UNITED STATES AIR FORCE
JOINT BASE ELMENDORF-RICHARDSON
ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

QUARTERLY GROUNDWATER ASSESSMENT MONITORING TECHNICAL MEMORANDUM

Groundwater and Landfill Gas Monitoring
JBER-Richardson Landfill
JBER, Alaska

REVISION 0

MAY 2013

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QUARTERLY GROUNDWATER ASSESSMENT MONITORING TECHNICAL MEMORANDUM

Groundwater and Landfill Gas Monitoring JBER-Richardson Landfill

JOINT BASE ELMENDORF-RICHARDSON, ALASKA

Prepared for:
673rd Civil Engineer Squadron, Asset Management Flight,
Natural Resources Element, Restoration Section

Prepared by:
Bristol Environmental Remediation Services, LLC

Under Contract to US Army Corps of Engineers
Contract No. W911KB-09-P-0036, Amendment P00007

MAY 2013

TECHNICAL MEMORANDUM

DATE: May 3, 2013

TO: 673rd CES/CEANR Environmental Restoration Section

FROM: Tyler Ellingboe, Project Manager
Bristol Environmental Remediation Services, LLC

RE: Second Quarterly Groundwater Assessment Monitoring
Technical Memorandum, JBER-Richardson Landfill, JBER, Alaska
Contract No. W911KB-09-P-0036, Amendment P00007

Bristol Environmental Remediation Services, LLC (Bristol), has prepared this Technical Memorandum (Tech Memo) at the request of the US Army Corps of Engineers (USACE), Alaska District. The Tech Memo provides a summary of results for the March 2013 quarterly groundwater assessment monitoring event conducted at the JBER-Fort Richardson Landfill, located in Anchorage, Alaska. The March 2013 assessment monitoring event was the second quarterly assessment monitoring event performed under Contract No. W911KB-09-P-0036.

SITE BACKGROUND

The JBER-Fort Richardson Landfill is located approximately 0.75 mile north of the Army cantonment area and immediately north of Circle Road (Figure 1). The operational landfill was an unlined trench and fill operation; therefore covered approximately 400 acres. The initial date of the landfill operations is unknown; however, the portion of the landfill that was first utilized was closed before 1966.

During its operation, construction rubble, grease, paint, and solvent waste were accepted at the landfill. In addition, the landfill contained a fire-training pit and a human waste disposal trench. Although most disposal activities had ceased by 1987, when solid waste from Fort Richardson was generally routed to the Anchorage Regional Landfill instead, some sanitary waste and mess-hall grease continued to be accepted at this location. All areas were closed and capped by 1997.

Detection monitoring has been ongoing since 1985, and has included groundwater monitoring, landfill gas monitoring, and visual monitoring. A review of the 2011 annual groundwater detection monitoring events indicated that diesel range organics (DRO), barium, calcium, chloride, chromium, magnesium, manganese, potassium, and sulfate in wells AP-3010, AP-3220, AP-3221, and AP-3222 (Bristol, 2012a) significantly exceed the concentration of these constituents in the currently designated background well, AP-3591. This determination triggered a requirement to initiate assessment monitoring in accordance with Title 18 Alaska Administrative Code, Chapter 60 (18 AAC 60) and Title 40 Code of Federal Regulations, Part 258.55 (40 CFR 258.55).

In 2012, two new groundwater monitoring wells were installed, one downgradient compliance well (AP-5783) and one upgradient background well (AP-5782). In 2012, annual detection monitoring of 11 wells coincided with the first quarterly assessment monitoring event (Bristol, 2013a). The groundwater monitoring well locations and groundwater elevation contours that were measured during the 2012 annual detection and first quarterly groundwater sampling events are shown on Figure 2.

SUMMARY OF MARCH 2013 FIELD ACTIVITIES

The following field activities were conducted between March 4 and March 7 2013:

- Collected six groundwater analytical samples using low-flow purging and sampling procedures
- Collected quality assurance/quality control (QA/QC) analytical samples, including a matrix spike/matrix spike duplicate (MS/MSD), a field duplicate, a trip blank and an equipment rinsate blank
- Disposed of all investigation-derived waste generated during groundwater sampling

Attachments to this Tech Memo include the following:

- Figures – Figure 1 Site Location Map
- Figure 2 Monitoring Well Location Map
- Tables – Table 1 Water Quality Parameter Summary
- Table 2 – Groundwater Analytical Results

- Appendix A – Field Forms
- Appendix B – Quality Assurance Summary and ADEC Laboratory Data Review Checklist

GROUNDWATER SAMPLING

Groundwater samples were collected from six monitoring wells [AP-3010, AP-3220, AP-3221, AP-3222, AP-5782, and AP-5783] from March 4 through 6, 2013. Groundwater samples were collected in accordance with the Fort Richardson Landfill Long-Term Monitoring Plan (CH2M Hill, 2009), the updated 2013 Monitoring Plan (Bristol, 2013b), and the Accident Prevention Plan (Bristol, 2012b).

The wells were purged and sampled with a submersible Grundfos pump using low-flow procedures. Wells AP-3010 and AP-3220 were sampled with a bailer. Well AP-3010 had a water column of less than 5 feet at a depth of 229 feet, which made the use of a submersible pump unfeasible because of pump overheating. Well AP-3220 is a slow recharge well; it was purged February 15 and allowed to recharge for two weeks. It had not fully recharged at the time of sampling. QA/QC samples, including one field duplicate, one equipment blank, and an MS/MSD set were collected.

Field notes and copies of the Groundwater Low-Flow Purging Forms completed for each well sampled are included in Appendix A. Table 1 includes a summary of groundwater parameters that were measured and recorded prior to sample collection. Groundwater samples, including a trip blank, were shipped via Alaska Airlines Goldstreak and received by Columbia Analytical Services, Inc., in Kelso, Washington, on March 8. The primary samples and QA/QC samples (field duplicate, MS, MSD, and equipment rinsate) were analyzed for the full list of constituents in 40 CFR 258, Appendix II (List of Hazardous Inorganic and Organic Constituents) in accordance with 18 AAC 60.850 ADEC Solid Waste Program.

Bristol verified the analytical data and completed a QA Summary (Appendix B). Appendix B also contains the complete laboratory data files and the completed ADEC Laboratory Data

Checklist. Analytical results from the sampling event have been qualified and are summarized in Table 2 in the Tables section of this report. A summary of groundwater results is presented below.

SUMMARY OF ANALYTICAL RESULTS

The results of the assessment monitoring program are presented in Table 2, along with the maximum contaminant levels (MCLs) found in the Safe Drinking Water Act (40 CFR Part 141) and the groundwater cleanup levels listed in 18 AAC75.345, Table C. It should be noted that federal MCLs only exist for 50 of the 215 substances that must be tested under assessment monitoring. Where the background concentrations are greater than the MCL for any constituent, the background concentration is used as the standard. None of the analytes were found to be present in concentrations exceeding MCLs. This is consistent with results from the first quarter of assessment monitoring with one exception: in the previous quarterly assessment monitoring event lead, and arsenic were present in concentrations exceeding MCLs at monitoring Well AP-3220.

REFERENCES

CH2M Hill. 2009. *Fort Richardson Landfill Long-Term Monitoring Plan.* Prepared for U.S. Army, Alaska, Directorate of Public Works Under Contract to U.S. Army Corps of Engineers, Contract No. W912EF07D0003. Task Order ZJ03. October.

Bristol Environmental Remediation Services, LLC (Bristol). 2012a. *United States Air Force, Joint Base Elmendorf-Richardson, Alaska, Environmental Compliance Program, Fall 2011 Annual Monitoring Report, JBER-Richardson Landfill, JBER, Alaska*. Prepared for 673rd Civil Engineer Squadron, Asset Management Flight, Natural Resources Element, Restoration Section Under Contract to U.S. Army Corps of Engineers. Contract No. W911KB-09-P-0036, Modification P00003. Final, *Revision 2*. November.

Bristol. 2012b. *United States Air Force, Joint Base Elmendorf-Richardson, Alaska, Environmental Restoration Program, Accident Prevention Plan, Groundwater and Landfill Gas Monitoring, JBER-Richardson Landfill, JBER, Alaska.* Prepared for 673rd Civil Engineer Squadron, Asset Management Flight, Natural Resources Element, Restoration Section Under Contract to U.S. Army Corps of Engineers, Contract No. W911KB-09-P-0036, Modification P00005. Draft, Revision 0. September.

Bristol. 2013a. *United States Air Force, Joint Base Elmendorf-Richardson, Alaska, Environmental Compliance Program, Fall 2012 Annual Monitoring Report, JBER-Richardson Landfill, JBER, Alaska*. Prepared for 673rd Civil Engineer Squadron, Asset Management Flight, Natural Resources Element, Restoration Section Under Contract to U.S. Army Corps of Engineers. Contract No. W911KB-09-P-0036, Modification P00005. *Revision 0*. February.

Bristol. 2013b. *United States Air Force, Joint Base Elmendorf-Richardson, Alaska, Environmental Compliance Program, Monitoring Plan, JBER-Richardson Landfill, JBER, Alaska*. Prepared for 673rd Civil Engineer Squadron, Asset Management Flight, Natural Resources Element, Restoration Section Under Contract to U.S. Army Corps of Engineers. Contract No. W911KB-09-P-0036, Modification P00005. *Revision 1*. January.

TABLES

Table 1 Quarter 2 Water Quality Parameter Results

Monitoring Well	pH[a]	Specific Conductance (mS/cm)[a]	Turbidity (NTU)[a]	DO (mg/L)[a]	ORP (mV)[a]
AP-3010	6.01[b]	0.527[b]	27.5[b]	10.52[b]	170.4[b]
AP-3220	7.29[b]	0.460[b]	17.6[b]	7.56[b]	112.8[b]
AP-3221	7.08	0.937	0.62	1.57	83.6
AP-3222	7.27	0.421	0.43	9.42	65.4
AP-5782	7.54	0.339	3.84	2.53	47.2
AP-5783	7.43	0.472	4.39	11.70	120.4

Notes:

[a]The pH, conductivity, turbidity, DO, and ORP were collected in the field using a YSI multiprobe.

[b]The low recharge in AP-3220 and pump operational limitations at AP-3010 required sampling by bailer; stable and reliable readings were not obtained.

