

*FINAL*

# 2022 Annual Groundwater Monitoring Report for the CCR Landfill at the Boardman Power Plant, near Boardman, Oregon

*Prepared for*

Portland General Electric

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# Acronyms and Abbreviations

amsl	above mean sea level
CCR	coal combustion residuals
CFR	Code of Federal Regulations
ft	foot
mg/L	milligram per liter
NAVD	North American Vertical Datum
PGE	Portland General Electric
Plant	Boardman Power Plant
SSI	statistically significant increase
SWFPR	sitewide false positive rate
UPL	Upper Prediction Limit
LPL	Lower Prediction Limit



# Executive Summary

This annual report documents groundwater monitoring performed in 2022 at the Portland General Electric (PGE) Boardman Power Plant (Plant) ash landfill (CCR Landfill), located near Boardman, Oregon. Groundwater monitoring for the CCR Landfill meets the groundwater monitoring requirements of the U.S. Environmental Protection Agency's (USEPA) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (CCR Rule; Title 40 of the Code of Federal Regulations Part 257 [40 CFR 257]).

The CCR Landfill unit remained in Detection Monitoring in accordance with 40 CFR 257.94 throughout 2022. The semi-annual Detection Monitoring events were completed in April and October 2022. No constituents or wells recorded a statistically significant increase (SSI) during semi-annual sampling for 2022. As such, no Assessment Monitoring (40 CFR 259.95) or Assessment of Corrective Measures (40 CFR 257.96) was required or performed.

The 2022 sampling events were Rounds 10 and 11 of CCR Detection Monitoring for the site. The groundwater sampling program included the constituents shown in 40 CFR 257 Appendix III. Groundwater elevations were measured from each CCR well prior to purging the wells for sampling, following the requirements of 40 CFR 257.93 (c). The groundwater hydraulic gradient and flow direction for 2022 have displayed limited variation since sampling began in 2016.

Detection Monitoring data collected for both the semi-annual sampling events for 2022 are presented in this report.

Based on 2022 groundwater monitoring results, Detection Monitoring will continue at the CCR Landfill in accordance with Section 257.94 of the CCR Rule with the next semi-annual groundwater sampling event scheduled to be performed in spring 2023.



# Introduction

This section summarizes the purpose and objectives, document organization, site description, and the status of the Coal Combustion Residuals (CCR) Landfill monitoring program for the Portland General Electric (PGE) Boardman Power Plant (Plant).

## 1.1 Purpose and Objectives

This 2022 annual report for the CCR Landfill is required per *CCR Groundwater Monitoring and Corrective Action* of 40 Code of Federal Regulations (CFR), 257.90(e), *Annual Groundwater Monitoring and Corrective Action Report*. Per the CCR regulations, the minimum requirements for each annual report submittal must include the following [as itemized per 40 CFR 257.90(e)(items 1 through 5)]:

1. A map showing the CCR unit (landfill) and the designated CCR groundwater monitoring network, including upgradient and downgradient wells with well identification numbers
2. The identification of monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description, and the reasons those actions were taken
3. A summary of the groundwater samples that were collected for analysis from each upgradient (or background) and downgradient well, the dates the samples were collected, and whether the sample was required by the detection or assessment monitoring program
4. A narrative discussion of transition between monitoring programs (the date and circumstances of transitioning from detection phase to assessment monitoring)
5. Other information required per 40 CFR 257.90 through 257.94, interpreted to include the following:
  - A map showing groundwater elevations, inferred groundwater elevation contours, and inferred groundwater flow direction from the sampling events conducted during the preceding year
  - A groundwater elevation hydrograph, including data over the period of record
  - Groundwater flow rates for the semiannual events conducted during the preceding year
  - Results from data quality review and data validation
  - A summary of the statistical method and the respective background (compliance) limits for Detection Monitoring (Appendix III) constituents
  - A summary of any Appendix III constituents that are identified as a statistically significant increase (SSI) greater than background levels

In addition to the above the annual report must also include narrative of the following items:

- Executive Summary
- Documentation of the status of the monitoring program (detection or assessment phase)
- Key actions completed for the preceding calendar year
- A description of problems encountered, and actions taken to resolve the problems (if needed)
- Key activities anticipated for the upcoming year

## 1.2 Document Organization

The document is organized into the following sections:

**Section 1. Introduction.** Presents the document purpose and objectives, site description, and status of monitoring program.

**Section 2. Monitoring Program Description.** Summarizes the groundwater monitoring system design and the sampling program for the CCR Landfill.

**Section 3. Groundwater Monitoring Results.** Summarizes the groundwater data, provides maps showing groundwater elevations and inferred flow direction, and estimates of groundwater seepage velocity.

**Section 4. Statistical Evaluation.** Summarizes the statistical method, compliance limits, and compares the 2022 semi-annual detection-phase compliance monitoring results to the compliance limits to determine whether there is an SSI greater than background conditions for the Appendix III constituents.

**Section 5. Summary.** Summarizes the key points of the 2022 annual report per the CCR regulatory requirements.

**Section 6. References.** Lists the documents consulted to develop this report.

## 1.3 Site Description

The Boardman Power Plant (the Plant) is located approximately 11 miles south-southwest of Boardman, Oregon (Figure 1). Figure 2 shows the Plant located immediately north of Carty Reservoir with the CCR Landfill approximately 0.25 to 0.5 mile southeast of Carty Reservoir. The Plant is currently being demolished.

The regional features and physiological setting include:

- The Carty Reservoir, which was constructed in 1980 and is inferred as a source of recharge for the uppermost groundwater observed at the site (URS, 2014).
- The Blue Mountains, which are located approximately 30 to 40 miles south of the CCR Landfill with an elevation of upwards of 4,000 feet (ft) above mean sea level (amsl), are inferred as a recharge area for uppermost groundwater observed at the site (URS, 2015). By comparison, the ground surface elevation of the CCR Landfill is approximately 680 to 700 feet amsl.
- The Columbia River, which is the inferred regional discharge zone for both surface and groundwater, is located approximately 11 miles north of the CCR Landfill and flows to the west. The normal surface stage (elevation) of Columbia River near Boardman (Oregon) is about 270 feet amsl; to put this in context, the typical groundwater elevations for the uppermost aquifer beneath the CCR Landfill range from approximately 645 to 665 ft amsl.

The climate of the Boardman area is characterized as semi-arid, with a mean annual precipitation of 8.9 inches per year (30-year average from 1981 to 2010 (Western Regional Climate Center, 2023).

## 1.4 Status of the Groundwater Monitoring Program

The CCR Landfill groundwater monitoring program is currently in the detection phase, as described under the CCR Rule 257.94, *Detection Monitoring Program*.

The following items summarize the key actions completed for the CCR Landfill to implement the CCR Rule since the program began:

- In April 2016, a focused field investigation was completed to implement the detection groundwater monitoring network to satisfy CCR regulations per CFR Part 257.91, *Groundwater Monitoring Systems*. The groundwater monitoring system design was documented in the *Coal Combustion Residual Groundwater Monitoring System Certification for the CCR Landfill at the Boardman Power Plant, Boardman, Oregon* (CH2M, 2017a).
- Beginning in May 2016, background groundwater monitoring and related data evaluation was initiated in support of establishing the CCR detection groundwater monitoring program.
- On October 16, 2017, the groundwater monitoring system design (CH2M, 2017a) and the selected statistical method as described in the *Coal Combustion Residual Selection of Statistical Method for the CCR Landfill at the Boardman Power Plant, Boardman, Oregon* (CH2M, 2017b) were documented and placed into the operating record. Both documents were posted to the publicly available website within 30 days of being placed in the operating record as required.
- Detection Phase Monitoring, based on the established background results, has been conducted on a semi-annual schedule since August 2017.



# Monitoring Program Description

## 2.1 Monitoring Program

The CCR Landfill groundwater monitoring program is currently in the detection phase, as described under the CCR Rule 257.94, *Detection Monitoring Program*.

Details regarding site hydrogeology, the stratigraphic sequence, uppermost aquifer, and the lower aquitard/confining unit are presented in the groundwater monitoring system design document (CH2M, 2017a) and posted to publicly available websites and are not reiterated herein. Details regarding the monitoring network, sampling, and field/laboratory quality control are described in the following sections.

## 2.2 Monitoring Network

Table 1 summarizes the CCR Landfill groundwater monitoring well network and construction details. Figure 3 shows the designated CCR groundwater monitoring network for the CCR Landfill. The existing CCR Landfill groundwater monitoring network consists of seven wells screened in the uppermost aquifer and located around the perimeter of the CCR Landfill. Monitoring well AL-008 is upgradient of the CCR Landfill and is used to characterize background conditions. Wells AL-001, AL-004, and AL-006 are downgradient and are compliance wells for the landfill. Monitoring wells MW-120, AL-002, and AL-007 are cross-gradient and are monitored to assess groundwater elevations and potential sitewide changes (trends) in groundwater quality. Further details of the groundwater monitoring well network design is available in the groundwater monitoring system design document (CH2M, 2017a).

## 2.3 Groundwater Level Measurement

Static groundwater level measurements are collected during each monitoring event to calculate groundwater elevations, estimate groundwater flow direction, and calculate the groundwater seepage velocity. Groundwater elevations are calculated by subtracting the field measured static depth to water from the top-of-casing elevations surveyed using the North American Vertical Datum of 1988 (NAVD88) in feet. Field-measured groundwater levels are recorded on field forms (provided in Appendix A); groundwater level data are presented in Section 3.

## 2.4 Groundwater Sampling

Dedicated bladder pumps are installed in all seven CCR wells to facilitate low-flow sampling methods as required for minimal drawdown groundwater sampling procedures described in *Groundwater Sampling Guidelines for Superfund and RCRA Project Managers* (EPA, 2002). Field parameters are measured using a factory- and field-calibrated multi-parameter probe. Copies of field sampling forms for both 2022 semiannual detection monitoring events are provided in Appendix A.

Groundwater samples are collected in laboratory-provided sample containers. The following list summarizes the test methods, reporting limits, and preservatives to collect groundwater samples for the Appendix III constituents (40 CFR 257):

Constituent	Analytical Test Method	Reporting Limit (mg/L)	Preservative
Boron	EPA 6010D	0.02	HNO <sub>3</sub>
Calcium	EPA 6010D	0.08	HNO <sub>3</sub>
Chloride	EPA 9056A	1.9	Chill to 4 Degrees Celsius
Fluoride	EPA 9056A	0.06	Chill to 4 Degrees Celsius
pH	EPA 9040C	0.1	Chill to 4 Degrees Celsius
Sulfate	EPA 9056A	3	Chill to 4 Degrees Celsius
Total Dissolved Solids	SM 2540C	13	Chill to 4 Degrees Celsius

Notes:

mg/L = milligram per liter

Laboratory analyses of groundwater samples are performed by an accredited and certified testing laboratory (*Pace Analytical* of Mt. Juliet, Tennessee).

## 2.5 Field and Laboratory Quality Control

Field and laboratory quality control are guided by the field quality control procedures that include sample labeling, chain-of-custody documentation, and sealing of sample containers following sample collection. Field duplicate and matrix spike (with duplicates) samples are collected during each sampling event.

Laboratory quality control procedures included analysis of method blanks, surrogates, duplicates, and matrix spike/matrix spike duplicates. Results from the laboratory quality control are included in the analytical data packages and are included in Appendix B.

# Groundwater Monitoring Results

This section summarizes the CCR Landfill monitoring results, groundwater elevations, groundwater flow direction, estimates of groundwater seepage velocity, and groundwater quality results from the 2022 detection-phase compliance events.

## 3.1 Background and Compliance Monitoring Events

CCR Landfill background conditions were established by conducting eight background groundwater monitoring events prior to the October 17, 2017 deadline, as required by the CCR Rule. Monitoring events conducted after the eight background events is considered detection-phase compliance monitoring as per the CCR Rule. Detection Monitoring is conducted to evaluate groundwater conditions against the background conditions established prior to the October 2017 deadline. The following list summarizes the detection monitoring sampling events conducted since establishment of background levels, including any required re-testing:

Event #	Monitoring Event Type/Purpose	Date Completed	Appendix III, Detection Monitoring Constituents	Appendix IV, Assessment Monitoring Constituents
1	Detection Phase Monitoring – <i>Initial Compliance Event</i>	August 22, 2017	Yes	No (not required)
-	Retest of well AL-001	January 31, 2018	Yes – Chloride only	No (not required)
2	Detection Phase Monitoring	April 25, 2018	Yes	No (not required)
3	Detection Phase Monitoring	September 25, 2018	Yes	No (not required)
4	Detection Phase Monitoring	June 4, 2019	Yes	No (not required)
-	Retest of well AL-001	September 9, 2019	Yes – pH only	No (not required)
5	Detection Phase Monitoring	October 22-23, 2019	Yes	No (not required)
6	Detection Phase Monitoring	June 30/July 1, 2020	Yes	No (not required)
7	Detection Phase Monitoring	October 14, 2020	Yes	No (not required)
8	Detection Phase Monitoring	April 13, 2021	Yes	No (not required)
9	Detection Phase Monitoring	October 12, 2021	Yes	No (not required)
10	Detection Phase Monitoring	April 11, 2022	Yes	No (not required)
11	Detection Phase Monitoring	October 10, 2022	Yes	No (not required)

## 3.2 Groundwater Levels and Hydrographs

Table 2 summarizes field-measured groundwater elevations for the 2022 semi-annual detection-phase compliance events in April and October 2022. Figure 4 presents a groundwater elevation hydrograph from the CCR Landfill wells since sampling began in May 2016. As shown in Figure 4, groundwater elevations continue to show relatively limited fluctuations in the CCR wells. Wells AL-008 and AL-002, located closest to Carty reservoir, have shown the greatest fluctuations in groundwater elevations of 2.7 and 2.0 feet, respectively since measurements began in May 2016. All other CCR groundwater elevations have fluctuated between 0.6 and 1.0 foot over the same timeframe.

### 3.3 Groundwater Flow Direction

Figures 5A and 5B show groundwater elevation contours and inferred flow direction for the 2022 semi-annual detection-phase compliance events conducted on April 11 and October 10, 2022. Based on depth to water measurements of CCR Landfill wells for both 2022 events, groundwater in the uppermost aquifer beneath the CCR Landfill flows to the east-northeast. The hydraulic gradient, as measured between wells AL-008 and AL-001, is estimated at 0.007 ft/ft for both 2022 monitoring events. An east-northeast flow direction is typical and representative of the background monitoring events, considering limited changes observed in groundwater elevations, demonstrated by the site hydrograph (Figure 4).

### 3.4 Groundwater Flow Velocity Estimates

The estimated groundwater seepage velocity ranges from 34 to 630 feet per year, which is based on the following equation and hydraulic assumptions for the uppermost aquifer:

$$v = \frac{K_a i}{n_e} \quad \text{Equation from Fetter, 1994}$$

where:  $V$  = groundwater velocity (seepage velocity)  
 $K_a$  = average horizontal hydraulic conductivity  
 $i$  = horizontal hydraulic gradient  
 $n_e$  = effective porosity

Assumptions:

- Hydraulic conductivity estimates ( $K_a$ ) in the range of 2 to 37 feet per day, which is based on single-well hydraulic response (specific capacity) observed during purging/well development (CH2M, 2017a).
- Hydraulic gradient ( $i$ ) of 0.007 feet per foot, which is representative of groundwater elevation contours developed from measurements collected from both semi-annual events during 2022, and is considered a typical value considering the limited degree of seasonal fluctuation as shown from hydrographs (Figure 4).
- Effective porosity ( $n_e$ ) of 0.15 (assumed value).

The seepage velocity values reported here are approximate given the expected variability in hydraulic properties of weathered and/or fractured basalt.

### 3.5 Groundwater Quality Results

Tables 3A and 3B present the field readings and groundwater quality results for the Appendix III constituents from the 2022 detection-phase compliance semi-annual events conducted on April 11 and October 10, 2022. Groundwater data from these events are compared to background data per the selected statistical method to determine whether the compliance values exceed background concentrations, as presented in Section 4. Laboratory reports for both sampling events are provided in Appendix B.

## 3.6 Data Quality Assessment

Groundwater quality data was reviewed to assess the quality and usability of data for both 2022 sampling events before performing statistical evaluations as presented in Section 4. The method for performing the data quality review follows procedures in the U.S. Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA, 2016). The data quality review confirmed the field and laboratory methods followed the proper procedures, the completeness target/goal of 100 percent was achieved, none of the data was rejected and detection-phase compliance data was found to satisfy the data quality objectives to be included for statistical evaluation.

All pH samples (for both events) were analyzed outside of the very short holding time for Method SM 4500H B (14 samples total). As a result, the associated sample results are possibly biased and were qualified as estimated and flagged “J”. However, the reported values are considered representative estimates at the time of sampling, and the results were reviewed and found to be approximate to the background values. Field pH readings collected prior to sampling of the CCR wells showed all pH values within control limits. Flagged results for the April and October 2022 events are shown in Tables 3A and 3B.

Data Quality Evaluations for the April and October 2022 sampling events are provided in Appendix B along with the laboratory analytical reports.



# Statistical Evaluation

This section summarizes the CCR regulatory requirements for statistical evaluation under the detection phase, as well as the selected statistical method, and compares the compliance data to compliance levels to determine whether compliance values exceeded background concentrations.

## 4.1 Statistical Evaluation Methods and Compliance Limits

Based on the site-specific groundwater conditions and evaluation of the background data, the selected statistical method for evaluating groundwater detection monitoring data is a prediction interval (limit) method, which is a statistical method option, per CCR Rule 257.93(f)(3). The prediction interval method will be used separately for each well-constituent pair. Thus, an individual well comparison approach will be used for the statistical analysis. Details and rationale for method selection are presented in *Coal Combustion Residual Selection of Statistical Method for the CCR Landfill at the Boardman Power Plant, Boardman, Oregon* (CH2M, 2017b), which is available on the CCR public website.

The EPA Unified Guidance (EPA, 2009) recommends that prediction limits be combined with retesting for maintaining a low sitewide false positive rate (SWFPR) while providing high statistical power. The exploratory analysis confirmed a “1-of-2” retesting strategy is acceptable and will be used to verify an apparent SSI for Appendix III constituents. Retesting is an integral part of the statistical methodology for controlling the SWFPR when multiple monitoring locations and parameters are being evaluated. Assuming the “1-of-2” retesting approach, an apparent SSI cannot be confirmed until the results of the resampling event have been obtained.

Assuming sample background data is normally distributed, or assuming they can be transformed to fit a normal distribution, the parametric upper prediction limit (UPL) or lower prediction limit (LPL), for pH only) is calculated from the following equation:

$$LPL, UPL = \bar{x} \pm Ks$$

where:  $\bar{x}$  is the sample mean,

s is the sample standard deviation, and

K is a multiplier factor that is chosen based on the number of background observations (n=8), evaluation schedule, which is assumed at twice per year from semiannual sampling (nE=2), number of constituents (nc=7), number of compliance wells (nw=3), overall sitewide false positive rate (SWFPR=10%), and the specific retesting scheme selected (1-of-2 method).

Table 4 summarizes statistical results for the 2016 – 2017 background monitoring evaluation period, including the background sample mean, background standard deviation, and the K multiplier values used to calculate the background (compliance) limits for each Appendix-III constituent following that equation. Note, for two cases that could not be transformed to fit normal distribution (such as calcium in AL-001, and sulfate in AL-004), a nonparametric method is required, and the compliance limit is the maximum observed value during the background monitoring period. Appendix C provides time-series plots illustrating the background data and the respective compliance limit(s).

## 4.2 Statistical Evaluation Results

Table 5 compares 2022 compliance results to background compliance limits to determine whether the compliance results exceed background conditions. Compliance values for both the April and October 2022 detection-phase sampling events are less than or within the respective limits, with the exception of pH for AL-006 (October 2022). Due to pH analyses not performed within the very short holding time for the analyses, these pH values were “J flagged”, meaning their quantification is thus considered as an estimate. Of additional note is that the field pH value measured at AL-006 immediately prior to sampling was 7.70, which is within the control limits. Based on these results, SSIs were not observed for 2022 that would initiate assessment monitoring.

## 4.3 Planned Activities for 2023

No constituents or wells recorded a SSI during semi-annual sampling events in 2022. As such, no Assessment Monitoring (40 CFR 259.95) or Assessment of Corrective Measures (40 CFR 257.96) was required or performed.

Based on the 2022 semi-annual Detection Monitoring Program groundwater results and evaluations, Detection Monitoring will continue for the CCR Landfill in accordance with Section 257.94 of the CCR Rule.

One minor change that could be considered, would be to report pH from calibrated onsite pH meters because of the very short holding times for laboratory pH analyses. No other changes for the CCR Landfill groundwater monitoring program are recommended for 2023.

The next semiannual groundwater sampling event will be performed in spring 2023.

# Summary

Key findings developed and/or confirmed through the 2022 annual groundwater report are summarized as follows:

- **Implementation of CCR Detection Monitoring Program.** PGE initiated the CCR requirements starting in spring 2016 with the focused field investigation and well installation effort. Certification documents for the groundwater monitoring system design and the selection of statistical method are available on the public website. The CCR Landfill monitoring program is in the detection-phase status per CCR Rule 257.94, *Detection Monitoring Program*.
- **Background and Detection-phase Compliance Monitoring Events.** The eight background monitoring events were completed from May 24, 2016 through June 7, 2017. Detection Monitoring was initiated in August 2017 and has continued with semi-annual events conducted in April and October 2022.
- **Groundwater Levels.** Groundwater elevations measured during background and detection-phase compliance monitoring events were used to develop a site hydrograph (Figure 4). The groundwater flow direction is to the east-northeast, with a typical gradient of 0.007 feet per foot, and an estimated groundwater seepage velocity ranging from 34 to 630 feet per year.
- **Detection Monitoring Results/Statistical Evaluation.** The prediction limit method confirmed the April and October 2022 detection-phase compliance values met the background compliance limits; and assessment monitoring was not required.
- **Planned 2023 Activities.** Detection Monitoring will continue for the CCR Landfill site on a semi-annual schedule for Appendix III constituents (tentatively scheduled for spring and fall 2023).



# References

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Tables



**Table 1.**

**CCR Landfill Groundwater Monitoring Well Network**

2022 Annual Groundwater Monitoring Report for CCR Landfill at the Boardman Power Plant

Well	Coordinates <sup>1</sup>		Ref. Point Elevation <sup>2</sup>	Well Screen Elevation		Hydraulic Designation	Hydrostratigraphic Unit
	Northing	Easting		Top	Bottom		
<i>Groundwater Monitoring Well Network Designated to Meet Minimum Performance Specifications per CCR Regulations</i>							
AL-008	733819.91	8383742.04	697.69	653.93	643.93	Upgradient	Upper Pomona Basalt (uppermost aquifer)
MW-120	733234.80	8384764.19	705.47	624.00	634.00	Cross-Gradient <sup>3</sup>	Upper Pomona Basalt (uppermost aquifer)
AL-001	734125.91	8385885.17	700.49	651.89	641.89	Downgradient	Upper Pomona Basalt (uppermost aquifer)
AL-004	734480.77	8385839.60	700.58	644.84	634.84	Downgradient	Upper Pomona Basalt (uppermost aquifer)
AL-006	733798.47	8385891.76	712.34	651.81	641.81	Downgradient	Upper Pomona Basalt (uppermost aquifer)
<i>Supplemental Wells<sup>4</sup></i>							
AL-007	733407.19	8385371.55	709.57	663.12	648.12	Cross-Gradient	Upper Pomona Basalt (uppermost aquifer)
AL-002	734445.81	8384651.85	692.41	646.71	636.71	Cross-Gradient	Upper Pomona Basalt (uppermost aquifer)

**Column Header Notes:**

<sup>1</sup> NAD 1983, Oregon State Plane, North 3601, Feet Intl.

<sup>2</sup> Reference point elevation is top of PVC casing; all elevations in feet above mean sea level (NAVD88).

<sup>3</sup> Hydraulically designated as 'cross-gradient' but effectively considered outside the influence from CCR Landfill and not included in the detection monitoring program. Well was used to characterize background.

<sup>4</sup> Designated cross-gradient (i.e., neither up or downgradient) and monitored to assess long-term trends; wells are not used to characterize background conditions, nor are they included in the detection monitoring testing procedure (i.e., statistical analysis) to assess for a statistically significant increase over background.

**Table 2.**  
**CCR Groundwater Levels and Field Parameters**  
 2022 Annual Groundwater Monitoring Report for CCR Landfill at the Boardman Power Plant

Well	Date Sampled	Reference Point Elevation (ft)	Depth to Water (ft btc)	Groundwater Elevation (ft)	Temp (°C)	pH	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Conductivity (mS/cm)	Turbidity (NTU)	Hydraulic Designation	Hydrostratigraphic Unit	Comments
AL-008	4/12/22	697.69	32.42	665.27	15.3	7.68	8.36	184	0.719	0	Upgradient	Pomona Basalt	
	10/10/22		32.32	665.37	16.8	7.82	4.46	88	0.765	24			
MW-120	4/11/22	705.47	44.62	660.85	13.7	7.67	9.01	141	1.18	6	Cross-Gradient	Pomona Basalt	
	10/10/22		44.30	661.17	16.0	7.48	8.26	227	1.17	2			
AL-002	4/12/22	692.41	33.66	658.75	15.5	7.44	5.26	206	0.718	7	Cross-Gradient	Pomona Basalt	MS/MSD Collected
	10/10/22		33.24	659.17	16.8	7.77	6.82	81	0.740	89			MS/MSD Collected
AL-007	4/11/22	709.57	53.93	655.64	12.1	7.33	9.27	227	1.17	4	Cross-Gradient	Pomona Basalt	
	10/10/22		53.82	655.75	16.3	7.46	8.98	118	1.20	2			
AL-001	4/11/22	700.49	50.80	649.69	14.2	7.71	7.01	122	1.24	28	Downgradient	Pomona Basalt	Field Duplicate Collected
	10/10/22		50.95	649.54	17.6	7.65	8.68	80	1.28	88			Field Duplicate Collected
AL-004	4/11/22	700.58	53.02	647.56	15.1	7.68	7.02	145	1.46	21	Downgradient	Pomona Basalt	
	10/10/22		52.82	647.76	18.0	7.69	8.92	75	1.51	16			
AL-006	4/11/22	712.34	63.13	649.21	13.1	7.75	7.41	183	1.05	25	Downgradient	Pomona Basalt	
	10/10/22		63.77	648.57	17.1	7.70	9.59	66	1.08	6			

Notes:

"--" = Not applicable, not available, and/or not measured.

Reference point elevation is top of PVC casing; all elevations are in feet above mean sea level (NAVD88).

Multi-parameter meter calibrated daily prior to start of monitoring. Field parameter readings are stabilized readings obtained immediately prior to sample collection.

ft = feet

ft btc = feet below top of casing

C = degrees celcius

mg/L = milligrams per liter

mV = millivolts

uS/cm = microsiemens per centimeter

NTU = Nephelometric Turbidity Units

Table 3A.

