2024 Annual Groundwater Monitoring and Corrective Action Report

Columbia Energy Center
Dry Ash Disposal Facility, Modules 1 through 3
Pardeeville, Wisconsin

Prepared for:

Alliant Energy

SCS ENGINEERS

25224067.00 | January 31, 2025

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

OVERVIEW OF CURRENT STATUS

Columbia Energy Center, Dry Ash Disposal Facility, Modules 1 through 3
2024 Annual Report

In accordance with §257.90(e)(6), this section at the beginning of the annual report provides an overview of the current status of groundwater monitoring and corrective action programs for the coal combustion residual (CCR) unit. The groundwater monitoring system for the Columbia Energy Center (COL) Dry Ash Disposal Facility Modules 1 through 3 monitors a single CCR unit. Supporting information is provided in the text of the annual report.

Category	Rule Requirement	Site Status
Monitoring Status – Start of Year	(i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95;	Detection
Monitoring Status – End of Year	(ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in §257.94 or the assessment monitoring program in §257.95;	Detection
Statistically Significant Increases (SSIs)	(iii) If it was determined that there was an SSI over background for one or more constituents listed in appendix III to this part pursuant to §257.94(e):	
	(A) Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase; and	October 2023 Boron: MW-33AR, MW-34A, MW-302 Chloride: MW-33AR Sulfate: MW-33AR, MW-34A April 2024 Boron: MW-33AR, MW-34A, MW-302 Chloride: MW-33AR Sulfate: MW-33AR, MW-34A
	(B) Provide the date when the assessment monitoring program was initiated for the CCR unit.	Alternative Source Demonstrations prepared for October 2023 and April 2024 events during 2024. Assessment monitoring not required.

Category	Rule Requirement	Site Status
Statistically Significant Levels (SSL) Above Groundwater Protection Standard (GPS)	(iv) If it was determined that there was an SSL above the GPS for one or more constituents listed in appendix IV to this part pursuant to §257.95(g) include all of the following:	Not applicable – Appendix IV sampling not required
	(A) Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase;	
	(B) Provide the date when the assessment of corrective measures was initiated for the CCR unit;	
	(C) Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit; and	
	(D) Provide the date when the assessment of corrective measures was completed for the CCR unit.	
Selection of Remedy	(v) Whether a remedy was selected pursuant to §257.97 during the current annual reporting period, and if so, the date of remedy selection; and	Not applicable – Site is in detection monitoring
Corrective Action	(vi) Whether remedial activities were initiated or are ongoing pursuant to §257.98 during the current annual reporting period.	Not applicable – Site is in detection monitoring

Table of Contents

Tables

Figures

Appendices

I:\25224067.00\Deliverables\2024 - Fed CCR Annual Report - COL Mod 1-3\250131_2024 Fed Annual Report - COL Mod 1-3_Final.docx

1.0 INTRODUCTION

This 2024 Annual Groundwater Monitoring and Corrective Action Report was prepared to support compliance with the groundwater monitoring requirements of the Coal Combustion Residuals (CCR) Rule [40 Code of Federal Regulations (CFR) 257.50-107]. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.90(e). The applicable sections of the Rule are provided below in italics, followed by applicable information relative to the 2024 Annual Groundwater Monitoring and Corrective Action Report for the CCR Units. The site location is shown on **Figure 1**.

This report covers the period of groundwater monitoring from January 1, 2024, through December 31, 2024.

The groundwater monitoring system for the Columbia Energy Center (COL) Dry Ash Disposal Facility Modules 1 through 3 monitors a single CCR unit:

- COL Dry Ash Disposal Facility – Modules 1-3 (existing CCR Landfill)

The system is designed to detect monitored constituents at the waste boundary of Modules 1 through 3 of the COL Dry Ash Disposal Facility as required by 40 CFR 257.91(d). The groundwater monitoring system consists of two upgradient and three downgradient monitoring wells (**Table 1** and **Figure 2**). Separate groundwater monitoring systems evaluate groundwater conditions for Modules 4 through 6 and Modules 10 through 13 of the COL Dry Ash Disposal Facility. Combining the landfill CCR units into two CCR units with a combined multi-unit monitoring system is planned for 2025.

2.0 BACKGROUND

To provide context for the required annual report information, the following background information is provided in this section of the report, prior to the required information:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system

2.1 GEOLOGIC AND HYDROGEOLOGIC SETTING

2.1.1 Regional Information

For the purposes of groundwater monitoring, the surficial sand and gravel aquifer is considered to be the uppermost aquifer unit, as defined under 40 CFR 257.53, at the COL Ash Disposal Facility Modules 1 through 3. Immediately underlying the surficial sand and gravel aquifer is the Cambrian-Ordovician sandstone aquifer. A summary of the regional hydrogeologic stratigraphy is presented in **Appendix A.**

The sand and gravel aquifer is capable of producing sufficient water for industrial or municipal use in some parts of Columbia County and is capable of producing sufficient water for domestic use in many areas, including along the Wisconsin River near the Columbia Energy Center (Harr et al., 1978). A map showing expected well yields within the sand and gravel aquifer in Columbia County is included in **Appendix A.**

Regional groundwater flow in the site vicinity is generally west toward the Wisconsin River. A map showing the regional water table elevations is included with the regional hydrogeologic information in **Appendix A.**

2.1.2 Site Information

Soils at the site are primarily sand to a depth of approximately 50 to 100 feet and overlie sandstone bedrock. Soils encountered during the site feasibility study for the COL Ash Disposal Facility were described as generally sandy with interbedded silty clay lenses up to 20 feet thick (Warzyn Engineering, Inc., 1978). During drilling of CCR wells MW-301 and MW-302, the unconsolidated materials were identified as consisting primarily of silty sand and sand. Boring logs for previously installed monitoring wells MW-33AR, MW-34A, MW-84A, and M-4R show silty sand and sand as the primary unconsolidated materials at these locations. The boring logs for Ash Disposal Facility Modules 1 through 3 CCR monitoring wells are provided in **Appendix B.** All CCR monitoring wells are screened within the unconsolidated sand unit.

In 2024, shallow groundwater on the site flowed predominantly from the southeast to northwest, with some local variability as discussed below. The water table elevations and groundwater flow directions for the April 2024 monitoring event are shown on **Figure 3.** A supplemental set of groundwater elevation measurements was collected in August 2024, as shown on **Figure 4.** The water table elevations and groundwater flow directions for the October 2024 monitoring event are shown on **Figure 5.** The groundwater elevation data for the CCR monitoring wells are provided in **Table 3.** Calculated horizontal gradients and flow velocities for representative flow paths are provided in **Table 4.**

The April 2024 flow map showed flow from the Module 1-3 area to the north and northwest consistent with previous flow maps. The August and October 2024 flow maps continue to show overall flow to the north and northwest, but also show a local water table high between wells MW-302 and MW-92A. The contours in this area of the site suggest radial flow to the west, northwest, and northeast. The current compliance wells are still downgradient from Modules 1-3 along the western and northwestern flow paths. The northeastern flow path does not lead to the Module 1-3 compliance wells but does lead to compliance wells that are monitored for Modules 4-6 and 10-13. To address this change in flow directions, WPL plans to combine the monitoring systems to establish a multi-unit monitoring system in 2025.

2.2 CCR RULE MONITORING SYSTEM

The groundwater monitoring system established in accordance with the CCR Rule consists of two upgradient (background) monitoring wells and three downgradient monitoring wells (**Table 1** and **Figure 2**). The background wells include MW-301 and MW-84A. The downgradient wells include MW-302, MW-33AR, and MW-34A. The CCR Rule wells are installed within the sand and gravel aquifer. Well depths range from approximately 29 to 43 feet, measured from the top of the well casing.

3.0 §257.90(e) ANNUAL REPORT REQUIREMENTS

Annual groundwater monitoring and corrective action report. *For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no* *later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For CCR management units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31, 2029, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:*

3.1 §257.90(e)(1) SITE MAP

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

A map of the site location is provided on **Figure 1**. A map showing the Dry Ash Disposal Facility Modules 1 through 3 and all background (or upgradient) and downgradient monitoring wells with identification numbers for the groundwater monitoring program is provided as **Figure 2**. Other CCR units are also shown on **Figure 2**.

3.2 §257.90(e)(2) MONITORING SYSTEM CHANGES

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

There were no monitoring system changes in 2024.

3.3 §257.90(e)(3) SUMMARY OF SAMPLING EVENTS

In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

Two semiannual groundwater sampling events were completed in 2024 at the COL Dry Ash Disposal Modules 1 through 3 as part of ongoing detection monitoring.

Groundwater samples collected during the semiannual events in April and October 2024 were analyzed for Appendix III constituents. A resampling event was also conducted in November 2024 for select constituents. A summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection or assessment monitoring program is included in **Table 2**.

The validation and evaluation of the October 2023 monitoring event data was completed and transmitted to WPL on February 2, 2024. The validation and evaluation of the April 2024 monitoring event data was completed and transmitted to WPL on September 11, 2024. The validation and evaluation of the October 2024 monitoring event data and November 2024 resample event data was in progress at the end of 2024 and will be transmitted to WPL in 2025; therefore, the October and November 2024 monitoring results and analytical report will be included in the 2025 Annual Groundwater Monitoring and Corrective Action Report. The October 2024 groundwater elevation data are included in this report.

The sampling results for Appendix III parameters in October 2023 and April 2024 are summarized in **Table 5.** Field parameter results for the October 2023 and April 2024 sampling events are provided in **Table 6.** The analytical laboratory reports for October 2023 and April 2024 are provided in **Appendix C.** Historical results for each monitoring well through April 2024 are summarized in **Appendix D.**

3.4 §257.90(e)(4) MONITORING TRANSITION NARRATIVE

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels);

There were no transitions between monitoring programs during 2024. The COL Dry Ash Disposal Facility, Modules 1 through 3, remained in the detection monitoring program.

In 2024, the monitoring results for the October 2023 and April 2024 monitoring events were evaluated for statistically significant increases (SSIs) in detection monitoring parameters relative to background. The comparison to background was based on a prediction limit approach, comparing the results to interwell upper prediction limits (UPLs) based on background monitoring results from the upgradient wells (MW-84A and MW-301). The interwell UPLs were updated in August 2024 using background data collected through October 2023. This statistical analysis is included in **Appendix F**. The Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act (RCRA) Facilities (U.S. Environmental Protection Agency [U.S. EPA], 2009; Section 5.3.1) recommends periodic updating of background for both intrawell and interwell analyses. For semiannual monitoring, an update interval of 2 to 3 years is recommended. The next UPL update is planned for 2026 or 2027.

For the October 2023 and April 2024 events, SSIs for boron, chloride, and sulfate were identified.

Alternative source demonstrations (ASDs) were completed for the October 2023 and April 2024 events, demonstrating that sources other than the CCR unit were the likely cause of the observed concentrations of boron, chloride, and sulfate. The ASD reports are provided in **Appendix E.**

3.5 §257.90(e)(5) OTHER REQUIREMENTS

Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

Additional potentially applicable requirements for the annual report, and the location of the requirement within the Rule, are provided in the following sections. For each cited section of the Rule, the portion referencing the annual report requirement is provided below in italics, followed by applicable information relative to the 2024 Annual Groundwater Monitoring and Corrective Action Report for the CCR Units.

