPC-066 is to the south-southwest and experiences little to no seasonal variability between June and September based on the 2014 data. However, the DTW measurements in Table 3-2 above show water elevations to be slightly higher (0.265 feet on average) in September than in June.

An accurate numerical groundwater flow solution cannot be obtained from the existing wells at the FPC-215 and former RRS sites because the number of wells and/or their spatial distribution is insufficient. Modeling at the former RRS suggests the primary direction of groundwater flow is to the east-northeast and secondary flow is to the northeast. Water elevations at RRS wells were, on average, 1.3 to 1.69 feet higher in June than in September, in contrast to FPC-066.

The FPC-215 wells are positioned linearly, an arrangement that prevents accurate modeling of groundwater flow direction. In addition, the prior TOC elevation for 215-MW-10 is no longer accurate, and flow direction cannot be triangulated with only two wells. The variation in water elevation at FPC-215 was approximately 0.89 feet higher in June than in September, as calculated from 215-MW-08 and 215-MW-09.

All groundwater flow directions are approximate and represent only estimates of the site conditions (refer to Sections 4.1, 4.2, and 4.3).

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4.0 RESULTS

This section summarizes analytical results from the September 2014 groundwater sampling effort. Groundwater samples were successfully collected from all 21 scheduled monitoring wells at FPC-066, FPC-215, and the former RRS sites.

4.1 FPC-066 SITE

In September 2014, groundwater samples were collected from 066-MW-05 and 066-MW-06 at FPC-066 and analyzed for DRO. Monitoring well 066-MW-05 contained a DRO concentration of 1.3 milligrams per liter (mg/L). The cleanup level for DRO is 1.5 mg/L. The field duplicate sample exhibited an identical concentration. Monitoring well 066-MW-06 contained a DRO concentration of 0.032 mg/L. This result was reported below the limit of quantitation (LOQ) but above the detection limit (DL). As such, the results are qualified J and are considered estimated quantities. Monitoring wells 066-MW-04 and 066-MW-07 were removed from the sampling schedule in 2014, as detailed in the NVPH's 2013 *Annual Groundwater Monitoring* Report (NVPH 2013). All 2014 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 (mg/L)	Result (mg/L)
066-MW-05	14PH-066-MW-05	DRO	1.5	1.3
	14PH-066-MW-059*	DRO	1.5	1.3
066-MW-06	14PH-066-MW-06	DRO	1.5	0.032 J

Notes:
18 AAC 75, Table C, Groundwater Cleanup Levels (ADEC 2014)
* = Field duplicate sample
J = The result was reported between the LOQ and the DL and should be considered as an estimated quantity.
Bold = Result exceeded the ADEC Table C, Groundwater Cleanup Levels
For definitions, see Acronyms and Abbreviations

4.2 FPC-215 SITE

In September 2014, groundwater samples were collected from the three wells at the FPC-215 site and analyzed for DRO. 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 0.022 mg/L to 0.036 mg/L. These results were reported below the LOQ but above the DL. As such, the results were qualified J and considered to be estimated. Results for FPC-215 are summarized in Table 4-2; analytical exceedances are displayed on Figure 4-2. As stated in Sections 2.0 and 3.1, monitoring well 215-MW-10 was found damaged. This well was repaired and developed during 2014 field activities prior to sampling. 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 (mg/L)[1]	Result (mg/L)
215-MW-08	14PH-215-MW-08	DRO	1.5	0.036 J
215-MW-09	14PH-215-MW-09	DRO	1.5	**12**
215-MW-10	14PH-215-MW-10	DRO	1.5	0.022 J

Notes:
[1] 18 AAC 75, Table C, Groundwater Cleanup Levels (ADEC 2014)
J = The result was reported between the LOQ and the DL and should be considered as an estimated quantity.
Bold = Result exceeded the ADEC Table C, Groundwater Cleanup Levels
For definitions, see the Acronyms and Abbreviations section.

4.3 FORMER RADIO RELAY STATION

Sample results at the former RRS identified multiple wells with contaminant constituents above applicable cleanup levels (Table 4-3).

Table 4-3
Former RRS Groundwater Exceedances

Location	Sample ID	Analyte	ADEC Cleanup Level (mg/L)[1]	Result (mg/L)
BLO-MW-01	14PH-BLO-MW-01	DRO	1.5	1,600
		RRO	1.1	150
		1,1,2,2-tetrachloroethane	0.0043	0.027
		TCE	0.005	0.005
DSA-MW-01	14PH-DSA-MW-01	TCE	0.005	0.0077
DSA-MW-02	14PH-DSA-MW-02	TCE	0.005	0.48
	14PH-DSA-MW-029*	TCE	0.005	0.49
DSA-MW-04	14PH-DSA-MW-04	TCE	0.005	0.09
PG1-MW-01	14PH-PG1-MW-01	TCE	0.005	0.039

Notes:
[1] 18 AAC 75, Table C, Groundwater Cleanup Levels (ADEC 2014).
For definitions, see the Acronyms and Abbreviations section.
* = field duplicate sample

DRO was detected at 1,600 mg/L exceeding the cleanup level of 0.005 mg/L in one monitoring well (BLO-MW-01). RRO was detected at a concentration of 150 mg/L, in the same monitoring well, exceeding the cleanup level of 0.005 mg/L. The concentration of 1,1,2,2-tetrachloroethane, reported at 0.027 mg/L, exceeded the cleanup level of 0.0043 mg/L in monitoring well BLO-MW-01.

TCE was detected above the cleanup level of 0.005 mg/L in five wells. The reported concentrations of TCE ranged from 0.005 mg/L (monitoring well BLO-MW-01) to 0.49 mg/L (monitoring well DSA-MW-02). Monitoring well BLO-MW-07 was successfully sampled for the first time since being installed in 2012. All analytes were reported as nondetect (ND) or at concentrations well below applicable cleanup criteria. TCE was reported as ND with an LOQ of 0.001 mg/L. All other target analytes at the former RRS were either detected at concentrations that were less than the cleanup levels or were reported as ND, with a laboratory DL below the applicable cleanup levels. The laboratory results that exceeded cleanup levels are shown in Table 4-3; analytical exceedances 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, that included alkalinity, iron, manganese, nitrogen (as nitrate/nitrite), and sulfate. Monitoring well BLO-MW-07, which has historically been dry, did not produce enough water to collect a total alkalinity and sulfate sample. This deviation from the Work Plan is noted in Section 2.0. 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 TCE degradation products 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) suggests that natural attenuation is occurring at monitoring well 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). 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)	Total Alkalinity (mg/L)	Iron (mg/L)	Manganese (mg/L)	Nitrogen, Nitrate-Nitrite (mg/L)	Sulfate (mg/L)
14PH-BLO-MW-01	BLO-MW-01	N/T	850	35.4	9.4	0.031	1.93
14PH-BLO-MW-05	BLO-MW-05	N/A	52	16.2	0.305	0.262	2
14PH-BLO-MW-06	BLO-MW-06	N/A	54	22.3	0.489	0.186	4.91
14PH-BLO-MW-07	BLO-MW-07	N/A	NS	38.8	0.839	0.22	NS
14PH-DSA-MW-01	DSA-MW-01	13.67	83	0.264	0.0086	0.333	5.07
14PH-DSA-MW-02	DSA-MW-02	8.91	136	6.04	0.0928	1.76	8.89
14PH-DSA-MW-029*	DSA-MW-02	8.91	135	5.91	0.0901	1.92	8.89
14PH-DSA-MW-04	DSA-MW-04	0.15	114	21.7	0.566	ND [0.02]	11.1
14PH-DSA-MW-05	DSA-MW-05	0.78	75	6	0.217	ND [0.02]	8.46
14PH-DSA-MW-06	DSA-MW-06	0.54	73	2.96	0.467	ND [0.02]	5.04
14PH-DSA-MW-069*	DSA-MW-069	0.54	73	2.99	0.463	ND [0.02]	5.05
14PH-DSA-MW-07	DSA-MW-07	N/A	80	45.7	0.895	0.191	7.3
14PH-GLO-MW-03	GLO-MW-03	12.24	65	4.48	0.101	0.126	3.72
14PH-GLO-MW-04	GLO-MW-04	10.38	47	1.47	0.055	0.063	3.25
14PH-PG-1-MW-01	PG-1-MW-01	N/A	111	7.63	0.156	0.33	6.35
14PH-RRS-MW-05	RRS-MW-05	12.70	57	7	0.0832	0.121	3.31
14PH-RRS-MW-06	RRS-MW-06	11.82	162	0.44	0.0091	0.274	3.49
14PH-UST-MW-02	UST-MW-02	N/A	180	101	1.85	0.365	4.41

Notes:
*-Field duplicate sample
The LOQ is provided in [ ]
N/A = Not applicable, the well was purged dry and DO 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 definitions, see the Acronyms and Abbreviations section.

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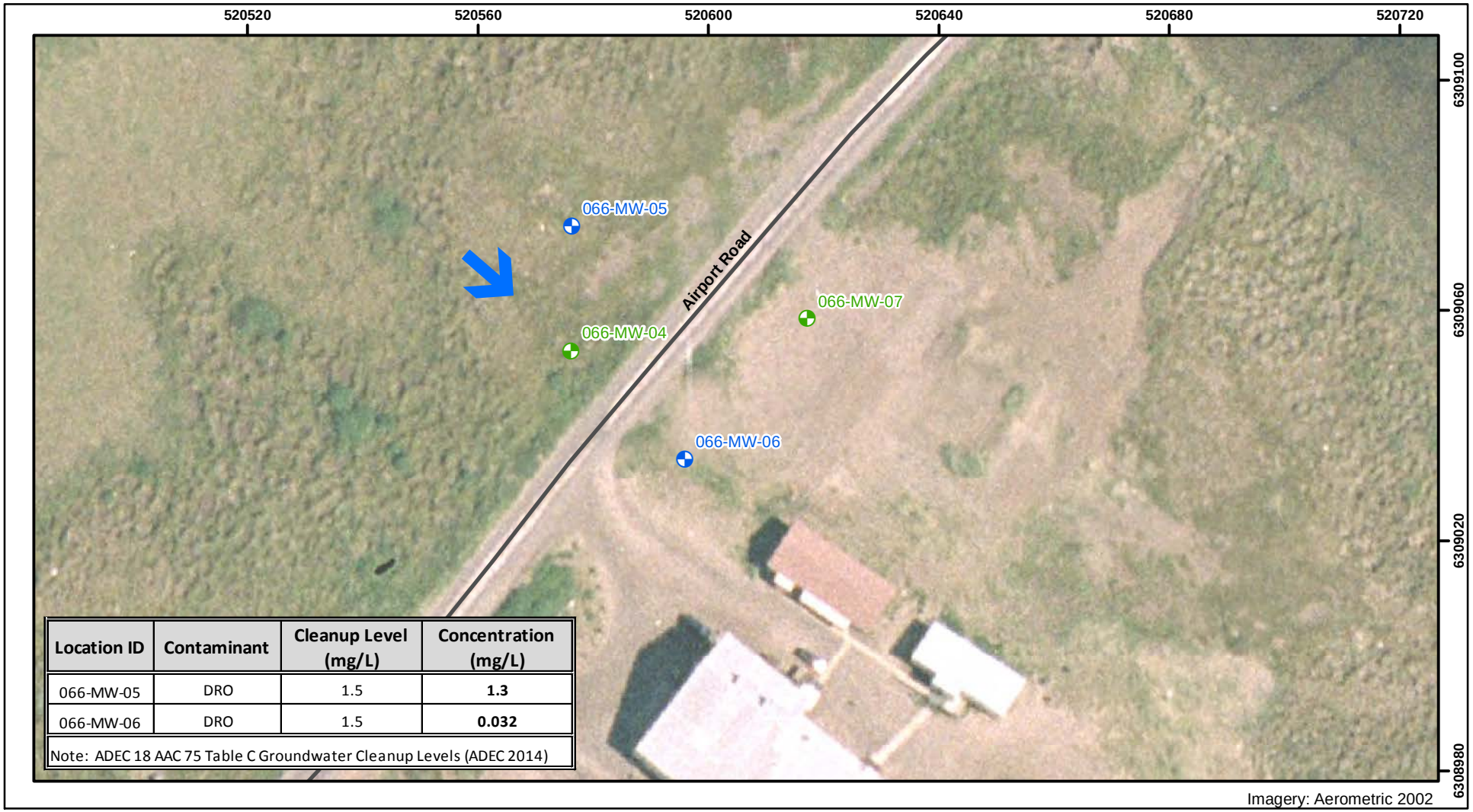
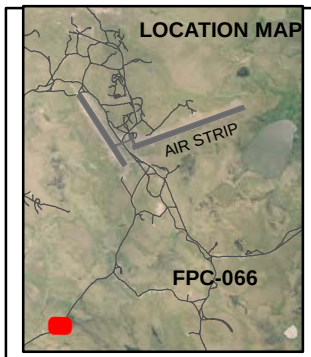


Location ID	Contaminant	Cleanup Level (mg/L)	Concentration (mg/L)
066-MW-05	DRO	1.5	**1.3**
066-MW-06	DRO	1.5	**0.032**

Note: ADEC 18 AAC 75 Table C Groundwater Cleanup Levels (ADEC 2014)

Imagery: Aerometric 2002



- Not sampled in 2014
- Groundwater monitoring wells with no exceedances
- Groundwater monitoring wells with exceedances
- Road
- *Approximate Groundwater Flow Direction*

All Locations Are Approximate

0 25 50 75 100
Feet

WGS 1984 UTM Zone 4N Transverse Mercator

N

FPC-066 Groundwater Monitoring
2014 Groundwater Results

Port Heiden, Alaska

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	19 DEC 2014	G. Rutkowski	4-1

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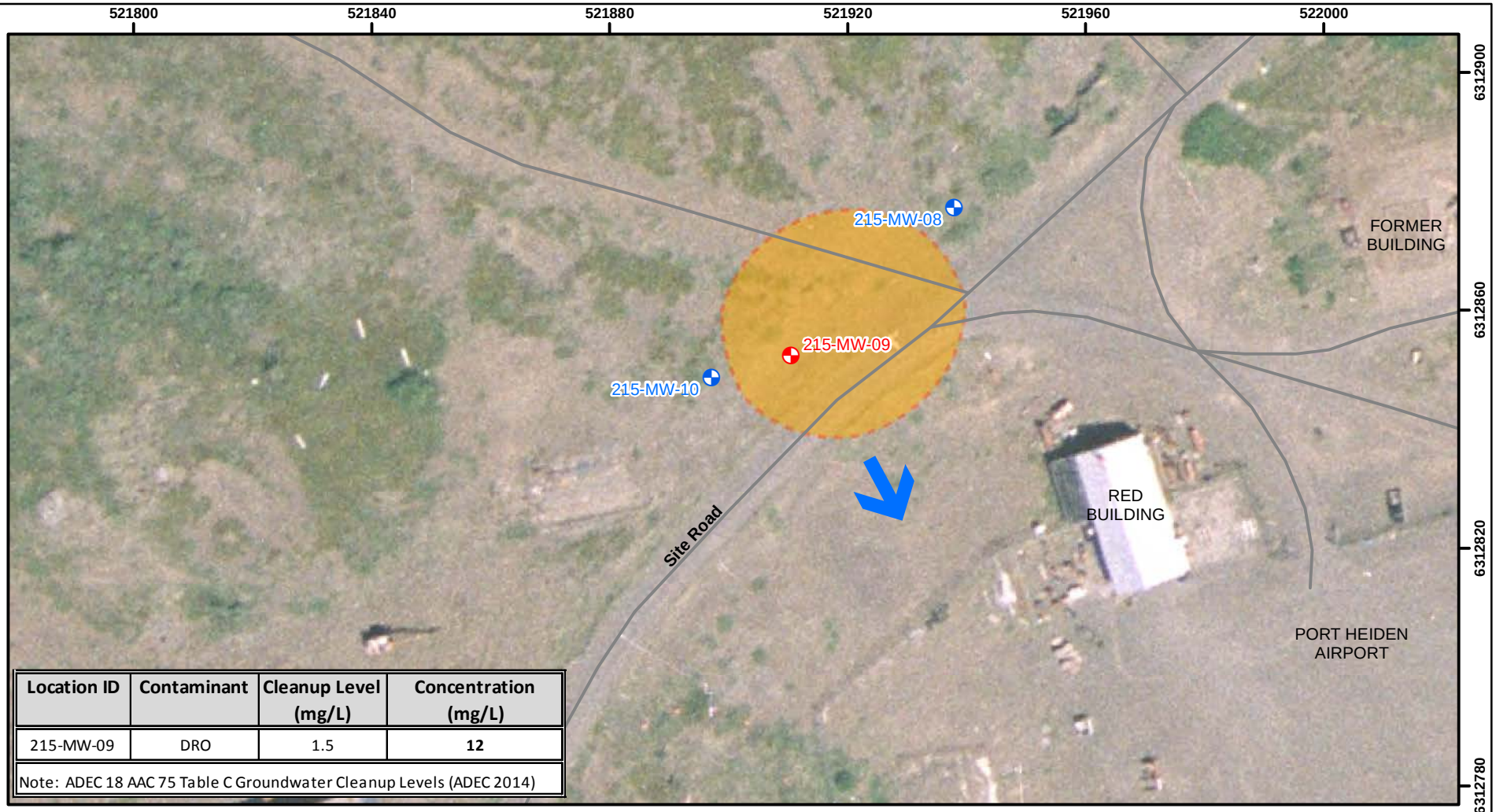
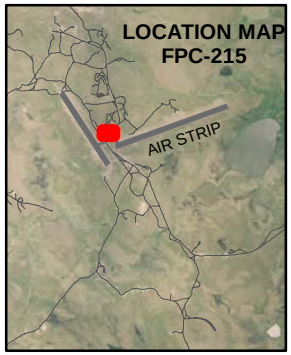


Location ID	Contaminant	Cleanup Level (mg/L)	Concentration (mg/L)
215-MW-09	DRO	1.5	**12**
Note: ADEC 18 AAC 75 Table C Groundwater Cleanup Levels (ADEC 2014)			

Imagery: Aerometric 2002



Approximate Groundwater Flow Direction

- Not Sampled in 2014
- Groundwater monitoring wells with no exceedances
- Groundwater monitoring wells with exceedances
- Road
- Interpolated DRO Groundwater Plume

All Locations Are Approximate

0 25 50 75 100

Feet

WGS 1984 UTM Zone 4N Transverse Mercator

N

FPC-215 Groundwater Monitoring
2014 Groundwater Exceedance

Port Heiden, Alaska

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	19 DEC 2014	G. Rutkowski	4-2

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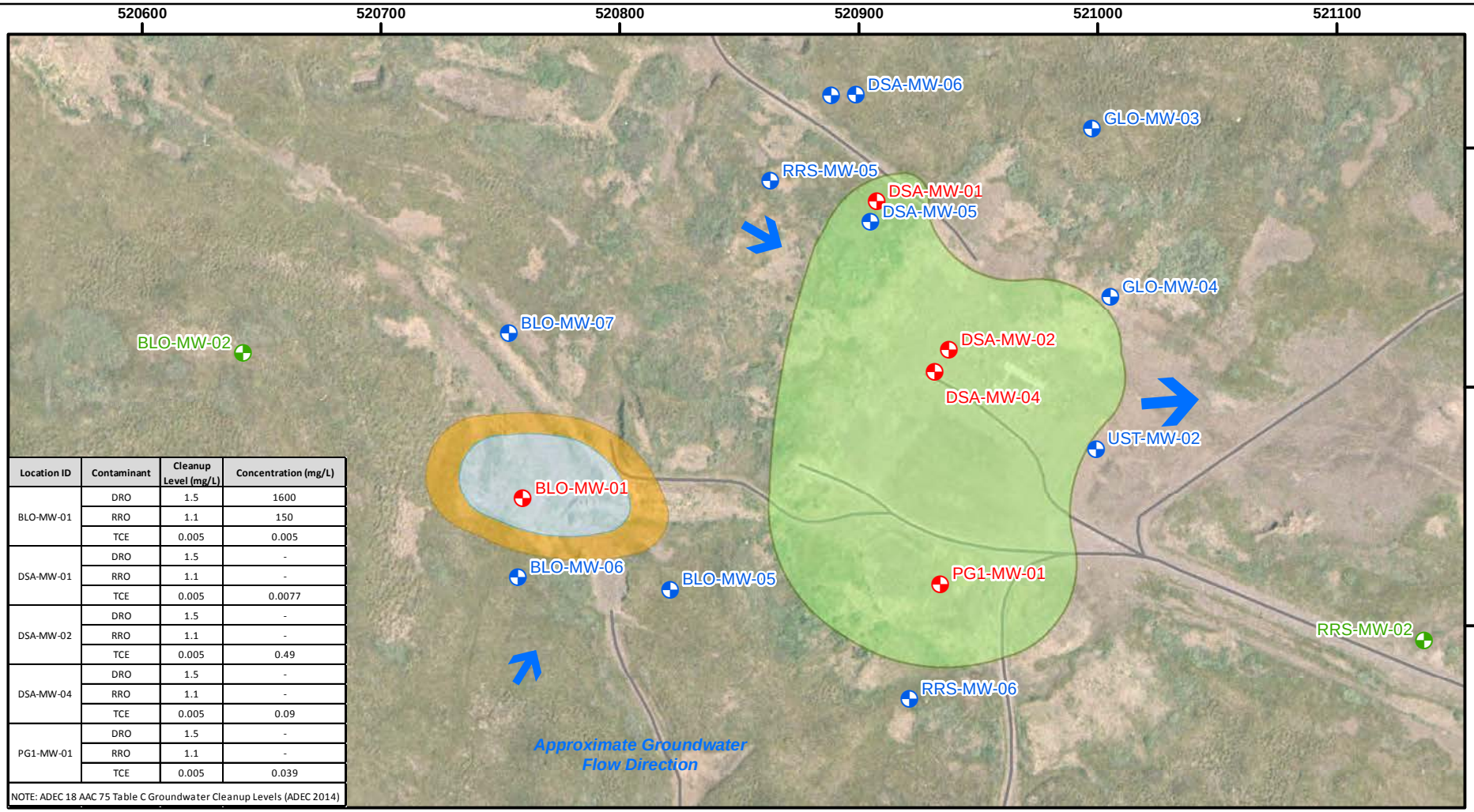
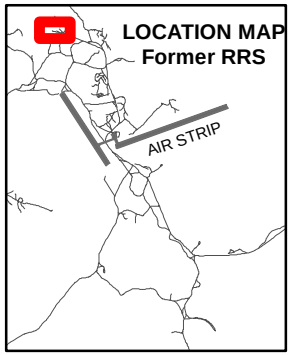


Location ID	Contaminant	Cleanup Level (mg/L)	Concentration (mg/L)
BLO-MW-01	DRO	1.5	1600
	RRO	1.1	150
	TCE	0.005	0.005
DSA-MW-01	DRO	1.5	-
	RRO	1.1	-
	TCE	0.005	0.0077
DSA-MW-02	DRO	1.5	-
	RRO	1.1	-
	TCE	0.005	0.49
DSA-MW-04	DRO	1.5	-
	RRO	1.1	-
	TCE	0.005	0.09
PG1-MW-01	DRO	1.5	-
	RRO	1.1	-
	TCE	0.005	0.039

NOTE: ADEC 18 AAC 75 Table C Groundwater Cleanup Levels (ADEC 2014)

Imagery: Aerometric 2002



- Not Sampled in 2014
- Groundwater monitoring wells with no exceedances
- Groundwater monitoring wells with exceedances
- Interpolated TCE Groundwater Plume
- Interpolated RRO Groundwater Plume
- Interpolated DRO Groundwater Plume
- Road

Note: Primary flow direction is east-northeast.