April 2022 CCR Groundwater Quality Data

2022 Annual Groundwater Monitoring Report for CCR Landfill at the Boardman Power Plant

Well		AL-008	MW-120	AL-007	AL-001	AL-001 (field duplicate)	AL-002	AL-004	AL-006	
Sample ID		041122-CCR-AL008	041122-CCR-MW120	041122-CCR-AL007	041122-CCR-AL001	041122-CCR-FD	041122-CCR-AL002	041122-CCR-AL004	041122-CCR-AL006	
Sample Date		4/12/2022	4/11/2022	4/11/2022	4/11/2022	4/11/2022	4/12/2022	4/11/2022	4/11/2022	
Hydraulic Designation		Upgradient	Cross-Gradient	Cross-Gradient	Downgradient	Downgradient	Cross-Gradient	Downgradient	Downgradient	
Analyte	Method	Units								
Field Parameters										
pH	Field Probe	units	7.68	8.20	7.67	7.71	7.71	7.44	7.68	7.75
Temperature	Field Probe	°C	15.3	16.0	13.7	14.2	14.2	15.5	15.1	13.1
Spec. Conductance	Field Probe	mS/cm	0.719	1.12	1.18	1.24	1.24	0.718	1.46	1.05
Dissolved Oxygen	Field Probe	mg/L	8.36	10.94	9.01	7.01	7.01	5.26	7.02	7.41
ORP	Field Probe	mV	184	118	141	122	122	206	145	183
Turbidity	Field Probe	NTU	0	0	6	28	28	7	21	25
Detection Monitoring Constituents (Appendix III to Part 257)										
Boron	EPA 6010D	mg/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Calcium	EPA 6010D	mg/L	57	92	101	103	103	52	122	82
Chloride	EPA 9056A	mg/L	39	95	107	150	149	45	187	114
Fluoride	EPA 9056A	mg/L	0.71	0.54	0.454	0.50	0.49	0.69	0.48	0.53
pH	EPA 9040C	unit	7.93 J	7.97 J	7.80 J	7.85 J	7.82 J	7.91 J	7.85 J	7.82 J
Sulfate	EPA 9056A	mg/L	76	223	235	146	146	98	239	148
Total Dissolved Solids	SM 2540C	mg/L	484	768	825	812	817	499	958	691

Notes:

Field parameters represent final stabilized readings obtained during purging immediately prior to sample collection.

Sample number 041122-CCR-FD is a field duplicate of AL-001 (Sample ID 041122-CCR-AL001)

Reference the Data Quality Evaluation (DQE) in Appendix B for a description of the qualifiers.

Non-detect values reported as "<" with the laboratory method detection limit.

J = Analyte was positively identified, the quantitation is an estimate due to missed holding time

Metals (boron and calcium) reported as total metals.

°C = degrees celcius

mg/L = milligrams per liter

mV = millivolts

mS/cm = millisiemens per centimeter

NTU = Nephelometric Turbidity Units

pCi/L = average picocuries per gram

**Table 3B.**  
**October 2022 Groundwater Quality Data**

2022 Annual Groundwater Monitoring Report for CCR Landfill at the Boardman Power Plant

Well			AL-008	MW-120	AL-007	AL-001	AL-001 (duplicate)	AL-002	AL-004	AL-006
Sample ID			AL-008	MW-120	AL-007	AL-001	AL-XXX	AL-002	AL-004	AL-006
Sample Date			10/10/2022	10/10/2022	10/10/2022	10/10/2022	10/10/2022	10/10/2022	10/10/2022	10/10/2022
Hydraulic Designation			Upgradient	Cross-Gradient	Cross-Gradient	Downgradient	Downgradient	Cross-Gradient	Downgradient	Downgradient
Analyte	Method	Units								
<b>Field Parameters</b>										
pH	Field Probe	units	7.82	7.48	7.56	7.65	7.65	7.77	7.62	7.70
Temperature	Field Probe	°C	16.8	16.0	16.3	17.6	17.6	16.8	18.0	17.1
Spec. Conductance	Field Probe	mS/cm	0.765	1.166	1.199	1.283	1.283	0.740	1.506	1.081
Dissolved Oxygen	Field Probe	mg/L	4.46	8.26	8.98	8.08	8.08	6.82	8.92	9.59
Oxygen Red. Potential	Field Probe	mV	88	227	118	80	80	81	75	66
Turbidity	Field Probe	NTU	24	2	2	88	88	89	16	6
<b>Detection Monitoring Constituents (Appendix III to Part 257)</b>										
Boron	EPA 6010D	mg/L	0.0457 J	0.0239 J	0.0207 J	<0.02	<0.02	0.0360 J	0.0257 J	0.0244 J
Calcium	EPA 6010D	mg/L	56.7	90.1	103	103	103	48.7 J	125	83.9
Chloride	EPA 9056A	mg/L	40.3	93.3	107	154	150	41.1	194	113
Fluoride	EPA 9056A	mg/L	0.646	0.495	0.405	0.432	0.426	0.575	0.419	0.473
pH	EPA 9040C	unit	8.03 J	7.99 J	7.87 J	7.91 J	7.95 J	8.04 J	7.86 J	7.98 J
Sulfate	EPA 9056A	mg/L	74.9	221	228	138	134	87.3	238	141
Total Dissolved Solids	SM 2540C	mg/L	495	702	750	782	772	461	900	622

**Notes:**

Field parameters represent final stabilized readings obtained immediately prior to sample collection.

Sample number AL-XXX is a field duplicate of AL-001

Reference the Data Quality Evaluation (DQE) in Appendix B for a description of the qualifiers.

Non-detect values reported as "<" with the laboratory method detection limit.

J = Analyte was positively identified, the quantitation is an estimate.

Metals (boron and calcium) reported as total metals.

°C = degrees celcius

mg/L = milligrams per liter

mV = millivolts

mS/cm = millisiemens per centimeter

NTU = Nephelometric Turbidity Units (note some drift was observed in field turbidity readings)

pCi/L = average picocuries per gram

**Table 4.**  
**Statistical Method and Compliance Limits**  
*2022 Annual Groundwater Monitoring Report for CCR Landfill at the Boardman Power Plant*

Constituent Name	Well	Method	Mean	Standard Deviation	K factor	Compliance Limits	
						Upper Limit	Lower Limit
Boron (mg/l)	AL-001	Prediction Limit, Intra-well, Parametric	0.02937	0.03029	2.49	0.105	--
Boron (mg/l)	AL-004	Prediction Limit, Intra-well, Parametric	0.02062	0.007763	2.49	0.040	--
Boron (mg/l)	AL-006	Prediction Limit, Intra-well, Parametric	0.02312	0.01033	2.49	0.049	--
Calcium (mg/l)	AL-001	Prediction Limit, Intra-well, Non-Parametric	--	--	--	130	--
Calcium (mg/l)	AL-004	Prediction Limit, Intra-well, Parametric	118.1	15.57	2.49	157	--
Calcium (mg/l)	AL-006	Prediction Limit, Intra-well, Parametric	85	10.82	2.49	112	--
Chloride (mg/l)	AL-001	Prediction Limit, Intra-well, Parametric	168.1	10.02	2.49	193	--
Chloride (mg/l)	AL-004	Prediction Limit, Intra-well, Parametric	211.9	32.45	2.49	293	--
Chloride (mg/l)	AL-006	Prediction Limit, Intra-well, Parametric	125.1	6.958	2.49	142	--
Fluoride (mg/l)	AL-001	Prediction Limit, Intra-well, Parametric	0.53	0.1715	2.49	0.957	--
Fluoride (mg/l)	AL-004	Prediction Limit, Intra-well, Parametric	0.5138	0.2084	2.49	1.03	--
Fluoride (mg/l)	AL-006	Prediction Limit, Intra-well, Parametric	0.5963	0.09117	2.49	0.823	--
pH (unit)	AL-001	Prediction Limit, Intra-well, Parametric	7.538	0.1522	2.88	7.98	7.10
pH (unit)	AL-004	Prediction Limit, Intra-well, Parametric	7.514	0.169	2.88	8.00	7.03
pH (unit)	AL-006	Prediction Limit, Intra-well, Parametric	7.518	0.1221	2.88	7.87	7.17
Sulfate (mg/l)	AL-001	Prediction Limit, Intra-well, Parametric	135.8	9.528	2.49	160	--
Sulfate (mg/l)	AL-004	Prediction Limit, Intra-well, Non-Parametric	--	--	--	346	--
Sulfate (mg/l)	AL-006	Prediction Limit, Intra-well, Parametric	149.5	32.58	2.49	231	--
Total Dissolved Solids (mg/l)	AL-001	Prediction Limit, Intra-well, Parametric	911.3	121.8	2.49	1215	--
Total Dissolved Solids (mg/l)	AL-004	Prediction Limit, Intra-well, Parametric	1028	127.8	2.49	1346	--
Total Dissolved Solids (mg/l)	AL-006	Prediction Limit, Intra-well, Parametric	728.8	79.36	2.49	926	--

**Notes:**

1. Upper and lower limits are calculated values based on mean, standard deviation, and K factor as described in Section 4.2.
2. Compliance limits assume retesting strategy of 1 future observation (i.e., 1-of-2 method).
3. pH requires both upper and lower limits; all other constituents have upper limit only.
4. Calcium at AL-001 and Sulfate at AL-004 are non-parametric and compliance limit is maximum observed during background monitoring events.

Table 5.

## Comparison of Compliance Sample Results to Compliance Limits

2022 Annual Groundwater Monitoring Report for CCR Landfill at the Boardman Power Plant

Constituent Name	Well	Method	Mean	Standard Deviation	K factor	Compliance Limits		April 2022 Compliance Values	Exceeds (Yes/No)	October 2022 Compliance Values	Exceeds (Yes/No)
						Upper Limit	Lower Limit				
Boron (mg/l)	AL-001	Intra-well, Parametric	0.02937	0.03029	2.49	0.105	--	< 0.20 **	No, see note	< 0.02	No
Boron (mg/l)	AL-004	Intra-well, Parametric	0.02062	0.007763	2.49	0.040	--	< 0.20 **	No, see note	0.0257 J	No
Boron (mg/l)	AL-006	Intra-well, Parametric	0.02312	0.01033	2.49	0.049	--	<0.20 **	No, see note	0.0244 J	No
Calcium (mg/l)	AL-001	Intra-well, Non-Parametric	--	--	--	130	--	103	No	103	No
Calcium (mg/l)	AL-004	Intra-well, Parametric	118.1	15.57	2.49	157	--	122	No	125	No
Calcium (mg/l)	AL-006	Intra-well, Parametric	85	10.82	2.49	112	--	82	No	83.9	No
Chloride (mg/l)	AL-001	Intra-well, Parametric	168.1	10.02	2.49	193	--	150	No	154	No
Chloride (mg/l)	AL-004	Intra-well, Parametric	211.9	32.45	2.49	293	--	187	No	194	No
Chloride (mg/l)	AL-006	Intra-well, Parametric	125.1	6.958	2.49	142	--	114	No	113	No
Fluoride (mg/l)	AL-001	Intra-well, Parametric	0.53	0.1715	2.49	0.957	--	0.50	No	0.432	No
Fluoride (mg/l)	AL-004	Intra-well, Parametric	0.5138	0.2084	2.49	1.03	--	0.48	No	0.419	No
Fluoride (mg/l)	AL-006	Intra-well, Parametric	0.5963	0.09117	2.49	0.823	--	0.53	No	0.473	No
pH (unit)	AL-001	Intra-well, Parametric	7.538	0.1522	2.88	7.98	7.10	7.85 J	No	7.91 J	No
pH (unit)	AL-004	Intra-well, Parametric	7.514	0.169	2.88	8.00	7.03	7.85 J	No	7.86 J	No
pH (unit)	AL-006	Intra-well, Parametric	7.518	0.1221	2.88	7.87	7.17	7.82 J	No	<b>7.98 J</b>	<b>No ***</b>
Sulfate (mg/l)	AL-001	Intra-well, Parametric	135.8	9.528	2.49	160	--	146	No	138	No
Sulfate (mg/l)	AL-004	Intra-well, Non-Parametric	--	--	--	346	--	239	No	238	No
Sulfate (mg/l)	AL-006	Intra-well, Parametric	149.5	32.58	2.49	231	--	148	No	141	No
Total Dissolved Solids (mg/l)	AL-001	Intra-well, Parametric	911.3	121.8	2.49	1215	--	812	No	782	No
Total Dissolved Solids (mg/l)	AL-004	Intra-well, Parametric	1028	127.8	2.49	1346	--	958	No	900	No
Total Dissolved Solids (mg/l)	AL-006	Intra-well, Parametric	728.8	79.36	2.49	926	--	691	No	622	No

## Notes:

***Bold and italics*** font indicates a compliance value which exceeds (or is below) the compliance limits.

< - Analyte is Non-Detect

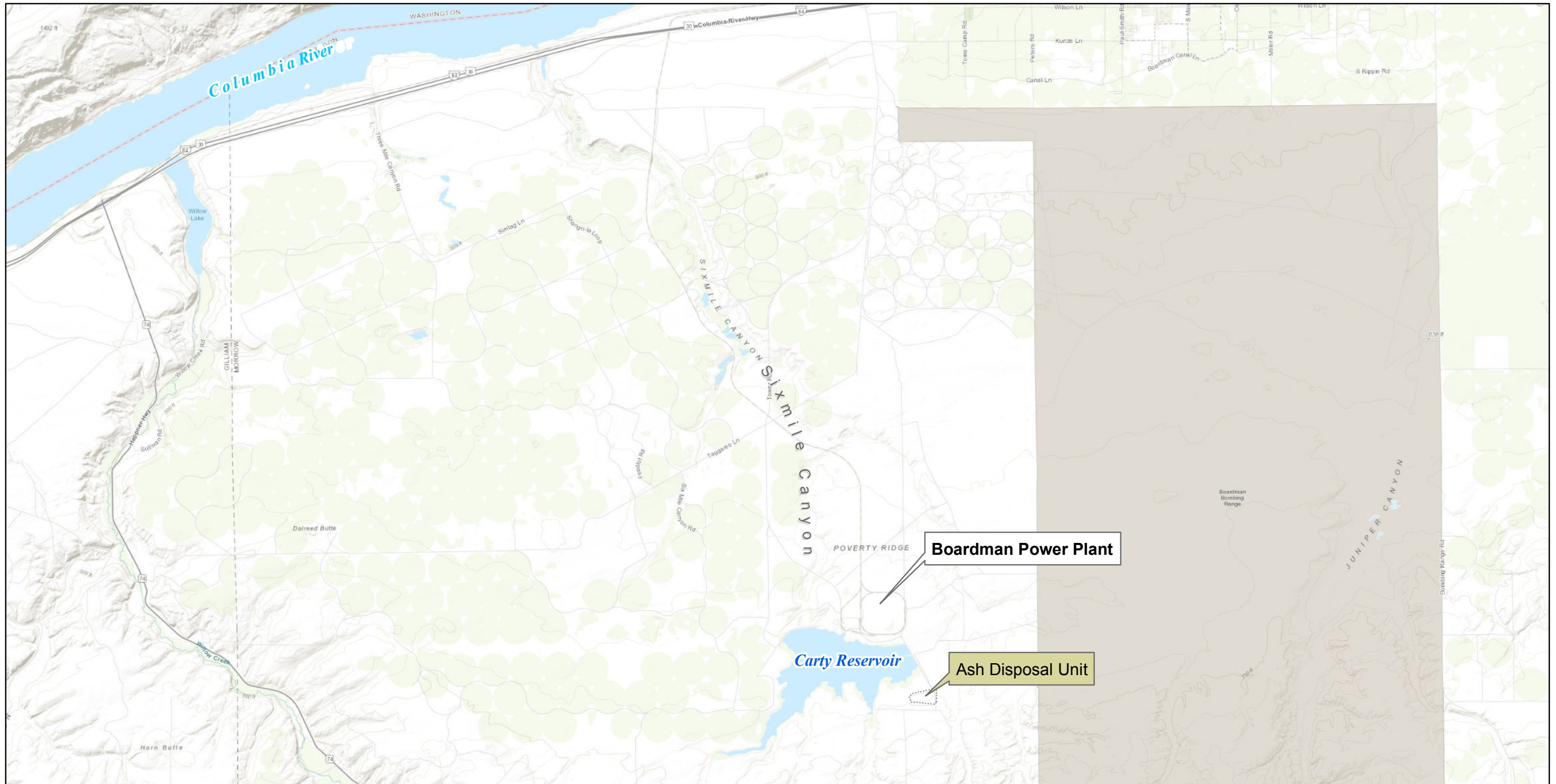
J = Analyte was positively identified, the quantitation is an estimate.

\*\* - For April 2022 boron analyses, the method detection limit (MDL) was 0.02 mg/L though the method reporting limit (MRL) was 0.2 mg/L. If analyte was detected above the MDL but below the MRL, it would have been "J" flagged.

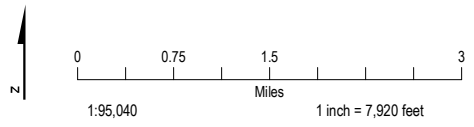
\*\*\* pH results were all "J" flagged due to being analyzed outside of holding time and are considered estimates. The field pH reading in October 2022 for AL-006 was 7.70 (see Table 2).

Figures





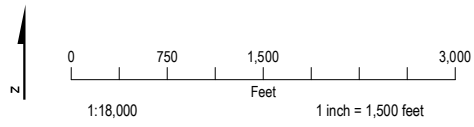
Source: USGS The National Map: National Boundaries Dataset, 3D Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; U.S. Census Bureau - TIGER/Line



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

**Figure 1.**  
**Vicinity Map**  
 2022 Annual Groundwater Monitoring Report for the CCR  
 Landfill at the Boardman Power Plant



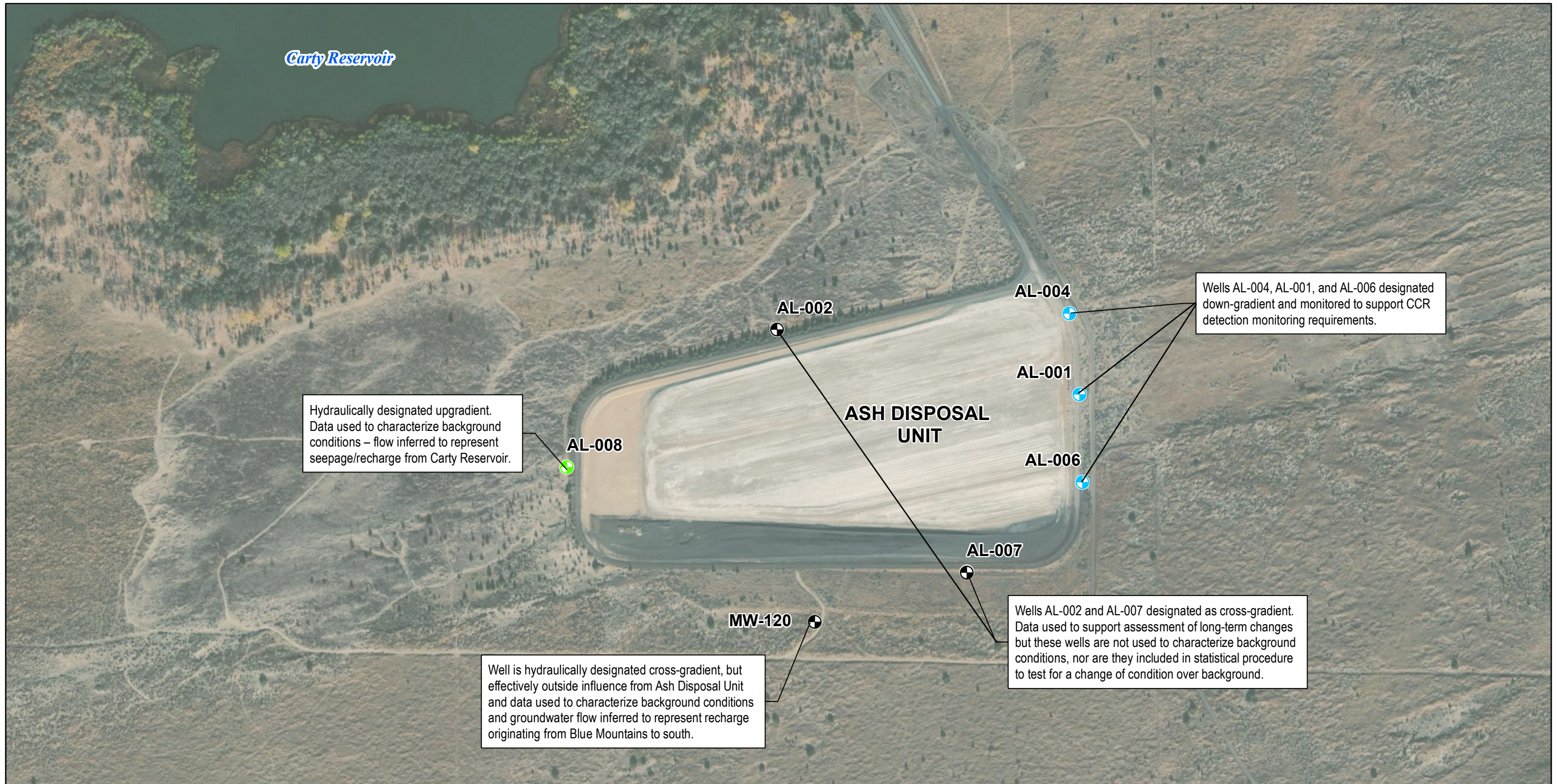


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**Figure 2.**  
**Site Map**

*2022 Annual Groundwater Monitoring Report for the CCR  
Landfill at the Boardman Power Plant*

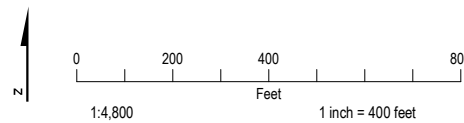




**LEGEND**

**Monitoring Well Location**

- Upgradient Well
- Cross-gradient Well
- Downgradient Well (Point of Compliance)

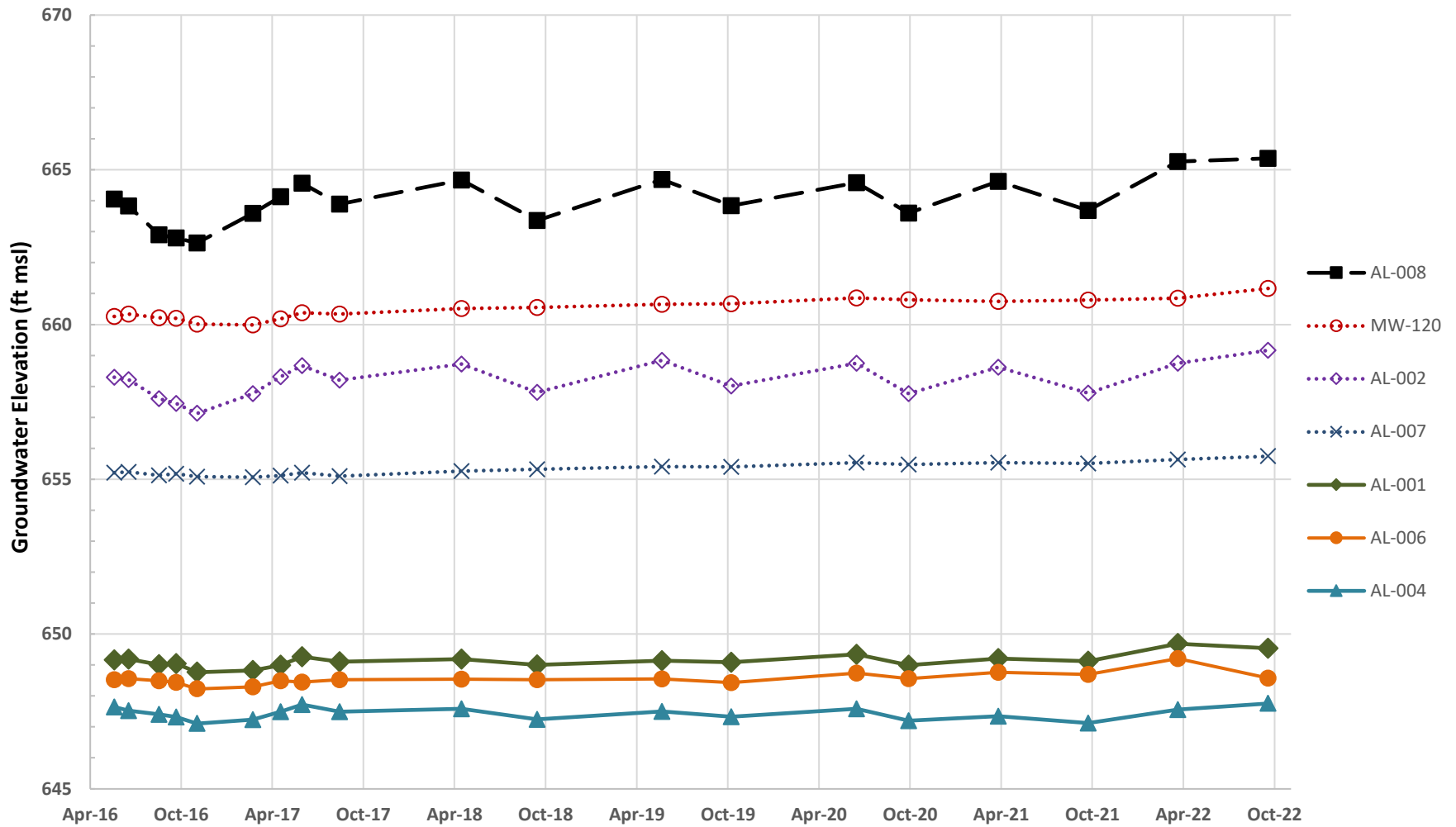


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**Figure 3.**  
**CCR Ground Water Monitoring Well Network**

*2022 Annual Groundwater Monitoring Report for the CCR Landfill at the Boardman Power Plant*



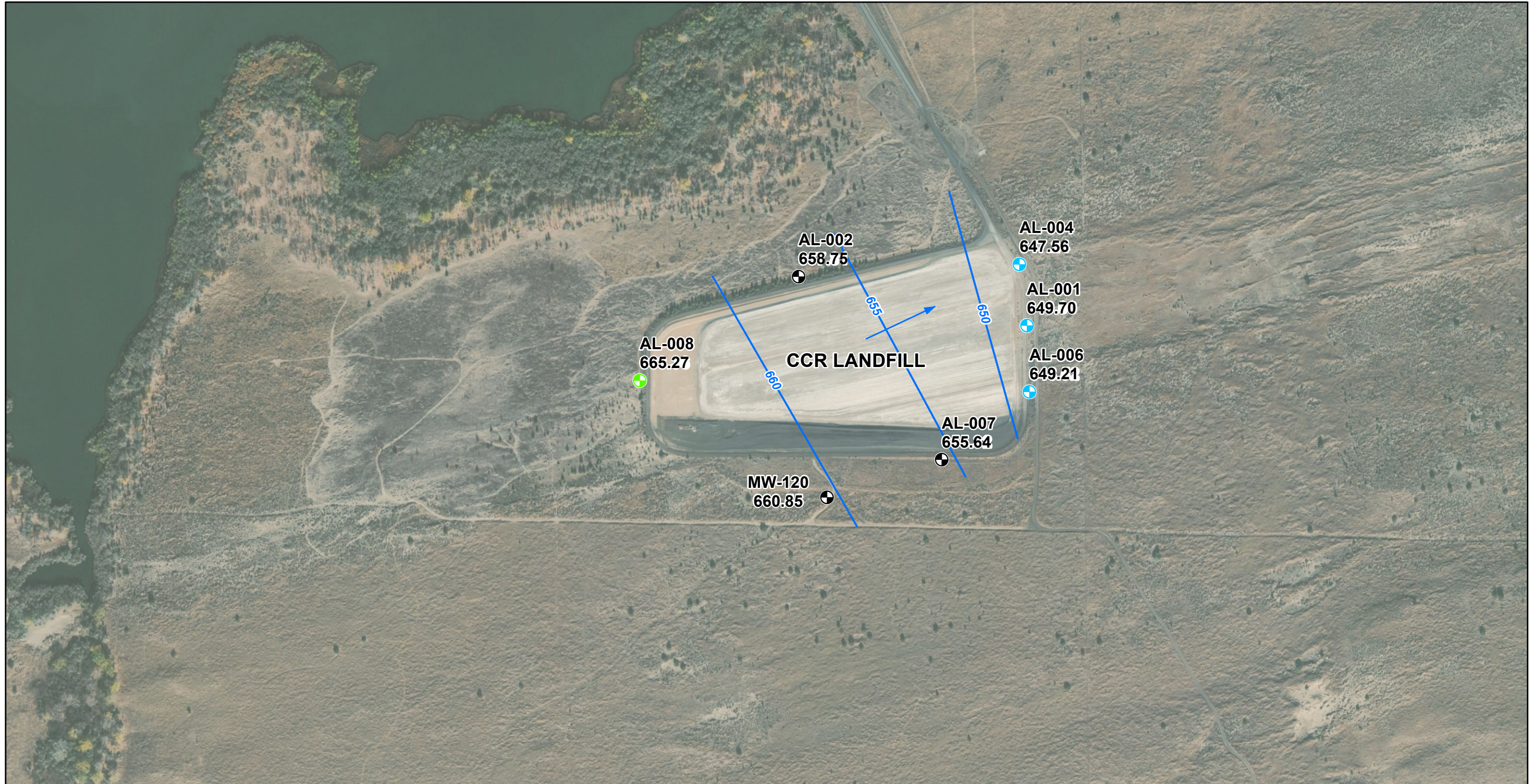


Notes.