3.5.1 § 257.90(e) General Requirements

For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year.

Status of Groundwater Monitoring and Corrective Action Program: The groundwater monitoring and corrective action program was in detection monitoring throughout 2024.

Summary of Key Actions Completed:

- Statistical evaluation and determination of SSIs for the October 2023 and April 2024 monitoring events.
- ASD reports for the SSIs identified from the October 2023 and April 2024 monitoring events.
- Two semiannual groundwater sampling and analysis events (April and October 2024).
- One resample event for select parameters (November 2024).

Description of Any Problems Encountered: As discussed in **Section 2.1.2**, water level monitoring in the second half of 2024 suggests that the current compliance wells may not monitor all groundwater pathways from the CCR unit.

Discussion of Actions to Resolve the Problems: To address the change in flow directions, WPL plans to combine the monitoring systems for the CCR landfill to establish a multi-unit monitoring system in 2025. The multi-unit monitoring system will monitor groundwater at the downgradient waste boundary of the combined CCR units.

Projection of Key Activities for the Upcoming Year (2025):

- Establish and certify multi-unit monitoring system.
- Complete statistical evaluation and determination of any SSIs for the October/November 2024 and April 2025 monitoring events.
- If an SSI is determined, then within 90 days either:
  - Complete ASD (if applicable), or
  - Establish an assessment monitoring program.
- Two semiannual groundwater sampling and analysis events (April and October 2025).

3.5.2 §257.94(d) Alternative Detection Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. No alternative detection monitoring frequency has been proposed.

3.5.3 §257.94(e)(2) Alternative Source Demonstration for Detection Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

The ASD reports prepared to address the SSIs observed for the October 2023 and April 2024 sampling events are provided in **Appendix E.** The ASD reports are certified by a qualified professional engineer.

3.5.4 §257.95(c) Alternative Assessment Monitoring Frequency

The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. Assessment monitoring has not been initiated.

3.5.5 §257.95(d)(3) Assessment Monitoring Results and Standards

Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).

Not applicable. Assessment monitoring has not been initiated.

3.5.6 §257.95(g)(3)(ii) Alternative Source Demonstration for Assessment Monitoring

The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. Assessment monitoring has not been initiated.

3.5.7 §257.96(a) Extension of Time for Corrective Measures Assessment

The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measure due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

Not applicable. Corrective measures assessment has not been initiated.

3.6 §257.90(E)(6) OVERVIEW

A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit.

The specific requirements for the overview under §257.90(e)(6) are listed and the information is provided at the beginning of this report, before the Table of Contents.

4.0 REFERENCES

Harr, C.A., L.C. Trotta, and R.G. Borman, 1978, “Ground-Water Resources and Geology of Columbia County, Wisconsin,” University of Wisconsin-Extension Geological and Natural History Survey Information Circular Number 37, 1978.

U.S. Environmental Protection Agency (U.S. EPA), 2009, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, EPA 530-R-09-007, March 2009.

Warzyn Engineering, Inc., 1978, Feasibility Study, Proposed Fly Ash and/or Scrubber Sludge Disposal Facility – Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

[This page left blank intentionally.]

Tables

Table 1. Groundwater Monitoring Well Network
Columbia Energy Center Dry Ash Disposal Facility - Modules 1-3
SCS Engineers Project #25224067.00

Monitoring Well	Location in Monitoring Network	Role in Monitoring Network
MW-84A	Upgradient	Background
MW-301	Upgradient	Background
MW-302	Downgradient	Compliance
MW-34A	Downgradient	Compliance
MW-33AR	Downgradient	Compliance

Note:

1. Monitoring well MW-1AR was abandoned in 2022 because it was within the footprint of the pending Modules 10-11 expansion area. The monitoring network certification was updated with the abandonment of MW-1AR in October 2022.

Last revision by: NLB Date: 11/18/2024
Checked by: RM Date: 12/5/2024

Table 2. CCR Rule Groundwater Samples Summary
Columbia Energy Center Dry Ash Disposal Facility - Modules 1-3
SCS Engineers Project #25224067.00

Sample Dates	Compliance Wells			Background Wells	
	MW-302	MW-34A	MW-33AR	MW-84A	MW-301
April 17, 2024	D	D	D	D	D
October 2, 2024	D	D	D	D	D
November 5, 2024	--	--	D-R	--	--
Total Samples	2	2	3	2	2

Abbreviations:
D = Required by Detection Monitoring Program
D-R = Detection Monitoring Retest Sample
-- = Not sampled

Last revision by: RM Date: 12/5/2024
Checked by: NLB Date: 12/6/2024

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

Dry Ash Facility (Facility ID #03025)	**Well Number**	**MW-1AR**	**MW-4**	**MW-5R**	**MW-33AR**	**MW-33BR**	**MW-34A**	**MW-34B**	**MW-37A**	**MW-83**	**MW-84A**	**MW-84B**	**MW-86**	**MW-91AR**	**MW-91B**	**MW-92A**	**MW-92B**	**MW-93A**	**MW-93B**	**MW-312**
	Top of Casing Elevation (feet amsl)	822.55	819.74	805.44	808.29	808.39	805.95	806.05	813.04	807.96	814.28	814.26	824.79	809.03	808.45	808.47	808.41	827.89	827.71	826.79
	Screen Length (ft)																	10	5	10
	Total Depth (ft from top of casing)	44.40	39.58	25.97	31.08	57.50	35.43	56.95	31.80	25.42	40.21	52.02	45.43	32.90	52.38	28.94	51.75	50.7	82.5	52.5
	Top of Well Screen Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66	787.19	750.21	784.29
	Measurement Date																			
	October 2, 2012	783.41	783.70	784.96	782.38	782.23	783.03	782.99	782.66	dry	783.84	783.94	783.81	784.09	783.90	784.49	784.06	NI	NI	NI
	April 15, 2013	785.44	784.02	786.09	784.16	784.14	784.74	784.79	783.87	784.49	785.83	785.76	785.22	785.14	785.01	785.75	785.34	NI	NI	NI
	October 8, 2013													785.66	785.42	785.97	785.52	NI	NI	NI
	October 15, 2013	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.66	785.42	785.97	785.52	NI	NI	NI
	April 14, 2014	784.95	784.09	785.63	783.74	783.91	784.63	784.70	783.45	783.73	785.58	785.52	784.96	785.04	784.96	785.99	785.54	NI	NI	NI
	October 2-3, 2014	785.03	785.39	786.08	784.37	784.28	784.57	784.54	784.56	dry	785.24	785.18	785.19	785.47	785.28	785.75	785.33	NI	NI	NI
	April 13-14, 2015	783.96	783.63	785.25	783.01	782.74	783.65	783.95	782.87	dry	784.43	784.51	784.17	784.48	784.37	785.07	784.66	NI	NI	NI
	October 6-7, 2015	784.28	784.44	785.72	783.68	783.33	784.05	784.02	783.66	dry	784.80	784.76	784.66	784.89	784.70	785.20	784.76	NI	NI	NI
	April 4-6, 2016	785.82	aband	787.02	785.29	785.07	785.63	785.67	784.76	785.43	786.37	786.26	785.89	786.05	785.95	786.61	786.21	NI	NI	NI
	October 11-13, 2016	786.64	aband	788.00	787.36	786.46	786.45	786.32	786.40	786.81	787.22	787.11	786.96	787.17	786.81	787.68	787.25	NI	NI	NI
	April 10-13, 2017	786.96	aband	788.13	786.39	785.99	786.30	786.28	786.34	786.23	787.16	787.06	786.96	787.24	787.03	787.90	787.60	NI	NI	NI
	October 3-5, 2017	785.48	aband	786.66	784.51	784.22	784.67	784.63	784.86	784.29	NM	786.49	785.58	786.08	785.83	786.47	786.02	NI	NI	NI
	October 9-10, 2017	NM	aband	NM	NM	NM	NM	NM	NM	NM	785.56 (6)	NM	NM	NM	NM	NM	NM	NI	NI	NI
	February 21, 2018	783.97	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.68	784.46	NM	NM	NI	NI	NI
	April 23-25, 2018	783.99	aband	785.36	783.09	786.36	781.77	780.79	783.28	783.32	785.88	784.91	782.54	784.71	784.53	785.23	784.81	NI	NI	NI
	October 23-25, 2018	788.25	aband	789.71	788.77	787.96	787.88	787.73	787.62	788.26	788.32	788.19	788.21	788.59	788.31	789.32	788.87	NI	NI	NI
	April 1-4, 2019	787.05	aband	788.64	786.63	786.54	786.82	786.92	786.47	786.78	787.35	787.34	787.16	787.45	787.18	788.04	787.63	NI	NI	NI
	October 7-9, 2019	787.26	aband	789.23	788.26	787.64	787.92	787.74	786.77	788.90	787.79	787.73	787.44	787.78	787.62	788.63	788.17	NI	NI	NI
	May 27-28, 2020	786.92	aband	788.34	786.01	785.75	785.98	785.99	786.22	786.03	787.02	786.99	786.94	787.26	787.05	787.86	787.47	NI	NI	NI
	October 7-8, 2020	785.95	aband	787.76	785.91	785.45	785.70	785.68	785.52	785.72	786.10	786.06	786.10	786.55	786.33	786.85	786.38	NI	NI	NI
	February 25, 2021	NM	aband	NM	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	April 14, 2021	778.12	aband	787.29	784.27	784.05	784.77	784.77	784.46	c	785.84	785.81	785.60	785.86	785.69	786.47	786.06	NI	NI	NI
	June 11, 2021	NM	aband	NM	784.19	NM	784.66	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	October 11-12, 14, 2021	784.47	aband	786.78	783.73	783.60	784.42	784.41	783.88	783.87	784.96	784.88	784.79	785.14	784.94	785.55	785.11	NI	NI	NI
	October 17, 2021	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	April 1, 2022	aband	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 11-13, 2022	aband	aband	785.52	783.27	783.45	784.30	784.42	783.26	783.78	785.02	785.00	784.70	784.83	784.72	785.45	785.02	783.99	783.97	783.73
	October 24-28, 2022	aband	aband	785.43	781.94	781.61	783.61	783.61	782.28	dry	784.57	784.54	784.38	784.64	784.47	785.05	784.62	783.74	782.76	783.50
	February 20-23, 2023	aband	aband	NM	783.57	NM	784.48	NM	NM	NM	785.25	NM	NM	NM	NM	NM	NM	NM	NM	NM
	March 27-28, 2023	aband	aband	NM	784.52	NM	785.23	NM	NM	NM	786.21	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 24-27, 2023	aband	aband	787.76	785.79	785.35	786.22	786.12	784.99	786.05	786.97	786.86	786.67	786.76	786.59	787.53	787.11	785.87	785.85	785.55
	May 16, 2023	aband	aband	787.79	785.64	785.25	786.06	786.05	785.39	785.77	786.88	786.79	786.74	786.95	786.75	787.47	787.05	786.23	786.21	785.97
	May 30-31, 2023	aband	aband	NM	785.23	NM	785.70	NM	NM	NM	786.57	NM	NM	NM	NM	NM	NM	NM	NM	NM
	October 9-11, 2023	aband	aband	785.33	782.57	782.39	783.55	783.40	782.94	dry	784.39	784.31	784.24	784.63	784.36	784.89	784.36	783.86	783.59	783.69
	April 15-17, 2024	aband	aband	dry	783.02	782.94	784.14	784.11	782.95	783.41	784.90	784.84	784.54	784.61	784.57	785.19	784.75	783.88	783.87	783.59
	April 19, 2024	aband	aband	785.47	783.06	783.02	784.28	784.30	783.05	dry	785.05	785.01	784.67	784.74	784.62	785.63	785.16	783.95	783.95	783.68
	July 29, 2024	aband	aband	NM	NM	NM	787.29	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	August 15, 2024	aband	aband	789.12	788.77	787.94	787.62	787.56	788.05	788.44	788.17	788.07	788.31	788.66	788.40	789.03	788.58	788.39	788.35	788.31
	October 1-3, 2024	aband	aband	788.25	787.33	786.64	786.79	786.75	786.60	788.86	787.14	787.06	787.14	787.81	787.52	788.33	787.86	787.00	786.97	786.90
	November 5, 2024	NM	NM	NM	785.98	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	Bottom of Well Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66	777.19	745.21	774.29