All Locations Are Approximate

0 125 250 500 Feet

WGS 1984 UTM Zone 4N Transverse Mercator

N

Former RRS Groundwater Monitoring 2014 Groundwater Results

Port Heiden, Alaska

JACOBS	DATE: 19 DEC 2014	PROJECT MANAGER: G. Rutkowski	FIGURE NO: 4-3

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5.0 HISTORICAL RESULTS

This section presents a comparison between the 2014 groundwater sampling results and historical sampling data at sites FPC-066, FPC-215, and the former RRS.

5.1 FPC-066 SITE

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, and 2013 (NVPH 2010, 2011, 2012, 2013, USAF 2104). Ground water samples were collected from FPC-066 wells in 2011, however, the samples were not analyzed for DRO.

Table 5-1
FPC-066 Comparison of DRO Concentrations

Well	2009 (mg/L)	2010 (mg/L)	2011 (mg/L)	2012 (mg/L)	2013 (mg/L)	2014 (mg/L)
ADEC Cleanup Level[1]	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
066-MW-05	**2.25**	**4.5**	NS	**2.02**	**1.6**	1.3
066-MW-06	ND [0.8]	ND [0.800]	NS	ND [0.360]	0.019 J	0.032 J
066-MW-07	ND [0.8]	ND [0.899]	NS	ND [0.360]	0.024 J	NS

Notes:
[1]ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2014).
J = analyte was positively identified, but associated result was less than the LOQ and greater than or equal to the DL.
ND = non detect
NS = not sampled
Bold = Laboratory reported concentration exceeds ADEC cleanup level.
The LOQ is provided in [ ]
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 has decreased from 4.5 mg/L in 2010 to 1.3 mg/L in 2014, and has exhibited a net decreasing trend since 2009. The most recent result for 066-MW-05 was below the cleanup level.

5.2 FPC-215 SITE

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, and 2013 (NVPH 2010, 2011, 2012, 2013; USAF 2014b).

Table 5-2
FPC-215 Comparison of DRO Concentrations

Well	2009 (mg/L)	2010 (mg/L)	2011 (mg/L)	2012 (mg/L)	2013 (mg/L)	2014 (mg/L)
ADEC Cleanup Level[1]	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
215-MW-09	**3.99**	**9.68**	**14**	**8.85**	**11**	**12**
215-MW-10	ND [0.8]	ND [0.856]	0.524 J	0.853	0.032 J	0.022 J

Notes:
[1]ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2014).
J = analyte was positively identified, but associated result was less than the LOQ and greater than or equal to the DL.
ND = non detect
Bold = laboratory reported concentration exceeds ADEC cleanup level.
The LOQ is provided in [ ]
For definitions, see Acronyms and Abbreviations

DRO has been historically detected above the cleanup level in two of the three monitoring wells. 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; the maximum detected concentration (14 mg/L) was reported in 2011. Based on the reported results from 2010 to 2014, the 2009 reported concentration of DRO should be consider an outlier, and may be biased low for reasons unknown. Reported levels of DRO have never exceeded the cleanup level in monitoring well 215-MW-10.

5.3 FORMER RADIO RELAY STATION

In 2004, 2010, 2011, 2012, 2013, and 2014 samples were collected from wells located in the former RRS (USAF 2006; NVPH 2010, 2011, 2012, 2013, USAF 2014b). The following wells sampled in 2014 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 current COCs at the former RRS site are GRO, DRO, RRO, and VOCs. However, only 1,1,2,2-tetrachloroethane, TCE, DRO, and RRO exceeded 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 detailed 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. As discussed in Section 3.1 and the *2013 Annual Groundwater Monitoring Report*, approximately 0.65 feet of free product were encountered in this well during the September 2013 sampling effort (USAF 2014b). In addition to DRO, RRO has historically exceeded cleanup levels in monitoring well BLO-MW-01; RRO concentrations have ranged from 2.8 mg/L in 2012 to 1,890 mg/L in 2010. During the most recent sampling event, RRO exhibited a concentration of 150 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
Former RRS Site Comparison of DRO Concentrations for Wells Sampled in 2014

Well	2004 (mg/L)	2009 (mg/L)	2010 (mg/L)	2011 (mg/L)	2012 (mg/L)	2013 (mg/L)	2014 (mg/L)
ADEC Cleanup Level[1]	1.5	1.5	1.5	1.5	1.5	1.5	1.5
BLO-MW-01	**17**	NS	**15,600[2]**	**70.5**	**26.5**	**1,300[2]**	**1,600**
BLO-MW-05	**2**[3]	NS	ND [0.860]	0.242 J	ND [0.360]	0.075	0.032 J
BLO-MW-06	NS	NS	ND [0.889]	0.883	ND [0.360]	0.074	0.042 J
BLO-MW-07	-	-	-	-	Installed Dry	Dry	0.084 J
UST-MW-02	NS	NS	ND [0.842]	ND [0.378]	0.213	0.093	0.22 J
DSA-MW02	0.086	NS	NS	0.479 J	ND [0.360]	0.031	0.031 J
DSA-MW02*	-	-	-	-	-	0.047	0.028 J
DSA-MW04	NS	NS	NS	NS	ND [0.360]	0.097	0.08 J

Notes:
* Field duplicate sample
[1]ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2014).
[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.
NS = not sampled
Bold = laboratory reported concentration exceeds ADEC cleanup level.
The LOQ is provided in [ ]
For definitions, see Acronyms and Abbreviations

Table 5-4
Former RRS Site Comparison of RRO Concentrations for Wells Sampled in 2014

Well	2004 (mg/L)	2010 (mg/L)	2011 (mg/L)	2012 (mg/L)	2013 (mg/L)	2014 (mg/L)
ADEC Cleanup Level[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**
BLO-MW-05	NS	ND [0.860]	ND [0.306]	ND [0.3]	0.18 J	0.19 J
BLO-MW-06	NS	ND [0.889]	0.223 J	ND [0.3]	0.360 J	0.15 J
BLO-MW-07	-	-	-	Installed Dry	Dry	0.36 J
DSA-MW-02	ND [0.039]	NS	ND [0.340]	0.252	0.062 J	0.073 J
DSA-MW-029*	**-**	**-**	-	-	0.087 J	0.073 J
DSA-MW-04	NS	NS	NS	ND [0.31]	0.082 J	0.059 J
UST-MW-02	NS	ND [0.526]	ND [0.316]	0.372	0.140 J	0.23 J

Notes:
[1]ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2014).
J = analyte was positively identified, but the associated result was less than the LOQ and greater than or equal to the DL.
NS = not sampled
Bold = laboratory reported concentration exceeds ADEC cleanup level
The LOQ is provided in [ ]
* - Field duplicate sample
For definitions, see Acronyms and Abbreviations

5.3.2 TCE Contamination

Seven of the 16 wells sampled in 2014 at the former RRS have a current and/or historically reported TCE concentration above the cleanup level of 0.005 mg/L. Table 5-5 provides a comparison of TCE concentrations over time.

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 2014 were relatively consistent, ranging from 0.49 to 0.508 mg/L.

In each of the five annual sampling events, monitoring well PG1-MW-01 exhibited TCE results greater than the cleanup level. The lowest TCE exceedance in this well (0.0078 mg/L) was reported in 2004, while the highest (0.0447 mg/L) was reported in 2012. There have been significant variations during interim monitoring events. All results reported between 2010 and 2014 were significantly higher than the 2004 reported concentration of 0.0078 mg/L.

Table 5-5
Former RRS Site Comparison of TCE Concentrations

Well	2004 (mg/L)	2010 (mg/L)	2011 (mg/L)	2012 (mg/L)	2013 (mg/L)	2014 (mg/L)
ADEC Cleanup Level[1]	0.005	0.005	0.005	0.005	0.005	0.005
BLO-MW-01	**0.0056**	*ND [0.020]*	0.0036 J	**0.0053**	0.0035	**0.005**
BLO-MW-02	ND [0.00021]	ND [0.001]	NS	ND [0.00062]	ND [0.0001]	NS
BLO-MW-05	0.00019	ND [0.001]	ND [0.00062]	ND [0.00062]	ND [0.0001]	0.00015 J
BLO-MW-06	ND [0.00018]	ND [0.001]	ND [0.00062]	ND [0.00062]	0.00088	0.00014 J
BLO-MW-07	Installed 2012	Installed 2012	Installed 2012	DRY	DRY	ND [0.0001]
DSA-MW-01	**0.017**	**0.0117**	**0.479 J**	0.00047	**0.0062**	**0.0077**
DSA-MW-02	**0.690 J**	**0.508**	**0.499**	**0.506**	**0.5[2]**	**0.49**
DSA-MW-04	Installed 2012	Installed 2012	Installed 2012	**0.0717**	**0.12**	**0.09**
DSA-MW-05	Installed 2012	Installed 2012	Installed 2012	**0.00525**	0.0028	0.0029
DSA-MW-06	Installed 2012	Installed 2012	Installed 2012	0.00054	ND [0.0001]	0.00015 J
DSA-MW-07	Installed 2012	Installed 2012	Installed 2012	**0.0447**	ND [0.0001]	ND [0.0001]
GLO-MW-03	NS	NS	ND [0.00062]	ND [0.00062]	ND [0.0001]	ND [0.0001]
GLO-MW-04	Installed 2012	Installed 2012	Installed 2012	ND [0.00062]	ND [0.0001]	ND [0.0001]
PG1-MW-01	**0.0078**	**0.0423**	**0.0325**	**0.0447**	**0.021**	**0.039**
RRS-MW-02	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	ND [0.0001]	NS
RRS-MW-05	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	0.00011 J	ND [0.0001]
RRS-MW-06	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	ND [0.0001]	ND [0.0001]
UST-MW-02	NS	ND [0.001]	ND [0.00062]	ND [0.00062]	0.00010 J	ND [0.0001]

Notes:
[1]ADEC Cleanup Level based on Table C, Groundwater Cleanup Levels (ADEC 2014).
[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.
NS = not sampled
Bold = laboratory reported concentration exceeds ADEC cleanup level
Italics = The LOQ exceeded ADEC cleanup levels
The limit of detection is provided in [ ]
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 were relatively consistent, ranging from 0.499 to 0.508 mg/L.
For definitions, see Acronyms and Abbreviations

In monitoring well DSA-MW-01, elevated concentrations of TCE existed in five of the six sampling events between 2004 and 2014. The maximum detected concentration (0.479 mg/L) was reported in 2011. The result is qualified J and is considered an estimated quantity. The

sample was diluted prior to analysis and the result was outside of the instrument calibration range. This may account for the dramatic decrease in TCE concentrations within this well that were observed in the subsequent sampling events. The concentration of TCE remains above the cleanup level in DSA-MW-01.

Historically, TCE concentrations in monitoring well BLO-MW-01 have only slightly exceeded the cleanup level of 0.005 mg/L, with exceedances ranging from 0.0056 mg/L in 2004 to 0.005 mg/L in 2014. TCE was not detected in 2010; 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 in the vicinity of this well. In 2014 approximately 3,500 cubic yards of TCE-contaminated soil was excavated adjacent to BLO-MW-01, as stated in the *2014 Draft Black Lagoon Biopile Treatability Study Report* (USAF 2015). Based on available data from this monitoring well, there is no evidence that TCE is naturally attenuating or declining over time.

Six of the wells presented in Table 5-5 were installed in 2012 and are listed below:

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

Between 2012 and 2014, the TCE concentration in monitoring well DSA-MW-04 has remained above cleanup levels. This well is in close proximity to monitoring well DSA-MW-02, which exhibits the greatest TCE concentration at this site. Although significant reductions in TCE concentrations occurred at all other wells installed in 2012 that were sampled from 2012 to 2014, there is currently an insufficient amount of data to assess any potential historical trends for the wells installed in 2012.

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 in the areas surrounding monitoring wells DSA-MW-01, DSA-MW-02, DSA-MW-04, and PG1-MW-01 (USAF 2006). 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.

6.0 WASTE MANAGEMENT

With one exception, all purge and wastewater generated during 2014 was combined into four 55-gallon drums and transferred to ELM Solutions Inc. (ELM) in September 2014 for disposal. Sampling of well 215-MW-10 was delayed until 20 September 2014 due to needed repairs to the well. This water remains onsite. Prior samples collected from the four 55-gallon drums (containing wastewater from the 2013 and 2014 sampling events) were analyzed for VOCs using the Resource Conservation and Recovery Act test method SW8260. Sample results were below the thresholds for hazardous waste outlined in 40 Code of Federal Regulations 261.24, Table 1. The drums were transported by ELM via barge to Columbia Ridge Landfill in Washington state. The sample result from well 215-MW-10 was significantly below the cleanup level. The purge water from this well will be discharged onsite in 2015. Other investigation-derived waste (e.g., disposable sampling supplies, used personal protective equipment, etc.) were combined with waste generated during Treatability Study activities and were also disposed of as nonhazardous waste at Columbia Ridge Landfill.

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7.0 CONCLUSIONS AND RECOMMENDATIONS

This section provides conclusions and recommendations that support the primary objectives from both the 2014 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. During the 2014 monitoring event, both monitoring wells sampled at FPC-066 contained DRO at concentrations below the cleanup level of 1.5 mg/L. Historically, 2014 marks the first sampling event where DRO concentrations have been below cleanup levels in monitoring well 066-MW-05. The USAF recommends collecting a sample from monitoring well 066-MW-05 in the spring or summer of 2015 to determine if levels remain below cleanup criteria. If the DRO concentrations remain below the cleanup level this site is recommended for closure.

7.2 FPC-215 SITE

DRO is the only COC currently monitored at the FPC-215 site. Concentrations of DRO in monitoring well 215-MW-09 exceeded the cleanup level in 2014 and appear to be increasing over time. Based on this observation, it is possible that one or more contamination sources remain onsite. Additional remediation activities should be considered to investigate potential source areas adjacent to monitoring well 215-MW-09. It is recommended that two additional groundwater monitoring wells be installed downgradient of 215-MW-09 to further delineate the extent of DRO contamination at FPC-215. The proposed well locations are presented on Figure 7-1.

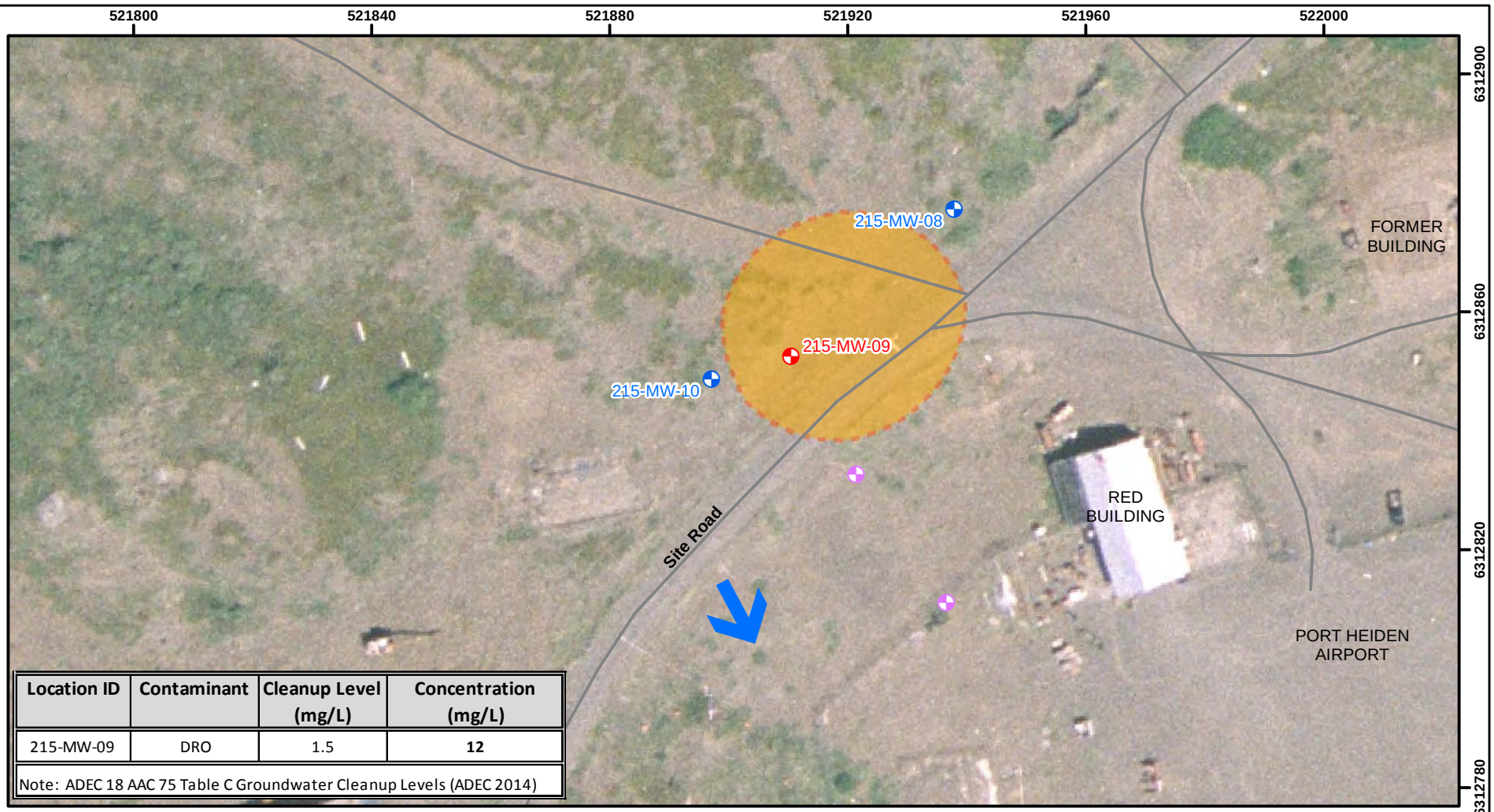
7.3 FORMER RADIO RELAY STATION

A recent Air Force Center for Engineering and the Environment study indicated a high probability of 1,4-dioxane to be collocated with TCE and 1,1,1-trichloroethane contamination (Anderson 2012). The ADEC has promulgated enforceable cleanup levels for 1,4-dioxane. The *First Five-Year Review of Environmental Restoration Program Sites OT001, WP002,*

SS004, LF007, and Four Unnumbered Sites (Antenna Pads, Contaminated Soil Removal Areas, Drum Storage Area, and Focus Area) Former Port Heiden Radio Relay Station recommends wells at the Former RRS historically containing TCE concentrations above cleanup levels be sampled for 1,4-dioxane annually for two consecutive events to assess if future sampling for 1,4-dioxane is warranted (USAF 2014a). For this reason it is recommended that the following monitoring wells be sampled for 1,4-dioxane during the 2015 and 2016 sampling events:

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

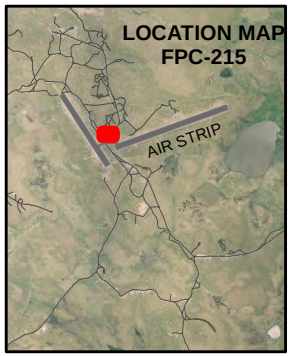
If after two consecutive sampling events 1,4-dioxane is not detected above the cleanup level, the USAF recommends that the frequency of long-term monitoring at these seven monitoring wells be changed to once every five years to coincide with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) five-year reviews.



Location ID	Contaminant	Cleanup Level (mg/L)	Concentration (mg/L)
215-MW-09	DRO	1.5	**12**

Note: ADEC 18 AAC 75 Table C Groundwater Cleanup Levels (ADEC 2014)

Imagery: Aerometric 2002



Approximate Groundwater Flow Direction

- Proposed Monitoring Well Location
- Groundwater Monitoring Well with No Exceedances
- Groundwater Monitoring Well with Exceedances
- Interpolated DRO Groundwater Plume
- Road

All Locations Are Approximate

0 25 50 75 100
Feet

WGS 1984 UTM Zone 4N Transverse Mercator

N

FPC-215 Groundwater Monitoring
Additional Proposed Monitoring Wells

Port Heiden, Alaska

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	28 APR 2015	G. Rutkowski	7-1

P:\PortHeiden\GIS\MXD\HTRW_TO06\14GW_Mon_Report\13PH_FPC215_ProposedGW_MonitoringWells.mxd beatycj

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Two contaminant plumes are present at the former RRS site: a fuel contamination plume in the BLO area and a TCE plume in the vicinity of the former DSA, BLO, and surrounding areas. Of the 16 wells sampled at this site, five contained concentrations of COCs above cleanup levels in 2014. Increased concentrations of DRO, TCE, and 1,1,2,2-tetrachloroethane were detected in BLO-MW-01. This increase is likely attributed to the excavation of approximately 3,500 cubic yards of TCE impacted soil adjacent to BLO-MW-01 during the July 2014 Treatability Study activities. Historically, seven wells have exhibited concentrations of COCs in excess of the cleanup levels. Of these wells, DSA-MW-05 and DSA-MW-07 are the only two that have been below cleanup levels during the previous two sampling events. Based on the 2014 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

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 CERCLA five-year reviews.

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8.0 REFERENCES

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APPENDIX A

Photograph Log

Photo No. 1 – 09 September 2014
Groundwater Monitoring at DSA-MW-05. Looking northwest.

Photo No. 2 – 10 September 2014
Loading purge water and wastewater drums onto a flatbed truck. Looking north.

