Groundwater Monitoring & Corrective Action Report
CCR Landfill - Hunter Power Plant

Castle Dale, Utah
January 2019

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ACRONYMS

AMSL	Above Mean Sea Level
bgs	Below Ground Surface
CCR	Coal Combustion Residuals
COC	Chain of Custody
CFR	U.S. Code of Federal Regulations
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
FGD	Flue-Gas Desulfurization
ICP	Inductively Coupled Plasma
MCL	Maximum Concentration Limit
MDL	Method Detection Limit
MS	Mass Spectrometer
ORP	Oxidation-Reduction Potential
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SC	Specific Conductance
SM	Standard Methods
SOP	Standard Operation Procedure
SWFPR	Site-Wide False Positive Rate
UTL	Upper Tolerance Limit

1.0 INTRODUCTION

The Hunter Power Plant is located in Emery County, approximately three miles south of Castle Dale, Utah. The Hunter Power Plant is a three-unit coal-fired electrical generation plant owned by PacifiCorp. After dewatering and treatment, Flue Gas De-sulfurization (FGD) waste, fly ash and bottom ash are disposed of in the CCR Landfill. As a result, it is considered a CCR unit.

This Groundwater Monitoring and Corrective Action Report was prepared for PacifiCorp by Water and Environmental Technologies. It was prepared to comply with the requirements detailed in *Code of Federal Regulations* § 257.90(e) (*Final Rule*). Detection monitoring was initiated in September of 2015 to ensure a minimum of eight independent measurements were acquired, prior to the October 17, 2017 requirement in the *Final Rule*. PacifiCorp met this requirement and provided the findings of initial detection monitoring in the first Groundwater Monitoring and Corrective Action Report for the CCR Landfill (WET 2018).

The results of detection monitoring revealed all Appendix III constituents exceeded site-specific background concentrations. Based on these findings, the CCR Landfill monitoring program transitioned to assessment monitoring in 2018. Two rounds of sampling were completed, groundwater protection standards were established for the CCR Landfill, and assessment monitoring results were compared to these standards. These comparisons revealed Appendix IV constituents: lithium and molybdenum exceeded the groundwater protection standards (Attachment B). As a result, an investigation was initiated to bound the nature and extent of the release. The CCR Landfill will proceed to corrective measures in 2019 (Section 8.0).

This report provides the results of two rounds of assessment monitoring, and comparisons of downgradient results to groundwater protection standards. Results from the nature and extent investigation will be used to develop corrective measures at the Hunter Power Plant and will be incorporated into the Corrective Measures Study for the CCR Landfill and the Annual Groundwater Monitoring and Corrective Action Report for 2019.

1.1 Report Purpose and Organization

The following sections provide a status update for activities initiated or completed at the Hunter Power Plant CCR Landfill, during the 2018 monitoring period. They also summarize any issues or problems encountered, and their resolutions. Each required element of the annual report is displayed below and is referenced to specific sections of the report where the required information can be found:

- Document the status of the Groundwater Monitoring and Corrective Action Program (Sections 1, 5, 6, 7 and 8);
- Summarize key actions completed (Section 1);
- Describe any problems encountered (Section 1.2);
- Discuss actions taken to resolve problems (Section 1.2); and
- Define key activities for the upcoming year (Section 8).

The Annual Groundwater Monitoring and Corrective Action Report also includes the following required elements:

- A map showing the CCR unit and all CCR Monitoring Program background (or upgradient) and downgradient monitoring wells, and their identification numbers (Figure 1).
- Identifies any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken (Section 3.1.3).
- A summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required for detection or assessment monitoring (Section 5 and Table 5).
- A narrative discussion of any transition between monitoring programs (i.e. transitioning from detection monitoring to assessment monitoring) - Section 1.0 and 7.0, in addition to identifying constituents detected at a statistically significant increase over background levels (Section 6.0).

Other information required under § 257.90 through § 257.98 of the *Final Rule* can be found in the report as follows:

- § 257.91: Installed the detection monitoring network as required (Section 3);
- § 257.92: Reserved (no requirements).
- § 257.93: Developed a site-specific sampling and analysis requirements (Section 4.0);
- § 257.94: Completed detection monitoring as required (Section 5.0)
- § 257.95: Completed assessment monitoring and initiated an investigation of the nature & extent of the release (Section 7.0)
- § 257.96: Initiated an assessment of corrective measures

1.2 Problems & Resolutions

Monitoring wells ELF-1D and ELF-3 did not produce sufficient water during detection or assessment monitoring and thus were not included in the statistical analysis.

2.0 HYDROGEOLOGIC SETTING

Based on past hydrogeologic studies and updates at the Hunter Power Plant, along with specific hydrologic investigations in multiple areas across the facility, an interpretation of surface/subsurface geology is presented below. This interpretation incorporates information gathered during the installation of the monitoring network, as well as monitoring required by the State of Utah. The monitoring network consists of includes 9 monitoring wells. Additionally, geologic, groundwater and statistical information has been gathered over the course of nearly 20 years of groundwater monitoring at the Hunter Power Plant, as mandated by the State of Utah.

2.1 Stratigraphy and Lithology

The Hunter Power Plant is located in the northwestern portion of the Colorado Plateau physiographic province and within the Mancos Shale Lowlands (Stokes, 1986). The Mancos Shale Lowlands are characterized by sloping, gravel-covered pediments, rugged badlands and narrow, flat-bottomed alluvial valleys. The CCR Landfill is located on the Bluegate Member of Mancos Shale (Figure 2).

The Mancos Shale was deposited in offshore and open-marine environments of the Cretaceous Interior Seaway. It is 3450 to 4150 feet thick were exposed in the southern part of the Piceance and Uinta Basins (Fisher and others, 1960) and geophysical logs indicate it is approximately 5400 feet thick in the central part of the Uinta Basin (Hettinger and Kirschbaum, 2002). The upper portion of the Mancos grades into and interfingers with the Mesaverde Group and the shale tongues typically have sharp basal contacts and gradational upper contacts.

Lithologic logs from monitoring onsite wells, completed in the shale (Kmbg) note a light gray to dark gray or gray-black shale in various stages of weathering from very weathered to consolidated and un-weathered or competent shale.

2.2 Groundwater

Facility slug testing indicates higher permeability in the colluvial wells, as compared to the shale wells (ELF-8 in Table 1 as compared to the other monitoring wells in the table). While some shale wells recharge very slowly and take more than 24 hours to recover from sample purging, others completed in fractured shale recover very quickly.

Groundwater beneath the CCR Landfill is present in the competent shale. The low permeability of the Mancos Shale and the arid high desert climate result in a discontinuous aquifer with multiple perched layers that may be locally de-watered seasonally and/or by sampling activities. This is shown in several wells completed in the shale that have little to no water present seasonally, if at all. Further downgradient of the CCR Landfill, water is present at the colluvial/shale contact. Infiltration of precipitation in the uplands moves down through the colluvium and accumulates in a water table aquifer at the colluvium/Mancos shale contact. Groundwater flows along the contact following the topography of the shale and, in some areas, infiltrates into the fractured Mancos shale.

Because of its geochemical composition and erodibility, the Mancos Shale, a dark gray to black ridge forming marine shale deposit, provides a natural source of soluble salts. It was deposited in a transgressive/regressive coastal-marine environment and is a known source of halite (NaCl) and calcium and sodium-sulfate minerals (Waddell et al.1979). These minerals are highly soluble and dissolve readily when in contact with groundwater.

2.3 Aquifer Characteristics

The water table aquifer beneath the Hunter CCR Landfill is present in the Bluegate Member of the Mancos Shale. Because the thickness of Mancos Shale is in excess of 5,000 ft (Hale and Van De Graaff, 1964) and undergoing various stages of weathering, groundwater migrates through the more permeable zones and no discernable bottom of the water bearing zones is present. Depths to water near the CCR Landfill at this site varies from 8 ft bgs to 84 ft bgs.

Recent slug testing indicates that the hydraulic conductivity of the upper most aquifer varies two orders of magnitude from approximately 0.1 to 76 ft/day (Table 1) with a geometric mean of 1.2 ft/day. Per Morris and Johnson, 1967 (in Kresic N. 2007), site-specific aquifer porosity and effective porosity are 35% and 12%, respectively.

Table 1. Hunter Power Plant - Monitoring Network Slug Test Results

	ELF-2	ELF-4	ELF-8	ELF-11
Calculated Hydraulic Conductivity	1.77E-05	4.41E-04	2.85E-02	9.26E-05
			2.32E-02	1.72E-04
			2.86E-02	1.72E-04
# of Measurements:	1	1	3	3
Mean Conductivity (cm/sec):	1.77E-05	4.41E-04	2.68E-02	1.45E-04
Mean Conductivity (ft/day):	0.1	1	76	0.4
Slug testing was conducted on a facility-wide subset of wells to characterize site-wide hydrogeologic characteristics. Not all of the slug test wells appear on every site-specific map.				

The groundwater flow direction beneath the CCR Landfill is predominantly eastward. The hydraulic gradient in the northern portion of the site varies from 1.03×10^{-2} ft/ft to 1.13×10^{-2} ft/ft and the corresponding groundwater flow velocity ranges from 0.10 ft/day to 0.11 ft/day. A groundwater contour map for each sampling event is presented in the Field Summary Reports included as Attachments A and B.

3.0 GROUNDWATER MONITORING NETWORK

The following sections describe the monitoring network developed and implemented to support groundwater monitoring at the Hunter CCR Landfill. A minimum of eight independent samples were collected for each of the background and downgradient wells as required in Section 257.94(b) of the *Final Rule*. Evaluation of the adequateness of the dataset and selection of the appropriate statistical method was completed by October 17, 2017.

3.1 Monitoring Network Installation

The CCR Landfill is an approximately 340-acre (Figure 1). The groundwater monitoring network includes 11 wells. The monitoring data collected from these wells includes groundwater

elevations and water chemistry data as required in Appendix III of the CCR *Final Rule*. The network employs three background and six downgradient wells.

Water level measurements were obtained from monitoring well ELF-1D and ELF-3 throughout detection and assessment monitoring. However, they did not produce sufficient water to support sampling for the majority of the sampling events. The groundwater elevations were used to develop groundwater potentiometric maps, but insufficient analytical data is available to support statistical analysis.

3.1.1 Background Wells

Background monitoring wells include four locations spanning the extent of the CCR Landfill south to north and include: ELF-1D, ELF-2, ELF-9, and ELF-10. Groundwater monitoring results from these locations indicate they are not being influenced by groundwater passing waste in the CCR unit, providing results representative of background concentrations for the site. Detection and assessment monitoring results are provided in Section 5.0 and Table 5.

3.1.2 Downgradient Wells

Downgradient monitoring wells for the CCR Landfill include seven locations placed to capture groundwater as it passes the waste unit boundary. Using historical data and knowledge of the site from ongoing state mandated groundwater monitoring, downgradient wells were placed along the groundwater flow path which generally travels from west to east as it passes across the CCR Landfill (Attachments A & B).

The downgradient monitoring wells include the following: ELF-3, ELF-4, ELF-5, ELF-6, ELF-7, ELF-8, and ELF-11. Table 2 provides a summary of well depths and well construction details for the monitoring network. Well logs for each are included in the site-specific sampling and analysis plan for the CCR Landfill, which is part of the facility operating record (WET 2017).

Table 2. Monitoring Well Information

Well ID	Latitude	Longitude	Top of Casing Elevation (ft. asl)	Screen Interval (ft. bgs)	Total Depth (ft.)
*ELF-1D	39.1540	-111.019	5669.55	78.3-83.3	83.6
ELF-2	39.1624	-111.014	5612.02	17.4-27.4	27.7
ELF-9	39.1516	-111.017	5661.00	30-50	50
ELF-10	39.1509	-111.009	5620.57	40-50	50
*ELF-3	39.1535	-111.006	5604.78	16.7-31.7	32
ELF-4	39.1569	-111.005	5581.50	8.5-18.5	18.8
ELF-5	39.1609	-111.004	5577.79	8.3-18.3	18.6
ELF-6	39.1639	-111.004	5579.61	8.4-18.4	18.7

Well ID	Latitude	Longitude	Top of Casing Elevation (ft. asl)	Screen Interval (ft. bgs)	Total Depth (ft.)
ELF-7	39.1577	-111.006	5579.81	7.4-17.4	17.7
ELF-8	39.1624	-111.007	5584.50	7.4-17.4	17.7
ELF-11	39.1646	-111.008	5597.32	20-30	30

* Well has insufficient water (<8 samples). GWE data used on maps, but analytical data not incorporated in statistics.

3.1.3 Well Decommissioning / Replacement

The monitoring well network described in the preceding section represents all of the wells utilized for detection and assessment monitoring at the Hunter CCR Landfill. No wells were replaced or decommissioned at the site during either detection or assessment monitoring.

To support an evaluation of the nature and extent of the release at the Hunter Power Plant, three new wells were installed east and downgradient of the CCR Landfill: ELF-12, ELF-13, and ELF-14 (Figure 1). These wells will be incorporated into groundwater monitoring moving forward. Well logs and well construction details will be placed in the operating record in 2019 and included in the next groundwater monitoring and corrective action report (2020).

3.1.4 Monitoring Network Adequacy

The minimum requirement for a groundwater monitoring network under the *Final Rule* is consistent with other elements of the Resource Conservation and Recovery Act (RCRA), which mandates a minimum of one upgradient and three downgradient monitoring wells for each CCR unit. The *Final Rule* goes further, stating that justification is required if the minimum number of wells is selected as the monitoring network.

As Section 3.1 demonstrates, the groundwater monitoring network for the CCR Landfill surpasses the minimum requirements, employing four background and seven downgradient wells. Their spatial distribution spans the geographic extent of the CCR Landfill along both the upgradient and downgradient boundaries of the CCR unit. The number and distribution of the wells provides a sufficient number of wells to capture groundwater immediately after it passes the waste unit boundary in all directions along the groundwater flow path (Attachments A & B). Coupled with site-specific aquifer testing, the network also provides an adequate measure of the upper aquifer characteristics.

As Section 2.3 describes, the upper-most water bearing formation beneath the CCR Landfill is present in the Bluegate Member of the Mancos Shale. Subsurface depths to water vary from approximately 8 to 84 feet bgs.

The monitoring network wells for the CCR Landfill were installed using appropriate spacing, location and depth as defined by the Code of Federal Regulations, 40 CFR, Part 257 and 261, *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from*

Electric Utilities; Final Rule § 257.91 (a) (1) and § 257.91 (b) and adequately monitor groundwater both hydraulically upgradient and downgradient of the site. The network is designed to sample the quality of groundwater passing the waste boundary of the CCR unit in accordance with § 257.91 (a) (2). The network exceeds the minimum monitoring requirements of one upgradient and three downgradient wells as defined in § 257.91 (c) (1), employing four upgradient and seven downgradient monitoring wells. All 11 wells are completed in the uppermost aquifer as required by § 257.91 (a) and were constructed and are maintained in compliance with § 257.91 (e).

Groundwater elevations were measured in each well immediately prior to purging each time groundwater was sampled. Groundwater elevations for the CCR Landfill were measured during a short enough period (same field visit), to avoid temporal variations in groundwater flow that could preclude accurate determination of groundwater flow rate and direction. Table 5 provides a summary of data acquired during detection and assessment monitoring.

4.0 SAMPLING AND ANALYSIS REQUIREMENTS

A site-specific sampling and analysis plan (SAP) was developed and implemented for the CCR Landfill to support the detection and assessment monitoring phase under the *Final Rule* (WET 2017). The SAP defines the procedures necessary to acquire data of known quality from the upper aquifer.

It includes provisions for all major elements of data collection and data evaluation, including those specified in the *Final Rule*:

- Water Levels & Well Purging
- Sample Collection & Preservation
- Sample Handling and Shipment / Delivery
- Chain of Custody
- Analytical Procedures
- Quality Assurance (QA) / Quality Control (QC)

4.1 Water Levels & Well Purging

Prior to initiating well purging activities, static water levels were acquired at each well, for each sampling event, using an electronic tape. The water levels were recorded in the field logbook at the time of collection. After returning from the field, water levels were reviewed, transferred to the data summary tables for groundwater monitoring, and used to support an examination of groundwater flow direction and flow rates. Water levels were acquired in accordance with Environmental Protection Agency (EPA) Standard Operating Procedure (SOP) EPA-SOP-GW-001, *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* (EPA 2010) and are summarized Attachments A & B. Total depths for each well are defined in Table 2 and the well logs are included in Appendix A of the site-specific sampling and analysis plan.

Well purging was completed in accordance with the SAP-specified standard investigation procedures (SIPs) and EPA-SOP-GW-001. During purging, field parameters were monitored to evaluate groundwater equilibration. They were measured using a YSI Environmental 556 Multiprobe System (YSI 556 MPS) with pre-calibrated dissolved oxygen (DO), pH, specific conductance (SC), and oxidation-reduction potential (ORP) probes, and a Hach 2100Q Portable Turbidimeter. Prior to sample collection, in-stream purge water was measured, by placing the multiprobe system into a pre-cleaned flow-through cell. The following field measurements were recorded on a groundwater sampling form. Once field parameters stabilized, groundwater samples were collected. Table 3 provides the stabilization criteria used for field parameters during well purging.

- Temperature: degrees Celsius
- SC: µS/cm
- DO: mg/L
- pH: standard units
- ORP: mV

Table 3. Field Parameter Stabilization Requirements

Parameter	Condition
Turbidity	1. 10% for values greater than 5 NTU 2. If three turbidity values are less than 5 NTU, the parameter is stabilized.
Dissolved Oxygen	1. 10% for values greater than 0.5 mg/L 2. If three dissolved oxygen values are less than 0.5, the parameter is stabilized.
Specific Conductance (µS/cm)	3%
Temperature (degrees Celsius)	3%
pH	±0.1 unit
Oxidation/Reduction Potential	±10 millivolts

4.2 Sample Collection & Preservation

Groundwater samples were collected using a dedicated pump in each well. Dedicated pumps were installed and used throughout detection and assessment monitoring, to prevent cross-contamination and to provide consistent sampling. Samples were acquired in accordance with SIP No. 5, *Groundwater Sampling* (Appendix D - SAP). The basic steps for preparing and collecting groundwater samples included the following.

- Complete sample labels on each container by entering the following information:
  - Sample number
  - Sampler initials
  - Date and time of collection

  - Mark whether filtered or un-filtered
- Don new disposable sampling gloves.
- Fill provided containers for each well by placing the tubing directly into the mouth of the container.
- Preserve the samples in accordance with specifications in Table 4.
- Seal the container.
- Place the container(s) into a cooler and maintain custody.

4.3 Sample Handling and Shipment / Delivery

Following the collection of a full sample container, samples were preserved, the container was sealed, placed in a plastic bag, and secured in a cooler packed with ice. Each cooler was secured by affixing custody seals to lid and body of the cooler at the end of each day. As needed, the seals were removed at the start of each day and discarded. Field personnel retained custody of the samples from the time of collection to delivery or shipment to the analytical laboratory.

Table 4. Analytical Methods, Sample Preservation, and Holding Times

Analysis Request:	Analytical Method:	Preservation:	Holding Time:
Metals	EPA 200.7 / 200.8 EPA 245.1 (Hg)	Nitric Acid Cool 4ºC	180 days
Chloride	EPA 300.0	Cool 4ºC	28 days
Fluoride	SM 4500-F	Cool 4ºC	28 days
pH	EPA 150.1	Cool 4ºC	Immediately
Sulfate	EPA 300.0	Cool 4ºC	28 days
Total Dissolved Solids	SM 2540C	Cool 4ºC	7 days

At the end of each sampling event, samples were either shipped using a national shipping vendor (e.g. Federal Express), or were hand delivered to the laboratory. When samples were shipped, labels were completed with the address of the contract laboratory and hand delivered to the shipping company. The original air bill was retained as part of the field records to ensure a complete custody history for the samples. To transfer custody, the date and time were recorded on the chain of custody (COC) form by the sampler, the COC was signed, the original retained, and the remaining copies affixed to the lid of the cooler. The cooler was then sealed, custody seals affixed, and the cooler was delivered for shipment or to the laboratory.

4.4 Chain of Custody

A COC record supplied by the analytical laboratory was completed for all samples, as they were collected. The records included the following information:

- Project name and number
- Name of the analytical laboratory destination
- Sampler's signature
- Sample identification number, date and time of collection, filtered/unfiltered
- Number of containers and type of sample
- Analysis requested, and number of containers provided per analysis
- Any special instructions or hazard warnings

Upon relinquishing custody of the samples, both parties (sampler and lab) signed and dated the COC, noting the time of the exchange of custody. The sampler signed first, relinquishing custody, and the laboratory personnel signed next, taking custody. Intermediate signatures may or may not be present, depending on the duration of sampling and related factors. When accepting custody of the samples, laboratory personnel performed a review, comparing information on the sample bottles with the chain-of-custody entries. If an error was noted, the sampler was notified, and the issue was resolved prior to performing analyses. Samples marked preserved were checked for proper pH adjustments to ensure enough preservative was added and cooler temperatures were checked using a temperature blank, or by checking all of the samples. All samples were recorded in the laboratory receiving logbook and given a unique sample-tracking number prior to initiating analysis.

4.5 Analytical Procedures

Industry standard analytical methods were used to quantify the Appendix III and IV constituents in each well during each sampling event. Sample preparation and analysis included measurement of total recoverable metals on unfiltered samples in accordance with EPA Methods 3005A and 200.7 – Inductively Coupled Plasma (ICP) and/or 200.8 ICP – mass spectrometry (MS). Other industry standard analytical methods were also employed for detection and assessment monitoring as outlined below:

- Chloride & Sulfate: EPA Method 300.0 – Ion Chromatography
- Fluoride: Standard Method 4500-F – Ion Selective Electrode
- pH: Standard Method A4500-H – Ion Selective Electrode
- Total Dissolved Solids (TDS): Standard Method 2540C – Gravimetric Method
- Metals: EPA 200.7 / 200.8 and EPA 245.1 (Hg)
- Ra^{226} & Ra^{228}: EPA 903.1 / EPA 904.0

4.6 Quality Assurance / Quality Control

The following sections define the quality control (QC) requirements specified for detection and assessment monitoring in the CCR Landfill sampling and analysis plan.

4.6.1 Field Quality Control Requirements

Field quality control samples were required at a minimum frequency of one field blank and one field duplicate for every 20 field samples. In general, field quality control samples were collected during each sampling event, exceeding the basic requirements outlined in the SAP. They were submitted for analysis with the group of samples they were collected with and underwent analysis for all Appendix III and IV constituents (Table 4).

Field blanks were collected and analyzed to monitor the cleanliness of sample containers, preservatives, and the sampling and analytical process. Field duplicates provided a measure of precision among a group of samples, by providing a direct measurement of the variability between samples in each group. Field blanks were prepared using de-ionized water in randomly selected sample bottles. The blank was then preserved and handled in the same manner as the natural samples it accompanied. Field duplicates were collected using the same collection procedures as the original sample, by collecting a separate sample using the low-flow sampling procedure. The sample was collected immediately following collection of the original sample and preserved and handled in accordance with the SAP provisions. A summary of field quality control performance is provided in Section 5.1.

Note: Equipment rinsates or cross-contamination blanks were not required for this sampling effort as dedicated pumps and tubing were used throughout the groundwater monitoring process.

4.6.2 Laboratory Quality Control Requirements

Laboratory quality control for detection and assessment monitoring consisted of analytical method-specific requirements. Laboratory quality control common to all the analytical methods includes:

- Chain of Custody
- Sample Preservation
- Holding Times
- Method Calibrations
- Field & Method Blanks
- Laboratory Control Samples
- Duplicates
- Matrix Spikes

Each of these elements, as well as method-specific QC requirements and corresponding field documentation underwent a full review as part of data validation. A summary of laboratory quality control performance is provided in Section 5.1.

5.0 ASSESSMENT MONITORING RESULTS AND DISCUSSION

The CCR Landfill was transitioned to assessment monitoring in 2018. Two rounds of sampling and analysis were completed, and these results were compared with groundwater protection standards. All of the samples underwent analysis in accordance with the requirements defined in the *Final Rule*.

In addition, water level data was acquired each time the wells were sampled, in accordance with the SAP. Table 5 provides 2018 assessment monitoring data collected for the CCR Landfill. A full examination of water quality is provided in Section 6.0. Attachments A and B contain groundwater contour maps, data validation, and the laboratory data packages for each event. Attachment B contains statistical analyses comparing downgradient groundwater values to groundwater protection standards.

5.1 Data Quality / Usability

All Appendix III and IV sample results underwent data validation in accordance with the EPA *National Functional Guidelines for Inorganic Data Review* (EPA 2017). The complete results are included in Attachments A & B. None of the analytical data used to assess groundwater quality for the CCR Landfill were rejected due to quality control issues. Several results were qualified J+, J-, or UJ due to a matrix spike outside of recovery criteria. Although qualified, these results meet the usability criteria for evaluating site conditions and decision making (EPA 1989).

5.1.1 Precision

Two field duplicates were collected in support of assessment monitoring at the Hunter Power Plant, one for each sampling event. This equates to a field duplicate frequency of one duplicate for every 11 samples, exceeding the frequency outlined in the SAP of one field duplicate for every 20 samples (5%). This equates to a total of 35 data points acquired. Two field duplicate results fell outside of the +/ 20% precision criteria or had an absolute difference greater than the method detection limit (EPA 2017). This equates to 5.7% of the field duplicate results that did not meet project precision goals. The remaining 94.3% met precision criteria defined for the project.

5.1.2 Accuracy

A total of 385 data points was acquired as part of assessment monitoring for the CCR Landfill. Of these, 24 were qualified during data validation due a matrix spike outside of recovery criteria. This equates to 6.2% of results that received qualification. The remaining 93.8% met all accuracy criteria for the project without qualification.

Table 5. Hunter Power Plant - Ash Landfill **Detection &** Assessment Monitoring Results

SAMPLE ID	WELL TYPE	COLLECTION DATE	TOC AMSL (ft)	DTW (ft)	GWE AMSL (ft)	Appendix III														Appendix IV																											
						B		Ca		Cl		F		pH		SO_4		TDS		Sb		As		Ba		Be		Cd		Cr		Co		Pb		Li		Hg		Mo		Se		Tl		Radium 226+228	
						mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	s.u	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	pCi/L	Q
ELF-1D	Background	9/18/2015	5669.55	84.43	5585.12	NS - Not enough water																																									
		11/10/2015		NM	NM	NS - Not enough water																																									
		12/1/2015		84.41	5585.14	NS - Not enough water																																									
		1/12/2016		84.25	5585.30	NS - Not enough water																																									
		2/2/2016		84.14	5585.41	NS - Not enough water																																									
		3/9/2016		NM	NM	NS - Not enough water																																									
		4/6/2016		83.45	5586.10	NS - Not enough water																																									
		5/4/2016		83.60	5585.95	NS - Not enough water																																									
		5/9/2017		82.60	5586.95	NS - Not enough water																																									
		8/2/2017		82.35	5587.20	NS - Not enough water																																									
		2/15/2018		98.82	5570.73	NS														<0.00200		<0.00200		0.0103		<0.00200		<0.000500		<0.00200		0.00542		<0.00200		2.12		<0.000150		0.0165		<0.00200		<0.00200		2.63	
		5/30/2018		99.87	5569.68	NS - Not enough water																																									
ELF-2	Background	9/18/2015	5612.02	20.20	5591.82	3.31		419		469		0.5		7.30		8150		11400		<0.001		<0.001		<0.05		<0.001		<0.001		<0.001		0.006		0.001		1.50		<0.0001		0.0030		0.608		<0.0005		2.3	
		11/10/2015		20.65	5591.37	3.27		419		444		<0.1		7.22		7870		11300		<0.002		<0.002		0.00915		<0.002		<0.0005		<0.002		<0.004		<0.002		4.93		<0.00015		0.00337		0.556		<0.002		0.8	
		12/1/2015		21.02	5591.00	3.24		392		461		<0.1		7.21		8320		11500		<0.002		<0.002		0.0128		<0.002		<0.0005		<0.002		0.00559		<0.002		3.97		<0.00015		0.00381		0.53		<0.002		8.1	J+
		1/12/2016		21.29	5590.73	3.38		420		473		0.277		7.24		8180		12300		<0.002		<0.002		0.0207		<0.002		<0.0005		<0.002		0.0114		<0.002		4.08		<0.00015		0.00431		0.499		<0.002		1.99	
		2/2/2016		21.43	5590.59	3.50		410		471		0.100		7.14		7350		12000		<0.002		<0.002		0.0119		<0.002		<0.0005		<0.002		0.00501		<0.002		3.93		<0.00015		0.00310		0.450		<0.002		1.25	
		3/9/2016		21.56	5590.46	3.48		395		430		<0.1		7.21		7190		11400		<0.002		<0.002		0.0138		<0.002		<0.0005		<0.002		0.00767		<0.002		2.14		<0.00015		0.00389		0.451		<0.002		2.87	
		4/7/2016		21.67	5590.35	3.33		404		457		<0.1		7.16		8370		12400		<0.002		<0.002		0.0091		<0.002		<0.0005		0.011		<0.004		<0.002		1.34		<0.00015		0.00505		0.463		<0.002		0.94	
		5/4/2016		21.69	5590.33	3.15		364		439		0.103		7.76		8040		11700		<0.002		<0.002		0.00951		<0.002		<0.0005		<0.002		<0.004		<0.002		1.45		<0.00015		0.0030		0.398		<0.002		0.85	
		9/8/2016		22.12	5589.90	3.25		428		446		0.299		7.30		7950		12300		<0.002		<0.002		0.00849		<0.002		<0.0005		<0.002		<0.004		<0.002		3.50		<0.00015		0.00288		0.366		<0.002		0.61	
		5/9/2017		22.21	5589.81	NS - Not enough water																																									
		8/2/2017		22.14	5589.88	3.11		383		363		<0.100		7.42		7950		11600		<0.00200		<0.00200		0.012		<0.00200		<0.000500		<0.00200		0.00565		<0.00200		1.54		<0.000150		0.00321		0.198		<0.00200		1.37	
		2/15/2018		22.30	5589.72	NS														<0.00200		<0.00200		0.0113		<0.00200		<0.000500		<0.00200		0.00677		<0.00200		1.61		<0.000150		0.00305		0.0879		<0.00200		2.29	
		5/30/2018		22.24	5589.78	3.58		369	J-	245		0.192		7.12		6030		12000		<0.00100		<0.00200		0.00998		<0.00200		<0.000500		<0.00200		<0.00400		<0.00200		1.75	J-	<0.000150	J-	0.00255		0.0766		<0.00200		0.99	
ELF-9	Background	9/18/2015	5661.00	NM	NM	NS - Not enough water																																									
		11/10/2015		NM	NM	NS - Not enough water																																									
		12/1/2015		NM	NM	NS - Not enough water																																									
		1/12/2016		51.14	5609.86	NS - Not enough water																																									
		2/2/2016		36.85	5624.15	<5.00		166		284		0.276		7.86		6470		9420		<0.002		0.00499		0.0794		<0.002		<0.0005		0.0157		<0.004		0.00435		2.48		<0.00015		0.0983		0.00424		<0.002		1.14	
		3/9/2016		23.63	5637.37	1.61		84.2		469		0.26		8.05		8030		11900		<0.002		0.00674		0.0411		<0.002		<0.0005		0.00557		<0.004		<0.002		1.05		<0.00015		0.158		<0.002		<0.002		1.15	
		4/7/2016		23.49	5637.51	1.35		112		316		<0.1		7.86		7080		10400		<0.002		0.00679		0.0946		<0.002		<0.0005		0.01830		0.00498		0.00549		0.724		<0.00015		0.129		<0.002		<0.002		2.6	
		5/4/2016		23.47	5637.53	1.30		64.6		282		1.29		7.75		6850		10100		<0.002		0.00546		0.0323		<0.002		<0.0005		0.00359		<0.004		<0.002		1.03		<0.00015		0.122		<0.002		<0.002		0.64	
		9/8/2016		23.40	5637.60	1.36		57.2		352		1.65		8.03		6750		10600		<0.002		0.00524		0.0189		<0.002		<0.0005		<0.002		<0.004		<0.002		1.60		<0.00015		0.123		<0.002		<0.002		0.66	
		5/9/2017		23.39	5637.61	NS - Not enough water																																									
		8/2/2017		31.38	5629.62	1.32		91.9		446		1.27		7.94		6900		12000		<0.00200		0.01140		0.102		<0.00200		0.000532		0.02010		0.0052		0.00768		0.748		<0.000150		0.141		<0.00200		<0.00200		1.84	
		8/29/2017		22.01	5638.99	1.50		53.9		391		1.16		7.94		5830		10500		<0.00200		0.00622		0.0165		<0.00200		<0.000500		<0.00200		<0.00400		<0.00200		0.801		<0.000150		0.106		<0.00200		<0.00200		2.23	
		9/15/2017		23.32	5637.68	1.39		60.3		359		1.84		8.06		5600		11900		<0.00200		0.00762		0.0348		<0.00200		<0.000500		0.00529		<0.00400		<0.00200		0.783		<0.000150		0.117		<0.00200		<0.00200		1.92	
		2/15/2018		22.81	5638.19	NS														<0.00200		0.0117		0.0767		<0.00200		<0.000500		0.0137		<0.00400		0.00489		0.74		<0.000150		0.127		<0.00200		<0.00200		1.38	
		5/30/2018		23.25	5637.75	1.57		52.7	J-	416		1.19		7.89		5460		11200		<0.00100		0.00824		0.0137		<0.00200		<0.000500		<0.00200		<0.00400		<0.00200		1.1	J-	<0.000150	J-	0.109		<0.00200		<0.00200		0.7	
ELF-10	Background	9/18/2015	5620.57	50.64	5569.93	NS - Not enough water																																									
		11/10/2015		43.09	5577.48	1.56		446		6790		<0.1		7.10		19900		37200		<0.002		0.00292		0.0501		<0.002		0.000563		0.00569		0.00788		0.00318		4.59		<0.00015		0.115		0.41		<0.002		0.7	
		12/1/2015		44.21	5576.36	1.68		457		7530		3.98		7.21		20100		40300		<0.002		<0.002		0.0329		<0.002		0.000511		<0.002		0.0055		<0.002		3.49		<0.00015		0.124		0.29		<0.002		14.2	J+
		1/12/2016		46.50	5574.07	1.62		484		7670		4.36		7.41		19800		40100		<0.002		<0.002		0.0353		<0.002		0.000576		<0.002		0.00493		<0.002		3.60		<0.00015		0.124		0.157		<0.002		1.14	
		2/2/2016		46.09	5574.48	NS - Not enough water																																									
		3/9/2016		47.82	5572.75	NS - Not enough water																																									
		4/7/2016		47.35	5573.22	1.54		479		7120		3.97		7.15		20700		38400		<0.002		0.00366		0.0519		<0.002		0.000595		0.00497		0.00444		0.00325		0.841		<0.00015		0.118		0.146		<0.002		2.66	
		5/4/2016		48.73	5571.84	1.48		470		7530		3.87		8.37		19300		37800		<0.002		0.00929		0.08627		<0.002		0.0011		0.0164		0.00793		0.012		1.12		<0.00015		0.107		0.105		<0.002		3.1	
		9/8/2016		48.05	5572.52	NS - Not enough water																																									
		5/9/2017		45.41	5575.16	NS - Not enough water																																									
		8/2/2017		46.80	5573.77	1.64		509		7150		<0.100		7.00		17300		38600		<0.00200		<0.00200		0.0391		<0.00200		0.000563		0.00841		0.00411		0.00217		2.09		<0.000150		0.0871		0.00903		<0.00200		0.46	
		8/29/2017		48.10	5572.47	1.84		500		6960		<0.100		7.28		16800		38200		<0.00200		<0.00200		0.0205		<0.00200		<0.000500		0.00204		<0.00400		<0.00200		1.53		<0.000150		0.0855		0.00821		<0.00200		3.56	
		9/15/2017		51.74	5568.83	1.6		445		5710		0.244		7.23		13100		39600		<0.00200		<0.00200		0.0601		<0.00200		<0.000500		0.00648		<0.00400		0.00311		2.20		<0.000150		0.0795		0.0105		<0.00200		3.42	
		2/15/2018		49.84	5570.73	NS														<0.00200		<0.00200		0.0679		<0.00200		<0.000500		0.00518		0.00429		0.00252		1.88		<0.000150		0.0618		<0.00200		<0.00200		2.3	
		5/30/2018		50.89	5569.68	1.73		468	J-	8790		<0.100		6.99		10000		35300		<0.00100		<0.00200		0.0304		<0.00200		<0.000500		0.00241		<0.00400		<0.00200		2.17	J-	<0.000150	J-	0.0546		<0.00200		<0.00200		2.2	

NS: Not Sampled
NM: Not Measured
GWE: Groundwater Elevation
DTW: Depth to Water
TOC: Top of Casing
AMSL: Above Mean Sea Level

Q: Data Validation Qualifier
J: Estimated
J+: Overestimated
UJ: Estimated Non-Detect
J-: Underestimated

Table 5. Hunter Power Plant - Ash Landfill **Detection &** Monitoring Results

SAMPLE ID	WELL TYPE	COLLECTION DATE	TOC AMSL (ft)	DTW (ft)	GWE AMSL (ft)	Appendix III													
						B		Ca		Cl		F		pH		SO_4		TDS	
						mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	s.u	Q	mg/L	Q	mg/L	Q
ELF-3	Downgradient	9/18/2015	5604.78	34.37	5570.41	NS - Not enough water													
		11/10/2015		NM	NM	NS - Not enough water													
		12/1/2015		34.40	5570.38	NS - Not enough water													
		1/12/2016		34.30	5570.48	NS - Not enough water													
		2/2/2016		34.25	5570.53	NS - Not enough water													
		3/9/2016		NM	NM	NS - Not enough water													
		4/7/2016		34.30	5570.48	NS - Not enough water													
		5/4/2016		NM	NM	NS - Not enough water													
		9/8/2016		34.02	5570.76	NS - Not enough water													
		5/9/2017		33.43	5571.35	NS - Not enough water													
		8/2/2017		33.32	5571.46	1.01		492		609		<0.100		7.79		33000		47700	
		2/15/2018		34.04	5570.74	NS													
		5/30/2018		34.80	5569.98	NS - Not enough water													
ELF-4	Downgradient	9/18/2015	5581.50	15.03	5566.47	4.66		526		2320		0.3		7.20		5790		10400	
		11/10/2015		14.97	5566.53	4.93		486		2040		4.46		6.94		5350		11200	
		12/1/2015		15.12	5566.38	4.88		482		2370		3.67		7.01		6240		11400	
		1/12/2016		15.22	5566.28	5.02		514		2500		3.93		7.52		5900		12400	
		2/2/2016		15.25	5566.25	5.19		495		2170		4.25		6.97		5410		11500	
		3/9/2016		15.36	5566.14	4.96		496		2240		4.06		7.03		5290		11200	
		4/6/2016		15.38	5566.12	4.77		519		2320		3.63		6.97		6110		11300	
		5/4/2016		14.41	5567.09	4.42		476		2280		<0.1		7.16		6010		11600	
		9/8/2016		NM	NM	NS - Not enough water													
		5/9/2017		16.05	5565.45	NS - Not enough water													
		8/2/2017		16.25	5565.25	4.35		483		2240		<0.100		7.21		5750		11600	
		2/15/2018		16.52	5564.98	NS													
		5/30/2018		16.53	5564.97	4.88		456	J-	2200		0.339		6.98		5290		11700	
ELF-5	Downgradient	9/18/2015	5577.79	16.61	5561.18	5.44		464		4250		0.4		7.20		11200		21000	
		11/10/2015		16.20	5561.59	5.89		499		4110		<0.1		6.98		11100		22600	
		12/2/2015		16.74	5561.05	5.53		480		4150		3.49		6.99		11200		21000	
		1/12/2016		16.85	5560.94	6.20		503		4210		4.85		7.26		11100		21300	
		2/2/2016		16.52	5561.27	6.10		481		3750		3.96		7.04		9890		21000	
		3/9/2016		16.47	5561.32	6.55		492		4170		4.62		7.05		10300		22300	
		4/6/2016		16.31	5561.48	5.35		476		3700		3.53		7.10		11200		19200	
		5/4/2016		15.35	5562.44	5.99		465		3900		<0.1		7.19		10700		21100	
		9/8/2016		17.30	5560.49	6.03		491		3980		<0.1		7.03		10300		20600	
		5/9/2017		17.13	5560.66	NS - Not enough water													
		8/2/2017		NM	NM	NS - Not enough water													
		2/15/2018		18.00	5559.79	NS													
		5/30/2018		17.98	5559.81	7.61		459	J-	4420		0.104		7.04		11100		27800	
ELF-6	Downgradient	9/18/2015	5579.61	15.97	5563.64	14.3		531		5650		0.6		7.20		9470		22100	
		11/10/2015		16.02	5563.59	16.0		518		4670		<0.10		6.78		9130		19500	
		12/1/2015		16.09	5563.52	14.4		454		4850		4.03		7.03		10300		19500	
		1/12/2016		16.20	5563.41	14.6		505		NA		NA		NA		NA		NA	
		2/2/2016		16.29	5563.32	13.6		493		4060		5.13		6.94		8800		20100	
		3/9/2016		16.26	5563.35	15.7		500		1190		5.07		6.90		930		20800	
		4/6/2016		16.30	5563.31	13.3		491		4890		4.87		7.04		9910		20200	
		5/4/2016		16.12	5563.49	12.6		491		4630		<0.1		7.40		8400		19600	
		9/8/2016		NM	NM														
		5/9/2017		16.52	5563.09	NS - Not enough water													
		8/2/2017		NM	NM														
		2/15/2018		16.30	5563.31	NS													
		5/30/2018		17.87	5561.74	NS - Not enough water													