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

Ash Pond Facility (Facility ID #02325)	**Well Number**	**M-3**	**M-4R**	**MW-39A**	**MW-39B**	**MW-48A**	**MW-48B**	**MW-57**	**MW-59**	**MW-216R**	**MW-217**	**MW-220RR**
	Top of Casing Elevation (feet amsl)	788.23	806.10	809.62	809.50	828.86	828.84	786.29	815.48	814.21	791.55	792.90
	Screen Length (ft)											
	Total Depth (ft from top of casing)	16.90	25.55	34.80	76.07	51.88	75.80	14.40	38.50	37.85	37.37	18.96
	Top of Well Screen Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94
	Measurement Date											
	October 2, 2012	780.13	786.76	781.49	781.34	782.03	781.93	780.58	779.88	781.91	780.95	780.55
	April 15, 2013	785.16	788.39	783.97	784.00	783.77	783.78	784.69	783.66	784.09	784.75	785.02
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM
	April 14, 2014	786.04	788.96	783.57	783.68	783.56	783.57	785.51	783.41	783.73	785.25	785.87
	October 1-3, 2014	781.16	787.55	783.42	783.32	784.05	783.94	782.32	783.55	783.79	782.63	783.03
	April 13-14, 2015	783.08	786.83	782.77	782.68	782.80	782.82	782.81	782.83	782.93	783.34	783.42
	October 6-7, 2015	780.66	786.12	782.97	782.81	783.10	783.01	781.82	783.25	783.18	781.95	782.26
	April 4-6, 2016	784.21	789.09	785.27	785.27	784.79	784.76	783.21	784.97	785.68	785.02	784.36
	October 11-13, 2016	781.88	787.88	785.75	785.52	785.73	785.61	783.12	786.51	786.16	783.75	784.09
	April 10-13, 2017	782.94	787.95	785.44	785.20	785.82	785.69	782.77	786.09	785.95	784.29	784.09
	October 3-5, 2017	780.93	787.04	783.35	783.18	784.30	784.19	782.37	784.23	783.89	782.48	782.61
	April 23-25, 2018	782.89	790.43	782.86	782.87	783.14	783.09	783.04	783.02	783.23	783.26	783.45
	October 23-25, 2018	782.95	788.47	787.12	786.88	787.12	786.99	783.48	787.73	787.49	784.90	784.52
	April 1-4, 2019	785.68	789.44	786.28	786.31	786.56	786.45	785.27	787.39	786.53	786.33	785.46
	October 7-9, 2019	785.33	790.65	787.10	787.02	786.68	786.65	785.29	786.68	787.07	786.01	785.42
	May 27-29, 2020	781.80	787.73	785.12	784.92	785.74	785.59	783.11	785.89	785.60	783.41	783.89
	October 7-8 &17, 2020	781.42	787.74	784.74	784.64	785.03	784.96	782.83	785.43	785.10	783.06	783.49
	April 12, 2021	782.30	786.34	783.66	783.65	784.13	784.08	782.79	784.08	783.97	783.15	783.49
	October 11-12, 14, 2021	781.03	786.33	782.94	782.85	783.09	783.03	781.94	783.11	783.04	782.15	782.66
	April 11-13, 2022	783.95	788.26	783.37	783.34	783.10	783.10	NM	782.99	783.40	783.93	783.83
	June 3, 2022	NM	NM	NM	NM	NM	NM	782.13	NM	NM	NM	NM
	October 25, 26, 28, 2022	780.41	783.85	780.76	780.66	779.57	779.55	779.23	778.98	778.61	780.33	781.49
	March 27-28, 2023	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 24-27, 2023	785.18	782.59	785.38	785.19	784.55	784.51	NM	784.83	784.46	783.78	785.30
	May 16, 2023	782.79	781.64	784.70	784.58	784.60	784.49	782.80	784.68	783.94	782.07	784.03
	October 9-11, 2023	779.65	780.54	781.50	781.30	781.94	781.69	780.26	781.95	781.21	779.89	780.43
	April 15-17, 2024	781.73	781.38	782.58	782.51	782.42	782.35	781.82	782.23	782.17	781.47	783.40
	April 19, 2024	NM	dry	782.78	782.80	782.57	782.56	NM	782.35	782.29	781.65	783.48
	August 15, 2024	781.49	784.27	786.74	786.56	787.47	787.31	783.56	787.87	786.90	783.38	783.95
	October 1-3, 2024	779.13	783.42	785.25	785.12	785.99	785.86	782.99	785.86	785.19	782.26	783.50
	October 4, 2024	--	783.57	--	--	--	--	--	--	--	--	--
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

	Well Number	**MW-301**	**MW-302**	**MW-303**	**MW-304**	**MW-304R**	**MW-305**	**M-4R**	**MW-33AR**	**MW-34A**	**MW-84A**	**MW-306**	**MW-307**	**MW-308**	**MW-309**	**MW-310**	**MW-311**	**MW-312**	**MW-313**	**MW-314**	**MW-315**	**MW-316**	**MW-317**	**MW-318**	**MW-319**
CCR Rule Wells	**Top of Casing Elevation (feet amsl)**	806.89	813.00	815.72	805.42	804.34	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74	826.786	820.3	821.57	819.78	808.49	818.88	820.37	828.28
	Screen Length (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Total Depth (ft from top of casing)	29.40	33.6	35.80	25.7	30.73	25.6	39.58	31.08	35.43	40.21	27	26.5	28	37.67	38.41	36.19	52.5	46.2	45.0	45.6	43.7	44.3	43	47.6
	Top of Well Screen Elevation (ft)	787.49	789.40	785.72	789.72	783.61	790.72	776.52	787.21	780.52	784.07	790.63	790.39	788.90	785.60	785.21	783.55	784.29	784.1	786.6	784.2	774.79	784.6	787.4	790.7
	Measurement Date																								
	December 21-22, 2015	785.56	784.78	784.11	786.13	NI	788.96	787.58	783.77	783.50	785.31	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
	April 4-5, 2016	786.78	785.81	785.48	788.08	NI	789.61	789.09	785.29	785.63	786.37	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	July 7-8, 2016	786.31	786.28	784.60	787.36	NI	789.26	787.43	785.19	785.05	785.89	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	July 28, 2016	NM	NM	784.35	NM	NI	NM	NM	NM	784.86	785.61	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	October 11-13, 2016	787.64	787.76	786.18	788.18	NI	789.78	787.88	787.36	786.45	787.22	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	December 29, 2016	787.37	787.05	NM	NM	NI	NM	NM	785.66	785.72	786.63	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	January 25-26, 2017	787.27	786.89	785.28	789.34	NI	789.36	789.64	785.88	785.98	786.70	785.50	785.36	785.73	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	April 10 & 11, 2017	787.89	787.55	786.00	788.22	NI	789.57	787.95	786.39	786.30	787.16	786.22	785.64	786.51	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	June 6, 2017	788.25	788.37	786.49	788.58	NI	789.79	787.83	787.27	786.66	787.63	786.85	786.07	786.46	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	August 7-9, 2017	787.34	787.55	785.42	789.52	NI	789.30	788.54	786.11	785.81	786.68	785.69	785.19	785.37	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	October 23-24, 2017	785.89	785.94	783.92	788.97	NI	788.14	788.00	784.13	784.50	785.32	783.97	784.79	784.17	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	February 21, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	783.19	783.05	783.02	NI	NI	NI	NI	NI	NI	NI	NI
	March 23, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	783.10	783.10	783.00	NI	NI	NI	NI	NI	NI	NI	NI
	April 23-25, 2018	785.29	784.37	783.27	789.69	NI	787.67	790.43	783.09	781.77	785.88	783.24	783.65	782.65	783.07	782.97	781.83	NI	NI	NI	NI	NI	NI	NI	NI
	May 24, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	785.79	785.09	NM	785.45	785.97	786.11	NI	NI	NI	NI	NI	NI	NI	NI
	June 23, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	786.03	786.64	786.47	NI	NI	NI	NI	NI	NI	NI	NI
	July 23, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	786.27	786.35	786.55	NI	NI	NI	NI	NI	NI	NI	NI
	August 7, 2018	787.06	NM	785.20	788.25	NI	788.56	787.63	NM	NM	786.55	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	August 22, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	785.54	785.40	785.46	NI	NI	NI	NI	NI	NI	NI	NI
	September 21, 2018	NM	788.37	786.50	NM	NI	NM	NM	787.90	787.01	NM	NM	NM	NM	787.08	787.24	787.66	NI	NI	NI	NI	NI	NI	NI	NI
	October 22-24, 2018	788.98	789.16	787.51	789.05	NI	790.04	788.47	788.77	787.88	788.32	787.66	786.57	787.81	787.99	788.18	788.64	NI	NI	NI	NI	NI	NI	NI	NI
	April 1-4, 2019	787.04	787.56	786.52	789.72	NI	790.07	789.44	786.63	786.82	787.35	786.72	786.71	787.53	786.30	786.38	786.38	NI	NI	NI	NI	NI	NI	NI	NI
	June 12, 2019	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	787.25	NM	NI	NI	NI	NI	NI	NI	NI	NI
	June 19, 2019	NM	NM	786.81	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 7-9, 2019	788.47	788.31	787.02	790.41	NI	790.36	790.65	NM	NM	NM	787.47	786.99	787.18	787.26	787.94	787.64	NI	NI	NI	NI	NI	NI	NI	NI
	December 13, 2019	--	--	--	--	NI	--	--	--	--	--	787.03	785.68	786.43	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	December 23, 2019	--	--	--	--	NI	--	--	--	--	--	--	--	--	--	775.22	--	NI	NI	NI	NI	NI	NI	NI	NI
	January 17, 2020	--	--	785.58	--	NI	--	--	--	--	--	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	February 3, 2020	787.24	NM	NM	NM	NI	NM	NM	NM	NM	786.50	785.77	785.57	786.48	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	May 27-29, 2020	787.77	787.29	785.56	789.30	NI	787.78	787.73	786.01	785.98	787.02	785.77	785.35	786.28	785.98	785.81	785.85	NI	NI	NI	NI	NI	NI	NI	NI
	June 30, 2020	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	August 6, 2020	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 7-8, 2020	786.53	786.74	785.16	788.52	NI	787.96	787.74	785.91	785.70	786.10	785.39	784.71	785.68	785.47	785.56	785.83	NI	NI	NI	NI	NI	NI	NI	NI
	December 11, 2020	NM	NM	NM	NM	NI	788.19	NM	NM	NM	NM	NM	NM	NM	785.26	785.26	NM	NI	NI	NI	NI	NI	NI	NI	NI
	February 25, 2021	NM	NM	784.27	NM	NI	788.36	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	April 12, 2021	786.50	785.77	784.07	787.99	NI	788.11	786.34	784.27	784.77	785.84	784.32	784.21	785.55	784.29	784.24	784.15	NI	NI	NI	NI	NI	NI	NI	NI
	June 11, 2021	NM	NM	NM	NM	NI	NM	NM	784.19	784.66	NM	NM	NM	NM	784.20	784.05	NM	NI	NI	NI	NI	NI	NI	NI	NI
	July 20, 2021	NM	NM	783.64	NM	NI	788.39	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 11-12, 14, 2021	785.28	785.09	783.09	787.78	NI	787.75	786.33	783.73	784.42	784.96	782.93	782.44	783.76	783.65	783.48	783.48	NI	NI	NI	NI	NI	NI	NI	NI
	December 21, 2021	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	782.93	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