-- = parameter not available

DO = dissolved oxygen

mg/L = milligrams per liter

mS/cm = millisiemens per centimeter

mV = millivolt

NTU = nephelometric turbidity unit

ORP = oxidation-reduction potential

Table 2 Groundwater Analytical Results

Analytical Method	Analyte	Units	Sample ID	13FRLFWA01	13FRLFWA02	13FRLFWA03	13FRLFWA04	13FRLFWA05[D]	13FRLFWA06	13FRLFWA07	13FRLFWA08
			Laboratory ID	K1302037-001	K1302037-002	K1302037-003	K1302037-004	K1302037-005	K1302037-006	K1302037-007	K1302037-008
			Well ID	AP 5782	AP 3220	AP 5783	AP 3221	AP 3221	AP 3010	AP 3222	Rinsate
			Date Sampled	3/4/2013	3/4/2013	3/5/2013	3/5/2013	3/5/2013	3/6/2013	3/6/2013	3/7/2013
			Maximum Contaminant Level[2]								
335.4	Cyanide, Total	mg/L	0.2	ND [0.009] ML	ND [0.009]	ND [0.009]	0.005 J	ND [0.009]	ND [0.009]	ND [0.009]	ND [0.009]
504.1	1,2,3-Trichloropropane	µg/L	0.05	ND [0.071]	ND [0.071]	ND [0.071]	ND [0.071]	ND [0.071]	ND [0.071]	ND [0.071]	ND [0.071]
504.1	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	0.2	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]
504.1	1,2-Dibromoethane (EDB)	µg/L	0.12	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]	ND [0.0040]
6020A	Antimony, Total	µg/L	6	0.094	0.222	0.107	0.071	0.07	0.2	0.085	ND [0.025]
6020A	Arsenic, Total	µg/L	10	0.484 J	5.84	0.652	0.318 J	0.291 J	1.31	0.763	ND [0.125]
6020A	Barium, Total	µg/L	2,000	6.73	56.4	11.5	62.1	62.1	24.9	8.3	0.115
6020A	Beryllium, Total	µg/L	4	ND [0.01]	0.02	ND [0.01]	ND [0.01]	ND [0.01]	0.058	ND [0.01]	ND [0.01]
6020A	Cadmium, Total	µg/L	5	0.017 J B	0.056	0.016 J B	0.037 B	0.039 B	0.078	ND [0.01]	0.006 J
6020A	Chromium, Total	µg/L	100	3.21 B	0.78	9.68	2.09 B	1.54 B	8.34	2.06 B	0.88
6020A	Cobalt, Total	µg/L	NS	0.147 B	0.239	0.464	0.151 B	0.131 B	4.26	0.038 B	0.017 J
6020A	Copper, Total	µg/L	1,000	1.23 B	1.6	1.87 B	0.74 B	0.81 B	10.5	0.35 B	1.07
6020A	Lead, Total	µg/L	15	0.061 B	0.412	0.135	0.014 J B	0.012 J B	3.72	0.016 J B	0.007 J
6020A	Nickel, Total	µg/L	100	1.46 B	1.44	6.38 B	2.19 B	2 B	11.2	0.99 B	0.71
6020A	Selenium, Total	µg/L	50	ND [0.5]	ND [0.5]	0.5 J	ND [0.5]	ND [0.5]	0.7 J	ND [0.5]	ND [0.5]
6020A	Silver, Total	µg/L	100	ND [0.01]	ND [0.01]	0.005 J	0.006 J	0.005 J	0.095	ND [0.01]	0.009 J
6020A	Thallium, Total	µg/L	2	ND [0.005]	0.011 J	ND [0.005]	ND [0.005]	ND [0.005]	0.010 J	ND [0.005]	ND [0.005]
6020A	Tin, Total	µg/L	NS	0.052 J	0.123	0.036 J	0.022 J	0.019 J	0.079 J	ND [0.025]	ND [0.025]
6020A	Vanadium, Total	µg/L	260	0.87 B	1.43	0.89 B	0.65 B	0.63 B	8.67	0.72 B	0.10 J
6020A	Zinc, Total	µg/L	5,000	1.48 B	4.56	1.87 B	1.45 B	1.42 B	16.5	0.6 B	1.95 B
7470A	Mercury, Total	µg/L	2	ND [0.05]	ND [0.05]	ND [0.05]	ND [0.05]	ND [0.05]	0.03 J	ND [0.05]	ND [0.05]
8081B	4,4'-DDD	ng/L	3,500	ND [0.50]	ND [0.52]	ND [0.51]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8081B	4,4'-DDE	ng/L	2,500	ND [0.40]	ND [0.41]	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8081B	4,4'-DDT	ng/L	2,500	ND [0.50]	ND [0.52]	ND [0.51]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8081B	Aldrin	ng/L	50	ND [0.40]	1.1 J	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8081B	alpha-BHC	ng/L	140	ND [0.40]	ND [0.41]	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8081B	beta-BHC	ng/L	470	ND [1.0]	ND [1.1]	ND [1.1]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8081B	Chlordane	ng/L	2,000	ND [10]	ND [12]	ND [11]	ND [10]	ND [10]	ND [10]	ND [10]	ND [16]
8081B	delta-BHC	ng/L	NS	ND [0.40]	ND [0.80]	ND [0.41]	ND [0.86]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8081B	Dieldrin	ng/L	53	ND [0.50]	ND [0.52]	ND [0.51]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8081B	Endosulfan I[4]	ng/L	NS	ND [0.40]	ND [0.71]	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8081B	Endosulfan II[4]	ng/L	NS	ND [0.40]	ND [0.97]	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.83]	ND [0.40]	ND [0.40]
	Endosulfan	ng/L	220	ND [0.80]	ND [1.68]	ND [0.82]	ND [0.80]	ND [0.80]	ND [0.80]	ND [0.80]	ND [0.80]
8081B	Endosulfan Sulfate	ng/L	NS	ND [1.0]	ND [1.1]	ND [1.1]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8081B	Endrin	ng/L	2,000	ND [0.40]	ND [0.41]	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8081B	Endrin Aldehyde	ng/L	NS	ND [0.50]	ND [0.52]	ND [0.64]	ND [0.50]	ND [0.50]	ND [0.65]	ND [0.50]	ND [0.61]
8081B	gamma-BHC (Lindane)	ng/L	200	ND [0.50]	ND [0.52]	ND [0.51]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8081B	Heptachlor	ng/L	400	ND [0.40]	ND [0.67]	ND [0.41]	ND [0.40]	ND [1.4]	ND [0.40]	ND [0.40]	ND [0.54]
8081B	Heptachlor Epoxide	ng/L	200	ND [1.0]	3	ND [1.1]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8081B	Hexachlorobenzene	ng/L	1,000	ND [0.40]	ND [0.41]	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]

Table 2 Groundwater Analytical Results

Analytical Method	Analyte	Units	Sample ID	13FRLFWA01	13FRLFWA02	13FRLFWA03	13FRLFWA04	13FRLFWA05[D]	13FRLFWA06	13FRLFWA07	13FRLFWA08
			Laboratory ID	K1302037-001	K1302037-002	K1302037-003	K1302037-004	K1302037-005	K1302037-006	K1302037-007	K1302037-008
			Well ID	AP 5782	AP 3220	AP 5783	AP 3221	AP 3221	AP 3010	AP 3222	Rinsate
			Date Sampled	3/4/2013	3/4/2013	3/5/2013	3/5/2013	3/5/2013	3/6/2013	3/6/2013	3/7/2013
			Maximum Contaminant Level[2]								
8081B	Hexachlorobutadiene	ng/L	7,300	ND [0.25]	ND [0.26]	ND [0.26]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]
8081B	Isodrin	ng/L	NS	ND [0.40]	ND [0.41]	ND [0.41]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8081B	Methoxychlor	ng/L	40,000	ND [0.50]	ND [7.2]	ND [0.51]	ND [0.76]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8081B	Toxaphene	ng/L	3,000	ND [25]	ND [130]	ND [74]	ND [25]	ND [25]	ND [30]	ND [25]	ND [25]
8082A	Aroclor 1016	µg/L	NS[5]	ND [0.0050]	ND [0.027]	ND [0.0051]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
8082A	Aroclor 1221	µg/L	NS[5]	ND [0.0050]	ND [0.0052]	ND [0.0051]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
8082A	Aroclor 1232	µg/L	NS[5]	ND [0.0050]	ND [0.048]	ND [0.0051]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
8082A	Aroclor 1242	µg/L	NS[5]	ND [0.0050]	ND [0.033]	ND [0.0051]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
8082A	Aroclor 1248	µg/L	NS[5]	ND [0.0050]	ND [0.0085]	ND [0.0051]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
8082A	Aroclor 1254	µg/L	NS[5]	ND [0.0050]	ND [0.0052]	ND [0.0051]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
8082A	Aroclor 1260	µg/L	NS[5]	ND [0.0050]	ND [0.0061]	ND [0.0051]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]	ND [0.0050]
	PCBs	µg/L	0.5	ND [0.035]	ND [0.133]	ND [0.035]	ND [0.035]	ND [0.035]	ND [0.035]	ND [0.035]	ND [0.035]
8151A	2,4,5-T	µg/L	NS	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.11]	ND [0.10]
8151A	2,4,5-TP (Silvex)	µg/L	50	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.11]	ND [0.10]
8151A	2,4-D	µg/L	70	ND [0.10]	ND [0.41]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.11]	ND [0.10]
8151A	2,4-DB	µg/L	NS	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.21]	ND [0.21]	ND [0.20]
8151A	Dalapon	µg/L	NS	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.21]	ND [0.21]	ND [0.20]
8151A	Dicamba	µg/L	NS	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.11]	ND [0.10]
8151A	Dichlorprop	µg/L	NS	ND [0.10]	0.068 J	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.11]	ND [0.10]
8151A	Dinoseb	µg/L	7 [6]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.063]	ND [0.060]
8151A	MCPA	µg/L	NS	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [21]	ND [21]	ND [20]
8151A	MCPP	µg/L	NS	ND [20]	ND [20]	ND [20]	ND [20]	ND [20]	ND [21]	ND [21]	ND [20]
8260C	1,1,1,2-Tetrachloroethane	µg/L	NS	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,1,1-Trichloroethane (TCA)	µg/L	200	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,1,2,2-Tetrachloroethane	µg/L	4.3	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,1,2-Trichloroethane	µg/L	5	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8260C	1,1-Dichloroethane (1,1-DCA)	µg/L	7,300	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,1-Dichloroethene (1,1-DCE)	µg/L	7	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,1-Dichloropropene	µg/L	NS	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,2,4-Trichlorobenzene	µg/L	70	ND [0.30]	0.14 J	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]
8260C	1,2-Dichlorobenzene	µg/L	600	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,2-Dichloroethane (EDC)	µg/L	5	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]
8260C	1,2-Dichloropropane	µg/L	5	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,3,5-Trimethylbenzene	µg/L	1,800	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,3-Dichlorobenzene	µg/L	3,300	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	1,3-Dichloropropane	µg/L	NS	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]
8260C	1,4-Dichlorobenzene	µg/L	75	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	2,2-Dichloropropane	µg/L	NS	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	2-Butanone (MEK)	µg/L	22,000	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]

Table 2 Groundwater Analytical Results

Analytical Method	Analyte	Units	Sample ID	13FRLFWA01	13FRLFWA02	13FRLFWA03	13FRLFWA04	13FRLFWA05[D]	13FRLFWA06	13FRLFWA07	13FRLFWA08
			Laboratory ID	K1302037-001	K1302037-002	K1302037-003	K1302037-004	K1302037-005	K1302037-006	K1302037-007	K1302037-008
			Well ID	AP 5782	AP 3220	AP 5783	AP 3221	AP 3221	AP 3010	AP 3222	Rinsate
			Date Sampled	3/4/2013	3/4/2013	3/5/2013	3/5/2013	3/5/2013	3/6/2013	3/6/2013	3/7/2013
			Maximum Contaminant Level[2]								
8260C	2-Chloro-1,3-butadiene (Chloroprene)	µg/L	NS	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]
8260C	2-Hexanone	µg/L	NS	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]
8260C	2-Methyl-1-propanol (Isobutyl Alcohol)	µg/L	250	R	R	R	R	R	R	R	R
8260C	3-Chloro-1-propene	µg/L	NS	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]
8260C	4-Methyl-2-pentanone (MIBK)	µg/L	2,900	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]
8260C	Acetone	µg/L	33,000	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]	ND [10]
8260C	Acetonitrile	µg/L	NS	ND [16]	ND [16]	ND [16]	ND [16]	ND [16]	ND [16]	ND [16]	ND [16]
8260C	Acrolein	µg/L	NS	ND [3.0]	ND [3.0]	ND [3.0]	ND [3.0]	ND [3.0]	ND [3.0]	ND [3.0]	ND [3.0]
8260C	Acrylonitrile	µg/L	NS	R	R	R	R	R	R	R	R
8260C	Benzene	µg/L	5	ND [0.10]	1.2	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]
8260C	Bromochloromethane	µg/L	10	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Bromodichloromethane	µg/L	14	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]
8260C	Bromoform	µg/L	110	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8260C	Bromomethane	µg/L	51	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]
8260C	Carbon Disulfide	µg/L	3,700	0.090 J B	0.070 J B	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	0.35 J B
8260C	Carbon Tetrachloride	µg/L	5	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Chlorobenzene	µg/L	100	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Chloroethane	µg/L	290	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Chloroform	µg/L	140	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	0.17 J B	0.62
8260C	Chloromethane	µg/L	66	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	cis-1,2-Dichloroethene	µg/L	70	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	cis-1,3-Dichloropropene	µg/L	NS	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Dibromochloromethane	µg/L	10	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8260C	Dibromomethane	µg/L	370	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8260C	Dichlorodifluoromethane (CFC 12)	µg/L	7,300	2.2	ND [0.20]	ND [0.20]	2.7	2.6	ND [0.20]	0.19 J	ND [0.20]
8260C	Dichloromethane (Methylene Chloride)	µg/L	5	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	0.15 J B	ND [0.20]	ND [0.20]
8260C	Ethyl Methacrylate	µg/L	3	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8260C	Ethylbenzene	µg/L	700	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]
8260C	Hexachlorobutadiene	µg/L	7.3	ND [0.30]	0.35 J	0.12 J	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]
8260C	Iodomethane	µg/L	NS	ND [0.40] QL	ND [0.40] QL	ND [0.40] QL	ND [0.40] QL	ND [0.40] QL	ND [0.40] QL	ND [0.40] QL	ND [0.40] QL
8260C	m,p-Xylenes	µg/L	NS[3]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Methacrylonitrile	µg/L	20	ND [1.2]	ND [1.2]	ND [1.2]	ND [1.2]	ND [1.2]	ND [1.2]	ND [1.2]	ND [1.2]
8260C	Methyl Methacrylate	µg/L	4	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8260C	Naphthalene	µg/L	730	ND [0.30]	0.13 J	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]	ND [0.30]
8260C	o-Xylene	µg/L	NS[3]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
	Xylenes	µg/L	10,000	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]	ND [0.40]
8260C	Propionitrile	µg/L	20	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]
8260C	Styrene	µg/L	100	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Tetrachloroethene (PCE)	µg/L	5	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]