1. Carty Reservoir Normal Pool Elevation: 667.5 ft msl.
2. Dashed line represents an upgradient well.
3. Dotted line are cross-gradient wells.
4. Solid lines indicate downgradient wells of the Ash Disposal Unit.

**Figure 4.**

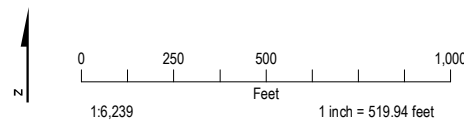
**Groundwater Elevation Hydrograph**  
 2022 Annual Groundwater Monitoring Report for the  
 CCR Landfill at the Boardman Power Plant



**LEGEND**

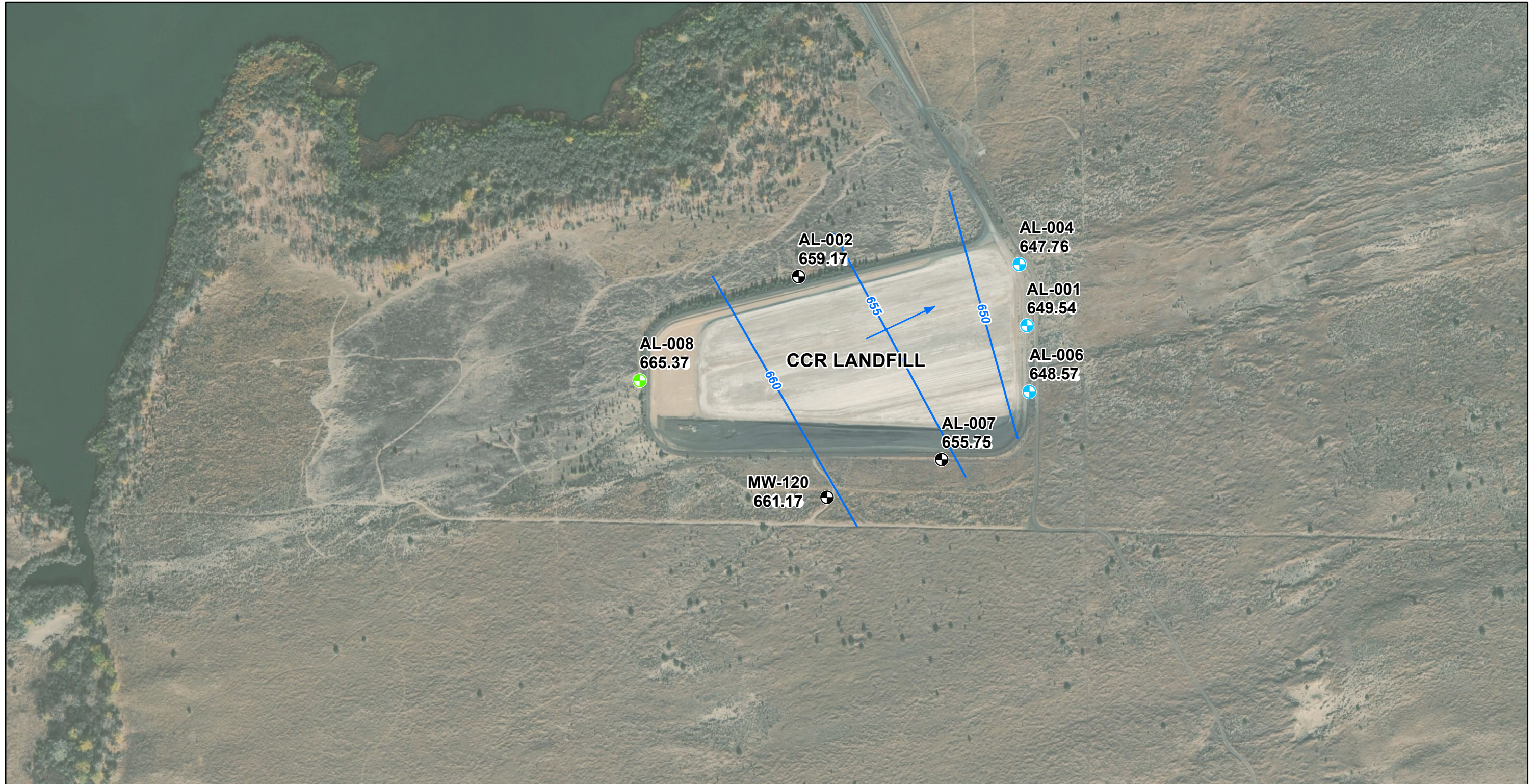
**Monitoring Well Location (Groundwater Elevation Measured April 11-12, 2022, ft NAVD88)**

- ⊕ Upgradient Well
- ⊗ Cross-gradient Well
- ⊕ Downgradient Well (Point of Compliance)
- ~ Groundwater Elevation Contour (5 ft Contour Interval, ft NAVD88)
- ➔ Inferred Groundwater Flow Direction



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

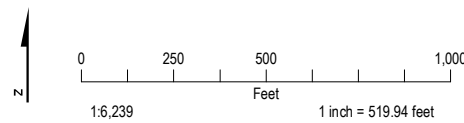
**FIGURE 5A**  
**Groundwater Elevation Contours and Flow Map,**  
**April 2022**  
**CCR Wells - Pomona Flow Top**  
 Boardman Power Plant  
 Morrow County, Oregon



**LEGEND**

**Monitoring Well Location (Groundwater Elevation Measured October 10, 2022, ft NAVD88)**

- Upgradient Well
- ⊕ Cross-gradient Well
- ⊕ Downgradient Well (Point of Compliance)
- ~ Groundwater Elevation Contour (5 ft Contour Interval, ft NAVD88)
- ➔ Inferred Groundwater Flow Direction



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

**FIGURE 5B**  
**Groundwater Elevation Contours and Flow Map,**  
**October 2022**  
**CCR Wells - Pomona Flow Top**  
 Boardman Power Plant  
 Morrow County, Oregon

# Appendix A

## Field Forms



# JACOBS PGE Boardman Groundwater Purging and Sampling Form

**SITE:** Boardman **Program/s (circle):** WPCF CCR **Well ID:** AL-001  
**Field Team:** D. Butler, J. Velasquez **Date:** 4/11/22  
**Weather/Temp:** cloudy, 30's, wind, snow **Arrival Time to Well:** 1205  
**Purge Method:**  Bladder  Peristaltic  Grab  Other: \_\_\_\_\_ **Initial DTW (ft btc):** ~~49.80~~ 60  
**Pump Setting**<sup>5</sup>: D=10, F=20 **Notes:** \_\_\_\_\_

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
1211	Begin Pumping								
1218	51.00	0	7.82	1.26	7.92	11.68	164	16.2	clear, no odor
1221	51.05	675	7.74	1.24	7.21	13.52	158	29.6	"
1224	51.09	1350	7.76	1.23	7.20	13.92	152	36.3	"
1227	51.09	2025	7.72	1.23	7.19	13.80	135	34.5	"
1230	51.11	2700	7.71	1.24	7.01	14.16	122	28.3	"
Params stable per footnote 3, proceed to sample									
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method  
<sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

**Sample ID:** 041122-WPCF-AL001 / 041122-CCR-AL001 **Sample Time:** 1235

**WPCF Analyses:** Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO<sub>4</sub>; Nitrate + Nitrite (NO<sub>x</sub>); DOC; Carb, Bicarb, Total Alk

**CCR Analyses:** Total B and Ca; Cl, F, SO<sub>4</sub>; pH; TDS

**QC SAMPLE:**  Field Duplicate  MS/MSD  EQ Rinsate Blank **TOTAL PURGED (GAL):** 1

**QC Sample ID:** 041122-CCR-FD (CCR only) **QC Sample Time:** 1200

**Comments:** Flow rate = 225 mL/min



SITE: Boardman Program/s (circle): WPCF CCR

Well ID: AL-004

Field Team: D. Outler, J. Velasquez

Date: 04/11/22

Weather/Temp: cloudy, mix rain sleet w/ wind

Arrival Time to Well: 1300

Purge Method:  Bladder  Peristaltic  Grab  Other: \_\_\_\_\_

Initial DTW (ft btc): 53.02

Pump Setting <sup>5</sup>: O=15, F=15

Notes: \_\_\_\_\_

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
<u>1300</u>	Begin Pumping								
<u>1312</u>	<u>53.10</u>	<u>0</u>	<u>7.82</u>	<u>1.49</u>	<u>7.52</u>	<u>13.23</u>	<u>127</u>	<u>19.8</u>	<u>clear no odor</u>
<u>1315</u>	<u>53.19</u>	<u>825</u>	<u>7.78</u>	<u>1.47</u>	<u>7.54</u>	<u>14.92</u>	<u>135</u>	<u>44.2</u>	<u>"</u>
<u>1318</u>	<u>53.21</u>	<u>1650</u>	<u>7.77</u>	<u>1.48</u>	<u>7.34</u>	<u>14.95</u>	<u>134</u>	<u>49.6</u>	<u>"</u>
<u>1321</u>	<u>53.14</u>	<u>2475</u>	<u>7.65</u>	<u>1.46</u>	<u>7.38</u>	<u>14.99</u>	<u>140</u>	<u>41.7</u>	<u>"</u>
<u>1324</u>	<u>53.19</u>	<u>3300</u>	<u>7.65</u>	<u>1.46</u>	<u>7.06</u>	<u>14.03</u>	<u>142</u>	<u>35.6</u>	<u>"</u>
<u>1327</u>	<u>53.19</u>	<u>4125</u>	<u>7.62</u>	<u>1.46</u>	<u>7.02</u>	<u>15.06</u>	<u>144</u>	<u>26.3</u>	<u>"</u>
<u>1330</u>	<u>53.19</u>	<u>4950</u>	<u>7.68</u>	<u>1.46</u>	<u>7.02</u>	<u>15.10</u>	<u>145</u>	<u>21.1</u>	<u>"</u>
<u>Params stable per footnote 3, proceed to sample</u>									
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method  
<sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: 041122-WPCF-AL004 / 041122-CCR-AL004

Sample Time: 1335

WPCF Analyses: Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO4; Nitrate + Nitrite (NOx); DOC; Carb, Bicarb, Total Alk

CCR Analyses: Total B and Ca; Cl, F, SO4; pH; TDS

QC SAMPLE:  Field Duplicate  MS/MSD  EQ Rinsate Blank

TOTAL PURGED (GAL): 1.75

QC Sample ID: \_\_\_\_\_

QC Sample Time: \_\_\_\_\_

Comments: Flow rate = 275 mL/min



SITE: Boardman Program/s (circle): WPCF CCR  
 Field Team: David Butler, Joey Velasquez  
 Weather/Temp: Cloudy, 40-30°, rain, wind  
 Purge Method:  Bladder  Peristaltic  Grab  Other: \_\_\_\_\_  
 Pump Setting <sup>5</sup>: D=15, F=45

Well ID: AL-007  
 Date: 4/11/22  
 Arrival Time to Well: 0845  
 Initial DTW (ft btc): 53.93

Notes: \_\_\_\_\_

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
0904	Begin Pumping								
0907	54.46	0	6.11	1.19	9.15	12.15	259	27.0	Clear, no odor
0911	54.20	1300	6.87	1.17	9.15	13.68	239	53.4	"
0914	54.43	1675	7.07	1.18	9.48	13.07	233	46.1	"
0917	54.27	2050	7.20	1.18	9.40	11.66	229	27.0	"
0920	54.36	2425	7.28	1.17	9.64	11.79	225	12.4	"
0923	54.55	2800	7.28	1.18	6.37	12.03	223	5.0	"
0926	54.29	3175	7.30	1.17	7.40	11.67	222	5.6	"
0929	54.39	3550	7.33	1.17	9.27	12.07	227	4.2	"
Params stable per footnote 3, proceed to sample									
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method

<sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method

<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method, minimum parameter subset: pH, sp. cond., and turbidity or DO

<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: WPCF-00 041122-WPCF-AL007/041122-CCR-AL007 Sample Time: 0930

WPCF Analyses: Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO<sub>4</sub>; Nitrate + Nitrite (NO<sub>x</sub>); DOC; Carb. Bicarb. Total Alk

CCR Analyses: Total B and Ca; Cl, F, SO<sub>4</sub>; pH; TDS

QC SAMPLE:  Field Duplicate  MS/MSD  EQ Rinsate Blank TOTAL PURGED (GAL): 1.5

QC Sample ID: \_\_\_\_\_ QC Sample Time: \_\_\_\_\_

Comments: Flow rate = 325 mL/min @ 0907, ≈ 125 @ 0914



# PGE Boardman Groundwater Purging and Sampling Form

SITE: Boardman

Program/s (circle): WPCF CCR

Well ID: AL008

Field Team: O. Butler, J. Velasquez

Date: 4/12/22

Weather/Temp: sunny partly cloudy

Arrival Time to Well: 0907

Purge Method:  Bladder  Peristaltic  Grab  Other: \_\_\_\_\_

Initial DTW (ft btc): 32.42

Pump Setting<sup>5</sup>: D=10, F=20 Notes: \_\_\_\_\_

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
<u>0913</u>	<u>Begin Pumping</u>								
<u>0918</u>	<u>32.45</u>	<u>0</u>	<u>7.69</u>	<u>0.719</u>	<u>10.95</u>	<u>15.03</u>	<u>189</u>	<u>0.0</u>	<u>clear no odor</u>
<u>0921</u>	<u>32.43</u>	<u>150<sup>SV</sup></u>	<u>7.70</u>	<u>0.719</u>	<u>9.46</u>	<u>15.09</u>	<u>186</u>	<u>0.0</u>	<u>  </u>
<u>0924</u>	<u>32.43</u>	<u>300<sup>SV</sup></u>	<u>7.75</u>	<u>0.719</u>	<u>9.21</u>	<u>15.30</u>	<u>186</u>	<u>0.0</u>	<u>  </u>
<u>0927</u>	<u>32.44</u>	<u>450<sup>SV</sup></u>	<u>7.72</u>	<u>0.719</u>	<u>8.80</u>	<u>15.28</u>	<u>184</u>	<u>0.0</u>	<u>  </u>
<u>0930</u>	<u>32.42</u>	<u>600<sup>SV</sup></u>	<u>7.68</u>	<u>0.719</u>	<u>8.36</u>	<u>15.35</u>	<u>184</u>	<u>0.0</u>	<u>  </u>
<u>Proceed to sample per footnote 3</u>						<u>3</u>			
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method  
<sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: 041222-CCR-AL008/041222-WPCF-AL008 Sample Time: 0935

WPCF Analyses: Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO4; Nitrate + Nitrite (NOx); DOC; Carb, Bicarb, Total Alk

CCR Analyses: Total B and Ca; Cl, F, SO4; pH; TDS

QC SAMPLE:  Field Duplicate  MS/MSD  EQ Rinsate Blank TOTAL PURGED (GAL): 1.0 Gal

QC Sample ID: \_\_\_\_\_ QC Sample Time: \_\_\_\_\_

Comments: flowrate = 150 mL/min SV or flowrate = 300 mL/min flowrate = 150 mL/min





# JACOBS PGE Boardman Groundwater Purging and Sampling Form

**SITE:** Boardman      **Program/s (circle):** WPCF CCR      **Well ID:** AL002  
**Field Team:** Henry Velasquez      **Date:** 10/10/22  
**Weather/Temp:** 75°F, 25 mph winds      **Arrival Time to Well:** 1355  
**Purge Method:**  Bladder     Peristaltic     Grab     Other: \_\_\_\_\_      **Initial DTW (ft btc):** 48.24  
**Pump Setting <sup>5</sup>:** 10/20      **Flow Rate (mL/min):** 350 ml/min

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
1400	Begin Pumping								
					9.16				
1404			7.89	1011	7.87	18.6	90	3.3	
1407	48.26		7.86	946	10.98	17.0	88	22	
1410			7.80	.804	8.55	16.9	87	<del>87</del> 44	
1413			7.79	.755	7.29	16.9	85	61	
1414			7.77	.739	6.83	16.9	83	71	
1419	48.26		7.77	.0.740	6.82	16.8	81	89	
		2.8 gal							
		1440 Done							
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method      <sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs      <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

**Sample ID:** AL002 MS/MSD      **Sample Time:** 1430

**WPCF Analyses:** Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO4; Nitrate + Nitrite (NOx); DOC; Carb, Bicarb, Total Alk

**CCR Analyses:** Total B and Ca; Cl, F, SO4; pH; TDS

**QC SAMPLE:**  Field Duplicate     MS/MSD     EQ Rinsate Blank      **TOTAL PURGED (GAL):** 4.5 gal

**QC Sample ID:** \_\_\_\_\_      **QC Sample Time:** \_\_\_\_\_

**Comments:** 3X all sample containers for CCR  
normal for WPCF

# JACOBS PGE Boardman Groundwater Purging and Sampling Form

SITE: Boardman Program/s (circle): WPCF CCR

Well ID: AL004

Field Team: Henry, Velasquez

Date: 10/10/22

Weather/Temp: 70°F, 15 mph breeze

Arrival Time to Well: 1045

Purge Method:  Bladder  Peristaltic  Grab  Other: \_\_\_\_\_

Initial DTW (ft btc): 52.83

Pump Setting<sup>5</sup>: 15/15 Flow Rate (mL/min): \_\_\_\_\_

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
Begin Pumping									
1155	52.84		7.72	1.486	7.65	19.4	74	4.5	
1159	52.82		7.63	1.495	9.02	19.2	74	9.5	
1202			7.64	1.520	9.06	18.2	75	12.4	
1205	52.82	1.2	7.62	1.506	8.92	18.0	75	15.8	Slightly out of draft possible
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method  
<sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: AL004 Sample Time: 1215

WPCF Analyses: Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO4; Nitrate + Nitrite (NOx); DOC; Carb. Bicarb, Total Alk

CCR Analyses: Total B and Ca; Cl, F, SO4; pH; TDS

QC SAMPLE:  Field Duplicate  MS/MSD  EQ Rinsate Blank TOTAL PURGED (GAL): 2.5

QC Sample ID: \_\_\_\_\_ QC Sample Time: \_\_\_\_\_

Comments: \_\_\_\_\_



SITE: Boardman Program/s (circle): WPCF CCR

Well ID: AL-007

Field Team: Henry Velasquez

Date: 10/10/22

Weather/Temp: 60°F, clear

Arrival Time to Well: 0922

Purge Method:  Judder  Peristaltic  Grab  Other: \_\_\_\_\_

Initial DTW (ft btc): 53.82

Pump Setting <sup>5</sup>: 15/45

Flow Rate (mL/min): 250/min

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
<u>0927</u>	<i>Begin Pumping</i>								
<u>0931</u>	<u>54.12</u>		<u>7.69</u>	<u>1.212</u>	<u>9.09</u>	<u>17.8</u>	<u>125</u>	<u>1.9</u>	
<u>0934</u>			<u>7.61</u>	<u>1.206</u>	<u>9.03</u>	<u>16.6</u>	<u>123</u>	<u>2.0</u>	
<u>0937</u>	<u>54.56</u>		<u>7.57</u>	<u>1.202</u>	<u>8.88</u>	<u>16.3</u>	<u>121</u>	<u>1.9</u>	
<u>0940</u>	<u>54.51</u>	<u>1.092</u>	<u>7.56</u>	<u>1.199</u>	<u>8.98</u>	<u>16.3</u>	<u>118</u>	<u>1.8</u>	
	<u>54.72</u>								
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method <sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: AL007 Sample Time: 1000

WPCF Analyses: Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO4; Nitrate + Nitrite (NOx); DOC; Carb, Bicarb, Total Alk

CCR Analyses: Total B and Ca; Cl, F, SO4; pH; TDS

QC SAMPLE:  Field Duplicate  MS/MSD  EQ Rinsate Blank TOTAL PURGED (GAL): 2.0

QC Sample ID: \_\_\_\_\_ QC Sample Time: \_\_\_\_\_

Comments: \_\_\_\_\_

SITE: Boardman Program/s (circle): WPCF CCR

Well ID: AL008

Field Team: Henry Velasquez

Date: 10/10/22

Weather/Temp: 75°F, 25 mph winds

Arrival Time to Well: 1450

Purge Method:  Bladder  Peristaltic  Grab  Other: \_\_\_\_\_

Initial DTW (ft btc): 32.53

Pump Setting<sup>5</sup>: 10/20 Flow Rate (mL/min): 350

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
<u>1453</u>	<i>Begin Pumping</i>								
<u>1455</u>	<u>32.32</u>		<u>8.03</u>	<u>0.763</u>	<u>5.38</u>	<u>19.0</u>	<u>91</u>	<u>1.7</u>	
<u>1458</u>	<u>32.41</u>		<u>7.88</u>	<u>0.763</u>	<u>4.47</u>	<u>16.9</u>	<u>91</u>	<u>9.9</u>	
<u>1501</u>	<u>32.46</u>		<u>7.83</u>	<u>0.765</u>	<u>4.38</u>	<u>16.8</u>	<u>88</u>	<u>21.3</u>	
<u>1505</u>	<u>32.51</u>	<u>2.0 gal</u>	<u>7.82</u>	<u>0.765</u>	<u>4.46</u>	<u>16.8</u>	<u>84</u>	<u>24.2</u>	
		<u>1530</u>	<u>Done</u>						
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method  
<sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: AL008 Sample Time: 1315

WPCF Analyses: Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO4; Nitrate + Nitrite (NOx); DOC; Carb, Bicarb, Total Alk

CCR Analyses: Total B and Ca; Cl, F, SO4; pH; TDS

QC SAMPLE:  Field Duplicate  MS/MSD  EQ Rinsate Blank TOTAL PURGED (GAL): 3.5 gal

QC Sample ID: \_\_\_\_\_ QC Sample Time: \_\_\_\_\_

Comments: \_\_\_\_\_

SITE: Boardman Program/s (circle): WPCF CCR Well ID: MW-120

Field Team: Henry Valasquez Date: 10/10/22

Weather/Temp: 50°F, Clear Arrival Time to Well: 0730

Purge Method:  Bladder  Peristaltic  Grab  Other: \_\_\_\_\_ Initial DTW (ft btc): 44.30

Pump Setting<sup>5</sup>: 17/42 Flow Rate (mL/min): 350 mL/min

Field Parameters									
Time <sup>1</sup>	DTW <sup>2</sup>	Purge Vol. (mL)	pH	Sp. Cond. (mS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
<u>0758</u>	<i>Begin Pumping</i>								
<u>0800</u>	<u>44.40</u>		<u>7.21</u>	<u>1.176</u>	<u>8.40</u>	<u>16.0</u>	<u>239</u>	<u>4.0</u>	<u>Clear</u>
<u>0803</u>	<u>44.40</u>		<u>7.42</u>	<u>1.166</u>	<u>8.27</u>	<u>16.0</u>	<u>234</u>	<u>2.2</u>	
<u>0806</u>	<u>44.40</u>		<u>7.48</u>	<u>1.166</u>	<u>8.26</u>	<u>16.0</u>	<u>227</u>	<u>2.3</u>	
		<u>1.5g</u>							
<u>0835</u>	<i>Done</i>								
Stabilization Criteria <sup>3</sup>	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% <sup>4</sup>	-

<sup>1</sup> Collect field parameters in consistent 3-5 minute intervals for Low-Flow method <sup>2</sup> DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method  
<sup>3</sup> Stabilization achieved once field parameters stabilize for 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO  
<sup>4</sup> For turbidity readings > 10 NTUs <sup>5</sup> Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: MW-120 Sample Time: 0830

WPCF Analyses: Total Metals; Mercury; Dissolved Metals (Ca, Mg, K, Na, P); Silica; TDS; Cl, F, SO4; Nitrate + Nitrite (NOx); DOC; Carb, Bicarb, Total Alk

CCR Analyses: Total B and Ca; Cl, F, SO4; pH; TDS

QC SAMPLE:  Field Duplicate  MS/MSD  EQ Rinsate Blank TOTAL PURGED (GAL): 2.5

QC Sample ID: \_\_\_\_\_ QC Sample Time: \_\_\_\_\_

Comments: MW-122 ⇒ DRY  
0915

Appendix B  
Laboratory Reports and Data Quality  
Evaluation



April 29, 2022

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2 Tc

3 Ss

4 Cn

5 Sr

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7 Gl

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9 Sc

**Jacobs- Richland, WA**

Sample Delivery Group: L1482387  
Samples Received: 04/14/2022  
Project Number: D3624800  
Description: Boardman- CCR

Report To: Mark Henry  
295 Bradley Blvd.  
Richland, WA 99352

Entire Report Reviewed By:



Kelly Mercer  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

**Pace Analytical National**12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 [www.pacenational.com](http://www.pacenational.com)

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# SAMPLE SUMMARY

## 041122-CCR-AL007 L1482387-01 GW

Collected by: David Butler  
 Collected date/time: 04/11/22 09:30  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1849185	1	04/15/22 11:13	04/15/22 14:48	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 14:24	04/21/22 14:24	RAF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	5	04/21/22 14:39	04/21/22 14:39	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850365	1	04/20/22 19:22	04/22/22 19:15	ZSA	Mt. Juliet, TN

- 1  
Cp
- 2  
Tc
- 3  
Ss
- 4  
Cn
- 5  
Sr
- 6  
Qc
- 7  
Gl
- 8  
Al
- 9  
Sc

## 041122-CCR-AL006 L1482387-02 GW

Collected by: David Butler  
 Collected date/time: 04/11/22 11:00  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1849185	1	04/15/22 11:13	04/15/22 14:48	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 14:55	04/21/22 14:55	RAF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	5	04/21/22 15:10	04/21/22 15:10	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850365	1	04/20/22 19:22	04/22/22 19:18	ZSA	Mt. Juliet, TN

## 041122-CCR-AL001 L1482387-03 GW

Collected by: David Butler  
 Collected date/time: 04/11/22 12:35  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1849185	1	04/15/22 11:13	04/15/22 14:48	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 15:25	04/21/22 15:25	RAF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	5	04/21/22 15:41	04/21/22 15:41	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850365	1	04/20/22 19:22	04/22/22 19:21	ZSA	Mt. Juliet, TN

## 041122-CCR-AL004 L1482387-04 GW

Collected by: David Butler  
 Collected date/time: 04/11/22 13:35  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1849185	1	04/15/22 11:13	04/15/22 14:48	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 15:56	04/21/22 15:56	RAF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	5	04/21/22 16:43	04/21/22 16:43	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850365	1	04/20/22 19:22	04/22/22 19:23	ZSA	Mt. Juliet, TN