	Well Number	**MW-301**	**MW-302**	**MW-303**	**MW-304**	**MW-304R**	**MW-305**	**M-4R**	**MW-33AR**	**MW-34A**	**MW-84A**	**MW-306**	**MW-307**	**MW-308**	**MW-309**	**MW-310**	**MW-311**	**MW-312**	**MW-313**	**MW-314**	**MW-315**	**MW-316**	**MW-317**	**MW-318**	**MW-319**
CCR Rule Wells (cont.)	**Top of Casing Elevation (feet amsl)**	806.89	813.00	815.72	805.42	804.34	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74	826.786	820.3	821.57	819.78	808.49	818.88	820.37	828.28
	Screen Length (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Total Depth (ft from top of casing)	29.40	33.6	35.80	25.7	30.73	25.6	39.58	31.08	35.43	40.21	27	26.5	28	37.67	38.41	36.19	52.5	46.2	45.0	45.6	43.7	44.3	43	47.6
	Top of Well Screen Elevation (ft)	787.49	789.40	785.72	789.72	783.61	790.72	776.52	787.21	780.52	784.07	790.63	790.39	788.90	785.60	785.21	783.55	784.29	784.1	786.6	784.2	774.79	784.6	787.4	790.7
	Measurement Date																								
	February 24, 2022	NM	NM	782.34	NM	NI	786.49	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	April 11-13, 2022	785.44	784.42	783.40	788.20	NI	787.87	788.26	783.27	784.30	785.02	783.11	783.32	784.19	783.14	783.19	783.04	NI	NI	NI	NI	NI	NI	NI	NI
	July 27, 2022	NM	NM	783.07	NM	NI	787.03	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 25-27, 2022	784.91	784.62	778.94	781.79	NI	784.97	783.85	781.94	783.61	784.57	778.32	777.89	784.16	781.50	780.96	781.23	NI	NI	NI	NI	NI	NI	NI	NI
	November 30, 2022	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	781.62	781.14	781.15	NI	NI	NI	NI	NI	NI	NI	NI
	December 2, 2022	785.12	784.48	NM	783.97	NI	NM	NM	781.91	783.71	784.76	778.52	779.54	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	January 12-13, 2023	785.20	784.55	NM	NM	NI	NM	NM	782.75	784.10	784.88	NM	NM	NM	782.57	782.45	782.32	NI	NI	NI	NI	NI	NI	NI	NI
	January 20, 2023	NM	NM	NM	788.08	NI	NM	NM	NM	NM	NM	782.15	782.11	784.98	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI
	January 24, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.73	783.36	783.63	783.77	NI	NI	NI	NI
	February 20-23, 2023	785.56	784.98	NM	NM	NI	NM	NM	NM	NM	NM	783.04	782.91	785.32	783.31	783.34	783.40	783.50	783.59	783.82	783.96	NI	NI	NI	NI
	March 27-28, 2023	786.83	785.87	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	783.84	783.98	784.43	NM	784.12	784.41	784.57	NI	NI	NI	NI
	April 24-27, 2023	787.57	786.87	784.38	784.03	NI	NM	782.59	785.79	786.22	786.97	784.82	784.25	787.75	785.05	785.18	785.69	NM	785.21	785.43	785.59	NI	NI	NI	NI
	May 5, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.55	NM	NM	NM	780.49	NI	NI	NI
	May 16, 2023	787.43	787.07	783.88	784.12	NI	dry	781.64	785.64	786.06	786.88	784.65	783.89	786.88	785.15	785.11	785.39	785.97	785.46	785.68	785.88	780.48	NI	NI	NI
	May 30-31, 2023	787.04	786.89	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	784.90	784.69	784.97	NM	785.24	785.55	785.77	NM	NI	NI	NI
	June 29-30, 2023	786.32	786.39	NM	NM	NI	NM	NM	784.32	785.04	785.92	NM	NM	NM	784.12	783.84	783.97	NM	784.67	784.95	785.17	NM	NI	NI	NI
	July 31, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.96	784.26	784.49	NM	NI	NI	NI
	August 31, 2023	NM	785.30	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	782.47	NM	NM	783.55	783.83	783.97	NM	NI	NI	NI
	October 9-11, 2023	784.67	784.65	781.21	780.09	NI	779.93	780.54	782.57	783.55	784.39	NM	NM	783.09	782.58	782.32	782.22	783.69	783.10	783.33	783.59	780.30	NI	NI	NI
	November 9, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	782.76	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	November 20, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	781.97	781.45	782.85	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	December 27, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.18	783.36	NM	NI	NI	NI
	April 15-17, 2024	785.27	784.49	782.16	aband	782.17	780.80	781.38	783.02	784.14	784.90	782.40	782.24	784.51	782.79	782.68	782.64	783.59	783.16	783.42	783.53	782.09	783.12	783.05	785.27
	April 19, 2024	785.51	784.55	782.26	aband	782.23	dry	dry	783.06	784.28	785.05	NM	782.64	784.69	782.90	782.82	782.74	783.68	783.30	783.49	783.62	782.15	NM	NM	NM
	May 20, 2024	NM	NM	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.25	NM	NM	NM	NM
	June 4, 2024	NM	NM	NM	aband	NM	783.03	783.66	NM	NM	NM	NM	NM	NM	784.27	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	June 27, 2024	NM	NM	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.87	785.97	787.20
	July 31, 2024	NM	NM	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	787.95	788.83	789.56
	August 8, 2024	NM	NM	787.17	aband	786.34	783.77	784.45	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.24	NM	NM	NM
	August 15, 2024	788.75	789.53	786.93	aband	786.03	783.75	784.27	788.77	787.62	788.17	787.66	787.24	788.39	787.90	787.93	788.37	788.31	aband	aband	aband	785.99	787.87	788.63	789.68
	August 30, 2024	NM	NM	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	aband	aband	aband	NM	787.28	787.78	789.17
	October 1-3, 2024	787.92	788.35	785.30	aband	784.91	782.80	783.42	787.33	786.79	787.14	786.04	785.94	786.88	786.46	786.35	786.40	786.90	aband	aband	aband	784.80	786.41	786.71	788.22
	October 18, 2024	NM	NM	NM	aband	NM	NM	NM	NM	NM	NM	785.50	785.08	786.34	NM	NM	NM	NM	aband	aband	aband	NM	NM	NM	NM
	October 31, 2024	NM	NM	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	aband	aband	aband	NM	785.73	785.92	787.88
	November 5, 2024	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.66	785.45	NM	NM	NM	NM	NM	NM	NM	NM	NM
	Bottom of Well Elevation (ft)	777.49	779.40	775.72	779.72	773.61	780.72	766.52	777.21	770.52	774.07	780.63	780.39	778.90	775.60	775.21	773.55	774.29	774.10	776.61	774.18	764.79	774.58	777.37	780.68

Notes:
NM = not measured
NI = not installed
aband = abandoned
Dry = well was dry at time of measurement
(1) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5, 2017 sampling event. The level was allowed to return to static and was measured on October 10, 2017
(2) MW-303 was extended in 2022 due to regrading. Prior to October 2022, the TOC elevation was 811.52'. For events in October 2022 and later, the TOC elevation is 815.72'.

Last revision by: EMS Date: 11/5/2024
Checked by: RM Date: 11/8/2024

Table 4. Horizontal Gradients and Flow Velocity
Columbia Energy Center Dry Ash Disposal Facility - Modules 1-3
SCS Engineers Project #25224067.00
January - December 2024

	Flow Path A - Northwest				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
4/15-17/2024	785.19	784.00	868	0.0014	0.035

	Flow Path B1 - North/Northwest				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
8/15/2024	789.00	788.00	1440	0.0007	0.018
	Flow Path B2 - West				
	789.00	788.00	289	0.0035	0.018

	Flow Path C1 - Northwest				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
10/1-3/2024	788.00	787.00	691	0.0014	0.037
	Flow Path C2 - West/Southwest				
	788.00	787.00	198	0.0051	0.129

Wells	**K Values (cm/sec)**	**K Values (ft/d)**
MW-34A	N/A	N/A
MW-302	3.22E-02	91.2
MW-33AR	4.01E-04	1.1
Geometric Mean	3.59E-03	10.2

Assumed Porosity, n
0.40

Groundwater flow velocity equation: V = [K*(Δh/Δl)] / n

ft = feet
ft/d = feet per day
cm/sec = centimeters per second
K = hydraulic conductivity
n = effective porosity
V = groundwater flow velocity

h1, h2 = point interpreted groundwater elevation at locations 1 and 2
Δl = distance between location 1 and 2
Δh = difference in elevation between locations 1 and 2
Δh/Δl = hydraulic gradient

Note:
1. See Figures 3 and 4 for velocity calculation flow path locations.

Last revision by: NLB Date: 1/6/2025
Checked by: BLR Date: 1/6/2025

Table 5A. Groundwater Analytical Results Summary - October 2023
Columbia Ash Disposal Facility Modules 1-3 / SCS Engineers Project #25224067.00

				Background Wells		Compliance Wells		
Parameter Name	**UPL Method**	**UPL**		**MW-84A**	**MW-301**	**MW-33AR**	**MW-34A**	**MW-302**
				10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Groundwater Elevation, ft amsl				784.39	784.67	782.57	783.55	784.65
Appendix III								
Boron, µg/L	P	35.6		14.0	36.2	485	237	309
Calcium, µg/L	NP	129,000		65,100	52,300	59,400	59,000	70,800
Chloride, mg/L	P	6.2		3.1	2.1	24.2	2.7	1.6 J
Fluoride, mg/L	DQ	DQ		<0.095	<0.095 M0	<0.095	<0.095	0.10 J
Field pH, Std. Units	P	7.78		7.51	7.06	7.88	7.78	7.40
Sulfate, mg/L	P	30.3		1.4 J	11.8	139	43.6	19.9
Total Dissolved Solids, mg/L	NP	514		324	300	448	302	354

4.4	Blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

Abbreviations:

UPL = Upper Prediction Limit
DQ = Double Quantitation
SSI = Statistically Significant Increase
mg/L = milligrams per liter
µg/L = micrograms per liter
ft amsl = feet above mean sea level

NP = Nonparametric UPL with 1-of-2 retesting
P = Parametric UPL with 1-of-2 retesting
LOQ = Limit of Quantitation
LOD = Limit of Detection
Std. Units = Standard Units

J = Estimated concentration at or above the LOD and below the LOQ.
M0 = Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

Notes:

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-84A and MW-301. Interwell UPLs based on 1-of-2 retesting approach. UPLs updated in January 2021 based on background well results through October 2019.