Table 2 Groundwater Analytical Results

Analytical Method	Analyte	Units	Sample ID	13FRLFWA01	13FRLFWA02	13FRLFWA03	13FRLFWA04	13FRLFWA05[D]	13FRLFWA06	13FRLFWA07	13FRLFWA08
			Laboratory ID	K1302037-001	K1302037-002	K1302037-003	K1302037-004	K1302037-005	K1302037-006	K1302037-007	K1302037-008
			Well ID	AP 5782	AP 3220	AP 5783	AP 3221	AP 3221	AP 3010	AP 3222	Rinsate
			Date Sampled	3/4/2013	3/4/2013	3/5/2013	3/5/2013	3/5/2013	3/6/2013	3/6/2013	3/7/2013
			Maximum Contaminant Level[2]								
8260C	Toluene	µg/L	1,000	0.20 J MH B	0.28 J B	0.43 J B	0.22 J B	0.14 J B	1.2	0.11 J B	0.37 J B
8260C	trans-1,2-Dichloroethene	µg/L	100	ND [0.20]	0.080 J	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	trans-1,3-Dichloropropene	µg/L	NS	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	trans-1,4-Dichloro-2-butene	µg/L	NS	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8260C	Trichloroethene (TCE)	µg/L	5	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]
8260C	Trichlorofluoromethane (CFC 11)	µg/L	11,000	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]	ND [0.20]
8260C	Vinyl Acetate	µg/L	37,000	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8260C	Vinyl Chloride	µg/L	2	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]
8270D	1,2,4,5-Tetrachlorobenzene	µg/L	NS	ND [0.50]	ND [0.53]	ND [0.52]	ND [0.52]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8270D	1,2,4-Trichlorobenzene	µg/L	70	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	1,2-Dichlorobenzene	µg/L	600	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	1,3,5-Trinitrobenzene	µg/L	1,100	ND [5.0]	ND [5.3]	ND [5.2]	ND [5.2]	ND [5.0]	ND [5.0]	ND [5.0]	ND [5.0]
8270D	1,3-Dichlorobenzene	µg/L	3,300	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	1,3-Dinitrobenzene	µg/L	3.7	ND [5.0]	ND [5.3]	ND [5.2]	ND [5.2]	ND [5.0]	ND [5.0]	ND [5.0]	ND [5.0]
8270D	1,4-Dichlorobenzene	µg/L	75	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	1,4-Naphthoquinone	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	1,4-Phenylenediamine	µg/L	NS	ND [20] QL	ND [22] QL	ND [21] QL	ND [21] QL	ND [20] QL	ND [20] QL	ND [20] QL	ND [20] QL
8270D	1-Naphthylamine	µg/L	NS	ND [2.0] QL	ND [2.2] QL	ND [2.1] QL	ND [2.1] QL	ND [2.0] QL	ND [2.0] QL	ND [2.0] QL	ND [2.0] QL
8270D	2,3,4,6-Tetrachlorophenol	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2,4,5-Trichlorophenol	µg/L	3,700	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2,4,6-Trichlorophenol	µg/L	77	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2,4-Dichlorophenol	µg/L	110	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2,4-Dimethylphenol	µg/L	730	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.0]	ND [4.1]	ND [4.0]	ND [4.1]
8270D	2,4-Dinitrophenol	µg/L	73	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0] QL	ND [2.0] QL	ND [2.1] QL	ND [2.0] QL	ND [2.1] QL
8270D	2,4-Dinitrotoluene	µg/L	1.3	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2,6-Dichlorophenol	µg/L	1.3	ND [0.50]	ND [0.53]	ND [0.52]	ND [0.52]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8270D	2,6-Dinitrotoluene	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2-Acetylaminofluorene	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	2-Chloronaphthalene	µg/L	2,900	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2-Chlorophenol	µg/L	180	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.10]	ND [0.11]
8270D	2-Methyl-5-nitroaniline (5-Nitro-o-toluidine)	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	2-Methylnaphthalene	µg/L	150	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2-Methylphenol	µg/L	1,800	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.16]	ND [0.15]	ND [0.16]
8270D	2-Naphthylamine	µg/L	NS	ND [2.0] QL	ND [2.2] QL	ND [2.1] QL	ND [2.1] QL	ND [2.0] QL	ND [2.0] QL	ND [2.0] QL	ND [2.0] QL
8270D	2-Nitroaniline	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	2-Nitrophenol	µg/L	NS	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.10]	ND [0.11]
8270D	3,3'-Dichlorobenzidine	µg/L	1.9	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.51]
8270D	3,3'-Dimethylbenzidine	µg/L	NS	ND [5.0] QL	ND [5.3] QL	ND [5.2] QL	ND [5.2] QL	ND [5.0] QL	ND [5.0] QL	ND [5.0] QL	ND [5.0] QL
8270D	3-Methylcholanthrene	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	3-Nitroaniline	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]

Table 2 Groundwater Analytical Results

Analytical Method	Analyte	Units	Sample ID	13FRLFWA01	13FRLFWA02	13FRLFWA03	13FRLFWA04	13FRLFWA05[b]	13FRLFWA06	13FRLFWA07	13FRLFWA08
			Laboratory ID	K1302037-001	K1302037-002	K1302037-003	K1302037-004	K1302037-005	K1302037-006	K1302037-007	K1302037-008
			Well ID	AP 5782	AP 3220	AP 5783	AP 3221	AP 3221	AP 3010	AP 3222	Rinsate
			Date Sampled	3/4/2013	3/4/2013	3/5/2013	3/5/2013	3/5/2013	3/6/2013	3/6/2013	3/7/2013
			Maximum Contaminant Level[2]								
8270D	4,6-Dinitro-2-methylphenol	µg/L	NS	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50] QL	ND [0.50] QL	ND [0.51] QL	ND [0.50] QL	ND [0.51] QL
8270D	4-Aminobiphenyl	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	4-Bromophenyl Phenyl Ether	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	4-Chloro-3-methylphenol	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	4-Chloroaniline	µg/L	16	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.10]	ND [0.11]
8270D	4-Chlorophenyl Phenyl Ether	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	4-Methylphenol[1]	µg/L	18,181	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.15]	ND [0.16]	ND [0.15]	ND [0.16]
8270D	4-Nitroaniline	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	4-Nitrophenol	µg/L	NS	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.51]	ND [0.50]	ND [0.51]
8270D	7,12-Dimethylbenz(a)anthracene	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Acenaphthene	µg/L	2,200	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Acenaphthylene	µg/L	2,200	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Acetophenone	µg/L	NS	ND [0.50]	ND [0.53]	ND [0.52]	ND [0.52]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8270D	Anthracene	µg/L	11,000	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Benz(a)anthracene	µg/L	1.2	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Benzo(a)pyrene	µg/L	0.2	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Benzo(b)fluoranthene	µg/L	1.2	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Benzo(g,h,i)perylene	µg/L	1,100	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Benzo(k)fluoranthene	µg/L	12	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Benzyl Alcohol	µg/L	NS	ND [0.10]	0.74	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.10]	ND [0.11]
8270D	Bis(2-chloroethoxy)methane	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Bis(2-chloroethyl) Ether	µg/L	0.77	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Bis(2-chloroisopropyl) Ether	µg/L	NS	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.10]	ND [0.11]
8270D	Bis(2-ethylhexyl) Phthalate	µg/L	6	ND [0.15] QL	4.8 QL	0.16 J B QL	0.20 J B QN	0.21 J B QN	12 QN	0.26 J B QN	0.16 J QN
8270D	Butyl Benzyl Phthalate	µg/L	7,300	0.044 J	ND [0.060]	ND [0.060]	0.058 J	0.042 J	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Chlorobenzilate	µg/L	NS	ND [0.50]	ND [0.53]	ND [0.52]	ND [0.52]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8270D	Chrysene	µg/L	120	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Diallate	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Dibenz(a,h)anthracene	µg/L	0.12	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Dibenzofuran	µg/L	73	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Diethyl Phthalate	µg/L	29,000	0.042 J B	0.17 J	0.032 J B	0.023 J B	0.027 J B	0.057 J	0.018 J B	0.030 J
8270D	Dimethoate	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Dimethyl Phthalate	µg/L	370,000	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Di-n-butyl Phthalate	µg/L	3,700	0.053 J B	0.25 B	0.040 J B	0.039 J B	0.040 J B	0.086 J B	0.046 J B	0.044 J B
8270D	Di-n-octyl Phthalate	µg/L	1,500	ND [0.060]	ND [0.060]	ND [0.060]	0.17 J B	0.16 J B	ND [0.061]	0.16 J B	0.15 J
8270D	Diphenylamine	µg/L	910	ND [1.0] QL	ND [1.1] QL	ND [1.1] QL	ND [1.1] QL	ND [1.0] QL	ND [1.0] QL	ND [1.0] QL	ND [1.0] QL
8270D	Disulfoton	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Ethyl Methanesulfonate	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]