SAMPLE ID	COLLECTION DATE	Appendix IV																											
		Sb		As		Ba		Be		Cd		Cr		Co		Pb		Li		Hg		Mo		Se		Tl		Radium 226+228	
		mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	pCi/L	Q
ELF-3	9/18/2015																												
	11/10/2015																												
	12/1/2015																												
	1/12/2016																												
	2/2/2016																												
	3/9/2016																												
	4/7/2016																												
	5/4/2016																												
	9/8/2016																												
	5/9/2017																												
	8/2/2017	<0.00200		<0.00200		0.015		<0.00200		<0.000500		<0.00200		0.00455		<0.00200		4.20		<0.000150		0.032		0.169		<0.00200		3.76	
	2/15/2018	<0.00200		<0.00200		0.0118		<0.00200		<0.000500		<0.00200		<0.00400		<0.00200		2.67		<0.000150		0.0335		0.125		<0.00200		2.22	
	5/30/2018																												
ELF-4	9/18/2015	<0.001		<0.001		<0.05		<0.001		<0.001		0.002	J+	0.008		<0.001		1.70		<0.0001		0.001		0.004	J+	<0.0005		2.1	
	11/10/2015	<0.002		<0.002		0.0116		<0.002		<0.0005		<0.002		0.00583		<0.002		5.41		<0.00015		0.00256		0.00496		<0.002		1.6	
	12/1/2015	<0.002		<0.002		0.0118		<0.002		<0.0005		<0.002		0.00591		<0.002		4.31		<0.00015		0.00256		0.00486		<0.002		11.59	J+
	1/12/2016	<0.002		<0.002		0.0155		<0.002		<0.0005		<0.002		<0.004		<0.002		4.43		<0.00015		0.00297		0.00471		<0.002		1.39	
	2/2/2016	<0.002		<0.002		0.0119		<0.002		<0.0005		<0.002		0.00582		<0.002		4.39		<0.00015		0.00252		0.00352		<0.002		3.6	
	3/9/2016	<0.002		<0.002		0.0153		<0.002		<0.0005		<0.002		0.00729		<0.002		2.37		<0.00015		0.00308		0.0036		<0.002		2.2	
	4/6/2016	<0.002		<0.002		0.0139		<0.002		<0.0005		<0.002		0.00675		<0.002		2.96		<0.00015		0.00260		0.00365		<0.002		0.62	
	5/4/2016	<0.002		<0.002		0.0123		<0.002		<0.0005		<0.002		0.00637		<0.002		1.40		<0.00015		0.00236		0.00281		<0.002		1.98	
	9/8/2016																												
	5/9/2017																												
	8/2/2017	<0.00200		<0.00200		0.0115		<0.00200		<0.000500		<0.00200		0.00611		<0.00200		1.65		<0.000150		0.00266		0.00255		<0.00200		2.57	
	2/15/2018	<0.00200		<0.00200		0.0141		<0.00200		<0.000500		0.00435		0.00833		<0.00200		1.71		<0.000150		0.00261		<0.00200		<0.00200		1.57	
	5/30/2018	<0.00100		<0.00200		0.0116		<0.00200		<0.000500		<0.00200		0.00666		<0.00200		1.78	J-	<0.000150	J-	0.00278		<0.00200		<0.00200		1.81	
ELF-5	9/18/2015	<0.001		<0.001		<0.05		<0.001		<0.001		0.004		<0.005		<0.001		3.70		<0.0001		0.002		0.052	J+	<0.0005		3.2	
	11/10/2015	<0.002		<0.002		0.0131		<0.002		<0.0005		<0.002		<0.004		<0.002		13.7		<0.00015		0.00446		0.0453		<0.002		1.7	
	12/2/2015	<0.002		<0.002		0.00971		<0.002		<0.0005		<0.002		<0.004		<0.002		9.96		<0.00015		0.0044		0.0376		<0.002		10.36	J+
	1/12/2016	<0.002		<0.002		0.0112		<0.002		<0.0005		<0.002		0.00402		<0.002		11.7		<0.00015		0.00451		0.0364		<0.002		1.56	
	2/2/2016	<0.002		<0.002		0.0097		<0.002		<0.0005		<0.002		<0.004		<0.002		10.6		<0.00015		0.00458		0.0325		<0.002		1.61	
	3/9/2016	<0.002		<0.002		0.0123		<0.002		<0.0005		<0.002		0.00413		<0.002		5.83		<0.00015		0.00497		0.0297		<0.002		2.89	
	4/6/2016	<0.002		<0.002		0.0179		<0.002		<0.0005		0.00215		0.00457		<0.002		3.10		<0.00015		0.00446		0.0337		<0.002		3.7	
	5/4/2016	<0.002		<0.002		0.0151		<0.002		<0.0005		<0.002		0.00424		<0.002		5.68		<0.00015		0.00439		0.0306		<0.002		1.75	
	9/8/2016	<0.002		<0.002		0.017		<0.002		<0.0005		0.00232		0.00409		<0.002		8.64		<0.00015		0.00417		0.0397		<0.002		2.02	
	5/9/2017																												
	8/2/2017																												
	2/15/2018	<0.00200		<0.00200		0.0103		<0.00200		<0.000500		<0.00200		<0.00400		<0.00200		4.35		<0.000150		0.00457		0.0181		<0.00200		1.81	
	5/30/2018	<0.00100		<0.00200		0.0117		<0.00200		<0.000500		<0.00200		0.0043		<0.00200		6.85	J-	<0.000150	J-	0.00497		0.025		<0.00200		2.37	
ELF-6	9/18/2015	<0.001		<0.002		<0.05		<0.001		<0.001		0.001	J+	0.027		<0.001		5.80		<0.0001		<0.001		0.284		<0.0005		4.7	
	11/10/2015	<0.002		<0.002		0.0102		<0.002		<0.0005		<0.002		0.0226		<0.002		18.7		<0.00015		<0.002		0.0797		<0.002		1.4	
	12/1/2015	<0.002		<0.002		0.00936		<0.002		<0.0005		<0.002		0.0208		<0.002		14.6		<0.00015		<0.002		0.0887		<0.002		33.62	J+
	1/12/2016	<0.002		<0.002		0.0105		<0.002		<0.0005		<0.002		0.0208		<0.002		15.1		<0.00015		<0.002		0.0892		<0.002		1.68	
	2/2/2016	<0.002		<0.002		0.00932		<0.002		<0.0005		<0.002		0.0191		<0.002		14.2		<0.00015		<0.002		0.0828		<0.002		2.26	
	3/9/2016	<0.002		<0.002		0.0109		<0.002		<0.0005		<0.002		0.0206		<0.002		7.20		<0.00015		<0.002		0.0959		<0.002		2.7	
	4/6/2016	<0.002		<0.002		0.00885		<0.002		<0.0005		<0.002		0.0178		<0.002		1.63		<0.00015		<0.002		0.0951		<0.002		1.93	
	5/4/2016	<0.002		<0.002		0.0115		<0.002		<0.0005		<0.002		0.0186		<0.002		7.92		<0.00015		<0.002		0.0917		<0.002		1.53	
	9/8/2016																												
	5/9/2017																												
	8/2/2017																												
	2/15/2018	<0.00200		<0.00200		0.00994		<0.00200		<0.000500		<0.00200		0.0147		<0.00200		5.5		<0.000150		0.0024		0.0924		<0.00200		1.76	
	5/30/2018																												

NS: Not Sampled
NM: Not Measured
GWE: Groundwater Elevation
DTW: Depth to Water
TOC: Top of Casing
AMSL: Above Mean Sea Level

Q: Data Validation Qualifier
J: Estimated
J+: Overestimated
UJ: Estimated Non-Detect
J-: Underestimated

Table 5. Hunter Power Plant - Ash Landfill **Detection &** Assessment Monitoring Results

SAMPLE ID	WELL TYPE	COLLECTION DATE	TOC AMSL (ft)	DTW (ft)	GWE AMSL (ft)	Appendix III: B (mg/L)	Q	Ca (mg/L)	Q	Cl (mg/L)	Q	F (mg/L)	Q	pH (s.u)	Q	SO_4 (mg/L)	Q	TDS (mg/L)	Q
ELF-7	Downgradient	9/18/2015	5579.81	13.24	5566.57	1.72		496		2800		0.4		7.10		8720		15300	
		11/10/2015		13.42	5566.39	1.86		480		2600		4.00		6.93		8650		19200	
		12/1/2015		13.60	5566.21	1.98		471		2790		3.12		6.99		9050		16800	
		1/12/2016		13.68	5566.13	1.79		480		2910		4.36		7.11		9140		14900	
		2/2/2016		13.67	5566.14	1.81		469		2660		4.63		6.13		8250		17100	
		3/9/2016		13.77	5566.04	1.79		443		2710		3.37		7.01		8180		16800	
		4/6/2016		13.76	5566.05	1.70		485		2850		3.19		6.94		9580		16500	
		5/4/2016		13.87	5565.94	1.58		445		2650		<0.1		7.16		8680		16900	
		9/8/2016		14.12	5565.69	1.84		458		2660		<0.1		7.07		8640		18100	
		5/9/2017		16.27	5563.54	NS - Not enough water													
		8/2/2017		14.37	5565.44	1.72		476		2480		<0.100		7.13		8680		17800	
		2/15/2018		14.71	5565.10	NS													
		5/30/2018		14.25	5565.56	1.86		444	J-	2590		0.329		6.99		8460		17200	
ELF-8	Downgradient	9/18/2015	5584.50	8.37	5576.13	26.6		628		2320		1.40		7.60		3120		7430	
		11/10/2015		8.15	5576.35	30.4		577		2160		<0.1		7.30		3140		7690	
		12/1/2015		8.29	5576.21	30.2		586		2370		0.874		7.52		3410		8070	
		1/12/2016		8.32	5576.18	29.7		623		2380	J+	1.04		7.62		3130		8340	
		2/2/2016		8.14	5576.36	27.2		579		2180		<0.100		7.47		2970		7860	
		3/9/2016		8.26	5576.24	26.6		590		2240		0.837		7.48		2950		7580	
		4/6/2016		8.40	5576.10	25.4		609		2300		<0.1		7.46		3390		7440	
		5/4/2016		8.45	5576.05	25.4		588		2190		0.946		7.61		3170		7900	
		9/8/2016		8.66	5575.84	27.4		595		2350		1.33		7.53		3280		8010	
		5/9/2017		8.60	5575.90	NS - Not enough water													
		8/2/2017		8.79	5575.71	31.6		623		2110		1.69		7.54		3260		8420	
		2/15/2018		8.56	5575.94	NS													
		5/30/2018		8.81	5575.69	28.7		537	J-	1940		0.975		7.47		2820		7920	
ELF-11	Downgradient	9/18/2015	5597.32	28.03	5569.29	14.4		432		1230		0.50		7.50		10200		14300	
		11/10/2015		28.09	5569.23	16.3		419		1180		<0.1		7.40		9890		15200	
		12/1/2015		28.45	5568.87	17.0		410		1290		<0.1		7.39		10900		17600	
		1/12/2016		28.42	5568.90	NS - Not enough water													
		2/2/2016		28.38	5568.94	16.3		414		952		<0.100		7.24		7910		15600	
		3/9/2016		28.46	5568.86	18.1		413		4290		<0.100		7.32		9020		15700	
		4/6/2016		28.41	5568.91	15.2		412		1230		<0.1		7.28		11100		15800	
		5/4/2016		28.31	5569.01	14.9		399		1170		<0.1		8.01		10000		15700	
		9/8/2016		28.20	5569.12	17.3		434		1180		<0.1		7.24		10000		16200	
		5/9/2017		28.13	5569.19	NS - Not enough water													
		8/2/2017		28.36	5568.96	NS - Not enough water													
		2/15/2018		28.20	5569.12	NS													
		5/30/2018		28.19	5569.13	18.8		406	J-	993		0.136		7.23		8780		16700	

SAMPLE ID	COLLECTION DATE	Appendix IV: Sb (mg/L)	Q	As (mg/L)	Q	Ba (mg/L)	Q	Be (mg/L)	Q	Cd (mg/L)	Q	Cr (mg/L)	Q	Co (mg/L)	Q	Pb (mg/L)	Q	Li (mg/L)	Q	Hg (mg/L)	Q	Mo (mg/L)	Q	Se (mg/L)	Q	Tl (mg/L)	Q	Radium 226+228 (pCi/L)	Q
ELF-7	9/18/2015	<0.001		<0.001		<0.05		<0.001		<0.001		<0.001		<0.005		<0.001		2.00		<0.0001		<0.001		0.455		<0.0005		3.0	
	11/10/2015	<0.002		<0.002		0.0101		<0.002		<0.0005		<0.002		0.00529		<0.002		6.83		<0.00015		0.00236		0.392		<0.002		1.5	
	12/1/2015	<0.002		<0.002		0.0112		<0.002		<0.0005		<0.002		0.00508		<0.002		5.41		<0.00015		0.00275		0.408		<0.002		9.8	J+
	1/12/2016	<0.002		<0.002		0.0126		<0.002		<0.0005		<0.002		0.00604		<0.002		5.67		<0.00015		0.00256		0.400		<0.002		1.27	
	2/2/2016	<0.002		<0.002		0.0100		<0.002		<0.0005		<0.002		0.00428		<0.002		5.35		<0.00015		0.00212		0.373		<0.002		3.84	
	3/9/2016	<0.002		<0.002		0.012		<0.002		<0.0005		<0.002		0.00668		<0.002		2.73		<0.00015		0.00295		0.383		<0.002		2.9	
	4/6/2016	<0.002		<0.002		0.00925		<0.002		0.000502		<0.002		0.00447		<0.002		2.64		<0.00015		0.00226		0.421		<0.002		1.39	
	5/4/2016	<0.002		<0.002		0.00983		<0.002		<0.0005		<0.002		0.00483		<0.002		0.639		<0.00015		0.00209		0.36		<0.002		1.64	
	9/8/2016	<0.002		<0.002		0.00957		<0.002		<0.0005		<0.002		0.00498		<0.002		4.59		<0.00015		0.00241		0.36		<0.002		2.34	
	5/9/2017																												
	8/2/2017	<0.00200		<0.00200		0.0124		<0.00200		<0.000500		<0.00200		0.00816		<0.00200		2.12		<0.000150		0.00254		0.253		<0.00200		2.28	
	2/15/2018	<0.00200		<0.00200		0.0107		<0.00200		<0.000500		<0.00200		0.00613		<0.00200		2.13		<0.000150		0.00249		0.175		<0.00200		1.35	
	5/30/2018	<0.00100		<0.00200		0.0088		<0.00200		<0.000500		<0.00200		<0.00400		<0.00200		2.49	J-	<0.000150	J-	0.00249		0.136		<0.00200		1.63	
ELF-8	9/18/2015	<0.001		0.002		0.07		<0.001		0.01		0.013		0.196		0.012		3.50		<0.0001		0.437		<0.004		<0.002		3.6	
	11/10/2015	<0.002		<0.002		0.0163		<0.002		0.000729		<0.002		0.147		0.00527		10.7		<0.00015		0.522		<0.002		<0.002		2.2	
	12/1/2015	<0.002		<0.002		0.0275		<0.002		0.000896		0.0035		0.15		0.00536		8.59		<0.00015		0.488		<0.002		<0.002		18.9	J+
	1/12/2016	<0.002		<0.002		0.0218		<0.002		0.000992		0.00216		0.200		0.00473		9.43		<0.00015		0.459		<0.002		<0.002		1.8	
	2/2/2016	<0.002		<0.002		0.0140		<0.002		<0.0005		<0.002		0.0143		<0.002		8.79		<0.00015		0.0173		0.00716		<0.002		1.98	
	3/9/2016	<0.002		0.00299		0.0533		<0.002		0.00113		0.00887		0.202		0.00682		5.09		<0.00015		0.433		<0.002		<0.002		3.7	
	4/6/2016	<0.002		<0.002		0.0244		<0.002		0.00114		0.00293		0.166		0.00545		<0.1		<0.00015		0.481		<0.002		<0.002		2.6	
	5/4/2016	<0.002		0.00224		0.0507		<0.002		0.00105		0.00966		0.172		0.00657		4.40		<0.00015		0.431		<0.002		<0.002		2.4	
	9/8/2016	<0.002		<0.002		0.012		<0.002		0.0017		<0.002		0.145		0.00628		7.77		<0.00015		0.471		<0.002		<0.002		2.1	
	5/9/2017																												
	8/2/2017	<0.00200		<0.00200		0.0212		<0.00200		0.00294		0.0023		0.161		0.0126		3.54		<0.000150		0.478		<0.00200		<0.00200		1.07	
	2/15/2018	<0.00200		<0.00200		0.013		<0.00200		0.00332		<0.00200		0.197		0.00633		3.68		<0.000150		0.431		<0.00200		<0.00200		1.24	
	5/30/2018	<0.00100		<0.00200		0.0114		<0.00200		0.00199		<0.00200		0.188		0.00737		3.95	J-	<0.000150	J-	0.441		<0.00200		<0.00200		1.98	
ELF-11	9/18/2015	<0.001		<0.001		<0.05		<0.001		<0.001		<0.001		0.017		<0.001		3.20		<0.0001		0.016		0.007		<0.0005		1.2	
	11/10/2015	<0.002		<0.002		0.0203		<0.002		<0.0005		<0.002		0.0151		<0.002		10.2		<0.00015		0.0253		0.00644		<0.002		1.2	
	12/1/2015	<0.002		<0.002		0.0189		<0.002		<0.0005		<0.002		0.0153		<0.002		8.58		<0.00015		0.021		0.00753		<0.002		31.52	J+
	1/12/2016																												
	2/2/2016	<0.002		<0.002		0.0139		<0.002		<0.0005		<0.002		0.0143		<0.002		8.49		<0.00015		0.0174		0.00739		<0.002		2.12	
	3/9/2016	<0.002		<0.002		0.0224		<0.002		<0.0005		<0.002		0.0131		<0.002		4.33		<0.00015		0.0241		0.00545		<0.002		3.23	
	4/6/2016	<0.002		<0.002		0.0191		<0.002		<0.0005		<0.002		0.0147		<0.002		3.29		<0.00015		0.0214		0.007		<0.002		1.24	
	5/4/2016	<0.002		<0.002		0.0245		<0.002		<0.0005		<0.002		0.014		<0.002		4.31		<0.00015		0.0205		0.00666		<0.002		2.78	
	9/8/2016	<0.002		<0.002		0.0163		<0.002		<0.0005		<0.002		0.0126		<0.002		6.44		<0.00015		0.0201		0.00885		<0.002		0.95	
	5/9/2017																												
	8/2/2017																												
	2/15/2018	<0.00200		<0.00200		0.0193		<0.00200		<0.000500		<0.00200		0.0154		<0.00200		3.43		<0.000150		0.022		0.0556		<0.00200		2.03	
	5/30/2018	<0.00100		<0.00200		0.0168		<0.00200		<0.000500		<0.00200		0.0202		<0.00200		3.99	J-	<0.000150	J-	0.0201		0.0727		<0.00200		1.83	

NS: Not Sampled
NM: Not Measured
GWE: Groundwater Elevation
DTW: Depth to Water
TOC: Top of Casing
AMSL: Above Mean Sea Level

Q: Data Validation Qualifier
J: Estimated
J+: Overestimated
UJ: Estimated Non-Detect
J-: Underestimated

5.1.3 Completeness

A total of 385 data points were collected from 11 monitoring wells. When precision and accuracy are given equal weight, 94.0% of the data met all project requirements. Although qualified results are assigned some uncertainty, all the results (100%) are usable to support decision-making and to assess groundwater quality at the CCR Landfill.

6.0 STATISTICAL METHOD SELECTION AND RESULTS

The upper tolerance limit (UTL) approach was selected to evaluate background and downgradient groundwater quality for the CCR Landfill as part of groundwater monitoring. This method was selected because it will support an examination of groundwater quality over time, regardless of the size of the data set. This means a larger dataset and a smaller dataset with similar characteristics should have similar UTLs over time. In addition, constituents exceed the background, or the groundwater protection standard will likely result from conditions originating from the CCR unit, not a change in the size of the data set. Using this approach, an upper tolerance limit for each constituent was established from the background data distribution and each constituent from the downgradient wells was compared to the UTL to determine if an increase was observed above background.

6.1 Detection Monitoring

Results from detection monitoring (2017) revealed all of the Appendix III constituents exceeded site-specific background concentrations (Table 6a). Based on this, the CCR Landfill was transitioned to assessment monitoring in 2018.

Table 6a. Summary of Groundwater Quality Comparisons – Detection Monitoring

Analyte	Background UTL (mg/L)	Downgradient Wells Exceeding Background
Boron	2.99	ELF-11, ELF-4, ELF-5, ELF-6, ELF-8
Calcium	554.8	ELF-8
Chloride	2,630	ELF-11, ELF-5, ELF-6, ELF-7
Fluoride	0.5385	ELF-4, ELF-5, ELF-6, ELF-7, ELF-8
pH Alkaline	8.37	None Exceed
pH Acidic	7.0	ELF-4, ELF-5, ELF-6, ELF-7
Sulfate	15,000	ELF-3
TDS	26,400	ELF-3

6.2 Assessment Monitoring

The *Final Rule* requires the owner or operator of a CCR unit to determine if groundwater protection standards have been exceeded for any Appendix IV constituents as part of assessment monitoring. For the CCR Landfill, site-specific background (UTL) concentrations were combined with *EPA National Primary Drinking Water Standards* to create groundwater protection standards. The higher of these was adopted as the standard and 2018 assessment monitoring values were compared to them to determine if a release had occurred. This comparison is provided in Table 6b and reveals Appendix IV constituents: lithium and molybdenum exceeded the groundwater protection standard. As a result, PacifiCorp initiated a nature and extent investigation to bound the release from the CCR Landfill.

Table 6b. Summary of Groundwater Quality Comparisons – Assessment Monitoring

Analyte	Upper Tolerance Limit (mg/L)	Maximum Contaminant Level (mg/L)	Ground Water Protection Limit (mg/L)	Downgradient Wells that Exceed Upper Tolerance Limit
Antimony	0.002	0.006	0.006	None Exceed
Arsenic	0.012	0.010	0.012	None Exceed
Barium	0.114	2	2	None Exceed
Beryllium	0.002	0.004	0.004	None Exceed
Cadmium	0.001	0.005	0.005	None Exceed
Chromium	0.020	0.10	0.10	None Exceed
Cobalt	0.011	0.006	0.011	None Exceed
Fluoride	4.36	4	4.36	None Exceed
Lead	0.012	0.015	0.015	None Exceed
Lithium	5.205	0.040	5.205	ELF-6, ELF-5
Mercury	0.0002	0.002	0.002	None Exceed
Molybdenum	0.16	0.10	0.16	ELF-8
Radium	8.5	5	8.5	None Exceed
Selenium	0.61	0.05	0.61	None Exceed
Thallium	0.002	0.002	0.002	None Exceed

7.0 CHARACERIZATION OF NATURE & EXTENT OF RELEASE

Because groundwater protection standards were exceeded at the waste unit boundary, PacifiCorp has initiated a supplemental investigation to support an evaluation of the nature and extent of the release from the CCR Landfill. The investigation utilizes data from existing wells, as well as, new wells placed on the facility boundary to comply with the *Final Rule*, and to bound the release on the Hunter Power Plant. The investigation will also incorporate data obtained from source material reflecting past disposal in CCR Landfill. Results from these efforts are being evaluated and a report detailing the nature and extent of the release will be included in the

Corrective Measures Study for the CCR Landfill and the Annual Groundwater Monitoring and Corrective Action Report for 2019.

8.0 FINDINGS AND CONCLUSIONS

The results of the detection monitoring completed in 2017, revealed all Appendix III exceeded site-specific background concentrations in the downgradient monitoring wells (Table 6a). As a result, the CCR Landfill was transitioned to assessment monitoring in 2018. The results of 2018 assessment monitoring concluded Appendix IV constituents, lithium and molybdenum exceeded their groundwater protection standards.

Based on this, PacifiCorp began the process to define the nature and extent of the release at the Hunter Power Plant in accordance with the *Final Rule*. This work will be completed in 2019. In accordance with the *Final Rule*, because groundwater at the waste unit boundary exceeded groundwater protection standards, the CCR Landfill will proceed to corrective measures in 2019.

9.0 UPCOMING YEAR

During 2019, it is anticipated PacifiCorp will complete the following activities at the CCR Landfill:

Semi-Annual Monitoring

- Conduct the first semi-annual monitoring event for Appendix III and IV constituents;
- Perform statistical analysis of data;
- Conduct the second semi-annual monitoring event for Appendix III and IV constituents;
- Perform statistical analysis of data; and
- Develop the Annual Groundwater Monitoring and Corrective Action Report.

Corrective Measures

- Complete characterization and extent of release;
- Complete an assessment of corrective measures;
- Develop a corrective measures study;
- Conduct a public meeting to discuss the corrective measures study;
- Select the preferred remedy alternative;
- Begin remediation; and
- Develop a semi-annual corrective measures progress report.

10.0 REFERENCES

EPA 2017. National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-201 7-001, January 2017.

EPA 2010. Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater from Monitoring Wells, EPASOP-GW 001, January 2010.

EPA 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A), EPA/540/1-89/002, December 1989.

Hale, L.A. and F.R. Van De Graaff, 1964. Guidebook to the Geology and Mineral Resources of the Uinta Basin: Utah's Hydrocarbon Storehouse. 1964 Copyright 2012 Utah Geological Association.

Hettinger, R.D. and Kirschbaum, M.A. 2002. Stratigraphy of the Upper Cretaceous Mancos Shale (Upper Part) and Mesaverde Group in the Southern Part of the Uinta and Piceance Basins, Utah and Colorado, USGS Geologic Investigation Series I-2764.

Morris, D.A. and Johnson, A.I. (1967). Summary of Hydrologic and Physical Properties of Rock and Soil Materials, as Analyzed by the Hydrologic Laboratory of the U.S. Geological Survey, 1948-1960. USGS Water Supply Paper: 1839-D. In Kresic N. 2007. Hydrogeology and Groundwater Modeling, p 111. CRC Press.

Waddell, K.M. Contratto, P.K. Sumison, C.T. and Butler, J.R. 1979. Hydrologic Reconnaissance of the Wasatch Plateau-Book Cliffs Coal-Fields Area, Utah. USGS Geological Survey – Water Supply Paper 2068.

WET, 2017. Sampling and Analysis Plan & Well Documentation, CCR Landfill – Hunter Power Plant, Castle Dale, Utah, Revision 1, October 2017.

Figures

Legend

MasterWells

N
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Feet
0 300 600 1,200

PACIFICORP

Water & Environmental TECHNOLOGIES

HUNTER POWER PLANT

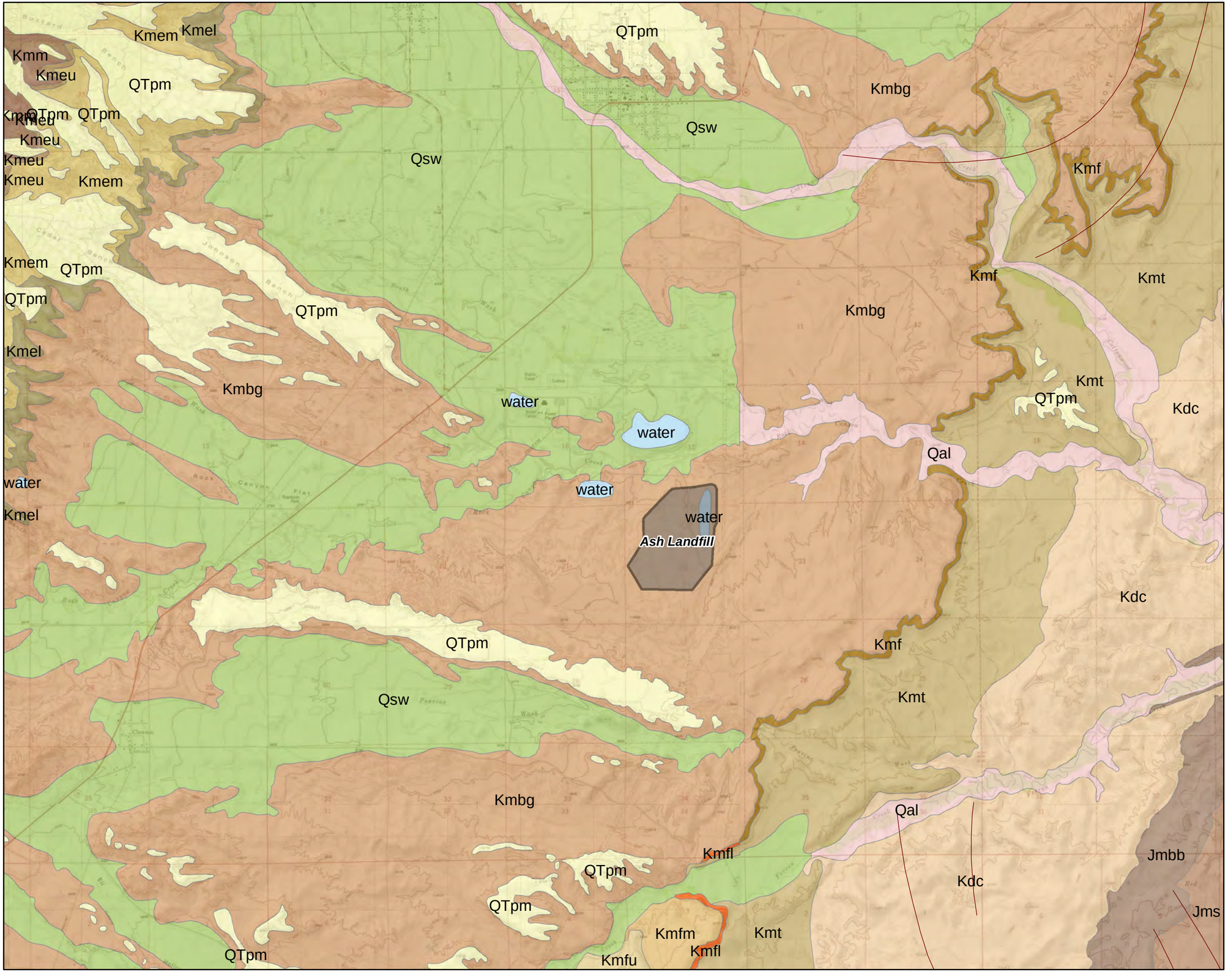
CCR Sample Locations

Job#: PERCM52

Date: 1/21/2019

FIGURE 1

Path: M:\PERC_CCR\Hunter\2018\Moly_53018.mxd, Author: jlieprowse



Legend

Folds

Geologic Unit

- Jmbb, Brushy Basin Member of Morrison Formation
- Jms, Salt Wash Sandstone Member of Morrison Formation
- Js, Summerville Formation
- Kdc, Dakota Sandstone and Cedar Mountain Formation
- Kmbg, Blue Gate Member of the Mancos Shale
- Kmel, Lower unit of the Emery Sandstone Member of the Mancos Shale
- Kmem, Middle unit of the Emery Sandstone Member of the Mancos Shale
- Kmeu, Upper unit of the Emery Sandstone Member of the Mancos Shale
- Kmf, Ferron Sandstone Member of Mancos Shale
- Kmfl, Lower unit of the Ferron Sandstone Member of the Mancos Shale
- Kmfm, Middle unit of the Ferron Sandstone Member of the Mancos Shale
- Kmfu, Upper unit of the Ferron Sandstone Member of the Mancos Shale
- Kmm, Masuk Member of the Mancos Shale
- Kmt, Tununk Member of the Mancos Shale
- QTpm, Pediment Mantle
- Qal, Alluvium
- Qsw, Slope wash
- water, water

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Feet
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Water & Environmental TECHNOLOGIES

HUNTER POWER PLANT

Geologic Map

Job#: PERCM52

Date: 12/20/2017

FIGURE 2

Path: M:\PERC_CCR\Hunter\Figure 2_Geology.mxd, Author: Stefanie

ATTACHMENT A:

Field Summary Report – February 2018 Event

Facility Name: Hunter Power Plant – CCR Landfill
Event Description: Assessment Monitoring
Event Dates: February 15, 2018
Field Personnel: Mike Shirley, Rebecca Farren

ACTIVITY SUMMARY. WET personnel arrived onsite at Hunter Power Plant on February 15, 2018 and performed groundwater sampling at CCR unit CCR Landfill. Prior to collecting samples, field instruments were calibrated, followed by the collection of water levels in the CCR monitoring wells. After recording water levels, the wells were purged in accordance with the EPA low-flow method. Field parameters were monitored during well purging in accordance with the site-specific sampling and analysis plan (SAP). Once field parameters met the SAP stabilization requirements, groundwater samples were collected for Appendix IV constituents. All calibration data and field measurements were recorded on the WET electronic field form. The wells that underwent sampling during this sampling event included:

- ELF-1D
- ELF-2
- ELF-3
- ELF-4
- ELF-5
- ELF-6
- ELF-7
- ELF-8
- ELF-9
- ELF-10
- ELF-11

After collection, the samples were preserved in accordance with the SAP, placed on ice, chain of custody forms were completed, and the samples were transported to American West Analytical Laboratories (AWAL) in Salt Lake City, Utah for analysis on February 15, 2018. The following details dates for conducting fieldwork and post-fieldwork data processing:

- Date(s) fieldwork completed: 2/15/2018
- Date(s) unvalidated lab data received:
  - Water Quality (AWAL): 3/1/2018
  - Radium 226 + 228 (ACZ): 3/15/2018
- Data validation completion date: 4/2/2018

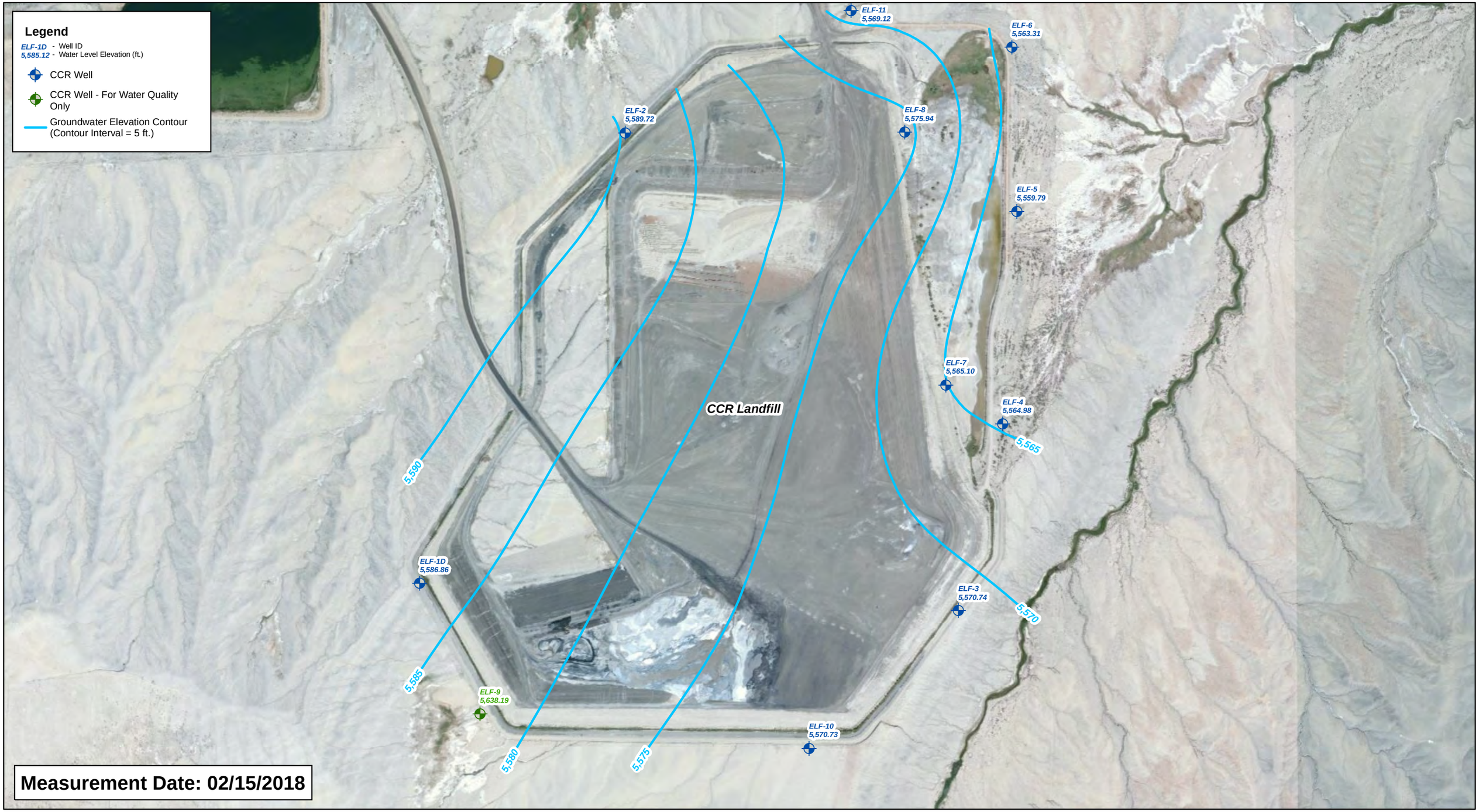
The following information is attached to this summary as a supplement:

- Attachment A: Groundwater Contour Map
- Attachment B: Data Validation Summary
- Attachment C: Field Data Sheets
- Attachment D: Laboratory Analytical Reports

SAP DEVIATIONS. There were no deviations from the SAP during this sampling event.

Attachment A:

Groundwater Contour Map



N
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Feet

0 300 600 1,200 1,800 2,400

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HUNTER POWER PLANT

Groundwater Elevation Map
CCR Landfill

Job#: PERCM053

Date: 5/1/2018

Attachment 1

Path: M:\PERC_CCR\Feb_2018_Sampling\All_Sites_DDPs.mxd, Author: brutherford

Attachment B:

Data Validation Summary

DATA VALIDATION SUMMARY
CCR COMPLIANCE SAMPLING

Facility Name:	Hunter	
Validator:	Tim Driscoll 4/2/2018	
Reviewer:	Pat Seccomb 04-10-18	
Laboratory:	American West Analytical Laboratories	
Laboratory Work Order#:	1802329	
Sample Media:	Groundwater	
Analytical Parameters:	**Appendix IV:** Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Se, Tl, Ra^{226} + Ra^{228}	
Review Element:	**Complete / Criteria Met? (Yes/No)**	**If no, describe:**
Chain of Custody:	Yes	
Field Documentation:	Yes	
Holding Times & Sample Preservation:	Yes	
Calibrations:	Yes	
Blanks:	Yes	
Laboratory Control Sample:	Yes	
Laboratory Duplicate:	Yes	
Matrix Spike:	Yes	
Overall Assessment:		
No qualifications were required.		