Last revision by: RM Date: 11/7/2023
Checked by: NLB Date: 11/14/2023

Table 5B. Groundwater Analytical Results Summary - April 2024
Columbia Ash Disposal Facility Modules 1-3 / SCS Engineers Project #25224067.00

				Background Wells		Compliance Wells		
Parameter Name	**UPL Method**	**UPL**		**MW-84A**	**MW-301**	**MW-33AR**	**MW-34A**	**MW-302**
				4/17/2024	4/17/2024	4/17/2024	4/17/2024	4/17/2024
Groundwater Elevation, ft amsl				784.90	785.27	783.02	784.14	784.49
Appendix III								
Boron, µg/L	NP	36.2		11.9	24.9	531	265	442
Calcium, µg/L	NP	126,000		73,700	102,000	64,200	58,500	77,800
Chloride, mg/L	P	5.76		3.2	1.6 J	22.8	2.2	1.1 J
Fluoride, mg/L	DQ	DQ		0.12 J	<0.095	<0.095	<0.095	0.12 J
Field pH, Std. Units	P	7.71		7.68	7.06	7.58	7.40	7.67
Sulfate, mg/L	NP	27.5		1.4 J	11.5	165	51.5	26.8
Total Dissolved Solids, mg/L	NP	514		322	458	452	278	344

4.4	Blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

Abbreviations:

UPL = Upper Prediction Limit
DQ = Double Quantitation
SSI = Statistically Significant Increase
mg/L = milligrams per liter
µg/L = micrograms per liter
ft amsl = feet above mean sea level

NP = Nonparametric UPL with 1-of-2 retesting
P = Parametric UPL with 1-of-2 retesting
LOQ = Limit of Quantitation
LOD = Limit of Detection
Std. Units = standard units

J = Estimated concentration at or above the LOD and below the LOQ.

Notes:

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-84A and MW-301. Interwell UPLs based on 1-of-2 retesting approach. UPLs updated in August 2024 based on background well results through October 2023.

Last revision by: SCC Date: 8/20/2024
Checked by: RM Date: 8/26/2024

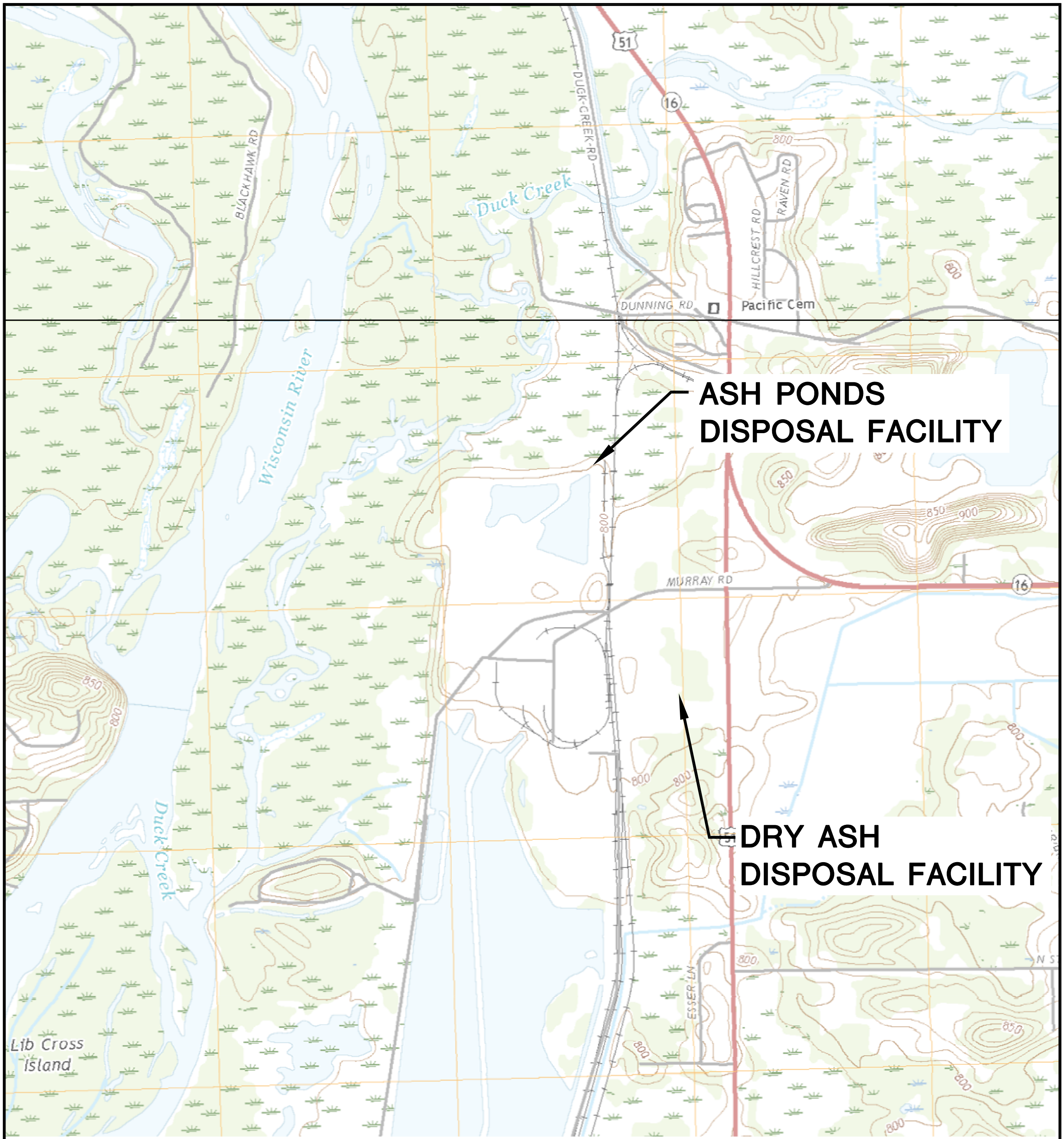
Table 6. Groundwater Field Data Summary
Columbia Energy Center Dry Ash Disposal Facility - Modules 1-3 / SCS Engineers Project #25224067.00

Well	Sample Date	Groundwater Elevation (feet)	Field Temperature (deg C)	Field pH (Std. Units)	Oxygen, Dissolved (mg/L)	Field Specific Conductance (umhos/cm)	Field Oxidation Potential (mV)	Turbidity (NTU)
MW-84A	10/11/2023	784.39	12.3	7.51	8.44	599.9	91.2	0.03
	4/17/2024	784.90	11.0	7.68	7.82	588.1	0.0	0.00
MW-301	10/11/2023	784.67	10.7	7.06	0.16	536.0	23.8	0.34
	4/17/2024	785.27	8.6	7.06	2.53	781.0	17.9	0.00
MW-302	10/11/2023	784.65	11.8	7.40	9.93	559.4	152.5	0.15
	4/17/2024	784.49	10.2	7.67	8.58	606.6	29.6	4.17
MW-33AR	10/11/2023	782.57	13.3	7.88	9.11	691.0	131.2	0.93
	4/17/2024	783.02	11.0	7.58	9.50	706.0	40.4	1.47
MW-34A	10/11/2023	783.55	13.0	7.78	8.32	457.3	122.4	1.05
	4/17/2024	784.14	11.3	7.40	8.57	472.6	44.4	3.65

Notes/Abbreviations:
deg C = degrees Celsius
Std. Units = standard units
mg/L = milligram per liter
umhos/cm = micromhos per centimeter
mV = millivolts
NTU - nephelometric turbidity unit

Last revision by: EMS Date: 9/13/2024
Checked by: BAS Date: 9/16/2024

Figures

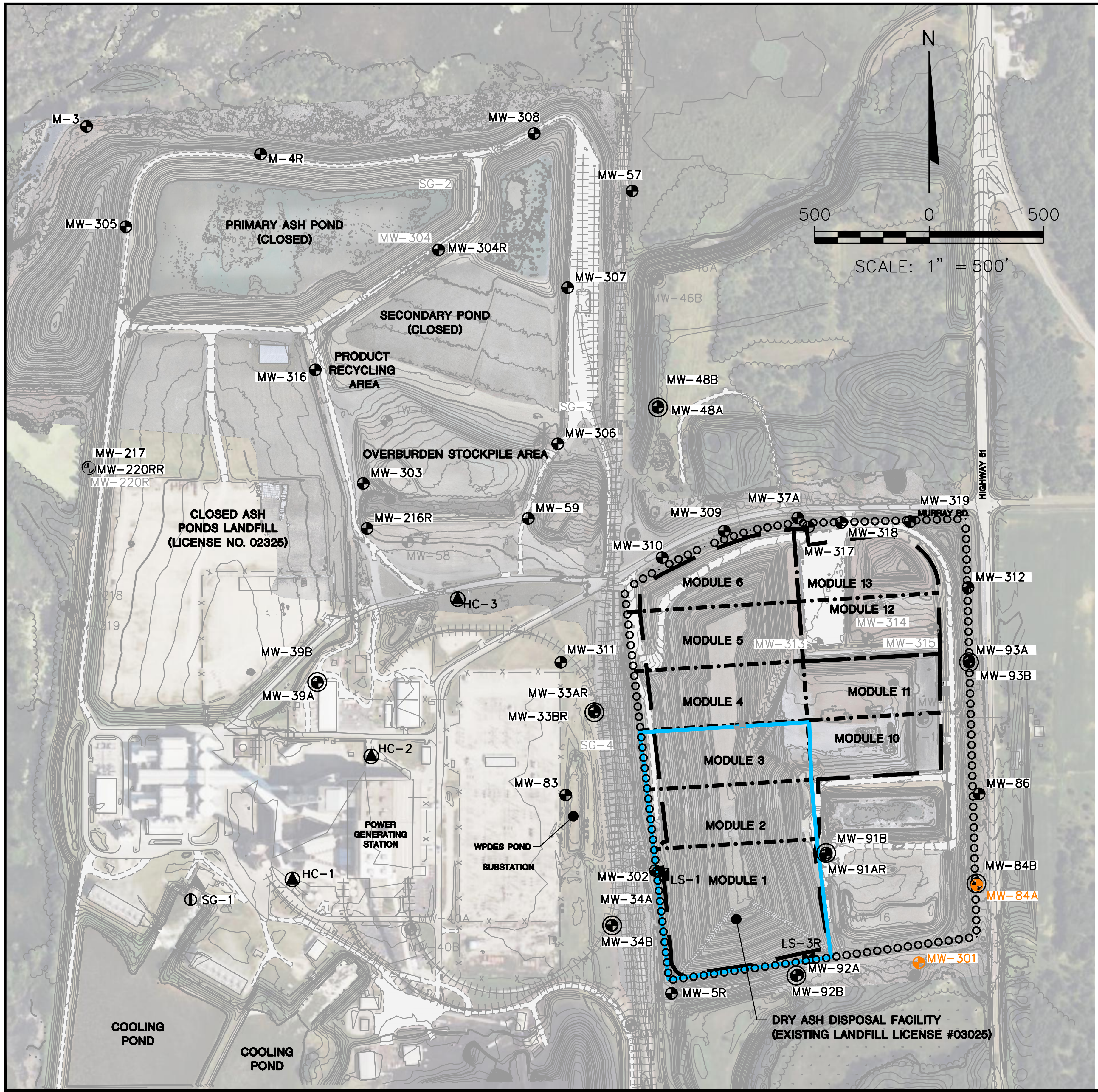


N

POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'