## 041122-CCR-FD L1482387-05 GW

Collected by: David Butler  
 Collected date/time: 04/11/22 12:00  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1849185	1	04/15/22 11:13	04/15/22 14:48	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 16:58	04/21/22 16:58	RAF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	5	04/21/22 17:13	04/21/22 17:13	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850365	1	04/20/22 19:22	04/22/22 19:26	ZSA	Mt. Juliet, TN

# SAMPLE SUMMARY

## 041122-CCR-MW120 L1482387-06 GW

Collected by: David Butler  
 Collected date/time: 04/11/22 15:50  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1849369	1	04/15/22 16:15	04/15/22 18:51	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 17:29	04/21/22 17:29	RAF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	5	04/21/22 17:44	04/21/22 17:44	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850370	1	04/21/22 03:27	04/21/22 11:23	ZSA	Mt. Juliet, TN



## 041122-CCR-AL002 L1482387-07 GW

Collected by: David Butler  
 Collected date/time: 04/12/22 08:45  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1849632	1	04/16/22 13:07	04/16/22 15:07	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 18:00	04/21/22 18:00	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850370	1	04/21/22 03:27	04/21/22 11:10	ZSA	Mt. Juliet, TN



## 041122-CCR-AL008 L1482387-08 GW

Collected by: David Butler  
 Collected date/time: 04/12/22 09:35  
 Received date/time: 04/14/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1850638	1	04/19/22 08:46	04/19/22 19:08	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1849562	1	04/16/22 14:20	04/16/22 14:20	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1849583	1	04/21/22 19:01	04/21/22 19:01	RAF	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1850370	1	04/21/22 03:27	04/21/22 11:26	ZSA	Mt. Juliet, TN



# CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.



Kelly Mercer  
Project Manager

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	825		13.3	1	04/15/2022 14:48	<a href="#">WG1849185</a>

Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.80	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.80	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

Sample Narrative:

L1482387-01 WG1849562: 7.8 at 16.9C

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	107		5.00	5	04/21/2022 14:39	<a href="#">WG1849583</a>
Fluoride	0.454		0.150	1	04/21/2022 14:24	<a href="#">WG1849583</a>
Sulfate	235		25.0	5	04/21/2022 14:39	<a href="#">WG1849583</a>

Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/22/2022 19:15	<a href="#">WG1850365</a>
Calcium	101		1.00	1	04/22/2022 19:15	<a href="#">WG1850365</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	691		13.3	1	04/15/2022 14:48	<a href="#">WG1849185</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.82	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.82	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

## Sample Narrative:

L1482387-02 WG1849562: 7.82 at 17.2C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	114		5.00	5	04/21/2022 15:10	<a href="#">WG1849583</a>
Fluoride	0.533		0.150	1	04/21/2022 14:55	<a href="#">WG1849583</a>
Sulfate	148		25.0	5	04/21/2022 15:10	<a href="#">WG1849583</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/22/2022 19:18	<a href="#">WG1850365</a>
Calcium	82.2		1.00	1	04/22/2022 19:18	<a href="#">WG1850365</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	812		13.3	1	04/15/2022 14:48	<a href="#">WG1849185</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.85	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.85	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

## Sample Narrative:

L1482387-03 WG1849562: 7.85 at 16.8C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	150		5.00	5	04/21/2022 15:41	<a href="#">WG1849583</a>
Fluoride	0.495		0.150	1	04/21/2022 15:25	<a href="#">WG1849583</a>
Sulfate	146		25.0	5	04/21/2022 15:41	<a href="#">WG1849583</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/22/2022 19:21	<a href="#">WG1850365</a>
Calcium	103		1.00	1	04/22/2022 19:21	<a href="#">WG1850365</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	958		20.0	1	04/15/2022 14:48	<a href="#">WG1849185</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.85	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.85	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

## Sample Narrative:

L1482387-04 WG1849562: 7.85 at 17C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	187		5.00	5	04/21/2022 16:43	<a href="#">WG1849583</a>
Fluoride	0.477		0.150	1	04/21/2022 15:56	<a href="#">WG1849583</a>
Sulfate	239		25.0	5	04/21/2022 16:43	<a href="#">WG1849583</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/22/2022 19:23	<a href="#">WG1850365</a>
Calcium	122		1.00	1	04/22/2022 19:23	<a href="#">WG1850365</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	817		13.3	1	04/15/2022 14:48	<a href="#">WG1849185</a>

Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.82	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.82	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

Sample Narrative:

L1482387-05 WG1849562: 7.82 at 17.6C

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	149		5.00	5	04/21/2022 17:13	<a href="#">WG1849583</a>
Fluoride	0.485		0.150	1	04/21/2022 16:58	<a href="#">WG1849583</a>
Sulfate	146		25.0	5	04/21/2022 17:13	<a href="#">WG1849583</a>

Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/22/2022 19:26	<a href="#">WG1850365</a>
Calcium	103		1.00	1	04/22/2022 19:26	<a href="#">WG1850365</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	768	<u>J3</u>	13.3	1	04/15/2022 18:51	<a href="#">WG1849369</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.97	<u>T8</u>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.97	<u>T8</u>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

## Sample Narrative:

L1482387-06 WG1849562: 7.97 at 17.8C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	95.0		1.00	1	04/21/2022 17:29	<a href="#">WG1849583</a>
Fluoride	0.543		0.150	1	04/21/2022 17:29	<a href="#">WG1849583</a>
Sulfate	223		25.0	5	04/21/2022 17:44	<a href="#">WG1849583</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/21/2022 11:23	<a href="#">WG1850370</a>
Calcium	92.1		1.00	1	04/21/2022 11:23	<a href="#">WG1850370</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	499		10.0	1	04/16/2022 15:07	<a href="#">WG1849632</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.91	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.91	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

## Sample Narrative:

L1482387-07 WG1849562: 7.91 at 18C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	44.5		1.00	1	04/21/2022 18:00	<a href="#">WG1849583</a>
Fluoride	0.688		0.150	1	04/21/2022 18:00	<a href="#">WG1849583</a>
Sulfate	98.1		5.00	1	04/21/2022 18:00	<a href="#">WG1849583</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/21/2022 11:10	<a href="#">WG1850370</a>
Calcium	52.0	<a href="#">O1</a>	1.00	1	04/21/2022 11:10	<a href="#">WG1850370</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	484		10.0	1	04/19/2022 19:08	<a href="#">WG1850638</a>

Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.93	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>
pH	7.93	<a href="#">T8</a>	1	04/16/2022 14:20	<a href="#">WG1849562</a>

Sample Narrative:

L1482387-08 WG1849562: 7.93 at 17.8C

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chloride	38.8		1.00	1	04/21/2022 19:01	<a href="#">WG1849583</a>
Fluoride	0.709		0.150	1	04/21/2022 19:01	<a href="#">WG1849583</a>
Sulfate	76.4		5.00	1	04/21/2022 19:01	<a href="#">WG1849583</a>

Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Boron	ND		0.200	1	04/21/2022 11:26	<a href="#">WG1850370</a>
Calcium	56.5		1.00	1	04/21/2022 11:26	<a href="#">WG1850370</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3782589-1 04/15/22 14:48

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

1 Cp

2 Tc

3 Ss

L1482387-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1482387-04 04/15/22 14:48 • (DUP) R3782589-3 04/15/22 14:48

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	958	982	1	2.47		5

4 Cn

5 Sr

6 Qc

L1482654-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1482654-04 04/15/22 14:48 • (DUP) R3782589-4 04/15/22 14:48

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	984	990	1	0.608		5

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3782589-2 04/15/22 14:48

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Dissolved Solids	8800	8490	96.5	77.4-123	

Method Blank (MB)

(MB) R3782358-1 04/15/22 18:51

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

L1482387-06 Original Sample (OS) • Duplicate (DUP)

(OS) L1482387-06 04/15/22 18:51 • (DUP) R3782358-3 04/15/22 18:51

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	768	728	1	5.35	J3	5

<sup>4</sup>Cn

<sup>5</sup>Sr

L1482444-10 Original Sample (OS) • Duplicate (DUP)

(OS) L1482444-10 04/15/22 18:51 • (DUP) R3782358-4 04/15/22 18:51

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	1490	1440	1	3.01		5

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

Laboratory Control Sample (LCS)

(LCS) R3782358-2 04/15/22 18:51

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Dissolved Solids	8800	8420	95.7	77.4-123	

<sup>9</sup>Sc

Method Blank (MB)

(MB) R3782363-1 04/16/22 15:07

Analyte	MB Result	<u>MB Qualifier</u>	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1482377-73 Original Sample (OS) • Duplicate (DUP)

(OS) L1482377-73 04/16/22 15:07 • (DUP) R3782363-3 04/16/22 15:07

Analyte	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Dissolved Solids	1610	1550	1	3.80		5

L1482654-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1482654-11 04/16/22 15:07 • (DUP) R3782363-4 04/16/22 15:07

Analyte	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Dissolved Solids	1510	1550	1	3.01		5

Laboratory Control Sample (LCS)

(LCS) R3782363-2 04/16/22 15:07

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
Dissolved Solids	8800	8570	97.4	77.4-123	

Method Blank (MB)

(MB) R3783290-1 04/19/22 19:08

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

L1482988-50 Original Sample (OS) • Duplicate (DUP)

(OS) L1482988-50 04/19/22 19:08 • (DUP) R3783290-3 04/19/22 19:08

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	1060	1090	1	2.78		5

<sup>4</sup>Cn

<sup>5</sup>Sr

L1482988-52 Original Sample (OS) • Duplicate (DUP)

(OS) L1482988-52 04/19/22 19:08 • (DUP) R3783290-4 04/19/22 19:08

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	1390	1450	1	4.24		5

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

Laboratory Control Sample (LCS)

(LCS) R3783290-2 04/19/22 19:08

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Dissolved Solids	8800	8560	97.3	77.4-123	

<sup>9</sup>Sc

L1482296-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1482296-01 04/16/22 14:20 • (DUP) R3781821-2 04/16/22 14:20

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.60	8.59	1	0.116		1

Sample Narrative:

OS: 8.6 at 15.9C

DUP: 8.59 at 16.9C

L1482387-08 Original Sample (OS) • Duplicate (DUP)

(OS) L1482387-08 04/16/22 14:20 • (DUP) R3781821-4 04/16/22 14:20

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	7.93	7.96	1	0.378		1

Sample Narrative:

OS: 7.93 at 17.8C

DUP: 7.96 at 18.1C

Laboratory Control Sample (LCS)

(LCS) R3781821-1 04/16/22 14:20

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
Corrosivity by pH	10.0	9.96	99.6	99.0-101	
pH	10.0	9.96	99.6	99.0-101	

Sample Narrative:

LCS: 9.96 at 19.2C

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

Method Blank (MB)

(MB) R3786465-1 04/21/22 10:47

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Chloride	U		0.379	1.00
Fluoride	U		0.0640	0.150
Sulfate	U		0.594	5.00

L1482387-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1482387-07 04/21/22 18:00 • (DUP) R3786465-3 04/21/22 18:15

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Chloride	44.5	44.5	1	0.000		15
Fluoride	0.688	0.647	1	6.05		15
Sulfate	98.1	98.1	1	0.0279		15

L1482593-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1482593-02 04/21/22 21:35 • (DUP) R3786465-6 04/21/22 21:51

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Chloride	2.44	2.44	1	0.0534		15
Fluoride		ND	1	4.04		15
Sulfate	28.3	28.4	1	0.226		15

Laboratory Control Sample (LCS)

(LCS) R3786465-2 04/21/22 11:03

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/l	mg/l	%	%	
Chloride	40.0	38.9	97.3	80.0-120	
Fluoride	8.00	7.74	96.8	80.0-120	
Sulfate	40.0	39.5	98.8	80.0-120	

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1482387-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1482387-07 04/21/22 18:00 • (MS) R3786465-4 04/21/22 18:30 • (MSD) R3786465-5 04/21/22 18:46

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Chloride	50.0	44.5	92.9	93.8	96.8	98.7	1	80.0-120			0.990	15
Fluoride	5.00	0.688	5.61	5.71	98.4	100	1	80.0-120			1.75	15
Sulfate	50.0	98.1	143	144	90.3	92.2	1	80.0-120	E	E	0.682	15

L1482593-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1482593-02 04/21/22 21:35 • (MS) R3786465-7 04/21/22 22:06

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Chloride	50.0	2.44	52.2	99.6	1	80.0-120	
Fluoride	5.00		5.03	99.3	1	80.0-120	
Sulfate	50.0	28.3	77.6	98.6	1	80.0-120	

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3784491-1 04/22/22 18:09

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Boron	U		0.0200	0.200
Calcium	U		0.0793	1.00

Laboratory Control Sample (LCS)

(LCS) R3784491-2 04/22/22 18:11

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/l	mg/l	%	%	
Boron	1.00	0.949	94.9	80.0-120	
Calcium	10.0	9.94	99.4	80.0-120	

L1482337-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1482337-01 04/22/22 18:14 • (MS) R3784491-4 04/22/22 18:19 • (MSD) R3784491-5 04/22/22 18:21

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
Boron	1.00	ND	1.14	1.14	94.2	93.9	1	75.0-125			0.192	20
Calcium	10.0	79.5	87.1	87.3	76.3	77.6	1	75.0-125			0.147	20

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

Method Blank (MB)

(MB) R3783753-1 04/21/22 11:05

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Boron	0.0218	⬇	0.0200	0.200
Calcium	U		0.0793	1.00

1 Cp

2 Tc

3 Ss

Laboratory Control Sample (LCS)

(LCS) R3783753-2 04/21/22 11:07

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/l	mg/l	%	%	
Boron	1.00	0.959	95.9	80.0-120	
Calcium	10.0	9.77	97.7	80.0-120	

4 Cn

5 Sr

6 Qc

L1482387-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1482387-07 04/21/22 11:10 • (MS) R3783753-4 04/21/22 11:15 • (MSD) R3783753-5 04/21/22 11:17

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
Boron	1.00	ND	0.989	0.994	94.0	94.6	1	75.0-125			0.586	20
Calcium	10.0	52.0	60.4	60.5	83.9	84.4	1	75.0-125			0.0830	20

7 Gl

8 Al

9 Sc

# GLOSSARY OF TERMS

## Guide to Reading and Understanding Your Laboratory Report

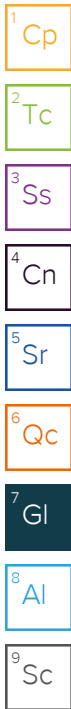
The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

### Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
O1	The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
T8	Sample(s) received past/too close to holding time expiration.



# ACCREDITATIONS & LOCATIONS

## Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	KY90010	South Carolina	84004002
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

\* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn


<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Company Name/Address: <b>Jacobs- Richland, WA</b> 295 Bradley Blvd. Richland, WA 99352		Billing Information: Mark Henry 295 Bradley Blvd. Richland, WA 99352		Pres Chk		Analysis / Container / Preservative							Chain of Custody Page 1 of 1			
Report to: Mark Henry		Email To: mark.henry1@jacobs.com											 <b>MT JULIET, TN</b> 12065 Lebanon Rd Mount Juliet, TN 37122 Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: <a href="https://info.pacelabs.com/hubs/pas-standard-terms.pdf">https://info.pacelabs.com/hubs/pas-standard-terms.pdf</a>			
Project Description: Boardman-CCR		City/State Collected: Boardman, OR		Please Circle: <input checked="" type="radio"/> PT <input type="radio"/> MT <input type="radio"/> CT <input type="radio"/> ET									SDG # <b>L1482587</b> <b>F170</b>			
Phone: 509-375-3444		Client Project # D3624800		Lab Project # JACOBSRWA-CCR									Acctnum: JACOBSRWA Template: T206808			
Collected by (print): David Butler		Site/Facility ID #		P.O. #									Prelogin: P916351 PM: 841 - Kelly Mercer PB: NS 4/4/22			
Collected by (signature): <i>David Butler</i>		Rush? (Lab MUST Be Notified) <input type="checkbox"/> Same Day <input type="checkbox"/> Five Day <input type="checkbox"/> Next Day <input type="checkbox"/> 5 Day (Rad Only) <input type="checkbox"/> Two Day <input type="checkbox"/> 10 Day (Rad Only) <input type="checkbox"/> Three Day		Quote #									Shipped Via: FedEX Ground			
Immediately Packed on Ice N <input type="checkbox"/> Y <input checked="" type="checkbox"/>				Date Results Needed									Remarks			
Sample ID		Comp/Grab	Matrix *	Depth	Date	Time	Cntrs	B, Ca 6010 250mlHDPE-HNO3	CHLORIDE 250mlHDPE-NoPres	Corrosivity 250mlHDPE-NoPres	FLUORIDE 250mlHDPE-NoPres	SULFATE 250mlHDPE-NoPres	TDS 1L-HDPE NoPres	pH 250mlHDPE-NoPres	Sample # (lab only)	
041122-CCR-AL007		G	GW	NA	4/1/22	0930	3	X	X	X	X	X	X	X	21	
041122-CCR-AL006		G	GW			1100	3								22	
041122-CCR-AL001		G				1235	3								23	
041122-CCR-AL004		G				1335	3								24	
041122-CCR-FD		G				1200	3								25	
041122-CCR-MW120		G				1550	3								26	
041222-CCR-AL002		G			4/12/22	0845	9								MS/MSD 27	
041222-CCR-AL008		G				0935	3								28	
* Matrix: SS - Soil AIR - Air F - Filter GW - Groundwater B - Bioassay WW - WasteWater DW - Drinking Water OT - Other		Remarks:		pH _____ Temp _____ Flow _____ Other _____		Samples returned via: UPS FedEx Courier		Tracking #		Sample Receipt Checklist COC Seal Present/Intact: <input type="checkbox"/> NP <input checked="" type="checkbox"/> Y <input type="checkbox"/> N COC Signed/Accurate: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Bottles arrive intact: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Correct bottles used: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Sufficient volume sent: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N If Applicable VOA Zero Headspace: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N Preservation Correct/Checked: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N RAD Screen <0.5 mR/hr: <input checked="" type="checkbox"/> Y <input type="checkbox"/> N						
Relinquished by: (Signature) <i>David Butler</i>		Date: 4/13/22	Time: 1500	Received by: (Signature)		Trip Blank Received: Yes/No 2 HCL MeOH TBR										
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Temp: °C Bottles Received: 30		If preservation required by Login: Date/Time								
Relinquished by: (Signature)		Date:	Time:	Received for lab by: (Signature)		Date: 4/14/22 Time: 900		Hold: Condition: NCF OK								

U1482587

<u>Tracking Numbers</u>	<u>Temperature</u>
5671 5380 7198	JAA6 $3.2 + 0 = 3.2$
5671 5380 3906	JAA6 $1.0 + 0 = 1.0$

U1482587

# CCR Groundwater Data Quality Evaluation for the Ash Disposal Unit at the Boardman Power Plant

PREPARED FOR: Project Files

PREPARED BY: Mark Fesler/JACOBS  
Mark Henry/JACOBS

REVIEWED BY: Berney Kidd/JACOBS

DATE: May 13, 2022

REFERENCE: Coal Combustion Residual (CCR) Semi-Annual Monitoring Event – April 11-12, 2022

## Introduction

The objective of this data quality evaluation (DQE) is to assess the representativeness and usability of data quality for groundwater quality samples collected to monitor the Ash Disposal Unit at the Boardman Power Plant. The rationale for monitoring, the data quality objectives (DQOs), and the method for performing this DQE is provided in the *Groundwater Monitoring Sampling and Analysis Plan for the Ash Disposal Unit at the Boardman Power Plant*, Boardman, Oregon, June 2016 (hereafter referred to as the *Ash Disposal Unit SAP*).

This DQE report includes an evaluation of groundwater quality data from seven groundwater locations collected on April 11-12, 2022, in accordance with the *Ash Disposal Unit SAP*. This DQE report is intended as a general data quality assessment designed to summarize data issues and performed in accordance with U.S. Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA, 2017).

## Findings

The overall summaries of the data validation findings are contained in Tables 1 through 6 and summarized in the method sections that follow:

- **Table 1:** Sample Summary by Chain of Custody – Data Summary. Presents the sample identifiers, sampling dates, and SDG sorted by chain-of-custody (COC) number.
- **Table 2:** Sample Chronology – Data Summary. Presents the sample identifiers, methods, sampling dates, received dates, extraction dates, and analysis dates sorted by SDG number.
- **Table 3:** Overall Flagging Summary. Presents the number of occurrences for each data validation reason by method.
- **Table 4:** Field Duplicate Precision – Results. Presents the relative percent difference (RPD) for all data with FD pair detects above the RL.
- **Table 5:** Holding Time – Qualified Data. Presents the data qualified because of holding time exceedances.
- **Table 6:** Site Completeness by Analyte – Qualified Data. Presents the percent completeness by method, analyte, and matrix.

## Analytical Data

This DQE report includes seven normal groundwater samples and one FD collected on April 11-12, 2022. These samples were reported under one sample delivery group: L1482387. A list of samples included in this DQE are presented in Table 1. Four methods were used to analyze the groundwater samples and are provided in Table 2. The analyses were performed by Pace Analytical, Inc. in Mount Juliet, Tennessee (ESRM). Samples were collected and delivered by overnight carrier to the laboratory.

The data were assessed according to the requirements of the *Ash Disposal Unit SAP* and included a review of:

1. chain of custody documentation;
2. holding-time compliance;
3. required quality control (QC) samples at the specified frequencies;
4. flagging for method blanks;
5. laboratory control sample/laboratory control sample duplicates (LCS/LCSD);
6. matrix spike/matrix spike duplicate (MS/MSD) recoveries;

and other method-specific criteria as defined by the *Ash Disposal Unit SAP*.

Field samples were also reviewed to ascertain field compliance and data quality issues. This included the review of a FD.

Data flags were assigned according to the *Ash Disposal Unit SAP*. These flags, as well as the reason for each flag, are entered into the electronic database and can be found in Table 3. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are those listed in the *Ash Disposal Unit SAP* and are defined below:

- J = the analyte was detected, but the associated numerical value is considered an estimated quantity.
- R = the sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified. No associated value is reported.
- U = the analyte was analyzed for but was not detected above the detection limit.
- UJ = the analyte was not detected above the detection limit. However, the detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

## Overall Flagging Summary

The overall summaries of the data validation findings are summarized in the following sections.

### Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination that would affect the sample results.

## Field Duplicates

In accordance with the *Ash Disposal Unit SAP*, one FD was collected from well AL001, and the precision criteria were met.

Table 4 shows the RPD between the primary (P) sample and FD, and was calculated for detected results above the RL using the following equation:

$$RPD = 100 * [ (P1 - FD1) / (P1 + FD1) / 2 ]$$

## Laboratory Duplicate Samples

Laboratory duplicate samples were analyzed as required. All precision criteria were met.

## Laboratory Control Samples

LCS were analyzed as required. All accuracy criteria were met.

## Matrix Spike Samples

MS/MSDs were analyzed at the required frequency. All accuracy and precision criteria were met.

## Holding Times

All holding-time criteria were generally met. Table 5 lists the following exception:

Several pH samples were analyzed outside of holding time for Method SW9040C, indicating the associated sample results are possibly biased. Eight associated detected results were qualified as estimated and flagged “J”.

## Chain of Custody

There were no COC discrepancies.

## Overall Assessment

The final activity in the DQE is an assessment of whether the data meets the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision-making process. The precision, accuracy, representativeness, completeness and comparability are addressed in the *Ash Disposal Unit SAP*. The following summary highlights the data evaluation findings for the above defined events:

1. No data were rejected and completeness was 100 percent for all method/matrix/analyte combinations as shown in Table 6.
2. Holding time exceedances were observed for Method SW9040C; eight results were qualified as estimated
3. The precision and accuracy of the data, as measured by field and laboratory QC indicators, suggests that the *Ash Disposal Unit SAP* goals for project use were met.
4. The field crew followed the *Ash Disposal Unit SAP* and project documents.

## Works Cited

CH2M HILL, Inc. 2016. *Groundwater Monitoring Sampling and Analysis Plan for the Ash Disposal Unit at the Boardman Power Plant (referenced herein as the Ash Disposal Unit SAP)*, Boardman, Oregon. June.

EPA, 2017. *National Functional Guidelines for Inorganic Superfund Methods Data Review*. January.

TABLE 1

Sample Summary by COC - Data Summary

CoC Number	Sample Date	Matrix	QAQC Type	Sample Identification	SDG	Laboratory
L1482387	04/11/2022	WATER	N	041122-CCR-AL001	L1482387	ESRM
	04/12/2022		N	041122-CCR-AL002	L1482387	ESRM
			MS	041122-CCR-AL002MS	L1482387	ESRM
			SD	041122-CCR-AL002SD	L1482387	ESRM
	04/11/2022		N	041122-CCR-AL004	L1482387	ESRM
			N	041122-CCR-AL006	L1482387	ESRM
			N	041122-CCR-AL007	L1482387	ESRM
	04/12/2022		N	041122-CCR-AL008	L1482387	ESRM
	04/11/2022		FD	041122-CCR-FD	L1482387	ESRM
			N	041122-CCR-MW120	L1482387	ESRM

SDG = Sample delivery group

ESRM = Pace Analytical

**QAQC Type**

FD = Field Duplicate

MS = Matrix Spike

N = Normal

SD = Matrix Spike Duplicate

TABLE 2

## Sample Chronology - Data Summary

Laboratory	SDG	Sample Identification	Method	Sample Date	Receive Date	Extract Date	Analysis Date
ESRM	L1482387	041122-CCR-AL001	A2540C	4/11/2022	4/14/2022	4/15/2022	4/15/2022
		041122-CCR-AL001	EPA 9056A	4/11/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL001	SW6010D	4/11/2022	4/14/2022	4/20/2022	4/22/2022
		041122-CCR-AL001	SW9040C	4/11/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-AL002	A2540C	4/12/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-AL002	EPA 9056A	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL002	SW6010D	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL002	SW9040C	4/12/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-AL002MS	EPA 9056A	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL002MS	SW6010D	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL002SD	EPA 9056A	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL002SD	SW6010D	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL004	A2540C	4/11/2022	4/14/2022	4/15/2022	4/15/2022
		041122-CCR-AL004	EPA 9056A	4/11/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL004	SW6010D	4/11/2022	4/14/2022	4/20/2022	4/22/2022
		041122-CCR-AL004	SW9040C	4/11/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-AL006	A2540C	4/11/2022	4/14/2022	4/15/2022	4/15/2022
		041122-CCR-AL006	EPA 9056A	4/11/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL006	SW6010D	4/11/2022	4/14/2022	4/20/2022	4/22/2022
		041122-CCR-AL006	SW9040C	4/11/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-AL007	A2540C	4/11/2022	4/14/2022	4/15/2022	4/15/2022
		041122-CCR-AL007	EPA 9056A	4/11/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL007	SW6010D	4/11/2022	4/14/2022	4/20/2022	4/22/2022
		041122-CCR-AL007	SW9040C	4/11/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-AL008	A2540C	4/12/2022	4/14/2022	4/19/2022	4/19/2022
		041122-CCR-AL008	EPA 9056A	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL008	SW6010D	4/12/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-AL008	SW9040C	4/12/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-FD	A2540C	4/11/2022	4/14/2022	4/15/2022	4/15/2022
		041122-CCR-FD	EPA 9056A	4/11/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-FD	SW6010D	4/11/2022	4/14/2022	4/20/2022	4/22/2022
		041122-CCR-FD	SW9040C	4/11/2022	4/14/2022	4/16/2022	4/16/2022
		041122-CCR-MW120	A2540C	4/11/2022	4/14/2022	4/15/2022	4/15/2022
		041122-CCR-MW120	EPA 9056A	4/11/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-MW120	SW6010D	4/11/2022	4/14/2022	4/21/2022	4/21/2022
		041122-CCR-MW120	SW9040C	4/11/2022	4/14/2022	4/16/2022	4/16/2022

TABLE 2  
Sample Chronology - Data Summary

---

SDG = sample delivery group

ESRM = Pace Analytical

TABLE 3

Overall Flagging Summary

Method	Matrix	Validation Reason	Qualifier*	Qualifier Type	Number of Affected Analytes
A2540C	WATER				
	Category = InvalidLabFlag	Invalid Laboratory Flag	=	Protocol	1
SW6010D	WATER				
	Category = InvalidLabFlag	Invalid Laboratory Flag	=	Protocol	1
SW9040C	WATER				
	Category = HoldingTime	Holding time exceeded	J	Protocol	8

\* The most severe flag for each analyte becomes the final validation flag.