Attachment C:

Field Data Sheets

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-1D	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, windy		
Depth to Water (ft):	82.69	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	0.00

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	9.20	21,798	7.05	7.29	213.20	21.40
2	10.00	22,455	5.54	7.18	227.80	21.40
6	10.80	22,785	3.01	6.90	223.70	4.80
8	10.80	22,812	2.46	6.84	221.00	4.50
10	10.80	22,691	0.55	6.77	165.40	4.20

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	12:15

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

FINAL DTW=TOP OF PUMP

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Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-2	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	SUNNY, WINDS		
Depth to Water (ft):	22.30	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	Not Measured

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	13.10	9,331	2.59	6.87	224.00	25.10
2	13.10	9,327	1.33	6.88	222.10	25.10
6	13.00	9,319	0.99	6.88	221.10	9.80
8	13.10	9,325	0.71	6.89	219.60	8.93
10	13.10	9,332	0.60	6.89	219.00	5.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	11:45

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

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Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM053
Sample ID:	ELF-3	**Project Location:**	Huntington UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, BREEZY		
Depth to Water (ft):	34.04	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	Not Measured

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	2.00	26,776	8.92	7.63	228.90	35.50
2	8.80	27,137	8.54	7.44	224.20	35.50
6	9.10	26,959	6.36	7.34	221.70	57.20
8	9.50	2,825	5.48	7.29	219.90	53.10
10	9.60	26,702	3.84	7.27	218.20	50.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	10:45

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

SLOW PRODUCER

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	RF	**Project Number:**	PERCM052
Sample ID:	ELF-4	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, cold		
Depth to Water (ft):	16.52	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	16.52

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	8.60	14,392	5.74	7.30		
2	11.70	15,034	2.66	7.00		
4	12.10	15,419	1.65	6.93		
6	12.10	15,255	1.11	6.91		60.00
8	12.20	15,444	0.96	6.90		54.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	9:52

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	RF	**Project Number:**	PERCM052
Sample ID:	ELF-5	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Cold, sunny		
Depth to Water (ft):	18.00	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	18.00

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	8.60	39,688	5.72	7.13		
2	11.40	39,892	1.78	6.94		
4	11.50	39,681	2.25	6.82		
6	11.90	39,579	2.55	6.81		46.00
8	12.10	39,256	1.22	6.79		

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	9:20

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM053
Sample ID:	ELF-6	**Project Location:**	Huntington UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, warm		
Depth to Water (ft):	16.30	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	Not Measured

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	13.50	36	8.01	4.13	246.90	988.00
2	9.00	15,544	4.47	6.83	201.00	988.00
6	9.30	15,568	3.91	6.83	196.70	214.00
8	9.80	15,670	3.04	6.83	190.80	200.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	9:45

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	RF	**Project Number:**	PERCM052
Sample ID:	ELF-7	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, cold		
Depth to Water (ft):	14.74	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	14.74

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	9.80	20,367	6.14	7.19		
2	12.20	22,363	0.59	6.90		
4	12.30	22,478	0.37	6.88		
6	12.30	22,467	0.35	6.86		136.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	10:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

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Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-8	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	PARTLY CLOUDY ~30F		
Depth to Water (ft):	8.56	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	Not Measured

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	12.40	7,525	0.28	6.93	157.00	221.00
2	12.40	9,925	0.14	7.17	141.00	221.00
4	12.40	7,538	0.14	7.24	129.90	75.00
6	12.40	7,549	0.14	7.26	122.30	62.20

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	8:37

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	RF	**Project Number:**	PERCM052
Sample ID:	ELF-9	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, chilly		
Depth to Water (ft):	22.81	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	22.81

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
4	11.50	15,250	1.63	7.83		21.00
6	11.50	15,830	1.16	7.81		21.00
8	11.50	15,970	0.52	7.79		178.00
10	11.50	15,893	0.45	7.78		224.00
12	11.40	15,395	0.23	7.77		230.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	12:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

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480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	RF	**Project Number:**	PERCM052
Sample ID:	ELF-10	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, cold, breezy		
Depth to Water (ft):	49.84	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	49.84

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	10.50	25,606	3.28	6.71		
2	10.80	45,158	1.14	6.73		
4	11.20	45,816	0.98	6.72		
6	10.90	45,697	0.98	6.72		227.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	10:50

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Landfill		
Sampler Initials:	RF	**Project Number:**	PERCM052
Sample ID:	ELF-11	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	2/15/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Cold, still		
Depth to Water (ft):	28.20	**Total Well Depth (ft):**	SAP
Well Diameter (in):	2	**Final DTW (ft):**	28.20

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
2	12.00	26,274	1.01	6.85		737.00
4	12.30	19,842	1.14	6.88		737.00
6	12.20	26,179	1.02	6.94		207.00
8	12.30	25,908	1.22	6.96		
10	12.50	25,729	1.19	6.99		75.00

SAMPLE COLLECTION

Appendix:	4	**Sample Time:**	8:55

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

FB-1 field blank taken 8:00 am

Attachment D:

Laboratory Analytical Reports

AMERICAN
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Jeff Tucker
PacifICorp
1407 West North Temple, # 280
Salt Lake City, UT 84116
TEL: (801) 220-2989

RE: Hunter CCR Sampling / PERCM52

Dear Jeff Tucker: Lab Set ID: 1802329

American West Analytical Laboratories received sample(s) on 2/15/2018 for the analyses presented in the following report.

American West Analytical Laboratories (AWAL) is accredited by The National Environmental Laboratory Accreditation Program (NELAP) in Utah and Texas; and is state accredited in Colorado, Idaho, New Mexico, Wyoming, and Missouri.

All analyses were performed in accordance to the NELAP protocols unless noted otherwise. Accreditation scope documents are available upon request. If you have any questions or concerns regarding this report please feel free to call.

The abbreviation "Surr" found in organic reports indicates a surrogate compound that is intentionally added by the laboratory to determine sample injection, extraction, and/or purging efficiency. The "Reporting Limit" found on the report is equivalent to the practical quantitation limit (PQL). This is the minimum concentration that can be reported by the method referenced and the sample matrix. The reporting limit must not be confused with any regulatory limit. Analytical results are reported to three significant figures for quality control and calculation purposes.

Thank You,

Approved by: Jose G. Rocha
Laboratory Director or designee

Sample(s) were subcontracted for the following analyses:
Radiological Testing

INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-001
Client Sample ID: ELF-11
Collection Date: 2/15/2018 855h
Received Date: 2/15/2018 1600h

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Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	**0.0193**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00400	**0.0154**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1631h	E200.7	0.100	**3.43**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 838h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	**0.0220**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	**0.0556**	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1407h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-002
Client Sample ID: FB-1
Collection Date: 2/15/2018 800h
Received Date: 2/15/2018 1600h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00400	< 0.00400	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1700h	E200.7	0.100	< 0.100	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 847h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1422h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-003
Client Sample ID: ELF-5
Collection Date: 2/15/2018 920h
Received Date: 2/15/2018 1600h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	**0.0103**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00400	< 0.00400	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1643h	E200.7	0.100	**4.35**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 849h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	**0.00457**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	**0.0181**	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1425h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifICorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-004
Client Sample ID: ELF-4
Collection Date: 2/15/2018 952h
Received Date: 2/15/2018 1600h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	**0.0141**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	**0.00435**	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00400	**0.00833**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1702h	E200.7	0.100	**1.71**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 851h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	**0.00261**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1428h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-005
Client Sample ID: ELF-7
Collection Date: **2/15/2018 1030h**
Received Date: **2/15/2018 1600h**

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	**0.0107**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	**0.000500**	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	**0.00400**	**0.00613**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1707h	E200.7	0.100	**2.13**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 853h	E245.1	**0.000150**	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	**0.00249**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	**0.175**	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1440h	E200.8	0.00200	< 0.00200	

INORGANIC ANALYTICAL REPORT

Client: PacifICorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-006
Client Sample ID: ELF-10
Collection Date: 2/15/2018 1050h
Received Date: 2/15/2018 1600h

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Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	**0.0679**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	**0.00518**	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00400	**0.00429**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	**0.00252**	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1718h	E200.7	0.100	**1.88**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 855h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	**0.0618**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1443h	E200.8	0.00200	< 0.00200	

INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-007
Client Sample ID: ELF-9
Collection Date: 2/15/2018 1230h
Received Date: 2/15/2018 1600h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	**0.0117**	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	**0.0767**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	**0.0137**	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00400	< 0.00400	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	**0.00489**	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1721h	E200.7	0.100	**0.740**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 856h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	**0.127**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1446h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifICorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-008
Client Sample ID: ELF-ID
Collection Date: 2/15/2018 1215h
Received Date: 2/15/2018 1600h

AMERICAN WEST ANALYTICAL LABORATORIES

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Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	**0.0103**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00400	**0.00542**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1723h	E200.7	0.100	**2.12**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 858h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	**0.0165**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1449h	E200.8	0.00200	< 0.00200	

INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-009
Client Sample ID: ELF-6
Collection Date: 2/15/2018 945h
Received Date: 2/15/2018 1600h

AMERICAN WEST ANALYTICAL LABORATORIES

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Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	**0.00994**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00400	**0.0147**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1725h	E200.7	0.100	**5.50**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 900h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	**0.00240**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	**0.0924**	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1452h	E200.8	0.00200	< 0.00200	

INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-010
Client Sample ID: ELF-8 DUP
Collection Date: 2/15/2018 915h
Received Date: 2/15/2018 1600h

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Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	**0.0126**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.000500	**0.00264**	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00400	**0.198**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	**0.00624**	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1739h	E200.7	0.100	**3.74**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 902h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	**0.440**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1455h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-011
Client Sample ID: ELF-8
Collection Date: 2/15/2018 900h
Received Date: 2/15/2018 1600h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	**0.0130**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.000500	**0.00332**	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00400	**0.197**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	**0.00633**	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1741h	E200.7	0.100	**3.68**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 908h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	**0.431**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1458h	E200.8	0.00200	< 0.00200	

INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-012
Client Sample ID: ELF-3
Collection Date: 2/15/2018 1045h
Received Date: 2/15/2018 1600h

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Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	**0.0118**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00400	< 0.00400	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1840h	E200.7	1.00	**2.67**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 910h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	**0.0335**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	**0.125**	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1501h	E200.8	0.00200	< 0.00200	

INORGANIC ANALYTICAL REPORT

Client: PacifiCorp **Contact:** Jeff Tucker
Project: Hunter CCR Sampling / PERCM52
Lab Sample ID: 1802329-013
Client Sample ID: ELF-2
Collection Date: 2/15/2018 1145h
Received Date: 2/15/2018 1600h

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Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	< 0.00200	
Arsenic	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	< 0.00200	
Barium	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	**0.0113**	
Beryllium	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	< 0.00200	
Cadmium	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.000500	< 0.000500	
Chromium	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00400	**0.00677**	
Lead	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	2/16/2018 1334h	2/27/2018 1746h	E200.7	0.100	**1.61**	
Mercury	mg/L	2/22/2018 1413h	2/23/2018 911h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	**0.00305**	
Selenium	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	**0.0879**	
Thallium	mg/L	2/16/2018 1334h	2/19/2018 1504h	E200.8	0.00200	< 0.00200	

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PC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1802329
Project: Hunter CCR Sampling / PERCM52

Contact: Jeff Tucker
Dept: ME
QC Type: LCS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: **LCS-54215**	Date Analyzed:	02/27/2018 1629h											
Test Code: 200.7-W	Date Prepared:	02/16/2018 1334h											
Lithium	0.983	mg/L	E200.7	0.00194	0.100	1.000	0	98.3	80 - 120				
Lab Sample ID: **LCS-54216**	Date Analyzed:	02/19/2018 1404h											
Test Code: 200.8-W	Date Prepared:	02/16/2018 1334h											
Antimony	0.186	mg/L	E200.8	0.000416	0.00200	0.2000	0	93.2	85 - 115				
Arsenic	0.200	mg/L	E200.8	0.000177	0.00200	0.2000	0	99.9	85 - 115				
Barium	0.195	mg/L	E200.8	0.000228	0.00200	0.2000	0	97.4	85 - 115				
Beryllium	0.202	mg/L	E200.8	0.0000318	0.00200	0.2000	0	101	85 - 115				
Cadmium	0.199	mg/L	E200.8	0.000226	0.000500	0.2000	0	99.3	85 - 115				
Chromium	0.201	mg/L	E200.8	0.000210	0.00200	0.2000	0	101	85 - 115				
Cobalt	0.200	mg/L	E200.8	0.0000336	0.00400	0.2000	0	99.9	85 - 115				
Lead	0.192	mg/L	E200.8	0.000308	0.00200	0.2000	0	95.8	85 - 115				
Molybdenum	0.198	mg/L	E200.8	0.000692	0.00200	0.2000	0	99.2	85 - 115				
Selenium	0.202	mg/L	E200.8	0.000176	0.00200	0.2000	0	101	85 - 115				
Thallium	0.188	mg/L	E200.8	0.000462	0.00200	0.2000	0	94.1	85 - 115				
Lab Sample ID: **LCS-54296**	Date Analyzed:	02/23/2018 832h											
Test Code: HG-DW-245.1	Date Prepared:	02/22/2018 1413h											
Mercury	0.00332	mg/L	E245.1	0.00000511	0.000150	0.003330	0	99.6	85 - 115				

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PC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1802329
Project: Hunter CCR Sampling / PERCM52

Contact: Jeff Tucker
Dept: ME
QC Type: MBLK

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: MB-54215	Date Analyzed:	02/27/2018 1627h											
Test Code: 200.7-W	Date Prepared:	02/16/2018 1334h											
Lithium	< 0.100	mg/L	E200.7	0.00194	0.100								
Lab Sample ID: MB-54216	Date Analyzed:	02/19/2018 1401h											
Test Code: 200.8-W	Date Prepared:	02/16/2018 1334h											
Antimony	< 0.00200	mg/L	E200.8	0.000416	0.00200								
Arsenic	< 0.00200	mg/L	E200.8	0.000177	0.00200								
Barium	< 0.00200	mg/L	E200.8	0.000228	0.00200								
Beryllium	< 0.00200	mg/L	E200.8	0.0000318	0.00200								
Cadmium	< 0.000500	mg/L	E200.8	0.000226	0.000500								
Chromium	< 0.00200	mg/L	E200.8	0.000210	0.00200								
Cobalt	< 0.00400	mg/L	E200.8	0.0000336	0.00400								
Lead	< 0.00200	mg/L	E200.8	0.000308	0.00200								
Molybdenum	< 0.00200	mg/L	E200.8	0.000692	0.00200								
Selenium	< 0.00200	mg/L	E200.8	0.000176	0.00200								
Thallium	< 0.00200	mg/L	E200.8	0.000462	0.00200								
Lab Sample ID: MB-54296	Date Analyzed:	02/23/2018 830h											
Test Code: HG-DW-245.1	Date Prepared:	02/22/2018 1413h											
Mercury	< 0.000150	mg/L	E245.1	0.00000511	0.000150								

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PC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1802329
Project: Hunter CCR Sampling / PERCM52

Contact: Jeff Tucker
Dept: ME
QC Type: MS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 1802329-001AMS	Date Analyzed:	02/27/2018 1636h											
Test Code: 200.7-W	Date Prepared:	02/16/2018 1334h											
Lithium	4.45	mg/L	E200.7	0.00194	0.100	1.000	3.43	101	75 - 125				
Lab Sample ID: 1802329-013AMS	Date Analyzed:	02/27/2018 1757h											
Test Code: 200.7-W	Date Prepared:	02/16/2018 1334h											
Lithium	2.73	mg/L	E200.7	0.00194	0.100	1.000	1.61	112	75 - 125				
Lab Sample ID: 1802329-001AMS	Date Analyzed:	02/19/2018 1416h											
Test Code: 200.8-W	Date Prepared:	02/16/2018 1334h											
Antimony	0.203	mg/L	E200.8	0.000416	0.00200	0.2000	0.00106	101	75 - 125				
Arsenic	0.223	mg/L	E200.8	0.000177	0.00200	0.2000	0.000827	111	75 - 125				
Barium	0.210	mg/L	E200.8	0.000228	0.00200	0.2000	0.0193	95.2	75 - 125				
Beryllium	0.199	mg/L	E200.8	0.0000318	0.00200	0.2000	0.00012	99.5	75 - 125				
Cadmium	0.196	mg/L	E200.8	0.000226	0.000500	0.2000	0.000257	98.0	75 - 125				
Chromium	0.197	mg/L	E200.8	0.000210	0.00200	0.2000	0.00164	97.5	75 - 125				
Cobalt	0.204	mg/L	E200.8	0.0000336	0.00400	0.2000	0.0154	94.2	75 - 125				
Lead	0.182	mg/L	E200.8	0.000308	0.00200	0.2000	0.00109	90.6	75 - 125				
Molybdenum	0.243	mg/L	E200.8	0.000692	0.00200	0.2000	0.022	110	75 - 125				
Selenium	0.265	mg/L	E200.8	0.000176	0.00200	0.2000	0.0556	105	75 - 125				
Thallium	0.177	mg/L	E200.8	0.000462	0.00200	0.2000	0	88.6	75 - 125				
Lab Sample ID: 1802329-013AMS	Date Analyzed:	02/19/2018 1507h											
Test Code: 200.8-W	Date Prepared:	02/16/2018 1334h											
Antimony	0.206	mg/L	E200.8	0.000416	0.00200	0.2000	0	103	75 - 125				
Arsenic	0.228	mg/L	E200.8	0.000177	0.00200	0.2000	0.000256	114	75 - 125				
Barium	0.206	mg/L	E200.8	0.000228	0.00200	0.2000	0.0113	97.4	75 - 125				
Beryllium	0.199	mg/L	E200.8	0.0000318	0.00200	0.2000	0	99.4	75 - 125				
Cadmium	0.199	mg/L	E200.8	0.000226	0.000500	0.2000	0	99.6	75 - 125				
Chromium	0.195	mg/L	E200.8	0.000210	0.00200	0.2000	0.00111	97.0	75 - 125				

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: **1802329**
Project: Hunter CCR Sampling / PERCM52

Contact: Jeff Tucker
Dept: ME
QC Type: MS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 1802329-013AMS	Date Analyzed: 02/19/2018 1507h												
Test Code: 200.8-W	Date Prepared: 02/16/2018 1334h												
Cobalt	0.197	mg/L	E200.8	0.0000336	0.00400	0.2000	0.00677	94.9	75 - 125				
Lead	0.180	mg/L	E200.8	0.000308	0.00200	0.2000	0.000313	89.8	75 - 125				
Molybdenum	0.223	mg/L	E200.8	0.000692	0.00200	0.2000	0.00305	110	75 - 125				
Selenium	0.315	mg/L	E200.8	0.000176	0.00200	0.2000	0.0879	113	75 - 125				
Thallium	0.175	mg/L	E200.8	0.000462	0.00200	0.2000	0	87.3	75 - 125				
Lab Sample ID: 1802329-001AMS	Date Analyzed: 02/23/2018 840h												
Test Code: HG-DW-245.1	Date Prepared: 02/22/2018 1413h												
Mercury	0.00278	mg/L	E245.1	0.00000511	0.000150	0.003330	0	83.6	80 - 120				

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1802329
Project: Hunter CCR Sampling / PERCM52

Contact: Jeff Tucker
Dept: ME
QC Type: MSD

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 1802329-001AMSD	Date Analyzed:	02/27/2018 1638h											
Test Code: 200.7-W	Date Prepared:	02/16/2018 1334h											
Lithium	4.50	mg/L	E200.7	0.00194	0.100	1.000	3.43	107	75 - 125	4.45	1.25	20	
Lab Sample ID: 1802329-013AMSD	Date Analyzed:	02/27/2018 1800h											
Test Code: 200.7-W	Date Prepared:	02/16/2018 1334h											
Lithium	2.73	mg/L	E200.7	0.00194	0.100	1.000	1.61	112	75 - 125	2.73	0.0763	20	
Lab Sample ID: 1802329-001AMSD	Date Analyzed:	02/19/2018 1419h											
Test Code: 200.8-W	Date Prepared:	02/16/2018 1334h											
Antimony	0.203	mg/L	E200.8	0.000416	0.00200	0.2000	0.00106	101	75 - 125	0.203	0.173	20	
Arsenic	0.223	mg/L	E200.8	0.000177	0.00200	0.2000	0.000827	111	75 - 125	0.223	0.0443	20	
Barium	0.209	mg/L	E200.8	0.000228	0.00200	0.2000	0.0193	94.6	75 - 125	0.21	0.572	20	
Beryllium	0.196	mg/L	E200.8	0.0000318	0.00200	0.2000	0.00012	97.8	75 - 125	0.199	1.75	20	
Cadmium	0.195	mg/L	E200.8	0.000226	0.000500	0.2000	0.000257	97.4	75 - 125	0.196	0.602	20	
Chromium	0.196	mg/L	E200.8	0.000210	0.00200	0.2000	0.00164	97.0	75 - 125	0.197	0.515	20	
Cobalt	0.203	mg/L	E200.8	0.0000336	0.00400	0.2000	0.0154	93.6	75 - 125	0.204	0.629	20	
Lead	0.179	mg/L	E200.8	0.000308	0.00200	0.2000	0.00109	89.2	75 - 125	0.182	1.62	20	
Molybdenum	0.241	mg/L	E200.8	0.000692	0.00200	0.2000	0.022	109	75 - 125	0.243	0.846	20	
Selenium	0.264	mg/L	E200.8	0.000176	0.00200	0.2000	0.0556	104	75 - 125	0.265	0.354	20	
Thallium	0.173	mg/L	E200.8	0.000462	0.00200	0.2000	0	86.5	75 - 125	0.177	2.30	20	
Lab Sample ID: 1802329-013AMSD	Date Analyzed:	02/19/2018 1519h											
Test Code: 200.8-W	Date Prepared:	02/16/2018 1334h											
Antimony	0.209	mg/L	E200.8	0.000416	0.00200	0.2000	0	104	75 - 125	0.206	1.39	20	
Arsenic	0.225	mg/L	E200.8	0.000177	0.00200	0.2000	0.000256	112	75 - 125	0.228	1.33	20	
Barium	0.204	mg/L	E200.8	0.000228	0.00200	0.2000	0.0113	96.3	75 - 125	0.206	1.07	20	
Beryllium	0.193	mg/L	E200.8	0.0000318	0.00200	0.2000	0	96.4	75 - 125	0.199	3.08	20	
Cadmium	0.200	mg/L	E200.8	0.000226	0.000500	0.2000	0	100	75 - 125	0.199	0.509	20	
Chromium	0.199	mg/L	E200.8	0.000210	0.00200	0.2000	0.00111	98.8	75 - 125	0.195	1.78	20	

jtK

AMERICAN WEST ANALYTICAL LABORATORIES
3440 South 700 West
Salt Lake City, Utah 84119
(801) 263-8686, Toll Free (888) 263-8686, Fax (801) 263-8687
e-mail: awal@awal-labs.com, web: www.awal-labs.com

Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

PC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1802329
Project: Hunter CCR Sampling / PERCM52

Contact: Jeff Tucker
Dept: ME
QC Type: MSD

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	%RPD	RPD Limit	Qual
Lab Sample ID: 1802329-013AMSD	Date Analyzed:	02/19/2018 1519h											
Test Code: 200.8-W	Date Prepared:	02/16/2018 1334h											
Cobalt	0.200	mg/L	E200.8	0.0000336	0.00400	0.2000	0.00677	96.6	75 - 125	0.197	1.69	20	
Lead	0.184	mg/L	E200.8	0.000308	0.00200	0.2000	0.000313	91.6	75 - 125	0.18	1.95	20	
Molybdenum	0.223	mg/L	E200.8	0.000692	0.00200	0.2000	0.00305	no	75 - 125	0.223	0.0340	20	
Selenium	0.311	mg/L	E200.8	0.000176	0.00200	0.2000	0.0879	111	75 - 125	0.315	1.26	20	
Thallium	0.177	mg/L	E200.8	0.000462	0.00200	0.2000	0	88.7	75 - 125	0.175	1.57	20	
Lab Sample ID: 1802329-001AMSD	Date Analyzed:	02/23/2018 841h											
Test Code: HG-DW-245.1	Date Prepared:	02/22/2018 1413h											
Mercury	0.00274	mg/L	E245.1	0.00000511	0.000150	0.003330	0	82.3	80 - 120	0.00279	1.63	20	

American West Analytical Laboratories

Rpt Emailed: HC
OL: GenericEDD QC

WORK ORDER Summary

Work Order: **1802329**

Client: PacifiCorp
Due Date: 3/1/2018
Client ID: PAC900 **Contact:** Jeff Tucker
Project: **Hunter CCR Sampling / PERCM52** **QC Level:** 1I+ WO Type: Project
Comments: QC2+. Include EDD. RADS sent to ACZ. Cc: Report to mshirley@waterenvtech.com, Laura Watson, Dave Erickson and Marcus Holland at mholland@waterenvtech.com.;

NB

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1802329-001A	**ELF-11**	2/15/2018 0855h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-001B				**OUTSIDE LAB**			ACZ	2
1802329-002A	**FB-1**	2/15/2018 0800h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-002B				**OUTSIDE LAB**			ACZ	2
1802329-003A	**ELF-5**	2/15/2018 0920h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-003B				**OUTSIDE LAB**			ACZ	2
1802329-004A	**ELF-4**	2/15/2018 0952h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				

Printed: 02/15/18 18:06 LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK _____ HOK _____ HOK _____ COC Emailed _____

WORK ORDER Summary

Work Order: **1802329**

Client: PacifiCorp

Due Date: 3/1/2018

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1802329-004A	**ELF-4**	2/15/2018 0952h	2/15/2018 1600h	**200.7-W-PR**	Aqueous		DF-Metals	1
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-004B				**OUTSIDE LAB**			ACZ	2
1802329-005A	**ELF-7**	2/15/2018 1030h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-005B				**OUTSIDE LAB**			ACZ	2
1802329-006A	**ELF-10**	2/15/2018 1050h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-006B				**OUTSIDE LAB**			ACZ	2
1802329-007A	**ELF-9**	2/15/2018 1230h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-007B				**OUTSIDE LAB**			ACZ	2

WORK ORDER Summary

Work Order: **1802329**

Client: PacifiCorp Due Date: 3/1/2018

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1802329-008A	**ELF-ID**	2/15/2018 1215h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CRCO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-008B				**OUTSIDE LAB**			ACZ	2
1802329-009A	**ELF-6**	2/15/2018 0945h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-009B				**OUTSIDE LAB**			ACZ	
1802329-010A	**ELF-8 DUP**	2/15/2018 0915h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CRCO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-010B				**OUTSIDE LAB**			ACZ	2
1802329-011A	**ELF-8**	2/15/2018 0900h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-01IB				**OUTSIDE LAB**			ACZ	2

Printed: 02/15/18 18:06 LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK _____ HOK _____ HOK _____ COC Emailed _____

WORK ORDER Summary

Work Order: **1802329**

Client: PacifiCorp

Due Date: 3/1/2018

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1802329-012A	**ELF-3**	2/15/2018 1045h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	1
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-012B				**OUTSIDE LAB**			ACZ	
1802329-013A	**ELF-2**	2/15/2018 1145h	2/15/2018 1600h	**200.7-W**	Aqueous		DF-Metals	**1**
				1 SEL Analytes: LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1802329-013B				**OUTSIDE LAB**			ACZ	2

AMERICAN WEST ANALYTICAL LABORATORIES

3440 S. 700 W. SALT LAKE CITY, UT 84119
PHONE # (801) 263-8686 TOLL FREE # (888) 263-8686
FAX # (801) 263-8687 EMAIL AWAL@AWAL-LABS.COM
WWW.AWAL-LABS.COM

CHAIN OF CUSTODY

1802329

ALL ANALYSIS WILL BE CONDUCTED USING NELAP ACCREDITED METHODS AND ALL DATA WILL BE REPORTED USING AWAL'S STANDARD ANALYTE LISTS AND REPORTING LIMITS (PQL) UNLESS SPECIFICALLY REQUESTED OTHERWISE ON THIS CHAIN OF CUSTODY AND/OR ATTACHED DOCUMENTATION.

AWAL LAB SAMPLE SET #
PAGE ____ OF ____

QC Level: 1 2 2+ 3 3+

Turn Around Time: 1 2 3 4 5 Stnd

Unless other arrangements have been made, signed reports will be emailed by 5:00 pm on the day they are due.

DUE DATE: 3/1/18

CLIENT: PacifICorp
ADDRESS:
CONTACT: Jeff Tucker
PHONE #: CELL #:
EMAIL:
PROJECT NAME: Hunter CCR Sampling
PROJECT #: PERCM52
PO #:
SAMPLER NAME: 12. Farren)yY).SVMYley

☐ REPORT DOWN TO THE MDL
X INCLUDE EDD:
☐ LAB FILTER FOR:
☐ FIELD FILTERED FOR:

FOR COMPLIANCE WITH:
☐ NELAP
☐ RCRA
☐ CWA
☐ SDWA
☐ ELAP / A2LA
☐ NLLAP
☐ NON-COMPLIANCE
☐ OTHER:

#	SAMPLE ID:	DATE SAMPLED	TIME SAMPLED	[illegible]	[illegible]	[illegible] Alkalinity	Anions	Fl[illegible]	[illegible] S	[illegible] S	Nitrogen [illegible]	[illegible] & [illegible] S				KNOWN HAZARDS & SAMPLE COMMENTS
1	ELF-11	2\g|lt	8:55	/3	W	K	X	K	X	X	X	X				
2	Ffr-I	2|fe)18	8:00	y3	W	X	X	K	X	X	X	X				
3	ELF-5	2|ir/it	T-20	/3	W	X	X	k	X	X	X	X				
4	ELF-4	Z/IT/Jb	9:52	/*	W	>	l	:C	X	X	X	X				
5	ELT-T	2)1?/12	/0:30	/4	W	>	f	x	X	X	X	X				
6	ELF-ID	2/15/18	/0:SO	A	W	>	x	x	X	X	X	X				
7	FI r~q	2))5)1b	13:30	4	W	X	x	x	X	X	X	X				
8	ajF-ip	2|IS|1«	12:15	4	W	X	x	x	X	X	X	X				
9	ELF-(*	2/15/18	9:45	/3	W	x	x	x	X	X	X	X				
10	ElF~%tX)P	a|IT lift	9:15	/3	W	c	r	x	X	X	X	X				
11	ELF-16	af/57fb	°j:CD	/3	W	C	x	x	X	X	5	X				
12	ELF/3	znrlib	/0:YT	/2	W	k	k	x	X	X	x	X				

LABORATORY USE ONLY

SAMPLES WERE:
1 SHIPPED OR HAND DELIVERED
2 AMBIENT OR CHILLED
3 TEMPERATURE 0.1 °C
4 RECEIVED BROKEN/LEAKING (IMPROPERLY SEALED) Y N
5 PROPERLY PRESERVED Y N CHECKED AT BENCH
6 RECEIVED WITHIN HOLDING TIMES Y N

COC TAPE WAS:
1 PRESENT ON OUTER PACKAGE Y N NA
2 UNBROKEN ON OUTER PACKAGE Y N NA
3 PRESENT ON SAMPLE Y N NA
4 UNBROKEN ON SAMPLE Y N NA

DISCREPANCIES BETWEEN SAMPLE LABELS AND COC RECORDS Y N

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	DATE/TIME	SPECIAL INSTRUCTIONS:
SIGNATURE: [signature] PRINT NAME: Rebecca Farren	DATE: 'stshb TIME: %lG)	SIGNATURE: [signature] PRINT NAME: Dotc*F£ Bruo-vi	DATE: 2/15/18 TIME: hMo	cr rtsu.Hs to YYcurcu& {-hiIanJ mhe land @uicler&\4rk.ce**-
SIGNATURE: PRINT NAME:	DATE: TIME:	SIGNATURE: PRINT NAME:	DATE: TIME:	
SIGNATURE: PRINT NAME:	DATE: TIME:	SIGNATURE: PRINT NAME:	DATE: TIME:	
SIGNATURE: PRINT NAME:	DATE: TIME:	SIGNATURE: PRINT NAME:	DATE: TIME:	

0 £LF-2.* Z//S/18 11:45 * extra sample

Denise Bruun

From: Laura Watson [lwatson@waterenvtech.com]
Sent: Friday, January 26, 2018 12:08 PM
To: Denise Bruun
Cc: Rebecca Farren; Mike Shirley
Subject: Bottle Order

Hi Denise,
Can you please prepare 13 bottle sets for groundwater to be analyzed for the following:
Sb
As
Ba
Be
Cd
Cr
Co
Pb
Li
Hg
Mo
Se
Tl
Radium 226+228

Please have these ready by February 13. They will be picked up either that day or the 14. We will let you know if we need a late pickup. Samples will be dropped off that week (Wed or Thurs).
Thanks,
Laura

Laura Watson
Staff Engineer
Water & Environmental TECHNOLOGIES
Direct: (406) 497-8681 Office: (406) 782-5220 Cell: (406) 431-2447
Bozeman Anaconda

Lab Set ED: 12Q2321

pH Lot #: SatO

Preservation Check Sheet

Sample Set Extension and pH

Analysis	Preservative	-coi	~COZ	-CO?)	-CV{	-QD5	-OOo	-051	-00%	~Q0ci	-OiQ	··0H	-0(2-	-01.3					
Ammonia	pH <2 H_2SQ_4																		
COD	pH <2 H_2S04																		
Cyanide	pH >12 NaOH																		
Metals	pH <2 HN03	yes	y&fj	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes					
NO_2 & N03	pH <2 H_2S04																		
O & G	pH <2 HCL																		
Phenols	pH <2 H_2SQ_4																		
Sulfide	pH >9 NaOH, Zn Acetate																		
TKN	pH <2 H_2SQ_4																		
TP04	pH <2 H_2SQ_4																		

Procedure:

1) Pour a small amount of sample in the sample lid
2) Pour sample from lid gently over wide range pH paper
3) **Do Not** dip the pH paper in the sample bottle or lid
4) If sample is not preserved, properly list its extension and receiving pH in the appropriate column above
5) Flag COC, notify client if requested
6) Place client conversation on COC
7) Samples may be adjusted

Frequency: All samples requiring preservation

* The sample required additional preservative upon receipt.

\+ The sample was received unpreserved.

▲ The sample was received unpreserved and therefore preserved upon receipt.

\# The sample pH was unadjustable to a pH < 2 due to the sample matrix.

• The sample pH was unadjustable to a pH > ____ due to the sample matrix interference.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

March 15, 2018

Report to:
Elona Hayward
American West Analytical Labs
3440 S. 700 W.
Salt Lake City, UT 84119

cc: Denise Bruun

Bill to:
Lynn Turner
American West Analytical Labs
3440 S. 700 W.
Salt Lake City, UT 84119

Project ID: 1802329
ACZ Project ID: L42758

Elona Hayward:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on February 20, 2018. This project has been assigned to ACZ's project number, L42758. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L42758. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 14, 2018. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek has reviewed and approved this report.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-11
Locator:

ACZ Sample ID: ***L42758-01***
Date Sampled: *02/15/18 8:55*
Date Received: *02/20/18*
Sample Matrix: *groundwater*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:02		0.43	0.14	0.13	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		1.6	1.3	1.3	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: FB-1
Locator:

ACZ Sample ID: ***L42758-02***
Date Sampled: *02/15/18 8:00*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:04		0.11	0.05	0.03	pCi/L		leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		0.29	0.62	0.64	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-5
Locator:

ACZ Sample ID: ***L42758-03***
Date Sampled: *02/15/18 9:20*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:05		0.79	0.16	0.26	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		0.97	0.9	0.9	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-4
Locator:

ACZ Sample ID: ***L42758-04***
Date Sampled: *02/15/18 9:52*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:07		0.71	0.27	0.59	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		1.1	1.5	1.5	pCi/L	*	gjb

Arizona license number: AZ0102

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-7
Locator:

ACZ Sample ID: ***L42758-05***
Date Sampled: *02/15/18 10:30*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:08		0.92	0.25	0.33	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		0.32	0.81	0.84	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-10
Locator:

ACZ Sample ID: ***L42758-06***
Date Sampled: *02/15/18 10:50*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:10		2.6	0.58	0.47	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		-0.3	0.76	0.83	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-9
Locator:

ACZ Sample ID: ***L42758-07***
Date Sampled: *02/15/18 12:30*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:11		0.93	0.27	0.48	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		1.7	1.2	1.2	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
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RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-1D
Locator:

ACZ Sample ID: ***L42758-08***
Date Sampled: *02/15/18 12:15*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:12		0.19	0.09	0.16	pCi/L		leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 13:51		2.1	0.98	0.91	pCi/L		gjb

Arizona license number: AZ0102

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-6
Locator:

ACZ Sample ID: ***L42758-09***
Date Sampled: *02/15/18 9:45*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:14		0.25	0.15	0.13	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 16:32		1.1	0.87	0.85	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
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RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-8 DUP
Locator:

ACZ Sample ID: ***L42758-10***
Date Sampled: *02/15/18 9:15*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:15		0.54	0.14	0.32	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 16:32		0.84	0.62	0.61	pCi/L		gjb

Arizona license number: AZ0102

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-8
Locator:

ACZ Sample ID: ***L42758-11***
Date Sampled: *02/15/18 9:00*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:17		0.56	0.16	0.18	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 16:32		0.3	0.8	0.83	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
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RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-3
Locator:

ACZ Sample ID: ***L42758-12***
Date Sampled: *02/15/18 10:45*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:18		0.27	0.12	0.26	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 16:32		1.3	1.3	1.3	pCi/L	*	gjb

Arizona license number: AZ0102

ACZ Laboratories, Inc.
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RadioChemistry Analytical Results

American West Analytical Labs
Project ID: 1802329
Sample ID: ELF-2
Locator:

ACZ Sample ID: ***L42758-13***
Date Sampled: *02/15/18 11:45*
Date Received: *02/20/18*
Sample Matrix: *Ground Water*

Radium 226 Prep Method:
M903.1

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226	03/13/18 0:20		0.22	0.14	0.38	pCi/L	*	leb

Radium 228 Prep Method:
M904.0

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228	03/06/18 16:32		2	0.94	0.87	pCi/L	*	gjb

Arizona license number: AZ0102

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Error(+/-)	Calculated sample specific uncertainty
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
LCL	Lower Control Limit, in % (except for LCSS, mg/Kg)
LLD	Calculated sample specific Lower Limit of Detection
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RER	Relative Error Ratio, calculation used for Dup. QC taking into account the error factor.
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
UCL	Upper Control Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

DUP	Sample Duplicate	*MS/MSD*	Matrix Spike/Matrix Spike Duplicate
LCSS	Laboratory Control Sample - Soil	*PBS*	Prep Blank - Soil
LCSW	Laboratory Control Sample - Water	*PBW*	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Matrix Spikes	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

H	Analysis exceeded method hold time.

Method Prefix Reference

M	EPA methodology, including those under SDWA, CWA, and RCRA
SM	Standard Methods for the Examination of Water and Wastewater.
D	ASTM
RP	DOE
ESM	DOE/ESM

Comments

(1)	Solid matrices are reported on a dry weight basis.
(2)	Preparation method: "Method" indicates preparation defined in analytical method.
(3)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

American West Analytical Labs

ACZ Project ID: ***L42758***

Radium 226 M903.1 **Units:** pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG443403																
WG442568PBW	PBW	03/13/18						.09	0.08	0.06			0.12			
WG442568LCSW	LCSW	03/13/18	PCN54812	20				24	0.65	0.06	120	43	148			
L42758-04DUP	DUP-RER	03/13/18			0.71	0.27	0.59	.47	0.2	0.11				0.71	2	
L42758-12DUP	DUP-RER	03/13/18			0.27	0.12	0.26	.51	0.18	0.11				1.11	2	
L42782-07MS	MS	03/13/18	PCN54812	50	0.07	0.07	0.07	53	1.5	0.26	106	43	148			

Radium 228 M904.0 **Units:** pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec	Lower	Upper	RPD/RER	Limit	Qual
WG442984																
WG442648PBW	PBW	03/06/18						-.39	0.69	0.76			1.52			
WG442648LCSW	LCSW	03/06/18	PCN53179	8.9				10	1.3	0.8	112	47	123			
L42852-03MS	MS	03/06/18	PCN53179	9.09	0.55	0.77	0.78	4.8	1.3	1.1	47	47	123			
L42852-02DUP	DUP-RER	03/06/18			-0.15	0.62	0.67	-.21	0.53	0.58				0.07	2	
L42744-02DUP	DUP-RER	03/06/18			0.38	0.78	0.81	-.22	0.67	0.73				0.58	2	

American West Analytical Labs ACZ Project ID: ***L42758***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L42758-01	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-02	WG442984	Radium 228	M904.0	DJ	Sample dilution required due to insufficient sample.
L42758-03	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-04	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-05	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-06	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-07	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-09	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-10	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
L42758-11	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.
L42758-12	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DJ	Sample dilution required due to insufficient sample.
L42758-13	WG443403	Radium 226	M903.1	D1	Sample required dilution due to matrix.
	WG442984	Radium 228	M904.0	DF	Sample required dilution due to high sediment.