Table 2 Groundwater Analytical Results

Analytical Method	Analyte	Units	Sample ID	13FRLFWA01	13FRLFWA02	13FRLFWA03	13FRLFWA04	13FRLFWA05[D]	13FRLFWA06	13FRLFWA07	13FRLFWA08
			Laboratory ID	K1302037-001	K1302037-002	K1302037-003	K1302037-004	K1302037-005	K1302037-006	K1302037-007	K1302037-008
			Well ID	AP 5782	AP 3220	AP 5783	AP 3221	AP 3221	AP 3010	AP 3222	Rinsate
			Date Sampled	3/4/2013	3/4/2013	3/5/2013	3/5/2013	3/5/2013	3/6/2013	3/6/2013	3/7/2013
			Maximum Contaminant Level[2]								
8270D	Famphur	µg/L	NS	ND [10]	ND [11]	ND [11]	ND [11]	ND [10]	ND [10]	ND [10]	ND [10]
8270D	Fluoranthene	µg/L	1,500	0.022 J	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Fluorene	µg/L	1,500	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Hexachlorobutadiene	µg/L	7.3	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Hexachlorocyclopentadiene	µg/L	50	R	ND [2.0]	ND [2.0]	ND [2.0] QL	ND [2.0] QL	ND [2.1] QL	ND [2.0] QL	ND [2.1] QL
8270D	Hexachloroethane	µg/L	40	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Hexachloropropene	µg/L	NS	ND [5.0] QL	ND [5.3] QL	ND [5.2] QL	ND [5.2] QL	ND [5.0] QL	ND [5.0] QL	ND [5.0] QL	ND [5.0] QL
8270D	Indeno(1,2,3-cd)pyrene	µg/L	1.2	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Isophorone	µg/L	900	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Isosafrole	µg/L	NS	ND [2.0] QL	ND [2.2] QL	ND [2.1] QL	ND [2.1] QL	ND [2.0] QL	ND [2.0] QL	ND [2.0] QL	ND [2.0] QL
8270D	Kepone	µg/L	NS	ND [10]	ND [11]	ND [11]	ND [11]	ND [10]	ND [10]	ND [10]	ND [10]
8270D	Methapyrilene	µg/L	NS	ND [10] QL	ND [11] QL	ND [11] QL	ND [11] QL	ND [10] QL	ND [10] QL	ND [10] QL	ND [10] QL
8270D	Methyl Methanesulfonate	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Methyl Parathion	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Naphthalene	µg/L	730	ND [0.060]	0.058 J	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Nitrobenzene	µg/L	18	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	N-Nitrosodiethylamine	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	N-Nitrosodimethylamine	µg/L	0.017	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.1]	ND [1.0]	ND [1.1]
8270D	N-Nitrosodi-n-butylamine	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	N-Nitrosodi-n-propylamine	µg/L	NS	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	N-Nitrosodiphenylamine	µg/L	170	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	N-Nitrosomethylethylamine	µg/L	NS	ND [5.0]	ND [5.3]	ND [5.2]	ND [5.2]	ND [5.0]	ND [5.0]	ND [5.0]	ND [5.0]
8270D	N-Nitrosopiperidine	µg/L	NS	ND [5.0]	ND [5.3]	ND [5.2]	ND [5.2]	ND [5.0]	ND [5.0]	ND [5.0]	ND [5.0]
8270D	N-Nitrosopyrrolidine	µg/L	NS	ND [5.0]	ND [5.3]	ND [5.2]	ND [5.2]	ND [5.0]	ND [5.0]	ND [5.0]	ND [5.0]
8270D	O,O,O-Triethyl Phosphorothioate	µg/L	NS	ND [0.50]	ND [0.53]	ND [0.52]	ND [0.52]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8270D	o-Toluidine	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Parathion	µg/L	NS	ND [5.0]	ND [5.3]	ND [5.2]	ND [5.2]	ND [5.0]	ND [5.0]	ND [5.0]	ND [5.0]
8270D	p-Dimethylaminoazobenzene	µg/L	NS	ND [1.0]	ND [1.1]	ND [1.1]	ND [1.1]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8270D	Pentachlorobenzene	µg/L	NS	ND [0.50]	ND [0.53]	ND [0.52]	ND [0.52]	ND [0.50]	ND [0.50]	ND [0.50]	ND [0.50]
8270D	Pentachloronitrobenzene (PCNB)	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Pentachlorophenol (PCP)	µg/L	1	ND [1.0]	0.91 J	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.1]	ND [1.0]	ND [1.1]
8270D	Phenacetin	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Phenanthrene	µg/L	11,000	ND [0.060]	0.025 J	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Phenol	µg/L	11,000	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.10]	ND [0.11]	ND [0.10]	ND [0.11]
8270D	Phorate	µg/L	NS	ND [1.0]	ND [1.1]	ND [1.1]	ND [1.1]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]

Table 2 Groundwater Analytical Results

Analytical Method	Analyte	Units	Sample ID	13FRLFWA01	13FRLFWA02	13FRLFWA03	13FRLFWA04	13FRLFWA05[D]	13FRLFWA06	13FRLFWA07	13FRLFWA08
			Laboratory ID	K1302037-001	K1302037-002	K1302037-003	K1302037-004	K1302037-005	K1302037-006	K1302037-007	K1302037-008
			Well ID	AP 5782	AP 3220	AP 5783	AP 3221	AP 3221	AP 3010	AP 3222	Rinsate
			Date Sampled	3/4/2013	3/4/2013	3/5/2013	3/5/2013	3/5/2013	3/6/2013	3/6/2013	3/7/2013
			Maximum Contaminant Level[2]								
8270D	Pronamide	µg/L	NS	ND [2.0]	ND [2.2]	ND [2.1]	ND [2.1]	ND [2.0]	ND [2.0]	ND [2.0]	ND [2.0]
8270D	Pyrene	µg/L	1,100	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.060]	ND [0.061]	ND [0.060]	ND [0.061]
8270D	Safrole	µg/L	NS	ND [1.0]	ND [1.1]	ND [1.1]	ND [1.1]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8270D	Thionazin	µg/L	NS	ND [1.0]	ND [1.1]	ND [1.1]	ND [1.1]	ND [1.0]	ND [1.0]	ND [1.0]	ND [1.0]
8290	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	30	ND [5.10] QL	ND [2.91]	ND [2.96]	ND [3.00]	ND [4.28]	ND [4.42]	ND [4.55]	ND [5.08]
9030M	Sulfide, Total	mg/L	NS	ND [0.09]	ND [0.09]	ND [0.09]	ND [0.09]	ND [0.09]	ND [0.09]	ND [0.09]	ND [0.09]

Notes:

Bold indicates result or LOD exceeds cleanup level

[D]sample is a field duplicate of the preceeding sample

[1]4-Methylphenol cannot be separated from 3-Methylphenol by the laboratory. Cleanup level is the added sum of the individual values added.

[2]18 AAC 75 Table C Groundwater Cleanup Levels - April 2012, except where otherwise noted with superscript

[3]Table C cleanup level specified for total xylenes = 10 mg/L (10,000 µg/L)

[4]Table C cleanup level specified for Endosulfan (Endosulfan I + Endosulfan II) = 0.22 mg/L (220 µg/L)

[5]Table C cleanup level specified for PCBs = 0.0005 mg/L (0.5 µg/L)

[6]Dinoseb has a federal MCL (40 CFR 141), but no Table C level

B = Analyte result is considered an estimated value due contamination present in the method blank, trip blank or rinsate blank

J = Analyte result is considered an estimated value because the level is below the laboratory LOQ

MH = Analyte result is considered an estimated value biased high due to matrix effects

ML = Analyte result is considered an estimated vlue biased low due to matrix effects

ND = Not detected; LOD in brackets

NS = Not specified

QL = Analyte result is considered an estimated value biased low due to a quality control failure

QN = Analyte result is considered an estimated value with an uncertain bias due to a quality control failure

R = Analyte result is rejected - result is unusable. Note that "R" replaces the chemical result.

µg/L = micrograms per liter

BHC = benzene hexachloride

CFR = Code of Federal Regulations

DDD = dichlorodiphenylethane

DDE = dichlorodiphenylethene

DDT = dichlorodiphenyltrichlorioethane

LOD = limit of detection

LOQ = limit of quantitation

MCPA = 2-Methyl-4-chlorophenoxyacetic acid

MCPP = Methylchlorophenoxypropionic acid

mg/L = milligrams per liter

PCB = polychlorinated biphenyls

Pg/L = pictograms per liter

FIGURES

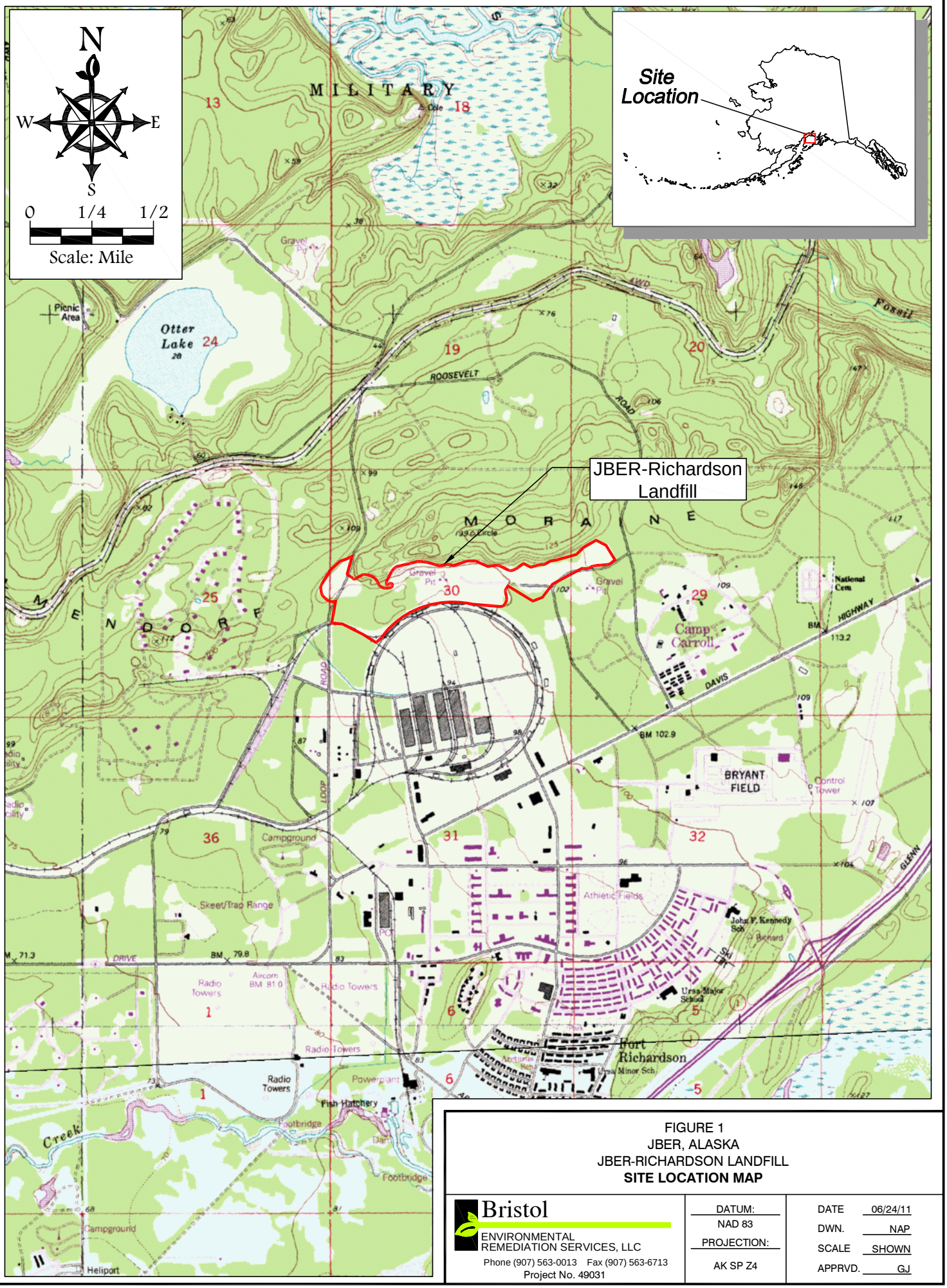
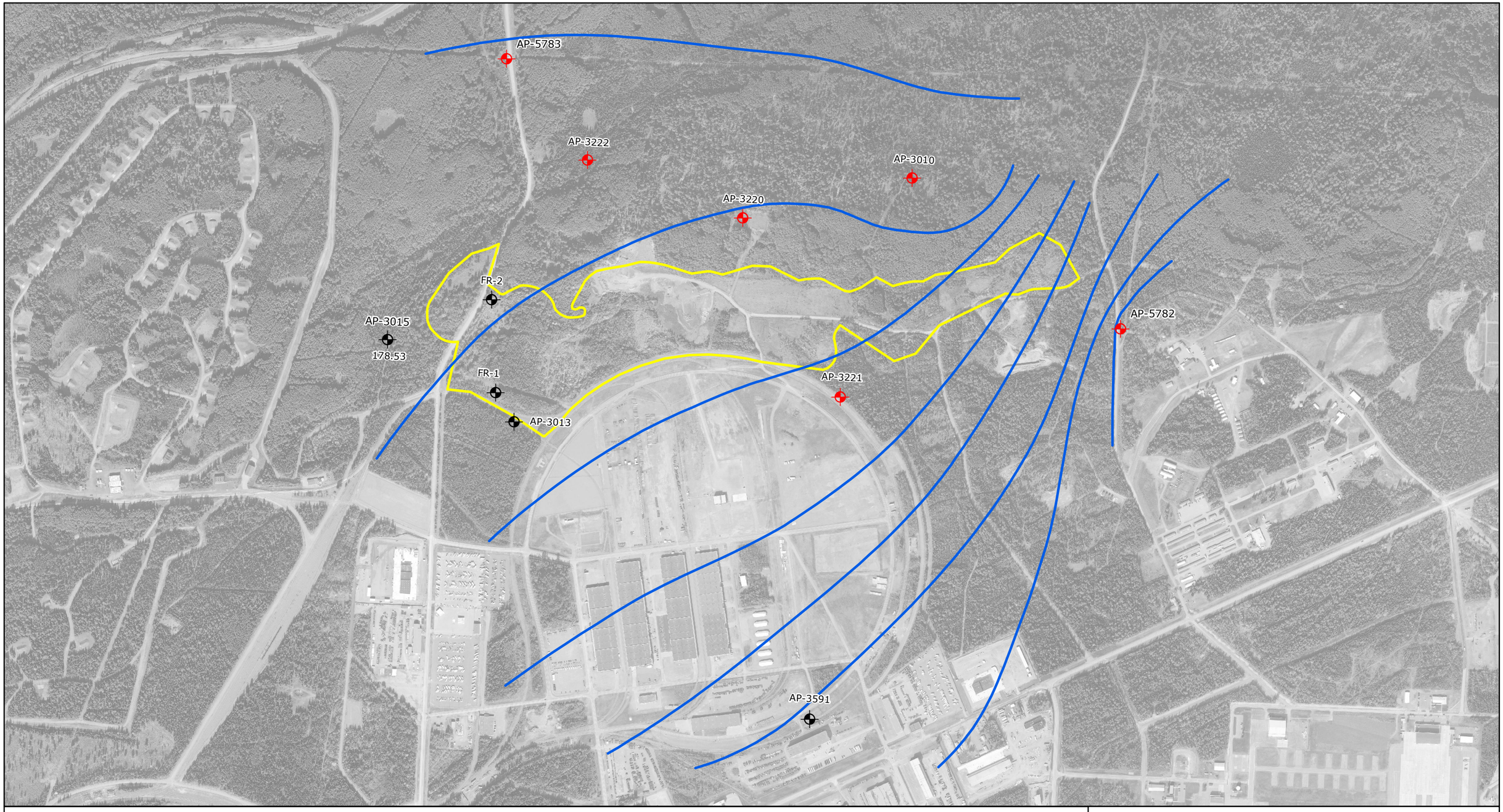