**Qualifier Description:**

= = The analyte was positively identified at a concentration above the reporting limit.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample because the concentration of the analyte was below the reporting limit for the sample and method.

**Qualifier Type:**

Protocol = Flagging due to contractor/laboratory protocol violations.

Other = Flagging due to sample, matrix, or field issues not related to Quality Assurance Project Plan (QAPP) or Sampling and Analysis Plan (SAP) protocol.

TABLE 4  
 Field Duplicate Precision  
 Sorted by Method and Normal Sample ID

Method	Normal Sample ID	Matrix	Analyte	SDG	Result	Field Duplicate	Result	Calculated RPD	Criteria
<b>A2540C</b>									
	041122-CCR-AL001	WATER	DISSOLVED SOLIDS	L1482387	812	041122-CCR-FD	817	0.61	40
<b>EPA 9056A</b>									
	041122-CCR-AL001	WATER	FLUORIDE	L1482387	0.495	041122-CCR-FD	0.485	2.04	40
<b>SW6010D</b>									
	041122-CCR-AL001	WATER	CALCIUM	L1482387	103	041122-CCR-FD	103	0	40
<b>SW9040C</b>									
	041122-CCR-AL001	WATER	PH	L1482387	7.85 T8	041122-CCR-FD	7.82 T8	0.38	40

'NC' = Not Calculated. RPD is calculated if both the normal and duplicate results are greater than the reporting limit.

TABLE 5  
Holding Times - Qualified Data

Method	Matrix	Sample Identification	Analyte	Holding Time	Result	Holding Time Qualifier	Criteria	Final Flag*
SW9040C	WATER	041122-CCR-AL001	pH	5 Days	7.85 PH UNITS	J	HTa>UCL	J
SW9040C	WATER	041122-CCR-AL002	pH	4 Days	7.91 PH UNITS	J	HTa>UCL	J
SW9040C	WATER	041122-CCR-AL004	pH	5 Days	7.85 PH UNITS	J	HTa>UCL	J
SW9040C	WATER	041122-CCR-AL006	pH	5 Days	7.82 PH UNITS	J	HTa>UCL	J
SW9040C	WATER	041122-CCR-AL007	pH	5 Days	7.8 PH UNITS	J	HTa>UCL	J
SW9040C	WATER	041122-CCR-AL008	pH	4 Days	7.93 PH UNITS	J	HTa>UCL	J
SW9040C	WATER	041122-CCR-FD	pH	5 Days	7.82 PH UNITS	J	HTa>UCL	J
SW9040C	WATER	041122-CCR-MW120	pH	5 Days	7.97 PH UNITS	J	HTa>UCL	J

PH UNITS = Undefined Unit in tlkpUnits

\* The most severe flag for each analyte becomes the final validation flag.

**Qualifier Description:**

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample because the concentration of the analyte was below the reporting limit for the sample and method.

**Criteria:**

HTa>UCL = Holding time exceeded

TABLE 6  
 Site Completeness by Analyte - Qualified Data

Method	Analyte	Units	Number of Occurrences					Contractor R-Flags	Contractor Completeness (%)	Overall Completeness (%)
			Analyses	Detects	Non- detects	Blank Flags	J-Flags			
A2540C	Total Dissolved Solids	MG/L	8	8					100	100
EPA 9056A	Chloride	MG/L	8	8					100	100
	Fluoride	MG/L	8	8					100	100
	Sulfate	MG/L	8	8					100	100
SW6010D	Boron	MG/L	8		8				100	100
	Calcium	MG/L	8	8					100	100
SW9040C	pH	PH UNITS	8	8			8		100	100

% = Percent  
 J-Flags = Estimated results  
 R-Flags = Rejected results  
 MG/L = milligrams per liter  
 PH UNITS = Undefined Unit in tlkpUnits

**Jacobs- Richland, WA**

Sample Delivery Group: L1545712  
Samples Received: 10/12/2022  
Project Number: D3624800  
Description: Boardman- CCR

Report To: Mark Henry  
295 Bradley Blvd.  
Richland, WA 99352

Entire Report Reviewed By:



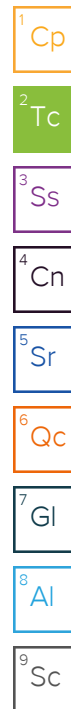
Kelly Mercer  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

**Pace Analytical National**12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 [www.pacenational.com](http://www.pacenational.com)

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# SAMPLE SUMMARY

## MW-120 L1545712-01 GW

Collected by  
Mark Henry

Collected date/time  
10/10/22 08:30

Received date/time  
10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943649	1	10/16/22 15:17	10/16/22 16:51	SLP	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1944923	1	10/19/22 17:00	10/19/22 17:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/13/22 23:50	10/13/22 23:50	LBR	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1943633	5	10/17/22 17:29	10/17/22 17:29	GEB	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 22:19	ZSA	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## AL-007 L1545712-02 GW

Collected by  
Mark Henry

Collected date/time  
10/10/22 10:00

Received date/time  
10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943649	1	10/16/22 15:17	10/16/22 16:51	SLP	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1944923	1	10/19/22 17:00	10/19/22 17:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/14/22 00:03	10/14/22 00:03	LBR	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1943633	5	10/17/22 17:44	10/17/22 17:44	GEB	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 22:21	ZSA	Mt. Juliet, TN

## AL-006 L1545712-03 GW

Collected by  
Mark Henry

Collected date/time  
10/10/22 10:45

Received date/time  
10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943649	1	10/16/22 15:17	10/16/22 16:51	SLP	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1944923	1	10/19/22 17:00	10/19/22 17:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/14/22 00:16	10/14/22 00:16	LBR	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 22:29	ZSA	Mt. Juliet, TN

## AL-001 L1545712-04 GW

Collected by  
Mark Henry

Collected date/time  
10/10/22 11:30

Received date/time  
10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943649	1	10/16/22 15:17	10/16/22 16:51	SLP	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1944923	1	10/19/22 17:00	10/19/22 17:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/14/22 00:30	10/14/22 00:30	LBR	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 22:32	ZSA	Mt. Juliet, TN

## AL-XXX L1545712-05 GW

Collected by  
Mark Henry

Collected date/time  
10/10/22 12:00

Received date/time  
10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943647	1	10/16/22 14:25	10/16/22 15:25	SLP	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1944923	1	10/19/22 17:00	10/19/22 17:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/14/22 00:43	10/14/22 00:43	LBR	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 22:35	ZSA	Mt. Juliet, TN

## AL-004 L1545712-06 GW

Collected by  
Mark Henry

Collected date/time  
10/10/22 12:15

Received date/time  
10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943647	1	10/16/22 14:25	10/16/22 15:25	SLP	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1944923	1	10/19/22 17:00	10/19/22 17:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/14/22 01:23	10/14/22 01:23	LBR	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1943633	5	10/17/22 18:00	10/17/22 18:00	GEB	Mt. Juliet, TN

# SAMPLE SUMMARY

## AL-004 L1545712-06 GW

Collected by: Mark Henry  
 Collected date/time: 10/10/22 12:15  
 Received date/time: 10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 22:38	ZSA	Mt. Juliet, TN

1 Cp

2 Tc

## AL-002 L1545712-07 GW

Collected by: Mark Henry  
 Collected date/time: 10/10/22 14:30  
 Received date/time: 10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943647	1	10/16/22 14:25	10/16/22 15:25	SLP	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1944923	1	10/19/22 17:00	10/19/22 17:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/14/22 01:37	10/14/22 01:37	LBR	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 21:29	ZSA	Mt. Juliet, TN

3 Ss

4 Cn

5 Sr

6 Qc

## AL-008 L1545712-08 GW

Collected by: Mark Henry  
 Collected date/time: 10/10/22 13:15  
 Received date/time: 10/12/22 09:15

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1943980	1	10/17/22 11:14	10/17/22 13:14	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1945608	1	10/21/22 15:00	10/21/22 15:00	NTG	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1949813	1	10/28/22 10:30	10/28/22 10:30	ARD	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1942039	1	10/14/22 02:31	10/14/22 02:31	LBR	Mt. Juliet, TN
Metals (ICP) by Method 6010D	WG1947662	1	10/27/22 14:46	10/28/22 22:40	ZSA	Mt. Juliet, TN

7 Gl

8 Al

9 Sc

# CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.



Kelly Mercer  
Project Manager

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	702		20.0	1	10/16/2022 16:51	<a href="#">WG1943649</a>

Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.99	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>
pH	7.99	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>

Sample Narrative:

L1545712-01 WG1944923: 7.99 at 19.3C

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Chloride	93.3		0.379	1.00	1	10/13/2022 23:50	<a href="#">WG1942039</a>
Fluoride	0.495		0.0640	0.150	1	10/13/2022 23:50	<a href="#">WG1942039</a>
Sulfate	221		2.97	25.0	5	10/17/2022 17:29	<a href="#">WG1943633</a>

Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Boron	0.0239	<a href="#">J</a>	0.0200	0.200	1	10/28/2022 22:19	<a href="#">WG1947662</a>
Calcium	90.1		0.0793	1.00	1	10/28/2022 22:19	<a href="#">WG1947662</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	750		20.0	1	10/16/2022 16:51	<a href="#">WG1943649</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.87	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>
pH	7.87	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>

## Sample Narrative:

L1545712-02 WG1944923: 7.87 at 19.3C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Chloride	107		0.379	1.00	1	10/14/2022 00:03	<a href="#">WG1942039</a>
Fluoride	0.405		0.0640	0.150	1	10/14/2022 00:03	<a href="#">WG1942039</a>
Sulfate	228		2.97	25.0	5	10/17/2022 17:44	<a href="#">WG1943633</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Boron	0.0207	<a href="#">J</a>	0.0200	0.200	1	10/28/2022 22:21	<a href="#">WG1947662</a>
Calcium	103		0.0793	1.00	1	10/28/2022 22:21	<a href="#">WG1947662</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	622	<u>J3</u>	20.0	1	10/16/2022 16:51	<a href="#">WG1943649</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.98	<u>T8</u>	1	10/19/2022 17:00	<a href="#">WG1944923</a>
pH	7.98	<u>T8</u>	1	10/19/2022 17:00	<a href="#">WG1944923</a>

## Sample Narrative:

L1545712-03 WG1944923: 7.98 at 19.4C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Chloride	113		0.379	1.00	1	10/14/2022 00:16	<a href="#">WG1942039</a>
Fluoride	0.473		0.0640	0.150	1	10/14/2022 00:16	<a href="#">WG1942039</a>
Sulfate	141		0.594	5.00	1	10/14/2022 00:16	<a href="#">WG1942039</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Boron	0.0244	<u>J</u>	0.0200	0.200	1	10/28/2022 22:29	<a href="#">WG1947662</a>
Calcium	83.9		0.0793	1.00	1	10/28/2022 22:29	<a href="#">WG1947662</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Dissolved Solids	782		20.0	1	10/16/2022 16:51	<a href="#">WG1943649</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis	Batch
Corrosivity by pH	7.91	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>
pH	7.91	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>

## Sample Narrative:

L1545712-04 WG1944923: 7.91 at 19.4C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
Chloride	154		0.379	1.00	1	10/14/2022 00:30	<a href="#">WG1942039</a>
Fluoride	0.432		0.0640	0.150	1	10/14/2022 00:30	<a href="#">WG1942039</a>
Sulfate	138		0.594	5.00	1	10/14/2022 00:30	<a href="#">WG1942039</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
Boron	U		0.0200	0.200	1	10/28/2022 22:32	<a href="#">WG1947662</a>
Calcium	103		0.0793	1.00	1	10/28/2022 22:32	<a href="#">WG1947662</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	772		20.0	1	10/16/2022 15:25	<a href="#">WG1943647</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	su			date / time	
Corrosivity by pH	7.95	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>
pH	7.95	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>

## Sample Narrative:

L1545712-05 WG1944923: 7.95 at 19.2C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/l		mg/l	mg/l		date / time	
Chloride	150		0.379	1.00	1	10/14/2022 00:43	<a href="#">WG1942039</a>
Fluoride	0.426		0.0640	0.150	1	10/14/2022 00:43	<a href="#">WG1942039</a>
Sulfate	134		0.594	5.00	1	10/14/2022 00:43	<a href="#">WG1942039</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/l		mg/l	mg/l		date / time	
Boron	U		0.0200	0.200	1	10/28/2022 22:35	<a href="#">WG1947662</a>
Calcium	103		0.0793	1.00	1	10/28/2022 22:35	<a href="#">WG1947662</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Dissolved Solids	900		20.0	1	10/16/2022 15:25	<a href="#">WG1943647</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.86	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>
pH	7.86	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>

## Sample Narrative:

L1545712-06 WG1944923: 7.86 at 19.2C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Chloride	194		0.379	1.00	1	10/14/2022 01:23	<a href="#">WG1942039</a>
Fluoride	0.419		0.0640	0.150	1	10/14/2022 01:23	<a href="#">WG1942039</a>
Sulfate	238		2.97	25.0	5	10/17/2022 18:00	<a href="#">WG1943633</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Boron	0.0257	<a href="#">J</a>	0.0200	0.200	1	10/28/2022 22:38	<a href="#">WG1947662</a>
Calcium	125		0.0793	1.00	1	10/28/2022 22:38	<a href="#">WG1947662</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Dissolved Solids	461		10.0	1	10/16/2022 15:25	<a href="#">WG1943647</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis	Batch
Corrosivity by pH	8.04	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>
pH	8.04	<a href="#">T8</a>	1	10/19/2022 17:00	<a href="#">WG1944923</a>

## Sample Narrative:

L1545712-07 WG1944923: 8.04 at 19.1C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
Chloride	41.1		0.379	1.00	1	10/14/2022 01:37	<a href="#">WG1942039</a>
Fluoride	0.575		0.0640	0.150	1	10/14/2022 01:37	<a href="#">WG1942039</a>
Sulfate	87.3		0.594	5.00	1	10/14/2022 01:37	<a href="#">WG1942039</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
Boron	0.0360	<a href="#">J</a>	0.0200	0.200	1	10/28/2022 21:29	<a href="#">WG1947662</a>
Calcium	48.7	<a href="#">O1</a>	0.0793	1.00	1	10/28/2022 21:29	<a href="#">WG1947662</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
Dissolved Solids	495		10.0	1	10/17/2022 13:14	<a href="#">WG1943980</a>

## Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis	Batch
Corrosivity by pH	8.04	<u>T8</u>	1	10/28/2022 10:30	<a href="#">WG1949813</a>
pH	8.03	<u>T8</u>	1	10/21/2022 15:00	<a href="#">WG1945608</a>

## Sample Narrative:

L1545712-08 WG1949813, WG1945608: 8.04 at 20.4C

L1545712-08 WG1949813, WG1945608: 8.03 at 19C

## Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
Chloride	40.3		0.379	1.00	1	10/14/2022 02:31	<a href="#">WG1942039</a>
Fluoride	0.646		0.0640	0.150	1	10/14/2022 02:31	<a href="#">WG1942039</a>
Sulfate	74.9		0.594	5.00	1	10/14/2022 02:31	<a href="#">WG1942039</a>

## Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
Boron	0.0457	<u>J</u>	0.0200	0.200	1	10/28/2022 22:40	<a href="#">WG1947662</a>
Calcium	56.7		0.0793	1.00	1	10/28/2022 22:40	<a href="#">WG1947662</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3851480-1 10/16/22 15:25

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

L1545568-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1545568-03 10/16/22 15:25 • (DUP) R3851480-3 10/16/22 15:25

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	1950	1960	1	0.512		5

<sup>4</sup>Cn

<sup>5</sup>Sr

L1545712-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1545712-05 10/16/22 15:25 • (DUP) R3851480-4 10/16/22 15:25

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	772	780	1	1.03		5

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

Laboratory Control Sample (LCS)

(LCS) R3851480-2 10/16/22 15:25

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Dissolved Solids	8800	8200	93.2	77.3-123	

<sup>9</sup>Sc

Method Blank (MB)

(MB) R3851908-1 10/16/22 16:51

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

L1545712-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1545712-03 10/16/22 16:51 • (DUP) R3851908-3 10/16/22 16:51

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	622	676	1	8.32	J3	5

L1545712-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1545712-04 10/16/22 16:51 • (DUP) R3851908-4 10/16/22 16:51

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	782	810	1	3.52		5

Laboratory Control Sample (LCS)

(LCS) R3851908-2 10/16/22 16:51

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Dissolved Solids	8800	8380	95.2	77.3-123	

Method Blank (MB)

(MB) R3852141-1 10/17/22 13:14

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Dissolved Solids	U		10.0	10.0

1 Cp

2 Tc

3 Ss

L1545441-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1545441-04 10/17/22 13:14 • (DUP) R3852141-3 10/17/22 13:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	636	694	1	8.72	J3	5

4 Cn

5 Sr

L1545441-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1545441-05 10/17/22 13:14 • (DUP) R3852141-4 10/17/22 13:14

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Dissolved Solids	750	742	1	1.07		5

6 Qc

7 Gl

8 Al

Laboratory Control Sample (LCS)

(LCS) R3852141-2 10/17/22 13:14

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Dissolved Solids	8800	8770	99.7	77.3-123	

9 Sc

L1545638-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1545638-03 10/19/22 17:00 • (DUP) R3850564-2 10/19/22 17:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
su	su			%		%
pH	7.88	7.89	1	0.127		1

Sample Narrative:

OS: 7.88 at 19.8C  
DUP: 7.89 at 19.9C



L1545712-06 Original Sample (OS) • Duplicate (DUP)

(OS) L1545712-06 10/19/22 17:00 • (DUP) R3850564-3 10/19/22 17:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
su	su			%		%
Corrosivity by pH	7.86	7.88	1	0.254		1

Sample Narrative:

OS: 7.86 at 19.2C  
DUP: 7.88 at 19.2C

L1545712-06 Original Sample (OS) • Duplicate (DUP)

(OS) L1545712-06 10/19/22 17:00 • (DUP) R3850564-4 10/19/22 17:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
su	su			%		%
pH	7.86	7.88	1	0.254		1

Sample Narrative:

OS: 7.86 at 19.2C  
DUP: 7.88 at 19.2C

Laboratory Control Sample (LCS)

(LCS) R3850564-1 10/19/22 17:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
su	su		%	%	
Corrosivity by pH	10.0	9.92	99.2	99.0-101	
pH	10.0	9.92	99.2	99.0-101	

Sample Narrative:

Laboratory Control Sample (LCS)

(LCS) R3850564-1 10/19/22 17:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
	su	su	%	%	

LCS: 9.92 at 19C

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1545712-08 Original Sample (OS) • Duplicate (DUP)

(OS) L1545712-08 10/21/22 15:00 • (DUP) R3851514-2 10/21/22 15:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.03	8.01	1	0.249		1

Sample Narrative:

OS: 8.03 at 19C  
 DUP: 8.01 at 19.1C

L1546153-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1546153-01 10/21/22 15:00 • (DUP) R3851514-3 10/21/22 15:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	7.50	7.43	1	0.938		1

Sample Narrative:

OS: 7.5 at 19C  
 DUP: 7.43 at 19.1C

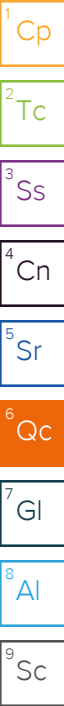
Laboratory Control Sample (LCS)

(LCS) R3851514-1 10/21/22 15:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
pH	10.0	9.91	99.1	99.0-101	

Sample Narrative:

LCS: 9.91 at 20C



Laboratory Control Sample (LCS)

(LCS) R3854157-1 10/28/22 10:30

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
	su	su	%	%	
Corrosivity by pH	10.0	9.91	99.1	99.0-101	

Sample Narrative:

LCS: 9.91 at 20.7C

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

Method Blank (MB)

(MB) R3848722-1 10/13/22 13:21

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Chloride	U		0.379	1.00
Fluoride	U		0.0640	0.150
Sulfate	U		0.594	5.00

L1545708-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1545708-01 10/13/22 20:42 • (DUP) R3848722-3 10/13/22 20:55

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Chloride	2.59	2.54	1	2.10		15
Fluoride	U	U	1	0.000		15
Sulfate	2.10	1.88	1	11.4	U	15

L1545712-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1545712-07 10/14/22 01:37 • (DUP) R3848722-5 10/14/22 01:50

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mg/l	mg/l		%		%
Chloride	41.1	40.1	1	2.26		15
Fluoride	0.575	0.560	1	2.61		15
Sulfate	87.3	85.1	1	2.62		15

Laboratory Control Sample (LCS)

(LCS) R3848722-2 10/13/22 13:34

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/l	mg/l	%	%	
Chloride	40.0	38.8	96.9	80.0-120	
Fluoride	8.00	7.92	99.0	80.0-120	
Sulfate	40.0	38.5	96.3	80.0-120	

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1545708-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1545708-01 10/13/22 20:42 • (MS) R3848722-4 10/13/22 21:09

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>
Chloride	50.0	2.59	51.3	97.3	1	80.0-120	
Fluoride	5.00	U	4.94	98.7	1	80.0-120	
Sulfate	50.0	2.10	50.1	95.9	1	80.0-120	

L1545712-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1545712-07 10/14/22 01:37 • (MS) R3848722-6 10/14/22 02:04 • (MSD) R3848722-7 10/14/22 02:17

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Chloride	50.0	41.1	87.1	88.9	92.0	95.6	1	80.0-120			2.01	15
Fluoride	5.00	0.575	5.28	5.41	94.0	96.8	1	80.0-120			2.55	15
Sulfate	50.0	87.3	129	133	84.1	90.5	1	80.0-120			2.45	15

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Method Blank (MB)

(MB) R3849841-1 10/17/22 15:29

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Sulfate	U		0.594	5.00

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc

L1546700-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1546700-01 10/18/22 01:10 • (DUP) R3849841-3 10/18/22 01:26

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Sulfate	U	U	1	0.000		15

L1546700-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1546700-02 10/18/22 02:45 • (DUP) R3849841-6 10/18/22 03:01

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Sulfate	0.863	0.837	1	3.11	↓	15

Laboratory Control Sample (LCS)

(LCS) R3849841-2 10/17/22 15:45

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Sulfate	40.0	39.1	97.9	80.0-120	

L1546700-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1546700-01 10/18/22 01:10 • (MS) R3849841-4 10/18/22 02:13 • (MSD) R3849841-5 10/18/22 02:29

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Sulfate	50.0	U	49.1	48.7	98.1	97.5	1	80.0-120			0.701	15

L1546700-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1546700-02 10/18/22 02:45 • (MS) R3849841-7 10/18/22 03:17

Analyte	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Sulfate	50.0	0.863	49.0	96.3	1	80.0-120	

Method Blank (MB)

(MB) R3854681-1 10/28/22 21:24

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/l		mg/l	mg/l
Boron	U		0.0200	0.200
Calcium	U		0.0793	1.00

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3854681-2 10/28/22 21:27

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/l	mg/l	%	%	
Boron	1.00	0.976	97.6	80.0-120	
Calcium	10.0	9.86	98.6	80.0-120	

L1545712-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1545712-07 10/28/22 21:29 • (MS) R3854681-4 10/28/22 21:35 • (MSD) R3854681-5 10/28/22 21:37

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
Boron	1.00	0.0360	1.02	1.04	98.1	100	1	75.0-125			2.24	20
Calcium	10.0	48.7	57.3	57.3	85.5	85.4	1	75.0-125			0.00924	20

# GLOSSARY OF TERMS

## Guide to Reading and Understanding Your Laboratory Report

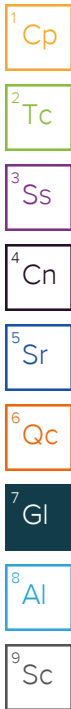
The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

### Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
O1	The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
T8	Sample(s) received past/too close to holding time expiration.



# ACCREDITATIONS & LOCATIONS

## Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico <sup>1</sup>	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	KY90010	South Carolina	84004002
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

\* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc

Company Name/Address: **Jacobs- Richland, WA**  
 295 Bradley Blvd.  
 Richland, WA 99352

Billing Information:  
 Mark Henry  
 295 Bradley Blvd.  
 Richland, WA 99352

Chain of Custody Page 1 of 1

**Pace**  
 PEOPLE ADVANCING SCIENCE

**MT JULIET, TN**  
 12065 Lebanon Rd Mount Juliet, TN 37122  
 Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at: <https://info.pacelabs.com/hubs/pas-standard-terms.pdf>

Report to: **Mark Henry** Email To: **mark.henry1@jacobs.com**

Project Description: **Boardman-CCR** City/State Collected: **Boardman, OR** Please Circle:  PT  MT  CT  ET

Phone: **509-375-3444** Client Project #: **D3624800** Lab Project #: **JACOBSRWA-CCR**

Collected by (print): **Mark Henry** Site/Facility ID #: **655.1912** P.O. #

Collected by (signature): *[Signature]* **Rush?** (Lab MUST Be Notified)  
 Same Day  Five Day  
 Next Day  5 Day (Rad Only)  
 Two Day  10 Day (Rad Only)  
 Three Day

Immediately Packed on Ice N  Y  Date Results Needed: **Standard TAT** No. of Cntrs

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	B, Ca 6010 250mlHDPE-HNO3	CHLORIDE 250mlHDPE-NoPres	Corrosivity 250mlHDPE-NoPres	FLUORIDE 250mlHDPE-NoPres	SULFATE 250mlHDPE-NoPres	TDS 1L-HDPE NoPres	pH 250mlHDPE-NoPres	Remarks	Sample # (lab only)
MW-120	G	GW	-	10/19/22	0830	3	X	X	X	X	X	X	X		-01
AL-007		GW	-	10/10/22	1000	3	X	X	X	X	X	X	X		-02
AL-006		GW	-	10/10/22	1045	3	X	X	X	X	X	X	X		-03
AL-001		GW	-	10/10/22	1130	3	X	X	X	X	X	X	X		-04
AL-XXX		GW	-	10/10/22	1200	3	X	X	X	X	X	X	X		-05
AL-004		GW	-	10/10/22	1215	3	X	X	X	X	X	X	X		-06
AL-002		GW	-	10/10/22	1430	9	X	X	X	X	X	X	X	ms/msd	-07
AL-008		GW	-	10/10/22	1315	3	X	X	X	X	X	X	X		-08
		GW	-												

\* Matrix: SS - Soil AIR - Air F - Filter GW - Groundwater B - Bioassay WW - WasteWater DW - Drinking Water OT - Other

Remarks: pH \_\_\_\_\_ Temp \_\_\_\_\_ Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  UPS  FedEx  Courier Tracking #: **88827539084**

**Sample Receipt Checklist**

COC Seal Present/Intact:  NP  N

COC Signed/Accurate:  N  N

Bottles arrive intact:  N  N

Correct bottles used:  N  N

Sufficient volume sent:  N  N

If Applicable

VOA Zero Headspace:  Y  N

Preservation Correct/Checked:  Y  N

RAD Screen <0.5 mR/hr:  Y  N

Relinquished by: (Signature) *[Signature]* Date: **10/11/22** Time: **1700** Received by: (Signature) *[Signature]* Trip Blank Received: Yes  No  HCL / MeOH TBR

Relinquished by: (Signature) Date: Time: Received by: (Signature) Temp: **6.84°C** Bottles Received: **30** If preservation required by Login: Date/Time

Relinquished by: (Signature) Date: Time: Received for lab by: (Signature) Date: **10/12/22** Time: **0915** Hold: Condition: **NCF / OK**

# Groundwater Data Quality Evaluation for the Ash Disposal Unit at the Boardman Power Plant

PREPARED FOR: Amber DiLoreto/PGE  
Project Files

PREPARED BY: Mark Fesler/JACOBS  
Mark Henry/JACOBS

REVIEWED BY: Berney Kidd/JACOBS

DATE: November 18, 2022

REFERENCE: Coal Combustion Residual (CCR) Semi-Annual Monitoring Event – October 10, 2022

## Introduction

The objective of this data quality evaluation (DQE) is to assess the representativeness and usability of data quality for groundwater quality samples collected to monitor the Ash Disposal Unit at the Boardman Power Plant. The rationale for monitoring, the data quality objectives (DQOs), and the method for performing this DQE is provided in the *Groundwater Monitoring Sampling and Analysis Plan for the Ash Disposal Unit at the Boardman Power Plant*, Boardman, Oregon, June 2016 (hereafter referred to as the *Ash Disposal Unit SAP*).