APPENDIX B

Data Quality Assessment

PACIFIC AIR FORCES
REGIONAL SUPPORT CENTER

JOINT BASE ELMENDORF-RICHARDSON, ALASKA

2014 ANNUAL GROUNDWATER MONITORING REPORT

FORMER RADIO RELAY STATION
PORT HEIDEN, ALASKA

APPENDIX B
DATA QUALITY ASSESSMENT

FINAL
MAY 2015

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ATTACHMENTS

Attachment B-1 Sample Summary and Analytical Data Tables
Attachment B-2 Qualified Sample Results Tables
Attachment B-3 ADEC Laboratory Data Review Checklists
Attachment B-4 Laboratory Deliverables

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ACRONYMS AND ABBREVIATIONS

%D	percent difference
ADEC	Alaska Department of Environmental Conservation
CCV	continuing calibration verification
DL	detection limit
DoD	Department of Defense
DQA	Data Quality Assessment
DRO	diesel-range organics
FD	field duplicate
GRO	gasoline-range organics
Jacobs	Jacobs Engineering Group Inc.
LOD	limit of detection
mg/L	milligrams per liter
MNA	monitored natural attenuation
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
QC	quality control
RPD	relative percent difference
RRO	residual-range organics
USAF	U.S. Air Force
VOC	volatile organic compound

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1.0 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 2014 Annual Groundwater Monitoring at Port Heiden, Alaska.

As part of the 2014 groundwater monitoring effort, 21 groundwater wells were sampled. Table 3-2 in the report section 3.1 lists details of each well and analyses. These were submitted to the analytical laboratory, ALS Environmental in Kelso, Washington 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 summarized in Table 3-2 of the main report.

Table B-1
Field Quality Control Sample Quantities

Method	Analyte(s)	Primary Samples	Field Duplicates	MS/MSD	Trip Blanks
Groundwater Samples					
AK101	GRO	7	1	1	1
AK102	DRO	12	2	2	-
AK103	RRO	7	1	1	-
SW8260C	VOC	16	2	1	3
ASTM2320B, E200.7, E300.0, E353.2	MNA	16	2	-	-

Note:
For definitions, see Acronyms and Abbreviations section.

The attachments to this DQA contain the sample summary table and analytical data tables (Attachment B-1); tables of sample results that did not meet the project data quality objectives (Attachment B-2); ADEC Laboratory Data Review Checklists (Attachment B-3); and the complete laboratory deliverables (Attachment B-4, available on CD).

1.1 QUALITY CONTROL CRITERIA

Jacobs Engineering Group Inc. (Jacobs) performed this DQA and completed ADEC Laboratory Data Review Checklists for the records associated with the 2014 annual groundwater monitoring event, as per the *2013 Groundwater Monitoring Work Plan* (U.S. Air Force [USAF] 2013). Data quality was evaluated against the following requirements: U.S.

Department of Defense (DoD) *Quality Systems Manual*, version 4.2 (DoD 2010); ADEC and U.S. Environmental Protection Agency analytical methods (ADEC 2002; U.S. Environmental Protection Agency [EPA] 2008); and laboratory limits.

The Jacobs project chemist performed a completeness check of the laboratory deliverables to verify that data packages and electronic files included all of the requested information. All analytical data were reviewed, including the chain-of-custody 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 (LOD) and detection limits (DL)
- 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 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. The following data qualifiers are applicable to the 2014 groundwater monitoring analytical data:

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

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

JC- The continuing calibration percent recovery was outside acceptable limits (< 80%); results were qualified as estimated and may be biased low.

JH The result was an estimated value because the analysis was performed past the method holding time.

JM- The result was an estimated value because the analyte failed recovery criteria in the MS or MSD sample, or both; results were biased low because the recovery was less than the lower control limit and/or the RPD between the MS and MSD exceeded the

QC criteria. The qualifier was applied to the sample and field duplicate, or the parent sample for MS/MSD.

JD The result was qualified because the relative percent difference (RPD) between the primary sample and the field duplicate (FD) sample exceeded 30 percent for water

E The result is nondetect and the LOD exceeds the ADEC cleanup level.

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2.0 DATA QUALITY SUMMARY

A review of the analytical results and associated quality control (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 (DQO) are qualified according to Section 1.1. Qualified results are considered estimated and, whenever possible, are indicated as either biased high (+) or low (–). All qualified results can be found in the tables of Attachment B-2; all associated ADEC checklists can be found in Attachment B-3.

2.1 SAMPLE HOLDING TIME

The diesel-range organics (DRO) analysis (method AK102) was performed past the method holding time for sample 14PH-066-MW-06. The sample was initially extracted within the 14-day holding time; however, due to laboratory error the sample extract was not analyzed within the 40-day extract-to-analysis holding time, at 63 days. The DRO result is considered potentially biased low and qualified JH. The data quality is minimally affected because the o-Terphenyl surrogate (added to the sample prior to extraction) recovery was within QC criteria (112 percent), and the result is significantly less than the respective cleanup criteria.

The affected sample result, along with the holding times and applied qualifiers, are summarized in Table B-2-6 (Attachment B-2).

2.2 CONTINUING CALIBRATION

Continuing calibration verification (CCV) recoveries for several volatile organic compound analytes were outside the 80-120 percent recovery criterion (DoD 2010). Results from samples that were associated with failing CCV recoveries (<80 %) were qualified as estimated with a low bias (JC-). A method reporting limit (MRL) standard check is performed as laboratory corrective action following a failing CCV. The MRL check standard verified instrument sensitivity and the ability to detect the analytes of concern at the MRL. The impact on data quality is minimal; all sample results that were qualified JC- were nondetect and had

LODs significantly less than the respective cleanup level, with the exception of dichlorodifluoromethane. The detected dichlorodifluoromethane result for sample 14PH-DSA-MW-04 (0.0005 milligrams per liter [mg/L], qualified JC-) is significantly below the ADEC cleanup level of 7.3 mg/L.

The affected samples and associated analytes, along with the CCV recoveries and applied qualifiers, are summarized in Table B-2-1 (Attachment B-2).

2.3 MATRIX SPIKES

The MS and/or MSD recoveries for DRO and nitrogen, nitrate-nitrite, were outside of the quality control criteria (biased low) for parents sample 14PH-215-MW-10 and 14PH-DSA-MW-05. The sample results were qualified JM- to indicate an estimated result with a potentially low bias. The RPD for DRO for MS/MSD was outside of criteria at 27.5% due to the low bias of the MS. The DRO result was qualified JD. The impact is minimal since the LCS/LCSD recoveries were within QC criteria and the affected sample results are significantly less than the ADEC Table C cleanup level for DRO of 1.5 mg/L (ADEC 2012).

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

2.4 FIELD DUPLICATES

Three FD samples were analyzed with the sixteen primary groundwater samples. FD precision was evaluated against the recommended RPD limit of 30 percent for water, as stated in the ADEC Laboratory Data Review Checklists (ADEC 2010). RPD values for sample pair results where one was nondetect and the other was detected were calculated using the LOD value for the nondetect result. Results were qualified as estimated (JD) in several samples due to high FD RPD values, which can likely be attributed to the sample matrix or low-level detections. The impact is minimal since the affected sample results are significantly less than the ADEC Table C cleanup level (ADEC 2012) and the higher value between the sample and the FD will be used for reporting. Table B-2-3 (Attachment B-2) provides a summary of JD-qualified sample results.

2.5 DETECTION LIMIT ASSESSMENT

Laboratory LODs for nondetect samples were evaluated against the corresponding water cleanup level. Two analytes, 1,2-dibromoethane (ethylene dibromide) and 1,2,3-trichloropropane, had LODs greater than the ADEC Table C groundwater cleanup level (ADEC 2012). Neither analyte was detected in any sample, nor are they considered contaminants of concern (USAF 2009).

Nondetect samples that had LOD results exceeding the screening level were qualified E; these results shown in italics in Attachment B-1 and in Table B-2-4 (Attachment B-2).

2.6 METHOD BLANKS/TRIP BLANKS

The following analytes were detected above the DL in method blanks or trip blanks that resulted in the qualification of sample results:

- AK102: DRO
- AK103: Residual-Range Organics (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 2008); therefore, the impact from the possible high bias is negligible. Table B-2-5 (Attachment B-2) provides a summary of B-qualified sample results.

Four trip blanks were submitted with coolers containing samples for volatile analyses; however only three were analyzed for SW8260 and only one was analyzed for AK101 gasoline-range organics (GRO). There were one or more samples with results that were nondetect for GRO; indicating there was no cross-contamination during transport and the data quality was not affected. The fourth trip blank, 14PH-TB004 (Chain of Custody [CoC] 14PH015), was not analyzed because no analyses was requested on the CoC. There was one

sample in this CoC where the results were nondetect for all analytes, with the exception of naphthalene. There was one or more naphthalene result in this CoC that was nondetect, indicating there was no cross-contamination during transport. Table B-2 provides a summary of trip blanks, along with the CoC, cooler IDs and analyses performed by the laboratory.

Table B-2
Trip Blank Analyses

Sample ID	CoC	Cooler ID	Analysis
14PH-TB-001	14PH009	First	SW8260C
14PH-TB-002	14PH011	Third	AK101, SW8260C
14PH-TB-003	14PH013	Fifth	SW8260C
14PH-TB-004	14PH015	Seventh	none

3.0 CONCLUSION

In general, 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 2014 Annual Groundwater Monitoring at Port Heiden; any qualifications applied during data validation did not adversely impact data usability. Limitations are discussed in this DQA and the ADEC Laboratory Data Review Checklists (Attachment B-3).

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4.0 REFERENCES

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ATTACHMENT B-1

Sample Summary and Analytical Data Tables

Table B-1-1
2014 Port Heiden Groundwater Monitoring Sample Summary

COCSampleID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QCType	TAT	Notes	COC Number	Cooler Name	Cooler Date	Lab	SDG
14PH-215-MW-08	215-MW-08	05-Sep-2014	1645	PB	2	Amber	1 L	HCl, 4C	GW	AK102		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-215-MW-09	215-MW-09	05-Sep-2014	1755	PB	2	Amber	1 L	HCl, 4C	GW	AK102		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-066-MW-05	066-MW-05	06-Sep-2014	1108	DM	6	Amber	1 L	HCl, 4C	GW	AK102	MS/MSD	30 day		14PH010	Second	10-Sep-14	ALS	K1409859
14PH-066-MW-059	066-MW-05	06-Sep-2014	1108	DM	2	Amber	1 L	HCl, 4C	GW	AK102	dup	30 day		14PH010	Second	10-Sep-14	ALS	K1409859
14PH-066-MW-06	066-MW-06	06-Sep-2014	1025	DM	2	Amber	1 L	HCl, 4C	GW	AK102		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-RRS-MW-06	RRS-MW-06	06-Sep-2014	1353	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-RRS-MW-06	RRS-MW-06	06-Sep-2014	1353	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-RRS-MW-06	RRS-MW-06	06-Sep-2014	1353	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-RRS-MW-06	RRS-MW-06	06-Sep-2014	1353	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-06	DSA-MW-06	06-Sep-2014	1544	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-06	DSA-MW-06	06-Sep-2014	1544	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-06	DSA-MW-06	06-Sep-2014	1544	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-06	DSA-MW-06	06-Sep-2014	1544	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-069	DSA-MW-06	06-Sep-2014	1544	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260	dup	30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-069	DSA-MW-06	06-Sep-2014	1544	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8	dup	30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-069	DSA-MW-06	06-Sep-2014	1544	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B	dup	30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-069	DSA-MW-06	06-Sep-2014	1544	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2	dup	30 day		14PH009	First	10-Sep-14	ALS	K1409859
14PH-DSA-MW-07	DSA-MW-07	08-Sep-2014	0926	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-07	DSA-MW-07	08-Sep-2014	0926	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-07	DSA-MW-07	08-Sep-2014	0926	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-07	DSA-MW-07	08-Sep-2014	0926	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-RRS-MW-05	RRS-MW-05	08-Sep-2014	1034	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-RRS-MW-05	RRS-MW-05	08-Sep-2014	1034	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-RRS-MW-05	RRS-MW-05	08-Sep-2014	1034	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-RRS-MW-05	RRS-MW-05	08-Sep-2014	1034	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-05	DSA-MW-05	08-Sep-2014	1240	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-05	DSA-MW-05	08-Sep-2014	1240	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-05	DSA-MW-05	08-Sep-2014	1240	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-05	DSA-MW-05	08-Sep-2014	1240	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-01	DSA-MW-01	08-Sep-2014	1328	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-01	DSA-MW-01	08-Sep-2014	1328	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-01	DSA-MW-01	08-Sep-2014	1328	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-01	DSA-MW-01	08-Sep-2014	1328	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-02	DSA-MW-02	08-Sep-2014	1415	DM	9	Amber	40 mL	HCl, 4C	GW	SW8260	MS/MSD	30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-02	DSA-MW-02	08-Sep-2014	1415	DM	9	Amber	40 mL	HCl, 4C	GW	AK101	MS/MSD	30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-02	DSA-MW-02	08-Sep-2014	1415	DM	6	Amber	1 L	HCl, 4C	GW	AK102/103	MS/MSD	30 day		14PH012	Fourth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-02	DSA-MW-02	08-Sep-2014	1415	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-02	DSA-MW-02	08-Sep-2014	1415	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-02	DSA-MW-02	08-Sep-2014	1415	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-029	DSA-MW-02	08-Sep-2014	1415	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260	dup	30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-029	DSA-MW-02	08-Sep-2014	1415	DM	3	Amber	40 mL	HCl, 4C	GW	AK101	dup	30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-029	DSA-MW-02	08-Sep-2014	1415	DM	2	Amber	1 L	HCl, 4C	GW	AK102/103	dup	30 day		14PH012	Fourth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-029	DSA-MW-02	08-Sep-2014	1415	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8	dup	30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-029	DSA-MW-02	08-Sep-2014	1415	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B	dup	30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-DSA-MW-029	DSA-MW-02	08-Sep-2014	1415	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2	dup	30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-GLO-MW-03	GLO-MW-03	09-Sep-2014	1417	DM	2	Amber	40 mL	HCl, 4C	GW	SW8260		30 day	Limited Quantity	14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-GLO-MW-03	GLO-MW-03	09-Sep-2014	1417	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-GLO-MW-03	GLO-MW-03	09-Sep-2014	1417	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-GLO-MW-03	GLO-MW-03	09-Sep-2014	1417	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-04	DSA-MW-04	09-Sep-2014	1605	DM	2	Amber	40 mL	HCl, 4C	GW	SW8260		30 day	Limited Quantity	14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-04	DSA-MW-04	09-Sep-2014	1605	DM	2	Amber	40 mL	HCl, 4C	GW	AK101		30 day	Limited Quantity	14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-04	DSA-MW-04	09-Sep-2014	1605	DM	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-04	DSA-MW-04	09-Sep-2014	1605	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-04	DSA-MW-04	09-Sep-2014	1605	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-DSA-MW-04	DSA-MW-04	09-Sep-2014	1605	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-GLO-MW-04	GLO-MW-04	09-Sep-2014	1808	DM	2	Amber	40 mL	HCl, 4C	GW	SW8260		30 day	Limited Quantity	14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-GLO-MW-04	GLO-MW-04	09-Sep-2014	1808	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-GLO-MW-04	GLO-MW-04	09-Sep-2014	1808	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-GLO-MW-04	GLO-MW-04	09-Sep-2014	1808	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-UST-MW-02	UST-MW-02	10-Sep-2014	1210	DM	2	Amber	40 mL	HCl, 4C	GW	SW8260		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-UST-MW-02	UST-MW-02	10-Sep-2014	1210	DM	2	Amber	40 mL	HCl, 4C	GW	AK101		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-UST-MW-02	UST-MW-02	10-Sep-2014	1210	DM	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		14PH014	Sixth	12-Sep-14	ALS	K1409859
14PH-UST-MW-02	UST-MW-02	10-Sep-2014	1210	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859

Table B-1-1
2014 Port Heiden Groundwater Monitoring Sample Summary

COCSampleID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QCType	TAT	Notes	COC Number	Cooler Name	Cooler Date	Lab	SDG
14PH-UST-MW-02	UST-MW-02	10-Sep-2014	1210	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-UST-MW-02	UST-MW-02	10-Sep-2014	1210	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-07	BLO-MW-07	10-Sep-2014	1232	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260/AK101		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-07	BLO-MW-07	10-Sep-2014	1232	DM	1	Amber	1 L	HCl, 4C	GW	AK102/103		30 day	Limited Quantity	14PH014	Sixth	12-Sep-14	ALS	K1409859
14PH-BLO-MW-07	BLO-MW-07	10-Sep-2014	1232	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-07	BLO-MW-07	10-Sep-2014	1232	DM	0	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day	Insufficient water to sample for this parameter	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-07	BLO-MW-07	10-Sep-2014	1232	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-06	BLO-MW-06	10-Sep-2014	1305	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260/AK101		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-06	BLO-MW-06	10-Sep-2014	1305	DM	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		14PH014	Sixth	12-Sep-14	ALS	K1409859
14PH-BLO-MW-06	BLO-MW-06	10-Sep-2014	1305	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-06	BLO-MW-06	10-Sep-2014	1305	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-06	BLO-MW-06	10-Sep-2014	1305	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-05	BLO-MW-05	10-Sep-2014	1347	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260/AK101		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-05	BLO-MW-05	10-Sep-2014	1347	DM	1	Amber	1 L	HCl, 4C	GW	AK102/103		30 day	Limited Quantity	14PH014	Sixth	12-Sep-14	ALS	K1409859
14PH-BLO-MW-05	BLO-MW-05	10-Sep-2014	1347	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-05	BLO-MW-05	10-Sep-2014	1347	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-05	BLO-MW-05	10-Sep-2014	1347	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-01	BLO-MW-01	10-Sep-2014	1508	DM	3	Amber	40 mL	HCl, 4C	GW	SW8260/AK101		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-01	BLO-MW-01	10-Sep-2014	1508	DM	2	Amber	1 L	HCl, 4C	GW	AK102/103		30 day		14PH014	Sixth	12-Sep-14	ALS	K1409859
14PH-BLO-MW-01	BLO-MW-01	10-Sep-2014	1508	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-01	BLO-MW-01	10-Sep-2014	1508	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-BLO-MW-01	BLO-MW-01	10-Sep-2014	1508	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-PG1-MW-01	PG1-MW-01	10-Sep-2014	1523	DM	2	Amber	40 mL	HCl, 4C	GW	SW8260		30 day	Limited Quantity	14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-PG1-MW-01	PG1-MW-01	10-Sep-2014	1523	DM	1	Poly	250 mL	HNO3, 4C	GW	EPA 200.8		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-PG1-MW-01	PG1-MW-01	10-Sep-2014	1523	DM	1	Poly	250 mL	4C	GW	EPA 300.0, SM21 2320B		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-PG1-MW-01	PG1-MW-01	10-Sep-2014	1523	DM	1	Poly	250 mL	H2SO4, 4C	GW	EPA 353.2		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-215-MW-10	215-MW-10	20-Sep-2014	1850	GR/MH/LD	4	Amber	1 L	HCl, 4C	GW	AK102	MS/MSD	30 day		14PH015	Canada	22-Sep-14	ALS	K1410237
14PH-TB-004		10-Sep-2014	0700	DM	4	Amber	40 mL	HCl, 4C	TB	SW8260/AK101		30 day		14PH015	Seventh	12-Sep-14	ALS	K1409859
14PH-TB-002		08-Sep-2014	0700	DM	3	Amber	40 mL	HCl, 4C	TB	SW8260		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-TB-002		08-Sep-2014	0700	DM	3	Amber	40 mL	HCl, 4C	TB	AK101		30 day		14PH011	Third	10-Sep-14	ALS	K1409859
14PH-TB-003		09-Sep-2014	0700	DM	3	Amber	40 mL	HCl, 4C	TB	SW8260		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-TB-003		09-Sep-2014	0700	DM	3	Amber	40 mL	HCl, 4C	TB	AK101		30 day		14PH013	Fifth	10-Sep-14	ALS	K1409859
14PH-TB-001		06-Sep-2014	0700	DM	3	Amber	40 mL	HCl, 4C	TB	SW8260/AK101		30 day		14PH009	First	10-Sep-14	ALS	K1409859