FIGURE 1
JBER, ALASKA
JBER-RICHARDSON LANDFILL
SITE LOCATION MAP

Bristol
ENVIRONMENTAL
REMEDIATION SERVICES, LLC
Phone (907) 563-0013 Fax (907) 563-6713
Project No. 49031

DATUM:	NAD 83
PROJECTION:	AK SP Z4
DATE	06/24/11
DWN.	NAP
SCALE	SHOWN
APPRVD.	GJ



Legend

- Annual Detection Monitoring Well
- Quarterly Assessment Monitoring Well
- Groundwater Elevation
- Landfill Extents

N W E S

0 500 1,000

Feet

FIGURE 2
JBER, ALASKA
JBER-RICHARDSON LANDFILL
2013 MONITORING WELL LOCATION MAP

Bristol
ENVIRONMENTAL
REMEDIATION SERVICES, LLC
Phone (907)563-0013 Fax (907)563-6713
Project No. 49031

DATUM: NAD 83
PROJECTION: SP AK 4

DATE 02/15/13
DWN. NAP
SCALE 1:10,771
APPRVD. GJ

SHEET 1 of 1

Path: G:\Jobs\49031_Ft_Rich_Well_Ev\Maps\Figure_3_v2.mxd

APPENDIX A

Field Notes
Groundwater Low-Flow Purging Forms

Rite in the Rain®
ALL-WEATHER WRITING PAPER

INCH

Name Lyndsey Klepper

Address 111 W 16th Ave
Anchorage, AK

Phone 907 563 0013

Project Ft. Rich Landfill Monitoring
W911KB-09-P-0076

Clear Vinyl Protective Slipcovers (Item No. 30) are available for this style of notebook.
Helps protect your notebook from wear & tear. Contact your dealer or the J. L. Darling Corporation

CONTENTS

2/15/13 E. Barnhill + L. Kleppin
overcast, warm (30°F), snowy
safety tailgate
Rented pre-calibrated YSI from TTT
428-5383 - Doyon water treatment plant
call prior to well access to inform security

pt padlock on Doyon gate AP 3220
231.15' to water
~7 gal IDW taken to IDW facility

well ID	analytes	containers
- AP 3010	VOC	3 HCl VOA
- AP 3220	EDB/DBCP	3 $Na_2S_2O_3$ VOA
- AP 3221	SVOC	1 L amber
- AP 3222	Pest	1 L amber
- AP 5783	Herb	1 L amber
- AP 5782	Tot. Met	1 HNO_3 500mL poly
Rinsate	Tot Cy	1 NaOH 1L poly
DUP	Tot Hg	1 HNO_3 100mL poly
MS/MSD	Tot Sulfides	1 Zinc Acetate/NaOH 1L poly
	PCB	1 L amber
	Diox/Furn	1 L amber

Assessment Monitoring — 1st Quarter

2/15/13 set up on AP 5782 Roosevelt Rd
- pump @ 290 Hz, no water/air from tubing

set pump @ ~155 BTOC

AP-5782
145.42' to water @ 320 Hz no water
frozen water in tubing

~7° F on base
remove tubing, decon WL + pump
purchase heat tape @ Lowe's
- well access not plowed to 3222, 3221, 3010
Reschedule sampling for March 4th
after call conferring w/ Mark Present
Return van to United Rentals
Return Generators pump/generator to TTT

Finish 17:30

Ft. Rich Qtrly Assessment Monitoring

3/4/13

800 - pick up rental van - Emily calibrate YSI #2 and turbidimeter @ Bristol

25° F, sunny, breeze

Load van, safety tailgate w/ Emily Conway and Lyndsey Klepper → trip hazards

146.69 YK AP 5782 Roosevelt Road

145.69 depth to water - grundfos pump + HDPE tube

1040 - Begin purge @ 290 Hz

(tubing extends ~10 outside of TOC)

pump set @ ~155' BTOC

good recovery, high turbidity

purge ~11 gal until stabilized @ <10 NTU

→ 1230 13FRLFWA01 AP 5782

MS/MSD

IDW to POL treatment facility

1430 @3220 well purged 2/15/13, allowed to 234.10 ft recover. (WL 231.15' on 2/15/13)

Dedicated poly bailer used - turbidity low - 17 NTU

→ 1430 13FRLFWA02 AP 3220

WL, grundfos + cooling shaft decon

IDW taken to POL facility. Leave site.

Sample management @ Bristol garage

Access to AP3010 being plowed, contacted Mark Preksat about AP 3021 and AP 3222 access.

13FRLFWA01 has 20 unpreserved 1L ambers (MS/MSD - 5 extra bottles for breakage)

End 1730

3/5/13

E. Conway + L. Klepper Safety tailgate – weather, bailing technique. Sunny, calm, 2 calibrate YSI #2 + turbidimeter – new confidence solution, conductivity standard

AP 5783 130.20' BTOC 144.3 TD

1100 begin purge – low turbidity (<10 NTU) good recharge 278 Hz on grundfos

→ 13FRLFWA03 1140 AP 5783

Dispose of IDW @ POL dewatering facility, warehouse rd

Pump, water level meter and YSI/flow-through cell decon w/ Alconox + DI water

AP 3221 150.81' BTOC to water

WL dropped and stabilized 2 feet below first static water level measurement

→ 13FRLFWA04 1500 AP 3221

DUP 13FRLFWA05 1600 AP 3221

pump speed increased from 282 Hz to 290 Hz due to temp increase / rising amperage ↑flow rate to cool pump w/ cooling stream

Duplicate sample taken

IDW taken to POL dewatering facility on warehouse drive

3/5/13

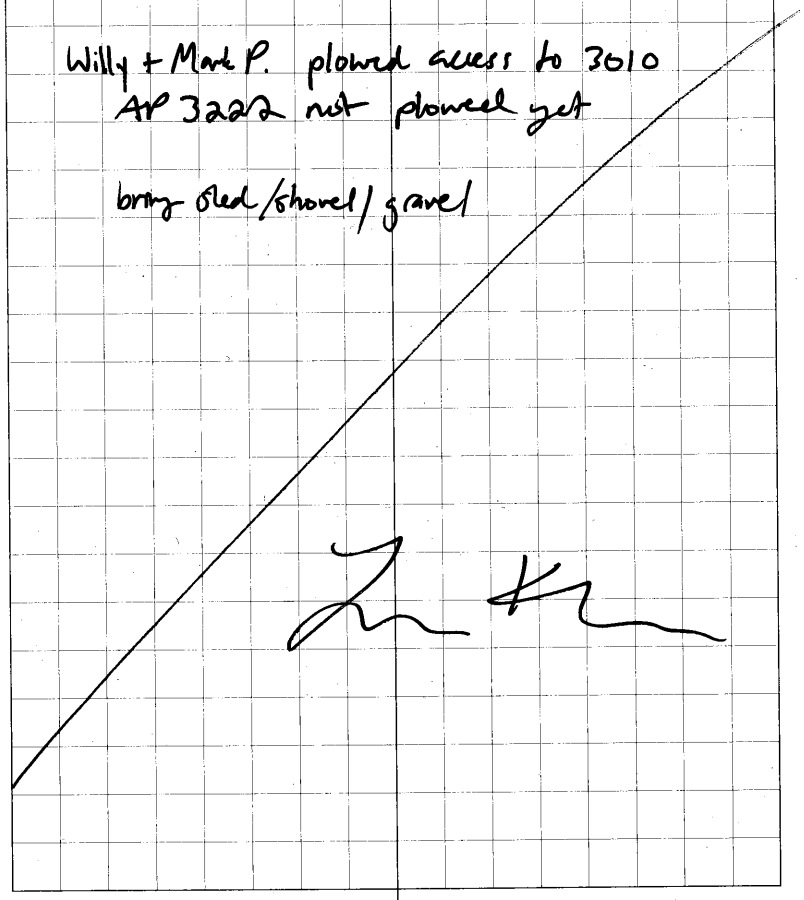
Return to Bristol, sample management and equipment decon

End 1700

Willy + Mark P. plowed access to 3010

AP 3222 not plowed yet

bring sled/shovel/gravel



3/6/13

800 Arrive Bristol, calibrate YSI #2/turbidimeter
Load van, arrive base.
E. Conway + L. Kleppen safety tailgate: bailing
cloudy, 25°F, calm. Refuel generator 4/gasoline.
Drive to AP 3010, purge well @ 1030
5' water column, 4" well, bail one casing
volume - 3.75 gallons (4 bailers full)
dedicated 4" poly bailer. Good recharge.
→ 1115 13FRLFWA06 AP 3010
one 1L amber has chip in lid (glass)
collect sample, decon WL meter, YSI

Dispose of IDW @ POL dewatering facility
Move to AP 3222 off of Otter Lake road
Access not plowed. Used sleds to haul
equipment from road to well. Postholing.
Purge well ~4.5 gallons to stabilize
→ 1430 13FRLFWA07 AP 3222
excellent recharge, turbidity 21 NTU.
Quick to stabilize.
Decon pump, WL meter, YSI, pack up.
Dispose of IDW on base, return to Bristol.
Sample management.
End 1700

3/7/13

800 Arrive Bristol. Sample management, equipment decon
→ 13FRLFWA08 1000 Rinsate

Ship 11 coolers via Goldstreak → PDX
cooler FRLF030713-01 has
VOC/GDB DBUP trip blanks and VOAs

Rinsate sample → placed decontaminated
grundfos pump w/cooling shroud into jug
of DI water with new HDPE teflon
lined tubing, pumped from jug into
sample jars.