CLIENT	ALLIANT ENERGY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	SITE	ALLIANT ENERGY COLUMBIA ENERGY CENTER PARDEEVILLE, WI	SITE LOCATION MAP

PROJECT NO.	25220067.00	DRAWN BY:	BSS	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN:	12/02/2019	CHECKED BY:	MDB			1
REVISED:	01/10/2020	APPROVED BY:	TK 04/10/2020			



LEGEND

———	EXISTING MAJOR CONTOUR (10' INTERVAL)
———	EXISTING MINOR CONTOUR (2' CONTOUR)
— x — x —	EXISTING FENCELINE
┼┼┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
=======	EXISTING UNPAVED ROAD
— · · · —	EDGE OF WATER
○○○○○○○○	DRY ASH DISPOSAL FACILITY LIMITS
— · — · —	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
◕	WATER TABLE WELL
◉	PIEZOMETER
☒	LYSIMETER
⦶	ABANDONED STAFF GUAGE
◕	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
◕	CCR MONITORING WELL
◕	CCR BACKGROUND MONITORING WELL
━━━	CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, PERIODIC SURVEYS BY SCS ENGINEERS AND CEDAR CREEK SURVEYING, LLC, AND DECEMBER 2023 DRONE SURVEY BY AMES.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
8. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
9. MONITORING WELLS MW-317, MW-318, AND MW-319 WERE INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 9 THROUGH 11, 2024. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE ABANDONED BY HORIZON CONSTRUCTION & EXPLORATION ON MAY 22, 2024.
10. BACKGROUND MONITORING WELLS ARE: MW-301 AND MW-84A.

PROJECT NO.	25224067.00	DRAWN BY:	SB
DRAWN:	01/03/2025	CHECKED BY:	NLB
REVISED:	01/21/2025	APPROVED BY:	TK (01/21/2025)

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

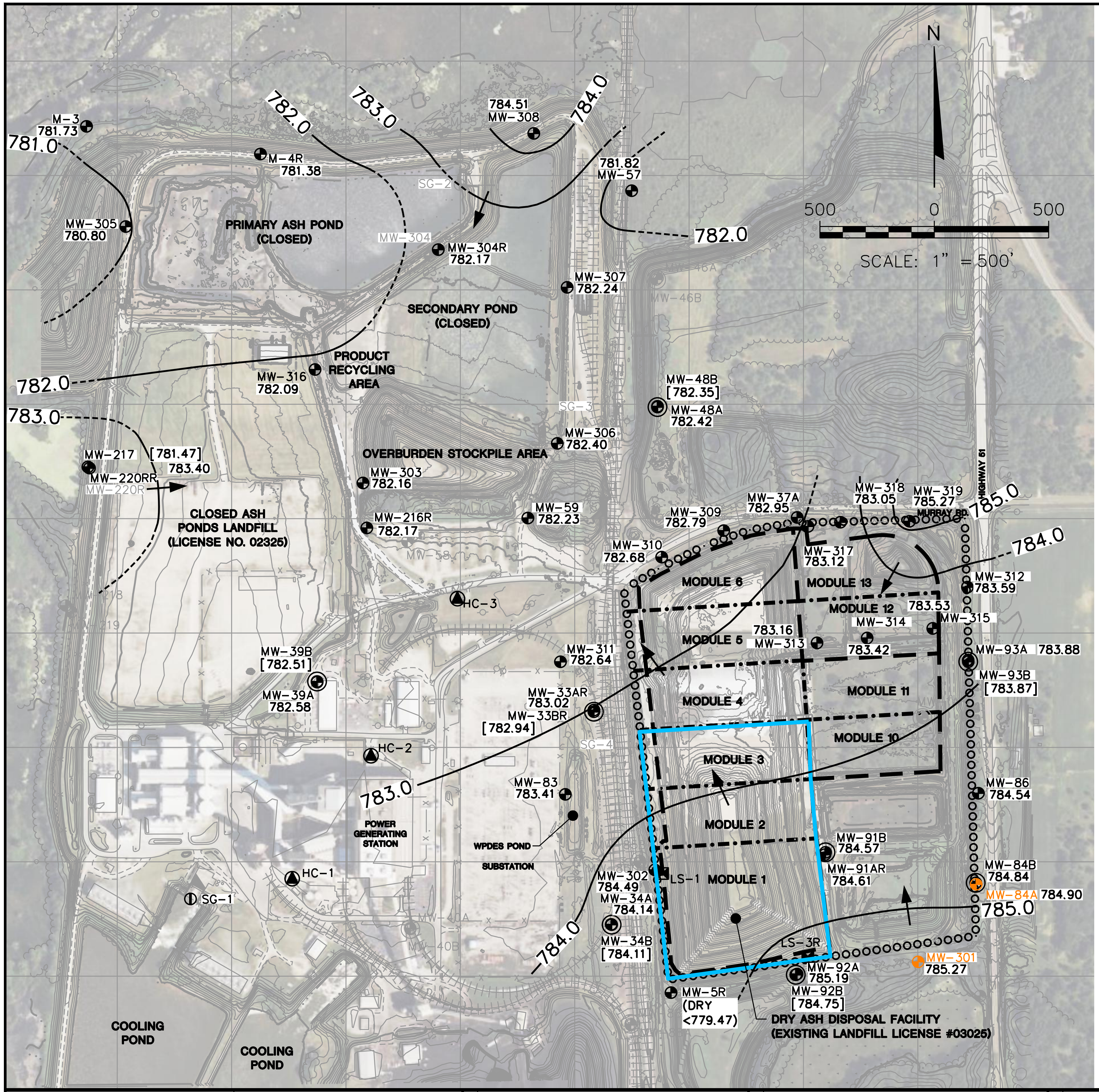
SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS
COLUMBIA DRY ASH DISPOSAL FACILITY

FIGURE
2

I:\Client\Alliant_PROJECT SITES\Columbia\CAD Master References COL\Water Table Maps\Site Plan\02_Col Site Plan Figures.dwg, 1/21/2025 2:59:23 PM



LEGEND

———	EXISTING MAJOR CONTOUR (10' INTERVAL)
———	EXISTING MINOR CONTOUR (2' CONTOUR)
— x — x —	EXISTING FENCELINE
┼┼┼┼┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
=========	EXISTING UNPAVED ROAD
— · · · —	EDGE OF WATER
·ooooooo	DRY ASH DISPOSAL FACILITY LIMITS
— · — · —	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
◕	WATER TABLE WELL
◉	PIEZOMETER
⊠	LYSIMETER
◕	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
◕	CCR MONITORING WELL
◕	CCR BACKGROUND MONITORING WELL
783.88	WATER TABLE ELEVATION
[781.47]	POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
(DRY)	SURFACE WATER ELEVATION (NOT CONTOURED)
——— — —	WATER TABLE CONTOUR (1-FOOT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
——→	APPROXIMATE GROUNDWATER FLOW DIRECTION
———	CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
8. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON DECEMBER 12 AND 19, 2022.
9. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
10. MONITORING WELLS MW-317, MW-318 AND MW-319 WERE INSTALLED BY HORIZON CONSTRUCTION 7 EXPLORATION ON APRIL 9 THROUGH 11, 2024.
11. BACKGROUND MONITORING WELLS ARE: MW-301 AND MW-84A.

PROJECT NO.	25224067.00	DRAWN BY:	SB
DRAWN:	11/05/2024	CHECKED BY:	NLB/BRK (01/21/2025)
REVISED:	01/21/2025	APPROVED BY:	TK (01/21/2025)

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

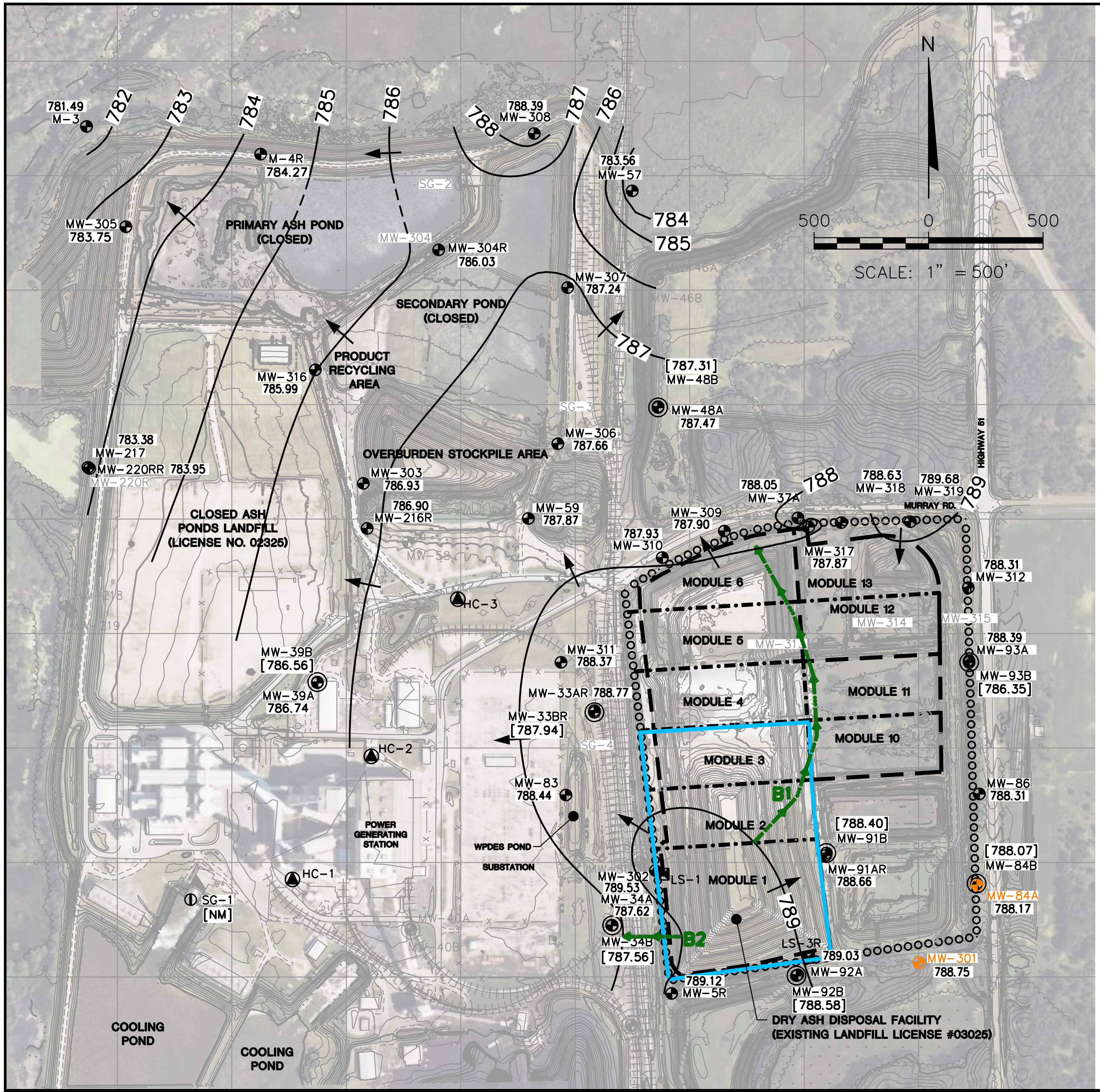
SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WI