Table B-1-2
2014 Port Heiden Groundwater Monitoring Sample Results

			Location ID	BLO-MW-01	BLO-MW-05	BLO-MW-06	BLO-MW-07	DSA-MW-01	DSA-MW-02	DSA-MW-02	DSA-MW-04	DSA-MW-05	DSA-MW-06	DSA-MW-06	DSA-MW-07
			Sample ID	14PH-BLO-MW-01	14PH-BLO-MW-05	14PH-BLO-MW-06	14PH-BLO-MW-07	14PH-DSA-MW-01	14PH-DSA-MW-02	14PH-DSA-MW-029	14PH-DSA-MW-04	14PH-DSA-MW-05	14PH-DSA-MW-06	14PH-DSA-MW-069	14PH-DSA-MW-07
			Lab Sample ID	K140985905	K140985904	K140985903	K140985902	K140985911	K140985912	K140985913	K140985918	K140985910	K140985925	K140985926	K140985908
			SDG	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859
			Collection Date	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/8/2014	9/8/2014	9/8/2014	9/9/2014	9/8/2014	9/6/2014	9/6/2014	9/8/2014
			Matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
			Laboratory	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS
			QA/QC	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate	Primary	Primary	Primary	Duplicate	Primary
Method	Analyte	Units	ADEC Cleanup Criteria[1]												
A2320B	Alkalinity, Total	mg/L	–	850 [60]	52 [6]	54 [6]	–	83 [6]	136 [6]	135 [6]	114 [6]	75 [6]	73 [6]	73 [6]	80 [6]
E300.0	Sulfate	mg/L	–	1.93 [0.1]	2 [0.04]	4.91 [0.04]	–	5.07 [0.04]	8.89 [0.04]	8.89 [0.04]	11.1 [0.04]	8.46 [0.04]	5.04 [0.04]	5.05 [0.04]	7.3 [0.04]
E353.2	Nitrogen, Nitrate-Nitrite	mg/L	–	0.031 [0.02] J	0.262 [0.02]	0.186 [0.02]	0.22 [0.02]	0.333 [0.02]	1.76 [0.04]	1.92 [0.02]	ND [0.02]	ND [0.02] JM-	ND [0.02]	ND [0.02]	0.191 [0.02]
SW6010C	Iron	mg/L	–	35.4 [0.01]	16.2 [0.01]	22.3 [0.01]	38.8 [0.01]	0.264 [0.01]	6.04 [0.01]	5.91 [0.01]	21.7 [0.01]	6 [0.01]	2.96 [0.01]	2.99 [0.01]	45.7 [0.01]
SW6010C	Manganese	mg/L	–	9.4 [0.001]	0.305 [0.001]	0.489 [0.001]	0.839 [0.001]	0.0086 [0.001]	0.0928 [0.001]	0.0901 [0.001]	0.566 [0.001]	0.217 [0.001]	0.467 [0.001]	0.463 [0.001]	0.895 [0.001]
AK101	Gasoline Range Organics (C6-C10)	mg/L	2.2	0.32 [0.025]	ND [0.025]	ND [0.025]	ND [0.025]	ND [0.025]	0.22 [0.025]	0.21 [0.025]	0.05 [0.025] J	ND [0.025]	ND [0.025]	ND [0.025]	ND [0.025]
AK102	Diesel Range Organics (C10-C25)	mg/L	1.5	**1600 [25]**	0.032 [0.023] J	0.042 [0.022] J	0.084 [0.02] J	–	0.031 [0.022] J	0.028 [0.022] J	0.08 [0.02] J	–	–	–	–
AK103	Residual Range Organics (C25-C36)	mg/L	1.1	**150 [63] J**	0.19 [0.056] J, B	0.15 [0.053] J, B	0.36 [0.05] J	–	0.073 [0.053] J, B	0.073 [0.053] J, B	0.059 [0.05] J, B	–	–	–	–
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	–	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1,1-Trichloroethane	mg/L	0.2	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	0.0011 [0.0005] J	0.0011 [0.0005] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.0043	**0.027 [0.0002]**	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1,2-Trichloroethane	mg/L	0.005	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.001]	ND [0.001]	0.00019 [0.0004] J	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]
SW8260C	1,1-Dichloroethane	mg/L	7.3	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1-Dichloroethene	mg/L	0.007	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1-Dichloropropene	mg/L	–	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,2,3-Trichlorobenzene	mg/L	–	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.001]	ND [0.001]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]
SW8260C	1,2,3-Trichloropropane	mg/L	0.00012	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0013] E*	*ND [0.0013] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.07	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.00075]	ND [0.00075]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	1,2,4-Trimethylbenzene	mg/L	1.8	0.0012 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	–	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.002]	ND [0.002]	ND [0.0008] JC-	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008]
SW8260C	1,2-Dibromoethane	mg/L	0.00005	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*
SW8260C	1,2-Dichlorobenzene	mg/L	0.6	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,2-Dichloroethane	mg/L	0.005	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00038]	ND [0.00038]	ND [0.00015]	0.00019 [0.00015] J	ND [0.00015]	ND [0.00015]	ND [0.00015]
SW8260C	1,2-Dichloropropane	mg/L	0.005	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,3,5-Trimethylbenzene	mg/L	1.8	0.01 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,3-Dichlorobenzene	mg/L	3.3	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,3-Dichloropropane	mg/L	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.00075]	ND [0.00075]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	1,4-Dichlorobenzene	mg/L	0.075	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	2,2-Dichloropropane	mg/L	–	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	2-Butanone	mg/L	22	0.0033 [0.004] J	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.01]	ND [0.01]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]
SW8260C	2-Chlorotoluene	mg/L	–	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	2-Hexanone	mg/L	–	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.025]	ND [0.025]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]
SW8260C	4-Chlorotoluene	mg/L	–	0.0012 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	4-Isopropyltoluene	mg/L	–	0.0035 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	4-Methyl-2-pentanone	mg/L	2.9	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.025]	ND [0.025]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]
SW8260C	Acetone	mg/L	33	0.013 [0.01] J	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.025]	ND [0.025]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]
SW8260C	Benzene	mg/L	0.005	0.0014 [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.00025]	ND [0.00025]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Bromobenzene	mg/L	–	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Bromochloromethane	mg/L	–	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Bromodichloromethane	mg/L	0.014	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.00075]	ND [0.00075]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	Bromoform	mg/L	0.11	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0013]	ND [0.0013]	ND [0.0005] JC-	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
SW8260C	Bromomethane	mg/L	0.051	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.00075] JC-	ND [0.00075] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-
SW8260C	Carbon disulfide	mg/L	3.7	0.00025 [0.0002] J	ND [0.0002]	ND [0.0002]	0.00014 [0.0002] J	ND [0.0002]	ND [0.0005]	ND [0.0005]	0.00015 [0.0002] J	0.00012 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Carbon tetrachloride	mg/L	0.005	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chlorobenzene	mg/L	0.1	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chloroethane	mg/L	0.29	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chloroform	mg/L	0.14	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005] JD	0.00023 [0.0005] J, JD	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chloromethane	mg/L	0.066	0.00031 [0.0002] J	0.0001 [0.0002] J	0.00019 [0.0002] J	0.00009 [0.0002] J	0.00015 [0.0002] J, B	0.0003 [0.0005] J, B	0.0003 [0.0005] J, B	0.00019 [0.0002] J, B	0.00014 [0.0002] J, B	0.00019 [0.0002] J, B	0.00016 [0.0002] J, B	0.00009 [0.0002] J, B
SW8260C	cis-1,2-Dichloroethene	mg/L	0.07	0.0036 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0085	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Dibromochloromethane	mg/L	0.01	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0013]	ND [0.0013]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
SW8260C	Dibromomethane	mg/L	0.37	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0013]	ND [0.0013]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
SW8260C	Dichlorodifluoromethane	mg/L	7.3	ND [0.0002] JC-	ND [0.0002] JC-	ND [0.0002] JC-	ND [0.0002] JC-	ND [0.0002]	ND [0.0005]	ND [0.0005]	0.00049 [0.0002] J, JC-	0.00019 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Ethylbenzene	mg/L	0.7	0.0058 [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.00025]	ND [0.00025]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Hexachlorobutadiene	mg/L	0.0073	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.00075]	ND [0.00075]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	Isopropylbenzene	mg/L	3.7	0.0061 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]

Table B-1-2
2014 Port Heiden Groundwater Monitoring Sample Results

				Location ID	BLO-MW-01	BLO-MW-05	BLO-MW-06	BLO-MW-07	DSA-MW-01	DSA-MW-02	DSA-MW-02	DSA-MW-04	DSA-MW-05	DSA-MW-06	DSA-MW-06	DSA-MW-07
				Sample ID	14PH-BLO-MW-01	14PH-BLO-MW-05	14PH-BLO-MW-06	14PH-BLO-MW-07	14PH-DSA-MW-01	14PH-DSA-MW-02	14PH-DSA-MW-029	14PH-DSA-MW-04	14PH-DSA-MW-05	14PH-DSA-MW-06	14PH-DSA-MW-069	14PH-DSA-MW-07
				Lab Sample ID	K140985905	K140985904	K140985903	K140985902	K140985911	K140985912	K140985913	K140985918	K140985910	K140985925	K140985926	K140985908
				SDG	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859
				Collection Date	9/10/2014	9/10/2014	9/10/2014	9/10/2014	9/8/2014	9/8/2014	9/8/2014	9/9/2014	9/8/2014	9/6/2014	9/6/2014	9/8/2014
				Matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
				Laboratory	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS
				QA/QC	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate	Primary	Primary	Primary	Duplicate	Primary
SW8260C	Methylene chloride	mg/L	0.005	0.00012 [0.0002] J, B	ND [0.0002]	ND [0.0002]	ND [0.0002]	0.00017 [0.0002] J, B	0.00055 [0.0005] J, B	0.00055 [0.0005] J, B	ND [0.0002]	0.00026 [0.0002] J, B	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.47	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.00075]	ND [0.00075]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	Naphthalene	mg/L	0.73	0.25 [0.003]	ND [0.0003]	0.00011 [0.0003] J, B	0.0001 [0.0003] J, B	ND [0.0003]	ND [0.00075]	ND [0.00075]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	n-Butylbenzene	mg/L	0.37	ND [0.002]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.00025]	ND [0.00025]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	n-Propylbenzene	mg/L	0.37	0.0012 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	o-Xylene	mg/L	10	0.00023 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	sec-Butylbenzene	mg/L	0.37	0.00067 [0.0001] J	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.00025]	ND [0.00025]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Styrene	mg/L	0.1	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	tert-Butylbenzene	mg/L	0.37	0.0027 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Tetrachloroethene (PCE)	mg/L	0.005	0.00016 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	0.00014 [0.0002] J, JD	ND [0.0002] JD	ND [0.0002]
SW8260C	Toluene	mg/L	1	0.00025 [0.0001] J	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.00025]	ND [0.00025]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	trans-1,2-Dichloroethene	mg/L	0.1	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0085	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Trichloroethene (TCE)	mg/L	0.005	**0.005 [0.0001]**	0.00015 [0.0001] J	0.00014 [0.0001] J	ND [0.0001]	**0.0077 [0.0001]**	**0.48 [0.005]**	**0.49 [0.005]**	**0.09 [0.001]**	0.0029 [0.0001]	0.00015 [0.0001] J	0.00014 [0.0001] J	ND [0.0001]
SW8260C	Trichlorofluoromethane	mg/L	11	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	0.00093 [0.0005] J	0.00083 [0.0005] J	ND [0.0002]	0.00013 [0.0002] J	0.00051 [0.0002]	0.00051 [0.0002]	ND [0.0002]
SW8260C	Vinyl chloride	mg/L	0.002	0.00008 [0.0001] J	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.00025]	ND [0.00025]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Xylene, Isomers m & p	mg/L	10	0.0048 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0005]	ND [0.0005]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]

Notes:

[1] Groundwater screening levels from 18 AAC 75, Table C, Groundwater Cleanup Levels (ADEC 2012).

– = No cleanup level / not analyzed.

[ ] = limit of detection (LOD)

Bold = The result exceeds the cleanup level.

B = The analyte was detected in the method blank or trip blank above the DL and the sample concentration was less than ten times the method blank concentration.

E and *Italics* = The result was nondetect and the LOD was greater than the cleanup level.

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

JC- = The result was estimated because the analyted failed recovery criteria in the CCV.

JD = The result was estimated because the field duplicate relelative percent difference was greater than the precision limit.

JM- = The The result was estimated and biased low because the analyted failed recovery criteria (low) in the matrix spike or matrix spike duplicate

GW=groundwater

mg/L = milligrams per liter

ND = nondetect

QA/QC = quality assurance / quality control

ALS = ALS Environmental, Kelso, WA

Table B-1-2
2014 Port Heiden Groundwater Monitoring Sample Results

				Location ID	GLO-MW-03	GLO-MW-04	PG1-MW-01	RRS-MW-05	RRS-MW-06	UST-MW-02	Trip Blank	Trip Blank	Trip Blank
				Sample ID	14PH-GLO-MW-03	14PH-GLO-MW-04	14PH-PG1-MW-01	14PH-RRS-MW-05	14PH-RRS-MW-06	14PH-UST-MW-02	14PH-TB-001	14PH-TB-002	14PH-TB-003
				Lab Sample ID	K140985917	K140985919	K140985906	K140985909	K140985924	K140985901	K140985927	K140985914	K140985920
				SDG	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859
				Collection Date	9/9/2014	9/9/2014	9/10/2014	9/8/2014	9/6/2014	9/10/2014	9/6/2014	9/8/2014	9/9/2014
				Matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW
				Laboratory	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS
				QA/QC	Primary	Primary	Primary	Primary	Primary	Primary	Trip Blank	Trip Blank	Trip Blank
Method	Analyte	Units	ADEC Cleanup Criteria[1]										
A2320B	Alkalinity, Total	mg/L	–		65 [6]	47 [6]	111 [6]	57 [6]	162 [6]	180 [6]	–	–	–
E300.0	Sulfate	mg/L	–		3.72 [0.04]	3.25 [0.04]	6.35 [0.04]	3.31 [0.04]	3.49 [0.04]	4.41 [0.04]	–	–	–
E353.2	Nitrogen, Nitrate-Nitrite	mg/L	–		0.126 [0.02]	0.063 [0.02]	0.33 [0.02]	0.121 [0.02]	0.274 [0.02]	0.365 [0.02]	–	–	–
SW6010C	Iron	mg/L	–		4.48 [0.01]	1.47 [0.01]	7.63 [0.01]	7 [0.01]	0.44 [0.01]	101 [0.02]	–	–	–
SW6010C	Manganese	mg/L	–		0.101 [0.001]	0.055 [0.001]	0.156 [0.001]	0.0832 [0.001]	0.0091 [0.001]	1.85 [0.002]	–	–	–
AK101	Gasoline Range Organics (C6-C10)	mg/L	2.2		ND [0.025]	ND [0.025]	0.026 [0.025] J	ND [0.025]	ND [0.025]	ND [0.025]	–	ND [0.025]	–
AK102	Diesel Range Organics (C10-C25)	mg/L	1.5		–	–	–	–	–	0.22 [0.023] J	–	–	–
AK103	Residual Range Organics (C25-C36)	mg/L	1.1		–	–	–	–	–	0.23 [0.056] J	–	–	–
SW8260C	1,1,1,2-Tetrachloroethane	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1,1-Trichloroethane	mg/L	0.2		ND [0.0002]	ND [0.0002]	0.0005 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1,2,2-Tetrachloroethane	mg/L	0.0043		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1,2-Trichloroethane	mg/L	0.005		ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]
SW8260C	1,1-Dichloroethane	mg/L	7.3		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1-Dichloroethene	mg/L	0.007		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,1-Dichloropropene	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,2,3-Trichlorobenzene	mg/L	–		ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]
SW8260C	1,2,3-Trichloropropane	mg/L	0.00012		*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*	*ND [0.0005] E*
SW8260C	1,2,4-Trichlorobenzene	mg/L	0.07		ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	0.0001 [0.0003] J, B	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	1,2,4-Trimethylbenzene	mg/L	1.8		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,2-Dibromo-3-chloropropane	mg/L	–		ND [0.0008] JC-	ND [0.0008] JC-	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008]	ND [0.0008] JC-
SW8260C	1,2-Dibromoethane	mg/L	0.00005		*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*	*ND [0.0002] E*
SW8260C	1,2-Dichlorobenzene	mg/L	0.6		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,2-Dichloroethane	mg/L	0.005		ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]
SW8260C	1,2-Dichloropropane	mg/L	0.005		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,3,5-Trimethylbenzene	mg/L	1.8		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,3-Dichlorobenzene	mg/L	3.3		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	1,3-Dichloropropane	mg/L	–		ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	1,4-Dichlorobenzene	mg/L	0.075		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	2,2-Dichloropropane	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	2-Butanone	mg/L	22		ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]	ND [0.004]
SW8260C	2-Chlorotoluene	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	2-Hexanone	mg/L	–		ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]
SW8260C	4-Chlorotoluene	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	4-Isopropyltoluene	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	4-Methyl-2-pentanone	mg/L	2.9		ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]
SW8260C	Acetone	mg/L	33		ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	ND [0.01]	0.0039 [0.01] J	ND [0.01]	0.0065 [0.01] J
SW8260C	Benzene	mg/L	0.005		ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Bromobenzene	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Bromochloromethane	mg/L	–		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Bromodichloromethane	mg/L	0.014		ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	Bromoform	mg/L	0.11		ND [0.0005] JC-	ND [0.0005] JC-	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005] JC-
SW8260C	Bromomethane	mg/L	0.051		ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	ND [0.0003] JC-	0.00018 [0.0003] J, JC-	ND [0.0003] JC-	ND [0.0003] JC-
SW8260C	Carbon disulfide	mg/L	3.7		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Carbon tetrachloride	mg/L	0.005		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chlorobenzene	mg/L	0.1		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chloroethane	mg/L	0.29		ND [0.0002]	ND [0.0002]	ND [0.0002]	0.00018 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chloroform	mg/L	0.14		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Chloromethane	mg/L	0.066		0.00019 [0.0002] J, B	0.00021 [0.0002] J, B	0.00026 [0.0002] J	0.0002 [0.0002] J, B	0.00016 [0.0002] J, B	ND [0.0002]	0.00033 [0.0002] J	0.00032 [0.0002] J	0.00061 [0.0002]
SW8260C	cis-1,2-Dichloroethene	mg/L	0.07		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	cis-1,3-Dichloropropene	mg/L	0.0085		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Dibromochloromethane	mg/L	0.01		ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
SW8260C	Dibromomethane	mg/L	0.37		ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
SW8260C	Dichlorodifluoromethane	mg/L	7.3		ND [0.0002] JC-	ND [0.0002] JC-	ND [0.0002] JC-	ND [0.0002]	ND [0.0002]	ND [0.0002] JC-	ND [0.0002]	ND [0.0002]	ND [0.0002] JC-
SW8260C	Ethylbenzene	mg/L	0.7		ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Hexachlorobutadiene	mg/L	0.0073		ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	Isopropylbenzene	mg/L	3.7		ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]

Table B-1-2
2014 Port Heiden Groundwater Monitoring Sample Results

				Location ID	GLO-MW-03	GLO-MW-04	PG1-MW-01	RRS-MW-05	RRS-MW-06	UST-MW-02	Trip Blank	Trip Blank	Trip Blank
				Sample ID	14PH-GLO-MW-03	14PH-GLO-MW-04	14PH-PG1-MW-01	14PH-RRS-MW-05	14PH-RRS-MW-06	14PH-UST-MW-02	14PH-TB-001	14PH-TB-002	14PH-TB-003
				Lab Sample ID	K140985917	K140985919	K140985906	K140985909	K140985924	K140985901	K140985927	K140985914	K140985920
				SDG	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859	K1409859
				Collection Date	9/9/2014	9/9/2014	9/10/2014	9/8/2014	9/6/2014	9/10/2014	9/6/2014	9/8/2014	9/9/2014
				Matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW
				Laboratory	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS	ALS
				QA/QC	Primary	Primary	Primary	Primary	Primary	Primary	Trip Blank	Trip Blank	Trip Blank
SW8260C	Methylene chloride	mg/L	0.005	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	0.0003 [0.0002] J, B	0.00027 [0.0002] J	0.00033 [0.0002] J
SW8260C	Methyl-tert-butyl ether (MTBE)	mg/L	0.47	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	Naphthalene	mg/L	0.73	ND [0.0003]	ND [0.0003]	0.0013 [0.0003] J, B	ND [0.0003]	ND [0.0003]	0.00012 [0.0003] J, B	ND [0.0003]	ND [0.0003]	ND [0.0003]
SW8260C	n-Butylbenzene	mg/L	0.37	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	n-Propylbenzene	mg/L	0.37	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	o-Xylene	mg/L	10	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	sec-Butylbenzene	mg/L	0.37	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Styrene	mg/L	0.1	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	tert-Butylbenzene	mg/L	0.37	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Tetrachloroethene (PCE)	mg/L	0.005	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	0.00029 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Toluene	mg/L	1	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	trans-1,2-Dichloroethene	mg/L	0.1	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	trans-1,3-Dichloropropene	mg/L	0.0085	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Trichloroethene (TCE)	mg/L	0.005	ND [0.0001]	ND [0.0001]	**0.039 [0.0001]**	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Trichlorofluoromethane	mg/L	11	ND [0.0002]	ND [0.0002]	0.00021 [0.0002] J	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
SW8260C	Vinyl chloride	mg/L	0.002	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
SW8260C	Xylene, Isomers m & p	mg/L	10	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]

Notes:

[1] Groundwater screening levels from 18 AAC 75, Table C, Groundwater Cleanup Levels (ADEC 2012).

– = No cleanup level / not analyzed.

[ ] = limit of detection (LOD)

Bold = The result exceeds the cleanup level.

B = The analyte was detected in the method blank or trip blank above the DL and the sample concentration was less than ten times the method blank concentration.

E and *Italics* = The result was nondetect and the LOD was greater than the cleanup level.

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

JC- = The result was estimated because the analyted failed recovery criteria in the CCV.

JD = The result was estimated because the field duplicate relelative percent difference was greater than the precision limit.

JM- = The The result was estimated and biased low because the analyted failed recovery criteria (low) in the matrix spike or matrix spike duplicate

GW=groundwater

mg/L = milligrams per liter

ND = nondetect

QA/QC = quality assurance / quality control

ALS = ALS Environmental, Kelso, WA

ATTACHMENT B-2

Qualified Sample Results Tables

Table B-2-1
Results Qualified JC- Due to Calibration Verification Accuracy

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result (mg/L)	LOD (mg/L)	LOQ (mg/L)	Lab Lot Number	Analysis Date	CCV Recovery (%)	CCV Limits (%)	Qualifier
K1409859	14PH-RRS-MW-06	K140985924	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412836	9/18/2014	69	80-120	JC-
K1409859	14PH-DSA-MW-06	K140985925	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412836	9/18/2014	69	80-120	JC-
K1409859	14PH-DSA-MW-069	K140985926	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412836	9/18/2014	69	80-120	JC-
K1409859	14PH-TB-001	K140985927	SW8260C	Bromomethane	0.00018	0.0003	0.0005	KWG1412836	9/18/2014	69	80-120	J, JC-
K1409859	14PH-DSA-MW-07	K140985908	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412906	9/20/2014	73	80-120	JC-
K1409859	14PH-RRS-MW-05	K140985909	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412906	9/20/2014	73	80-120	JC-
K1409859	14PH-DSA-MW-05	K140985910	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412906	9/20/2014	73	80-120	JC-
K1409859	14PH-DSA-MW-01	K140985911	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412906	9/20/2014	73	80-120	JC-
K1409859	14PH-DSA-MW-02	K140985912	SW8260C	Bromomethane	ND	0.00075	0.0013	KWG1412906	9/20/2014	73	80-120	JC-
K1409859	14PH-DSA-MW-029	K140985913	SW8260C	Bromomethane	ND	0.00075	0.0013	KWG1412906	9/20/2014	73	80-120	JC-
K1409859	14PH-TB-002	K140985914	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412906	9/20/2014	73	80-120	JC-
K1409859	14PH-GLO-MW-03	K140985917	SW8260C	Bromoform	ND	0.0005	0.0005	KWG1412925	9/21/2014	74	80-120	JC-
K1409859	14PH-GLO-MW-03	K140985917	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412925	9/21/2014	60	80-120	JC-
K1409859	14PH-GLO-MW-03	K140985917	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412925	9/21/2014	71	80-120	JC-
K1409859	14PH-GLO-MW-03	K140985917	SW8260C	1,2-Dibromo-3-chloropropane	ND	0.0008	0.002	KWG1412925	9/21/2014	71	80-120	JC-
K1409859	14PH-DSA-MW-04	K140985918	SW8260C	Bromoform	ND	0.0005	0.0005	KWG1412925	9/21/2014	74	80-120	JC-
K1409859	14PH-DSA-MW-04	K140985918	SW8260C	1,2-Dibromo-3-chloropropane	ND	0.0008	0.002	KWG1412925	9/21/2014	71	80-120	JC-
K1409859	14PH-DSA-MW-04	K140985918	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412925	9/21/2014	60	80-120	JC-
K1409859	14PH-DSA-MW-04	K140985918	SW8260C	Dichlorodifluoromethane	0.00049	0.0002	0.0005	KWG1412925	9/21/2014	71	80-120	J, JC-
K1409859	14PH-GLO-MW-04	K140985919	SW8260C	1,2-Dibromo-3-chloropropane	ND	0.0008	0.002	KWG1412925	9/21/2014	71	80-120	JC-
K1409859	14PH-GLO-MW-04	K140985919	SW8260C	Bromoform	ND	0.0005	0.0005	KWG1412925	9/21/2014	74	80-120	JC-
K1409859	14PH-GLO-MW-04	K140985919	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412925	9/21/2014	71	80-120	JC-
K1409859	14PH-GLO-MW-04	K140985919	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412925	9/21/2014	60	80-120	JC-
K1409859	14PH-TB-003	K140985920	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412925	9/21/2014	60	80-120	JC-
K1409859	14PH-TB-003	K140985920	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412925	9/21/2014	71	80-120	JC-
K1409859	14PH-TB-003	K140985920	SW8260C	Bromoform	ND	0.0005	0.0005	KWG1412925	9/21/2014	74	80-120	JC-
K1409859	14PH-TB-003	K140985920	SW8260C	1,2-Dibromo-3-chloropropane	ND	0.0008	0.002	KWG1412925	9/21/2014	71	80-120	JC-
K1409859	14PH-UST-MW-02	K140985901	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-UST-MW-02	K140985901	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-07	K140985902	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-07	K140985902	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-06	K140985903	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-06	K140985903	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-05	K140985904	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-05	K140985904	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-01	K140985905	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-BLO-MW-01	K140985905	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-PG1-MW-01	K140985906	SW8260C	Dichlorodifluoromethane	ND	0.0002	0.0005	KWG1412987	9/23/2014	67	80-120	JC-
K1409859	14PH-PG1-MW-01	K140985906	SW8260C	Bromomethane	ND	0.0003	0.0005	KWG1412987	9/23/2014	67	80-120	JC-

Notes:

CCV = continuing calibration verification

LOD = limit of detection

LOQ = limit of quantitation

mg/L = milligrams per liter

ND = nondetect

SDG = sample delivery group

See the Data Quality Assessment for data qualifier definitions.