Bristol

ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: Ft. Rock Landfill Well No.: AP 3010
Job Number: 49031 Well Type: ☒ Monitor ☐ Extraction ☐ Other
Company: BERS Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 3/6/13 Time: 1030
Purged by: L. Klepper (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 235

Water Level Depth (WL in feet BTOC): 229.22

PURGE METHOD

☐ Pump – Type:

☐ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☒ Other – Type: 4" poly bailer

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): _____ Screen Interval in Feet (BTOC)

PURGE TIME

1030
1100 Start 1115 Stop 45 Elapsed

PURGE RATE

Initial — gpm Final — gpm

ACTUAL PURGE VOLUME

3.75 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
—		—	—	2.41	0.527	6.01	170.4	10.52	27.5	3.75

Bristol

ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: Ft. Rich Landfill Well No.: 3220
Job Number: 49031 Well Type: ☒ Monitor ☐ Extraction ☐ Other
Company: BERS Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 3/04/13 Time: 14:30
Purged by: L. Kleppin (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC):

Water Level Depth (WL in feet BTOC): 234.10

PURGE METHOD

☐ Pump – Type:

☐ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☒ Other – Type: 4" HDPE PVC Bailer (Dedicated)

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☒ Other

Depth in feet (BTOC): _____ Screen Interval in Feet (BTOC)

PURGE TIME

— Start — Stop — Elapsed

PURGE RATE

Initial — gpm Final — gpm

ACTUAL PURGE VOLUME

— gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
—		—	—	3.54	0.460	7.29	112.8	7.56	17.6	— *

* purged 2/15/13

Bristol

ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: Ft Rich Landfill Well No.: AP 322 I

Job Number: 44031 Well Type: ☒ Monitor ☐ Extraction ☐ Other

Company: BERS Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 3/5/13 Time: 1415

Purged by: L. Kleppin (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 175.4

Water Level Depth (WL in feet BTOC): 150.81

160

PURGE METHOD

☐ Pump – Type:

☐ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☐ Other – Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): _____ Screen Interval in Feet (BTOC)

PURGE TIME

1420 Start 1446 Stop 26 Elapsed

PURGE RATE

Initial _____ gpm Final _____ gpm

ACTUAL PURGE VOLUME

3 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
8	152.39	284 H_2		9.25	0.742	7.14	106.9	3.91	0.39	.5
11	152.49	282 H_2		9.97	0.809	7.08	102.4	2.37	0.36	1
14	152.57	282		10.61	0.679	7.06	94.3	1.88	0.32	2
17	152.57	282		11.62	0.820	7.09	100.2	1.68	0.46	2.25
20	152.71	282		12.15	0.690	7.08	90.5	1.63	0.25	2.5
23	152.7	282		12.47	0.868	7.09	85.7	1.60	0.47	2.75
26	152.78	282		12.48	0.937	7.08	83.6	1.57	0.62	3

Bristol

ENVIRONMENTAL REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: Ft. Kent Landfill Well No.: AP 3222
Job Number: 49031 Well Type: ☒ Monitor ☐ Extraction ☐ Other
Company: BERS Well Material ☒ PVC ☐ St. Steel ☐ Other
Date: 3/6/13 Time: 1400
Purged by: L Kleppin (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 139.8

Water Level Depth (WL in feet BTOC): 126.64

132

PURGE METHOD

☒ Pump – Type: Grundfos w/ cooling sheath

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☐ Other – Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☒ Other

Depth in feet (BTOC): _____ Screen Interval in Feet (BTOC)

PURGE TIME

1400 Start 1430 Stop 30 Elapsed

PURGE RATE

Initial — gpm Final — gpm

ACTUAL PURGE VOLUME

4.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial Hz	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
15	126.64	263.1 Hz		8.55	0.421	6.91	64.5	10.64	0.42	1
18	126.64	263.1		9.11	0.421	7.03	62.4	10.20	0.44	
21	126.64	263.1		9.20	0.420	7.08	62.5	10.00	0.39	
24	126.64	263.1		9.21	0.422	7.22	64.0	9.65	0.34	
27	126.64	263.1		9.20	0.420	7.25	64.6	9.53	0.41	
30	126.64	263.1		9.22	0.421	7.27	65.4	9.42	0.43	4.5

Bristol

ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: Ft. Rich Well No.: AP 5782
Job Number: 49031 Well Type: ☒ Monitor ☐ Extraction ☐ Other
Company: BERS Well Material ☒ PVC ☐ St. Steel ☐ Other
Date: 3/04/13 Time:
Purged by: L. Klypin (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 167

Water Level Depth (WL in feet BTOC): 145.69

155

PURGE METHOD

☐ Pump – Type:

☐ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☐ Other – Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): _____ Screen Interval in Feet (BTOC)

PURGE TIME

1040 Start 1225 Stop 105 min Elapsed

PURGE RATE

Initial _____ gpm Final _____ gpm

ACTUAL PURGE VOLUME

11.25 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Hz Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	~~mS/cm~~ µS/cm Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
27	147.15								37.3	4
35	147.05	283.3								
46	146.76	279.6							24.3	7
50	146.64	277.5								
1145 65	146.64	277		10.32	0.327	7.52	67.5	2.79	11.0	9
70	146.64	277		10.23	0.328	7.53	51.1	2.78	9.76	
75	146.64	277		10.34	0.330	7.55	49.6	2.76	8.81	
80	146.64	277		10.07	0.321	7.55	48.9	2.65	8.19	10

after 85 min. → YSI shut off after this reading.

GROUNDWATER LOW-FLOW PURGING FORM (continued)

AP 5782 Page 2

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. (µS/cm)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
85	146.64	277		10.30	0406	754	67.1	3.30	6.00	
90	146.64	277		10.32	2.66	7.55	49.8	2.65	6.00	10.5
95	146.64	277		10.25	0.300	7.55	51.1	2.59	4.39	
100	146.65	277		10.48	0.404	7.55	50.0	2.60	4.03	11
105	146.66	277		10.65	0.339	7.54	47.2	2.53	3.84	11.25

Bristol

ENVIRONMENTAL
REMEDIATION SERVICES, LLC

GROUNDWATER LOW-FLOW PURGING FORM

Job Name: Ft. Rich Landfill Well No.: AP 5783

Job Number: 49031 Well Type: ☒ Monitor ☐ Extraction ☐ Other

Company: BERS Well Material: ☒ PVC ☐ St. Steel ☐ Other

Date: 3/05/2013 Time: 1100

Purged by: L. Kleppin (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):

☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other

Total Depth of Casing (TD in feet BTOC): 135

Water Level Depth (WL in feet BTOC): 130.20

PURGE METHOD

☐ Pump – Type: Grundfos

☒ Submersible ☐ Centrifugal ☐ Bladder ☐ Peristaltic.

☐ Other – Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other

Depth in feet (BTOC): _____ Screen Interval in Feet (BTOC)

PURGE TIME

1100 Start 1132 Stop 32 Elapsed

PURGE RATE

Initial _____ gpm Final _____ gpm

ACTUAL PURGE VOLUME

_____ gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	Specific Cond. mS/cm (~~µS/cm~~)	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
8	130.21	277½		9.51	0.482	7.29	129.0	13.99	8.39	1
12	130.21	278		10.13	0.466	7.41	137.1	13.41	9.39	1.5
16	130.21	278		10.56	0.468	7.42	104.9	12.71	8.31	2
19				10.63	0.478	7.47	103.6	12.46	8.23	2.5
22	130.21			10.75	0.467	7.47	107.2	12.02	7.60	3
25	130.21	278		10.93	0.457	7.44	123.1	12.28	6.53	3.5
28	130.21	278		11.21	0.470	7.45	123.3	12.11	5.74	4
32	130.21	278		11.44	0.465	7.46	119.1	12.07	5.41	4.5

GROUNDWATER LOW-FLOW PURGING FORM (continued)

AP5783 Page 2

FIELD PARAMETER MEASUREMENT (Continued)

Minutes Since Pumping Began	Water Depth below MP	Pump Dial	Purge Rate (ml/min)	T ☒ °C ☐ °F	mS/cm Specific Cond. ~~(µS/cm)~~	pH	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Cumulative Volume Purged
36	130.21	278		10.88	0.451	7.46	119.6	11.76	5.14	
39	130.21	278		11.03	0.472	7.73	120.4	11.70	4.39	4.75

APPENDIX B

Quality Assurance Summary
ADEC Laboratory Data Review Checklist

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ADEC	Alaska Department of Environmental Conservation
ALS	ALS Environmental
CCV	continuing calibration verification
CoC	chain of custody
DL	detection limit
DoD	U.S. Department of Defense
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ICV	initial calibration verification
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOQ	limit of quantitation
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
QA	quality assurance
QC	quality control
QSM	Quality System Manual
RPD	relative percent difference
SDG	sample delivery group
SOP	Standard Operating Procedure
SW	EPA Solid Waste Test Method
USACE	US Army Corps of Engineers

1.0 QUALITY ASSURANCE SUMMARY

This is a Quality Assurance Summary of the laboratory report of the analytical data results collected from samples in support of the landfill monitoring project at Fort Richardson, Alaska.

One sample delivery group (SDG) was submitted (K1302037). The water samples were submitted to ALS Environmental (ALS) (formerly CAS) in Kelso, Washington, Alaska Department of Environmental Conservation (ADEC) accreditation No. UST-040. The ALS facility in Houston conducted the dioxin analyses.

The complete data package associated with this SDG is presented on a supplemental CD. All data were reviewed in accordance with appropriate U.S. Environmental Protection Agency (EPA) procedural guidance documents and ADEC regulatory guidance documents. The reference documents include the EPA Functional Guidelines for Organic Data Review (EPA, 2008a), EPA Functional Guidelines for Inorganic Data Review (EPA, 2010) and ADEC Environmental Laboratory Data and Quality Assurance Requirements—Technical Memorandum 06-002 (ADEC, 2009). The ADEC Laboratory Data Review Checklists (ADEC, 2010) have been completed for each of the work orders/data packages listed above. The checklists are also included as an attachment to this appendix.

Samples were analyzed in accordance with applicable specifications in EPA Test Methods for Evaluating Solid Waste, SW-846, Final Update IV, Third Edition (EPA, 2008b) and the laboratory Standard Operating Procedures (SOPs) approved by National Environmental Laboratory Accreditation Conference (NELAC), the State of Alaska, and the State of Washington. However, the laboratory did not follow the U.S. Department of Defense Quality Systems Manual (DoD QSM) for Environmental Laboratories (DoD, 2010) or the project Quality Assurance Project Plan (Bristol Environmental Remediation Services, LLC, 2013) in a few specific areas, as noted during the data review. The laboratory reported

these data without requesting a nonconformance approval and without communicating these issues prior to the reporting data. The noted deviations include reporting of laboratory control samples/laboratory control sample duplicate (LCS/LCSD) outside acceptance limits as required by QSM Box D-5, reporting of continuing calibration verification (CCV) results outside acceptance limits as required by QSM Table F-4, and initial calibration verification (ICV) results reported outside acceptance limits as required by QSM Table F-4. The laboratory also did not follow QSM Box D-10, which requires matrix spike (MS/MSD) recoveries to be evaluated using the same acceptance criteria used for the LCS. As a corrective action, the laboratory resubmitted the data package. These deviations were communicated to Mike Utley, US Army Corps of Engineers (USACE) project chemist, when identified and ongoing corrective action is underway with the laboratory.