Certification Qualifiers

American West Analytical Labs ACZ Project ID: ***L42758***

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

American West Analytical Labs

ACZ Project ID: L42758
Date Received: 02/20/2018 10:40
Received By:
Date Printed: 2/21/2018

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? [1]	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
5158	4.1	NA	15	N/A

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

American West Analytical Labs

ACZ Project ID:	L42758
Date Received:	02/20/2018 10:40
Received By:	
Date Printed:	2/21/2018

[1] The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na2S2O3 preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

L42758 Chain of Custody

est Analytical Laboratories

L 42758

Chain of Custody

Lab Sample Set # _____

Client: **American West Analytical Laboratories**
Address: **3440 S. 700 W.**
Salt Lake City, UT 84119
Project Name: **Huntington CCR Sampling / PERCM53**
PO#: **1802329**

Contact: **Elona Hayward**
Phone: **801-263-8686**
Fax : **801-263-8687**
Email: elona@awal-labs.com
denise@awal-labs.com

QC Level: **2+**

Turn Around Time
Standard

Sample ID:	Date Sampled	Time	# of Containers	Sample Matrix		Radium 226 + Radium 228											Comments
LF- **ELF-11**	2/15/2018	8:55	2	Aq		x											
FB-1	2/15/2018	8:00	2	Aq		x											QC 2+: Include
ELF-5	2/15/2018	9:20	2	Aq		x											Batch QC summaries
ELF-4	2/15/2018	9:52	2	Aq		x											performed on client
ELF-7	2/15/2018	10:30	2	Aq		x											sample in report
ELF-10	2/15/2018	10:50	2	Aq		x											
ELF-9	2/15/2018	12:30	2	Aq		x											
ELF-1D	2/15/2018	12:15	2	Aq		x											
ELF-6	2/15/2018	9:45	1	Aq		x											
ELF-8 DUP	2/15/2018	9:15	2	Aq		x											
ELF-8	2/15/2018	9:00	2	Aq		x											
ELF-3	2/15/2018	10:45	1	Aq		x											
ELF-2	2/15/2018	11:45	2	Aq		x											

Samples sent to ACZ

Appropriate Utah state certifications required.

Laboratory Use Only

Samples Were:
1 Shipped or hand delivered
2 Ambient or Chilled
3 Temperature _____
4 Received Broken/Leaking (Improperly Sealed) Y N
5 Properly Preserved Y N
6 Received Within Holding Times Y N

COC Tape Was:
1 Present on Outer Package Y N NA
2 Unbroken on Outer Package Y N NA
3 Present on Sample Y N NA
4 Unbroken on Sample Y N NA

Discrepancies Between Sample Labels and COC Record? Y N

Special Instructions: **Include project name and PO# on final report and invoice. Email results to both Elona and Denise.**

Relinquished by: *Signature*	Denise Brown	Date:	2/16/18	Received by: *Signature*		Date:	2/20/18
Print Name	Denise Brown	Time:	10:30	*Print Name*	ACZ	Time:	10:40

ATTACHMENT B:

Field Summary Report – May 2018 Event

Facility Name: Hunter Power Plant – CCR Landfill
Event Description: Assessment Monitoring
Event Dates: May 30, 2018
Field Personnel: Mike Shirley, James Foltz

ACTIVITY SUMMARY. WET personnel arrived onsite at Hunter Power Plant on May 30, 2018 and performed ground water sampling at CCR unit CCR Landfill. Prior to collecting samples, field instruments were calibrated, followed by the collection of water levels in the CCR monitoring wells. After recording water levels, the wells were purged in accordance with the EPA low-flow method. Field parameters were monitored during well purging in accordance with the site-specific sampling and analysis plan (SAP). Once field parameters met the SAP stabilization requirements, ground water samples were collected for Appendix III & IV constituents. All calibration data and field measurements were recorded on the WET electronic field form. The wells that underwent sampling during this sampling event included:

- ELF-1D
- ELF-2
- ELF-3
- ELF-4
- ELF-5
- ELF-6
- ELF-7
- ELF-8
- ELF-9
- ELF-10
- ELF-11

After collection, the samples were preserved in accordance with the SAP, placed on ice, chain of custody forms were completed, and the samples were transported to American West Analytical Laboratories (AWAL) in Salt Lake City, Utah for analysis on June 1, 2018. The following details dates for conducting fieldwork and post-fieldwork data processing:

- Date(s) fieldwork completed: May 30, 2018
- Date(s) unvalidated lab data received:
  - Water Quality (AWAL): June 16, 2018
  - Radium 226 (ALS): July 5, 2018
  - Radium 228 (ALS): July 5, 2018
- Data validation completion date: July 18, 2018

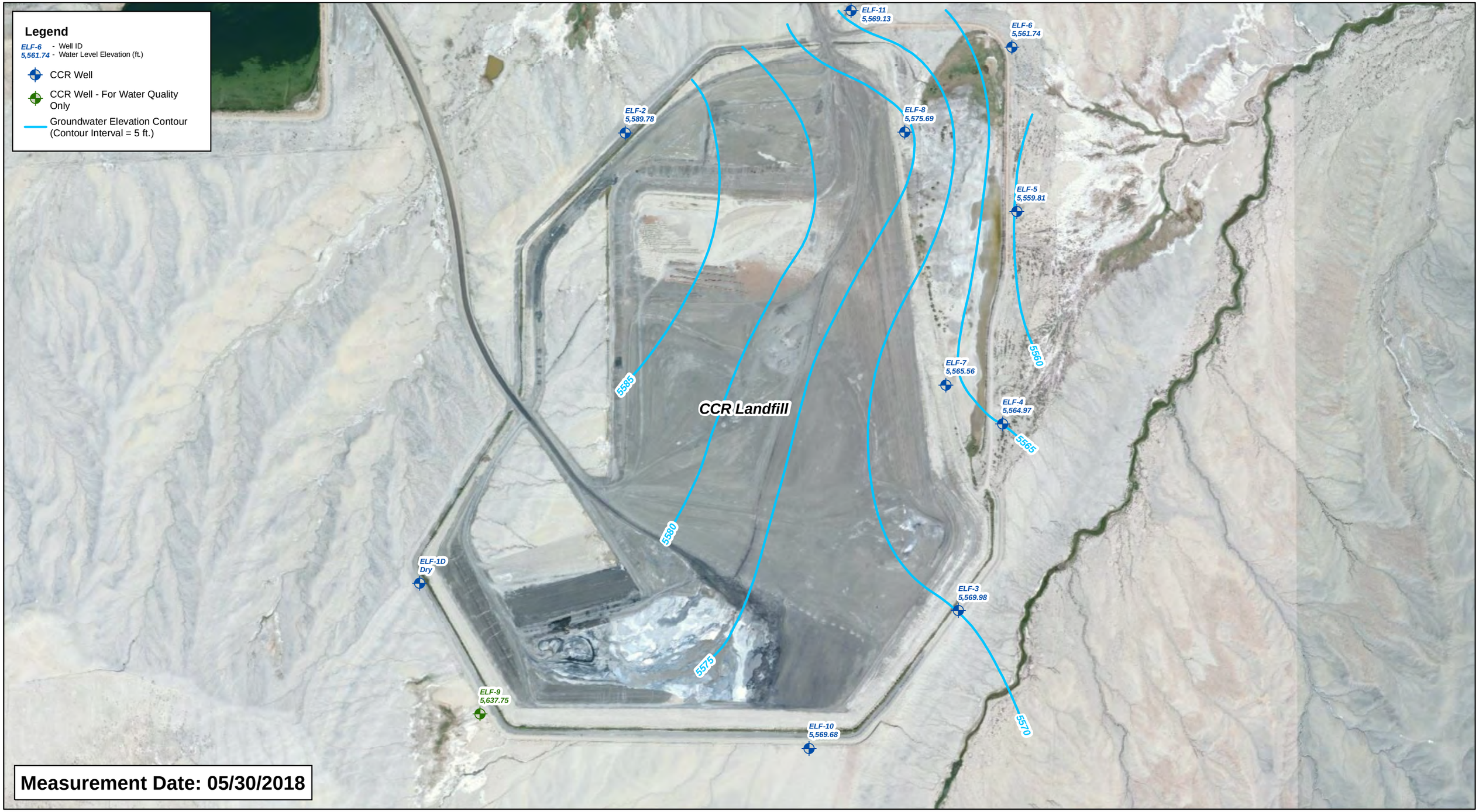
The following information is attached to this summary as a supplement:

- Attachment A: Groundwater Contour Map
- Attachment B: Data Validation Summary
- Attachment C: Statistical Analysis
- Attachment D: Field Data Sheets
- Attachment E: Laboratory Analytical Reports

SAP DEVIATIONS. Monitoring wells ELF-1D, ELF-3 and ELF-6 were dry and were not able to be sampled.

Attachment A:

Groundwater Contour Map



N
W E
S

Feet

0 300 600 1,200 1,800 2,400

PACIFICORP

Water & Environmental TECHNOLOGIES

HUNTER POWER PLANT

Groundwater Elevation Map
CCR Landfill

Job#: PERCM053

Date: 8/13/2018

Attachment 1

Path: M:\PERC_CCR\2018_May_Sampling\2018_May_All Sites_DDPs.mxd, Author: brutherford

Attachment B:

Data Validation Summary

DATA VALIDATION SUMMARY
CCR COMPLIANCE SAMPLING

Facility Name:	Hunter Sampled 05/30/2018	
Validator:	Tim Driscoll 06/19/2018	
Reviewer:	Pat Seccomb 06-21-18	
Laboratory:	American West Analytical Laboratories	
Laboratory Work Order#:	1806002	
Sample Media:	Groundwater	
Analytical Parameters:	**Appendix III:** B, Ca, Cl, ^{1}F, pH, $S0_4$, TDS **Appendix IV:** Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Se, Tl, Ra^{226} + Ra^{228}	
Review Element:	**Complete / Criteria Met? (Yes/No)**	**If no, describe:**
Chain of Custody:	Yes	
Field Documentation:	Yes	
Holding Times & Sample Preservation:	Yes	
Calibrations:	Yes	
Blanks:	Yes	
Laboratory Control Sample:	Yes	
Laboratory Duplicate:	Yes	
Matrix Spike:	Yes	Calcium, lithium and mercury were recovered outside of advisory limits in a matrix spike. Qualification are detailed below.

Overall Assessment:

Due to a low recovery of calcium in the matrix spike, the following samples were qualified J-:

- ELF-7, ELF-4, ELF-11, ELF-8, ELF-5, ELF-10, ELF-9, and ELF-2.

Due to a low recovery of mercury in a matrix spike, the following samples were qualified UJ:

- ELF-7, ELF-4, ELF-11, ELF-8, ELF-5, ELF-10, ELF-9, and ELF-2.

Due to a high recovery of lithium in a matrix spike, the following samples were qualified J+:

- ELF-7, ELF-4, ELF-11, ELF-8, ELF-5, ELF-10, ELF-9, and ELF-2.

No other qualification were required.

DATA VALIDATION SUMMARY
CCR COMPLIANCE SAMPLING

Facility Name:	Hunter RAD 226 5/30/2018	
Validator:	Tim Driscoll 7/16/2018	
Reviewer:	Pat Seccomb 7-18-18	
Laboratory:	American West Analytical Labs	
Laboratory Work Order#:	1806065	
Sample Media:	Groundwater	
Analytical Parameters:	**Appendix IV:** Ra^{226}	
Review Element:	**Complete / Criteria Met? (Yes/No)**	**If no, describe:**
Chain of Custody:	Yes	
Field Documentation:	Yes	
Holding Times & Sample Preservation:	Yes	
Calibrations:	Yes	
Blanks:	Yes	
Laboratory Control Sample:	Yes	
Laboratory Duplicate:	Yes	
Matrix Spike:	Yes	
Overall Assessment:		
No qualifications were required.		

Attachment C:

Statistical Analysis

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

This appendix contains a statistical analysis of the data collected from the groundwater monitoring wells associated with the CCR Landfill at the Hunter Power Plant in Castle Dale, Utah. Methods used to compare upgradient with downgradient wells vary depending on the characteristics of the upgradient well data. Upgradient well data were analyzed for outliers, normality, non-detects, and other characteristics that affect the comparison measures. A comprehensive statistical analysis is presented in along with a discussion of the methods used to compare upgradient with downgradient water quality.

2.0 PRELIMINARY DATA ANALYSIS

The primary purpose of this statistical analysis was to establish background values from the upgradient well data, and compare these to the downgradient well data to determine if the downgradient water quality has been impacted by the CCR Landfill. Familiarity with numerical and distributional characteristics of the upgradient wells aid in computing appropriate limits and in correctly interpreting those limits. This section contains a statistical summary of the upgradient well data. It is essential to understand the statistical characteristics of the data, prior to making the upgradient / downgradient well comparison. This understanding helps to ensure the appropriate calculations have been done and comparisons are completed using the proper statistical measures. The mean, standard deviation, quartiles, and other statistical quantities and corresponding graphs are presented in the following sections.

2.1 Data Analysis Techniques

The following sections summarize the statistical tools and techniques, used to evaluate upgradient well data from the CCR Landfill.

2.1.1 Mean

One measure of primary interest is the center of the data. The average ($\overline{x}$), or the mean, is the most commonly used measure of the central tendency of the data. However, it can be heavily influenced by outliers and by asymmetric data. The mean is calculated using Equation (1):

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n} \quad (1)$$

Where:

$\overline{x}$ = mean

n = number of observations

x_i = i^{th} observation.

2.1.2 Standard Deviation

Another quantity of interest is the spread of the data. The standard deviation (s) is the most commonly used measure of spread, as it is easy to interpret and is used in many other statistical methods. Because it is calculated using the average, it is also sensitive to outliers and affected by data that are not symmetric. The standard deviation is calculated using Equation (2):

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} \quad (2)$$

Where:

s = standard deviation

n = number of observations

x_i = i^{th} observation

$\bar{x}$ = mean of the observations.

2.1.3 Coefficient of Variance

The coefficient of variance (CV) is a relative measure of variation in the sample data which expresses the standard deviation relative to the mean. The CV is expressed as a percentage and provides a direct comparison to the standard deviations of two different data sets. It is important to note the mean of the data may be very close to or very far away from zero and the spread may be independent of the distance from the mean to zero. Therefore, no firm guidelines have been established for interpreting the CV. The CV was calculated for each detected analyte in each data grouping using Equation (3):

$$CV = \frac{s}{\bar{X}} \times 100\% \quad (3)$$

Where:

s = standard deviation

$\bar{X}$ = mean of the observations

2.1.4 Quartiles and the Five Number Summary

The five-number summary is a set of five numbers that are used to assess the spread of the data. It consists of the minimum value, first quartile, median, third quartile, and maximum of the data value. The first quartile is the 25th percentile of the data, the median is the 50th percentile of the data, and the third quartile is the 75th percentile of the data. The 25th percentile of the data is the

number such that 25% of the data are less than that number and 75% of the data are above the 25th percentile. The median and third quartiles are found in a similar manner.

2.2 Visual Tools

It is difficult to review numerical summary statistics and identify the degree of symmetry or normality of data without the aid of visual tools. In completing the statistical analysis for the CCR Landfill, histograms and normal-quantile plots were developed for each of the analytes with at least on detectable observation. All graphs were developed using the R Statistical Package (R Core Team 2018).

2.2.1 Histograms

Histograms display the distribution and symmetry of the data. The data are displayed in such a way, that deviations from a normal (i.e., bell shaped) distribution can easily be observed. Outliers are also often identifiable in a histogram. Histograms for the upgradient wells were generated using both non-detects and detected results. The method detection limit (MDL) is plotted on the histogram for non-detect observations. A line was added to the histograms presenting non-detect values to show the location of the largest MDL on the graph. Figure C.1 below is a histogram of fluoride data for the upgradient wells for the CCR Landfill. It is provided here to illustrate data distribution using a histogram. All of the histograms used to examine the analytes from the CCR Landfill upgradient well data, are provided in at the end of this appendix in Figure C.3.

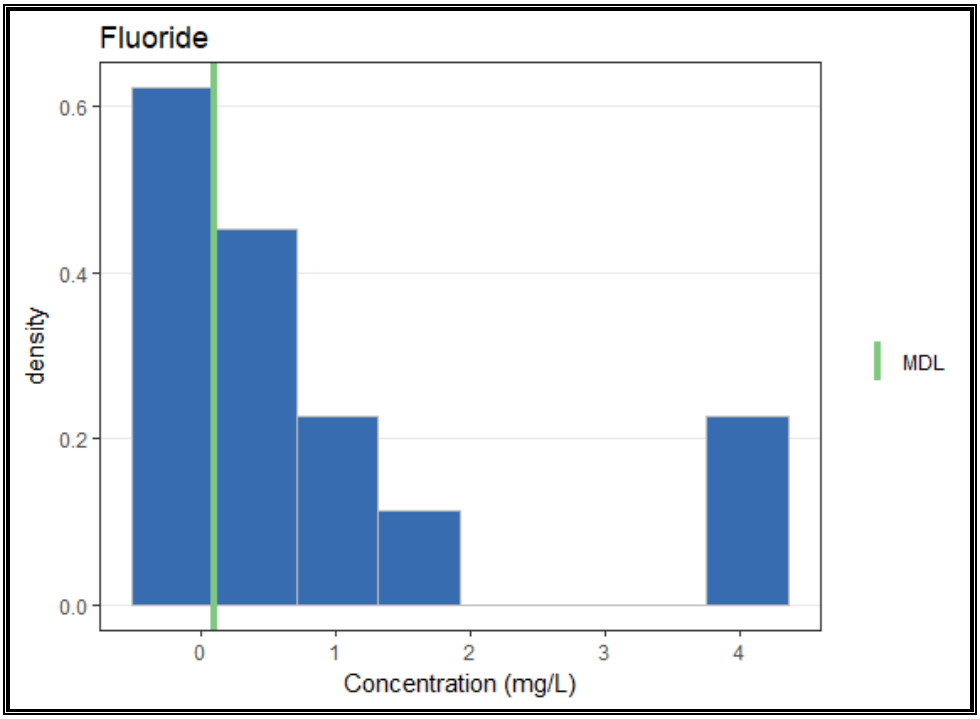


Figure C.1. Histogram of fluoride data from the CCR Landfill upgradient wells.

2.2.2 Normal-Quantile Plots

A normal-quantile plot is a graphical tool used to determine if the data follow a normal distribution and to look for outliers. When the data follow a normal distribution, the points on the graph lie along a straight line. Any deviations from a straight line are indicative of deviations from normality. It is important to note that no real-world data set is perfectly normal, so a certain amount of deviation from the line is to be expected even in data that are sufficiently normal to perform normality based statistics. Normal-quantile plots in this document were generated using both non-detects and detected values. The MDL was used to plot a non-detected value. Detected values are denoted by solid circles and non-detected values are identified by hollow circles. The gray area shows the region of acceptable deviations from normality. Figure C.2 uses the same fluoride data points used to develop the Figure C.1. Several of the points fall outside of the gray region. This indicates that the data are not normally distributed. All of the normal-quantile plots used to examine the CCR Landfill upgradient well data are provided at the end of this appendix in Figure C.3.

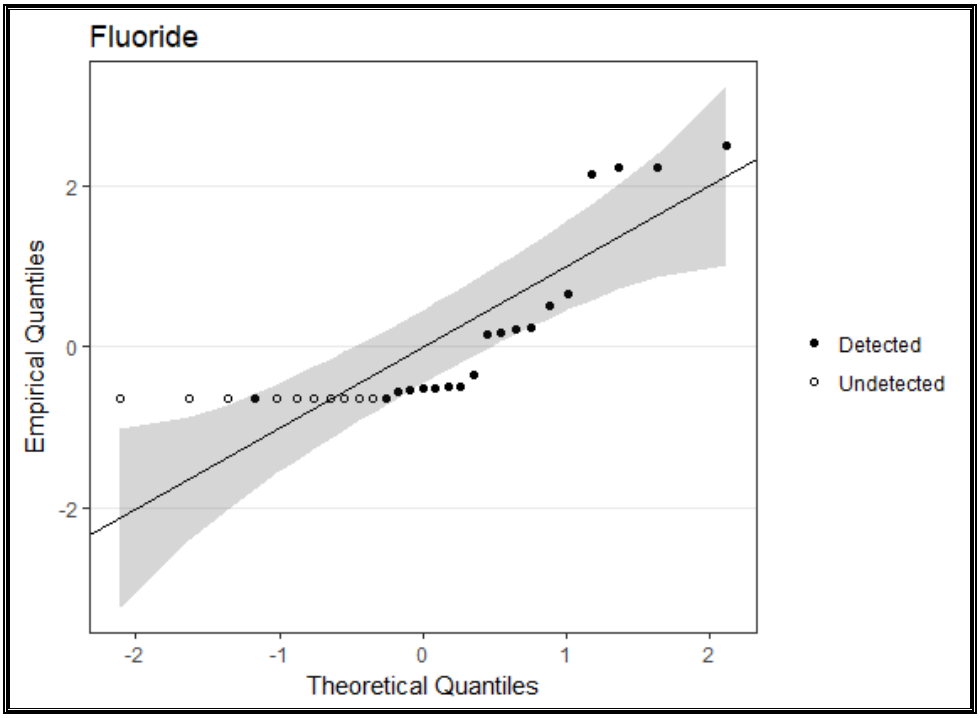


Figure C.2. Normal quantile plot of fluoride data the CCR Landfill upgradient wells

2.2.3 Outliers

Outliers are data points that are notably larger or smaller than the rest of the data set and may indicate a problem with the data point or the data set as a whole. Examples which may be indicative of outliers include: 1) a misreported or erroneous concentration, 2) analytical error(s), or 3) natural variations in groundwater concentrations. Outliers are generally not omitted from project data simply because they are outliers. Rather, the result is examined individually or by project, to ensure the outlier does not represent an erroneous result or another concern warranting

either additional sampling or omission of the outlier from the data analysis. There are reasonable situations when it is appropriate to remove outliers. For example, if outliers which represent exceedingly low concentrations are used to compute background concentrations, they may result in background levels which are too conservative. Conversely, use of excessively high outlier concentrations to compute background values, may result in an overestimation of background concentrations resulting in false-negative comparisons for downgradient groundwater quality. Outliers were detected in the cadmium, lead, and radium data CCR Landfill data. However, none of the outliers are extreme enough to warrant removal from the dataset.

2.2.4 Treatment of Non-Detects

Non-detect values are common in environmental data. When present in data sets, non-detects produce difficulties in computing statistical metrics because reliable values cannot be assigned. Substituting a value such as the MDL or one-half of the MDL for non-detects are common practices. However, use of the detection limit, or one-half of the detection limit, can produce unstable or unreliable results (EPA 2009). Statistical methods, such as Kaplan-Meier (Helsel 2004), can be used to appropriately evaluate data sets containing significant quantities of non-detects, by producing estimates of the survival probability function for non-detects. These estimates can then be used to compute summary statistics on the data set. However, Kaplan-Meier does not perform well if more than 50% of the results are non-detects or if fewer than eight detections are available for evaluation. The arsenic, cadmium, chromium, and lead data have more than 50% non-detects. Antimony, beryllium, mercury, and thallium were not detected in any of the samples. Thus, statistical analysis cannot be done for those analytes. The cobalt, fluoride, and selenium data are more than 15% non-detects, but more than half of the data are detected. As a result, Kaplan-Meier was used to compute means, standard deviations, and statistical limits used to compare the upgradient downgradient water quality for cobalt, fluoride, and selenium.

2.3 Summary Results

Table C.1 provides summary statistics for the CCR Landfill upgradient well data. Although the data from the upgradient wells were combined when compared to the downgradient wells, the summary statistics presented in this section are separated by well and are presented as pooled data. The data are presented in this way, due to observed differences between the different wells for many of the analytes. These tables in conjunction with the histograms and normal-quantile plots, provide information about differences between wells and the data properties of the combined data. Analytes that were not detected in any upgradient well samples are not listed in Table C.1.

Table C.1. Summary statistics for the CCR Landfill upgradient wells

Analyte	Well	Number of Samples	Samples Detected	Median (mg/L)	Mean (mg/L)	Standard Deviation (mg/L)	Coefficient of Variation (%)
Arsenic	ELF-10	10	3	NA	NA	NA	NA
Arsenic	ELF-2	12	0	NA	NA	NA	NA
Arsenic	ELF-9	10	10	0.007	0.007	0.002	32%
Arsenic	ELF-1D	1	0	NA	NA	NA	NA
Arsenic	Pooled	33	13	NA	NA	NA	NA
Barium	ELF-10	10	10	0.045	0.047	0.020	42%
Barium	ELF-2	12	11	0.012	0.012	0.004	31%
Barium	ELF-9	10	10	0.038	0.051	0.034	66%
Barium	ELF-1D	1	1	0.010	NA	NA	NA
Barium	Pooled	33	32	0.030	0.03	0.03	81%
Cadmium	ELF-10	10	6	0.0005	0.0006	0.0002	31%
Cadmium	ELF-2	12	0	NA	NA	NA	NA
Cadmium	ELF-9	10	1	NA	NA	NA	NA
Cadmium	ELF-1D	1	0	NA	NA	NA	NA
Cadmium	Pooled	33	7	NA	NA	NA	NA
Chromium	ELF-10	10	8	0.005	0.006	0.004	80%
Chromium	ELF-2	12	1	NA	NA	NA	NA
Chromium	ELF-9	10	7	0.005	0.009	0.007	75%
Chromium	ELF-1D	1	0	NA	NA	NA	NA
Chromium	Pooled	33	16	NA	NA	NA	NA
Cobalt	ELF-10	10	7	0.004	0.01	0.00	30%
Cobalt	ELF-2	12	7	0.005	0.006	0.002	32%
Cobalt	ELF-9	10	2	NA	NA	NA	NA
Cobalt	ELF-1D	1	1	NA	NA	NA	NA
Cobalt	Pooled	33	17	0.004	0.005	0.002	32%
Fluoride	ELF-10	9	5	0.24	1.93	2.12	109%
Fluoride	ELF-2	11	6	0.10	0.18	0.14	76%
Fluoride	ELF-9	9	8	1.19	1.02	0.61	60%
Fluoride	Pooled	29	19	0.26	0.96	1.37	143%
Lead	ELF-10	10	6	0.002	0.003	0.003	90%
Lead	ELF-2	12	1	NA	NA	NA	NA
Lead	ELF-9	10	4	NA	NA	NA	NA
Lead	ELF-1D	1	0	NA	NA	NA	NA
Lead	Pooled	33	11	NA	NA	NA	NA
Lithium	ELF-10	10	10	2.13	2.35	1.19	50%

Analyte	Well	Number of Samples	Samples Detected	Median (mg/L)	Mean (mg/L)	Standard Deviation (mg/L)	Coefficient of Variation (%)
Lithium	ELF-2	12	12	1.95	2.65	1.32	50%
Lithium	ELF-9	10	10	0.92	1.11	0.55	50%
Lithium	ELF-1D	1	1	2.12	NA	NA	NA
Lithium	Pooled	33	33	1.61	2.07	1.23	59%
Molybdenum	ELF-10	10	10	0.0970	0.0956	0.0256	27%
Molybdenum	ELF-2	12	12	0.0032	0.0034	0.0007	21%
Molybdenum	ELF-9	10	10	0.1225	0.1230	0.0174	14%
Molybdenum	ELF-1D	1	1	0.017	NA	NA	NA
Molybdenum	Pooled	33	33	0.0855	0.0680	0.0557	82%
Radium	ELF-10	10	10	2.48	3.37	3.96	117%
Radium	ELF-2	12	12	1.31	2.03	2.04	101%
Radium	ELF-9	10	10	1.26	1.43	0.69	49%
Radium	ELF-1D	1	1	2.63	NA	NA	NA
Radium	Pooled	33	33	1.84	2.27	2.57	113%
Selenium	ELF-10	10	8	0.058	0.115	0.142	123%
Selenium	ELF-2	12	12	0.451	0.390	0.177	45%
Selenium	ELF-9	10	1	NA	NA	NA	NA
Selenium	ELF-1D	1	0	NA	NA	NA	NA
Selenium	Pooled	33	21	0.077	0.178	0.214	120%

Table C.2 provides the five-number summaries for the CCR Landfill upgradient wells. As with the summary statistics, a five-number summary was computed for each well as well as for the pooled data. If a minimum or a quartile falls within the range of non-detects it is denoted using a less-than (<) symbol. Analytes that were not detected in any of the upgradient well samples are not listed in Table C.2.

Table C.2. Five-number summary for the CCR Landfill upgradient wells.

Analyte	Well	Minimum (mg/L)	First Quartile (mg/L)	Median (mg/L)	Third Quartile (mg/L)	Maximum (mg/L)
Arsenic	ELF-10	<0.002	<0.002	<0.002	0.003	0.009
Arsenic	ELF-2	<0.001	<0.002	<0.002	<0.002	<0.002
Arsenic	ELF-9	0.005	0.005	0.007	0.008	0.012
Arsenic	ELF-1D	<0.002	<0.002	<0.002	<0.002	<0.002
Arsenic	Pooled	<0.001	<0.002	<0.002	0.005	0.012
Barium	ELF-10	0.021	0.033	0.045	0.060	0.086

Analyte	Well	Minimum (mg/L)	First Quartile (mg/L)	Median (mg/L)	Third Quartile (mg/L)	Maximum (mg/L)
Barium	ELF-2	<0.008	0.009	0.012	0.013	0.050
Barium	ELF-9	0.014	0.019	0.038	0.079	0.102
Barium	ELF-1D	0.010	0.010	0.010	0.010	0.010
Barium	Pooled	<0.008	0.012	0.030	0.050	0.102
Cadmium	ELF-10	<0.0005	<0.0005	0.0005	0.0006	0.0011
Cadmium	ELF-2	<0.0005	<0.0005	<0.0005	<0.0005	<0.0010
Cadmium	ELF-9	<0.0005	<0.0005	<0.0005	<0.0005	0.0005
Cadmium	ELF-1D	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cadmium	Pooled	<0.0005	<0.0005	<0.0005	<0.0005	0.0011
Chromium	ELF-10	<0.002	0.002	0.005	0.006	0.016
Chromium	ELF-2	<0.001	<0.002	<0.002	<0.002	0.011
Chromium	ELF-9	<0.002	<0.002	0.005	0.016	0.020
Chromium	ELF-1D	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	Pooled	<0.001	<0.002	<0.002	0.006	0.020
Cobalt	ELF-10	<0.004	<0.004	0.004	0.005	0.008
Cobalt	ELF-2	<0.004	<0.004	0.005	0.006	0.011
Cobalt	ELF-9	<0.004	<0.004	<0.004	<0.004	0.005
Cobalt	ELF-1D	0.005	0.005	0.005	0.005	0.005
Cobalt	Pooled	<0.004	<0.004	0.004	0.005	0.011
Fluoride	ELF-10	<0.1	<0.1	0.24	3.97	4.36
Fluoride	ELF-2	<0.1	<0.1	0.10	0.23	0.50
Fluoride	ELF-9	<0.1	0.28	1.19	1.29	1.84
Fluoride	Pooled	<0.1	<0.1	0.26	1.27	4.36
Lead	ELF-10	<0.002	<0.002	0.002	0.003	0.012
Lead	ELF-2	<0.001	<0.002	<0.002	<0.002	0.002
Lead	ELF-9	<0.002	<0.002	<0.002	0.005	0.008
Lead	ELF-1D	<0.002	<0.002	<0.002	<0.002	<0.002
Lead	Pooled	<0.001	<0.002	<0.002	0.003	0.012
Lithium	ELF-10	0.841	1.53	2.13	3.49	4.59
Lithium	ELF-2	1.34	1.52	1.95	3.95	4.93
Lithium	ELF-9	0.724	0.748	0.916	1.10	2.48
Lithium	ELF-1D	2.12	2.12	2.12	2.12	2.12
Lithium	Pooled	0.724	1.10	1.61	2.48	4.93
Molybdenum	ELF-10	0.055	0.080	0.097	0.118	0.124
Molybdenum	ELF-2	0.003	0.003	0.003	0.004	0.005
Molybdenum	ELF-9	0.098	0.109	0.123	0.129	0.158

Analyte	Well	Minimum (mg/L)	First Quartile (mg/L)	Median (mg/L)	Third Quartile (mg/L)	Maximum (mg/L)
Molybdenum	ELF-1D	0.017	0.017	0.017	0.017	0.017
Molybdenum	Pooled	0.003	0.004	0.086	0.118	0.158
Radium	ELF-10	0.46	1.14	2.48	3.42	14.20
Radium	ELF-2	0.61	0.90	1.31	2.30	8.10
Radium	ELF-9	0.64	0.70	1.26	1.92	2.60
Radium	ELF-1D	2.63	2.63	2.63	2.63	2.63
Radium	Pooled	0.46	0.94	1.84	2.60	14.20
Selenium	ELF-10	<0.002	0.008	0.058	0.157	0.410
Selenium	ELF-2	0.077	0.282	0.451	0.515	0.608
Selenium	ELF-9	<0.002	<0.002	<0.002	<0.002	0.004
Selenium	ELF-1D	<0.002	<0.002	<0.002	<0.002	<0.002
Selenium	Pooled	<0.002	<0.002	0.077	0.398	0.608

3.0 UPGRADIENT AND DOWNGRADIENT WELL COMPARISON

Groundwater quality was assessed using upper tolerance limits (UTLs) and the Maximum Contaminant Levels (MCL) for each of the Appendix IV analytes. The data measured from the upgradient/background wells, was used to compute a UTL, which serves as the background value. The larger of the UTL and MCL was used as the groundwater protection limit (GWPL). Data obtained from the downgradient wells were compared point-by-point to the GWPLs to determine if the site complies with the *Final Rule*. The software package Sanitas© v.2016, was used to compute the UTLs. As part of this evaluation, groundwater data were examined for characteristics that impact how the UTL was computed. These characteristics include the:

- Number of non-detect results
- Data distribution
- Site-wide false-positive rate (SWFPR)
- Spatial and seasonal variability.

Summary statistics and other statistical characteristics of the data are discussed in the previous section. These characteristics were used to compute the appropriate UTL for each analyte.

3.1 Groundwater Protection Limits

The shape or distribution of the data was assessed to ensure that the most appropriate UTL was used for comparison purposes. The most efficient UTL is a parametric UTL that assumes the data follow a normal distribution. If the data do not follow a normal distribution, a non-parametric UTL is typically used. Thus, the data for each analyte are assessed to determine if a

parametric UTL can be computed from the data. The parametric UTL is computed using the formula below:

$$UTL = \bar{X} + \kappa \times S$$

Where:

$\bar{X}$ = the average of the background data
κ = multiplier from EPA Unified Guidance, March 2009
S = standard deviation of the background data

3.1.1 Normal Distribution

Histograms and normal-quantile plots were used to visually inspect the data for deviations from normality and to determine if outliers were present. This examination reveals the outliers are present in the cadmium, lead, and radium data. The Shapiro-Wilk test was used to assess normality in conjunction with the normal quantile plots. If the p-value associated with the test was greater than or equal to 0.05, the data are considered normally distributed and a parametric UTL was computed using the upgradient measurements. If the p-value is less than 0.05, then the maximum detectable value was used as the UTL.

Note: The 0.05 p-value is not a hard and fast rule. Parametric UTLs were computed for analytes whose p-values were close to 0.05 as selected by the Sanitas software (Sanitas 2016).

If the data for an analyte were not normally distributed, the ladder of powers method was used to determine if a reasonable transformation existed that would produce normal data. The ladder of powers tests different monotonic transformations of the data, such as the natural logarithm or square, to see if the transformed data have a normal distribution. If a transformation within the ladder of powers can be found that produces normal data, a parametric UTL was computed using the transformed data. If a transformation was identified, it was applied to both upgradient / background and downgradient groundwater data prior to comparison.

A non-parametric UTL was computed for data that are not normally distributed and cannot be transformed. The non-parametric UTL is the largest value measured in the upgradient / background wells. Table C.3 summarizes the results of the Shapiro-Wilk test for each of the Appendix IV analytes where at least 50% of the measurements were detects. An appropriate transformation was found for barium, lithium, and radium. Non-parametric UTLs were computed for all of the analytes except for barium, lithium, and radium.

Table C.3. Shapiro-Wilk Test for the CCR Landfill upgradient wells.

Analyte	Well	W-Statistic	P-Value	Normal
Barium	Pooled	0.8565	0.0005	Not Normal
LN of Barium	Pooled	0.9223	0.0213	Normal
Cobalt	Pooled	0.6914	<0.0001	Not Normal
Fluoride	Pooled	0.6677	<0.0001	Not Normal
Lithium	Pooled	0.8757	0.0013	Not Normal
LN of Lithium	Pooled	0.9449	0.0945	Normal
Molybdenum	Pooled	0.8243	0.0001	Not Normal
Radium	Pooled	0.5734	<0.0001	Not Normal
LN of Radium	Pooled	0.9482	0.1178	Normal
Selenium	Pooled	0.7806	<0.0001	Not Normal

3.1.2 Upper Tolerance Limits and Groundwater Protection Limit

This section contains the GWPL computed for each analyte. Table C.4 lists the UTL, MCL, and GWPL for each of the analytes detected in the upgradient wells. The following criteria was used for determining each GWPL:

- If more than 50% of the data were detected and have a normal distribution, a parametric UTL was computed.
- If the data were not normally distributed or more than 50% of the data were non-detects, the greater of the larger MDL and maximum detected value was used as the UTL.
- If all of the upgradient samples were non-detects, the largest MDL was used as the UTL.
- The larger of the MCL and the UTL was used as the GWPL.

Graphs were constructed for each of the analytes that had at least one detectable measurement in the downgradient wells. The graphs illustrate the GWPL as a horizontal line with the measurements from each of the downgradient wells plotted on the same graph. Non-detects are represented by hollow gray circles on the graphs. These graphs clearly depict how the downgradient measurements compare to the GWPL. Results above the GWPL line represent values exceeding the GWPL. As the graphs illustrate, lithium and molybdenum exceed the GWPL. Table C.4 list the GWPLs and the wells that exceed for each analyte and list the downgradient wells that exceed the UTLs (Figure C.4). UTL plots are not provided for analytes that were not detected in any downgradient samples.

Table C.4. Comparison of downgradient wells to the groundwater protection limit

Analyte	Upper Tolerance Limit (mg/L)	Maximum Contaminant Level (mg/L)	Groundwater Protection Limit (mg/L)	Downgradient Wells that Exceed Upper Tolerance Limit
Antimony	0.002	0.006	0.006	None Exceed
Arsenic	0.012	0.010	0.012	None Exceed
Barium	0.114	2	2	None Exceed
Beryllium	0.002	0.004	0.004	None Exceed
Cadmium	0.001	0.005	0.005	None Exceed
Chromium	0.020	0.10	0.10	None Exceed
Cobalt	0.011	0.006	0.011	ELF-6, ELF-8, ELF-11
Fluoride	4.36	4	4.36	None Exceed
Lead	0.012	0.015	0.015	None Exceed
Lithium	5.205	0.040	5.205	ELF-6, ELF-5
Mercury	0.0002	0.002	0.002	None Exceed
Molybdenum	0.16	0.100	0.16	ELF-8
Radium	8.511	5	8.511	None Exceed
Selenium	0.608	0.05	0.608	None Exceed
Thallium	0.002	0.002	0.002	None Exceed

4.0 CONCLUSIONS

Data were collected from wells CCR Landfill near the Hunter Power Plant. A comprehensive data analysis was completed on the upgradient wells to ensure that comparisons between upgradient and downgradient wells were done correctly. Exceedances were noted for cobalt, lithium and molybdenum in the downgradient wells for the CCR Landfill.