This DQE report includes an evaluation of groundwater quality data from seven groundwater locations collected on October 10, 2022 in accordance with the *Ash Disposal Unit SAP*. This DQE report is intended as a general data quality assessment designed to summarize data issues, and performed in accordance with U.S. Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA, 2017).

## Findings

The overall summaries of the data validation findings are contained in Tables 1 through 7 and summarized in the method sections that follow:

- **Table 1:** Sample Summary by Chain of Custody – Data Summary. Presents the sample identifiers, sampling dates, and SDG sorted by chain-of-custody (COC) number.
- **Table 2:** Sample Chronology – Data Summary. Presents the sample identifiers, methods, sampling dates, received dates, extraction dates, and analysis dates sorted by SDG number.
- **Table 3:** Overall Flagging Summary. Presents the number of occurrences for each data validation reason by method.
- **Table 4:** Field Duplicate Precision – Results. Presents the relative percent difference (RPD) for all data with FD pair detects above the RL.
- **Table 5:** Matrix Spike Precision and Accuracy – Qualified Data. Presents the results that are qualified because of MS, SD, or post-digestion spike recovery exceedances.

- **Table 6:** Holding Time – Qualified Data. Presents the data qualified because of holding time exceedances.
- **Table 7:** Site Completeness by Analyte – Qualified Data. Presents the percent completeness by method, analyte, and matrix.

## Analytical Data

This DQE report includes seven normal groundwater samples and one FD collected on October 10, 2022. These samples were reported under one sample delivery group: L1545712. A list of samples included in this DQE are presented in Table 1. Four methods were used to analyze the groundwater samples and are provided in Table 2. The analyses were performed by Pace Analytical, Inc. in Mount Juliet, Tennessee (ESRM). Samples were collected and delivered by overnight carrier to the laboratory.

The data were assessed according to the requirements of the *Ash Disposal Unit SAP* and included a review of:

1. chain of custody documentation;
2. holding-time compliance;
3. required quality control (QC) samples at the specified frequencies;
4. flagging for method blanks;
5. laboratory control sample/laboratory control sample duplicates (LCS/LCSD);
6. matrix spike/matrix spike duplicate (MS/MSD) recoveries;

and other method-specific criteria as defined by the *Ash Disposal Unit SAP*.

Field samples were also reviewed to ascertain field compliance and data quality issues. This included the review of a FD.

Data flags were assigned according to the *Ash Disposal Unit SAP*. These flags, as well as the reason for each flag, are entered into the electronic database and can be found in Table 3. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are those listed in the *Ash Disposal Unit SAP* and are defined below:

- J = the analyte was detected, but the associated numerical value is considered an estimated quantity.
- R = the sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified. No associated value is reported.
- U = the analyte was analyzed for but was not detected above the detection limit.
- UJ = the analyte was not detected above the detection limit. However, the detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

## Overall Flagging Summary

The overall summaries of the data validation findings are summarized in the following sections.

### Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination that would affect the sample results.

### Field Duplicates

In accordance with the *Ash Disposal Unit SAP*, one FD was collected from well AL008, and the precision criteria were met.

Table 4 shows the RPD between the primary (P) sample and FD, and was calculated for detected results above the RL using the following equation:

$$RPD = 100 * [ (P1 - FD1) / (P1 + FD1) / 2 ]$$

### Laboratory Duplicate Samples

Laboratory duplicate samples were analyzed as required. All precision criteria were met.

### Laboratory Control Samples

LCS were analyzed as required. All accuracy criteria were met.

### Matrix Spike/Post Digestion Spike Samples

MS/MSDs were analyzed at the required frequency. All accuracy and precision criteria were met.

A post-digestion spike (PDS) sample was prepared and analyzed for the analytical batch associated with Method SW6010D. All recovery criteria were generally met. Table 5 lists the follow exception:

The recovery of calcium in the post-digestion spike was less than the method specified acceptance criteria for Method SW6010D, indicating the associated sample results are possibly biased low. One associated detected result was qualified as estimated and flagged “J”.

### Holding Times

All holding-time criteria were generally met. Table 6 lists the following exception:

Several pH samples were analyzed outside of holding time for Method SW9040C, indicating the associated sample results are possibly biased. Eight associated detected results were qualified as estimated and flagged “J”.

### Chain of Custody

There were no COC discrepancies.

### Overall Assessment

The final activity in the DQE is an assessment of whether the data meets the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision-making process. The precision, accuracy, representativeness, completeness and comparability are addressed in the *Ash Disposal Unit SAP*. The following summary highlights the data evaluation findings for the above defined events:

1. No data were rejected and completeness was 100 percent for all method/matrix/analyte combinations as shown in Table 7.
2. PDS exceedance was observed for Method SW6010D; one result was qualified as estimated.

3. Holding time exceedances were observed for Method SW9040C; eight results were qualified as estimated
4. The precision and accuracy of the data, as measured by field and laboratory QC indicators, suggests that the *Ash Disposal Unit SAP* goals for project use were met.
5. The field crew followed the *Ash Disposal Unit SAP* and project documents.

## Works Cited

CH2M HILL, Inc. 2016. *Groundwater Monitoring Sampling and Analysis Plan for the Ash Disposal Unit at the Boardman Power Plant (referenced herein as the Ash Disposal Unit SAP)*, Boardman, Oregon. June.

EPA, 2017. *National Functional Guidelines for Inorganic Superfund Methods Data Review*. January.

**TABLE 1. Sample Summary by COC - Data Summary**

CoC Number	Sample Date	Matrix	QAQC Type	Sample Identification	SDG	Laboratory
L1545712	10/10/2022	WATER	N	101022-CCR-AL-001	L1545712	ESRM
			N	101022-CCR-AL-002	L1545712	ESRM
			MS	101022-CCR-AL-002MS	L1545712	ESRM
			SD	101022-CCR-AL-002SD	L1545712	ESRM
			N	101022-CCR-AL-004	L1545712	ESRM
			N	101022-CCR-AL-006	L1545712	ESRM
			N	101022-CCR-AL-007	L1545712	ESRM
			N	101022-CCR-AL-008	L1545712	ESRM
			FD	101022-CCR-AL-XXX	L1545712	ESRM
			N	101022-CCR-MW-120	L1545712	ESRM

SDG = Sample delivery group

ESRM = Pace Analytical

**QAQC Type**

FD = Field Duplicate

MS = Matrix Spike

N = Normal

SD = Matrix Spike Duplicate

**TABLE 2. Sample Chronology - Data Summary**

Laboratory	SDG	Sample Identification	Method	Sample Date	Receive Date	Extract Date	Analysis Date
ESRM	L1545712	101022-CCR-AL-001	A2540C	10/10/2022	10/12/2022	10/16/2022	10/16/2022
		101022-CCR-AL-001	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-001	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-001	SW9040C	10/10/2022	10/12/2022	10/19/2022	10/19/2022
		101022-CCR-AL-002	A2540C	10/10/2022	10/12/2022	10/16/2022	10/16/2022
		101022-CCR-AL-002	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-002	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-002	SW9040C	10/10/2022	10/12/2022	10/19/2022	10/19/2022
		101022-CCR-AL-002MS	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-002MS	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-002SD	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-002SD	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-004	A2540C	10/10/2022	10/12/2022	10/16/2022	10/16/2022
		101022-CCR-AL-004	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-004	EPA 9056A	10/10/2022	10/12/2022	10/17/2022	10/17/2022
		101022-CCR-AL-004	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-004	SW9040C	10/10/2022	10/12/2022	10/19/2022	10/19/2022
		101022-CCR-AL-006	A2540C	10/10/2022	10/12/2022	10/16/2022	10/16/2022
		101022-CCR-AL-006	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-006	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-006	SW9040C	10/10/2022	10/12/2022	10/19/2022	10/19/2022
		101022-CCR-AL-007	A2540C	10/10/2022	10/12/2022	10/16/2022	10/16/2022
		101022-CCR-AL-007	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-007	EPA 9056A	10/10/2022	10/12/2022	10/17/2022	10/17/2022
		101022-CCR-AL-007	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-007	SW9040C	10/10/2022	10/12/2022	10/19/2022	10/19/2022
		101022-CCR-AL-008	A2540C	10/10/2022	10/12/2022	10/17/2022	10/17/2022
		101022-CCR-AL-008	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-008	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-008	SW9040C	10/10/2022	10/12/2022	10/21/2022	10/21/2022
		101022-CCR-AL-XXX	A2540C	10/10/2022	10/12/2022	10/16/2022	10/16/2022
		101022-CCR-AL-XXX	EPA 9056A	10/10/2022	10/12/2022	10/14/2022	10/14/2022
		101022-CCR-AL-XXX	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-AL-XXX	SW9040C	10/10/2022	10/12/2022	10/19/2022	10/19/2022
101022-CCR-MW-120	A2540C	10/10/2022	10/12/2022	10/16/2022	10/16/2022		
101022-CCR-MW-120	EPA 9056A	10/10/2022	10/12/2022	10/13/2022	10/13/2022		
101022-CCR-MW-120	EPA 9056A	10/10/2022	10/12/2022	10/17/2022	10/17/2022		

**TABLE 2. Sample Chronology - Data Summary**

<b>Laboratory</b>	<b>SDG</b>	<b>Sample Identification</b>	<b>Method</b>	<b>Sample Date</b>	<b>Receive Date</b>	<b>Extract Date</b>	<b>Analysis Date</b>
ESRM	L1545712	101022-CCR-MW-120	SW6010D	10/10/2022	10/12/2022	10/27/2022	10/28/2022
		101022-CCR-MW-120	SW9040C	10/10/2022	10/12/2022	10/19/2022	10/19/2022

SDG = sample delivery group

ESRM = Pace Analytical

**TABLE 3. Overall Flagging Summary**

Method (Matrix)	Category	Validation Reason	Qualifier*	Qualifier Type	Number of Affected Analytes
A2540C (WATER)					
	InvalidLabFlag	Invalid Laboratory Flag	=	Protocol	1
SW6010D (WATER)					
	Matrix	Post spike recovery less than the lower control limit	J	Other	1
SW9040C (WATER)					
	HoldingTime	Holding time exceeded	J	Protocol	8

\* The most severe flag for each analyte becomes the final validation flag.

**Qualifier Description:**

= = The analyte was positively identified at a concentration above the reporting limit.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample because the concentration of the analyte was below the reporting limit for the sample and method.

**Qualifier Type:**

Protocol = Flagging due to contractor/laboratory protocol violations.

Other = Flagging due to sample, matrix, or field issues not related to Quality Assurance Project Plan (QAPP)

or Sampling and Analysis Plan (SAP) protocol.

**TABLE 4**  
**Field Duplicate Precision**

*Sorted by Method and Normal Sample ID*

Method	Normal Sample ID	Matrix	Analyte	SDG	Result	Field Duplicate	Result	Calculated RPD	Criteria
<b>A2540C</b>									
	101022-CCR-AL-001	WATER	DISSOLVED SOLIDS	L1545712	782	101022-CCR-AL-XXX	772	1.29	40
<b>EPA 9056A</b>									
	101022-CCR-AL-001	WATER	CHLORIDE	L1545712	154	101022-CCR-AL-XXX	150	2.63	40
	101022-CCR-AL-001	WATER	FLUORIDE	L1545712	0.432	101022-CCR-AL-XXX	0.426	1.4	40
	101022-CCR-AL-001	WATER	SULFATE	L1545712	138	101022-CCR-AL-XXX	134	2.94	40
<b>SW6010D</b>									
	101022-CCR-AL-001	WATER	CALCIUM	L1545712	103	101022-CCR-AL-XXX	103	0	40

'NC' = Not Calculated. RPD is calculated if both the normal and duplicate results are greater than the reporting limit.  
 RPDs for actual validation may be calculated differently.

**TABLE 5. Matrix Spike Precision/Accuracy - Qualified Data**

Method (Matrix) Analyte	Sample Identification	Result	MS/MSD Qualifier*	MS Recovery	Criteria
SW6010D (WATER)					
Calcium	101022-CCR-AL-002	48.7 MG/L	J	PDS exceeded criteria (CN note)	PostSpike<LCL

%R = percent recovery

LCL = lower control limit

UCL = upper control limit

MG/L = milligrams per liter

\* The most severe flag for each analyte becomes the final validation flag.

**Qualifier Description:**

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample because the concentration of the analyte was below the reporting limit for the sample and method.

**Criteria:**

PostSpike<LCL = Post spike recovery less than the lower control limit

**TABLE 6. Holding Times - Qualified Data**

Method (Matrix)	Sample Identification	Analyte	Holding Time	Result	Holding Time Qualifier	Criteria	Final Flag*
SW9040C (WATER)							
	101022-CCR-AL-001	pH	9 Days	7.91 PH UNITS	J	HTa>UCL	J
	101022-CCR-AL-002	pH	9 Days	8.04 PH UNITS	J	HTa>UCL	J
	101022-CCR-AL-004	pH	9 Days	7.86 PH UNITS	J	HTa>UCL	J
	101022-CCR-AL-006	pH	9 Days	7.98 PH UNITS	J	HTa>UCL	J
	101022-CCR-AL-007	pH	9 Days	7.87 PH UNITS	J	HTa>UCL	J
	101022-CCR-AL-008	pH	11 Days	8.03 PH UNITS	J	HTa>UCL	J
	101022-CCR-AL-XXX	pH	9 Days	7.95 PH UNITS	J	HTa>UCL	J
	101022-CCR-MW-120	pH	9 Days	7.99 PH UNITS	J	HTa>UCL	J

PH UNITS = Undefined Unit in tlkpUnits

\* The most severe flag for each analyte becomes the final validation flag.

**Qualifier Description:**

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample because the concentration of the analyte was below the reporting limit for the sample and method.

**Criteria:**

HTa>UCL = Holding time exceeded

**TABLE 7. Site Completeness by Analyte - Qualified Data**

Method	Analyte	Units	Number of Occurrences					Contractor R-Flags	Total	Contractor Completeness (%)	Overall
			Analyses	Detects	Non- detects	Blank Flags	J-Flags				
A2540C	Total Dissolved Solids	MG/L	8	8						100	100
EPA 9056A	Chloride	MG/L	8	8						100	100
	Fluoride	MG/L	8	8						100	100
	Sulfate	MG/L	8	8						100	100
SW6010D	Boron	MG/L	8	6	2		6			100	100
	Calcium	MG/L	8	8			1			100	100
SW9040C	pH	PH UNITS	8	8			8			100	100

% = Percent

J-Flags = Estimated results

R-Flags = Rejected results

MG/L = milligrams per liter

PH UNITS = Undefined Unit in tlkpUnits

# Appendix C

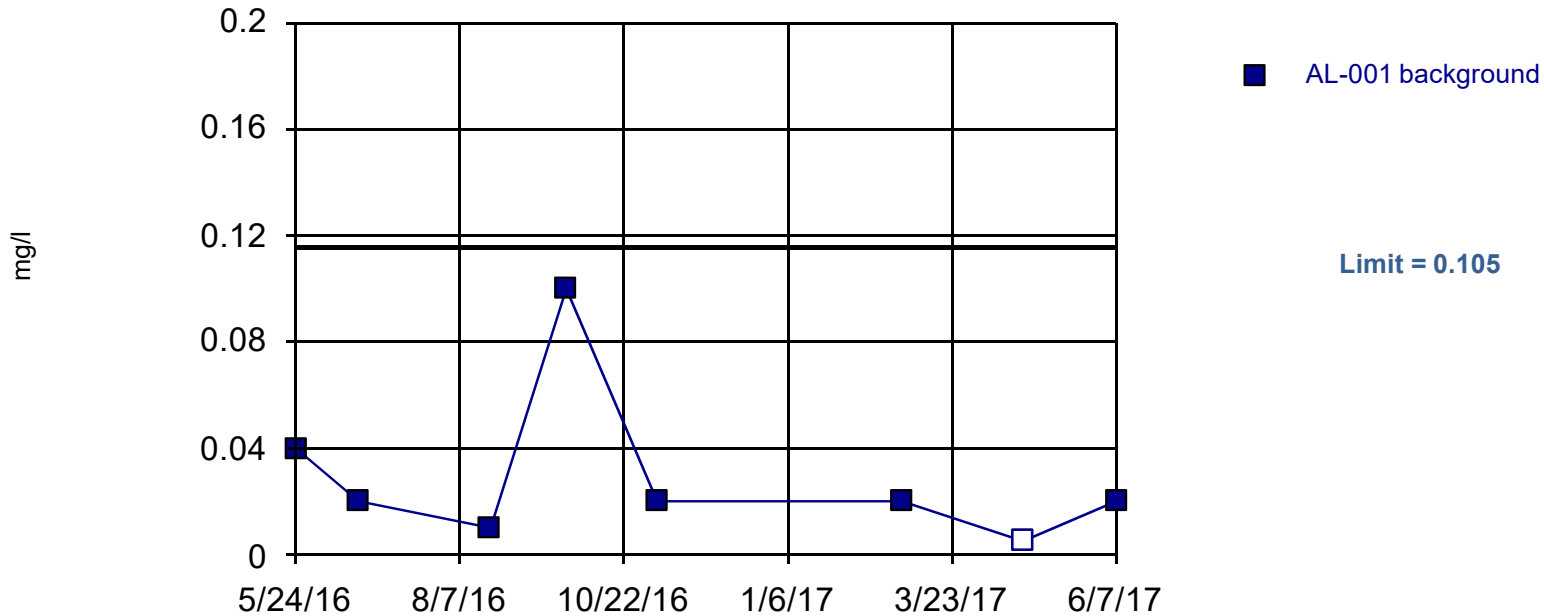
## Compliance Limits



Solid symbols are detected values; hollow symbols indicate non-detect values.

## Prediction Limit

### Intrawell Parametric, AL-001, Boron



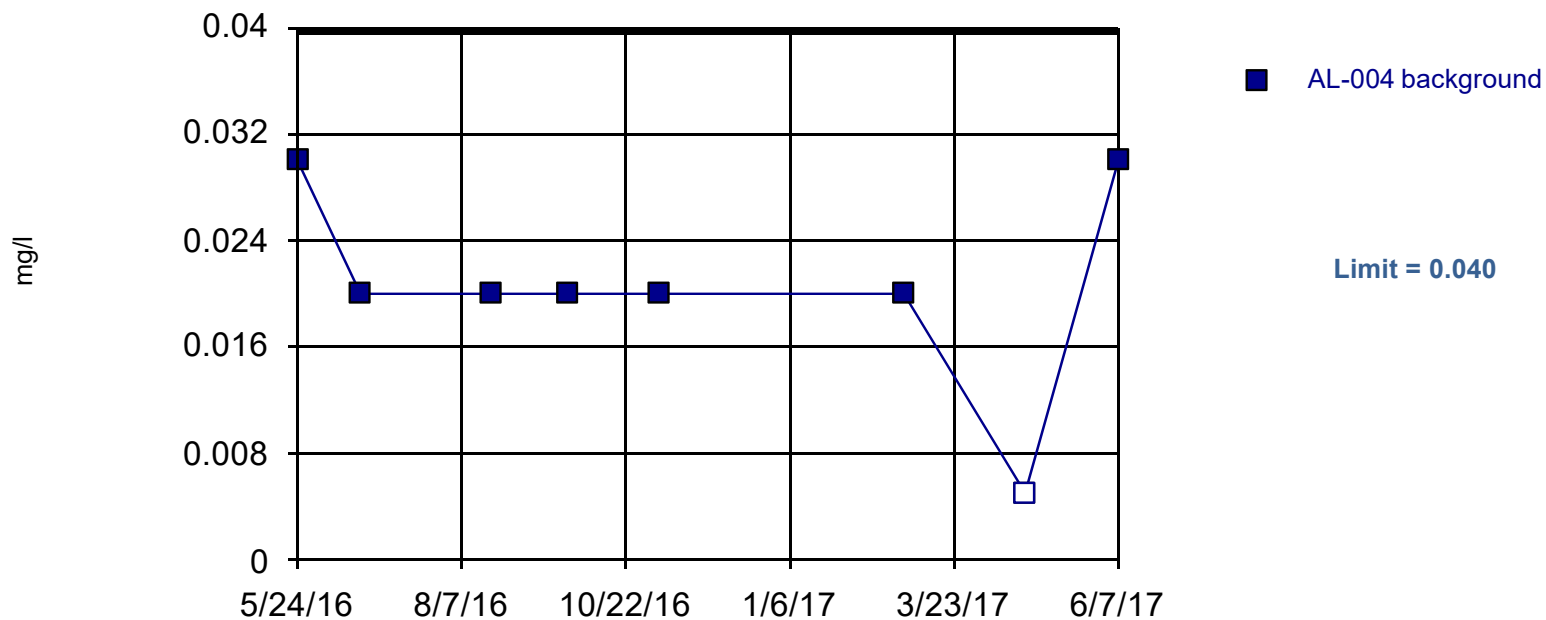
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8357, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

### Intrawell Parametric, AL-004, Boron



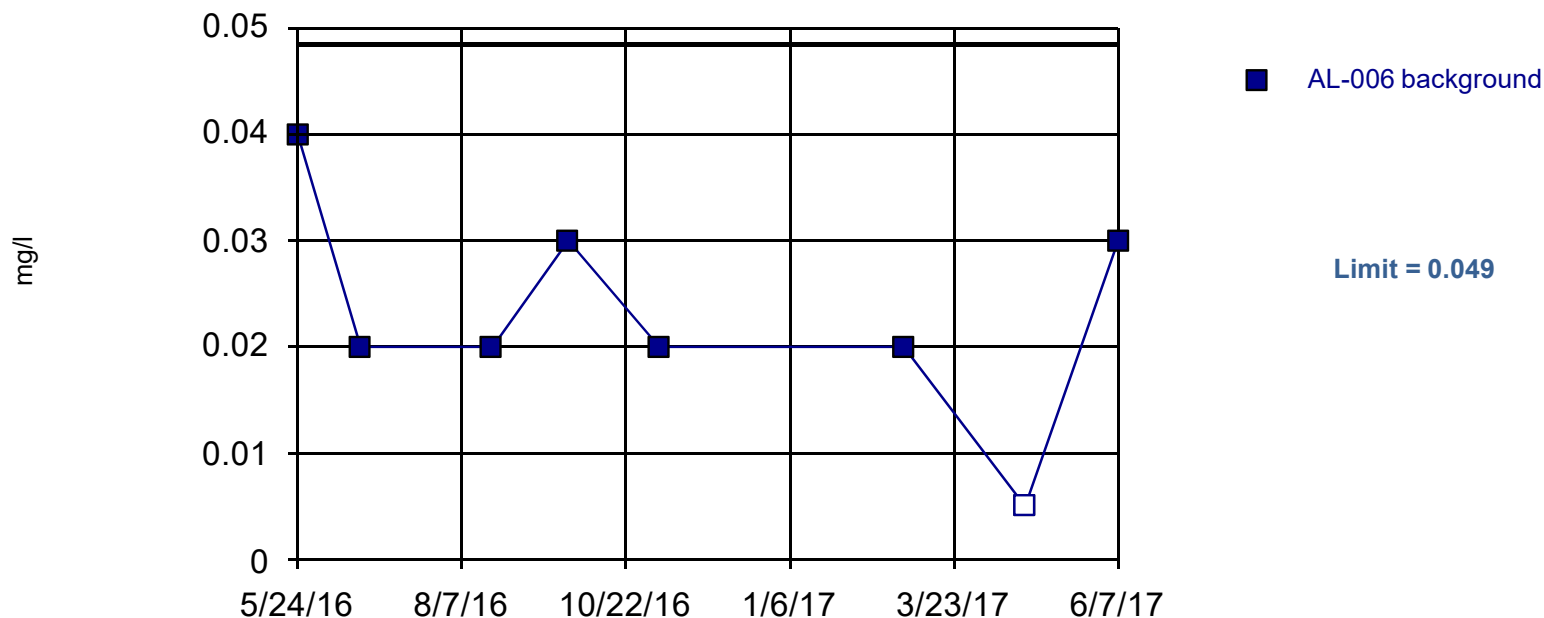
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7933, critical= 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

### Intrawell Parametric, AL-006, Boron



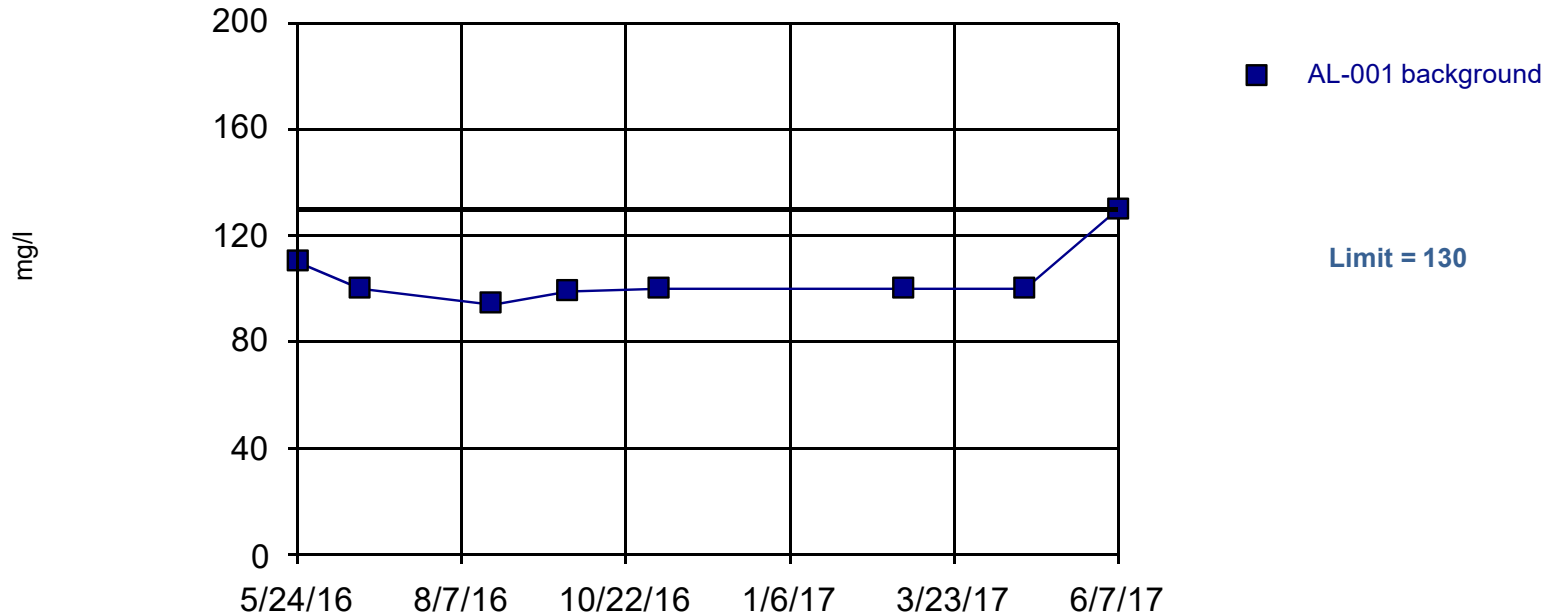
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9113, critical= 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Boron Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