Table B-2-2
Results Qualified JM Due to Matrix Spike Accuracy

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result (mg/L)	LOD (mg/L)	LOQ (mg/L)	Recovery (%)	LCL (%)	UCL (%)	Lab Lot Number	Lab Parent Sample	Spike Amount (mg/L)	Expected Result (mg/L)	RPD (%)	Qualifier
K1410237	14PH-215-MW-10	K141023701	AK102	Diesel Range Organics (C10-C25)	0.022	0.022	0.85	-	-	-	KWG1413367	-	-	-	-	J, B, JM-, JD
K1410237	MS	KWG14133673	AK102	Diesel Range Organics (C10-C25)	1.1	0.02	0.79	69	75	125	KWG1413367	K141023701	1.57	1.592	27.5	-
K1410237	MSD	KWG14133674	AK102	Diesel Range Organics (C10-C25)	1.45	0.02	0.79	91	75	125	KWG1413367	K141023701	1.57	1.592	27.5	-
K1409859	14PH-DSA-MW-05	K140985910	E353.2	Nitrogen, Nitrate-Nitrite	ND	0.02	0.05	-	-	-	219407	-	-	-	-	JM-
K1409859	MS	K140985910MS	E353.2	Nitrogen, Nitrate-Nitrite	0.675	0.02	0.05	68	89	114	219407	K140985910	1	1	2.9	-
K1409859	MSD	K140985910SD	E353.2	Nitrogen, Nitrate-Nitrite	0.695	0.02	0.05	70	89	114	219407	K140985910	1	1	2.9	-

Notes:

LCL = lower control limit
LOD = limit of detection
LOQ = limit of quantitation
mg/L = milligrams per liter
MS/MSD = matrix spike/matrix spike duplicate
ND = nondetect
RPD = relative percent difference
SDG = sample delivery group
UCL = upper control limit
See the Data Quality Assessment for data qualifier definitions.

Table B-2-3
Results Qualified JD Due to Field Duplicate Precision

Sample ID	Lab Sample ID	Duplicate Sample ID	Duplicate Lab Sample ID	Method	Analyte	Result (mg/L)	Duplicate Result (mg/L)	RPD (%)
14PH-DSA-MW-02	K140985912	14PH-DSA-MW-029	K140985913	SW8260C	Chloroform	*0.0005*	0.00023	73.9
14PH-DSA-MW-06	K140985925	14PH-DSA-MW-069	K140985926	SW8260C	Tetrachloroethene (PCE)	0.00014	*0.0002*	35.3

Notes:

mg/L = milligrams per liter

RPD = relative percent difference

Italics - The LOD was used in place of the ND sample result in the RPD calculation.

See the Data Quality Assessment for data qualifier definitions.

Table B-2-4
Results Qualified E Due to Limits of Detection Greater Than the Project Action Limit

SDG	Sample ID	Lab Sample ID	Method	Analyte	Cleanup Level (mg/L)	Result (mg/L)	LOD (mg/L)	LOQ (mg/L)	Dilution Factor	Qualifier
K1409859	14PH-DSA-MW-04	K140985918	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-GLO-MW-04	K140985919	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-DSA-MW-069	K140985926	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-BLO-MW-05	K140985904	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-DSA-MW-06	K140985925	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-RRS-MW-05	K140985909	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-DSA-MW-01	K140985911	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-RRS-MW-06	K140985924	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-DSA-MW-07	K140985908	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-BLO-MW-07	K140985902	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-UST-MW-02	K140985901	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-BLO-MW-06	K140985903	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-PG1-MW-01	K140985906	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-DSA-MW-02	K140985912	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0005	0.005	2.5	E
K1409859	14PH-GLO-MW-03	K140985917	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-TB-002	K140985914	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-TB-001	K140985927	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-DSA-MW-029	K140985913	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0005	0.005	2.5	E
K1409859	14PH-BLO-MW-01	K140985905	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-DSA-MW-05	K140985910	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-TB-003	K140985920	SW8260C	1,2-Dibromoethane	0.00005	ND	0.0002	0.002	1	E
K1409859	14PH-PG1-MW-01	K140985906	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-GLO-MW-04	K140985919	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-GLO-MW-03	K140985917	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-DSA-MW-029	K140985913	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0013	0.0013	2.5	E
K1409859	14PH-BLO-MW-01	K140985905	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-DSA-MW-01	K140985911	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-DSA-MW-05	K140985910	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-DSA-MW-06	K140985925	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-BLO-MW-07	K140985902	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-DSA-MW-02	K140985912	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0013	0.0013	2.5	E
K1409859	14PH-DSA-MW-069	K140985926	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-DSA-MW-04	K140985918	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-TB-002	K140985914	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-RRS-MW-05	K140985909	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-RRS-MW-06	K140985924	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-BLO-MW-06	K140985903	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-TB-001	K140985927	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-UST-MW-02	K140985901	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-DSA-MW-07	K140985908	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-TB-003	K140985920	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E
K1409859	14PH-BLO-MW-05	K140985904	SW8260C	1,2,3-Trichloropropane	0.00012	ND	0.0005	0.0005	1	E

Notes:

LOD = limit of detection

LOQ = limit of quantitation

mg/L = milligrams per liter

ND = nondetect

SDG = sample delivery group

See the Data Quality Assessment for data qualifier definitions.

Table B-2-5
Results Qualified B Due to Method Blank/Trip Blank Contamination

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result (mg/L)	LOD (mg/L)	LOQ (mg/L)	Qualifier	Lab Lot Number	CoC Number
K1410237	Method Blank	KWG14133677	AK102	Diesel Range Organics (C10-C25)	0.013	0.02	0.76	-	KWG1413367	-
K1410237	14PH-215-MW-10	K141023701	AK102	Diesel Range Organics (C10-C25)	0.022	0.022	0.85	J, B	KWG1413367	14PH015
K1409859	Method Blank	KWG14130695	AK103	Residual Range Organics (C25-C36)	0.039	0.05	0.49	-	KWG1413069	-
K1409859	14PH-BLO-MW-06	K140985903	AK103	Residual Range Organics (C25-C36)	0.15	0.053	0.53	J, B	KWG1413069	14PH014
K1409859	14PH-BLO-MW-05	K140985904	AK103	Residual Range Organics (C25-C36)	0.19	0.056	0.56	J, B	KWG1413069	14PH014
K1409859	14PH-DSA-MW-02	K140985912	AK103	Residual Range Organics (C25-C36)	0.073	0.053	0.53	J, B	KWG1413069	14PH012
K1409859	14PH-DSA-MW-029	K140985913	AK103	Residual Range Organics (C25-C36)	0.073	0.053	0.53	J, B	KWG1413069	14PH012
K1409859	Method Blank	KWG14129625	AK103	Residual Range Organics (C25-C36)	0.022	0.05	0.48	-	KWG1412962	-
K1409859	14PH-066-MW-05	K140985915	AK103	Residual Range Organics (C25-C36)	0.091	0.05	0.48	J, B	KWG1412962	14PH010
K1409859	14PH-DSA-MW-04	K140985918	AK103	Residual Range Organics (C25-C36)	0.059	0.05	0.49	J, B	KWG1412962	14PH013
K1409859	Method Blank	KWG14129875	SW8260C	Methylene chloride	0.00014	0.0002	0.002	-	KWG1412987	-
K1409859	14PH-BLO-MW-01	K140985905	SW8260C	Methylene chloride	0.00012	0.0002	0.002	J, B	KWG1412987	14PH015
K1409859	Method Blank	KWG14128365	SW8260C	1,2,4-Trichlorobenzene	0.00018	0.0003	0.002	-	KWG1412836	-
K1409859	14PH-RRS-MW-06	K140985924	SW8260C	1,2,4-Trichlorobenzene	0.0001	0.0003	0.002	J, B	KWG1412836	14PH009
K1409859	Method Blank	KWG14128365	SW8260C	Methylene chloride	0.00041	0.0002	0.002	-	KWG1412836	-
K1409859	14PH-TB-001	K140985927	SW8260C	Methylene chloride	0.0003	0.0002	0.002	J, B	KWG1412836	14PH009
K1409859	Method Blank	KWG14129875	SW8260C	Naphthalene	0.00031	0.0003	0.002	-	KWG1412987	-
K1409859	14PH-UST-MW-02	K140985901	SW8260C	Naphthalene	0.00012	0.0003	0.002	J, B	KWG1412987	14PH015
K1409859	14PH-PG1-MW-01	K140985906	SW8260C	Naphthalene	0.0013	0.0003	0.002	J, B	KWG1412987	14PH015
K1409859	14PH-BLO-MW-07	K140985902	SW8260C	Naphthalene	0.0001	0.0003	0.002	J, B	KWG1412987	14PH015
K1409859	14PH-BLO-MW-06	K140985903	SW8260C	Naphthalene	0.00011	0.0003	0.002	J, B	KWG1412987	14PH015
K1409859	14PH-TB-002 (Trip Blank)	K140985914	SW8260C	Methylene chloride	0.00027	0.0002	0.002	J	KWG1412906	14PH011
K1409859	14PH-DSA-MW-05	K140985910	SW8260C	Methylene chloride	0.00026	0.0002	0.002	J, B	KWG1412906	14PH011
K1409859	14PH-DSA-MW-01	K140985911	SW8260C	Methylene chloride	0.00017	0.0002	0.002	J, B	KWG1412906	14PH011
K1409859	14PH-DSA-MW-02	K140985912	SW8260C	Methylene chloride	0.00055	0.0005	0.005	J, B	KWG1412906	14PH011
K1409859	14PH-DSA-MW-029	K140985913	SW8260C	Methylene chloride	0.00055	0.0005	0.005	J, B	KWG1412906	14PH011
K1409859	14PH-TB-001 (Trip Blank)	K140985927	SW8260C	Chloromethane	0.00033	0.0002	0.0005	J	KWG1412836	14PH009
K1409859	14PH-RRS-MW-06	K140985924	SW8260C	Chloromethane	0.00016	0.0002	0.0005	J, B	KWG1412836	14PH009
K1409859	14PH-DSA-MW-06	K140985925	SW8260C	Chloromethane	0.00019	0.0002	0.0005	J, B	KWG1412836	14PH009
K1409859	14PH-DSA-MW-069	K140985926	SW8260C	Chloromethane	0.00016	0.0002	0.0005	J, B	KWG1412836	14PH009
K1409859	14PH-TB-002 (Trip Blank)	K140985914	SW8260C	Chloromethane	0.00032	0.0002	0.0005	J	KWG1412906	14PH011
K1409859	14PH-DSA-MW-07	K140985908	SW8260C	Chloromethane	0.00009	0.0002	0.0005	J, B	KWG1412906	14PH011
K1409859	14PH-RRS-MW-05	K140985909	SW8260C	Chloromethane	0.0002	0.0002	0.0005	J, B	KWG1412906	14PH011
K1409859	14PH-DSA-MW-05	K140985910	SW8260C	Chloromethane	0.00014	0.0002	0.0005	J, B	KWG1412906	14PH011
K1409859	14PH-DSA-MW-01	K140985911	SW8260C	Chloromethane	0.00015	0.0002	0.0005	J, B	KWG1412906	14PH011
K1409859	14PH-DSA-MW-02	K140985912	SW8260C	Chloromethane	0.0003	0.0005	0.0013	J, B	KWG1412906	14PH011
K1409859	14PH-DSA-MW-029	K140985913	SW8260C	Chloromethane	0.0003	0.0005	0.0013	J, B	KWG1412906	14PH011
K1409859	14PH-TB-003 (Trip Blank)	K140985920	SW8260C	Chloromethane	0.00061	0.0002	0.0005	-	KWG1412925	14PH013
K1409859	14PH-GLO-MW-03	K140985917	SW8260C	Chloromethane	0.00019	0.0002	0.0005	J, B	KWG1412925	14PH013
K1409859	14PH-DSA-MW-04	K140985918	SW8260C	Chloromethane	0.00019	0.0002	0.0005	J, B	KWG1412925	14PH013
K1409859	14PH-GLO-MW-04	K140985919	SW8260C	Chloromethane	0.00021	0.0002	0.0005	J, B	KWG1412925	14PH013

Notes:

CoC = chain=of-custody

LOD = limit of detection

LOQ = limit of quantitation

mg/L = milligrams per liter

SDG = sample delivery group

See the Data Quality Assessment for data qualifier definitions.

Table B-2-6
Results Qualified JH Due to Holding Time Exceedance

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result (mg/L)	LOD (mg/L)	LOQ (mg/L)	Collection Date	Extraction Date	Analysis Date	Sample Collection to Sample Exraction (Days)	Extraction Holding Time (Days)	Sample Extraction to Analysis (Days)	Analysis Holding Time (Days)	Lab Lot Number	Qualifier
K1409859	14PH-066-MW-06	K140985923	AK102	Diesel Range Organics (C10-C25)	0.032	0.02	0.79	9/6/2014	9/18/2014	11/20/2014	12	14	63	40	KWG1412962	J, JH

Notes:

LOD = limit of detection

LOQ = limit of quantitation

mg/L = milligrams per liter

SDG = sample delivery group

See the Data Quality Assessment for data qualifier definitions.

ATTACHMENT B-3

ADEC Laboratory Data Review Checklists

Laboratory Data Review Checklist

Completed by:	Candace Ede		
Title:	Project Chemist	**Date:**	11-07-2014
CS Report Name:	2014 Annual Groundwater Monitoring Report	**Report Date:**	May 2015
Consultant Firm:	Jacobs Engineering Group Inc.		
Laboratory Name:	ALS	**Laboratory Report Number:**	K1409859
ADEC File Number:	2637.38.002.08	**ADEC Hazard ID:**	186

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:

All samples were analyzed by ALS of Kelso, WA.

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° ± 2° C)?

☑ Yes ☑ No ☐ NA (Please explain.) Comments:

The sample/cooler temperatures were:

Cooler Seventh: 2.9° C /2.4° C
Cooler Sixth: 4.7° C /1.1° C
Cooler Third: 5.0° C /0.2° C
Cooler Fourth: 1.6° C /2.6° C
Cooler Second: 5.1° C /5.4° C
Cooler Fifth: 4.0° C /4.7° C
Cooler First: 3.9° C /2.9° C

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 acceptable range, insufficient or missing samples, etc.?

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

Two of the seven coolers were received with a temperature below the acceptable range.
In Cooler Seventh, six VOA vials for 14PH-TB-004 were received instead of four, which was indicated on the COC.

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

Comments:

The coolers that were received with temperatures below 2° C had no indication of frozen samples and the data quality and usability was not affected.

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:

8260: Several CCVs were outside of recovery criteria for the following analytes (biased low): Bromomethane, Dichlorofluoromethane, 1,2-Dibromo-3-chloropropane, 2,2-Dichloropropane and Bromoform. Associated sample results were qualified (JC-).

Other QC failures are discussed in the relevant sections of this checklist.

c. Were all corrective actions documented?

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

In accordance with the EPA Method, 80% or more of the CCV analytes must pass within 20% of the true value. The ALS SOP allows for 40% difference for the remaining analytes. The CCV met these criteria. A method reporting limit (MRL) check standard containing the analytes of concern were analyzed each day of analysis.

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

Comments:

Results qualified JC- are biased low. The MRL check standard showed that the sensitivity was adequate to detect the compounds in question, and the results are minimally affected.

5. <u>Samples Results</u>

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:

Sample 14PH-066-MW-06 was analyzed past the recommended method holding time for DRO (AK102). DRO results are qualified “JH”.

c. All soils reported on a dry weight basis?

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

There were no soils submitted for this SDG.

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:

SW8260 - The LODs does not meet the project action limit for 1,2 –Dibromoethane and 1,2,3-Trichloropropane in one or more samples. The nondetect results with LODs greater than the project action limit were qualified “E”.

e. Data quality or usability affected?

Comments:

Sample 14PH-066-MW-06 was extracted within the 14 day hold time on 9/18/14; however the lab misplaced the extract and the sample was finally analyzed on 11/20/14. The o-Terphenyl surrogate added during the extraction process was within acceptable limits (112% recovery) and the data quality is minimally affected.

Data quality and usability were minimally affected since 1,2-Dibromoethane and 1,2,3-trichloropropane are not a contaminants of concern.

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:

Method blanks were evaluated at the DL rather than the LOQ. The following analytes had detections in the method blank above the DL: DRO, RRO, Total Alkalinity, methylene chloride, 1,2,4-trichlorobenzene and naphthalene.

iii. If above PQL, what samples are affected?

Comments:

The following samples were qualified if the concentration did not exceed the method blank contamination by a factor of five (factor of ten for methylene chloride): 14PH-UST-MW-02, 14PH-BLO-MW-07, 14PH-BLO-MW-06, 14PH-BLO-MW-05, 14PH-PG1-MW-01, 14PH-DSA-MW-02, 14PH-DSA-MW-029, 14PH-066-MW-05, 14PH-DSA-MW-04, 14PH-RRS-MW-06, 14PH-BLO-MW-01, and 14PH-TB-001.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

Associated samples were qualified B.

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

Comments:

Data quality and usability were minimally affected since all results qualified B are biased high and less than respective ADEC criteria.

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:

An LCS/LCSD and MS/MSD was included for all batches, with the exception of batches KWG1412836, KWG1412925 and KWG1412987 for 8260 analysis.

An LCS/LCSD was included in batch KWG1412836 and KWG1412925 and an LCS was included in batch KWG1412987.

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

One LCS and one set of MS/MSDs and/or one set of sample duplicates was included for each batch.

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:

All LCS/LCSD recoveries were within the QC criteria.

8260 – The 14PH-DSA-MW-02 MS/MSD recoveries in batch KWG1412906 were outside of QC criteria (biased high) for the following analytes: o-xylene, sec-Butylbenzene, isopropylbenzene, trichloroethene (TCE), chloroethane, chlorobenzene, 1,1-Dichloroethene, 1,2-Dichlorobenzene and 4-Isopropyltoluene.

353.2 - The 14PH-DSA-MW-05 MS/MSD recovery for Nitrogen, nitrate-nitrite in batch 219407 were outside of QC criteria (biased low).

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

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

Comments:

8260: 14PH-DSA-MW-02
353.2: 14PH-DSA-MW-05

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

☑ Yes ☑ No ☐ NA (Please explain.) Comments:

8260: A data flag for MS/MSD recovery was not required for sample 14PH-DSA-MW-02. The parent sample concentration was greater than the spike amount for trichloroethane (TCE). The other analytes are not detected above the LOD; therefore do not need a qualifier for a high bias matrix spike recovery.

353.2: The Nitrogen, nitrate-nitrite results for 14PH-DSA-MW-05 was qualified JM- due to MS recovery below the QC limit.

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

Comments:

The data quality was minimally affected. The 14PH-DSA-MW-05 Nitrogen, nitrate-nitrite sample result qualified JM- are considered estimated and biased low. The impact is minimal since the LCS recovery was acceptable.

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:

AK102/103: The n-Tricontane and o-Terphenyl surrogate recoveries were not within QC criteria for sample 14PH-BLO-MW-01.

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:

A data flag is not required for samples with a dilution factor of 5 or greater.

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

Comments:

The data quality and usability were not affected.

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:

Four trip blanks were submitted for this SDG, of which three were not properly analyzed. A trip blank was submitted with Cooler Seventh, CoC 14PH015, however no analysis was requested on the CoC and the trip blank was not analyzed. Trip blanks 14PH-TB-001 and 14PH-TB-003 were only analyzed for 8260 only, not AK101.

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:

Trip blanks were evaluated at the DL rather than the LOQ. The following analytes had detections in the trip blank above the DL: methylene chloride and chloromethane.

iv. If above PQL, what samples are affected?

Comments:

The following samples were qualified if the concentration did not exceed the trip blank contamination by a factor of five (factor of ten for methylene chloride): 14PH-DSA-MW-05, 14PH-DSA-MW-01, 14PH-DSA-MW-02, 14PH-DSA-MW-029, 14PH-RRS-MW-06, 14PH-DSA-MW-06, 14PH-DSA-MW-069, 14PH-DSA-MW-07, 14PH-RRS-MW-05, 14PH-GLO-MW-03, 14PH-DSA-MW-04 and 14PH-GLO-MW-04.

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

Comments:

Data quality and usability were minimally affected since all results qualified B are biased high and less than the respective ADEC criteria.

For the Cooler Seventh, CoC 14PH015, the results for one sample are nondetect for all analytes, with the exception of naphthalene, which is less than the respective ADEC cleanup level, while other naphthalene results are nondetect.

There is more than one sample where the GRO results are non-detect for the coolers where the trip blanks were not analyzed for AK101. This indicates there is no cross-contamination during transport and the data quality is not affected.

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)

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☑ No ☐ NA (Please explain.) Comments:

8260 – The RPD for sample/duplicate 14PH-DSA-MW-02/ 14PH-DSA-MW-029 was greater than 30% for chloroform at 74%. The RPD for sample/duplicate 14PH-DSA-MW-06/ 14PH-DSA-MW-069 was greater than 30% for tetrachloroethene (PCE) at 35%.