5.0 REFERENCES

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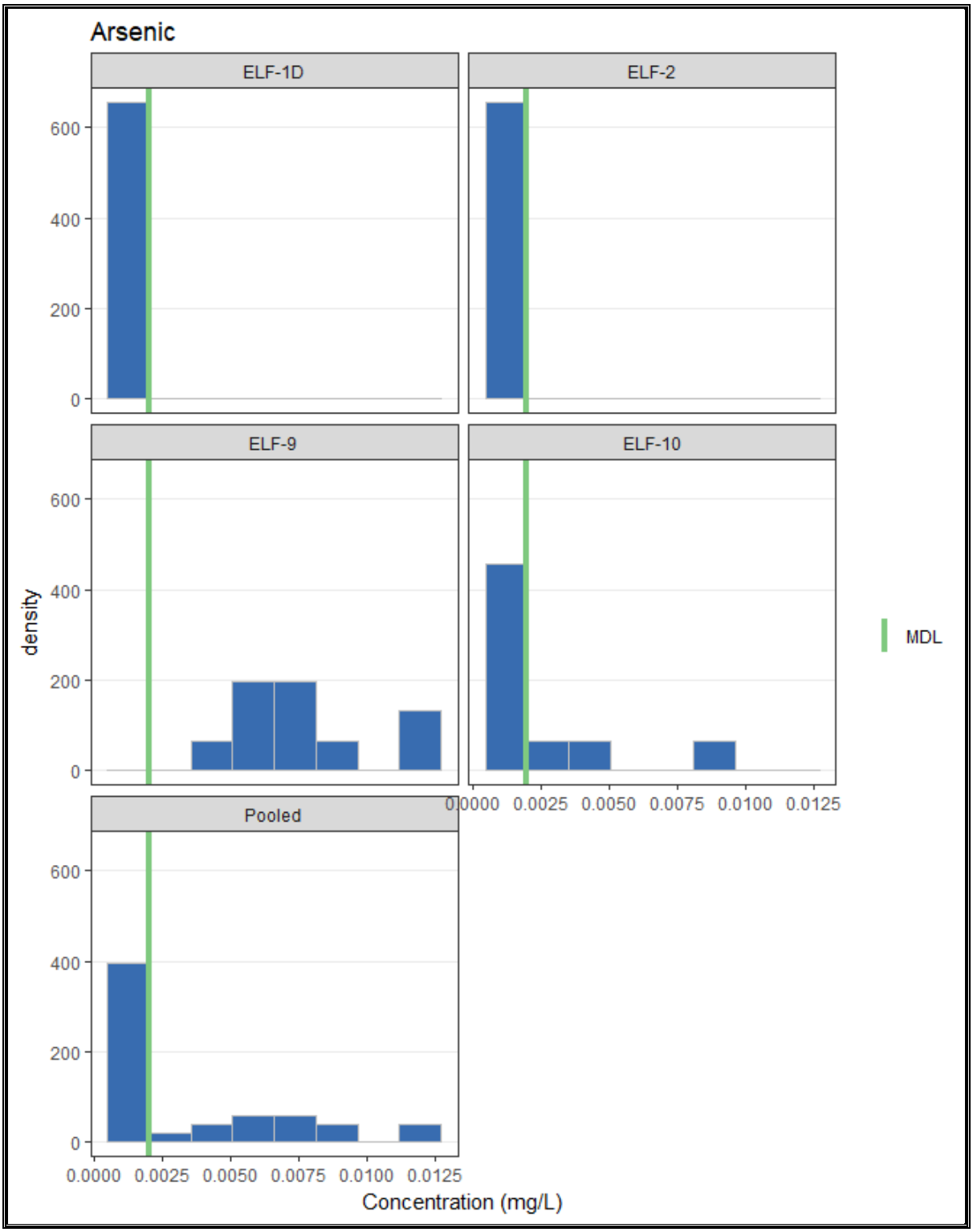

Figure C.3. Summary statistics plots for the CCR Landfill.