WATER TABLE CONTOUR MAP
APRIL 15-17, 2024

FIGURE
3

I:\25224067.00\Drawings\COL April 2024 WTBL CCR Units.dwg, 1/21/2025 1:11:29 PM



LEGEND	
───	EXISTING MAJOR CONTOUR (10' INTERVAL)
───	EXISTING MINOR CONTOUR (2' CONTOUR)
— x — x —	EXISTING FENCELINE
┼┼┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
=========	EXISTING UNPAVED ROAD
─── · · · ───	EDGE OF WATER
·oooooooo	DRY ASH DISPOSAL FACILITY LIMITS
━ · ━ · ━	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
●	CCR MONITORING WELL
●	CCR BACKGROUND MONITORING WELL
788.75	WATER TABLE ELEVATION
[781.47]	POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
[NM]	NOT MEASURED
─── — —	WATER TABLE CONTOUR (1-FOOT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
→	APPROXIMATE GROUNDWATER FLOW DIRECTION
-·-·➤-·-·➤	FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 4)
───	CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
8. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
9. MONITORING WELLS MW-317, MW-318 AND MW-319 WERE INSTALLED BY HORIZON CONSTRUCTION 7 EXPLORATION ON APRIL 9 THROUGH 11, 2024. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE ABANDONED BY HORIZON CONSTRUCTION AND EXPLORATION ON MAY 22-23, 2024.
10. BACKGROUND MONITORING WELLS ARE: MW-301 AND MW-84A.

PROJECT NO.	25224067.00	DRAWN BY:	SB
DRAWN:	11/05/2024	CHECKED BY:	NLB/BRK (01/21/2025)
REVISED:	01/21/2025	APPROVED BY:	TK (01/21/2025)

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

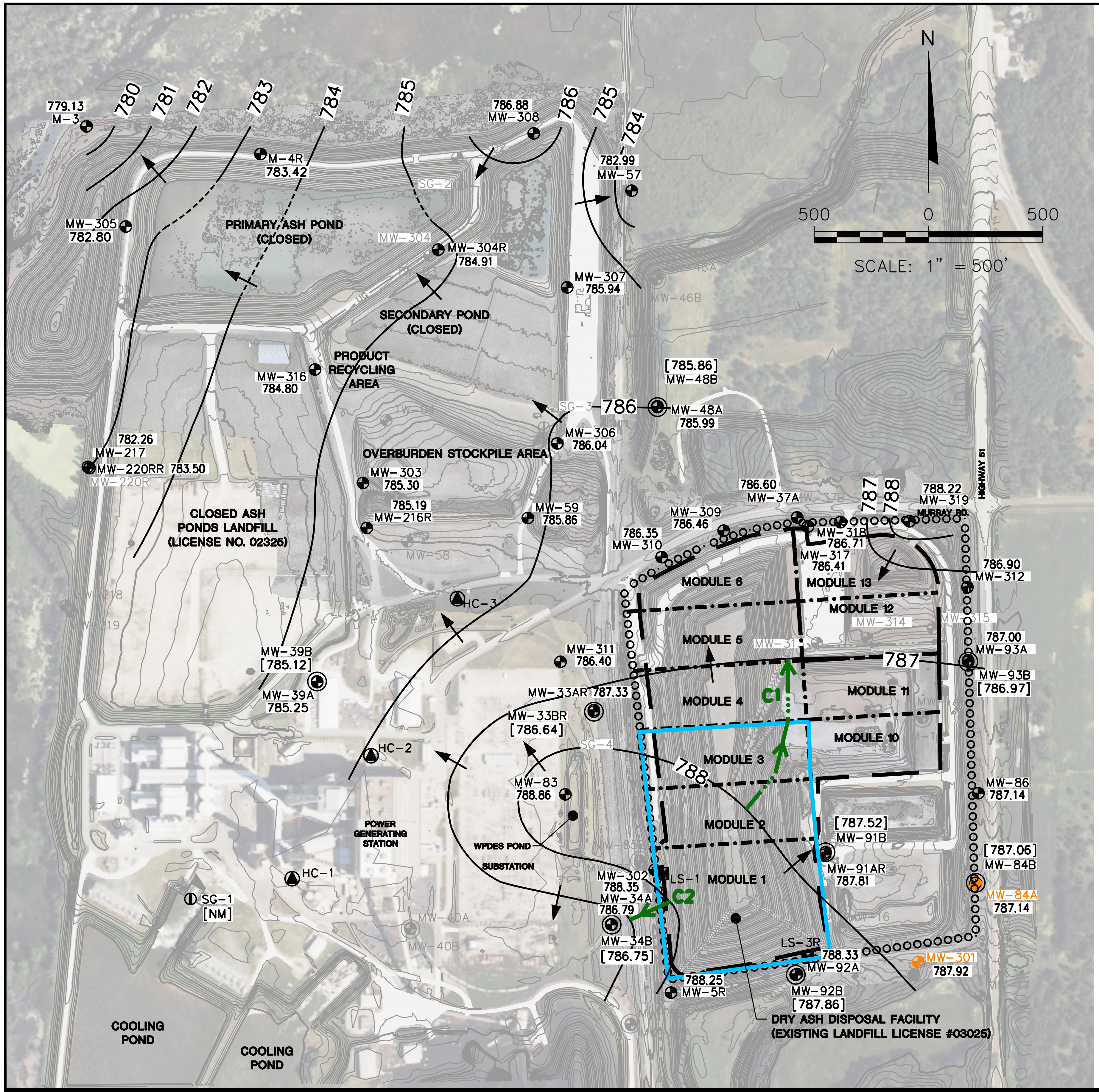
SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WI

WATER TABLE CONTOUR MAP
AUGUST 15, 2024

FIGURE
4

I:\25224067.00\Drawings\COL August 2024 WTBL CCR Units.dwg, 1/21/2025 12:55:47 PM



LEGEND

───	EXISTING MAJOR CONTOUR (10' INTERVAL)
───	EXISTING MINOR CONTOUR (2' CONTOUR)
— x — x —	EXISTING FENCELINE
┼┼┼┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
==========	EXISTING UNPAVED ROAD
— · · · —	EDGE OF WATER
·OOOOOOOO	DRY ASH DISPOSAL FACILITY LIMITS
—·—·—·—	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
⊠	LYSIMETER
⦶	ABANDONED STAFF GUAGE
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
●	CCR MONITORING WELL
●	CCR BACKGROUND MONITORING WELL
788.75	WATER TABLE ELEVATION
[781.47]	POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
[NM]	NOT MEASURED
——— — —	WATER TABLE CONTOUR (1-FOOT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
⟶	APPROXIMATE GROUNDWATER FLOW DIRECTION
·-·→·-·	FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 4)
───	CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, PERIODIC SURVEYS BY SCS ENGINEERS AND CEDAR CREEK SURVEYING, LLC, AND DECEMBER 2023 DRONE SURVEY BY AMES.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
8. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
9. MONITORING WELLS MW-317, MW-318 AND MW-319 WERE INSTALLED BY HORIZON CONSTRUCTION 7 EXPLORATION ON APRIL 9 THROUGH 11, 2024. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE ABANDONED BY HORIZON CONSTRUCTION AND EXPLORATION ON MAY 22-23, 2024.
10. BACKGROUND MONITORING WELLS ARE: MW-301 AND MW-84A.

PROJECT NO.	25224067.00	DRAWN BY:	SB
DRAWN:	11/05/2024	CHECKED BY:	NLB/BRK (01/21/2025)
REVISED:	01/21/2025	APPROVED BY:	TK (01/21/2025)

ENGINEER
SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE
ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PARDEEVILLE, WI

WATER TABLE CONTOUR MAP
OCTOBER 1-3, 2024

FIGURE
5

I:\25224067.00\Drawings\COL October 2024 WTBL CCR Units.dwg, 1/21/2025 1:03:17 PM

Appendix A

Regional Hydrogeologic Information

Table COL-3. Regional Hydrogeologic Stratigraphy
Columbia Energy Center / SCS Engineers Project #25215053

Approximate Age	Hydrogeologic Unit	General Thickness (feet)	Name of Rock Unit*	Predominant Lithology
Quaternary (0-1 million years old)	Surficial Aquifer	0 to 300+	Holocene & Pleistocene Deposits	• Unconsolidated clay, silt, sand, gravel, cobbles, boulders, and organic matter
Ordovician (460 to 490 million years old)	Sandstone Aquifer	0 to 800+	Galena Decorah Platteville St. Peter Prairie du Chien	• Dolomite and shaley dolomite • Sandstone
Cambrian (490 to 500 million years old)			Trempeleau Franconia Galesville Eau Claire Mt. Simon	• Sandstone
Precambrian (more than 1 billion years old)	Used for domestic supply in some areas	--	Precambrian	• Igneous and metamorphic rocks

*This nomenclature and classification of rock units in this report are those of the Wisconsin Geological and Natural History Survey and do not necessarily coincide with those accepted by the U.S. Geological Survey.

Sources:

Harr, C.A., L.C. Trotta, and R.G. Borman, "Ground-Water Resources and Geology of Columbia County, Wisconsin," University of Wisconsin-Extension Geological and Natural History Survey Information Circular Number 37, 1978.

Wisconsin Geological and Natural History Survey, Bedrock Stratigraphic Units in Wisconsin, UW Extension Educational Series 51, ISSN: 1052-2115, 2011.