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

8260: The data quality has been minimally affected. The chloroform and tetrachloroethene results for sample/duplicate 14PH-DSA-MW-02/ 14PH-DSA-MW-029 and 14PH-DSA-MW-06/ 14PH-DSA-MW-069 were qualified JD due to field duplicate precision exceedance. All results are less than the than respective ADEC criteria. The higher result will be used for reporting purposes.

f. Decontamination or Equipment Blank (If not used explain why).

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

A decontamination/equipment blank was not submitted with this SDG.

i. All results less than PQL?

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

NA

ii. If above PQL, what samples are affected?
Comments:

NA

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

The data quality and usability were not affected.

7. <u>Other Data Flags/Qualifiers (ACOE, AFCEE, Lab-Specific, etc.)</u>

a. Defined and appropriate?

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

Qualifiers applied are defined in the Data Quality Assessment appendix of the report.

Laboratory Data Review Checklist

Completed by:	Candace Ede		
Title:	Project Chemist	**Date:**	11-06-2014
CS Report Name:	2014 Annual Groundwater Monitoring Report	**Report Date:**	May 2015
Consultant Firm:	Jacobs Engineering Group Inc.		
Laboratory Name:	ALS	**Laboratory Report Number:**	K1410237
ADEC File Number:	2637.38.002.08	**ADEC Hazard ID:**	186

1. Laboratory

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

Samples associated with the 2014 Black Lagoon Biopile Treatability Study were submitted with this SDG; however they are not evaluated in this checklist.

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:

All samples were analyzed by ALS of Kelso, WA.

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° ± 2° C)?

☑ Yes ☑ No ☐ NA (Please explain.) Comments:

The sample/cooler temperatures were:

Cooler Canada: 1.9° C /-0.4° C

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 acceptable range, insufficient or missing samples, etc.?

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

The cooler temperature, Cooler Canada, was outside of acceptable range was noted on the cooler receipt form.

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

Comments:

For Cooler Canada, there was no indication of frozen samples and the data quality and usability was not affected.

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:

There are no discrepancies identified by the lab.

Other QC failures are discussed in the relevant sections of this checklist.

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:

The data quality and usability was not affected.

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:

There were no soils submitted that are associated with the 2014 Port Heiden Annual Groundwater Monitoring Report.

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?

Comments:

The data quality and usability were not affected.

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:

All method blank results were less than the DL.

iii. If above PQL, what samples are affected?

Comments:

NA

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

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

NA

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

Comments:

The data quality and usability were not affected.

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

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

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

An LCS/LCSD and MS/MSD was included as QC for batch KWG1413367.

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

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

No metals/inorganics were reported.

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:

AK102/103 – The LCS/LCSD recoveries were within QC criteria. The 14PH-215-MW-10 MS recovery for DRO in batch KWG1413367 was outside of QC criteria (biased low).

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

☐ Yes ☑ No ☐ NA (Please explain.) Comments:

AK 102/103 - The 14PH-215-MW-10 MS/MSD RPD for DRO in batch KWG1413367 was outside of QC criteria at 27%

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

Comments:

AK 102/103: 14PH-215-MW-10

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

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

AK 102/103: The DRO results for 14PH-215-MW-10 was qualified JM- due to MS recovery below the QC limit. A data flag "JD" was applied to sample 14PH-215-MW-10 for RPD criteria.

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

Comments:

The data quality was minimally affected. The 14PH-215-MW-10 DRO sample result qualified JM- are considered estimated and biased low. The impact is minimal since the LCS/LCSD recoveries and precision were acceptable and the sample result for DRO is below the action limit.

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:

NA

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

Comments:

The data quality and usability were not affected.

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:

There were no volatile samples associated with this checklist.

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:

NA

iii. All results less than PQL?

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

NA

iv. If above PQL, what samples are affected?

Comments:

NA

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

Comments:

The data quality and usability were not affected.

e. Field Duplicate

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

☐ Yes ☑ No ☐ NA (Please explain.) Comments:

A field duplicate was not submitted with this SDG.

ii. Submitted blind to lab?

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

NA

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:

NA

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

NA

f. Decontamination or Equipment Blank (If not used explain why).

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

A decontamination/equipment blank was not submitted with this SDG.

i. All results less than PQL?

☐ Yes ☐ No ☑ NA (Please explain.) Comments:

NA

ii. If above PQL, what samples are affected?
Comments:

NA

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

The data quality and usability were not affected.

7. <u>Other Data Flags/Qualifiers (ACOE, AFCEE, Lab-Specific, etc.)</u>

a. Defined and appropriate?

☑ Yes ☐ No ☐ NA (Please explain.) Comments:

Qualifiers applied are defined in the Data Quality Assessment appendix of the report.

ATTACHMENT B-4

Laboratory Deliverables

(Available separately on CD)

APPENDIX C

Field Logbooks and Groundwater Monitoring Sheets

Port Heiden
Toob Groundwater
2014

"Rite in the Rain"®
ALL-WEATHER
ENVIRONMENTAL
No. 550

Michal Pelka-MP

HTRW-J07-0SF45L61-H04-0007

Toob Groundwater 2014

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

ALL-WEATHER

ENVIRONMENTAL FIELD BOOK

Name Jacobs Engineering

Address 4300 B Street Suite 600
Anchorage AK 99503

Phone 907-563-3322

Project Port Heiden Tac6
Groundwater

This book is printed on "Rite in the Rain" All-Weather Writing Paper - A unique paper created to shed water and enhance the written image. It is widely used throughout the world for recording critical field data in all kinds of weather. For best results, use a pencil or an all-weather pen.

Specifications for this book.

Page Pattern		Cover Options	
Left Page	Right Page	Polydura Cover	Fabrikoid Cover
Columnar	1/4" Grid	Item No. 550	Item No. 550F

CONTENTS

PAGE	REFERENCE	DATE

Reference Page Index

147 Error codes, Hazardous classifications, Container types
148 Sampling guidelines (Liquids)
149 Sampling guidelines (Solids)
150 Approximate Volume of Water in Casing or Hole, Ground Water Monitoring Well
151 PVC Pipe casing tables
152 Soil Classification
153 Soil Classification
154 Conversions (Length, Weight, Volume, Temp, etc...)
155 Conversions (Concentrations, Volume/Flow or Time, Velocity, Acceleration)
156 Maximum Concentration of Contaminants for the Toxicity Characteristic

CONTENTS

PAGE	REFERENCE	DATE

Location Fort Holden Date 6-5-14

Project / Client TOO6 USACE

Personnel:
Julia Cohen
Michal Pelka

Objective:
Depth to GW at all MW

PPE
Level D Modified

~~2~~MP 6-5

1435 Arrive at MW near school

1450 Leaving school area
2 Part Alconox & water decon used at all wells -

1455 arrived at MWs near Red building
-well caps have different locks. Will look for correct key and return

1518 Arrive at RRS-MW-02

1522 Arrived at VST-MW-02

1528 Arrived at PG1-MW-01

1532 Arrived at RRS-MW-06

1549 Arrive at GIO-MW-03

1552 Arrive at GIO-MW-04

Location Port Heiden Date 6-5-14

Project / Client T006 USACE

* missing wells: RRS-MW-04
DSA-MW-03
BLO-MW-03

1740 Disposed of wastewater in 55 gal drums from previous years sampling effort

1743 Back at Red building

1800 End of Day

QC 6/11/14 PB

Location PORT HEIDEN Date 6-5-14

Project / Client T006 / USACE

overcast / light rain, 20-30 mph wind, 50°F

MW ID	Depth	time	Notes
066-MW-05	8.40	1437	
066-MW-04	6.65	1440	
066-MW-07	5.81	1445	
066-MW-06	5.00	1443	
RRS-MW-02	57.26	1520	
UST-MW-02	64.95	1524	
PG1-MW-01	56.60	1529	
RRS-MW-06	56.80	1533	
G10-MW-03	58.43	1550	
G10-MW-04	56.18	1553	
DSA-MW-07	~~43~~.87	1600	
DSA-MW-06	56.30	1604	
RRS-MW-05	49.48	1607	
DSA-MW-01	52.55	1612	
DSA-MW-05	57.96	1614	
DSA-MW-02	62.33	1618	
~~DSA-MW-03~~ DSA-MW-04 11:24 AK	66.80	1622	
BLO-MW-02	30.49	1628	
BLO-MW-07	38.30	1634	
BLO-MW-05	47.18	1637	
BLO-MW-06	41.16	1640	
BLO-MW-01	43.75	1642	
215-MW-10	13.79	1725	partial obstruction?

Location Port Hueden Date 6-5-14

Project / Client T006 USACE

MW ID	Depth	Time	Notes
215-MW-09	12.89	1727	
215-MW-08	11.32	1730	

Summary
measured depth to GW in 25 monitoring wells

CQC RB 6/11/14

Location Port Hueden Date 8.31.2014

Project / Client TO-06 USACE

35-60°F, CLEAR, 5-15 MPH WIND

0700 TAILGATE AT FIELD OFFICE
PERSONNEL: DREW MULLINS (JACOBS)
DON FLEMING (JACOBS)
PPE: MOD LEVEL D
OBJECTIVE: GET DEPTH TO WATER MEASUREMENTS FOR ALL MONITORING WELLS.

1015 MOBILIZED TO FPC 026

(IN FEET)

WELL ID	DTW (btoc)	NOTES
066-MW-04	6.39	NO PRODUCT
066-MW-05	8.15	SLIGHT FUEL ODOR (NO PRODUCT)
066-MW-06	4.72	NO PRODUCT
066-MW-07	5.54	
215-MW-08	12.27	
215-MW-09	13.72	
215-MW-10	WELL CASING DAMAGED BEYOND REPAIR. ALL BOLLARDS NOT LAYING ON THEIR SIDE WELL AND PROTECTIVE CASING BROKEN. (SEE PHOTOGRAPH)	

Location Port Hadlock Date 8.31.2014

Project / Client HTRW TO-06 : USACE

WELL ID	DTW (btoc)	NOTES
PEI-MW-01	58.42	NO PRODUCT
RRS-MW-02	58.24	
RRS-MW-05	50.92	
RRS-MW-06	58.27	
UST-MW-02	65.87	
DSA-MW-01	53.52	
DSA-MW-02	63.33	
DSA-MW-04	67.53	
DSA-MW-05	59.55	
DSA-MW-06	57.01	
DSA-MW-07	48.67	NO SIGNIFICANT PRODUCT < 0.01"
BLO-MW-01	45.57	
BLO-MW-02	32.75	NO PRODUCT
BLO-MW-05	49.37	
BLO-MW-06	43.05	
BLO-MW-07	42.07	
ILO-MW-03	59.56	
ILO-MW-04	57.15	

Location PORT HADLOCK Date 9/2/14

Project / Client ~~Kitsap~~ TO-06 USACE

PARTLY CLOUDY (AM), 50s, 5-15 mph wind

0700 TAILGATE AT FIELD OFFICE. SOO SIGN IN SHEET FOR PERSONNEL

- OLEG McCLURE (JACOBS) PPE AND LEVEL D

OBJECTIVE: REPAIR 215-MW-10

1200 PERRY BULLOCK (JACOBS) ARRIVED ONSITE FROM ANCHORAGE, AK.

1500 BEGAN REPAIRING ~~MW~~ 215-MW-10 THE WELL APPEARS TO HAVE SHIFTED OR BEEN PULLED OUT OF THE GROUND (ONLY THE PROTECTIVE SURROUND AND ~~A~~ MONUMENT GROUND WELL CASING.

1515 THE WELL CASING WAS REATTACHED TO THE MW AND THE PROTECTIVE SURROUND WAS REPLACED AND BUCKLED. THREE BOLLARDS WERE BURIED AROUND WELL.

1545 END OF DAY

Location Port Hadlock Date 9/3/2014

Project / Client TO-06

MOSTLY CLOUDY, 40-50s, 5-10mph WIND

0700 TAILGATE AT FIELD OFFICE
SEE SIGN IN SHEET
(BULLOCK & MCCLURE)

PPE AND COLD

OBJECTIVE: BEGIN SAMPLING WELLS

0910 CALIBRATION CHECK
YSI

		RANGE	
TEMP =	14.53°C		
COND =	7.844 mS	7600-7970 µS	✓
ORP =	253.7	229-263	✓
pH =	6.94	6.8-7.2	✓

OK

0915 NO PID ON SITE.

WORK PLAN DEVIATION

PID READINGS WILL NOT BE RECORDED FOR WELLS.

1020 AS A RESULT OF NOT HAVING A PID OR DI WATER ~~(WHICH HAS BEEN MISSED)~~ (DW) WE WILL WAIT TO START GW MONITORING UNTIL 9/5 OR 9/6 WHEN OUR DI WATER AND PID ARRIVE. END OF DAY

Location Port Hadlen Date 9/5/14

Project / Client TO-06

Mostly cloudy ~52°F 15mpH

1500 start gathering items for groundwater sampling.
1515 Arrive MW08
1645 Begin Sampling MW08
14PH-215-MW-08
2 1L Amber + HCl + 4°C
analysis AK102
1700 Arrive MW09
1755 Begin sampling MW09
14PH-215-MW-09
2 1L Ambes + HCl + 4°C
analysis AK102
1800 Decon and head back to field office for sample management

Summary: 2 samples
+0 dup + 0 MS/MSD

EOD P. Bullock

12

Location Port Hueneme Date 9/6/14

Project / Client TO-06

Partly Cloudy, 55°F, 5-15 mph wind

0700 TAILGATE AT FIELD OFFICE
SEE SIGN IN SHEET.

PPE: MOD LEVEL D.

OBJECTIVE: CONTINUE GW SAMPLING AT FPC-066 AND THE RRS.

0915 CALIBRATION CHECK

	YSI	RANGE	
TEMP:	15.05 °C		
COND:	7.910	7.600 - 7.970	OK
ORP:	247.6	229 - 263	OK
pH:	6.90	6.8 - 7.2	OK

YSI CAL CHECK PASSED

0930 SEE WELL SHEETS FOR 9/6/14

1630 END OF DAY

Summary

SAMPLED 4 WELLS
PURGED 5 WELLS
DSA-MW07 → PURGED DRY
4 PRIMARY + 2 DUPLICATES + 1 MS/MSD

13

Location Port Hueneme Date 9/8/14

Project / Client TO-06

Partly Cloudy, 45-55°F, wind 20+ mph

0700 TAILGATE AT FIELD OFFICE
SEE SIGN IN SHEET

PPE: MOD LEVEL D

OBJECTIVES: CONTINUE GW MONITORING AT THE RRS.

0825 CALIBRATION CHECK

	YSI	RANGE	
TEMP =	17.09	—	OK
COND =	7.876	7.680 - 7.970	OK
ORP =	225	222 - 252	OK
pH =	~~6.98~~ 6.98 on 9/8	6.8 - 7.2	

YSI CHECK PASSED

0840 SEE MONITORING LOGS FOR

Location Port Hordon Date 9/9/14

Project / Client TO-06

Partly cloudy, 50s, 5-15 mph winds

0700 TAILGATE AT FIELD OFFICE
SEE SIGN IN SHEET

PPE: MOD LEVEL D

OBJECTIVES: CONTINUE GW MONITORING AT RRS

1445 YSI CAL CHECK

		RANGE	
TEMP	15.12	—	OK
COND	7.975	7.600 - 7.970	(HIGH)
ORP	230.1	229 - 261	OK
pH	6.82	6.8 - 7.2	OK

* CONDUCTIVITY HIGH.
CALIBRATED FOR CONDUCTIVITY

1500 SEE WELL SHEETS FOR SAMPLING INFO.

2010 END OF DAY

SUMMARY
3 WELLS WERE SAMPLED
3 WELLS PURGED DRY
3 PRIMARY NO DUP NO MS/MSD

Location Port Hordon Date 9/10/14

Project / Client TO-06

Partly cloudy, WIND 5-15 mph, 50's F.

0700 TAILGATE AT FIELD OFFICE
SEE SIGN IN SHEET

PPE MOD LEVEL D

OBJECTIVES: FINISH SAMPLING MONITORING WELLS (DTW 9/12)
ALL MWs, EXCLUDING
215-MW-10, WHICH NEEDS TO BE DOWNLOADED

1300 SEE GW LOGS

1930 HAULED WASTE WATER TO BARGE LANDING

1400 END OF DAY — GW-001, GW-002, GW-003, GW004

SUMMARY
SAMPLED 6 WELLS
BLO-MW-07 HAD STRONG GAS ODOR. LAST YEAR THIS WELL CONTAINED FREE PRODUCT. NO PRODUCT THIS YEAR.
* 6 PRIMARY SAMPLES, 0 DUPLICATES, 0 MS/MSDS
* LIMITED QUANTITIES, LOW YIELD WELLS

Location Point Hollow Date 9/11/14

Project / Client SD-06

OVERCAST, 50°s, WIND 10-30 mph

0800 TAIL GATE AT FIELD OFFICE (SEE SIGN IN SHEET)

PPE: MOD LEVEL D

OBJECTIVES: ~~Gloso/~~ MAKE SURE ALL MWs ARE LOCKED AND COLLECT PID READINGS FROM WELLS.

0930 ALL MONITORING WELLS WERE LOCKED.

NOTE: PID BATTERY LOW. NO PID READINGS WERE COLLECTED. PID READINGS WILL BE TAKEN NEXT WEEK.

dm 9/11

Location Date

Project / Client

PAGE SKIPPED

dm 9/23

Location Port Heiden Date 9/19/14

Project / Client TO-06 Groundwater

Overcast, 50s°, wind 5-20 mph GR/MH/LD

0730 - Morning tailgate meeting (see signin Sheet)

PPE - Level D Modified

Objectives - Develop monitoring well 215-MW-10 after repairs were made.

Personnel - G. Rutkowski, M. Houck, L. Deloney

1200 - Bump check PID MiniRae 2000
Isobutylene @ 100ppm
Lot # 13-4638
Exp - 10-17-14
Reading 96.4 ppm - within 5% ✓
Calibration date: 9/3/14 by TTT

1245 YSI Calibration Check

Temp.	16.06	
Cond.	7.788	7630-7970 Pass
ORP.	212.5	222-252 * Fail
pH	6.98	6.8-7.2 Pass

9/19/14

Location Port Heiden Date 9/19/14

Project / Client TO-06 Groundwater GR/MH/LD

Overcast, 50°, wind 5-20 mph

1255 Recalibrated ORP due to failure of calibration check

1300 Re-check of YSI

	YSI	Purge	
Temp	16.26 °C	7630-7970	Pass
Cond	7.937		
ORP	226.2	222-252	Pass
pH	6.90	6.8-7.2	Pass

YSI calibration check acceptable.

1355 Setup at 215-MW-10 and began surging and purging.

1440 Water still very turbid. Well surged again.

1530 Well starting to clear up. Setup YSI.

1604 Initiated YSI parameter measurements. See Groundwater Well Development Form for all measurements + calculations

9/19/14

Location Port Hueden Date 9/19/14

Project / Client TO-06 Groundwater GR/MH/LD

Overcast 50's, light rain, wind 5-20 mph

1725 Completed purging well, All parameters stabilized except turbidity.

1740 Broke down equipment and returned to office.

MBeHuk 9/19/14

Location Port Hueden Date 9/20/14

Project / Client TO-06 Groundwater GR/MH/LD

Partly Sunny, Mid 50's, 15 mph wind

0800 - Morning tailgate meeting (see sign-in sheet)

PPE - Level D modified

Objectives - Sample 715-MW-10 for DRO

1605 Bump check PID Mini Rae 2000
Isobutylene @ 100ppm
Lot # 134638
Exp - 10/17/14
Reading 99.0 ppm - within 5% ✓
Calibration date: 9/3/14 by TJT

1610 YSI Calibration Check
YSI Confidence Solutions - Lot # 13J1C
expires 9/17/14

	Reading	Ranges
Temp	16.11	-
Cond.	7110	7630-7970 - Fail
ORP	210	222-252 - Fail
pH	7.01	6.8-7.2 - Pass

MBeHuk 9/20/14

Location Fort Heiden Date 9/20/14

Project / Client TO #6 Groundwater GR/MM/LD

~~Partly Sunny~~, Mid 50's, 13 mph winds

1617 Recalibrate YSI for ORP and conductivity due to failing calibration check

ORP Solution - Hanna Instruments
Lot # 7657, expires 5/19
240 ~~mV~~ mm 9/24/14

Conductivity Solution 1413 µS/cm
Oakton: Lot # 542
Expires 6/20/16

1625 YSI Calibration Check
YSI Confidence Solution - Lot # 13I2C
Expires 9/17/14

	Reading	Accept Range	
Temp.	16.05	—	
Cond.	7878	7630-7960	✓
ORP.	225	222-252	✓
pH	7.05	~~6.8~~ 6.8-7.1 mm 9/24/14	✓

1655 Loaded equipment in truck.

Mike Hulse 9/20/14

Location Fort Heiden Date 9/20/14

Project / Client TO #6 Groundwater GR/MM/LD

Partly Sunny, Mid 50's, 13 mph winds

1715 Setting up equipment at 215-MW-10.

1742 - Initiated purging at 215-MW-10.
- See GW Sampling Data Sheet for info.

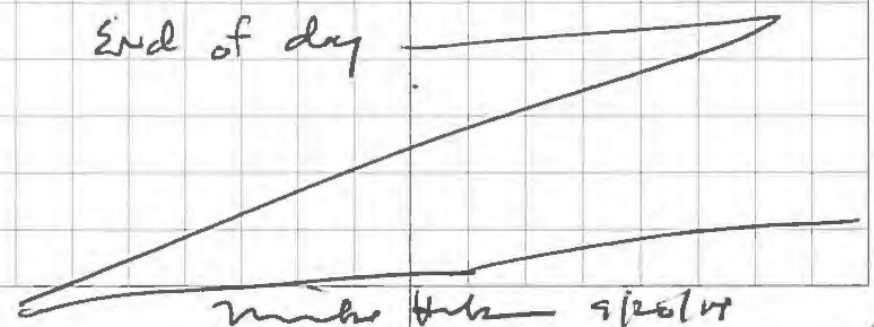
1829 Parameter stabilization achieved.

1850 Collected 14PH-215-MW-10 for DRO by AK102. Collected MS/MSD aliquot.

1900 Packed up equipment and hauled purge water to drum at Storage Area 1.

* Note - while breaking down equipment at well tubing was lost down the well.