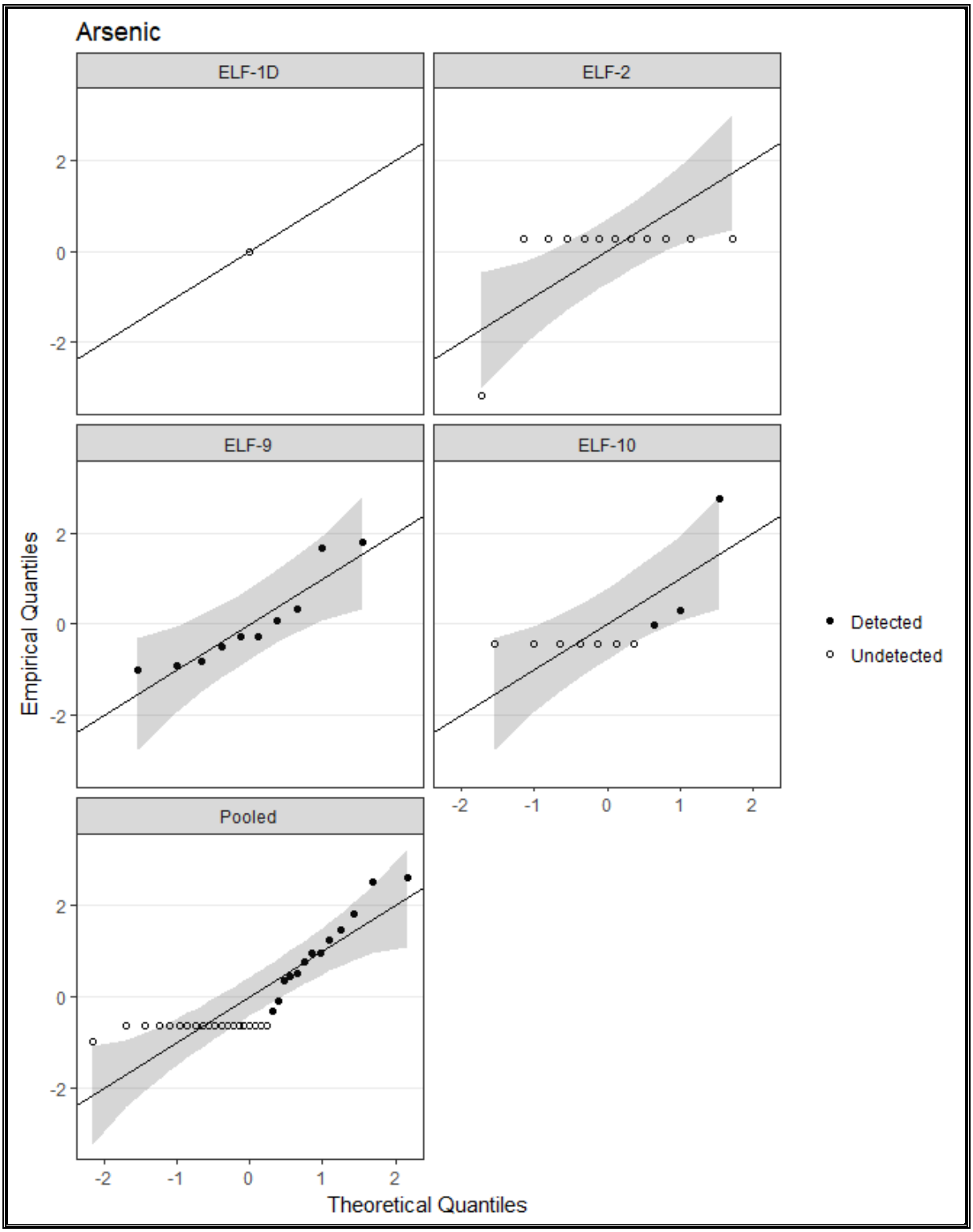

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

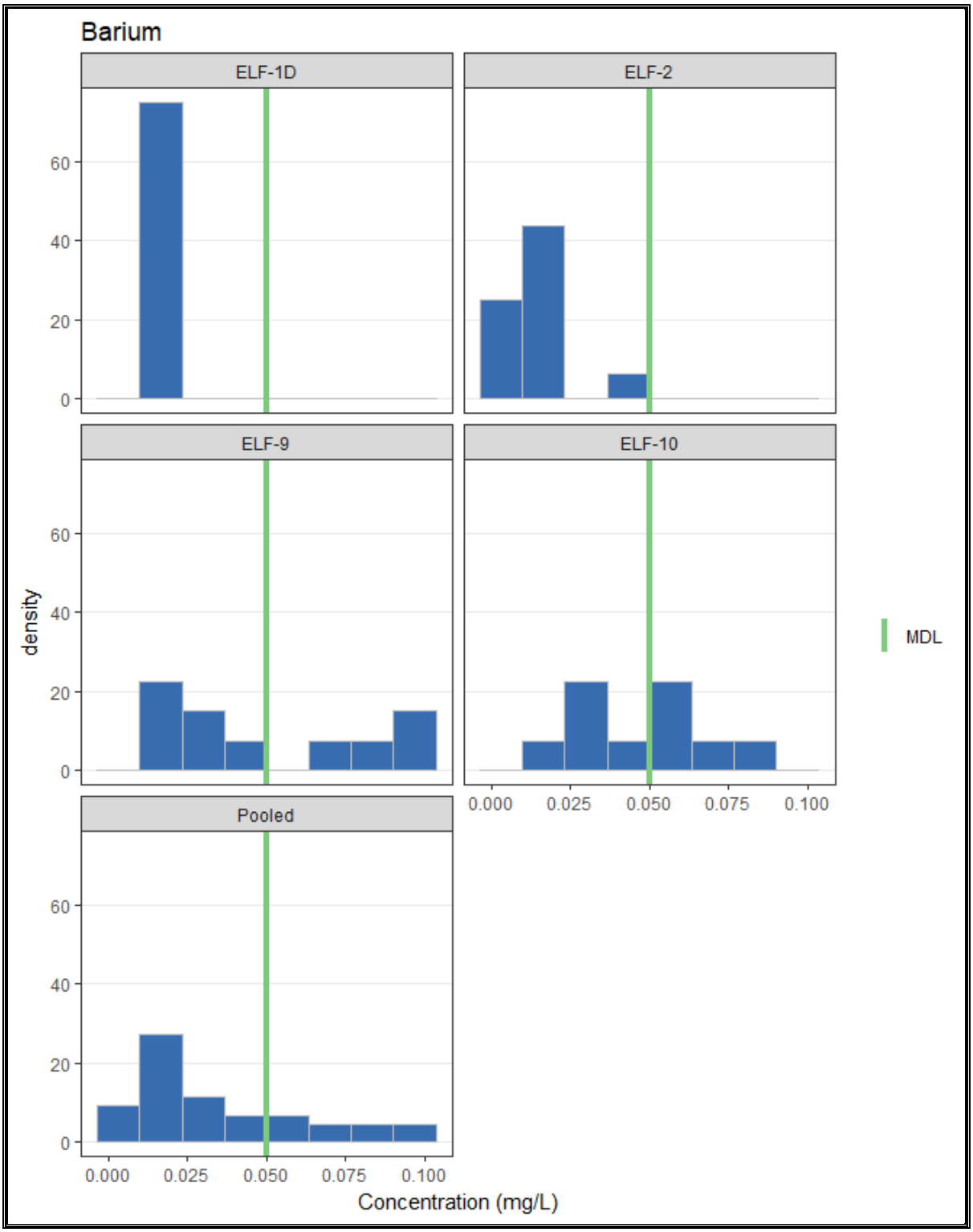

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

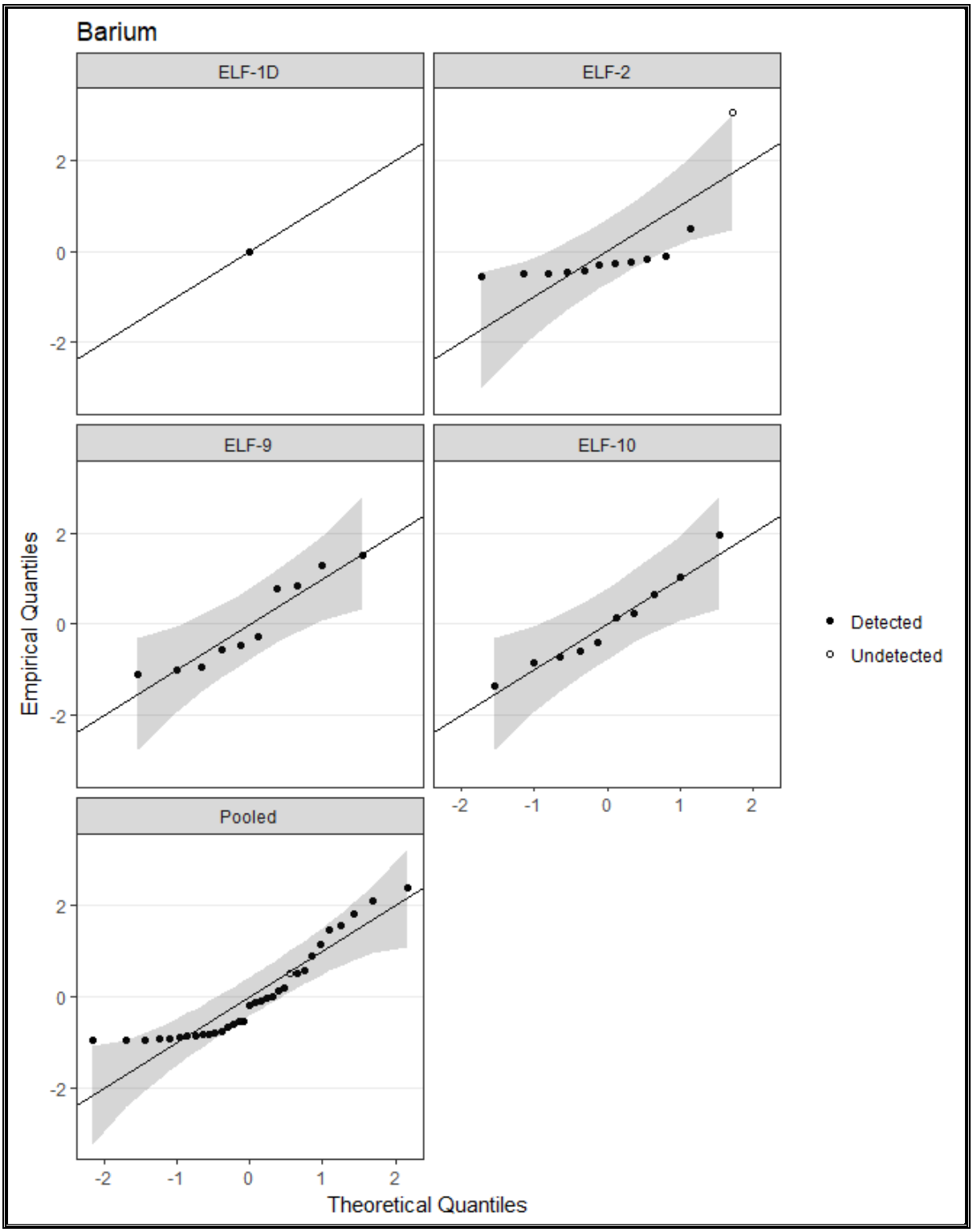

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

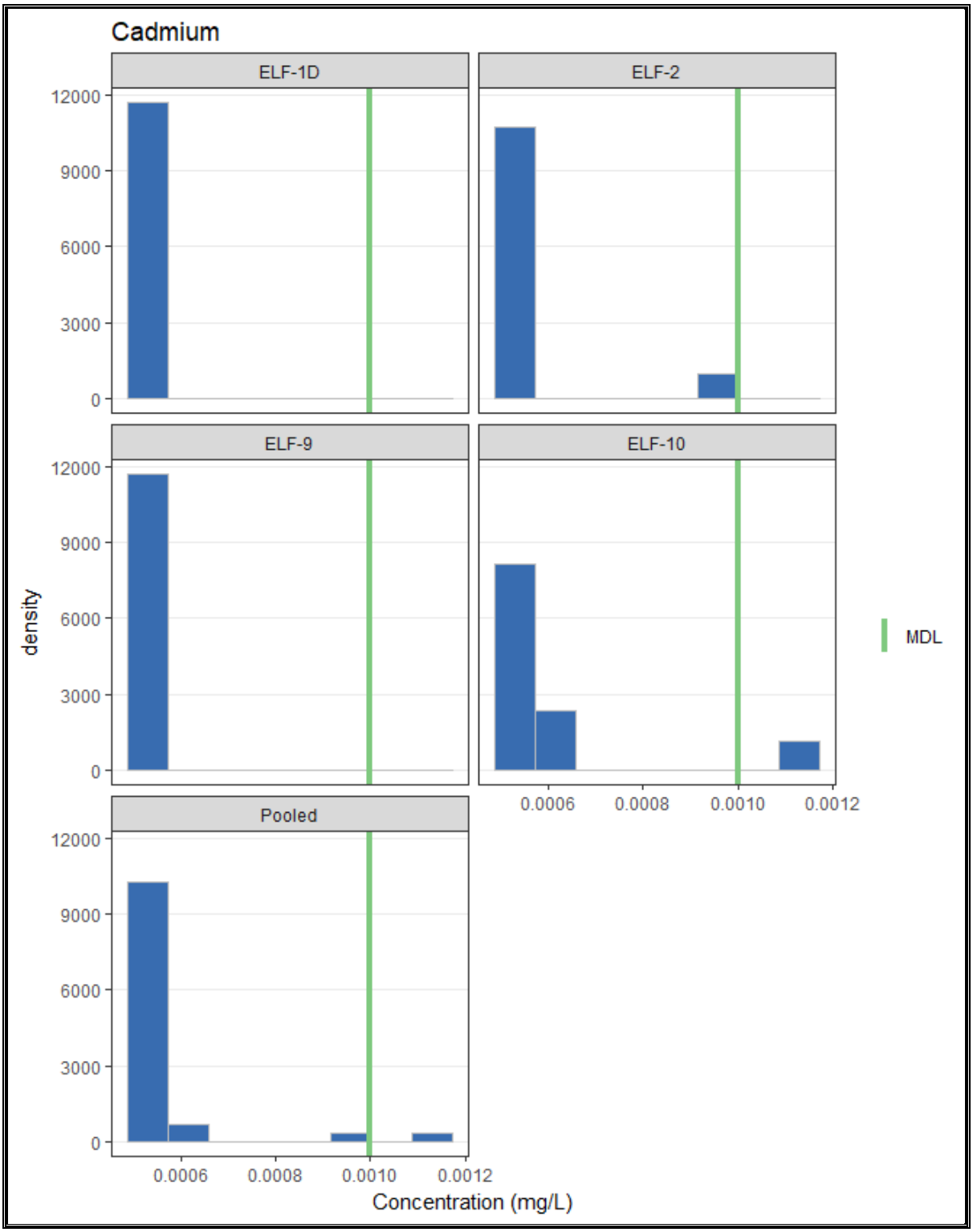

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

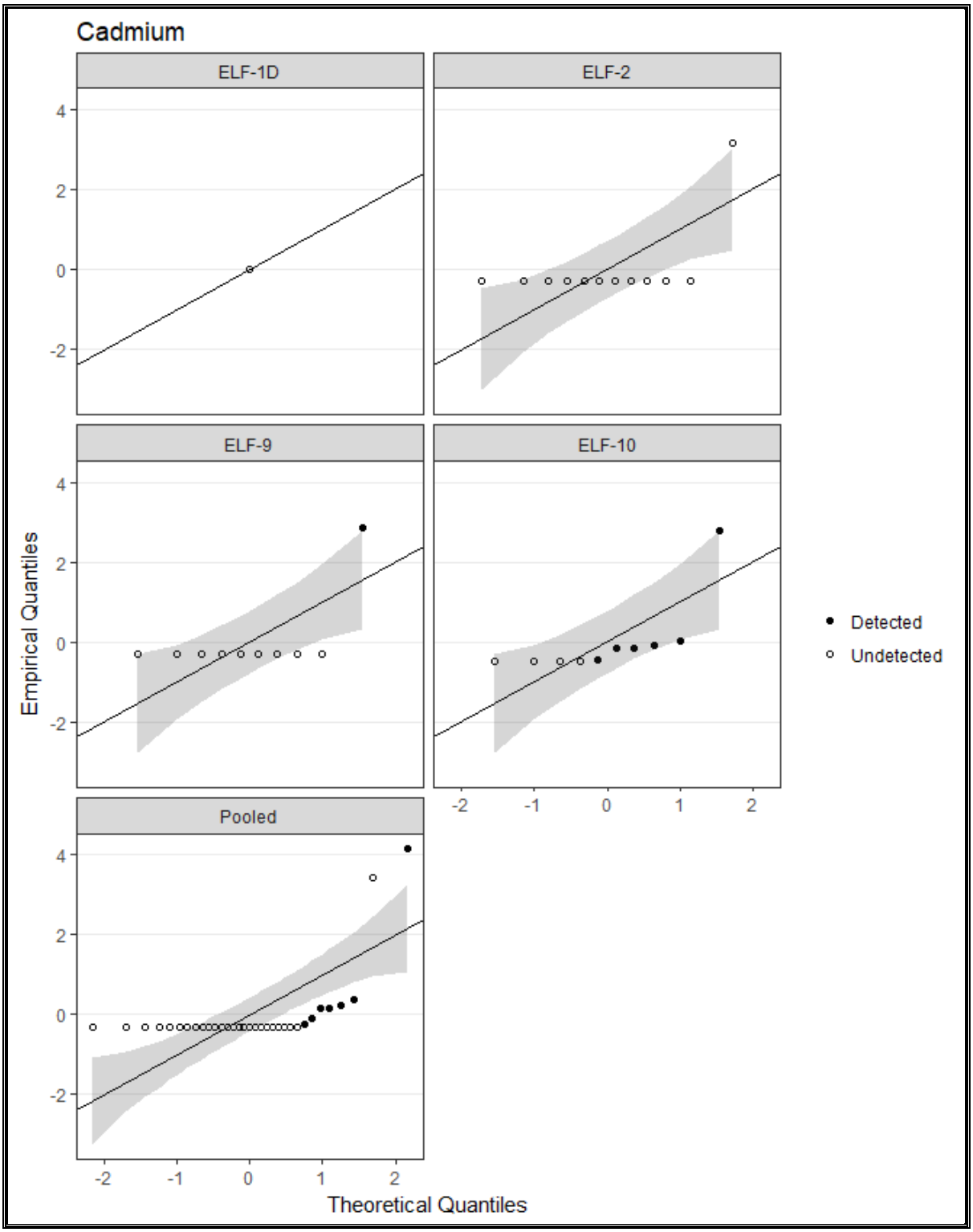

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

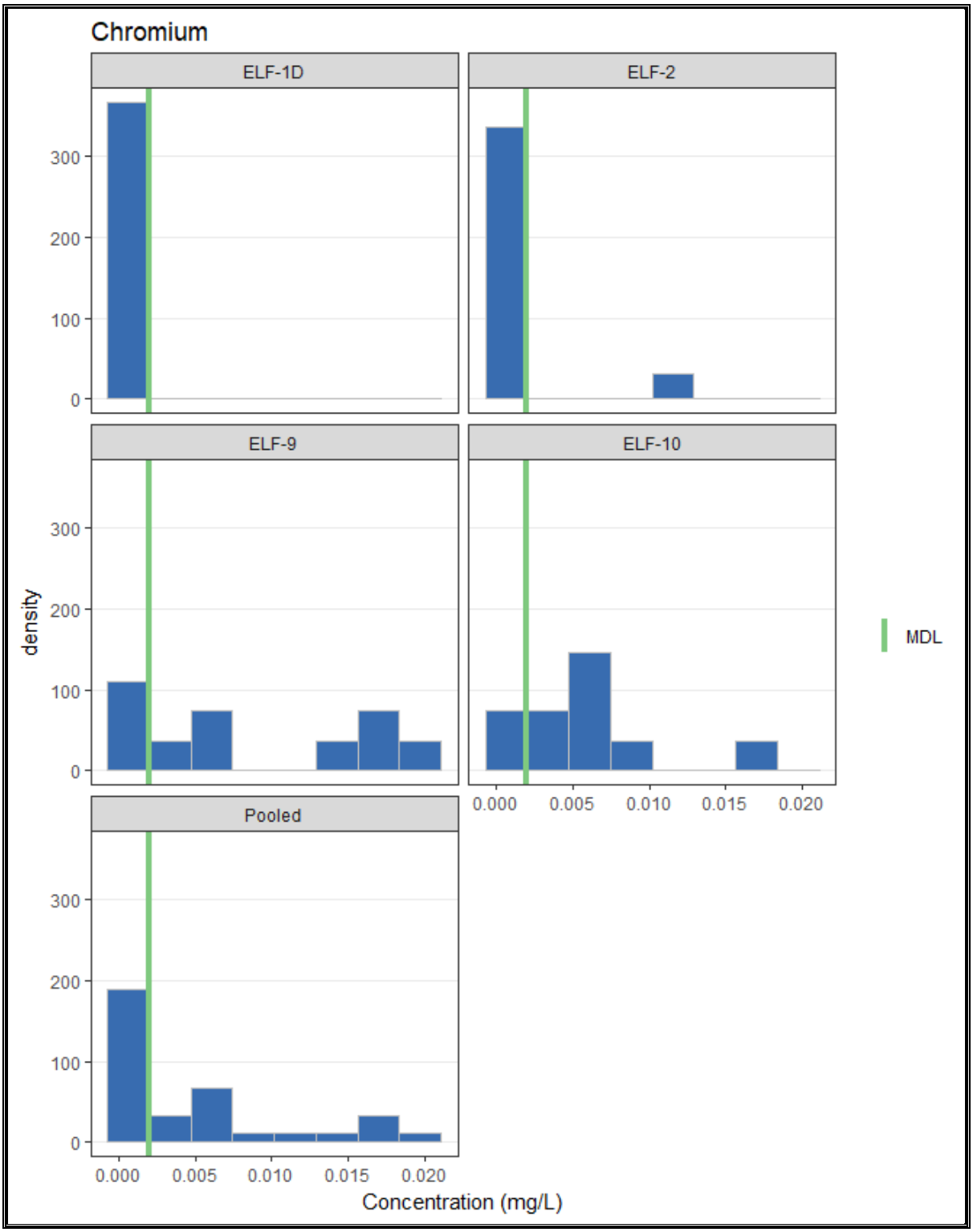

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

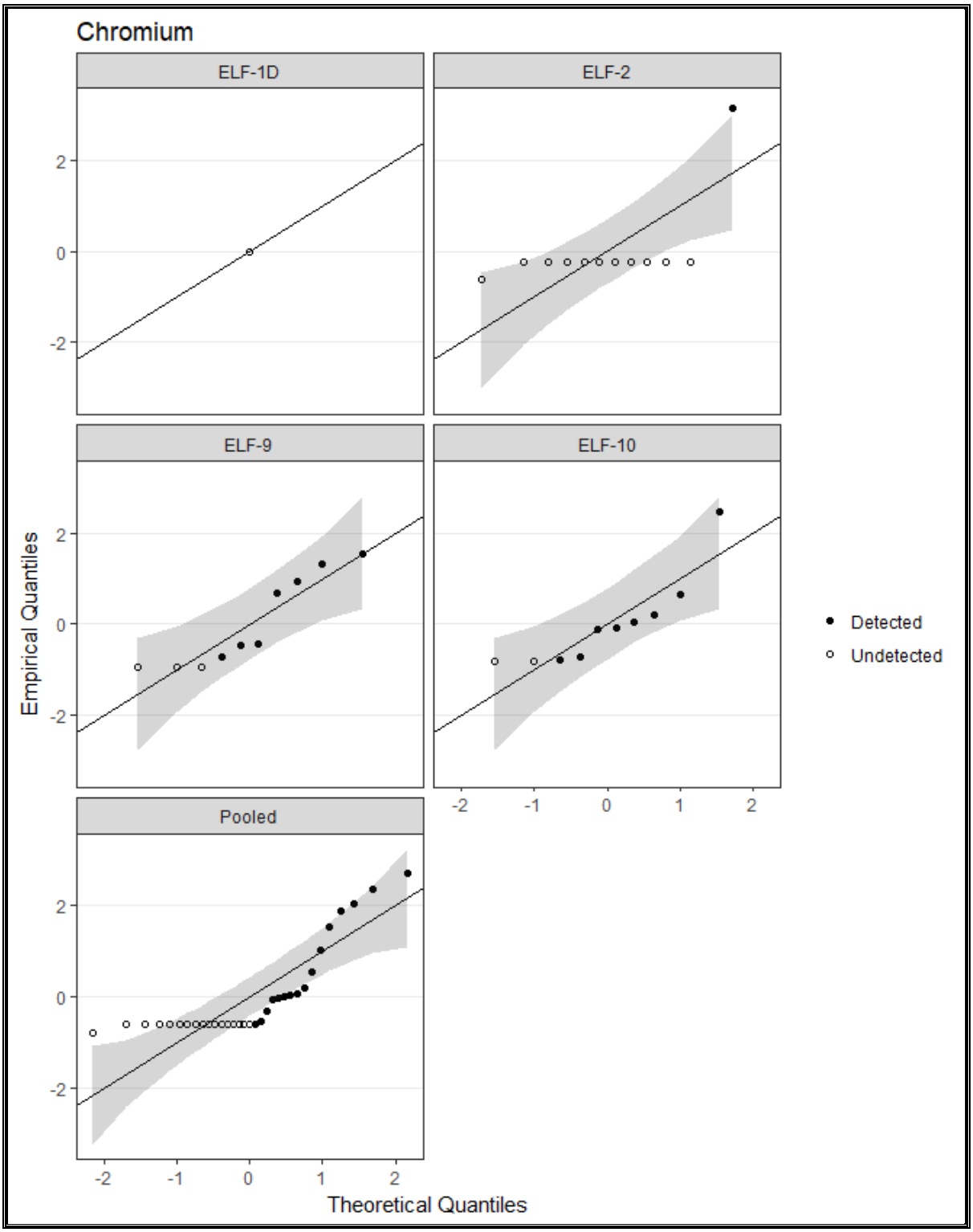

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

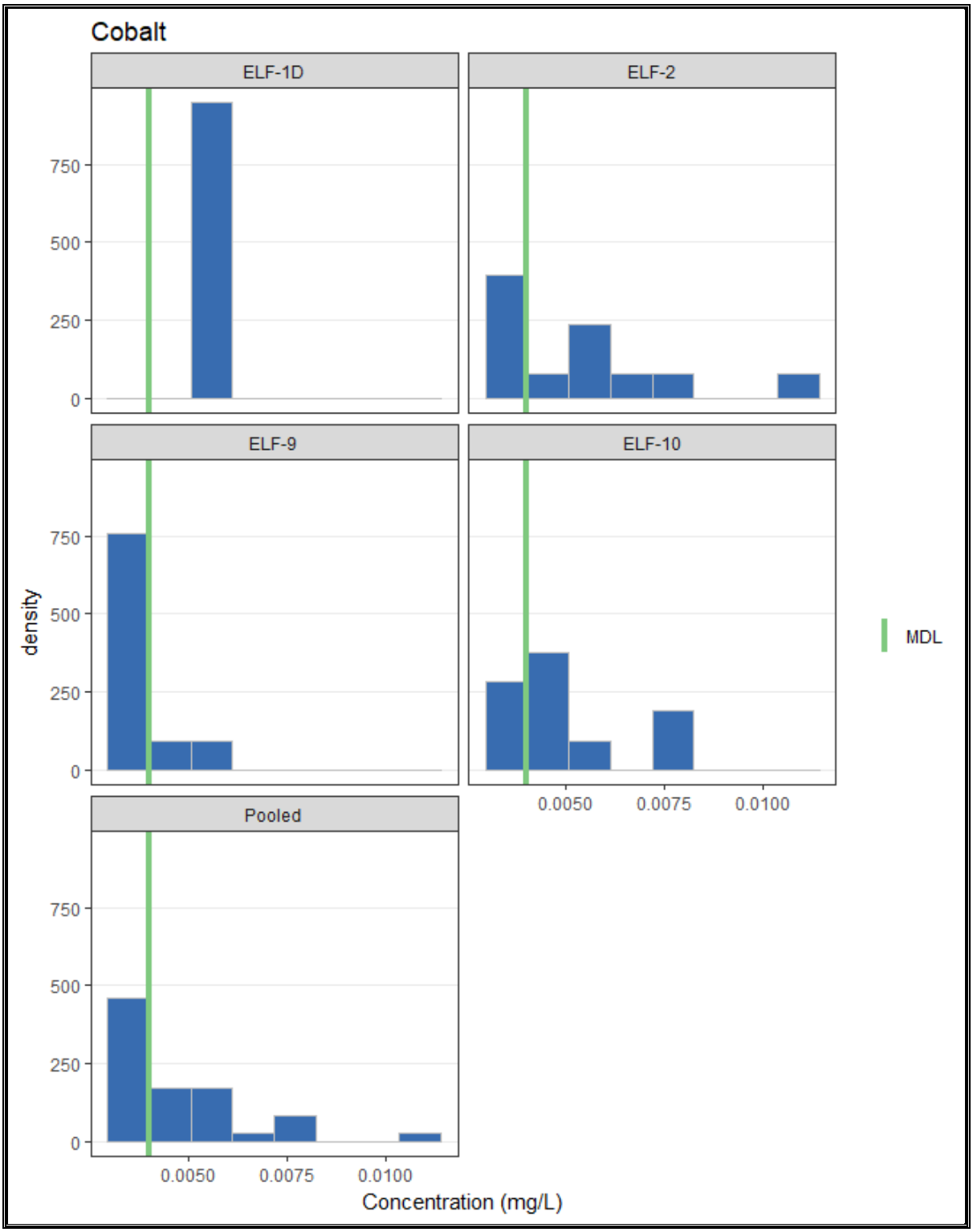

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

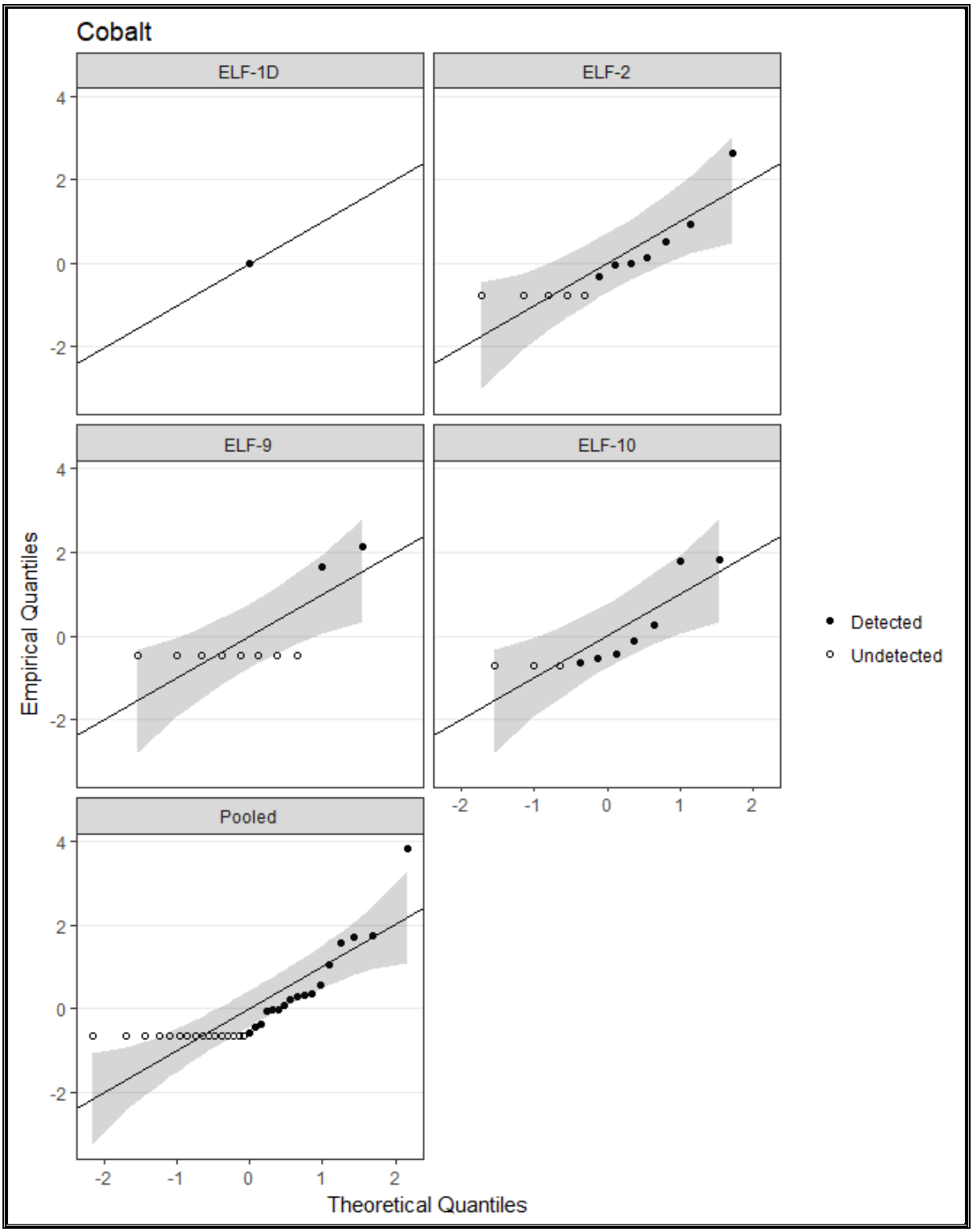

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

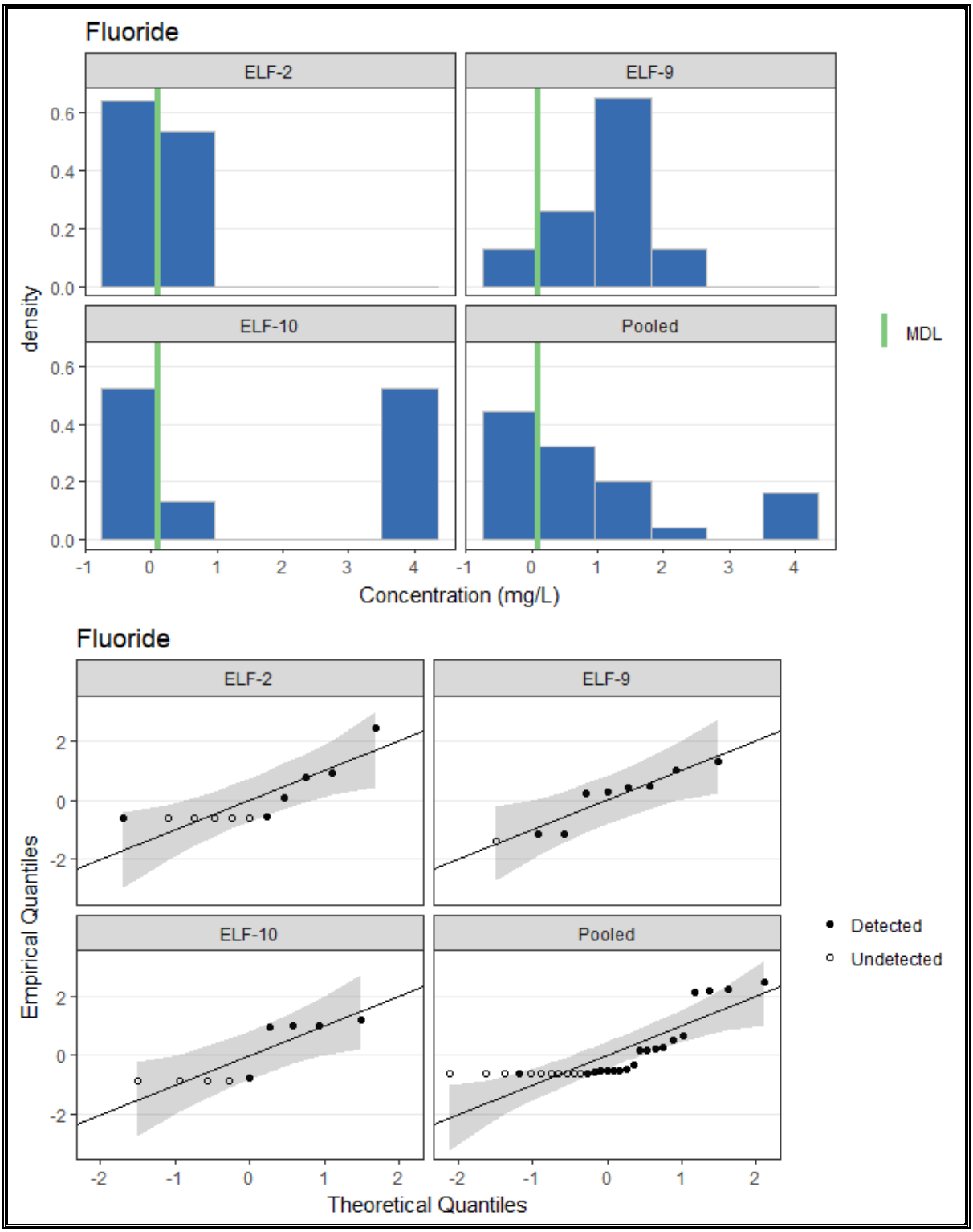

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

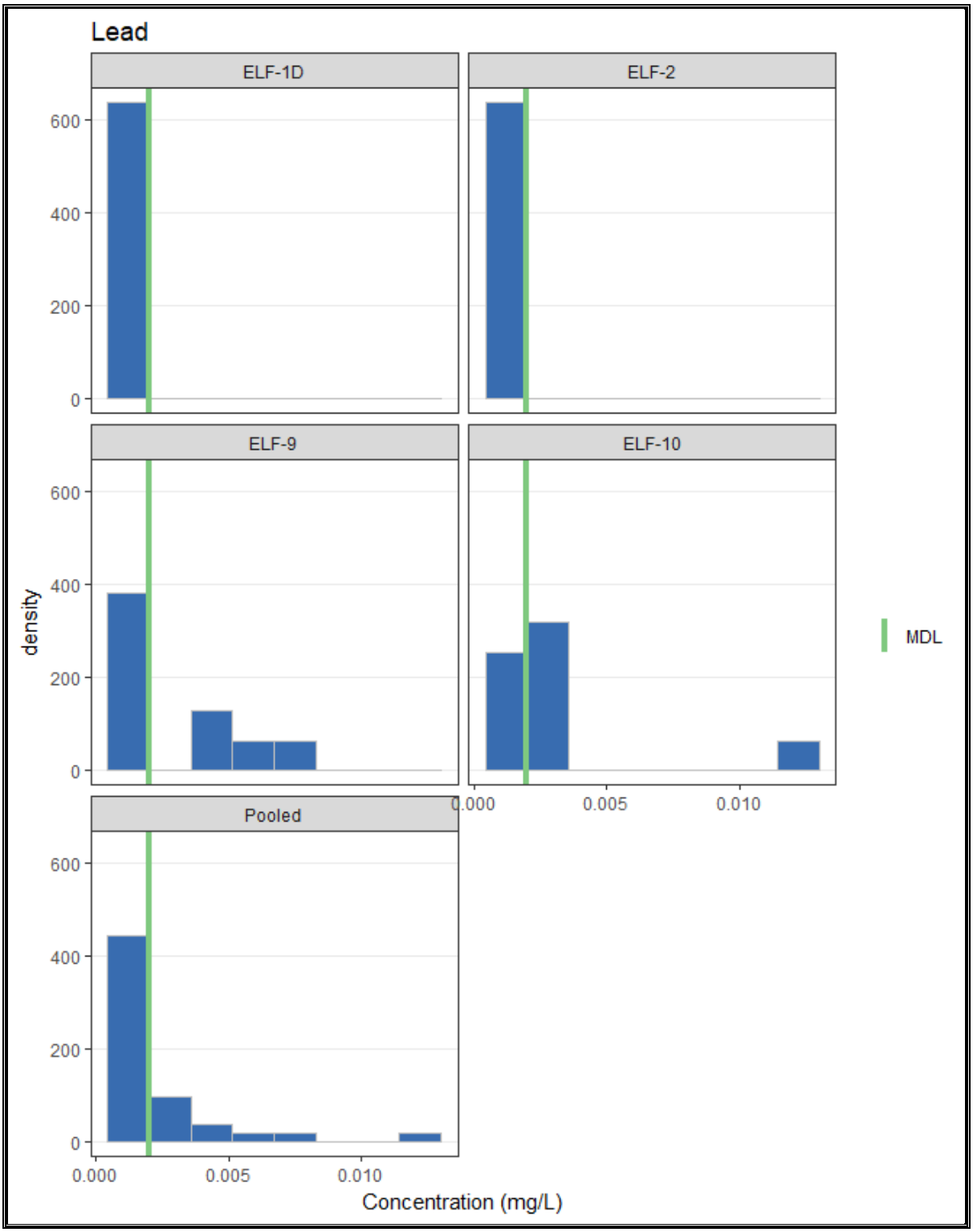

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

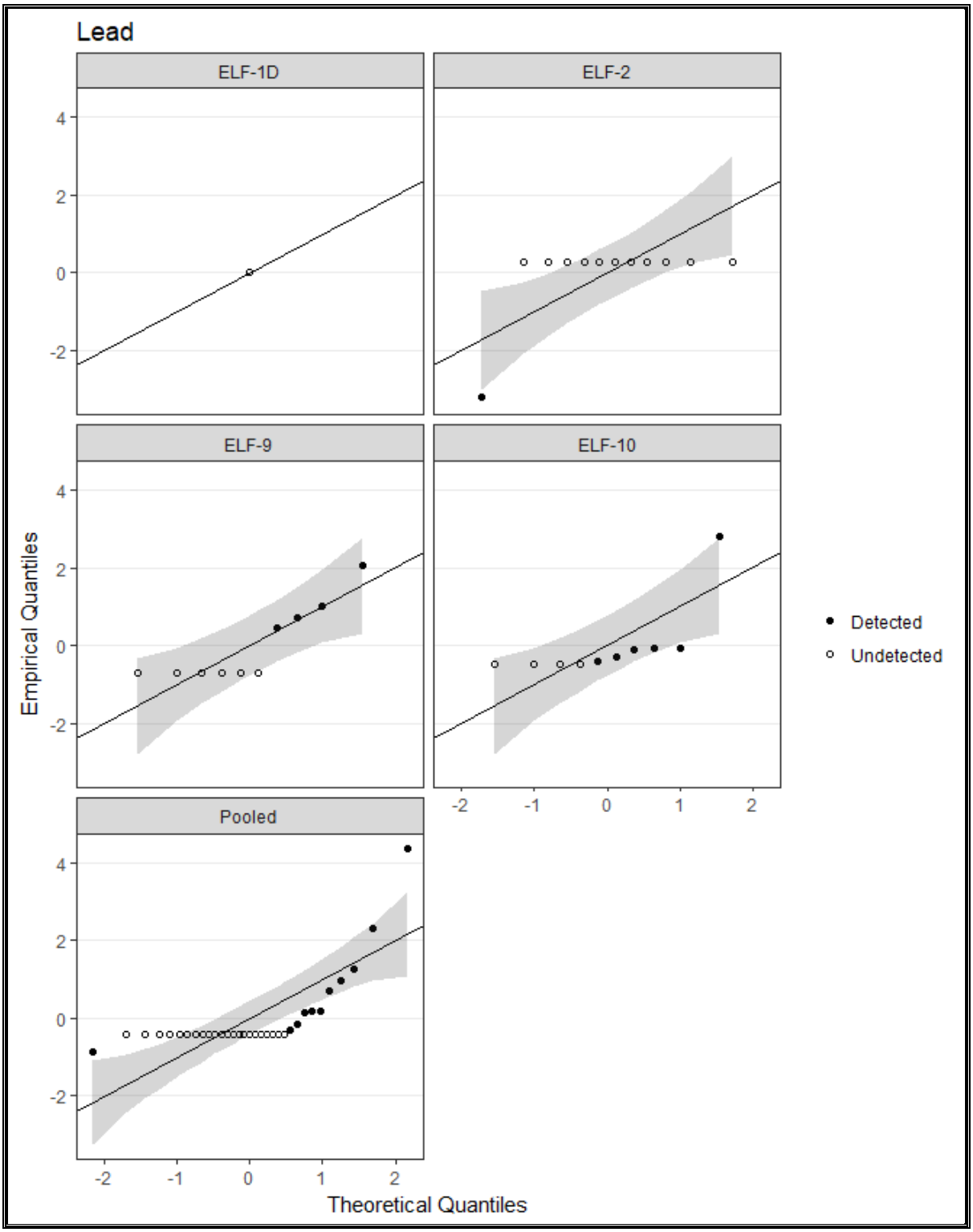

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

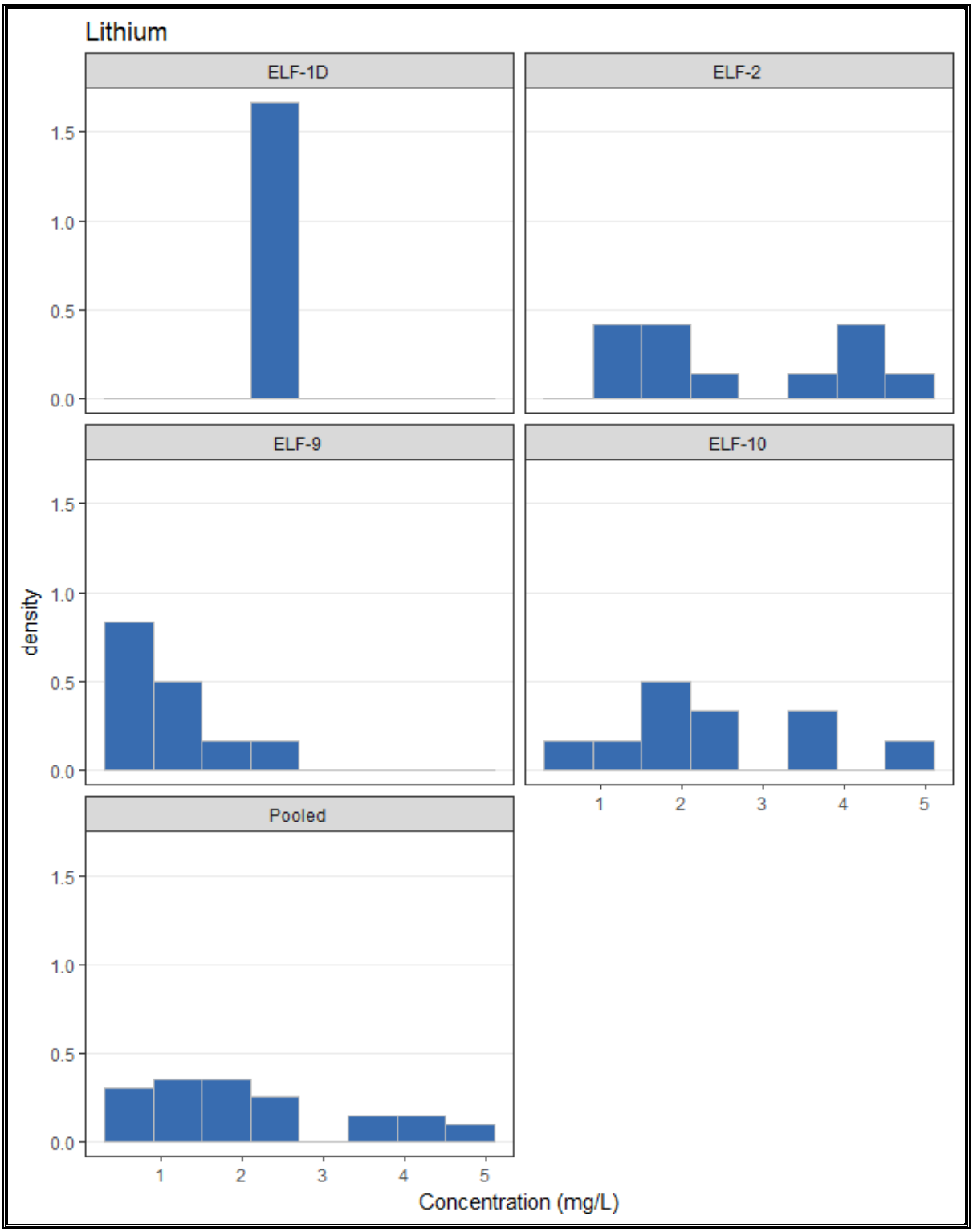

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

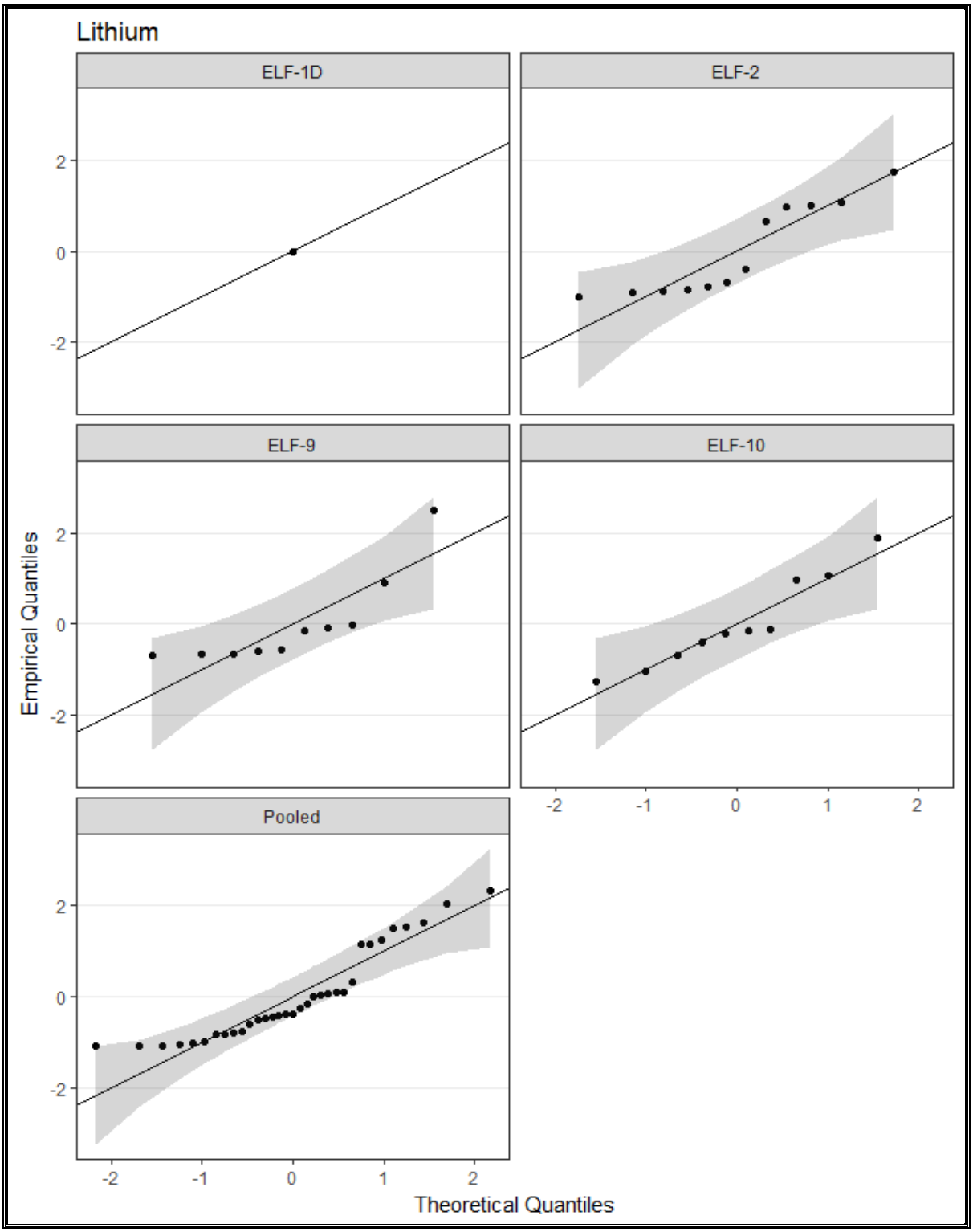

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

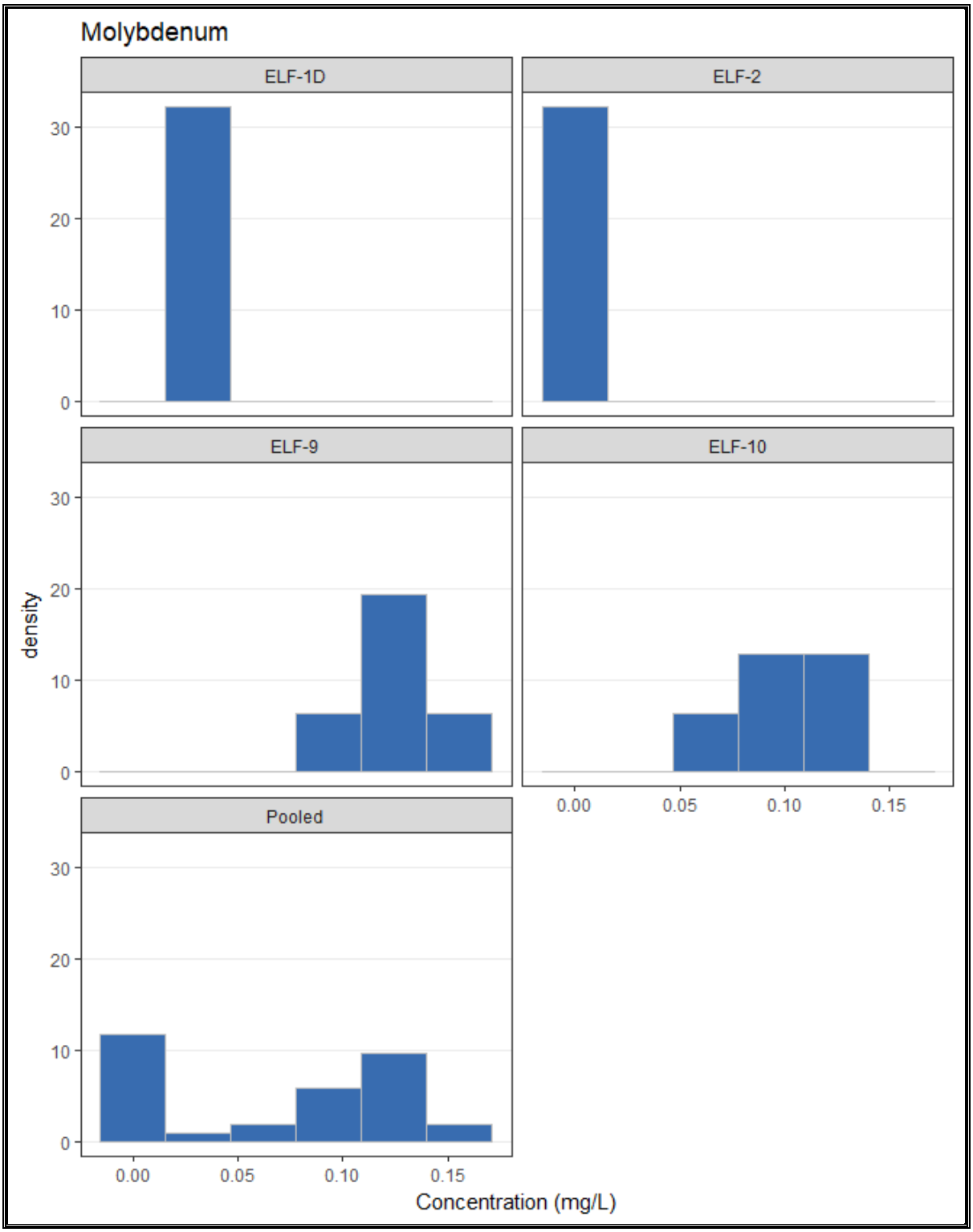

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

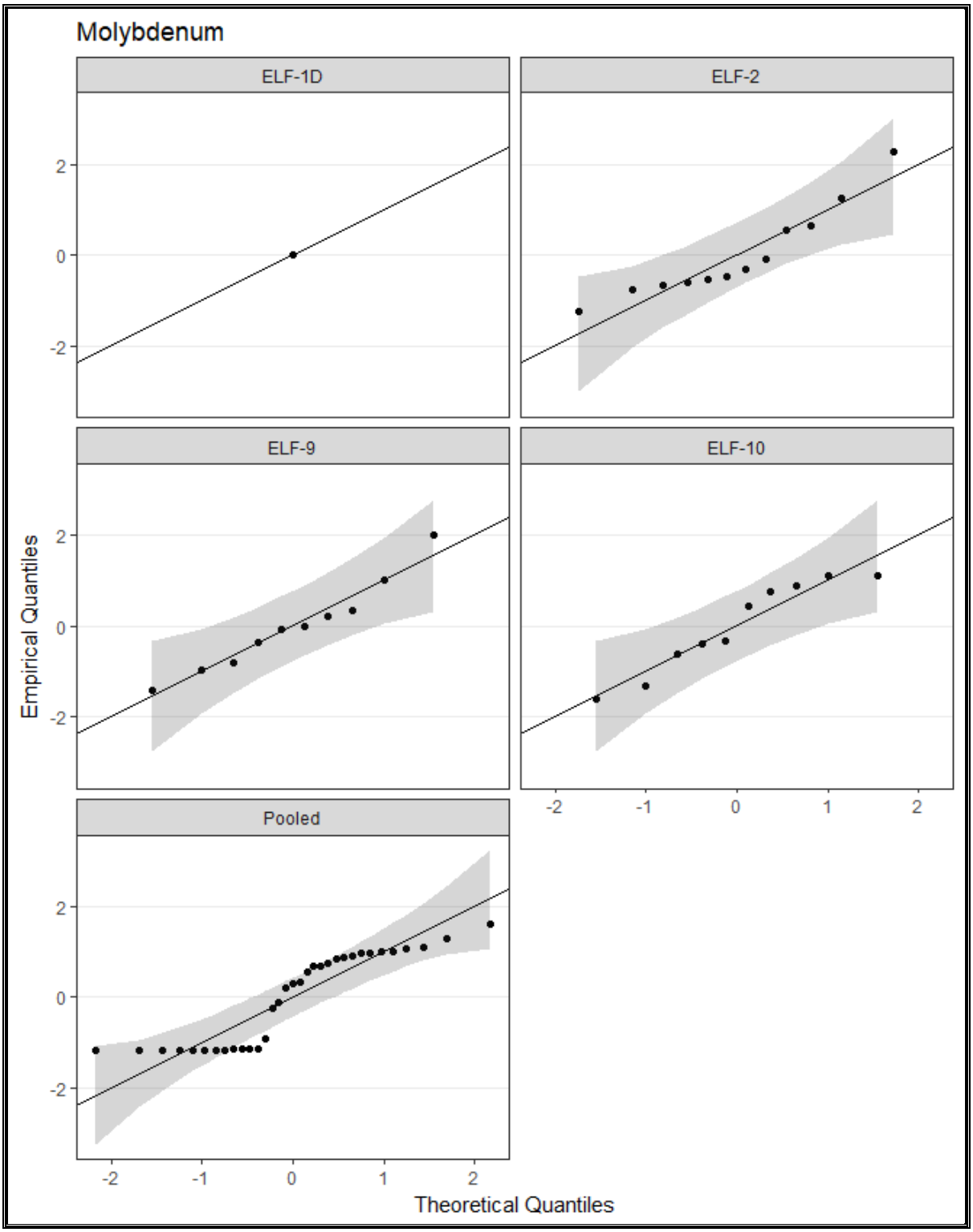

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

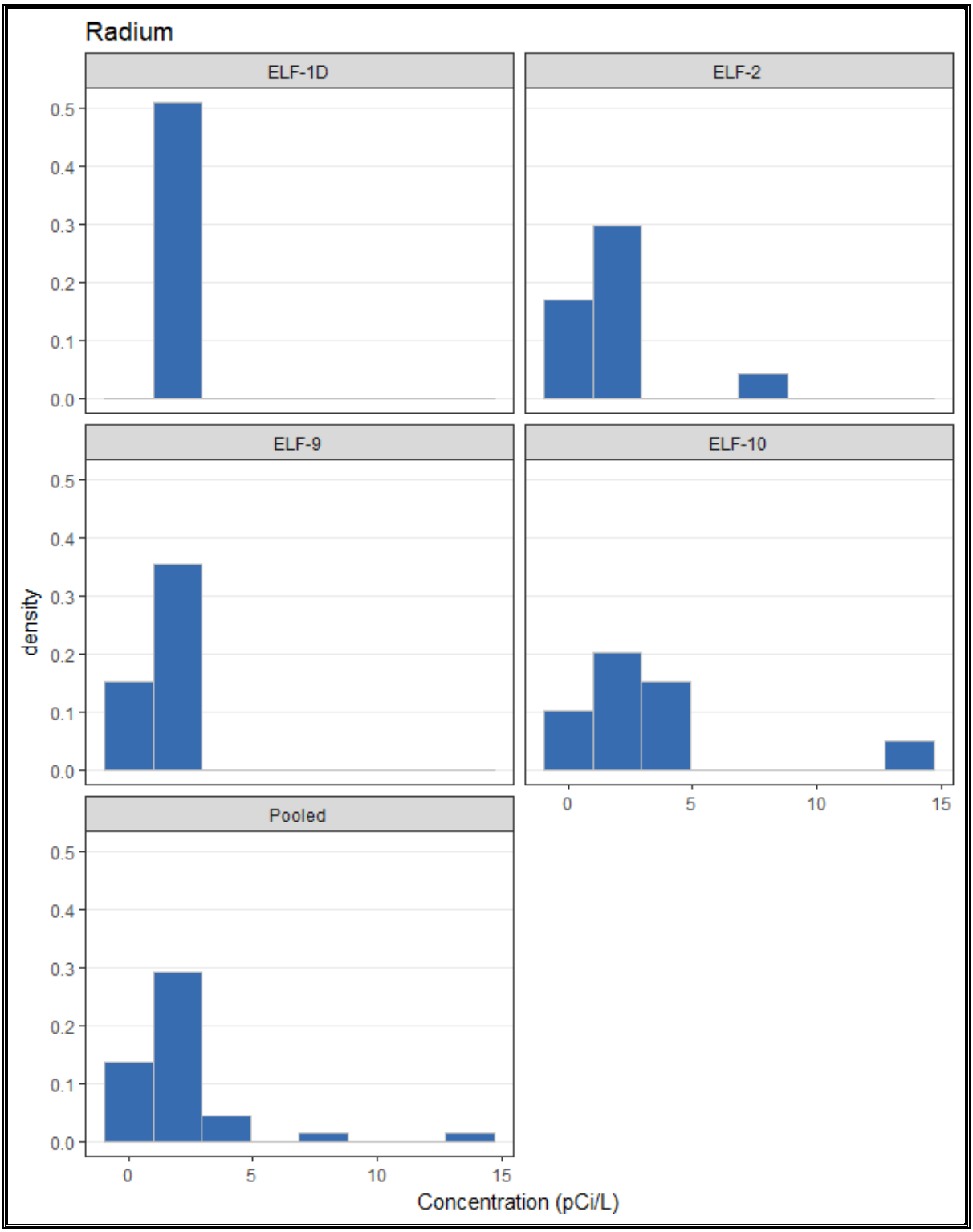

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

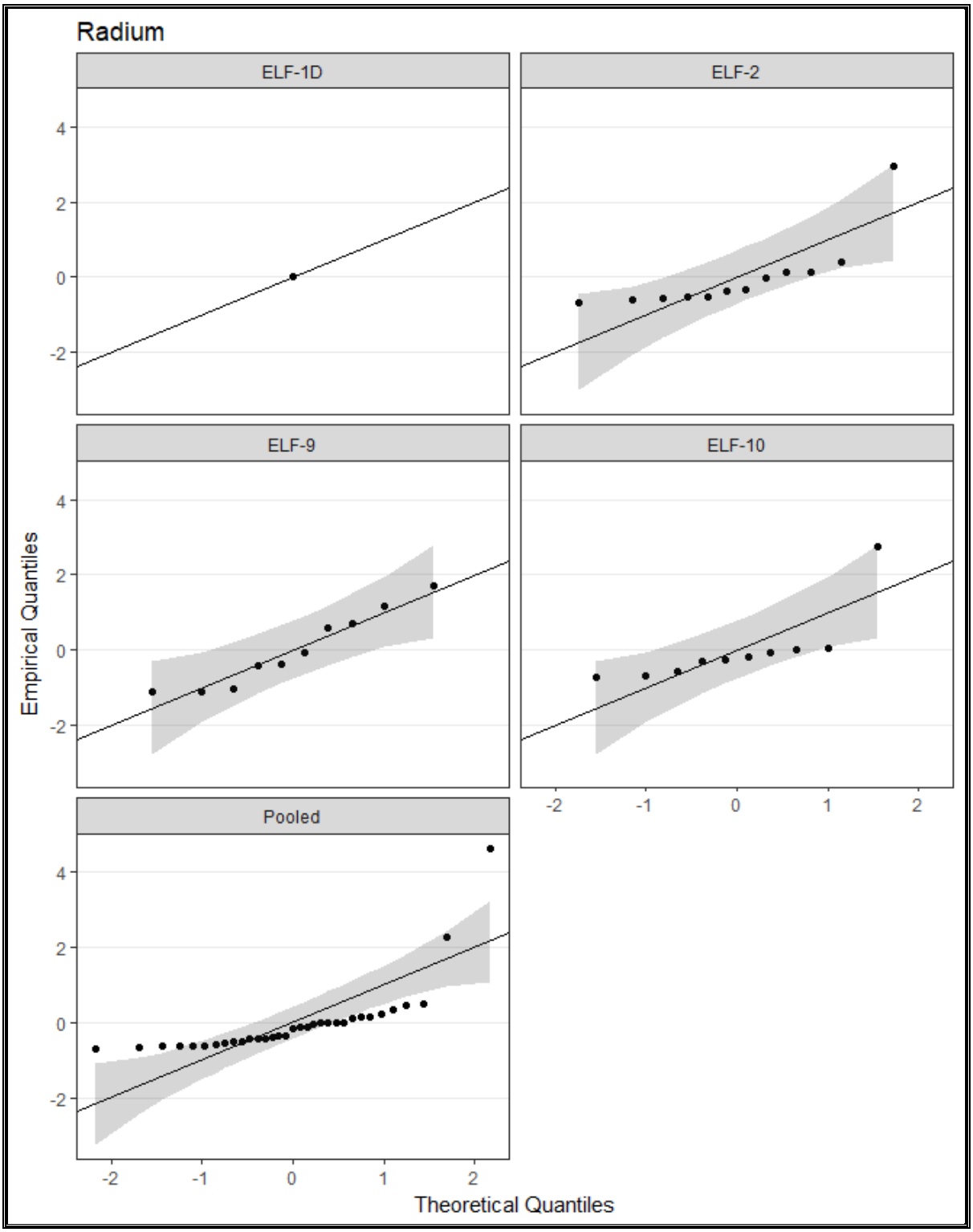

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

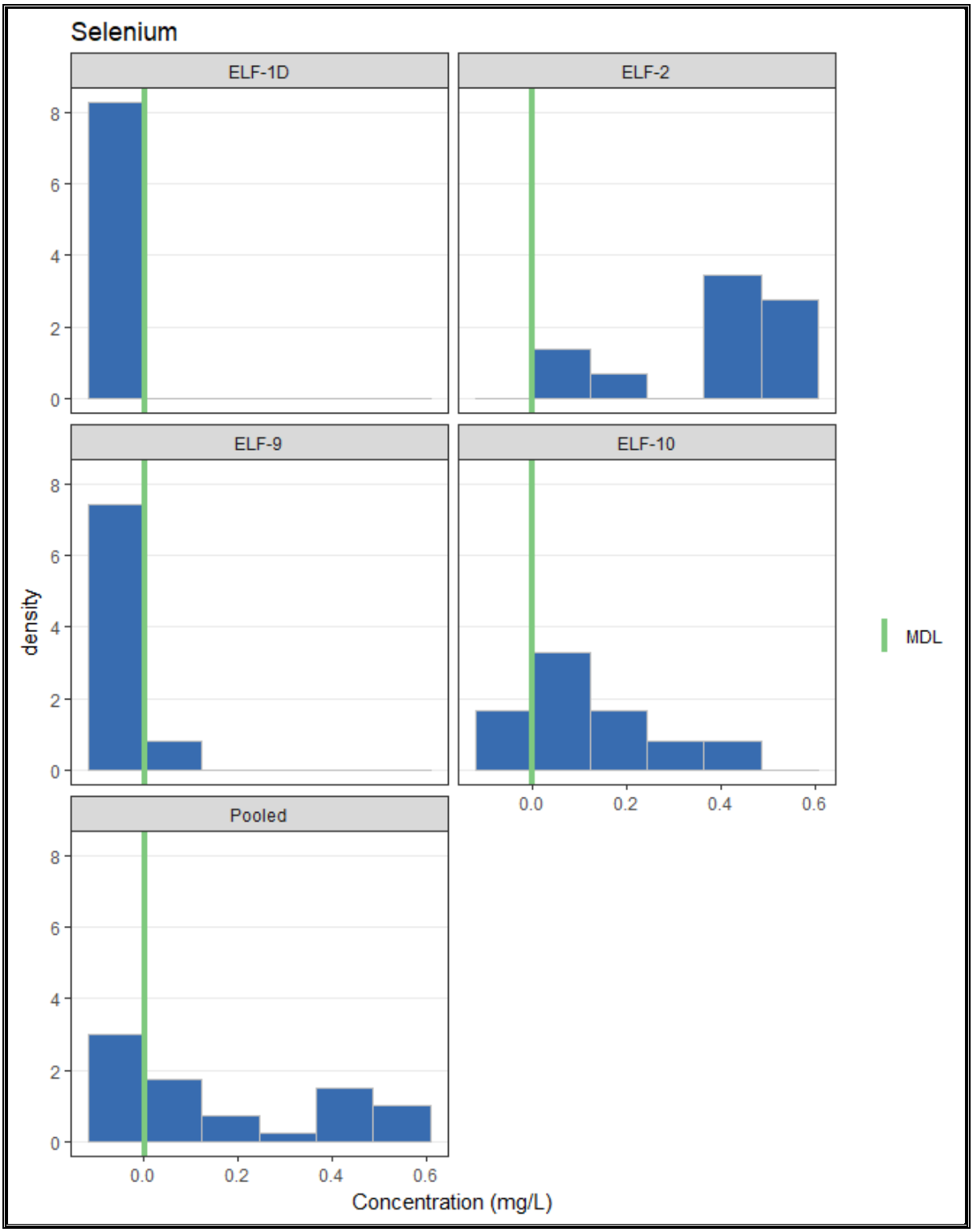

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

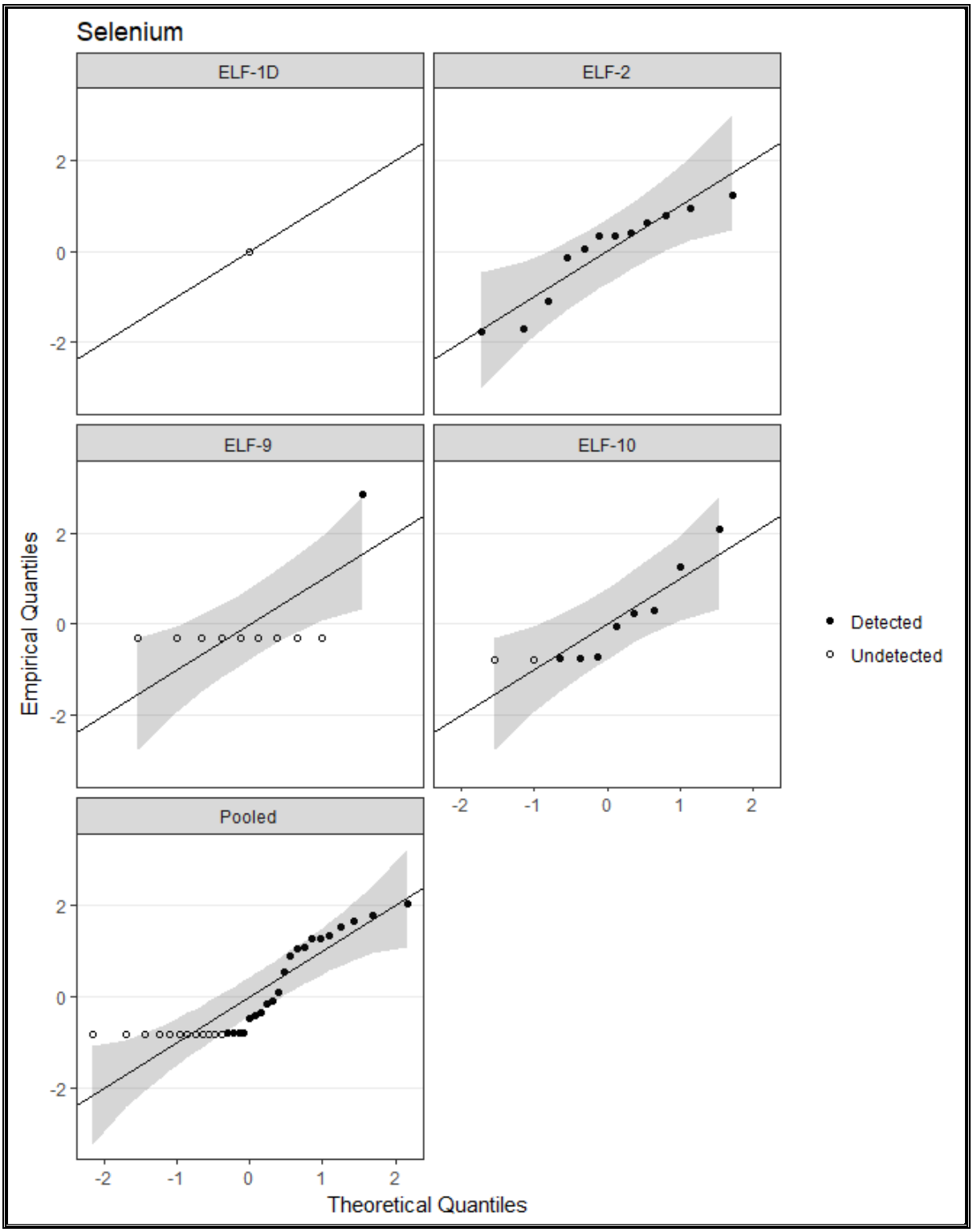

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

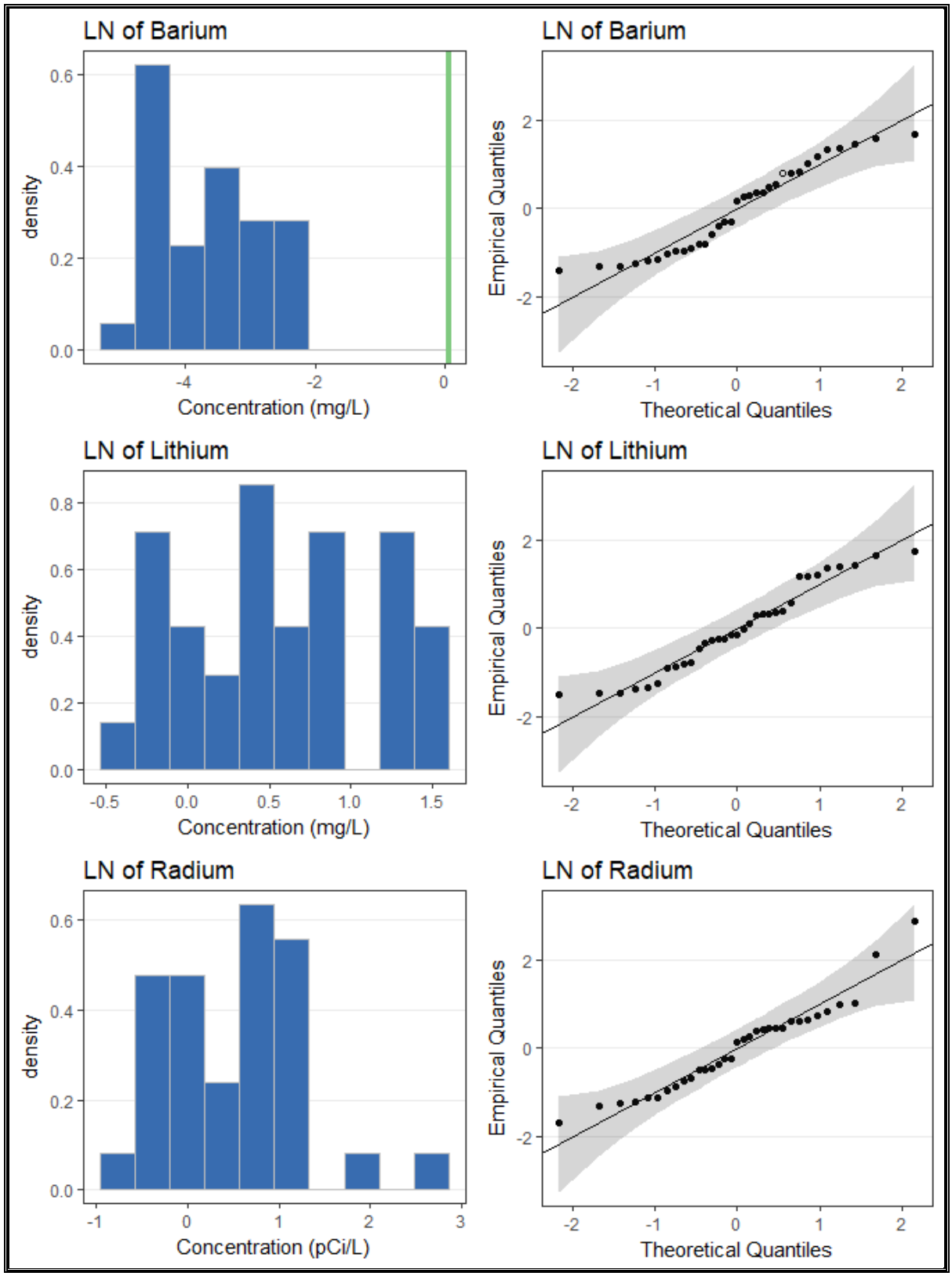

Figure C.3 (cont). Summary statistics plots for the CCR Landfill.