The following laboratory analytical methods were used for sample analyses:

- EPA 335.4 (Total Cyanide)
- EPA 504.1 Ethylene Dibromide (EDB), Dibromochloropropane (DBCP), and 1,2,3-Trichloropropane (TCP)
- SW 9030M (Sulfide)
- SW 8260C (Volatile Organic Analyses including BTEX).
- SW 8270D and 8270LL (Semivolatile Organic Analyses)
- SW 6020A (Metals)
- SW 7470A (Mercury)
- SW 8082A (PCBs)
- SW 8081B (Pesticides)
- SW 8151 (Herbicides)
- SW 8290 (Dioxins)

This data review focuses on criteria for the following quality assurance/quality control (QA/QC) parameters and their effect on data quality and usability:

- Sample handling and chain of custody (CoC)
- Holding time compliance
- Field QA/QC (trip blanks, field duplicates)
- Laboratory QA/QC (method blanks, LCS/LCSD, surrogates, MS/MSD, and analytical methods
- Method reporting limits
- Precision and accuracy
- Representativeness
- Completeness
- Comparability
- Sensitivity reporting limits less than allowable maximum contamination levels (MCLs)

In the absence of other QC guidance, method- and/or SOP-specific QC limits were also utilized to apply qualifiers to the data.

1.1 SAMPLE HANDLING

Samples were shipped to ALS-Kelso. All sample coolers were shipped with custody seals. CoC forms, laboratory sample receipt forms, and the case narrative were reviewed to determine whether any sample-handling activities might have affect the integrity of the samples and the quality of the associated data.

All sample containers in the sample coolers were received at the laboratory intact and within the specified temperature range of 4 degrees Celsius (°C) +/- 2°C, with no exceptions.

1.2 HOLDING TIME COMPLIANCE

All samples were extracted, digested, and/or analyzed within the holding time criteria for the applicable analytical methods and in accordance with Monitoring Plan specifications.

1.3 FIELD QA/QC

Field QA/QC protocols are designed to monitor for possible contamination during collection and transport of samples collected in the field. Collection and analysis of field duplicates also facilitates an evaluation of precision that takes into account potential variables associated with sampling procedures and laboratory analyses. For this project, trip blanks and field duplicates were submitted for analysis.

1.3.1 Trip Blanks

Water trip blanks were prepared at the laboratory by filling 40-ounce volatile organic analysis (VOA) vials with de-ionized water. Trip blanks with positive results are noted below. Field sample results with reported concentrations less than 10 times the reported concentration in the trip blank are B flagged on the data tables.

All compounds were reported as ND except for methylene chloride and toluene, which were both reported below the limit of quantitation (LOQ). One well sample result was reported as detectable for methylene chloride and is flagged B to indicate an estimated result with a high bias due to the contamination present in the trip blank. All sample results had detectable toluene results and seven were qualified on the basis of trip blank contamination sample. 13FRLFWA06 contained toluene at a concentration that was more than 10 times the amount in the trip blank; therefore, this result was not qualified on the basis of trip blank contamination.

1.3.2 Field Duplicates

One set of water duplicates were collected and analyzed during the completion of the project. The frequency of field duplicate collection met frequency requirements specified in the Monitoring Plan. When analytes were detected in both duplicate pairs above the LOQ, the relative percent differences (RPDs) between the analytes were calculated. When analytes were present at concentrations below the LOQ in one or both samples, no

valid comparison could be made. Duplicate sample results that did not meet RPD precision criteria were "QN" flagged and are considered estimates. The majority of analytes were not detected. Overall, there was adequate comparability of field duplicate results to meet the project data quality objectives (DQOs) with noted exceptions.

- Chromium results showed an RPD of 30.3 percent, which rounds to 30. No results are qualified on the basis of field duplicate RPDs.

1.3.3 Rinsate Blank

A rinsate blank was included in this sampling event. The rinsate blank was prepared using the Grundfos pump which was used to collect samples at four of the six wells. Barium, chromium, copper, nickel, zinc, and chloroform were detected above the LOQ. Cadmium, cobalt, lead, silver, vanadium, carbon disulfide, toluene, bis(2-ethylhexyl) phthalate, diethyl phthalate, and di-n-octyl phthalate were detected less than the LOQ. The results for these compounds, for samples collected with the Grundfos pump that were within 10 times the concentration in the rinsate blank, are B flagged to indicate a high estimated value due to contamination in the rinsate blank. Zinc and carbon disulfide results were B flagged because of method blank contamination; therefore the associated zinc and carbon disulfide sample results will not be B flagged for rinsate blank contamination. Toluene results were B flagged because of trip blank contamination; therefore, the associated toluene sample results will not be B flagged for rinsate blank contamination. Barium and silver were the other compounds detected in the rinsate blank that did not lead to any B flags in the associated sample results because all associated sample results were more than 10 times the concentration in the rinsate.

1.4 LABORATORY QA/QC

1.4.1 Laboratory Blanks

Method blanks are analyzed concurrent with a batch of 20 or fewer primary samples for each of the analytical procedures performed for this project. Method blanks were

analyzed at the required frequency and target analytes were ND with the following exceptions:

- All method blank results were less than LOQ. Zinc, carbon disulfide, di-n-butyl phthalate, endrin aldehyde, and methylene chloride were reported as detected below the LOQ and/or LOD, but above the detection limit (DL). Associated detected sample results within 10 times the amount in the respective method blank are flagged B as an estimated value with a potential high bias due to method blank contamination. Six zinc, three carbon disulfide, eight di-n-butyl phthalate, and two methylene chloride results (one is trip blank) were qualified.

1.4.2 Laboratory Control Samples

Analyses of LCS/LCSD for target analytes met laboratory and project QC goals for target analytes in all SDGs, except as noted below:

- A 8270LL LCSD had recoveries of most compounds below acceptance limits which also caused the RPDs to be outside acceptance criteria. The laboratory determined that this was an issue limited to the extraction of the LCSD. Based on surrogate recovery control and MS/MSD recovery control of these compounds, these compounds were not qualified.
- A 8270D LCS and LCSD had eight compounds below acceptance criteria. These compounds are flagged QL in all samples.
- The 8270LL LCS recovery of bis(2-ethylhexyl) phthalate was above acceptance criteria and the recovery of this compound in the LCSD was below acceptance criteria; therefore, the associated results for this compound are flagged QN, with the exception of those already flagged QL on the basis of CCV recovery as discussed in Section 1.4.6 below.

1.4.3 Surrogates

System monitoring compounds (surrogates) are specified for organic chromatographic analytical procedures. Surrogates are compounds similar to target analytes. These compounds are added to each sample prior to collection or extraction. Subsequent surrogate recovery indicates overall method performance. Surrogate recoveries were within prescribed control limits for all primary samples, LCS/LCSD, MS/MSD, and other QA/QC, except as noted below.

- Three LCSs are extracted, analyzed, and reported as primary results in order to achieve the entire 8270 list of compounds. One of the six 8270LL surrogates was above acceptance criteria by one percent for one LCS. Also, this surrogate was within acceptance limits in all the samples; therefore, no qualifications were made on the basis of this surrogate recovery.

- All surrogates in one of the three LCSDs for 8270 were out low. All other 8270 surrogates were within acceptance criteria; therefore, there were no qualifications made on the basis of this surrogate set.

- The surrogate associated with the 8290 analysis of sample 13FRLFWA01 was below acceptance criteria; therefore, the associated sample result is flagged QL to indicate an estimated results with a low bias.

1.4.4 Matrix Spikes

One MS/MSD was included with the sample shipment; the frequency of MS/MSD followed the Monitoring Plan. A full analyte list of compounds is normally expected for 8270 MS/MSD; however, a variance was approved via a December 5, 2012, email from Mike Utley, USACE project chemist. The laboratory is spiking MS/MSDs for 8270 for approximately half of the compounds being reported for water samples. The full list spike for LCS/LCSDs requires three QC samples for each LCS. The discussion that follows is limited to those LCS/LCSDs that had recoveries and/or RPDs outside acceptance limits.

- The MS recovery of cyanide on sample 13FRLFWA01 was below acceptance criteria by 1 percent, while the MSD recovery equaled the lower acceptance limit. This result will be flagged ML to indicate that the result is considered an estimate with a low bias due to matrix effects.
- There was insufficient volume submitted to the laboratory to perform a 8081 MS/MSD. This was in part due to a change in 8270 methodology, which was undertaken to achieve reporting limits below cleanup levels and which involved two extractions and analyses per sample for 8270 results. An increased sample volume will be collected in subsequent sampling events.
- The MS recoveries of 2,4-D and 2,4,5-T were above acceptance criteria; however, these compounds were not detected in the sample; the MSD and LCS recoveries of these compounds were acceptable, and the RPDs were acceptable. Therefore, no qualification was necessary on the basis of this MS.

- Eleven 8260 MS/MSD compounds were recovered above acceptance criteria and two additional 8260 compounds were above acceptance criteria in the MS for sample 13FRLFWA01. Only toluene was detected in the sample; therefore, only this compound will be flagged MH to indicate an estimated result with a high bias due to matrix effects.
- The laboratory reported that MS and MSD recoveries of hexachlorocyclopentadiene as zero percent recovery. This compound has a lower acceptance limit of ten percent. This compound in the spiked sample, 13FRLFWA01, is considered rejected and replaced with a R. Dimethoate was above acceptance criteria in the MS. However, the associated sample result was not detected; therefore, no qualification was necessary.
- The MS/MSD recoveries were below acceptance limits for eight compounds already flagged QL due to LCS/LCDs recoveries. Therefore, there were no additional qualifications made on the basis of these MS/MSD recoveries.

1.4.5 Method Reporting Limits (Sensitivity)

Reporting limits for all analyses met or exceeded (i.e., were lower than) the criteria specified for this project in the Monitoring Plan. While the case narrative discusses some instances of elevated DLs, the limits still met the project cleanup levels or evaluation criteria.

1.4.6 Initial and Continuing Calibration Verification

Analyses of ICV and CCV for target analytes met laboratory and project QC goals for target analytes in all SDGs, except as noted below:

- The 8260 CCV run on March 14 had exceedances for acetonitrile, isobutyl alcohol, and iodomethane. The iodomethane CCV was below recovery acceptance limits and all iodomethane results are flagged QL. Acetonitrile and isobutyl alcohol did not meet the minimum relative response factor in both this CCV and in the initial calibration (ICAL). These results are considered rejected and are replaced with an R.
- The 8270D ICV exceeded the upper control limit for 1,3,5-trinitrobenzene, phorate, and pronamide. However, all associated results were not detected; therefore, there were no qualifications made on the basis of these ICV results.
- The 8270LL CCV run on March 22 was below the recovery limit for bis(2-ethylhexyl) phthalate. Three sample results were reported from this date

(13FRLFWA01 through 13FRLFWA03) and the results are flagged QL. This same CCV was above the upper control limit for hexachlorobutadiene, 2,4,6-trichlorophenol, 2,3,4,6-tetrachlorophenol, 4-chlorophenyl phenyl ether, 4-bromophenyl phenyl ether, hexachlorobenzene, and 2,4,6-tribromophenol. The compound 2,4,6-tribromophenol is a surrogate and the other compounds had only ND results; therefore, these results were not qualified on the basis of these compounds exceeding acceptance limits in this CCV.

- A 8270LL CCV run on April 2 had recoveries below the lower acceptance limit for 2,4-dinitrophenol, 4,6-dinitro-2-methylphenol (2-methyl-4,6-dinitrophenol), and hexachlorocyclopentadiene. This CCV was the closing CCV for five sample results reported from this run (13FRLFWA04 through 13FRLFWA08). These results are flagged QL on the basis of this CCV recovery.
- A 8270LL CCV run on April 1 was below the lower recovery limit for 2,4-dinitrophenol. This CCV was the opening CCV for the sample results already qualified on the basis of the closing CCV as discussed above. The compound 2,4-dimethylphenol was above the upper recovery limit for this same CCV; however, there were no detected results for this compound. Therefore, there were no qualifications made on the basis of this CCV's recoveries.
- A 8270D CCV exceeded the upper control limit for methapyrilene and o,o,o-triethyl phosphorothioate. However, there were no detected sample results reported for these compounds; therefore, there were no qualifications made on the basis of this CCV.