End of day



Mike Hulse 9/20/14

Location _____ Date _____

Project / Client _____

Location Port Heiden Date _____

Project / Client TOOB / USACE

PHOTOLOG

#	Description + sampling	Date	Direction
100-0225	unlocking GW well	6-5-14	S
100-0226	unlocking GW well	6-5-14	S

Groundwater Well Development Form

JACOBS

Site Name: Port Heiden Former RRS
Site ID: ~~GA15~~ FPC-215
Project #: ~~05PC1551~~ 05F45601
Date: 9/19/14
Start Time: 1355
Finish Time:
Developed ~~Sampled~~ By: GR/MH
PID Reading: 0.0 ppm
Weather Conditions: Overcast 50°s, 10-15mph wind

Well ID: 215-MW-10
Well Type: (Monitor) Extraction Well point
Well Material: (PVC) Stainless Steel
Well Integrity: Excellent, Good, (Fair) *, Poor

Acceptable Range for Well Stabilization Parameters	
pH	~~±0.2~~ ±0.1
Conductivity	± 3%
Temperature	~~±1.0~~ C ±0.2°C
Turbidity	10% or ± 1 NTU
DO	10% or ± 0.2 mg/L
ORP	±10 mV

Probe Type: (Oil/Water Interface) Electronic Water Indicator, Other_____

Casing Diameter (in)	Gallons/Linear Foot	Casing Radius² (ft)
(1.5)	~~0.066~~ (0.092)	~~0.0047~~ (0.00212)
2	0.17	0.0069
4	0.66	0.028

Purging Information

Start Time: 1420
Finish Time:

Depth to GW: 13.67 ~~Ft.~~ TOC
Total Depth of Casing: 23.32 ft.
Product Level: —
Amount of Product: —

Purging Equipment: Bailer, Submersible Pump, (Peristaltic Pump) Waterra Surge Blo

Casing Volume (Gallons) = 3.14 x (_____) x (_____ - _____) x 7.48 x 3 = _____ Gallons
* See below
(Casing Radius² (ft); TD of Casing (ft); Depth to GW (ft); There are 3785 mL/gallon)

Actual Volume Purged: Gallons

Time (HH:mm)	Volume (Gallons)	pH (S.U.)	Conductivity (µS/cm)	Temperature (F) (C)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Water Level (feet btoc)
16:04	7.0	6.55	0.150	5.60	—	12.55	-5.7	13.67
16:13	7.75	6.59	0.149	5.49	—	12.72	-8.0	13.67
16:22	8.5	6.62	0.150	5.55	—	12.52	-10.1	13.67
16:37	9.25	6.62	0.151	5.35	2000	12.63	-8.8	13.67
16:56	10.0	6.63	0.153	5.59	—	12.42	-8.8	13.67
17:05	10.25	6.68	0.155	5.62	1780	12.18	-10.3	13.67
17:15	11.0	6.67	0.155	5.76	1828	12.20	-11.0	13.67
17:25	12.5	6.65	0.157	6.01	964	11.99	-12.7	13.67

continued on back of form —>

Color: Clear, (Cloudy), Yellow, Brown
Odor: (None), Faint, Moderate, Strong
Purged Dry? Yes (No)
Sheen? Yes No
Meters Used: (YSI), Horiba U-22, (Hach Turbidimeter)
Discharge Water: Treated, Discharged, (Stored)

* Min. ~~Max~~ Purge Volume = (23.32 ft - 13.67 ft) x 0.092 gal/ft x 3 = 2.66 gallons
MH 9/19/14

- Some seals in the well were difficult to get the tubing past.

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Grey Lagoon Outfall	GLO-MW04	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
OVERCAST, 58°F, 10-15 MPH WND	(Monitoring Well) Groundwater Monitoring Probe	9/9/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	3.0	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
57.15	60.07	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (60.07 † ft – 57.15 ft) 0.163 gal/ft * 3 = 1.43 gal * 3.785 L/gal = 5.40 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1747		~ 58.5	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear Cloudy (Brown) Other:	(None) Moderate Faint Strong	Yes (No)	Yes No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability Max Vol. | Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or (Liters))		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1750	1.7	1.7	4.54	87	10.89	6.41	-32.2	+99.9	57.25
1753	1.5	3.2	4.57	87	10.67	6.36	-30.9	+99.9	57.29
1756	2.0	5.2	4.59	87	10.54	6.31	-31.1	+99.9	57.35
1800	2.0	7.2	4.61	87	10.48	6.31	-32.2	67.5	57.36
★	WATER BEGINNING TO CLOUD UP. ALLOWING EXTRA PURGE TO REDUCE TURBIDITY								
1803	2.4	9.6	4.64	88	10.47	6.33	-34.0	42.0	57.36
1806	1.9	10.5	4.67	88	10.38	6.34	-35.1	32.8	57.38

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1808	1811	~ 58.5	Peristaltic Pump (Submersible Pump)

SAMPLE ID: 14PH-GLO-MW-04 | QC: Dup MS/MSD (None) | Duplicate ID: —

(orm 4a) Container/Preservative	Analysis Requested	Notes
2 x 3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on '

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	FPC-215	215-MW08	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
Cloudy, windy, ~55°F	(Monitoring Well) Groundwater Monitoring Probe	9/5/14	PB

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	1.25	(PVC) SS	1 / 0.041 (1.5 / 0.092) 2 / 0.163 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
12.27	~~12.27~~ PM 20.05	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] • gallons per linear foot of casing • 3

SHOW WORK Max Purge Volume = (20.05 † ft – 12.27 ft) • 0.092 gal/ft • 3 = 2.15 gal • 3.785 L/gal = 8.13 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1615	1645	13.5'	Bailer (Peristaltic Pump) Submersible Pump

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability (Max Vol.) Purge water was: Treated (Stored) Other Nota:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1620		0.25	6.05°C	94	14.32	6.34	7.2	1.70	12.25 -0.0
1625	0.25	0.50	5.46	86	13.15	6.51	-13.7	2.00	-0.04
1630	0.50	1.0	4.79	90	12.10	6.59	-29.5	2.86	-0.05
1635	0.5	1.5	4.58	94	10.0	6.65	-100.3	1.62	-0.05
1640	0.50	2.0	4.57	97	9.95	6.62	-121.3	1.52	-0.06
1645	0.50	2.5	4.56	99	9.65	6.63	-130.3	1.42	-0.05
		MAX							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1645	1650 9/5/14	13.5'	(Peristaltic Pump) Submersible Pump

SAMPLE ID: 14PH-215-MW-08 QC: Dup MS/MSD (None) Duplicate ID:

Container/Preservative	Analysis Requested	Notes
2 X 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO by AK102	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	FPC-215	215-MW09	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
Cloudy, windy, ~55°F	(Monitoring Well) Groundwater Monitoring Probe	9/5/14	PB

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	4.06	(PVC) SS	1 / 0.041 (1.5 / 0.092) 2 / 0.163 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
13.72	20.62	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (20.62† ft – 13.72 ft) * 0.092 gal/ft * 3 = 1.90 gal * 3.785 L/gal = 7.21 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1720	1755	14.5'	Bailer (Peristaltic Pump) Submersible Pump

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) (Cloudy) Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability (Max Vol.) Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or (Liters))		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1725	0	1	6.56	336	2.77	6.26	-78.5	65.9	-0.07
1730	1.0	2.0	6.66	325	1.53	6.33	-83.3	23.0	-0.01
1735	1.0	3.0	6.63	331	1.22	6.38	-84.2	12.9	-0.14
1740	1.0	4.0	6.61	335	1.25	6.39	-85.8	13.2	-0.18
1745	1.0	5.0	6.60	335	1.31	6.40	-86.0	6.23	-0.22
1750	1.0	6.0	6.58	336	1.38	6.42	-86.8	6.17	-0.26
1755	1.0	7.0	6.60	337	1.36	6.42	-87.4	6.22	-0.30
		MAX							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
PB 9/5 ~~1800~~ 1755	1800	14.5'	(Peristaltic Pump) Submersible Pump

SAMPLE ID: 14PH-215-MW-09 QC: Dup MS/MSD (None) Duplicate ID:

Container/Preservative	Analysis Requested	Notes
2 X 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO by AK102	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	FPC-066	066-MW06	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
P/C, 55°F, 5-10 mpH WIND	(Monitoring Well) Groundwater Monitoring Probe	9/6/2014	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	0.4	(PVC) SS	1 / 0.041 (1.5 / 0.092) 2 / 0.163 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
4.72	12.28	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] • gallons per linear foot of casing • 3

SHOW WORK Max Purge Volume = (12.28† ft – 4.72 ft) • 0.092 gal/ft • 3 = 2.09 gal • 3.785 L/gal = 7.90 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1003	1025	~ 6.2	Bailer (Peristaltic Pump) Submersible Pump

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other: SLIGHT BROWN TINT	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached (Stability) Max Vol. Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Volume (Gallons or Liters) Total	Acceptable Range to Demonstrate Stability: ± 0.2 °C Temperature (°C)	± 3% Conductivity (mS/cm)	± 10% or 0.2 mg/L (whichever is greater) DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	<10 NTU and ±1 NTU Turbidity (NTU)	Drawdown < 0.3 ft Water Level (feet btoc)
1005	0.5L	0.5	7.30	0.144	56.0	6.72	-32.5	28.2	4.72 INITIAL
1010	1.0	1.5	6.85	~~ORP~~ 0.155	4.16 (SDM)	6.31	-46.8	14.0	0.00 CHANGE
1014	1.5	3.0	6.32	0.174	2.88	6.00	-46.4	4.61	0.00
1018	2.5	5.5	6.04	0.195	1.97	6.07	-51.1	6.27	0.00
1021	1.9	7.4	6.08	0.195	2.02	6.12	-53.0	4.57	0.00
1024	0.5	7.9	6.06	0.197	2.07	6.18	-54.7	2.64	0.00
		MAX							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1025	1030	~6.2	(Peristaltic Pump) Submersible Pump

SAMPLE ID: 14PH-066-MW-06 QC: ~~Dup~~ ~~MS/MSD~~ None Duplicate ID: ~~14PH-066-MW-069~~ DM 9/6

Container/Preservative	Analysis Requested	Notes
DM 9/6 2 ~~3~~ X 1-L Ambers (HCl, stored at 4°C ± 2°C) DM 9/6	DRO by AK102	~~MS/MSD~~
ONLY A PRIMARY SAMPLE WAS COLLECTED. AN MS/MSD + DUPLICATE WILL BE COLLECTED FROM 66MW05		

"——" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	FPC-066	066-MW05	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
P/C, 55°F, 5-10mph wnw	(Monitoring Well) Groundwater Monitoring Probe	9/6/2014	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.4	(PVC) SS	1 / 0.041 (1.5 / 0.092) 2 / 0.163 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
8.15	15.00	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (15.00† ft – 8.15 ft) * 0.092 gal/ft * 3 = 1.89 gal * 3.785 L/gal = 7.16 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1039	1106	~9.5	Bailer (Peristaltic Pump) Submersible Pump

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other:	None Moderate (Faint) Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability (Max Vol.) Purge water was: (Treated) Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1043	1.5	1.5	6.27	112	4.51	6.39	-66.0	17.3	8.25 -.1
1048	1.0	2.5	6.19	111	1.05	6.28	-61.5	9.68	8.31 -.16
1053	1.2	3.7	6.09	110 ✓	0.66	6.34	-67.0	7.18	8.35 -.2
1058	1.1	4.8	6.05	109 ✓	0.44	6.41	-92.7	4.57	8.37 -.2
1102	1.1	5.9	5.96	109 ✓	0.29	6.53	-109.2	3.26	8.36 -.2
1106	1.6	7.5	5.96	109 ✓	0.27 ✓	6.59	-117.5	2.40	8.37 -.2
		MAX							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1108	1127	~9.5	(Peristaltic Pump) Submersible Pump
SAMPLE ID: 14PH-066-MW-05		QC: (Dup) (MS/MSD) None	Duplicate ID: 14PH-066-MW-059

Container/Preservative	Analysis Requested	Notes
8 X 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO by AK102	MS/MSD

"——" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Radio Relay Station	RRS-MW06	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
OVERCAST, 55°F, 5 mph NNW	(Monitoring Well) Groundwater Monitoring Probe	9/6/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.19	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
58.27	~~59.16~~ 67.10 (DM)	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (~~59.16~~ 67.10 ft – 58.27 ft) * 0.163 gal/ft * 3 = 4.32 gal * 3.785 L/gal = 16.34 L

(DM 9/3)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1335	1353	~60.0	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear (Cloudy) Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: (Stability) Max Vol. Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1339	2.5	2.5	4.64	208	12.04	6.43	−38.4	120	58.32 -.01
1344 ~~1344~~	2.5	5.0	4.88	209	11.77	6.48	−41.3	52.9	58.31 -.00
1347 ~~1347~~	2.0	7.0	4.84	210	11.66	6.52	−43.2	34.4	58.31 -.00
1350 ~~1350~~	2.1	9.1	4.64	209 ✓	11.68 ✓	6.54 ✓	−44.5 ✓	19.7	58.31 -.00
1353 ~~1353~~	2.0	11.1	4.49 ✓	209 ✓	11.82 ✓	6.54 ✓	−44.9 ✓	14.1	58.31 -.00
				STABLE	STABLE	STABLE	STABLE		

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1353	1400	~60.0	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-RRS-MW-06		QC: Dup MS/MSD (None)	Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓"= stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Drum Storage Area	DSA-MW06	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
Sunny, 56°F, 5-10 mph NNW	(Monitoring Well) Groundwater Monitoring Probe	9/6/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.21	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
57.01	90.81	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (90.81 † ft – 57.01 ft) * 0.163 gal/ft * 3 = 16.53 gal * 3.785 L/gal = 62.56 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1520	1543	~87	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: (Stability) Max Vol. Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1525	4.0	4.0	6.31	116	1.70	6.63	-45.4	+99.9	57.05
1530	3.7	7.7	5.73	116	1.27	6.67	-45.9	72.9	57.10
1535	3.0	10.7	4.72	123	1.04	6.68	-44.6	37.6	57.08
1538	2.1	12.8	4.56	123	0.80	6.72	-46.6	31.3	57.08
1541	2.8	15.6	4.67 ✓	124 ✓	0.54	6.77 ✓	-49.7 ✓	24.7	57.08
			STABLE	STABLE	–	STABLE	STABLE		
+	2.0	17.6							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1544	1552	✓87	Peristaltic Pump (Submersible Pump)

SAMPLE ID: 14PH-DSA-MW-06 QC (Dup) MS/MSD None Duplicate ID: 14PH-DSA-MW-069

Container/Preservative	Analysis Requested	Notes
6 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
2 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
2 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
2 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Drum Storage Area	DSA-MW07	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
mostly sunny, 55°F. Slight wind	(Monitoring Well) Groundwater Monitoring Probe	9/6/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.25	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
48.67	56.65	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (56.65† ft – 48.67 ft) * 0.163 gal/ft * 3 = 3.90 gal * 3.785 L/gal = 14.77 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1436		50.0 →	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear (Cloudy) Brown DM 9/6	(None) Moderate	Yes	(Yes)	(YSI Multi Meter) Horiba Water Quality Meter
Other: LIGHT BROWN TINT	Faint Strong	(No)	No	

Purging reached: (Stability) Max Vol. | Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or (Liters))		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1441	1.0	1.0	7.19	129	11.12	6.65	-48.7	OVER*	50.50
1446	0.8	1.8	6.58	129	11.34	6.61	-47.7	+99.9	51.25
1451	0.6	2.4	6.86	128	11.01	6.58	-48.8	+99.9	51.90
NOTE: DRAWDOWN IS OVER 0.3 EVEN WHEN PUMP RATE IS AT ≈ 0.1 L/min.									
1456	0.8	3.2	6.71	129	10.29	6.62	-52.8	+99.9	52.02
				STABLE	STABLE	STABLE	STABLE		
1458	WELL PURGED DRY. WILL ALLOW FOR RECHARGE BEFORE SAMPLING.								
0920	NOW DEPTH TO WATER = 50.17 ft btoc								
* → OVER = OVER 99.9 NTU								*	

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
0926	0931 9/8/14	~ 51.5	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-DSA-MW-07		QC: Dup MS/MSD (None)	Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	Radio Relay Station	RRS-MW05	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
SUNNY, 56°F, 5-10 mph wind	(Monitoring Well) Groundwater Monitoring Probe	9/8/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.42	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
50.92	58.65	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (58.65 †ft – 50.92 ft) * 0.163 gal/ft * 3 = 3.78 gal * 3.785 L/gal = 14.31 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
~~0920~~ 1002	1034	~52 → 55	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: (Stability) Max Vol. | Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1007	2.5	2.5	5.12	98	13.23	6.45	-25.6	+99.9	51.09 -1.5
1013	2.0	4.5	4.35	95	13.37	6.22	-21.7	+99.9	52.27 -1.3
1018	2.0	6.5	4.69	95	12.50	6.20	-20.4	+99.9	52.52 -1.6
REDUCED FLOW RATE - EXCESSIVE DRAWDOWN									
1023	1.1	7.6	5.12	98	12.51	6.31	-27.9	+99.9	52.70 -1.7
1026	0.7	8.5	5.08	98	12.85	6.39	-29.6	+99.9	53.01 -2.0
1029	1.2	9.7	5.14 ✓	98 ✓	12.66 ✓	6.42 ✓	-30.3 ✓	+99.9	53.29 -2.3
1032	1.0	10.7	5.01 ✓	98 ✓	12.70 ✓	6.47 ✓	-31.1 ✓		53.67 -2.7
	+.4	11.1	STABLE	→	→	→	→		

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1034	1038	~55	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-RRS-MW-05		QC: Dup MS/MSD (None)	Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓"= stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	Radio Relay Station (Underground Storage Tank)	UST-MW02	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Init**
Partly Cloudy, 50°F, 15-20 mph wind	(Monitoring Well) Groundwater Monitoring Probe	4/8/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.23	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
65.87	70.03	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (70.03 † ft – 65.87 ft) • 0.163 gal/ft • 3 = 2.03 gal • 3.785 L/gal = 7.70 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1040	~1050	~66 TO 69 FT	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability Max Vol. | Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1045	1.7	1.7	7.03	251	9.17	5.74	6.2	24.7	~69 (DRY)
1040	0.8	2.5	—	—	—	—	—	—	—
* WELL PURGED DRY. WILL ALLOW FOR RECHARGE PRIOR SAMPLING.									
			THE MS/MSD AND DUPLICATES WILL BE MOVED TO A DIFFERENT WELL. THIS WELL IS A POOR PRODUCING WELL.						
9/10	DTW 66.85 = 66.85								

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1210	1225	~~DTW 66~~ ~69	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-UST-MW-02		QC: ~~Dup~~ ~~MS/MSD~~ None	Duplicate ID: ~~14PH-UST-MW-029~~ DM 9/8

DM 9/10 DM 9/8

Container/Preservative	Analysis Requested	Notes
2 ~~1~~ x 40mL VOA (HCl, stored at 4°C ± 2°C)	GRO by AK101	~~MS/MSD~~
2 ~~1~~ x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	~~MS/MSD~~
2 ~~1~~ x 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO/RRO by AK101/102	MS/MSD
1 ~~2~~ x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	Limited Quantity
1 ~~2~~ x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 ~~2~~ x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sapt 2014 Port Helden GW Sampling	Black Lagoon Outfall	BLO-MW07	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
OVERCAST, 55°F, 10 mph WIND	(Monitoring Well) Groundwater Monitoring Probe	9/9/2014	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.25	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
42.07	47.00	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous[T] total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (47.00[T] ft – 42.07 ft) * 0.163 gal/ft * 3 = 2.41 gal * 3.785 L/gal = 9.12 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1528	1535	~43 → 46 (BELOW SCREEN)		Bailer Peristaltic Pump (Submersible Pump)
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy (Brown) Other: DARK	(None) Moderate Faint Strong	Yes (No)	(Yes) No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability Max Vol. | Purge water was: Treated (Stored) Other | Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1533	1.7	1.7	–	–	–	–	–	–	44.73
	WATER NOT CLEARING UP, NO PARAMETERS TAKEN								
1575	1.4	3.1	WELL PURGED DRY						
	WELL RELEASED FOR ABANDONMENT								
9/10	DTW btoc =		44.22						

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1232	1257	~45.5	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-BLO-MW-07		QC: Dup MS/MSD (None)	Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
2 ~~3~~ x 40mL VOA (HCl, stored at 4°C ± 2°C)	GRO by AK101	Limited Quantity
1 ~~2~~ x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	↓
1 ~~2~~ x 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO/RRO by AK101/102	↓
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
~~1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)~~	EPA 300.0 and SM21 2320B	Insufficient recharge
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	limited quantity

DTW 9/10

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable

____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	Black Lagoon Outfall	BLO-MW05	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
RAIN, 50s, 5-10 mph WIND	(Monitoring Well) Groundwater Monitoring Probe	9/9/14	DOM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.85	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
DTM 32.75 49.37	DTM ~~50.96~~ 57.74	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (~~50.96~~ 57.74 † ft – ~~32.75~~ 49.37 ft) * 0.163 gal/ft * 3 = ~~5.90~~ 4.09 gal * 3.785 L/gal = ~~33.70~~ 15.49 L

DTM 9/3 DTM DTM 9/3

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1912	1919	~52 → 57	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear (Cloudy) (Brown) Other:	(None) Moderate Faint Strong	Yes (No)	(Yes) No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability Max Vol. | Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1915	1.5	1.5	4.54	79	13.48	6.84	-29.2	+99.9	51.07
1918	~~4.2~~ 1.2	2.7	4.93	80	12.51	6.59	-24.1	+99.9	53.12
	(DTM 9/5)								
		*	PURGED DRY (BELOW SCREEN). WILL ALLOW FOR RECHARGE BEFORE SAMPLING						
9/10	DTW	btoc	= 49.35						

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1347	1405	~32	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-BLO-MW-05		QC: Dup MS/MSD (None)	Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	GRO by AK101	limited quantity
~~3x~~ 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	↓
1 ~~2~~ x 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO/RRO by AK101/102	limited quantity
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓"= stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Black Lagoon Outfall	BLO-MW06	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
RAIN, 50s, 5-10 mph wind	(Monitoring Well) Groundwater Monitoring Probe	9/9/14	BM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.44	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
43.05	51.47	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (51.47 † ft – 43.05 ft) * 0.163 gal/ft * 3 = 4.12 gal * 3.785 L/gal = 15.58 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1930	1950	~45 – 49.6	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear (Cloudy) Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability Max Vol. | Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or (Liters))		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1935	1.5	1.5	5.00	93	9.42	6.62	-23.4	+99.9	45.78
★	FLOW RATE DECREASED								
1938	0.7	2.2	4.77	93	9.60	6.58	-21.5	+99.9	46.72
1941	0.5	2.7	5.49	95	8.25	6.53	-21.4	+99.9	47.24
1945	0.7	3.4	4.84	96	8.07	6.64	-27.6	+99.9	47.90
1948	0.7	4.1	4.90	96	6.73	6.55	-24.0	+99.9	48.52
1950	★ WELL PURGED DRY WELL REMAIN FOR RECHARGE BEFORE SAMPLING				— BOTTOM SCREEN				+49.37
9/10	DTW btoc = 43.2								