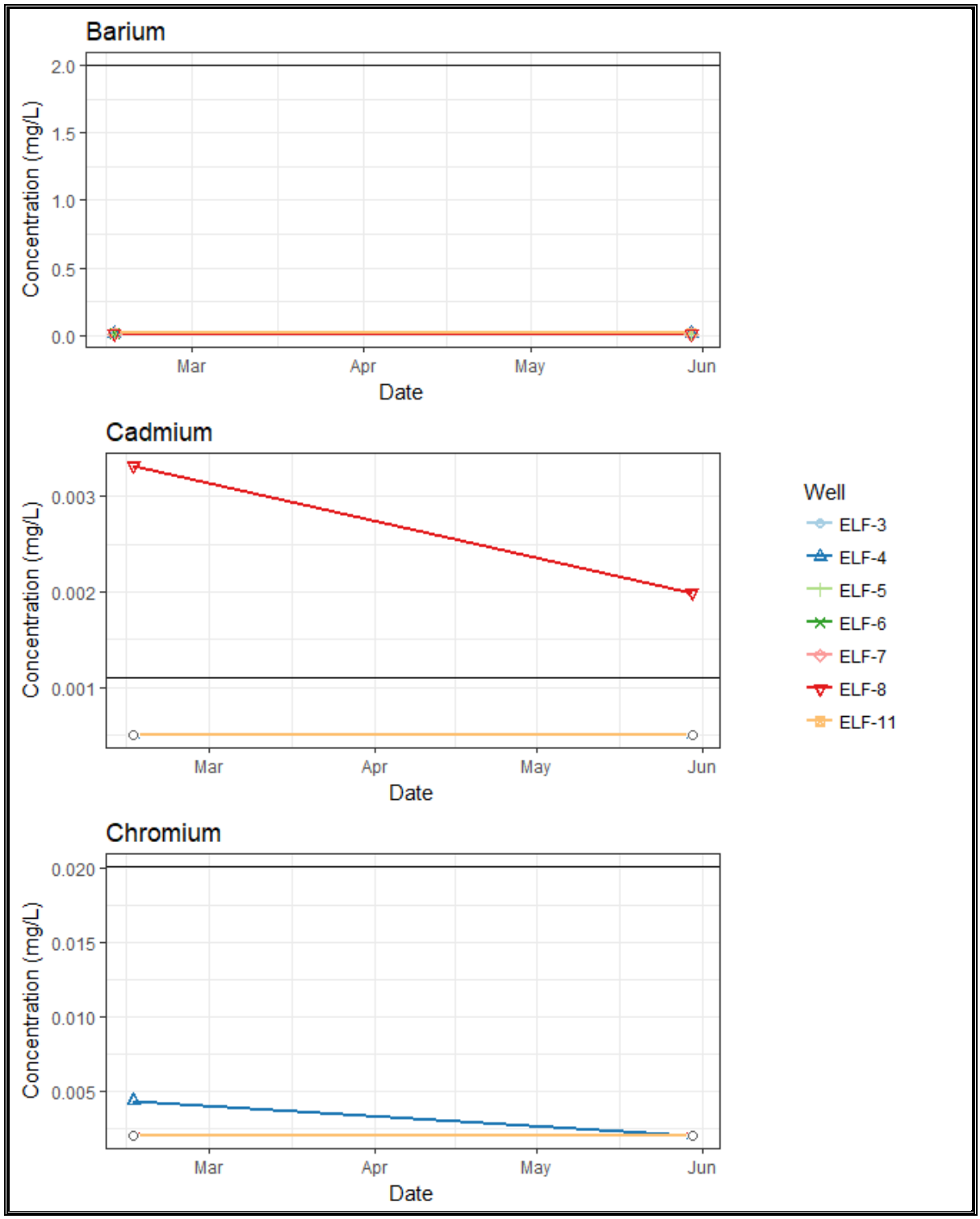

Figure C.4. Upper tolerance limit plots for the CCR Landfill.

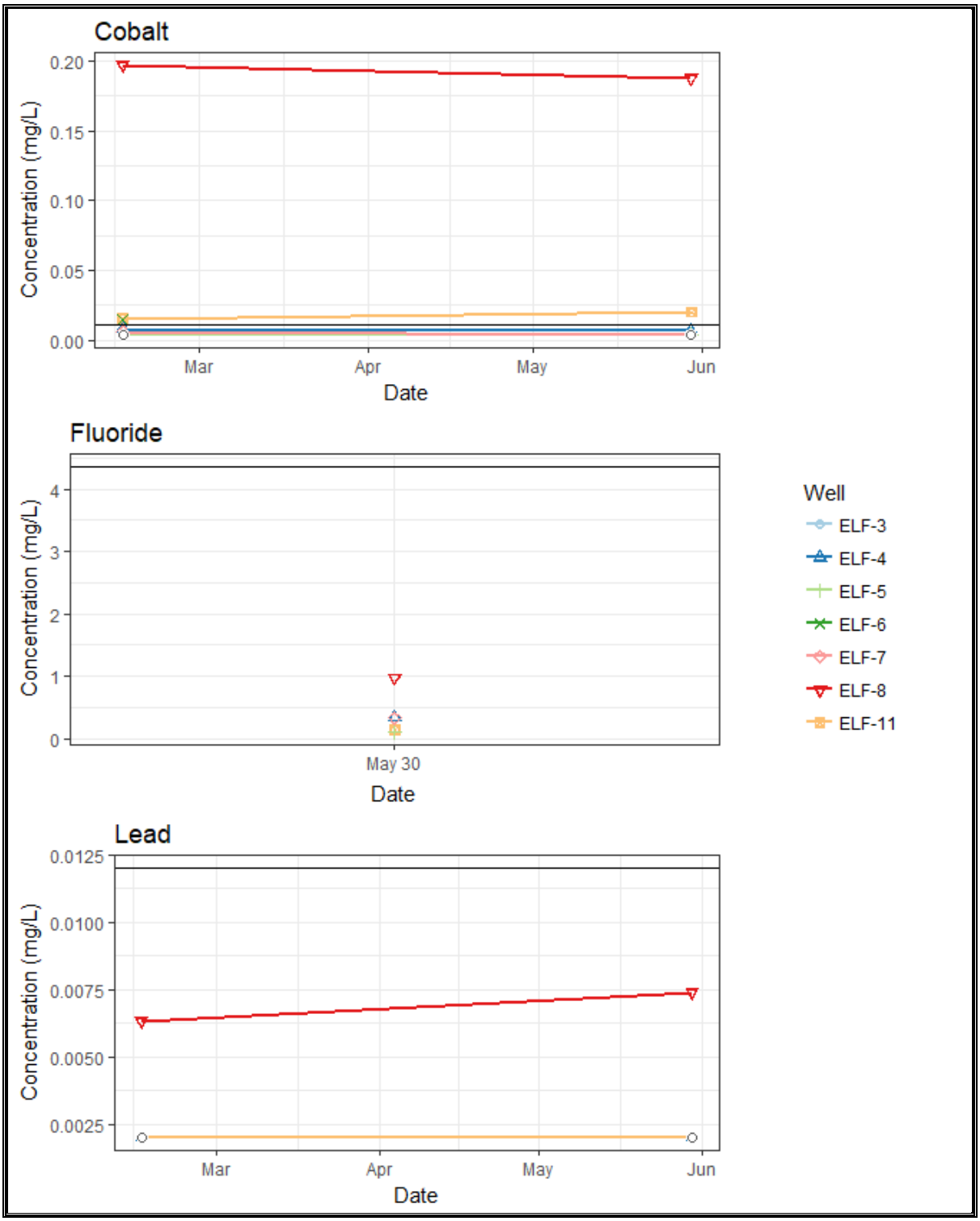

Figure C.4 (cont). Upper tolerance limit plots for the CCR Landfill.

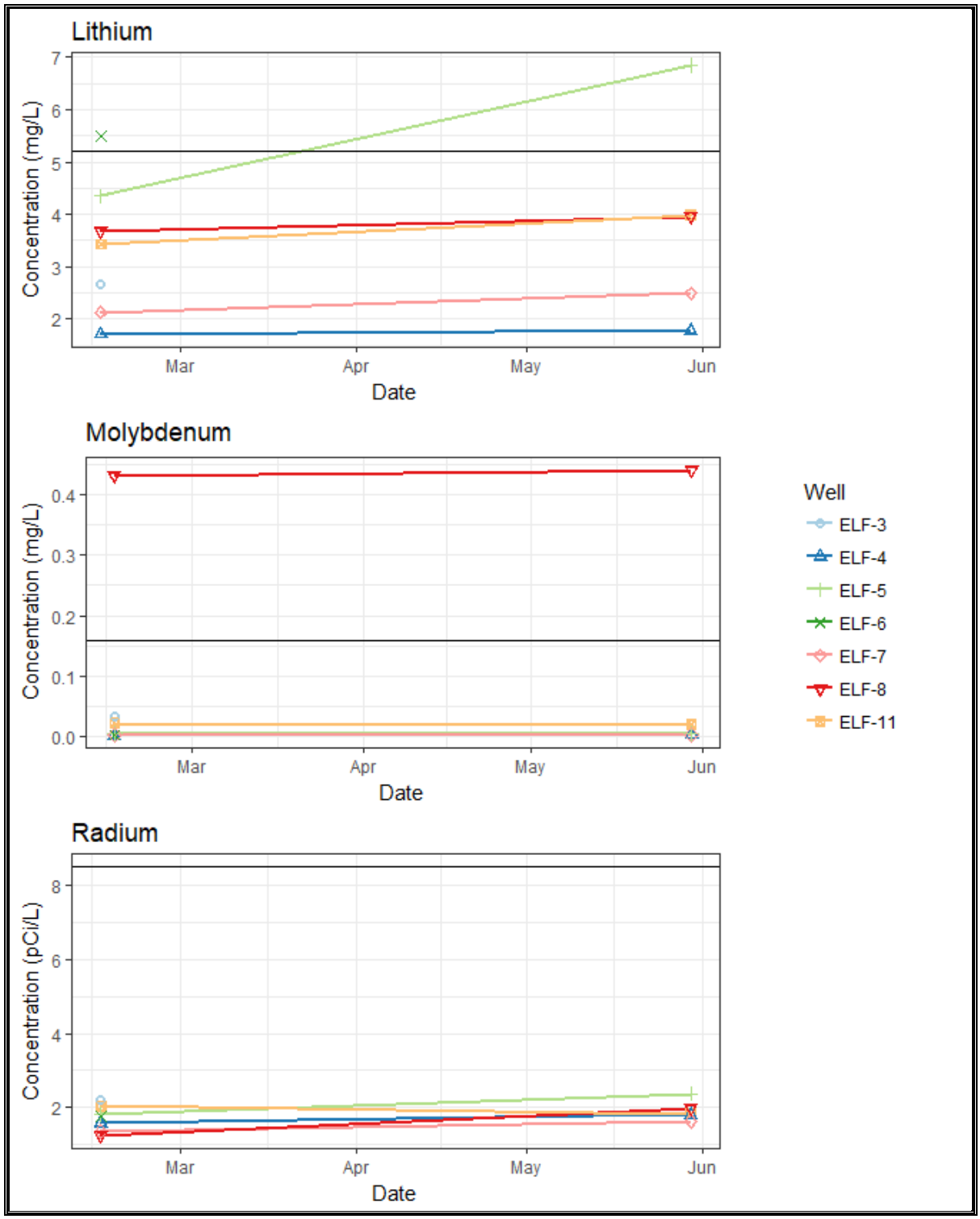

Figure C.4 (cont). Upper tolerance limit plots for the CCR Landfill.

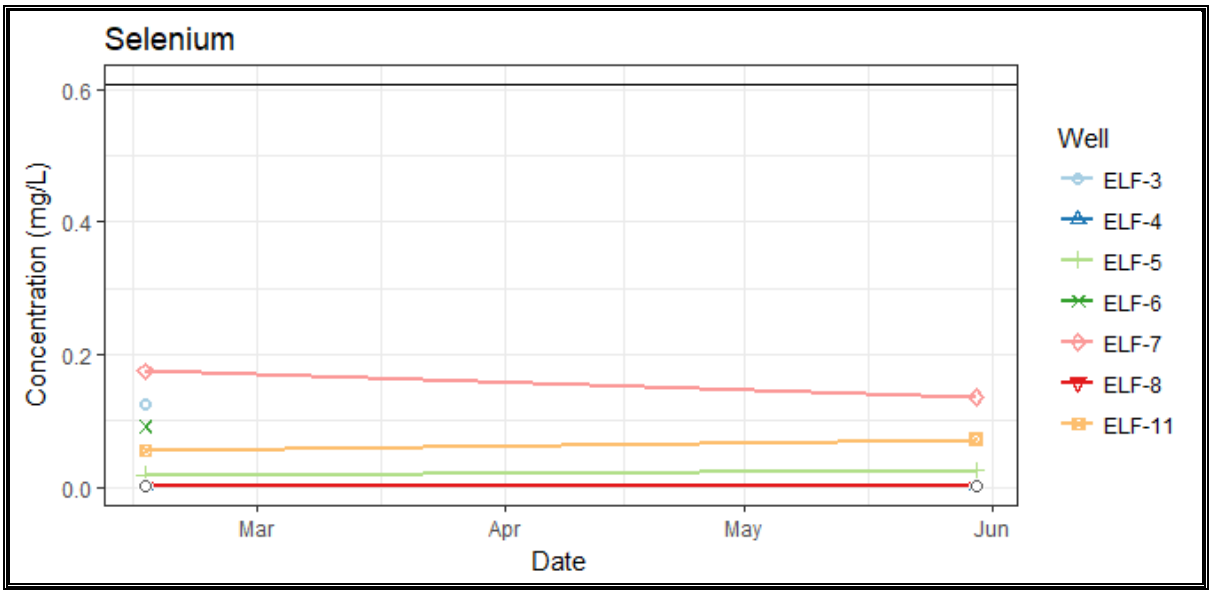

Figure C.4 (cont). Upper tolerance limit plots for the CCR Landfill.

Attachment D:

Field Data Sheets

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-1D	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	PARTLY CLOUDY, WINDY		
Depth to Water (ft):	Dry		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:16

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

TAGGED TOP OF PUMP WITH SOUNDING TAPE. ATTEMPTED TO PUMP WATER, WAS NOT ABLE TO PRODUCE.

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-2	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	PARTLY CLOUDY, WINDY		
Depth to Water (ft):	22.24		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	13.60	10,006	1.02	7.03	272.60	21.30
2	13.60	10,004	1.05	7.07	272.10	21.30
4	13.50	9,995	0.99	7.08	271.90	10.30
6	13.60	9,994	0.95	7.08	271.10	4.90

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:00

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

DUPICATE TAKEN AT1715

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	Jf	**Project Number:**	PERCM052
Sample ID:	ELF-11	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Overcast windy		
Depth to Water (ft):	28.19		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	147.00	16,333	5.95	7.10	117.20	184.00
3	14.30	15,885	2.26	7.03	129.00	184.00
7	14.40	15,889	1.28	7.04	146.30	77.90

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	16:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-3	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	SUNNY~76 DEGREES FARENHEIT		
Depth to Water (ft):	34.80		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	18:00

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

TAGGED TOP OF PUMP UPON ARRIVAL. PULLED PUMP TO GET DEPTH TO WATER. UNABLE TO GET PUMP TO PRODUCE WATER. NO SAMPLE.

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-4	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	SUNNY, SLIGHT BREEZE		
Depth to Water (ft):	16.53		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	12.50	10,925	1.81	6.78	256.60	66.80
2	12.40	10,906	1.24	6.84	256.20	66.80
4	12.30	10,887	0.84	6.93	255.60	42.60
6	12.20	10,888	0.68	6.97	255.10	26.60

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	19:00

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	Jf	**Project Number:**	PERCM052
Sample ID:	Elf-5	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Sunny, light wind		
Depth to Water (ft):	17.98		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	16.30	21,391	7.39	6.89	248.10	22.50
5	14.90	31,926	2.91	6.83	227.30	22.50
8	15.10	30,630	3.51	6.86	228.10	12.50

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	18:00

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	Jf	**Project Number:**	PERCM052
Sample ID:	Elf-6	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Overcast light wind		
Depth to Water (ft):	17.87		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water level below pump depth. Unable to sample

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-7	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	SUNNY		
Depth to Water (ft):	14.25		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	12.80	16,021	1.25	6.99	259.80	118.00
2	12.70	16,018	1.07	7.02	259.40	118.00
4	12.50	16,012	0.78	7.08	257.10	61.80
6	12.50	16,020	0.78	7.09	257.80	47.60

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	18:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	Jf	**Project Number:**	PERCM052
Sample ID:	Elf-8	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	Overcast light wind		
Depth to Water (ft):	8.81		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	16.40	9,579	6.48	7.30	161.30	185.00
4	13.50	9,512	0.99	7.39	152.70	185.00
8	13.50	9,459	0.41	7.39	124.90	6.44

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:00

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-9	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	PARTLY CLOUDY		
Depth to Water (ft):	23.25		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	12.90	11,494	1.77	7.61	253.50	206.00
2	12.80	11,479	0.82	7.78	246.30	206.00
4	12.80	10,903	0.59	7.82	243.20	50.70
6	12.70	10,653	0.52	7.84	241.20	26.70

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:30

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

Water & Environmental TECHNOLOGIES

Consulting Scientists and Engineers
480 East Park Street
Butte, Montana 59701
Phone: 406-782-5220
Fax: 406-723-1537

Project Name:	Hunter Power Plant CCR Monitoring - CCR Landfill		
Sampler Initials:	MLS	**Project Number:**	PERCM052
Sample ID:	ELF-10	**Project Location:**	Castle Dale UT
Water Disposal:	Ground	**Sample Date:**	5/30/2018
Sample Method:	Low Flow Bladder Pump	**Decon Method:**	Dedicated Equipment
Field Conditions:	PARTLY CLOUDY		
Depth to Water (ft):	50.89		

FIELD PARAMETERS

TIME (min)	TEMP (C)	SC (uS)	DO (mg/l)	pH (s.u.)	ORP (mv)	Turb. (NTU)
0	15.30	33,586	2.77	7.03	261.20	36.80
2	14.60	33,429	1.72	6.96	261.20	36.80
4	14.40	33,354	1.12	6.96	258.80	81.60
6	14.30	33,377	0.85	6.95	258.10	51.70

SAMPLE COLLECTION

Appendix:	3_4	**Sample Time:**	17:45

Containers	Preservatives	Analytes/Comments
(1) 1/2 gal poly	HNO3	Radium 226 + 228
(1) 250 mL poly	HNO3	Total metals, Total mercury
(1) 250 mL poly	H2SO4	Nitrate + Nitrite
(1) 1-L poly	None	TDS, pH, anions, fluoride, alkalinity

Comments/Observations:

POOR PRODUCER

Attachment E:

Laboratory Analytical Reports

AMERICAN
WEST
ANALYTICAL
LABORATORIES

Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

3440 South 700 West
Salt Lake City, Utah
84119

(801) 263-8686
Toll Free (888) 263-8686
Fax (801) 263-8687

awal@awal-labs.com

Jeff Tucker
PacifiCorp
1407 West North Temple, # 280
Salt Lake City, UT 84116
TEL: (801) 220-2989

RE: PERCM052

Dear Jeff Tucker:

Lab Set ID: 1806002

American West Analytical Laboratories received sample(s) on 6/1/2018 for the analyses presented in the following report.

American West Analytical Laboratories (AWAL) is accredited by The National Environmental Laboratory Accreditation Program (NELAP) in Utah and Texas; and is state accredited in Colorado, Idaho, New Mexico, Wyoming, and Missouri.

All analyses were performed in accordance to the NELAP protocols unless noted otherwise. Accreditation scope documents are available upon request. If you have any questions or concerns regarding this report please feel free to call.

The abbreviation "Surr" found in organic reports indicates a surrogate compound that is intentionally added by the laboratory to determine sample injection, extraction, and/or purging efficiency. The "Reporting Limit" found on the report is equivalent to the practical quantitation limit (PQL). This is the minimum concentration that can be reported by the method referenced and the sample matrix. The reporting limit must not be confused with any regulatory limit. Analytical results are reported to three significant figures for quality control and calculation purposes.

Thank You,

Approved by: Jose G. Rocha
Laboratory Director or designee

Sample(s) were subcontracted for the following analyses:

Radium 226 and 228 Combined

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Laboratory Director

Jose Rocha
QA Officer

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-001
Client Sample ID: ELF-7
Collection Date: 5/30/2018 1830h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1514h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	**0.00880**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/12/2018 2012h	E200.7	0.500	**1.86**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1209h	E200.7	10.0	**444**	2
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00400	< 0.00400	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1209h	E200.7	1.00	**2.49**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 825h	E245.1	0.000150	< 0.000150	1
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	**0.00249**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	**0.136**	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1337h	E200.8	0.00200	< 0.00200	

[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.
[2] - Analyte concentration is too high for accurate matrix spike recovery and/or RPD.

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-002
Client Sample ID: ELF-4
Collection Date: 5/30/2018 1900h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1517h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	**0.0116**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/12/2018 2019h	E200.7	0.500	**4.88**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1218h	E200.7	10.0	**456**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00400	**0.00666**	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1218h	E200.7	1.00	**1.78**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 831h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	**0.00278**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1352h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-003
Client Sample ID: ELF-11
Collection Date: 5/30/2018 1630h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1529h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	**0.0168**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/12/2018 2021h	E200.7	0.500	**18.8**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1221h	E200.7	10.0	**406**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00400	**0.0202**	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1221h	E200.7	1.00	**3.99**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 833h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	**0.0201**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	**0.0727**	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1355h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-004
Client Sample ID: ELF-8
Collection Date: 5/30/2018 1700h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1532h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	**0.0114**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/13/2018 1223h	E200.7	5.00	**28.7**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.000500	**0.00199**	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1223h	E200.7	10.0	**537**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00400	**0.188**	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	**0.00737**	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1223h	E200.7	1.00	**3.95**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 835h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	**0.441**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1358h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-005
Client Sample ID: ELF-5
Collection Date: 5/30/2018 1800h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1535h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	**0.0117**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/13/2018 1225h	E200.7	5.00	**7.61**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1225h	E200.7	10.0	**459**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00400	**0.00430**	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1225h	E200.7	1.00	**6.85**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 844h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	**0.00497**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	**0.0250**	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1410h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-006
Client Sample ID: ELF-10
Collection Date: 5/30/2018 1745h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1538h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	**0.0304**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/14/2018 1208h	E200.7	1.00	**1.73**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1227h	E200.7	10.0	**468**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	**0.00241**	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00400	< 0.00400	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1227h	E200.7	1.00	**2.17**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 846h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	**0.0546**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1413h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-007
Client Sample ID: ELF-9
Collection Date: 5/30/2018 1730h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1541h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	**0.00824**	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	**0.0137**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/12/2018 2031h	E200.7	0.500	**1.57**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1236h	E200.7	1.00	**52.7**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00400	< 0.00400	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1236h	E200.7	0.100	**1.10**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 848h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	**0.109**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1416h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-008
Client Sample ID: ELF-2
Collection Date: 5/30/2018 1700h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1544h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	**0.00998**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/12/2018 2033h	E200.7	0.500	**3.58**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1238h	E200.7	10.0	**369**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00400	< 0.00400	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1238h	E200.7	1.00	**1.75**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 850h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	**0.00255**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	**0.0766**	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1419h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-009
Client Sample ID: DUP
Collection Date: 5/30/2018 1715h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1547h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	**0.0113**	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/14/2018 1159h	E200.7	0.500	**3.66**	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1240h	E200.7	10.0	**370**	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00400	**0.00807**	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1240h	E200.7	1.00	**1.76**	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 852h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	**0.00275**	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	**0.0726**	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1422h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-010
Client Sample ID: FB
Collection Date: 5/30/2018 1845h
Received Date: 6/1/2018 729h

Analytical Results TOTAL METALS

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Antimony	mg/L	6/1/2018 1214h	6/4/2018 1550h	E200.8	0.00100	< 0.00100	
Arsenic	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	
Barium	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	
Beryllium	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	
Boron	mg/L	6/1/2018 1214h	6/13/2018 1243h	E200.7	0.500	< 0.500	
Cadmium	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.000500	< 0.000500	
Calcium	mg/L	6/1/2018 1214h	6/13/2018 1243h	E200.7	1.00	< 1.00	
Chromium	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	
Cobalt	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00400	< 0.00400	
Lead	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	
Lithium	mg/L	6/1/2018 1214h	6/13/2018 1243h	E200.7	0.100	< 0.100	
Mercury	mg/L	6/5/2018 1500h	6/6/2018 854h	E245.1	0.000150	< 0.000150	
Molybdenum	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	
Selenium	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	
Thallium	mg/L	6/1/2018 1214h	6/4/2018 1425h	E200.8	0.00200	< 0.00200	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-001
Client Sample ID: ELF-7
Collection Date: 5/30/2018 1830h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 1734h	E300.0	100	**2,590**	
Fluoride	mg/L		6/8/2018 036h	E300.0	0.100	**0.329**	
pH @ 25° C	pH Units		6/1/2018 1252h	SM4500-H+B	1.00	**6.99**	H
Sulfate	mg/L		6/7/2018 1734h	E300.0	750	**8,460**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**17,200**	@

@ - High RPD due to suspected sample non-homogeneity or matrix interference.
H - Sample was received outside of the holding time.

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-002
Client Sample ID: ELF-4
Collection Date: 5/30/2018 1900h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 1825h	E300.0	100	**2,200**	
Fluoride	mg/L		6/8/2018 052h	E300.0	0.100	**0.339**	
pH @ 25° C	pH Units		6/1/2018 1252h	SM4500-H+B	1.00	**6.98**	H
Sulfate	mg/L		6/7/2018 1825h	E300.0	750	**5,290**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**11,700**	

H - Sample was received outside of the holding time.

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-003
Client Sample ID: ELF-11
Collection Date: 5/30/2018 1630h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 1841h	E300.0	100	**993**	
Fluoride	mg/L		6/8/2018 109h	E300.0	0.100	**0.136**	
pH @ 25° C	pH Units		6/1/2018 1252h	SM4500-H+B	1.00	**7.23**	H
Sulfate	mg/L		6/7/2018 1841h	E300.0	750	**8,780**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**16,700**	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-004
Client Sample ID: ELF-8
Collection Date: 5/30/2018 1700h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 1858h	E300.0	100	**1,940**	
Fluoride	mg/L		6/8/2018 126h	E300.0	0.100	**0.975**	
pH @ 25° C	pH Units		6/1/2018 1420h	SM4500-H+B	1.00	**7.47**	H
Sulfate	mg/L		6/7/2018 1858h	E300.0	750	**2,820**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**7,920**	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-005
Client Sample ID: ELF-5
Collection Date: 5/30/2018 1800h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 1915h	E300.0	100	**4,420**	
Fluoride	mg/L		6/8/2018 736h	E300.0	0.100	**0.104**	
pH @ 25° C	pH Units		6/1/2018 1420h	SM4500-H+B	1.00	**7.04**	H
Sulfate	mg/L		6/7/2018 1915h	E300.0	750	**11,100**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	500	**27,800**	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-006
Client Sample ID: ELF-10
Collection Date: 5/30/2018 1745h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 2005h	E300.0	100	**8,790**	
Fluoride	mg/L		6/8/2018 753h	E300.0	0.100	< 0.100	
pH @ 25° C	pH Units		6/1/2018 1420h	SM4500-H+B	1.00	**6.99**	H
Sulfate	mg/L		6/7/2018 2005h	E300.0	750	**10,000**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**35,300**	

H - Sample was received outside of the holding time.

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-007
Client Sample ID: ELF-9
Collection Date: 5/30/2018 1730h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 2130h	E300.0	10.0	**416**	
Fluoride	mg/L		6/8/2018 810h	E300.0	0.100	**1.19**	
pH @ 25° C	pH Units		6/1/2018 1420h	SM4500-H+B	1.00	**7.89**	H
Sulfate	mg/L		6/7/2018 2022h	E300.0	750	**5,460**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**11,200**	

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-008
Client Sample ID: ELF-2
Collection Date: 5/30/2018 1700h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 2146h	E300.0	10.0	**245**	
Fluoride	mg/L		6/8/2018 826h	E300.0	0.100	**0.192**	
pH @ 25° C	pH Units		6/1/2018 1420h	SM4500-H+B	1.00	**7.12**	H
Sulfate	mg/L		6/7/2018 2039h	E300.0	750	**6,030**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**12,000**	

H - Sample was received outside of the holding time.

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-009
Client Sample ID: DUP
Collection Date: 5/30/2018 1715h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/8/2018 951h	E300.0	10.0	**252**	
Fluoride	mg/L		6/8/2018 843h	E300.0	0.100	**0.135**	
pH @ 25° C	pH Units		6/1/2018 1420h	SM4500-H+B	1.00	**7.09**	H
Sulfate	mg/L		6/7/2018 2056h	E300.0	750	**6,170**	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	100	**12,400**	

H - Sample was received outside of the holding time.

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INORGANIC ANALYTICAL REPORT

Client: PacifiCorp
Contact: Jeff Tucker
Project: PERCM052
Lab Sample ID: 1806002-010
Client Sample ID: FB
Collection Date: 5/30/2018 1845h
Received Date: 6/1/2018 729h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Chloride	mg/L		6/7/2018 2113h	E300.0	0.100	**0.122**	
Fluoride	mg/L		6/7/2018 2113h	E300.0	0.100	< 0.100	
pH @ 25° C	pH Units		6/1/2018 1420h	SM4500-H+B	1.00	**6.18**	H
Sulfate	mg/L		6/7/2018 2113h	E300.0	0.750	< 0.750	
Total Dissolved Solids	mg/L		6/1/2018 1230h	SM2540C	10.0	**16.0**	

H - Sample was received outside of the holding time.

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: ME
QC Type: LCS

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**LCS-56164**	Date Analyzed:	06/12/2018 1642h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Boron		1.15	mg/L	E200.7	0.0812	0.500	1.000	0	115	85 - 115				
Calcium		10.0	mg/L	E200.7	0.0729	1.00	10.00	0	100	85 - 115				
Lithium		1.01	mg/L	E200.7	0.0216	0.100	1.000	0	101	80 - 120				
Lab Sample ID:	**LCS-56165**	Date Analyzed:	06/04/2018 1334h											
Test Code:	200.8-W	Date Prepared:	06/01/2018 1214h											
Antimony		0.188	mg/L	E200.8	0.00330	0.00400	0.2000	0	94.0	85 - 115				
Arsenic		0.188	mg/L	E200.8	0.000338	0.00200	0.2000	0	93.8	85 - 115				
Barium		0.187	mg/L	E200.8	0.00152	0.00200	0.2000	0	93.5	85 - 115				
Beryllium		0.189	mg/L	E200.8	0.000256	0.00200	0.2000	0	94.5	85 - 115				
Cadmium		0.192	mg/L	E200.8	0.0000898	0.000500	0.2000	0	95.9	85 - 115				
Chromium		0.206	mg/L	E200.8	0.00124	0.00200	0.2000	0	103	85 - 115				
Cobalt		0.204	mg/L	E200.8	0.000188	0.00400	0.2000	0	102	85 - 115				
Lead		0.205	mg/L	E200.8	0.000524	0.00200	0.2000	0	102	85 - 115				
Molybdenum		0.199	mg/L	E200.8	0.000702	0.00200	0.2000	0	99.3	85 - 115				
Selenium		0.185	mg/L	E200.8	0.000296	0.00200	0.2000	0	92.3	85 - 115				
Thallium		0.210	mg/L	E200.8	0.000288	0.00200	0.2000	0	105	85 - 115				
Lab Sample ID:	**LCS-56220**	Date Analyzed:	06/06/2018 758h											
Test Code:	HG-DW-245.1	Date Prepared:	06/05/2018 1500h											
Mercury		0.00335	mg/L	E245.1	0.0000307	0.000150	0.003330	0	100	85 - 115				

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: ME
QC Type: LCSD

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**LCSD-56220**	Date Analyzed:	06/06/2018 800h											
Test Code:	HG-DW-245.1	Date Prepared:	06/05/2018 1500h											
Mercury		0.00327	mg/L	E245.1	0.0000307	0.000150	0.003330	0	98.3	85 - 115	0.00335	2.17	10	

Insufficient sample mass/volume was received to perform MS/MSD analysis. An LCSD was added to provide precision data.

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: ME
QC Type: MBLK

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: MB-56164	Date Analyzed:	06/12/2018 1640h											
Test Code: 200.7-W	Date Prepared:	06/01/2018 1214h											
Boron	< 0.500	mg/L	E200.7	0.0812	0.500								
Calcium	< 1.00	mg/L	E200.7	0.0729	1.00								
Lithium	< 0.100	mg/L	E200.7	0.0216	0.100								
Lab Sample ID: MB-56165	Date Analyzed:	06/04/2018 1331h											
Test Code: 200.8-W	Date Prepared:	06/01/2018 1214h											
Antimony	< 0.00400	mg/L	E200.8	0.00330	0.00400								
Arsenic	< 0.00200	mg/L	E200.8	0.000338	0.00200								
Barium	< 0.00200	mg/L	E200.8	0.00152	0.00200								
Beryllium	< 0.00200	mg/L	E200.8	0.000256	0.00200								
Cadmium	< 0.000500	mg/L	E200.8	0.0000898	0.000500								
Chromium	< 0.00200	mg/L	E200.8	0.00124	0.00200								
Cobalt	< 0.00400	mg/L	E200.8	0.000188	0.00400								
Lead	< 0.00200	mg/L	E200.8	0.000524	0.00200								
Molybdenum	< 0.00200	mg/L	E200.8	0.000702	0.00200								
Selenium	< 0.00200	mg/L	E200.8	0.000296	0.00200								
Thallium	< 0.00200	mg/L	E200.8	0.000288	0.00200								
Lab Sample ID: MB-56165	Date Analyzed:	06/04/2018 1511h											
Test Code: 200.8-W	Date Prepared:	06/01/2018 1214h											
Antimony	< 0.00100	mg/L	E200.8	0.000825	0.00100								
Lab Sample ID: MB-56220	Date Analyzed:	06/06/2018 756h											
Test Code: HG-DW-245.1	Date Prepared:	06/05/2018 1500h											
Mercury	< 0.000150	mg/L	E245.1	0.0000307	0.000150								

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: ME
QC Type: MS

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**1806002-001BMS**	Date Analyzed:	06/12/2018 2014h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Boron		3.12	mg/L	E200.7	0.0812	0.500	1.000	1.86	126	70 - 130				
Lab Sample ID:	**1806002-001BMS**	Date Analyzed:	06/13/2018 1214h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Calcium		447	mg/L	E200.7	0.729	10.0	10.00	444	31.5	70 - 130				2
Lithium		3.67	mg/L	E200.7	0.216	1.00	1.000	2.49	118	75 - 125				
Lab Sample ID:	**1806003-008BMS**	Date Analyzed:	06/13/2018 1309h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Boron		46.6	mg/L	E200.7	0.812	5.00	1.000	45.4	120	70 - 130				
Calcium		580	mg/L	E200.7	0.729	10.0	10.00	570	94.2	70 - 130				
Lab Sample ID:	**1806003-008BMS**	Date Analyzed:	06/13/2018 1654h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Lithium		2.36	mg/L	E200.7	0.0216	0.100	1.000	0.845	152	75 - 125				1
Lab Sample ID:	**1806002-001BMS**	Date Analyzed:	06/04/2018 1346h											
Test Code:	200.8-W	Date Prepared:	06/01/2018 1214h											
Antimony		0.203	mg/L	E200.8	0.00330	0.00400	0.2000	0	102	75 - 125				
Arsenic		0.208	mg/L	E200.8	0.000338	0.00200	0.2000	0.000398	104	75 - 125				
Barium		0.193	mg/L	E200.8	0.00152	0.00200	0.2000	0.0088	91.9	75 - 125				
Beryllium		0.181	mg/L	E200.8	0.000256	0.00200	0.2000	0	90.3	75 - 125				
Cadmium		0.183	mg/L	E200.8	0.0000898	0.000500	0.2000	0.000225	91.4	75 - 125				
Chromium		0.192	mg/L	E200.8	0.00124	0.00200	0.2000	0	95.8	75 - 125				
Cobalt		0.186	mg/L	E200.8	0.000188	0.00400	0.2000	0.00394	91.1	75 - 125				
Lead		0.184	mg/L	E200.8	0.000524	0.00200	0.2000	0	92.0	75 - 125				
Molybdenum		0.216	mg/L	E200.8	0.000702	0.00200	0.2000	0.00249	107	75 - 125				
Selenium		0.328	mg/L	E200.8	0.000296	0.00200	0.2000	0.136	95.9	75 - 125				

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: ME
QC Type: MS

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**1806002-001BMS**	Date Analyzed:	06/04/2018 1346h											
Test Code:	200.8-W	Date Prepared:	06/01/2018 1214h											
Thallium		0.192	mg/L	E200.8	0.000288	0.00200	0.2000	0.000837	95.4	75 - 125				
Lab Sample ID:	**1806003-008BMS**	Date Analyzed:	06/04/2018 1502h											
Test Code:	200.8-W	Date Prepared:	06/01/2018 1214h											
Antimony		0.207	mg/L	E200.8	0.00330	0.00400	0.2000	0	103	75 - 125				
Arsenic		0.210	mg/L	E200.8	0.000338	0.00200	0.2000	0.00347	104	75 - 125				
Barium		0.231	mg/L	E200.8	0.00152	0.00200	0.2000	0.0422	94.4	75 - 125				
Beryllium		0.188	mg/L	E200.8	0.000256	0.00200	0.2000	0	94.0	75 - 125				
Cadmium		0.195	mg/L	E200.8	0.0000898	0.000500	0.2000	0.000398	97.3	75 - 125				
Chromium		0.208	mg/L	E200.8	0.00124	0.00200	0.2000	0.0239	92.1	75 - 125				
Cobalt		0.206	mg/L	E200.8	0.000188	0.00400	0.2000	0.0259	90.1	75 - 125				
Lead		0.201	mg/L	E200.8	0.000524	0.00200	0.2000	0.00302	99.1	75 - 125				
Molybdenum		0.250	mg/L	E200.8	0.000702	0.00200	0.2000	0.0344	108	75 - 125				
Selenium		0.229	mg/L	E200.8	0.000296	0.00200	0.2000	0.0302	99.5	75 - 125				
Thallium		0.205	mg/L	E200.8	0.000288	0.00200	0.2000	0	102	75 - 125				
Lab Sample ID:	**1806002-001BMS**	Date Analyzed:	06/06/2018 827h											
Test Code:	HG-DW-245.1	Date Prepared:	06/05/2018 1500h											
Mercury		0.00268	mg/L	E245.1	0.0000307	0.000150	0.003330	0	80.4	80 - 120				

[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.