1.5 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, COMPARABILITY, AND SENSITIVITY (PARCCS)

The following subsections summarize the overall precision, accuracy, representativeness, completeness, and comparability, portions. The sensitivity portion is addressed in Section 1.4.5 Method Reporting Limits (Sensitivity).

1.5.1 Precision and Accuracy

Precision criteria monitor analytical reproducibility. Accuracy criteria monitor agreement of measured results with "true values" established by spiking applicable samples with a known quantity of analyte or surrogate. Precision and accuracy were evaluated by comparing field duplicates, MS/MSD and LCS/LSCD pairs for this project. Field duplicates and MS/MSD samples were collected in accordance with the Monitoring

Plan specifications. Field duplicate RPDs met applicable control limits, except as noted in Section 1.3.2. Recoveries and RPDs for all LCS/LSCD and MS/MSD samples were within the required limits, except as noted in sections 1.4.2 and 1.4.4, respectively.

1.5.2 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). The overall project completeness goal is 90%:

$$\% \text{ completeness} = \frac{\text{number of valid (i.e., non-R flagged) results}}{\text{number of results}}$$

The project completeness goal of 90% usable data was met.

1.5.3 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental conditions. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. The DQO for representativeness was met.

1.5.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this project followed applicable field sampling techniques and specific analytical methodology. The DQO for comparability was met, though some field duplicates had poor agreement between results. Those results were flagged QN as estimates.

1.6 DATA SUMMARY

In general, the overall quality of the data was acceptable. The data quality was determined as acceptable, estimated, or rejected. Acceptable data are associated with QC data that meet all QC criteria, or with QC samples that did not meet QC criteria but

DQOs were not affected. Estimated results are considered inaccurate due to a bias created by matrix interference or QC acceptance criteria, which were not met. Rejected "R" results are not usable. The EPA National Functional Guidelines (EPA, 2010) were used to evaluate the acceptability of the data.

Data quality meets the DQOs established for this project.

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2.0 REFERENCES

Alaska Department of Environmental Conservation. 2010. *Laboratory Data Review Checklist*. January 2010.

Bristol Environmental Remediation Services LLC. 2013. *United States Air Force Joint Base Elmendorf-Richardson, Alaska, Environmental Restoration Program, Quality Assurance Project Plan, JBER-Richardson Landfill. JBER, Alaska, Revision 0*. February 2013.

U.S. Department of Defense. 2010. DoD Quality Systems Manual for Environmental Laboratories. Version 4.2. October 25, 2010.

U.S. Environmental Protection Agency (EPA). 2008a. *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. Office of Superfund Remediation and Technology Innovation (OSRTI). United States Environmental Protection Agency (USEPA). OSWER 9240.1-46 USEPA-540-R-08-01. Washington, DC 20460. June 2008.

EPA. 2008b. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846, Final Update IV, Third Edition. USEPA January 3, 2008.

EPA. 2010. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review*. Office of Superfund Remediation and Technology Innovation (OSRTI). United States Environmental Protection Agency (USEPA). OSWER 9240.1-51 USEPA 540-R-10-011. Washington, DC 20460. January 2010.

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Laboratory Data Review Checklist

Completed by: Keather McLoone

Title: Project Chemist Date: 5/10/2013

CS Report Name: Fort Rich Landfill Report Date: 5/6/2013 (date on report, although 5/10/13 was date of transmission)

Consultant Firm: Bristol Environmental Remediation Services

Laboratory Name: Columbia Analytical Services (ALS) - Kelso Laboratory Report Number: K1302307.02 (revised)

ADEC File Number: ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      X 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 X NA (Please explain.) Comments:

      SW8290 (dioxin) samples were transferred to ALS-Houston. ADEC CS does not certify this method.

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      X Yes ☐ No ☐NA (Please explain.) Comments:

   b. Correct analyses requested?
      X 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 X No ☐NA (Please explain.) Comments:

      Eleven coolers were included in this shipment to ALS-Kelso. Five coolers, including the two coolers forwarded by ALS-Kelso to ALS-Houston, had cooler temperatures or temperature blanks below 2 degrees Celsius. However, both laboratories noted that the samples were received in good condition with no breakage noted. Therefore, there are no qualifications necessary on the basis of temperature.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
X Yes □ No □NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
X Yes No NA (Please explain.) Comments:

All samples received in good condition.

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.?
X Yes □ No □ NA (Please explain.) Comments:

One sample container did not have a sample id on the label but was identified by process of elimination by the lab.

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

Results are usable without qualification.

4. Case Narrative
a. Present and understandable?
X Yes □ No □NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
X Yes No NA (Please explain.) Comments:

The case narrative discusses MS/MSDs, MBs, LCSs, CCVs, surrogates, and elevated detection limits. The case narrative, however, does not discuss method blank detections less than the LOQ.

c. Were all corrective actions documented?
X Yes □ No NA (Please explain.) Comments:

Case narrative focuses on issues that arose and that the lab felt did not require corrective actions. See QA summary for more details.

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

See the following sections and QA summary for more details.

5. Samples Results
   a. Correct analyses performed/reported as requested on COC?
      X Yes □ No □NA (Please explain.) Comments:

   b. All applicable holding times met?
      X Yes No □NA (Please explain.) Comments:

   c. All soils reported on a dry weight basis?
      Yes □ No □ X NA (Please explain.) Comments:

      Water samples only.

   d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
      X Yes □ No NA (Please explain.)
      Comments:

      While the case narrative discusses some instances of elevated detection limits, the limits still met the project cleanup levels or evaluation criteria.

   e. Data quality or usability affected?
      Comments:

      See above.

6. QC Samples
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      X Yes □ No □NA (Please explain.) Comments:

      ii. All method blank results less than PQL?
      X Yes No □NA (Please explain.) Comments:

      Method blank results were all less than LOQ. Zinc, carbon disulfide, di-n-butyl phthalate, endrin aldehyde, and methylene chloride were reported as detected below the LOQ and/or LOD but above the DL. Associated detected sample results within ten times the amount in the respective method blank are flagged B as an estimated value with a potential high bias due to method blank contamination. Six zinc, three carbon disulfide, eight di-n-butyl phthalate, and two methylene chloride results (one is trip blank) were qualified.

      iii. If above PQL, what samples are affected?

      N/A

Comments:

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
X Yes □ No NA (Please explain.) Comments:

See above.

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

See above.

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

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
Yes □X No □NA (Please explain.) Comments:

LCSD was reported for 8081 and 8270. No LCSD was reported for 8260, 504.1, 8151, 8082 or 8290. Precision information will rely on MS/MSD and field duplicates for these methods.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
□ Yes □ X No □ NA (Please explain.) Comments:

A laboratory duplicate was reported for 300, 335.4, and 9030M but not 6020 or 7470. Precision information will rely on MS/MSD and field duplicates for 6020 and 7470.

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 □x No □NA (Please explain.) Comments:

A 8270LL LCSD had recoveries of most compounds below acceptance limits which also caused the RPDs to be outside acceptance criteria. The laboratory determined that this was an issue limited to the extraction of the LCSD. Based on surrogate recovery control and MS/MSD recovery control of these compounds, these compounds were not qualified. A 8270D LCS and LCSD had eight compounds below acceptance criteria. These compounds are flagged QL in all samples. The 8270LL LCS recovery of bis(2-ethylhexyl) phthalate was above acceptance criteria and the recovery of this compound in the LCSD was below acceptance criteria; therefore, the associated results for this compound are flagged QN with the exception of those already flagged QL on the basis of CCV recoveries of this compound. See QA summary for more details regarding CCVs.

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)

See above.

Yes X No □NA (Please explain.) Comments:

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

See above.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
X Yes □ No □ NA (Please explain.) Comments:

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

Sample results flagged QL indicate an estimated result with a low bias due to quality control issues.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
X 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 X No □NA (Please explain.) Comments:

Three LCSs are extracted, analyzed, and reported as primary results in order to achieve the entire 8270 list of compounds. One of the six 8270LL surrogates was above acceptance criteria by one percent for one LCS. Also, this surrogate was within acceptance limits in all the samples; therefore, no qualifications were made on the basis of this surrogate recovery. All surrogates in one of the three LCSDs for 8270 were out low. All other 8270 surrogates were within acceptance criteria; therefore, there were no qualifications made on the basis of this surrogate set. The surrogate associated with the 8290 analysis of sample 13FRLFWA01 was below acceptance criteria; therefore, the associated sample result is flagged QL to indicate an estimated results with a low bias.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
□Yes □X No NA (Please explain.) Comments:

See above.

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

See QA summary for more details.

Comments:

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.)

x Yes □ No NA (Please explain.) Comments:

One trip blank per analysis submitted in this eleven cooler shipment. The CoC indicates that all the volatile samples and trip blanks are were shipped in one cooler.

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)

x Yes □ No □NA (Please explain.) Comments:

See above.

iii. All results less than PQL?

X Yes □ No NA (Please explain.) Comments:

All compounds were reported as not detected except methylene chloride and toluene which were both reported below the LOQ. One well sample result was reported as detectable for methylene chloride and is flagged B to indicate an estimated result with a high bias due to contamination present in the trip blank. All sample results had detectable toluene results and seven were qualified on the basis of trip blank contamination. 13FRLFWA06 contained toluene at a concentration that was more than ten times the amount in the trip blank; therefore, this result was not qualified on the basis of trip blank contamination.

iv. If above PQL, what samples are affected?

Comments:

See above.

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

Comments:

See above.

e. Field Duplicate

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

X Yes No NA (Please explain.) Comments:

One set of field duplicates, field sample ids = 13FRLFWA04 and 13FRLFWA05 was submitted with this SDG containing 6 samples, one duplicate, trip blank samples (one per analysis), and one rinsate blank.

ii. Submitted blind to lab?
X Yes No NA (Please explain.) Comments:

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

□X Yes No NA (Please explain.) Comments:

Chromium results showed a RPD of 30.3 percent which rounds to 30. No results are qualified on the basis of field duplicate RPDs.

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

Comments:

No.

f. Decontamination or Equipment Blank (If not used explain why).
X□Yes □ No □NA (Please explain.) Comments:

A rinsate blank was included in this SDG.

i. All results less than PQL?

□Yes □X No□NA (Please explain.) Comments:

Barium, chromium, copper, nickel, zinc, and chloroform were detected above the LOQ. Cadmium, cobalt, lead, silver, vanadium, carbon disulfide, toluene, bis(2-ethylhexyl) phthalate, diethyl phthalate, and di-n-octyl phthalate were detected less than the LOQ. The rinsate blank was prepared using the Grundfos pump which was used to collect samples at four of the six wells sampled in this event. Sample results for these compounds within ten times the amount in the rinsate blank, collected with the Grundfos pump, not already B flagged for method blank or trip blank contamination, will be flagged B to indicate a high estimated value due to contamination in the rinsate blank. Zinc and carbon disulfide results were B flagged because of method blank contamination so associated sample zinc and carbon disulfide results will not be B flagged for rinsate blank contamination. Toluene results were B flagged because of trip blank contamination so associated sample toluene results will not be B flagged for rinsate blank contamination. Barium and silver were the other compounds detected in the rinsate blank that did not lead to any B flags in associated sample results because all associated sample results were more than ten times the amount in the rinsate.

ii. If above PQL, what samples are affected?

See above.

Comments:

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

Comments:

n/a

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      X Yes □ No □NA (Please explain.) Comments:

Flags/qualifiers are on the data tables and are also discussed in the QA summary, which was prepared after this checklist.