### Intrawell Non-parametric, AL-001, Calcium

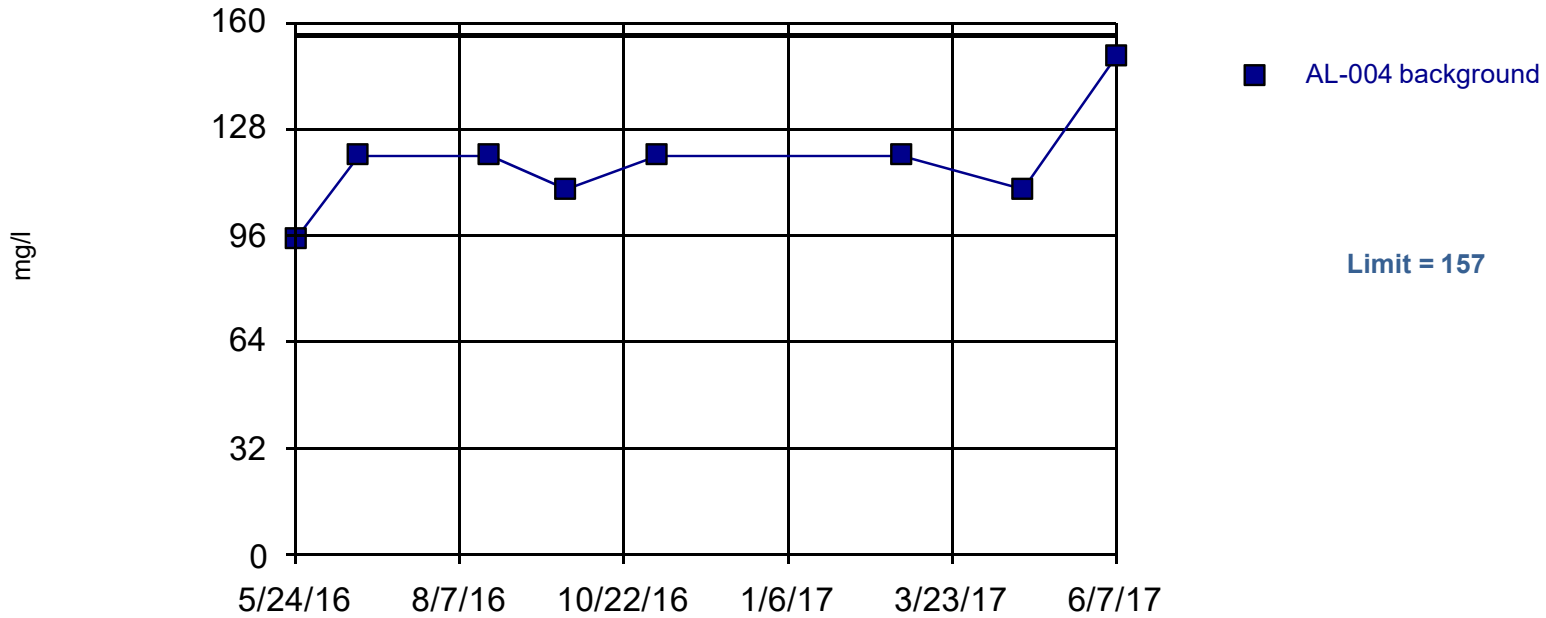


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 8 background values. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2). Assumes 1 future value. Insufficient data to test for seasonality: data were not deseasonalized.

Constituent: Calcium Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-004, Calcium

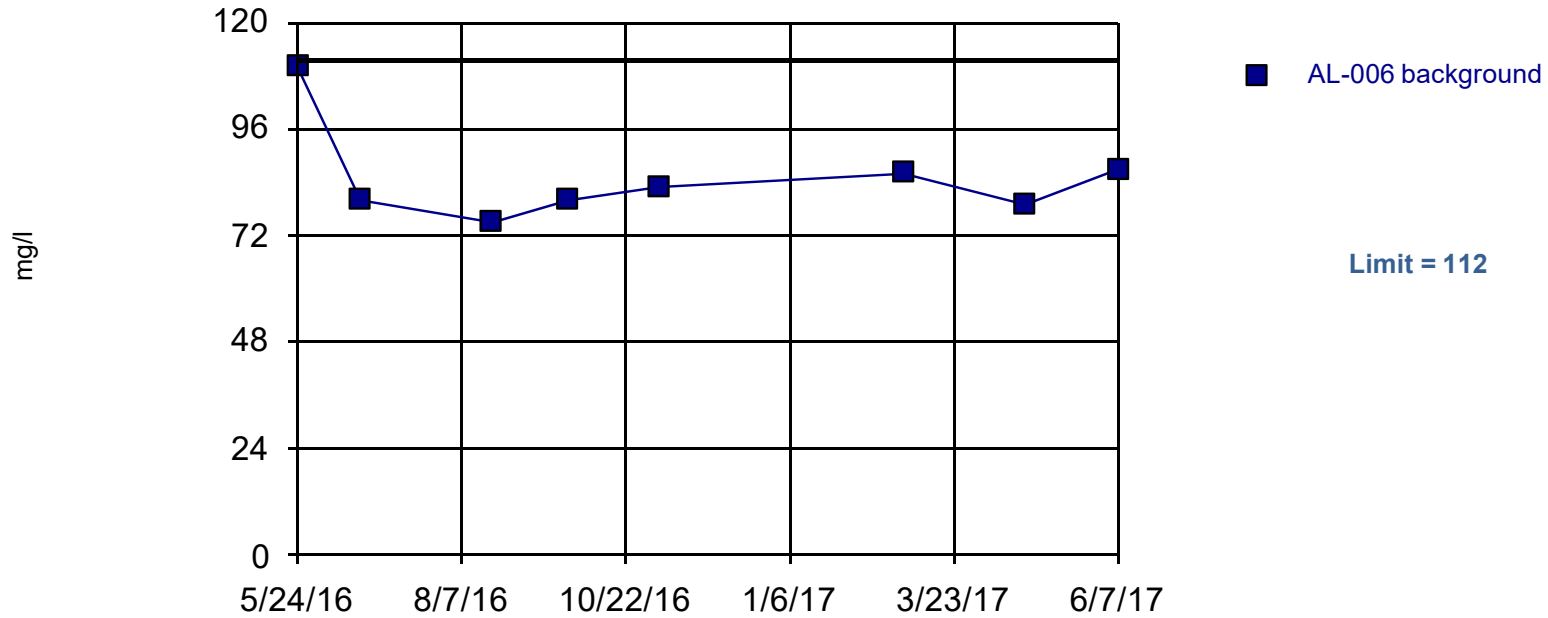


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8596, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, **AL-006, Calcium**



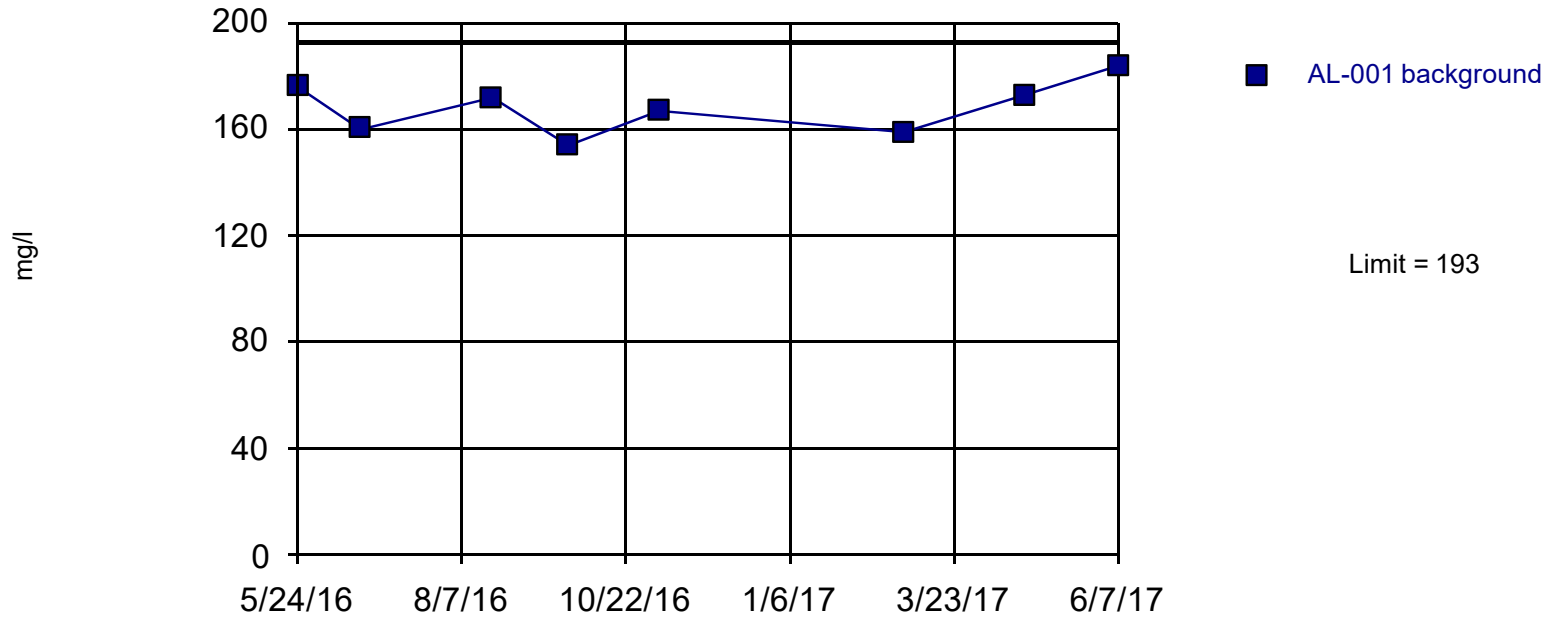
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7578, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

### Intrawell Parametric, **AL-001, Chloride**

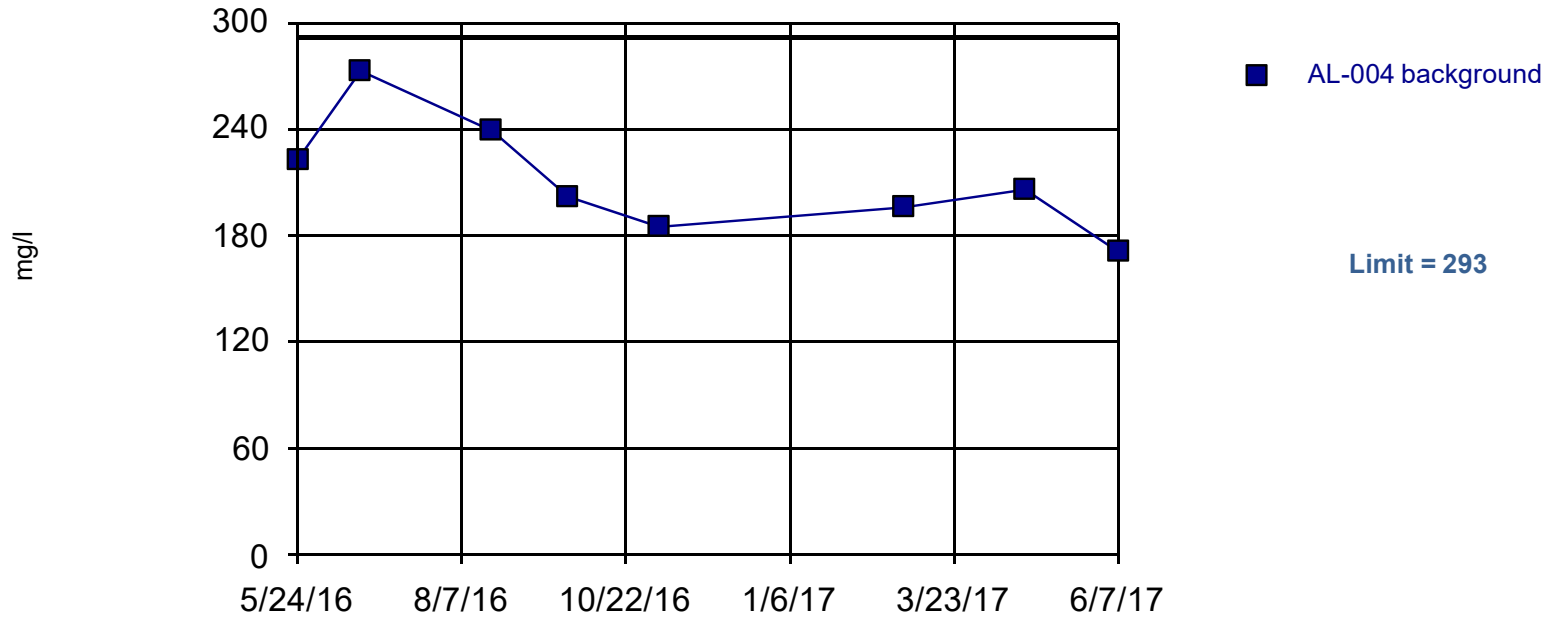


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9678, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, **AL-004, Chloride**



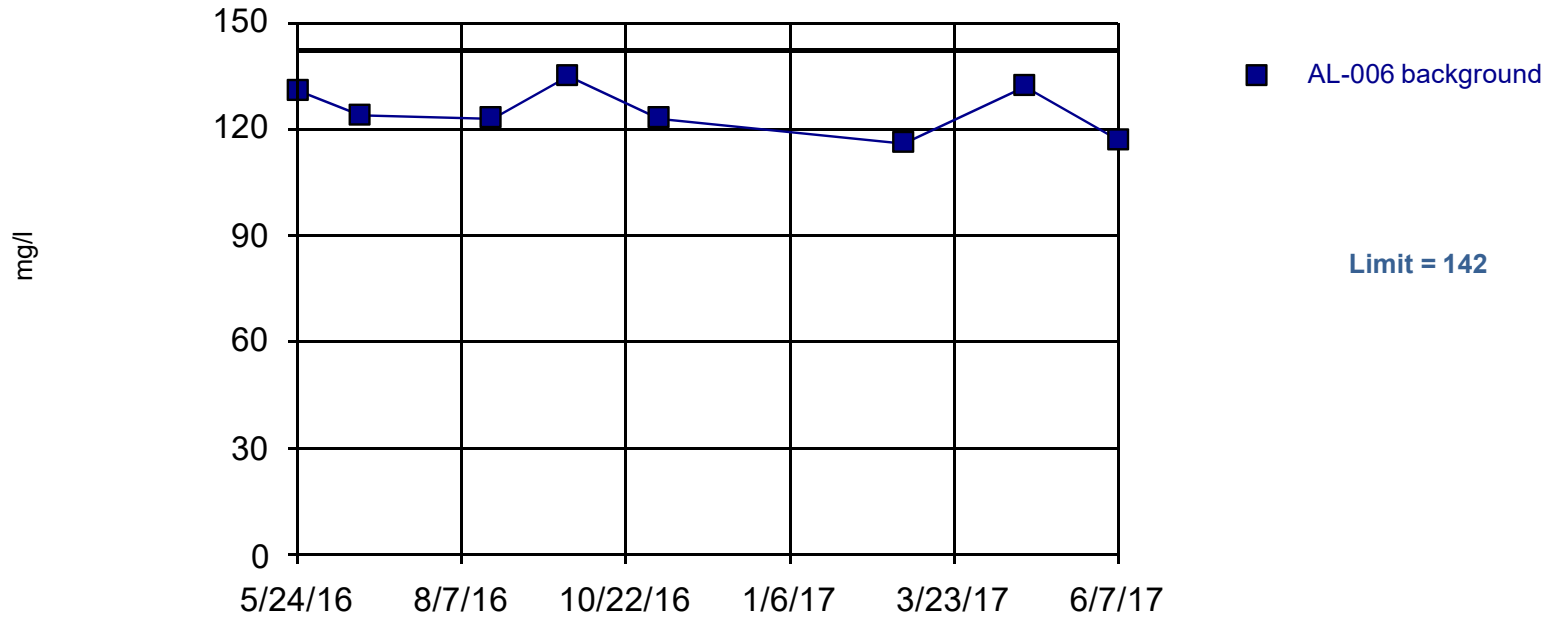
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9513, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

### Intrawell Parametric, **AL-006, Chloride**

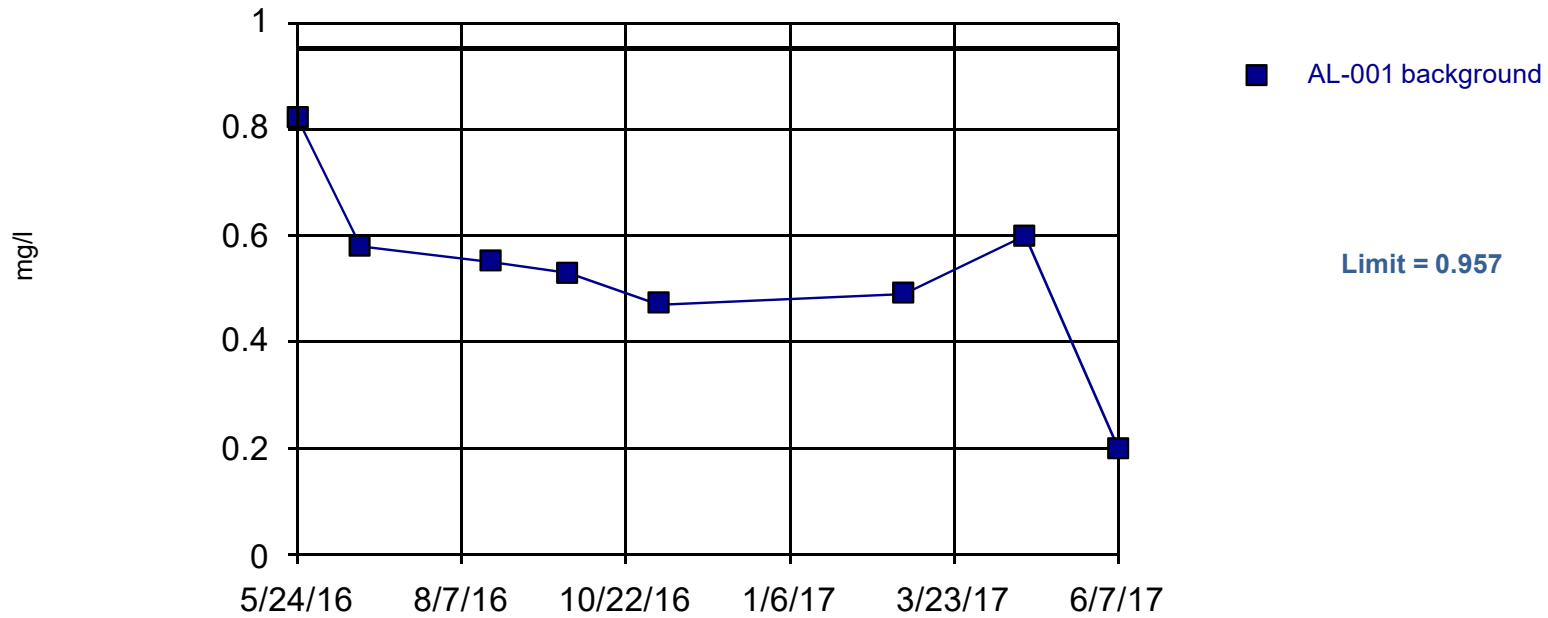


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.924, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Chloride Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-001, Fluoride

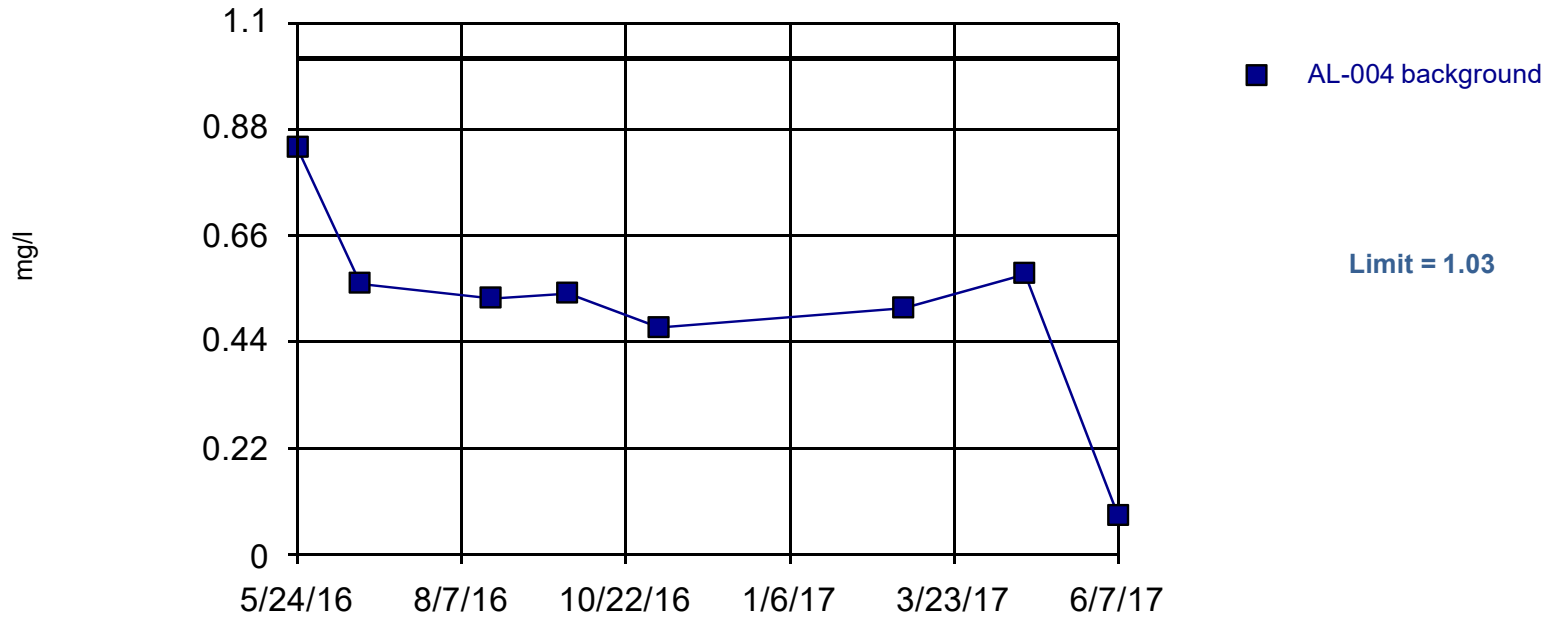


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9108, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Fluoride Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-004, Fluoride

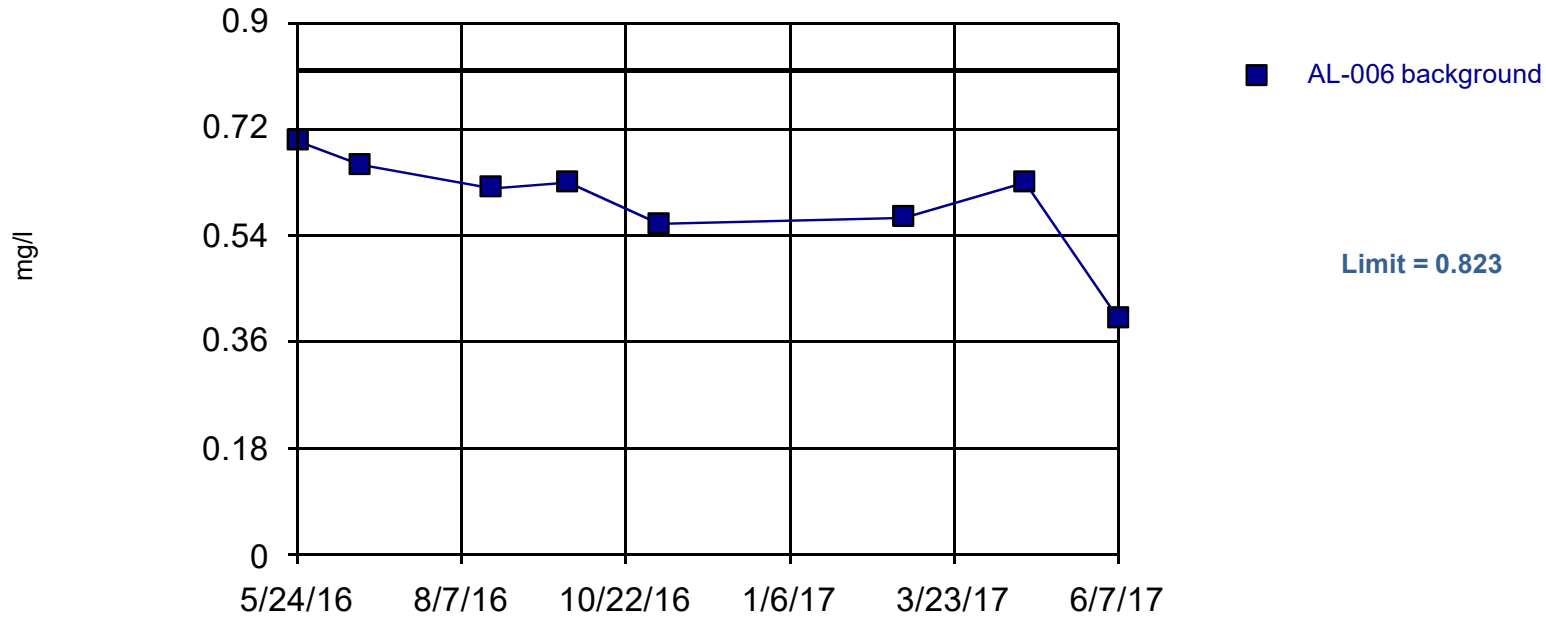


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8357, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Fluoride Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-006, Fluoride