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1305	1323	~45.10 47	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-BLO-MW-06		QC: Dup MS/MSD (None)	Duplicate ID: N/A (DM 9/15)

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C) 3 combined	GRO by AK101	Limited quantity
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
2 x 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO/RRO by AK101/102	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	Black Lagoon Outfall	BLO-MW01	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
Mostly Sunny, 55°F, 5 mph 10 mph wind	(Monitoring Well) Groundwater Monitoring Probe	9/10	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.35	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
45.57	52.60	NONE DETECTED	NO PRODUCT THIS YEAR

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (52.60 † ft – 45.57 (ft) * 0.163 gal/ft * 3 = 3.44 gal * 3.785 L/gal = 13.0) L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1540	~4	~48	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear Cloudy Brown Other: GREY	None Moderate Faint (Strong) FUEL	(Yes) No	Yes No	YSI Multi Meter Horiba Water Quality Meter

Purging reached: Stability (Max Vol.) Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1545	2.3	2.3	NO STABILIZATION PARAMETERS TAKEN DUE TO SHEEN & STRONG FUEL ODOR. WILL ALLOW FOR MAX PURGE (3 WELL VOLUMES) BEFORE SAMPLING					5 ABOVE	45.92
	(mm?/d)								
1507	11.0?	13.3							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1508	1521	~48	Peristaltic Pump (Submersible Pump)

SAMPLE ID: 14PH-BLO-MW-01 QC: Dup MS/MSD (None) Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	GRO by AK101	Limited quantity
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	↓
2 x 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO/RRO by AK101/102	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

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Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Radio Relay Station (PG1)	PG1-MW01	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
OVERCAST, 52°F, 10-20 mph WIND	(Monitoring Well) Groundwater Monitoring Probe	9/8/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.92	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
58.42	65.40	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (65.40 † ft – 58.42 ft) * 0.163 gal/ft * 3 = 3.41 gal * 3.785 L/gal = 12.92 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1121	1135	~60		Bailer Peristaltic Pump (Submersible Pump)
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
(Clear) Cloudy Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability Max Vol. | Purge water was: Treated (Stored) Other | Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
DTW	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1125	1025	1.7	1.7	5.54	181	13.21	6.49	-38.9	82.9	59.95
1130	1030	1.5	3.2	5.47	179	10.79	6.55	-45.7	>99.9	61.54
~~1133~~	~~1033~~	1.0	4.2	—	—	—	—	—	—	63.20
1135	~~1035~~	*	WELL PURGED DRY		WILL ALLOW FOR RECHARGE				
			BEFORE SAMPLING						
9/10	DTW btoc			58.42					
				100% Recharge					

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1523	1535	~60	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-PG1-MW-01		QC: Dup MS/MSD (None)	Duplicate ID:

DUP	Container/Preservative	Analysis Requested	Notes
2	3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	limited quantity
	1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
	1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
	1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

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Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	Drum Storage Area	DSA-MW05	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
Partly Cloudy, 55°F, 15-20 mph WIND	(Monitoring Well) Groundwater Monitoring Probe	9/8/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.40	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
59.55	88.49	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (88.49 † ft – 59.55 ft) * 0.163 gal/ft * 3 = 14.15 gal * 3.785 L/gal = 53.56 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1211	1240	~ 85		Bailer Peristaltic Pump (Submersible Pump)
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear (Cloudy) Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter
Purging reached: (Stability) Max Vol.	Purge water was: Treated (Stored) Other	Note:		

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1215	2.0	2.0	4.42	136	1.89	6.31	-38.3	+99.9	63.01
1217	1.0	3.0	4.99	138	1.40	6.29	-35.3	+99.9	64.00
* EXCESSIVE DRAWDOWN			REDUCED FLOW RATE.						
1220	0.7	3.7	5.52	140	1.30	6.29 ✓	-35.1 ✓	+99.9	64.41
1223	0.8	4.5	5.66	140	1.17	6.29 ✓	-35.1 ✓	+99.9	64.60
1226	1.0	5.5	6.31	142	1.02	6.38 ✓	-40.1 ✓	+99.9	64.63
1229	1.4	6.9	5.58	141	0.94	6.45	-41.2 ✓	88.7	65.27
1232	1.0	7.9	5.99	143 ✓	0.88 ✓	6.48	-40.1 ✓	67.8	65.81
1235	1.0	8.9	6.28	146 ✓	0.79 ✓	6.55	-45.4 ✓	50.0	65.81
1238	0.8	9.7	6.40	145 ✓	0.78 ✓	6.56 ✓	-45.6 ✓	46.1	65.43 +
+	0.5	10.2		STABLE	STABLE	STABLE	STABLE	↓	

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1240	1246	~ 85	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-DSA-MW-05		QC: Dup MS/MSD (None)	Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all perameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	Drum Storage Area	DSA-MW01	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
Mostly Sunny 56° 10-20 mph NW	(Monitoring Well) Groundwater Monitoring Probe	9/8/14	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	0.94	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
53.52	58.25	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (58.25† ft – 53.52 ft) * 0.163 gal/ft * 3 = 2.31 gal * 3.785 L/gal = 8.75 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1308	1327	55	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other: VERY CLEAR	(None) Moderate Faint Strong	Yes (No)	Yes No	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability (Max Vol.) Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1312	2.3	2.3	5.44	142	14.95	6.91	-37.5	23.9	53.62
1315	1.1	3.4	5.24	141	14.30	6.86	-35.0	22.6	53.63
1318	1.7	5.1	5.45	139	13.42	6.79	-35.1	14.5	53.63
1322	1.5	6.6	5.63	140	13.72	6.85	-37.6	13.0	53.63
1325	1.4	8.0	5.64	141	13.54	6.91	-39.5	9.1	53.63
1327	1.0	9.0	5.68	141	13.67	6.88	-40.1		53.63
		max							

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1328	1333	~55	Peristaltic Pump (Submersible Pump)

SAMPLE ID: 14PH-DSA-MW-01 QC: Dup MS/MSD (None) Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
3 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 23208	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	Drum Storage Area	DSA-MW02	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
OVERCAST, 50s, 10-20 mph WIND	(Monitoring Well) Groundwater Monitoring Probe	9/8/2014	DM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor		(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
63.33	68.34	NO PRODUCT	NA | NA

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (68.34† ft – 63.33 ft) * 0.163 gal/ft * 3 = 2.45 gal * 3.785 L/gal = 9.27 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1352	1485	~65 to 67	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear Cloudy (Brown) Other:	(None) Moderate Faint Strong	Yes (No)	Yes No	~~YSI~~ Multi Meter Horiba Water Quality Meter

Purging reached: (Stability) Max Vol. Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1357	1.5	1.5	6.63	229	10.85	6.45	-35.4	+99.9	64.75
1400	0.8	2.3	6.69	229	10.41	6.44	-36.3	+99.9	64.81
1403	1.0	3.3	6.78	230	9.91	6.47	-38.4	+99.9	65.02
1406	0.8	4.1	6.99	233	9.58	6.49	-40.2	+99.9	65.10
1410	1.0	5.1	7.50	237	9.24	6.52	-44.6	+99.9	65.17
1413	0.5	5.6	7.59	237	8.91	6.57	-48.9	+99.9	65.23
	+0.2	5.8		STABLE	STABLE	STABLE	STABLE		
NOTE: DTW @ END OF SAMPLING = 65.82									

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1415	1527	~67	Peristaltic Pump (Submersible Pump)
SAMPLE ID: 14PH-DSA-MW-02		QC: (Dup) (MS/MSD) None	Duplicate ID: 14PH-DSA-MW-029

Container/Preservative	Analysis Requested	Notes
12 ~~3~~ x 40mL VOA (HCl, stored at 4°C ± 2°C)	GRO by AK101	MS/MSD
12 ~~3~~ x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	MS/MSD
8 ~~2~~ x 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO/RRO by AK101/102	MS/MSD
2 1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
2 1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
2 1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"____" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Drum Storage Area	DSA-MW04	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
LIGHT RAIN, 52°F, 10 MPH WIND	(Monitoring Well) Groundwater Monitoring Probe	9/9	

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	2.45	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
67.53	99.87	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (99.87 †ft – 67.53ft) • 0.163 gal/ft • 3 = 15.81 gal • 3.785 L/gal = 59.86 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
~~1435~~ 1540	~~1502~~ 1502	~69	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: (Stability) Max Vol. Purge water was: Treated (Stored) Other Note:

Time (HH:mm) (MM/D)	Volume (Gallons or (Liters)) Change	Volume (Gallons or (Liters)) Total	Acceptable Range to Demonstrate Stability: ± 0.2 °C Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.2 mg/L (whichever is greater) DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	<10 NTU and ±1 NTU Turbidity (NTU)	Drawdown < 0.3 ft Water Level (feet btoc)
~~1540~~ 1540	2.3	2.3	5.20	148	1.45	6.24	-29.9	96.3	67.70
~~1543~~ 1543	2.0	4.3	5.11	148	1.21	6.20	-27.0	+99.9	67.70
~~1546~~ 1546	2.4	6.7	5.09	156	1.01	6.26	-26.3	+99.9	67.70
~~1550~~ 1550	2.8	9.5	5.04	169	0.62	6.25	-29.8	+99.9	67.73
~~1553~~ 1553	2.4	11.9	4.93	175	0.38	6.26	-20.8	99.8	67.79
~~1556~~ 1556	2.7	14.6	4.73	180	0.32	6.27	-23.4	87.6	67.80
			x	x	x	✓	✓		
~~1559~~ 1559	2.5	17.1	4.62	184	0.28 ✓	6.29 ✓	-26.1 ✓	67.9	67.80
~~1602~~ 1602	2.6	19.7	4.57 ✓	185 ✓	0.15 ✓	6.35 ✓	-28.2 ✓	50.8	67.80
+	1.2	20.9		STABLE					

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1605	1630	69FT AND 95FT	Peristaltic Pump (Submersible Pump)

SAMPLE ID: 14PH-DSA-MW-04 QC: Dup MS/MSD (None) Duplicate ID: —

Container/Preservative	Analysis Requested	Notes
2 x 40mL VOA (HCl, stored at 4°C ± 2°C)	GRO by AK101	COLLECTED FROM A DEPTH OF 69FT
2 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	Collected @ 95 FT
2 x 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO/RRO by AK101/102/103	COLLECTED AT A DEPTH OF 69FT
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	Collected @95F
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	"
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	"

"—" = not measured "✓"= stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on b

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Helden GW Sampling	Grey Lagoon Outfall	GLO-MW03	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
OVERCAST, 52°F, 10 mph WIND	(Monitoring Well) Groundwater Monitoring Probe	9/9/2014	DM

DM 9/9

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) (Fair) Poor	2.50	(PVC) SS	1 / 0.041 1.5 / 0.092 (2 / 0.163) 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
59.56	64.60	NO PRODUCT	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] * gallons per linear foot of casing * 3

SHOW WORK Max Purge Volume = (64.60† ft – 59.56 ft) • 0.163 gal/ft • 3 = 2.47 gal • 3.785 L/gal = 9.33 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
1358		~64.5	Bailer Peristaltic Pump (Submersible Pump)

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
(Clear) Cloudy Brown Other:	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: Stability (Max Vol) Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1402	1.5	1.5	5.08	121	15.27	6.34	-39.3	+99.9	59.78
1405	1.3	2.8	4.91	119	13.38	6.31	-32.3	+99.9	59.79
1408	1.7	5.5	4.99	117	12.86	6.33	-31.2	+99.9	59.81
1411	1.9	7.4	5.06	118	12.78	6.38	-34.2	+99.9	59.81
	* HIGH TURBIDITY. WILL ALLOW FOR MAX PURGE (3 WELL VOL) BEFORE SAMPLING								
1415	2.0	9.4	5.26	119	12.24	6.46	-37.8	48.0	59.81

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1417	1422	~61.5	Peristaltic Pump (Submersible Pump)

SAMPLE ID: **14PH-GLO-MW-03** QC: Dup MS/MSD (None) **Duplicate ID:** —

Container/Preservative	Analysis Requested	Notes
2-6 x 40mL VOA (HCl, stored at 4°C ± 2°C)	VOCs by SW8260	limited quantity
1 x 250 mL Poly (HNO_3 stored at 4°C ± 2°C)	EPA 200.8	
1 x 250 mL Poly (unpreserved stored at 4°C ± 2°C)	EPA 300.0 and SM21 2320B	
1 x 250 mL Poly (H_2SO_4 stored 4°C ± 2°C)	EPA 353.2	

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

Groundwater Sampling Data Sheet

JACOBS

Site Name	Site ID	Well ID	Project Number
Sept 2014 Port Heiden GW Sampling	FPC-215	215-MW10	05F45601
Weather Conditions	**Type of Well**	**Date**	**Sampler Initials**
Overcasts, Mid 50s, Windy	(Monitoring Well) Groundwater Monitoring Probe	9/20/14	GR/MH/LD

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
(Good) Fair Poor	4.42	(PVC) SS	1 / 0.041 (1.5 / 0.092) 2 / 0.163 4 / 0.653
Depth to GW (ft btoc)	**Total Depth of Casing (ft btoc)**	**Depth to Product (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
13.62	23.32	N/A	N/A

Max purge volume (3 well casing volumes) = [previous† total depth of casing (ft) – depth to water (ft)] • gallons per linear foot of casing • 3

SHOW WORK Max Purge Volume = (23.32† ft – 13.62 ft) • 0.092 gal/ft • 3 = 2.68 gal • 3.785 L/gal = 10.13 L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
17:42	1829	16.5	Bailer (Peristaltic Pump) Submersible Pump

Color	Odor	Sheen	Purged Dry	Meter Used During Purging
Clear Cloudy Brown Other: clear	(None) Moderate Faint Strong	Yes (No)	Yes (No)	(YSI Multi Meter) Horiba Water Quality Meter

Purging reached: (Stability) Max Vol. Purge water was: Treated (Stored) Other Note:

Time (HH:mm)	Volume (Gallons or Liters)		Acceptable Range to Demonstrate Stability						
			± 0.2 °C	± 3%	± 10% or 0.2 mg/L (whichever is greater)	± 0.1	± 10 mV	<10 NTU and ±1 NTU	Drawdown < 0.3 ft
	Change	Total	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	Water Level (feet btoc)
1748	0.5g	0.5g	6.82	114	119.7%	6.86	-3.0	97.7	13.68
1757	0.5g	1.0g	5.69	104	100.4%	6.99	-34.2	83.6	13.72
1807	0.5g	1.5g	5.89	106	~~10.8~~ 12.37	6.80	-34.6	92.1	13.72
1814	0.25g	1.75g	5.88	108	12.29	6.78	-36.8	72.4	13.72
1820	0.25g	2.0g	5.96	110	12.44	6.83	-38.3	60.7	13.72
1829	0.25g	2.25g	6.07	111	12.35	6.78	-25.0	45.4	13.72
			Stable	Stable	Stable	Stable			13.72

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1838	1850 9/20/14	16.5	(Peristaltic Pump) Submersible Pump
SAMPLE ID: 14PH-215-MW-10		QC: Dup (MS/MSD) None	Duplicate ID:

Container/Preservative	Analysis Requested	Notes
4 X 1-L Ambers (HCl, stored at 4°C ± 2°C)	DRO by AK102	MS/MSD
MH 9/20/14		

"—" = not measured "✓" = stable "+" = rising "-" = falling "*" = all parameters stable ____ Additional observations on back

APPENDIX D

Port Heiden Key Personnel and Qualifications

TO06 Port Heiden Site Inspection Key Personnel Responsibilities and Qualifications

The following table identifies project personnel associated with each organization, contractor, and subcontractor participating in responsible roles, including data users, decision-makers, project managers, quality assurance officers, project contacts for organizations involved in the project, project health and safety officers, geotechnical engineers and hydrogeologists, field operation personnel, analytical services, and data reviewers. Resumes for key personnel are located at the Jacobs Anchorage office.

Name	Organizational Affiliation	Title	Responsibilities	Education and Experience Qualifications
Kelly McGovern	Jacobs	Jacobs Project Manager	Coordinating day-to-day project activities, contract issues, and providing support.	2007 MBA 1986 B.S. Biological Sciences, 15 years of Project Manager experience, and 20 years of environmental experience Resume located in project files
Kelly McGovern	Jacobs	HSE Manager	Managing overall project safety and coordinating amendments and addendums to the SSHP.	2007 MBA 1986 B.S. Biological Sciences, 15 years of Project Manager experience, and 20 years of environmental experience Resume located in project files
Greg Rutkowski	Jacobs	Project Manager	Coordinating day-to-day project activities, contract issues, and providing support.	B.S. Environmental Science 10 years of Experience Resume provided to ADEC for review.
Andrew McClure	Jacobs	Technical Lead	Coordinating day-to-day safety activities and inspections and ensuring adherence to the SSHP, QC, and quality assurance.	B.S. Natural Science (Biology and Geology) 3 years of Experience Resume provided to ADEC for review
David Summerville	Jacobs	Chemist	Coordinating with the laboratory, reviewing data, and ensuring that data quality objectives are met. Managing field laboratory operations.	M.S. Chemistry 8 years of experience Resume provided to ADEC for review.
Keith Barnack	AFCEC	Project Manager	Provide external oversight	On file with agency

TO06 Port Heiden Site Inspection Key Personnel Responsibilities and Qualifications (Continued)

Name	Organizational Affiliation	Title	Responsibilities	Education and Experience Qualifications
Meseret Ghebresllassie	USACE	Project Manager	Overall contract oversight	On file with agency
Louis Howard	ADEC	Regulatory Manager	Regulatory oversight	On file with agency
Brian Englund	ADEC	Regulatory Chemist	Regulatory oversight	On file with agency
Caitlin Jelle Penny Bullock Larry Amskold Andrew McClure Michal Pelka	Jacobs	ADEC Qualified People On-site	Supervise or perform onsite remediation tasks.	All persons meet ADEC Qualified Person criteria under 18 AAC 75.900 (100).
Michal Pelka Julia Billings (formerly Cohen) Andrew McClure Penny Bullock	Jacobs	ADEC Qualified People On-site Field Season 2014	Supervise or perform onsite remediation tasks.	All persons meet ADEC Qualified Person criteria under 18 AAC 75.900 (100).

APPENDIX E

Response to Comments

Alaska Department of Environmental Conservation
Comments on the Draft Groundwater Monitoring Report Port Heiden, Alaska dated January 2015
Commenter: Louis Howard (ADEC), Comments Received: 30 January 2015
Responses Drafted By: Jacobs Engineering, 11 February 2015
Responses Submitted: 27 April 2015

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
1.	7-1	7.1	**FPC-066 Site** ADEC concurs with the recommendation that one more sampling event for DRO in 2015 is needed prior to recommending site for closure.	Agreed.
2.	7-1	7.2	**FPC-215 Site** ADEC disagrees with the recommendation that the monitoring frequency be reduced from annually to biennial for all FPC-215 wells. Monitoring well 215-MW-09 is increasing in contamination and prior to any remediation, ADEC will require downgradient wells to delineate the full nature and extent[1] of DRO contamination. ADEC recommends the Air Force install at least two wells downgradient[2] of the 215-MW-09 (e.g. 75' and 150'). The other two existing wells are crossgradient of the groundwater flow at the site (Figure 4-2) and do not give the data necessary to show what the full extent of groundwater contamination at the site. Without such data, ADEC is unable to determine where the ultimate point of compliance in groundwater should be for FPC-215. In groundwater, the point of compliance where groundwater cleanup levels must be attained is throughout the site from each point	Agreed. The installation of two monitoring wells is recommended to screen for down gradient contamination. A Figure depicting the proposed well locations has been added as Figure 7-1, and immediately follows Section 7.0, Conclusions and Recommendations. All FPC-215 wells will remain on an annual sampling schedule and further remediation at this site will not be recommended until sampling results for the additional wells have been reviewed. Note: DRO is the only remaining COC at FPC-215. A peristaltic pump will continue to be used to collect samples. The two recommended monitoring wells will be installed and developed in accordance with *Monitoring Well Guidance* (ADEC 2013).

[1] 18 AAC 75.335. Site characterization. (a) Before proceeding with site cleanup under the site cleanup rules, a responsible person shall characterize the extent of hazardous substance contamination at the site.
[2] UST Procedure manual (2002): "Unless otherwise directed by ADEC, if groundwater monitoring wells are required, the installation must be as required by 18 AAC 78.615(b), and the following procedures must be used: (1) if the direction of groundwater flow is known, at least three monitoring wells must be installed and sampled, one upgradient and two downgradient of the potential contamination source."

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Responses Drafted By: Jacobs Engineering, 11 February 2015
Responses Submitted: 27 April 2015

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			extending vertically from the uppermost level of the saturated zone to the lowest possible depth that could potentially be affected by the discharge or release of a hazardous substance, unless ADEC approves an alternative point of compliance as part of the cleanup action under 18 AAC 75.360 [18 AAC 75.345(e)].	
3.	7-2	7.3	**Former Radio Relay Station** ADEC disagrees with the recommendation to decrease monitoring of groundwater from every year to every five years. ADEC will allow for monitoring of groundwater to decrease from annually to every five years at the former RRS after two annual groundwater monitoring events for 1,4-Dioxane are conducted and results are below Table C cleanup levels for 1,4-Dioxane (0.077 mg/L) in addition to the other contaminants of concern. The following EPA methods are recommended by ADEC to analyze for 1,4-Dioxane and have a low enough limit of detection to meet 77 µg/L cleanup level: EPA 522 (Approved for DW, can be used for groundwater) EPA SW 846 Method 8270 Modified EPA SW 846 Method 8270 EPA Method 625 (Validated for waste water) EPA SW 846 Method 8270SIM EPA SW 846 Method 8260SIM Unless there is data to the contrary, it appears that the ALS Laboratory did not run the full analysis of VOCs to	Agreed. Samples will be collected for 1,4-dioxane, in addition to the previous contaminants of concern (COC), on an annual basis from the following RRS wells that currently or historically exceeded cleanup levels for TCE: • BLO-MW-01 • DSA-MW-01 • DSA-MW-02 • DSA-MW-04 • DSA-MW-05 (historically) • DSA-MW-07 (historically) • PG1-MW01 This frequency will remain in effect until it has been proven for two consecutive sampling events that 1,4-dioxane is below the cleanup level. ALS Laboratories uses EPA SW-846 Method 8270D SIM for the analysis of 1,4-dioxane. All other wells at the RRS exhibited concentrations of COCs below cleanup levels during all prior sampling events. Groundwater monitoring for the following wells

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Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			include 1,4-Dioxane and ADEC cannot tell whether or not the limit of detection or limit of quantitation for ALS analysis of VOCs by EPA Method 8260 met the cleanup level criteria for 1, 4-Dioxane.	will be changed from annually to every five years to coincide with the CERCLA 5-year review: • 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