[2] - Analyte concentration is too high for accurate matrix spike recovery and/or RPD.

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: ME
QC Type: MSD

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**1806002-001BMSD**	Date Analyzed:	06/12/2018 2016h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Boron		3.15	mg/L	E200.7	0.0812	0.500	1.000	1.86	129	70 - 130	3.12	0.977	20	
Lab Sample ID:	**1806002-001BMSD**	Date Analyzed:	06/13/2018 1216h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Calcium		457	mg/L	E200.7	0.729	10.0	10.00	444	130	70 - 130	447	2.18	20	2
Lithium		3.73	mg/L	E200.7	0.216	1.00	1.000	2.49	124	75 - 125	3.67	1.62	20	
Lab Sample ID:	**1806003-008BMSD**	Date Analyzed:	06/13/2018 1311h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Boron		46.1	mg/L	E200.7	0.812	5.00	1.000	45.4	66.7	70 - 130	46.6	1.15	20	2
Calcium		566	mg/L	E200.7	0.729	10.0	10.00	570	-40.7	70 - 130	580	2.35	20	2
Lab Sample ID:	**1806003-008BMSD**	Date Analyzed:	06/13/2018 1656h											
Test Code:	200.7-W	Date Prepared:	06/01/2018 1214h											
Lithium		2.55	mg/L	E200.7	0.0216	0.100	1.000	0.845	170	75 - 125	2.06	21.2	20	1@
Lab Sample ID:	**1806002-001BMSD**	Date Analyzed:	06/04/2018 1349h											
Test Code:	200.8-W	Date Prepared:	06/01/2018 1214h											
Antimony		0.206	mg/L	E200.8	0.00330	0.00400	0.2000	0	103	75 - 125	0.203	1.18	20	
Arsenic		0.210	mg/L	E200.8	0.000338	0.00200	0.2000	0.000398	105	75 - 125	0.208	0.943	20	
Barium		0.196	mg/L	E200.8	0.00152	0.00200	0.2000	0.0088	93.7	75 - 125	0.193	1.88	20	
Beryllium		0.184	mg/L	E200.8	0.000256	0.00200	0.2000	0	91.9	75 - 125	0.181	1.83	20	
Cadmium		0.186	mg/L	E200.8	0.0000898	0.000500	0.2000	0.000225	92.8	75 - 125	0.183	1.52	20	
Chromium		0.194	mg/L	E200.8	0.00124	0.00200	0.2000	0	96.9	75 - 125	0.192	1.16	20	
Cobalt		0.188	mg/L	E200.8	0.000188	0.00400	0.2000	0.00394	92.1	75 - 125	0.186	1.11	20	
Lead		0.187	mg/L	E200.8	0.000524	0.00200	0.2000	0	93.5	75 - 125	0.184	1.56	20	
Molybdenum		0.219	mg/L	E200.8	0.000702	0.00200	0.2000	0.00249	108	75 - 125	0.216	1.13	20	
Selenium		0.338	mg/L	E200.8	0.000296	0.00200	0.2000	0.136	101	75 - 125	0.328	3.02	20	

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: ME
QC Type: MSD

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**1806002-001BMSD**	Date Analyzed:	06/04/2018 1349h											
Test Code:	200.8-W	Date Prepared:	06/01/2018 1214h											
Thallium		0.193	mg/L	E200.8	0.000288	0.00200	0.2000	0.000837	96.3	75 - 125	0.192	0.975	20	
Lab Sample ID:	**1806003-008BMSD**	Date Analyzed:	06/04/2018 1505h											
Test Code:	200.8-W	Date Prepared:	06/01/2018 1214h											
Antimony		0.208	mg/L	E200.8	0.00330	0.00400	0.2000	0	104	75 - 125	0.207	0.564	20	
Arsenic		0.212	mg/L	E200.8	0.000338	0.00200	0.2000	0.00347	104	75 - 125	0.21	0.772	20	
Barium		0.233	mg/L	E200.8	0.00152	0.00200	0.2000	0.0422	95.3	75 - 125	0.231	0.792	20	
Beryllium		0.190	mg/L	E200.8	0.000256	0.00200	0.2000	0	95.1	75 - 125	0.188	1.19	20	
Cadmium		0.196	mg/L	E200.8	0.0000898	0.000500	0.2000	0.000398	97.7	75 - 125	0.195	0.331	20	
Chromium		0.211	mg/L	E200.8	0.00124	0.00200	0.2000	0.0239	93.8	75 - 125	0.208	1.59	20	
Cobalt		0.207	mg/L	E200.8	0.000188	0.00400	0.2000	0.0259	90.6	75 - 125	0.206	0.439	20	
Lead		0.202	mg/L	E200.8	0.000524	0.00200	0.2000	0.00302	99.6	75 - 125	0.201	0.502	20	
Molybdenum		0.251	mg/L	E200.8	0.000702	0.00200	0.2000	0.0344	109	75 - 125	0.25	0.658	20	
Selenium		0.230	mg/L	E200.8	0.000296	0.00200	0.2000	0.0302	99.8	75 - 125	0.229	0.294	20	
Thallium		0.206	mg/L	E200.8	0.000288	0.00200	0.2000	0	103	75 - 125	0.205	0.542	20	
Lab Sample ID:	**1806002-001BMSD**	Date Analyzed:	06/06/2018 829h											
Test Code:	HG-DW-245.1	Date Prepared:	06/05/2018 1500h											
Mercury		0.00265	mg/L	E245.1	0.0000307	0.000150	0.003330	0	79.5	80 - 120	0.00268	1.19	20	1

@ - High RPD due to suspected sample non-homogeneity or matrix interference.

[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.

[2] - Analyte concentration is too high for accurate matrix spike recovery and/or RPD.

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Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: WC
QC Type: DUP

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 1806003-001ADUP Date Analyzed: 06/01/2018 1252h Test Code: PH-4500H+B													
pH @ 25° C	8.38	pH Units	SM4500-H+B	1.00	1.00					8.3	0.959	5	H
Lab Sample ID: 1806003-009ADUP Date Analyzed: 06/01/2018 1252h Test Code: PH-4500H+B													
pH @ 25° C	6.14	pH Units	SM4500-H+B	1.00	1.00					6.22	1.29	5	H
Lab Sample ID: 1806002-001ADUP Date Analyzed: 06/01/2018 1252h Test Code: PH-4500H+B													
pH @ 25° C	7.04	pH Units	SM4500-H+B	1.00	1.00					6.99	0.713	5	H
Lab Sample ID: 1806002-004ADUP Date Analyzed: 06/01/2018 1420h Test Code: PH-4500H+B													
pH @ 25° C	7.46	pH Units	SM4500-H+B	1.00	1.00					7.47	0.134	5	H
Lab Sample ID: 1806002-001ADUP Date Analyzed: 06/01/2018 1230h Test Code: TDS-W-2540C													
Total Dissolved Solids	18,200	mg/L	SM2540C	80.0	100					17200	5.53	5	@

@ - High RPD due to suspected sample non-homogeneity or matrix interference.
H - Sample was received outside of the holding time.

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: WC
QC Type: LCS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: LCS-R114306	Date Analyzed:	06/07/2018 1338h											
Test Code: 300.0-W													
Chloride	4.98	mg/L	E300.0	0.0581	0.100	5.000	0	99.7	90 - 110				
Fluoride	4.96	mg/L	E300.0	0.0353	0.100	5.000	0	99.3	90 - 110				
Sulfate	4.90	mg/L	E300.0	0.102	0.750	5.000	0	97.9	90 - 110				
Lab Sample ID: LCS-R114104	Date Analyzed:	06/01/2018 1252h											
Test Code: PH-4500H+B													
pH @ 25° C	8.93	pH Units	SM4500-H+B	1.00	1.00	9.000	0	99.2	98 - 102				
Lab Sample ID: LCS-R114105	Date Analyzed:	06/01/2018 1420h											
Test Code: PH-4500H+B													
pH @ 25° C	8.92	pH Units	SM4500-H+B	1.00	1.00	9.000	0	99.1	98 - 102				
Lab Sample ID: LCS-R114168	Date Analyzed:	06/01/2018 1230h											
Test Code: TDS-W-2540C													
Total Dissolved Solids	178	mg/L	SM2540C	8.00	10.0	205.0	0	86.8	80 - 120				

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Kyle F. Gross
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Jose Rocha
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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: WC
QC Type: MBLK

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: MB-R114306	Date Analyzed:	06/07/2018 1321h											
Test Code: 300.0-W													
Chloride	< 0.100	mg/L	E300.0	0.0581	0.100								
Fluoride	< 0.100	mg/L	E300.0	0.0353	0.100								
Sulfate	< 0.750	mg/L	E300.0	0.102	0.750								
Lab Sample ID: MB-R114168	Date Analyzed:	06/01/2018 1230h											
Test Code: TDS-W-2540C													
Total Dissolved Solids	< 10.0	mg/L	SM2540C	8.00	10.0								

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: WC
QC Type: MS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 1806002-001AMS Date Analyzed: 06/07/2018 1751h													
Test Code: 300.0-W													
Chloride	12,600	mg/L	E300.0	116	200	10,000	2590	100	90 - 110				
Fluoride	9,550	mg/L	E300.0	70.6	200	10,000	0	95.5	90 - 110				
Sulfate	17,700	mg/L	E300.0	204	1,500	10,000	8460	92.4	90 - 110				

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QC SUMMARY REPORT

Client: PacifiCorp
Lab Set ID: 1806002
Project: PERCM052

Contact: Jeff Tucker
Dept: WC
QC Type: MSD

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 1806002-001AMSD Date Analyzed: 06/07/2018 1808h													
Test Code: 300.0-W													
Chloride	12,400	mg/L	E300.0	116	200	10,000	2590	97.9	90 - 110	12600	2.09	20	
Fluoride	9,490	mg/L	E300.0	70.6	200	10,000	0	94.9	90 - 110	9550	0.634	20	
Sulfate	17,900	mg/L	E300.0	204	1,500	10,000	8460	94.4	90 - 110	17700	1.13	20	

American West Analytical Laboratories

Rpt Emailed: HC
OL: GenericEDD QC

WORK ORDER Summary

Work Order: **1806002**

Client: PacifiCorp
Due Date: 6/15/2018
Client ID: PAC900 **Contact:** Jeff Tucker
Project: **PERCM052** **QC Level:** II+ WO Type: Project
Comments: QC2+. Include EDD. RADS sent to ALS Ft. Collins. Footnote report, pH received outside of hold. CC report to mholland@waterenvtech.com; RW/DB

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1806002-001A	**ELF-7**	5/30/2018 1830h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-001B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-001C				**OUTSIDE LAB**			ALS	2
1806002-001D							HOLD	1
1806002-002A	**ELF-4**	5/30/2018 1900h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-002B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-002C				**OUTSIDE LAB**			ALS	2
1806002-002D							HOLD	1
1806002-003A	**ELF-11**	5/30/2018 1630h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	

LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK DB HOK_____ HOK_____ COC Emailed_____

WORK ORDER Summary

Work Order: **1806002**

Client: PacifiCorp

Due Date: 6/15/2018

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1806002-003A	**ELF-11**	5/30/2018 1630h	6/1/2018 0729h	**TDS-W-2540C**	Aqueous		DF-WC	1
1806002-003B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-003C				**OUTSIDE LAB**			ALS	2
1806002-003D							HOLD	1
1806002-004A	**ELF-8**	5/30/2018 1700h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-004B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-004C				**OUTSIDE LAB**			ALS	2
1806002-004D							HOLD	1
1806002-005A	**ELF-5**	5/30/2018 1800h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-005B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	

LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK_____ HOK_____ HOK_____ COC Emailed_____

WORK ORDER Summary

Work Order: **1806002**

Client: PacifiCorp

Due Date: 6/15/2018

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1806002-005C	**ELF-5**	5/30/2018 1800h	6/1/2018 0729h	**OUTSIDE LAB**	Aqueous		ALS	2
1806002-005D							HOLD	1
1806002-006A	**ELF-10**	5/30/2018 1745h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-006B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-006C				**OUTSIDE LAB**			ALS	
1806002-006D							HOLD	
1806002-007A	**ELF-9**	5/30/2018 1730h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-007B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-007C				**OUTSIDE LAB**			ALS	2
1806002-007D							HOLD	1
1806002-008A	**ELF-2**	5/30/2018 1700h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-008B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				

LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK_____ HOK_____ HOK_____ COC Emailed_____

WORK ORDER Summary

Work Order: **1806002**

Client: PacifiCorp

Due Date: 6/15/2018

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
1806002-008B	**ELF-2**	5/30/2018 1700h	6/1/2018 0729h	**200.7-W-PR**	Aqueous		DF-Metals	1
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-008C				**OUTSIDE LAB**			ALS	2
1806002-008D							HOLD	1
1806002-009A	**DUP**	5/30/2018 1715h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-009B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-009C				**OUTSIDE LAB**			ALS	2
1806002-009D							HOLD	1
1806002-010A	**FB**	5/30/2018 1845h	6/1/2018 0729h	**300.0-W**	Aqueous		DF-WC	1
				3 SEL Analytes: CL F SO4				
				PH-4500H+B			DF-WC	
				TDS-W-2540C			DF-WC	
1806002-010B				**200.7-W**			DF-Metals	
				3 SEL Analytes: B CA LI				
				200.7-W-PR			DF-Metals	
				200.8-W			DF-Metals	
				11 SEL Analytes: SB AS BA BE CD CR CO PB MO SE TL				
				200.8-W-PR			DF-Metals	
				HG-DW-245.1			DF-Metals	
				HG-DW-PR			DF-Metals	
1806002-010C				**OUTSIDE LAB**			ALS	2
1806002-010D							HOLD	1

LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK_____ HOK_____ HOK_____ COC Emailed_____

WORK ORDER Summary

Work Order: **1806002**

Client: PacifiCorp

Due Date: 6/15/2018

AWAL Use Only - One or more samples expired upon receipt:

Test Code
PH-4500H+B

LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK_____ HOK_____ HOK_____ COC Emailed_____

American West Analytical Laboratories

3440 S. 700 W. Salt Lake City, UT 84119
Phone # (801) 263-8686 Toll Free # (888) 263-8686
Fax # (801) 263-8687 Email awal@awal-labs.com
www.awal-labs.com

CHAIN OF CUSTODY

All analysis will be conducted using NELAP accredited methods and all data will be reported using AWAL's standard analyte lists and reporting limits (PQL) unless specifically requested otherwise on this Chain of Custody and/or attached documentation.

AWAL Lab Sample Set #: 1806002
Page 1 of 1

QC Level: 1 2 (2+) 3 3+
Turn Around Time: 1 2 3 4 5 (Stnd)
Unless other arrangements have been made, signed reports will be emailed by **5:00 pm** on the day they are due.
Due Date: 6-15-18

Client: Pacificorp-UT
Address:
City, State, Zip: Salt Lake City, UT
Contact:
Phone #: Cell #:
E-mail:
Project Name: ~~PERCMOS 2~~
Project #: PERCMOS2
PO #:
Sampler Name: MLS

☐ Report down to the MDL
☐ Include EDD:
☐ Lab Filter for:
☐ Field Filtered For:

For Compliance With:
☐ NELAP
☐ RCRA
☐ CWA
☐ SDWA
☐ ELAP / A2LA
☐ NLLAP
☐ Non-Compliance
☐ Other:

	Sample ID:	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Total Metals	Wet Chemistry	SEE Attachment								Known Hazards & Sample Comments
1	ELF-7	5/30/2018	1830	5	W	X	X	X								
2	ELF-4	↓	1900	↓	↓	↓	↓	↓								
3	ELF-11	↓	1630	↓	↓	↓	↓	↓								
4	ELF-8	↓	1700	↓	↓	↓	↓	↓								
5	ELF-5	↓	1800	↓	↓	↓	↓	↓								
6	ELF-10	↓	1745	↓	↓	↓	↓	↓								* Well went dry, only 1 RAD bottle filled -RW 6/1/18
7	ELF-9	↓	1730	↓	↓	↓	↓	↓								
8	ELF-2	↓	1700	↓	↓	↓	↓	↓								
9	DUP	↓	1715	↓	↓	↓	↓	↓								
10	FB	↓	1845	↓	↓	↓	↓	↓								
11		↓														
12		↓														
13		↓														
14		↓														
15		↓														

Laboratory Use Only

COC Tape Was:
1 Present on Outer Package Y N (NA)
2 Unbroken on Outer Package Y N (NA)
3 Present on Sample Y (N)
4 Unbroken on Sample Y N (NA)

Samples Were:
1 (Shipped or hand delivered)
2 Ambient or (Chilled)
3 Temperature 2.2 °C
4 Received Intact (Y) N
5 Properly Preserved (Y) N Checked at bench
6 Received Within Holding Times ~~Y~~ RB 6/6/18 (N) pH out of hold

Sample Labels and COC Record Match? (Y) N

Relinquished by: Signature	Date:	Received by: Signature	Date:
[signature] Print Name: Mike Shirley	6/1/2018 Time: 0729	[signature] Print Name: Kyle E. Gross	6/1/18 Time: 0729
Relinquished by: Signature Print Name:	Date: Time:	Received by: Signature Print Name:	Date: Time:
Relinquished by: Signature Print Name:	Date: Time:	Received by: Signature Print Name:	Date: Time:

Special Instructions: Please CC Marcus Holland With analytical results @ MHolland@Waterenvtech.com

Constituents Analyzed	
Appendix III	Appendix IV
Boron	Antimony
Calcium	Arsenic
Chloride	Barium
Fluoride	Beryllium
pH	Cadmium
Sulfate	Chromium
Total Dissolved Solids (TDS)	Cobalt
	Fluoride
	Lead
	Lithium
	Mercury
	Molybdenum
	Selenium
	Thallium
	Radium 226 and 228 Combined

Fluoride is included in both Appendix III and Appendix IV analyte lists. All wells have undergone analysis for both analyte lists for each event. Fluoride was not analyzed twice. The results are reported once under Appendix III constituents for each sample / each event.

Please only include these constituents on analytical report

Thanks,

Mike Shirley

Lab Set ID: 1806002

pH Lot #: 5550

Preservation Check Sheet

Sample Set Extension and pH

Analysis	Preservative	-001	-002	-003	-004	-005	-006	-007	-008	-009	-010								
Ammonia	pH <2 H_2SO_4																		
COD	pH <2 H_2SO_4																		
Cyanide	pH >12 NaOH																		
Metals	pH <2 HNO_3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes								
NO_2 & NO_3	pH <2 H_2SO_4																		
O & G	pH <2 HCL																		
Phenols	pH <2 H_2SO_4																		
Sulfide	pH >9 NaOH, Zn Acetate																		
TKN	pH <2 H_2SO_4																		
T PO_4	pH <2 H_2SO_4																		
HOLD	pH <2 H_2SO_4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes								

Procedure:

1) Pour a small amount of sample in the sample lid
2) Pour sample from lid gently over wide range pH paper
3) **Do Not** dip the pH paper in the sample bottle or lid
4) If sample is not preserved, properly list its extension and receiving pH in the appropriate column above
5) Flag COC, notify client if requested
6) Place client conversation on COC
7) Samples may be adjusted

Frequency: All samples requiring preservation

* The sample required additional preservative upon receipt.

\+ The sample was received unpreserved.

▲ The sample was received unpreserved and therefore preserved upon receipt.

\# The sample pH was unadjustable to a pH < 2 due to the sample matrix.

• The sample pH was unadjustable to a pH > ____ due to the sample matrix interference.

Radium-226

Case Narrative

American West Analytical Labs

PERCM052

Work Order Number: 1806065

1. This report consists of the analytical results for ten water samples received by ALS on 06/05/2018.

2. These samples were prepared and analyzed according to the current revision of SOP 783. The analyses were completed on 06/27/2018.

3. The analysis results for these samples are reported in units of pCi/L. The samples were not filtered prior to analysis.

4. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.

5. ALS uses the following convention for reporting significant digits in the TPU and MDC results. The TPU value is rounded to two significant digits. The MDC value is rounded to the same decimal place as the TPU value. In practice, this could result in an MDC reported value of zero for samples with significant activity, including the batch laboratory control sample.

6. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Jean Anderson — 6/29/18
Jean Anderson — Date
Radiochemistry Primary Data Reviewer

7/5/18
Radiochemistry Final Data Reviewer — Date

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1806065
Client Name: American West Analytical Labs
Client Project Name: PERCM052
Client Project Number:
Client PO Number: 1806002

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
ELF-7	1806065-1		WATER	30-May-18	18:30
ELF-4	1806065-2		WATER	30-May-18	19:00
ELF-11	1806065-3		WATER	30-May-18	16:30
ELF-8	1806065-4		WATER	30-May-18	17:00
ELF-5	1806065-5		WATER	30-May-18	18:00
ELF-10	1806065-6		WATER	30-May-18	17:45
ELF-9	1806065-7		WATER	30-May-18	17:30
ELF-2	1806065-8		WATER	30-May-18	17:00
DUP	1806065-9		WATER	30-May-18	17:15
FB	1806065-10		WATER	30-May-18	18:15

American West
Analytical Laboratories
3440 S. 700 W. Salt Lake City, UT 84119
Phone # (801) 263-8686 Toll Free # (888) 263-8686
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www.awal-labs.com

CHAIN OF CUSTODY

1806065
AWAL Lab Sample Set #

Page ____ of ____

All analysis will be conducted using NELAP accredited methods and all data will be reported using AWAL's standard analyte lists and reporting limits (PQL) unless specifically requested otherwise on this Chain of Custody and/or attached documentation.

QC Level:	Turn Around Time:	Unless other arrangements have been made, signed reports will be emailed by
2+	Standard	5:00 pm on the day they are due

PO#: 1806002

Client: American West Analytical Laboratories
Address: 3440 S. 700 W.
City, State, Zip: Salt Lake City , UT 84119
Contact: Elona Hayward
Phone #: (801) 263-8686 Cell #:
E-mail: elona@awal-labs.com; denise@awal-labs.com
Project Name:
Project #: PERCM052
PO #: 1806002
Sampler Name:

- ☐ Report down to the MDL
- ☐ Include EDD:
- ☐ Lab Filter for:
- ☐ Field Filtered For:

For Compliance With:

- ☐ NELAP
- ☐ RCRA
- ☐ CWA
- ☐ SDWA
- ☐ ELAP / A2LA
- ☐ NLLAP
- ☐ Non-Compliance
- ☐ Other:

	Sample ID:	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Radium 226 and 228 Combined	Known Hazards & Sample Comments
1	ELF-7	5/30/2018	18:30	2	W	X	
2	ELF-4	5/30/2018	19:00	2	W	X	
3	ELF-11	5/30/2018	16:30	2	W	X	
4	ELF-8	5/30/2018	17:00	2	W	X	
5	ELF-5	5/30/2018	18:00	2	W	X	
6	ELF-10	5/30/2018	17:45	1	W	X	* Well went dry, only 1 bottle collected
7	ELF-9	5/30/2018	17:30	2	W	X	
8	ELF-2	5/30/2018	17:00	2	W	X	
9	DUP	5/30/2018	17:15	2	W	X	
10	FB	5/30/2018	18:15	2	W	X	
11							
12							
13							
14							
15							

Laboratory Use Only

COC Tape Was:
1 Present on Outer Package Y N NA
2 Unbroken on Outer Package Y N NA
3 Present on Sample Y N
4 Unbroken on Sample Y N NA

Samples Were:
1 Shipped or hand delivered
2 Ambient or Chilled
3 Temperature ____ °C
4 Received Intact Y N
5 Properly Preserved Y N Checked at bench
6 Received Within Holding Times Y N

Sample Labels and COC Record Match? Y N

Relinquished by: Signature	Date: 6/1/18	Received by: Signature	Date: 6-5-18
Print Name: REBEKAH WINKLER	Time: 18:00	Print Name: C TRIMBLE	Time: 0930
Relinquished by: Signature	Date:	Received by: Signature	Date:
Print Name:	Time:	Print Name:	Time:
Relinquished by: Signature	Date:	Received by: Signature	Date:
Print Name:	Time:	Print Name:	Time:

Special Instructions:
QC 2+ = Final Report, COC, surrogate, recoveries, MB, LCS,
MS/MSD performed on customer sample

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: AM West Workorder No: 1806065

Project Manager: [illegible] Initials: CDS Date: 6-5-18

1. Does this project require any special handling in addition to standard ALS procedures?		YES	(NO)
2. Are custody seals on shipping containers intact?	NONE	(YES)	NO
3. Are Custody seals on sample containers intact?	(NONE)	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		(YES)	NO
5. Are the COC and bottle labels complete and legible?		(YES)	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	(NO)
9. Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
10. Is there sufficient sample for the requested analyses?		(YES)	NO
11. Were all samples placed in the proper containers for the requested analyses?		(YES)	NO
12. Are all samples within holding times for the requested analyses?		(YES)	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	(NO)
16. Were the samples shipped on ice?		YES	(NO)
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1							
Temperature (°C):	Amb							
No. of custody seals on cooler:	2							
DOT Survey/ Acceptance Information — External µR/hr reading:	10							
Background µR/hr reading:	13							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

Samples: 1806065-3-2, 065-4-1 and 065-5-1
Initial pH3.
HNO_3 added 1.0 ml 0.5 ml 1.5 ml
Final pH<2 on all 3 bottles @ 1500, 6-5-18,
HNO_3 lot no. 169331

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: [signature] 6/6/18

Form 201r25.xls
(02/12/2018)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

1806065

ORIGIN ID:NPHA (800) 356-9135
SHIPPING DEPT
ALS ENVIRONMENTAL GRP
960 W LEVOY DR.

SALT LAKE CITY, UT 84123
UNITED STATES US

SHIP DATE: 04JUN18
ACTWGT: 56.10 LB
CAD: 192107/CAFE3208

BILL SENDER 10

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL-FORT COLLINS
225 COMMERCE DRIVE

FORT COLLINS CO 80524
(970) 490-1511 REF: SALT LAKE SHIPPING
DEPT: SALT LAKE SHIPPING

FedEx
Express
E

2 of 2
MPS# 0263 4386 2620 8924
Mstr# 4386 2620 8913 0201

TUE - 05 JUN 10:30A
PRIORITY OVERNIGHT

XH FTCA

80524
CO-US DEN

No Ice

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Lab ID: RE180613-1MB

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 13-Jun-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes

Final Aliquot: 995 ml
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.011 +/- 0.097	0.186	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17140	17000	ug	99.2	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Lab ID: RE180613-1LCS

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 13-Jun-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes

Final Aliquot: 995 ml
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13982-63-3	Ra-226	44 +/- 11	0	47.88	92.5	67 - 120	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17130	16780	ug	97.9	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Lab ID: RE180613-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 13-Jun-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes

Final Aliquot: 995 ml
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13982-63-3	Ra-226	49 +/- 12	0	47.88	102	67 - 120	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17140	16900	ug	98.6	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID:
Lab ID: RE180613-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 13-Jun-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
13982-63-3	Ra-226	44 +/- 11	0	P	49 +/- 12	0	P	0.282	2.13

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

LT - Result is less than Request MDC, greater than sample specific MDC

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-7
Lab ID: 1806065-1

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	1.65 +/- 0.49	0.16	1	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17130	16480	ug	96.2	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-4
Lab ID: 1806065-2

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.49 +/- 0.20	0.12	1	NA	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17170	16350	ug	95.2	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-11
Lab ID: 1806065-3

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.27 +/- 0.17	0.21	1	NA	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17150	14010	ug	81.7	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-8
Lab ID: 1806065-4

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.54 +/- 0.23	0.13	1	NA	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17150	16490	ug	96.2	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-5
Lab ID: 1806065-5

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.51 +/- 0.24	0.22	1	NA	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17130	16550	ug	96.6	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-10
Lab ID: 1806065-6

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 498 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.24 +/- 0.22	0.31	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17130	16740	ug	97.7	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-9
Lab ID: 1806065-7

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.15 +/- 0.12	0.17	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17140	16500	ug	96.3	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-2
Lab ID: 1806065-8

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.02 +/- 0.10	0.19	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17140	16560	ug	96.7	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: DUP
Lab ID: 1806065-9

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.14 +/- 0.13	0.19	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17140	16360	ug	95.5	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-226 by Radon Emanation - Method 903.1

PAI 783 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: FB
Lab ID: 1806065-10

Sample Matrix: WATER
Prep SOP: PAI 783 Rev 13
Date Collected: 30-May-18
Date Prepared: 13-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RE180613-1
QCBatchID: RE180613-1-1
Run ID: RE180613-1A
Count Time: 35 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
13982-63-3	Ra-226	0.10 +/- 0.12	0.19	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	17150	16560	ug	96.6	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RE1806065-1*

Radium-228

Case Narrative

American West Analytical Labs

PERCM052

Work Order Number: 1806065

1. This report consists of the analytical results for ten water samples received by ALS on 06/05/2018.

2. These samples were prepared according to the current revision of SOP 749.

3. The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac, which is the ingrown progeny of ^{228}Ra, according to the current revision of SOP 724. The analyses were completed on 06/26/2018.

4. The analysis results for these samples are reported in units of pCi/L. The samples were not filtered prior to analysis.

5. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.

6. The requested MDC was not met for sample 1806065-6. The reported activity for this sample exceeds the achieved MDC. This sample is identified with an “M3” qualifier on the final reports.

7. No further anomalous situations were noted during the preparation and analysis of these samples. All remaining quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Jean Anderson — 6/29/18
Radiochemistry Primary Data Reviewer — Date

7/5/18
Radiochemistry Final Data Reviewer — Date

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1806065
Client Name: American West Analytical Labs
Client Project Name: PERCM052
Client Project Number:
Client PO Number: 1806002

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
ELF-7	1806065-1		WATER	30-May-18	18:30
ELF-4	1806065-2		WATER	30-May-18	19:00
ELF-11	1806065-3		WATER	30-May-18	16:30
ELF-8	1806065-4		WATER	30-May-18	17:00
ELF-5	1806065-5		WATER	30-May-18	18:00
ELF-10	1806065-6		WATER	30-May-18	17:45
ELF-9	1806065-7		WATER	30-May-18	17:30
ELF-2	1806065-8		WATER	30-May-18	17:00
DUP	1806065-9		WATER	30-May-18	17:15
FB	1806065-10		WATER	30-May-18	18:15

American West
Analytical Laboratories
3440 S. 700 W. Salt Lake City, UT 84119
Phone # (801) 263-8686 Toll Free # (888) 263-8686
Fax # (801) 263-8687 Email: awal@awal-labs.com
www.awal-labs.com

CHAIN OF CUSTODY

1806065
AWAL Lab Sample Set #

Page ____ of ____

All analysis will be conducted using NELAP accredited methods and all data will be reported using AWAL's standard analyte lists and reporting limits (PQL) unless specifically requested otherwise on this Chain of Custody and/or attached documentation.

QC Level:	Turn Around Time:	Unless other arrangements have been made, signed reports will be emailed by
2+	Standard	5:00 pm on the day they are due.

PO#: 1806002

Client: American West Analytical Laboratories
Address: 3440 S. 700 W.
City, State, Zip: Salt Lake City , UT 84119
Contact: Elona Hayward
Phone #: (801) 263-8686 Cell #:
E-mail: elona@awal-labs.com; denise@awal-labs.com
Project Name:
Project #: PERCM052
PO #: 1806002
Sampler Name:

- ☐ Report down to the MDL
- ☐ Include EDD:
- ☐ Lab Filter for:
- ☐ Field Filtered For:

For Compliance With:

- ☐ NELAP
- ☐ RCRA
- ☐ CWA
- ☐ SDWA
- ☐ ELAP / A2LA
- ☐ NLLAP
- ☐ Non-Compliance
- ☐ Other:

	Sample ID:	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Radium 226 and 228 Combined	Known Hazards & Sample Comments
1	ELF-7	5/30/2018	18:30	2	W	X	
2	ELF-4	5/30/2018	19:00	2	W	X	
3	ELF-11	5/30/2018	16:30	2	W	X	
4	ELF-8	5/30/2018	17:00	2	W	X	
5	ELF-5	5/30/2018	18:00	2	W	X	
6	ELF-10	5/30/2018	17:45	1	W	X	* Well went dry, only 1 bottle collected
7	ELF-9	5/30/2018	17:30	2	W	X	
8	ELF-2	5/30/2018	17:00	2	W	X	
9	DUP	5/30/2018	17:15	2	W	X	
10	FB	5/30/2018	18:15	2	W	X	
11							
12							
13							
14							
15							

Laboratory Use Only

COC Tape Was:
1 Present on Outer Package Y N NA
2 Unbroken on Outer Package Y N NA
3 Present on Sample Y N
4 Unbroken on Sample Y N NA

Samples Were:
1 Shipped or hand delivered
2 Ambient or Chilled
3 Temperature ____ C
4 Received Intact Y N
5 Properly Preserved Y N Checked at bench
6 Received Within Holding Times Y N

Sample Labels and COC Record Match? Y N

Relinquished by: Signature	Date: 6/1/18	Received by: Signature	Date: 6-5-18
Print Name: REBEKAH WINKLER	Time: 18:00	Print Name: C TRIMBLE	Time: 0930
Relinquished by: Signature	Date:	Received by: Signature	Date:
Print Name:	Time:	Print Name:	Time:
Relinquished by: Signature	Date:	Received by: Signature	Date:
Print Name:	Time:	Print Name:	Time:

Special Instructions:
QC 2+ = Final Report, COC, surrogate, recoveries, MB, LCS,
MS/MSD performed on customer sample

4 of 20

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: AM West Workorder No: 1806065

Project Manager: [illegible] Initials: CDS Date: 6-5-18

1. Does this project require any special handling in addition to standard ALS procedures?		YES	(NO)
2. Are custody seals on shipping containers intact?	NONE	(YES)	NO
3. Are Custody seals on sample containers intact?	(NONE)	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		(YES)	NO
5. Are the COC and bottle labels complete and legible?		(YES)	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	(NO)
9. Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
10. Is there sufficient sample for the requested analyses?		(YES)	NO
11. Were all samples placed in the proper containers for the requested analyses?		(YES)	NO
12. Are all samples within holding times for the requested analyses?		(YES)	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	(NO)
16. Were the samples shipped on ice?		YES	(NO)
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1							
Temperature (°C):	Amb							
No. of custody seals on cooler:	2							
DOT Survey/ Acceptance Information — External µR/hr reading:	10							
Background µR/hr reading:	13							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

Samples: 1806065-3-2, 065-4-1 and 065-5-1
Initial pH3.
HNO_3 added 1.0 ml 0.5 ml 1.5 ml
Final pH<2 on all 3 bottles @ 1500, 6-5-18,
HNO_3 lot no. 169331

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: [signature] 6/6/18

Form 201r25.xls
(02/12/2018)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

1806065

ORIGIN ID:NPHA (800) 356-9135
SHIPPING DEPT
ALS ENVIRONMENTAL GRP
960 W LEVOY DR.

SALT LAKE CITY, UT 84123
UNITED STATES US

SHIP DATE: 04JUN18
ACTWGT: 56.10 LB
CAD: 192107/CAFE3208

BILL SENDER 10

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL-FORT COLLINS
225 COMMERCE DRIVE

FORT COLLINS CO 80524
(970) 490-1511 REF: SALT LAKE SHIPPING
DEPT: SALT LAKE SHIPPING

551C1/48E5/104C

FedEx
Express
E

J181118020501uv

2 of 2
MPS# 4386 2620 8924
0263
Mstr# 4386 2620 8913
0201

TUE - 05 JUN 10:30A
PRIORITY OVERNIGHT

XH FTCA

80524
CO-US DEN

No Ice

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Lab ID: RA180618-2MB

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 18-Jun-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes

Final Aliquot: 1500 ml
Result Units: pCi/l
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
15262-20-1	Ra-228	-0.01 +/- 0.26	0.59	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34150	31180	ug	91.3	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Lab ID: RA180618-2LCS

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 18-Jun-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes

Final Aliquot: 1500 ml
Result Units: pCi/l
File Name: RAC0626C

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
15262-20-1	Ra-228	5.6 +/- 1.4	0.6	6.049	91.8	70 - 130	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34150	31370	ug	91.9	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Lab ID: RA180618-2LCSD

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 18-Jun-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes

Final Aliquot: 1500 ml
Result Units: pCi/l
File Name: RAC0626C

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
15262-20-1	Ra-228	5.7 +/- 1.4	0.6	6.049	95.0	70 - 130	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34150	29410	ug	86.1	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID:
Lab ID: RA180618-2LCSD

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 18-Jun-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes

Final Aliquot: 1500 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: RAC0626C

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
15262-20-1	Ra-228	5.6 +/- 1.4	0.6	P	5.7 +/- 1.4	0.6	P	0.0986	2.13

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

LT - Result is less than Request MDC, greater than sample specific MDC

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-7
Lab ID: 1806065-1

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 1200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	3.28	0.7	1	NA	
15262-20-1	Ra-228	1.63 +/- 0.55	0.70	1	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34170	30630	ug	89.7	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-4
Lab ID: 1806065-2

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 1200 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	1.81	0.68	1	NA	
15262-20-1	Ra-228	1.32 +/- 0.48	0.68	1	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34160	32530	ug	95.2	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-11
Lab ID: 1806065-3

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 997 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	1.83	0.91	1	NA	
15262-20-1	Ra-228	1.56 +/- 0.61	0.91	1	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34170	29070	ug	85.1	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-8
Lab ID: 1806065-4

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 997 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	1.98	0.82	1	NA	
15262-20-1	Ra-228	1.44 +/- 0.55	0.82	1	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34160	31440	ug	92.0	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-5
Lab ID: 1806065-5

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 26-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 997 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	2.37	0.86	1	NA	
15262-20-1	Ra-228	1.86 +/- 0.65	0.86	1	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34160	30450	ug	89.1	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-10
Lab ID: 1806065-6

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 509 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	2.2	1.9	1	NA	
15262-20-1	Ra-228	2.2 +/- 1.1	1.9	1	NA	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34180	29290	ug	85.7	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-9
Lab ID: 1806065-7

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 997 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	0	0.87	1	NA	U
15262-20-1	Ra-228	0.70 +/- 0.45	0.87	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34170	30670	ug	89.8	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: ELF-2
Lab ID: 1806065-8

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 997 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	0.99	0.89	1	NA	
15262-20-1	Ra-228	0.99 +/- 0.51	0.89	1	NA	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34160	29330	ug	85.9	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: DUP
Lab ID: 1806065-9

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 997 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	1.65	0.9	1	NA	
15262-20-1	Ra-228	1.65 +/- 0.62	0.90	1	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34160	29470	ug	86.3	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*

Radium-228 Analysis by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806065
Client Name: American West Analytical Labs
ClientProject ID: PERCM052

Field ID: FB
Lab ID: 1806065-10

Sample Matrix: WATER
Prep SOP: SOP749 Rev 4
Date Collected: 30-May-18
Date Prepared: 18-Jun-18
Date Analyzed: 27-Jun-18

Prep Batch: RA180618-2
QCBatchID: RA180618-2-2
Run ID: RA180618-2A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 997 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: DPM
File Name: RAC0626C

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
	COMBINED RA (226+228)	0	0.95	1	NA	U
15262-20-1	Ra-228	0.34 +/- 0.44	0.95	1	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
BARIUM	34170	29010	ug	84.9	40 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: *RA1806065-1*