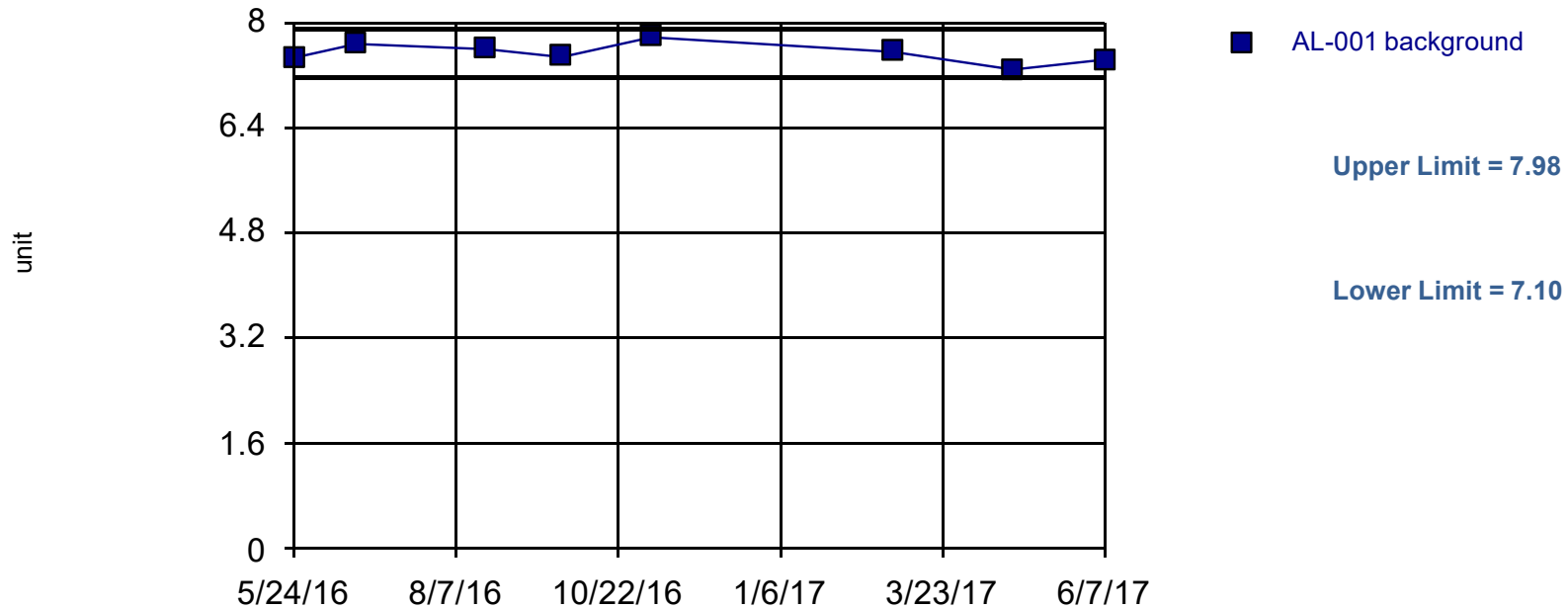


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.864, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Fluoride Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-001, pH



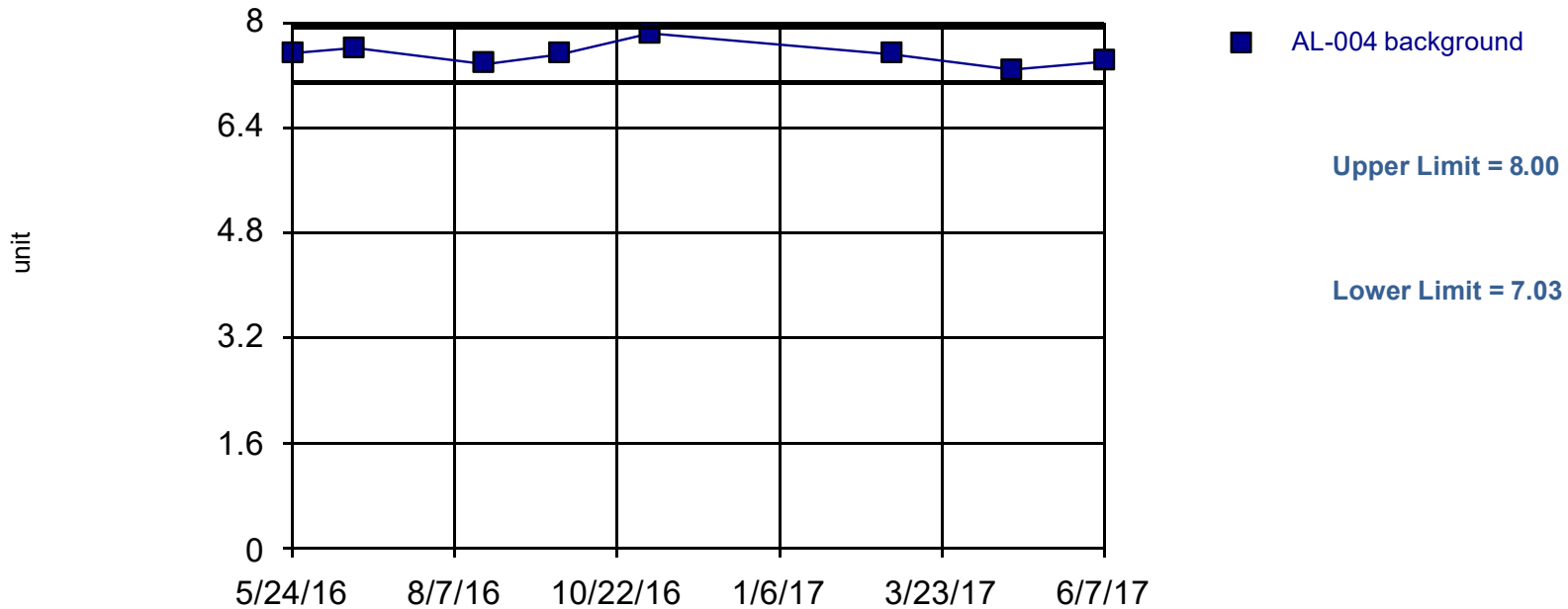
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9849, critical = 0.749. Kappa = 2.88 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

Intrawell Parametric, **AL-004**, pH

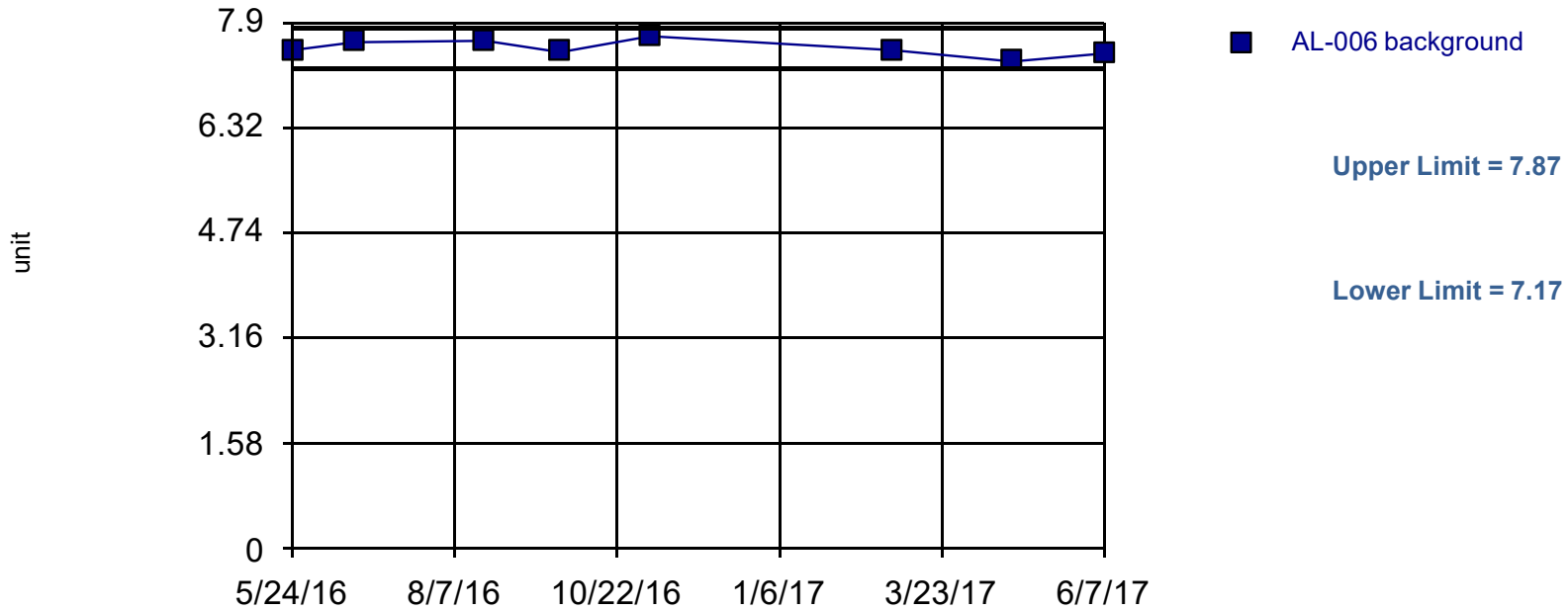


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9445, critical = 0.749. Kappa = 2.88 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-006, pH



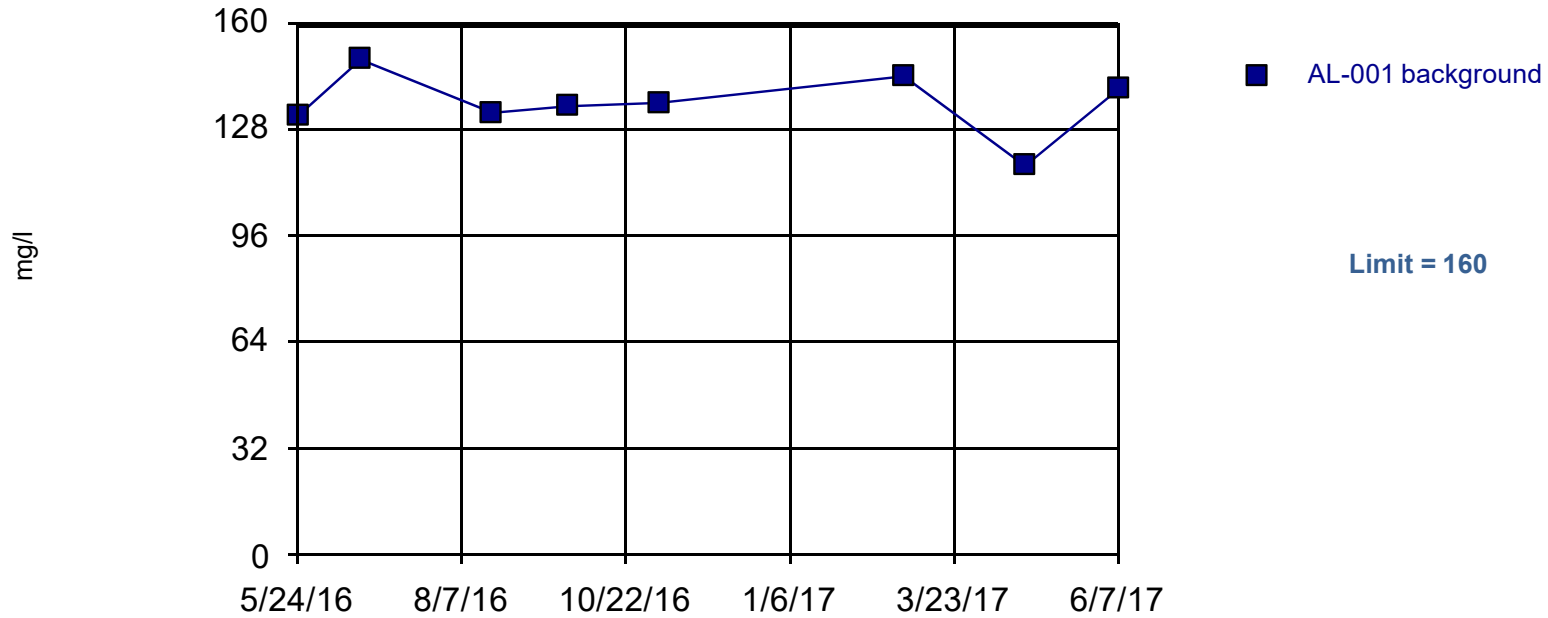
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9584, critical = 0.749. Kappa = 2.88 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: pH Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

### Intrawell Parametric, AL-001, Sulfate



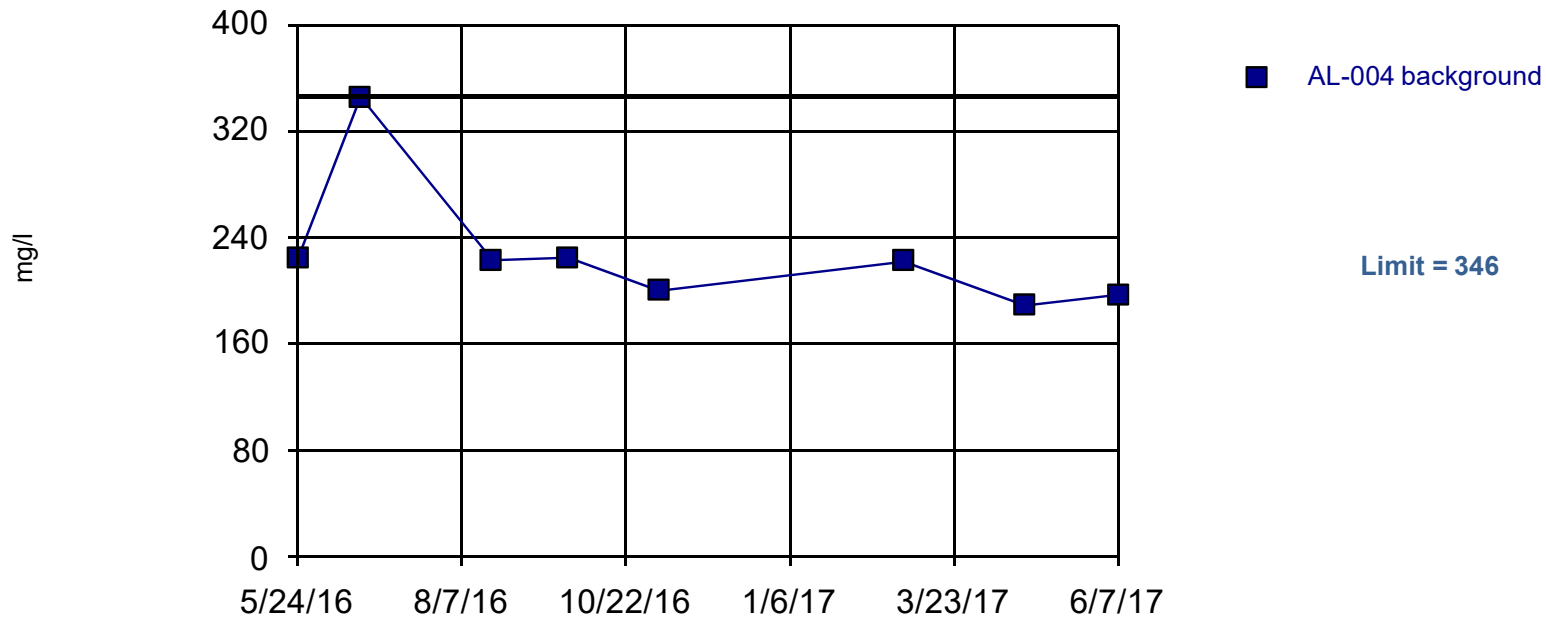
Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9399, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

## Prediction Limit

### Intrawell Non-parametric, AL-004, Sulfate

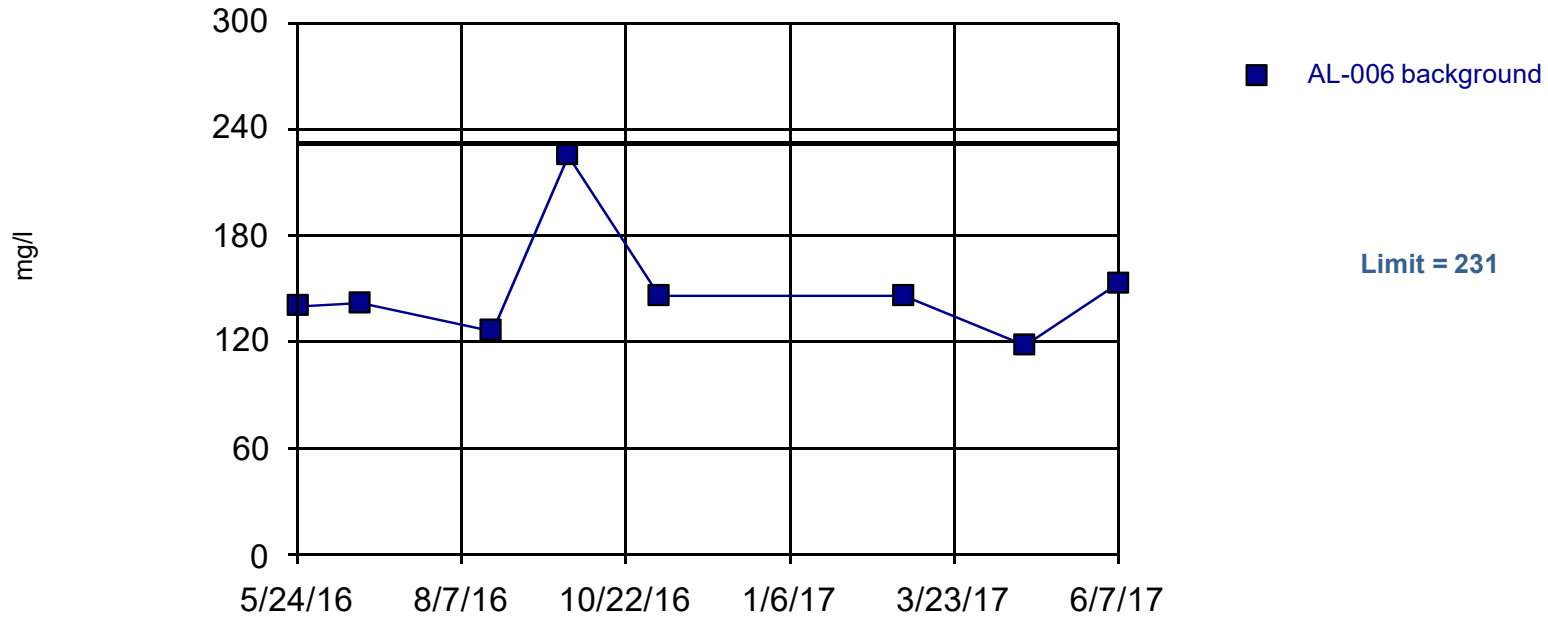


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 8 background values. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2). Assumes 1 future value. Insufficient data to test for seasonality: data were not deseasonalized.

Constituent: Sulfate Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-006, Sulfate

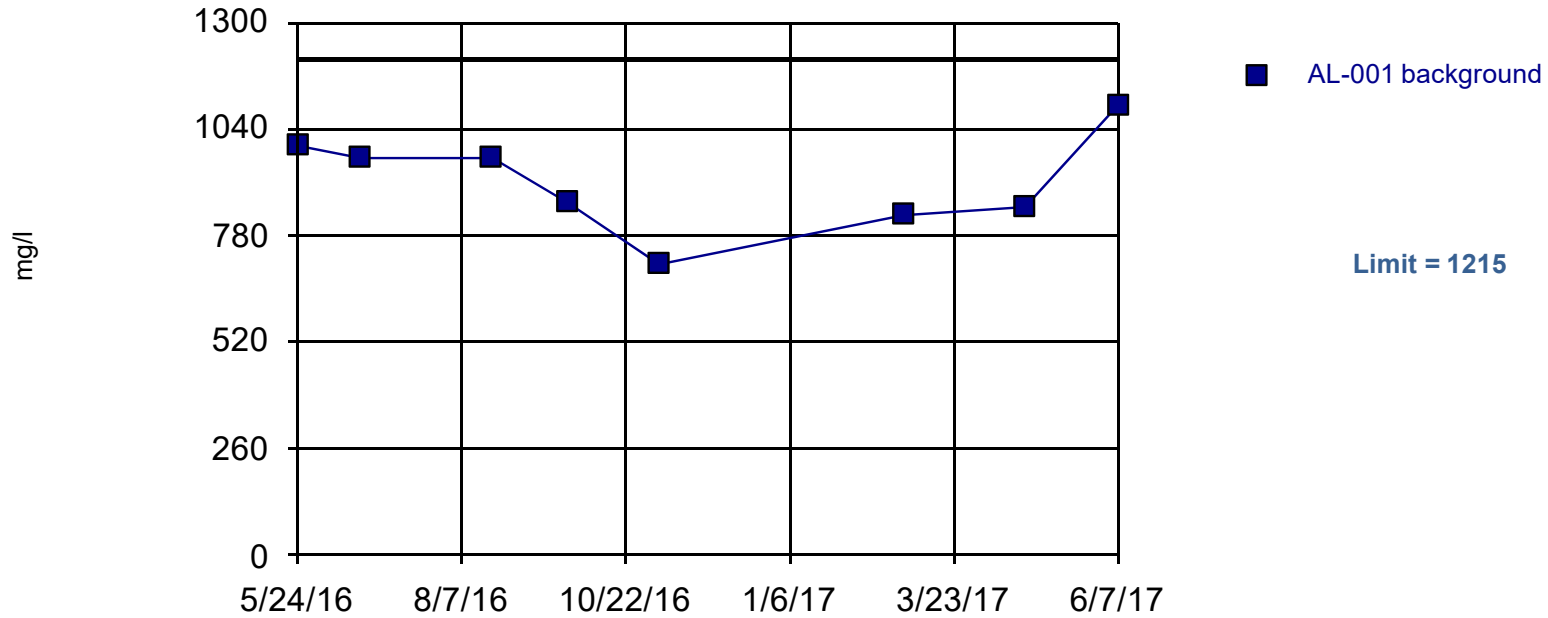


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7857, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, AL-001, TDS

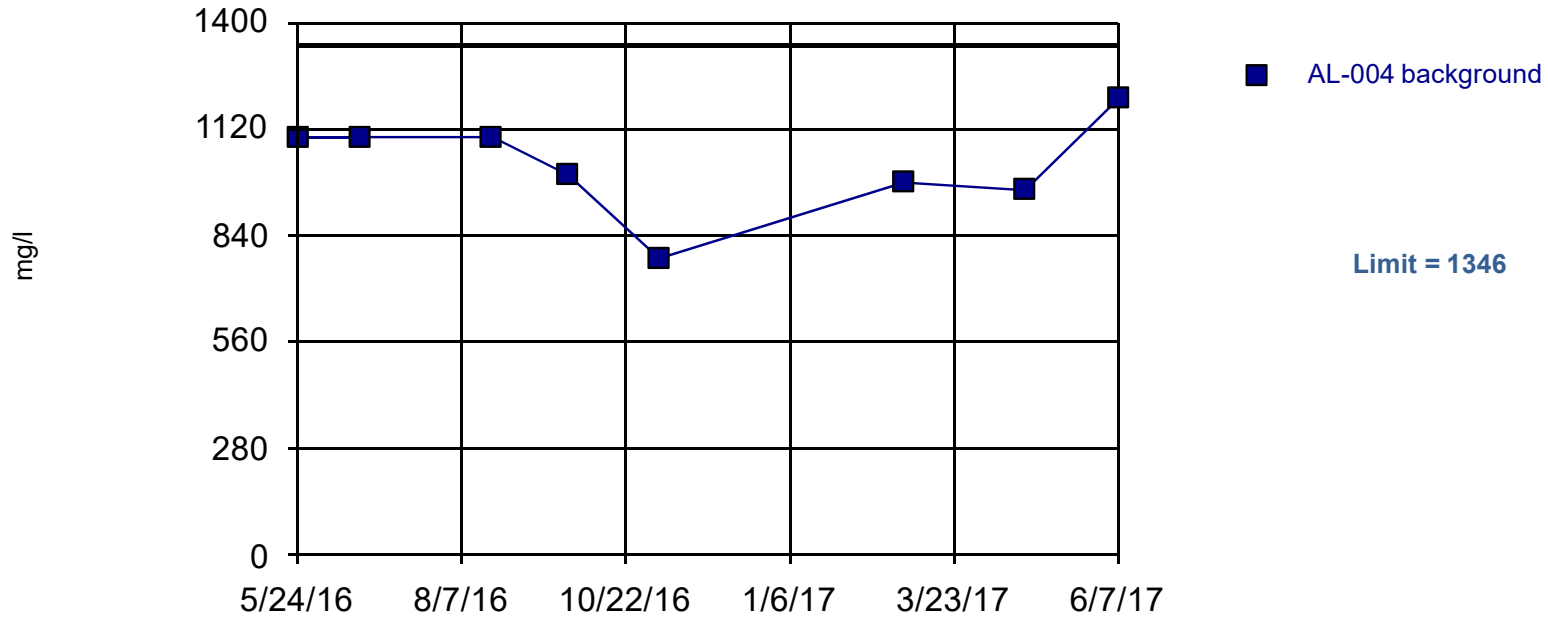


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9667, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, **AL-004, TDS**

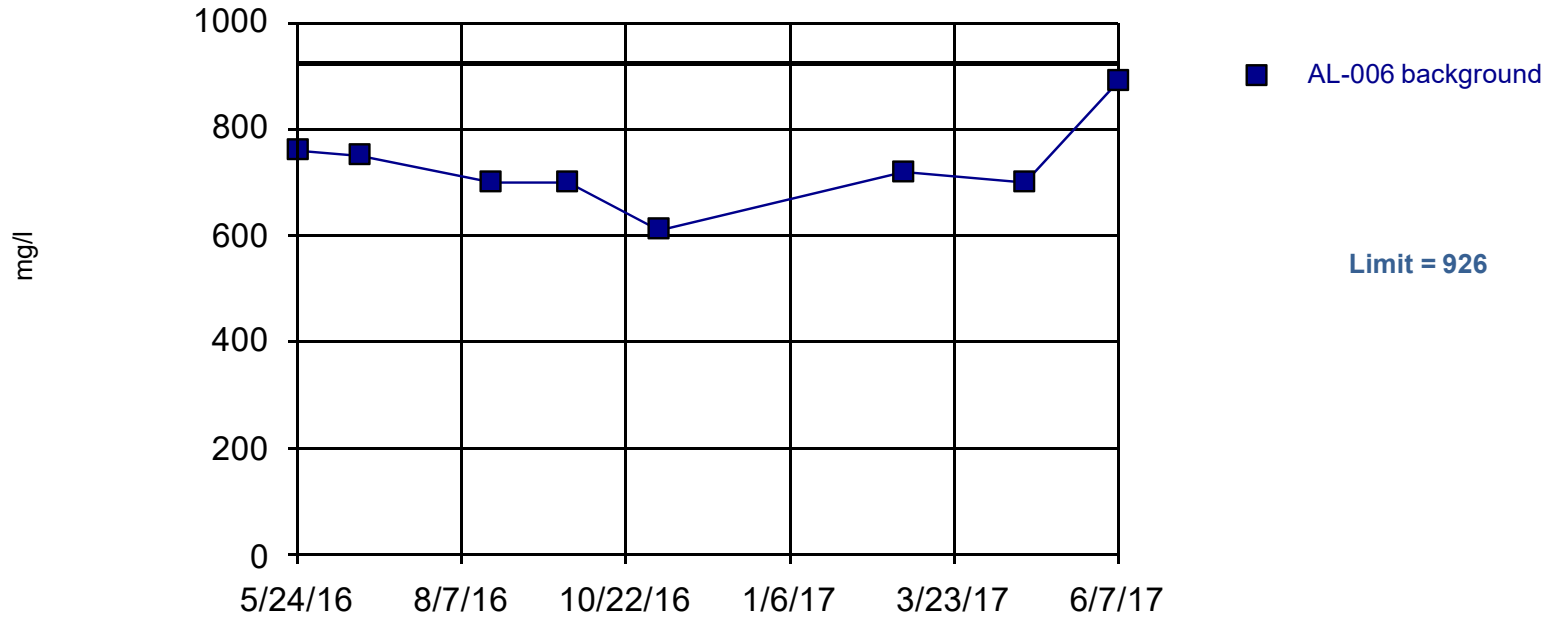


Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9237, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original

### Prediction Limit Intrawell Parametric, **AL-006**, TDS



Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8917, critical = 0.749. Kappa = 2.49 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/11/2017 12:39 PM

Facility: Boardman Facility Client: Portland General Electric Data File: A.2\_Sanitas\_CCR\_Task3\_07182017\_original