I:\25215053\Reports\Report 3 - Columbia\Tables\Table_2_Regional_Hydrogeologic_Stratigraphy.doc

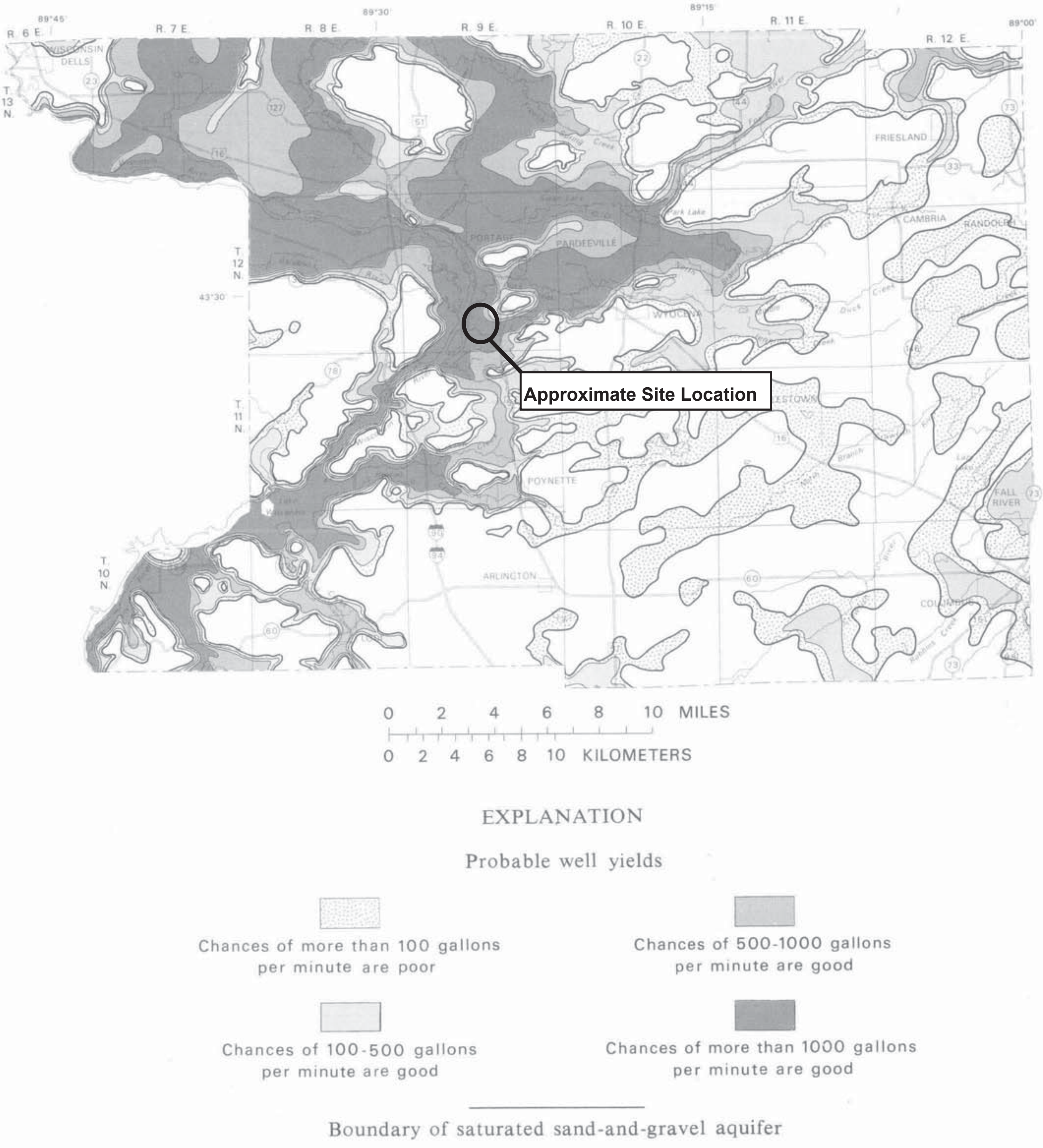
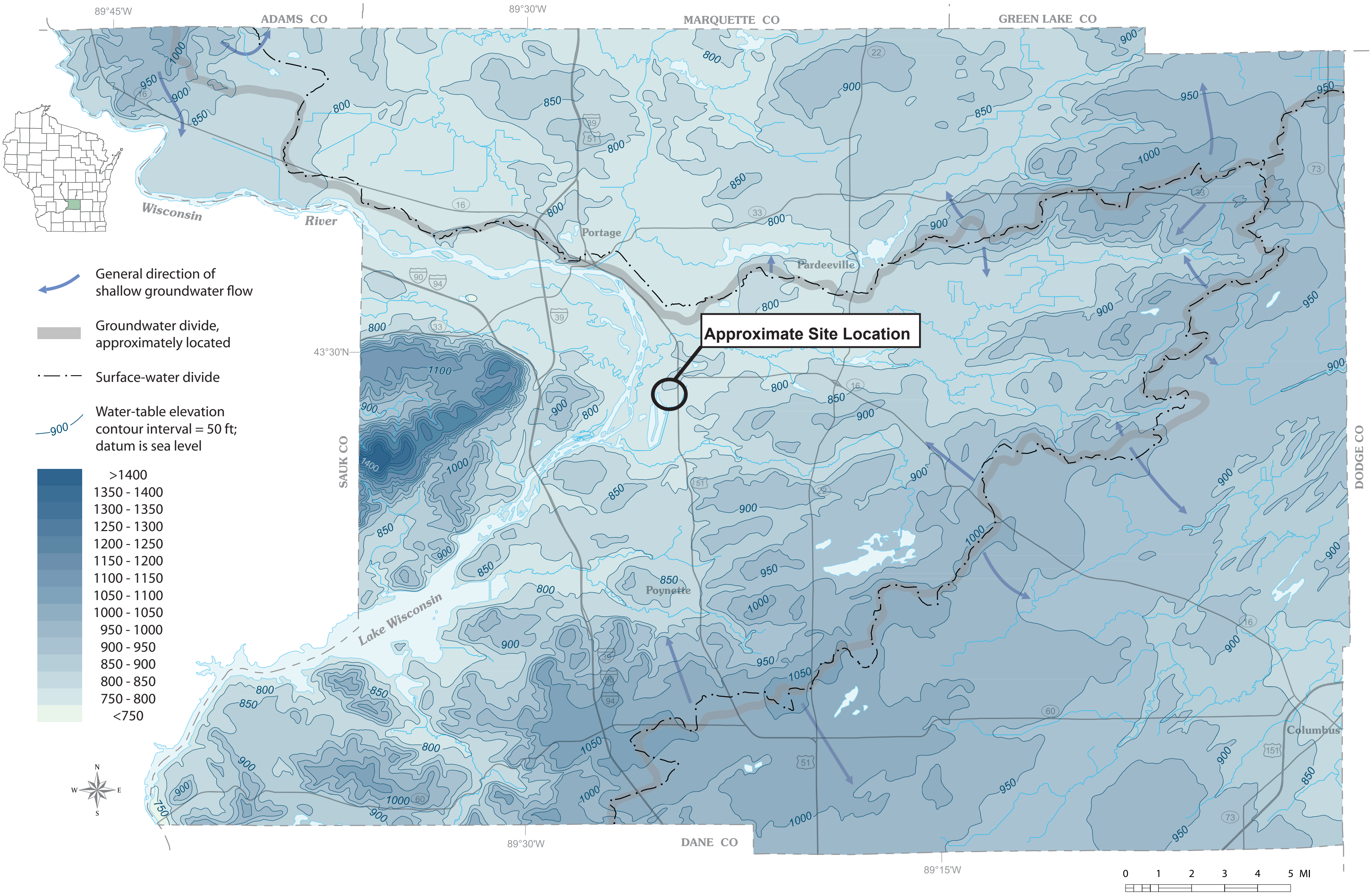


Figure 9. Probably well yields from the sand-and-gravel aquifer.

Source: Harr, C.A., L.C. Trotta, and R.G. Borman, “Ground-Water Resources and Geology of Columbia County, Wisconsin,” University of Wiconisn-Extension Geological and Natural History Surevy Information Circular Number 37, 1978.

Generalized water-table elevation in Columbia County, Wisconsin



Extension Wisconsin Geological and Natural History Survey

02/26/2025 - Classification: Internal - ECRM13462138

Source: Sellwood, Stephen M., Wisconsin Geologic and Natural History Survey, Water Table Elevation, Groundwater Resources of Columbia County Wisconsin,

Appendix B

Boring Logs and Well Construction Documentation

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

Page 1 of 1

Facility/Project Name Alliant Energy - Columbia	License/Permit/Monitoring Number 03025	Boring Number MW-33AR

Boring Drilled By: Name of crew chief (first, last) and Firm Ryan Fisher Boart Longyear	Date Drilling Started 4/9/2003	Date Drilling Completed 4/9/2003	Drilling Method 4 1/4" HSA

WI Unique Well No. PE223	DNR Well ID No. 138	Common Well Name MW-33AR	Final Static Water Level Feet MSL	Surface Elevation 805.4 Feet MSL	Borehole Diameter 8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 542,663 N, 2,123,584 E S/C/N
NE 1/4 of SW 1/4 of Section 27, T 12 N, R 9 E

Lat ___° ___' ___"
Long ___° ___' ___"

Local Grid Location
Feet ☐ N ☐ S
Feet ☐ E ☐ W

Facility ID 111049180	County Columbia	County Code 11	Civil Town/City/ or Village Pacific

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5	**Blind drilled to 29 feet. See log of MW-33BR for lithology.**	SM									
				End of boring at 29 feet.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm RMT, Inc.

Tel:
Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

Page 1 of 3

Facility/Project Name Alliant Energy - Columbia	License/Permit/Monitoring Number 03025	Boring Number MW-33BR

Boring Drilled By: Name of crew chief (first, last) and Firm Ryan Fisher Boart Longyear	Date Drilling Started 4/8/2003	Date Drilling Completed 4/9/2003	Drilling Method 4 1/4" HSA

WI Unique Well No. PE224	DNR Well ID No. 140	Common Well Name MW-33BR	Final Static Water Level 785.3 Feet MSL	Surface Elevation 805.3 Feet MSL	Borehole Diameter 8.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 542,660 N, 2,123,585 E S/C/N
NE 1/4 of SW 1/4 of Section 27, T 12 N, R 9 E
Lat ° ' "
Long ° ' "
Local Grid Location
☐ N ☐ E
Feet ☐ S Feet ☐ W

Facility ID 111049180	County Columbia	County Code 11	Civil Town/City/ or Village Pacific

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
AUGER	60		0–5											
1 SS	24	4 4 4 4	5–7	**SILTY SAND (SM),** 85% fine to medium sand, 15% fines, nonplastic, 10YR 5/4 yellowish brown, no odor, moist.	SM									
2 SS	24	3 5 5 5	10–12											
			15											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm RMT, Inc.
Tel:
Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-33BR Use only as an attachment to Form 4400-122. Page 2 of 3

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
3 SS	24	4 5 4 5	16											
			17											
			18											
			19											
4 SS	24	4 3 4 4	20	Same as above, but wet.			▼							
			21											
			22		SM									
			23											
			24											
5 SS	24	50/0	25	Hit a rock, auger through.										
			26											
			27											
			28											
			29											
6 SS	24	8 20 19 27	30	**SILTY SAND WITH GRAVEL (SM),** 70% fine to medium sand, 15% gravel, 15% fines, nonplastic, 10YR 4/3 brown, wet, dense.										
			31											
			32											
			33											
			34											
7 SS	24	10 17 19 24	35		SM									
			36											
			37											
			38											
			39											
			40											

WDNR_SBL_98 03024WDRY.GPJ WI_DNR98.GDT 7/18/03

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-33BR Use only as an attachment to Form 4400-122.

Page 3 of 3

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
8 SS	24	18 20 28 39	41 42 43 44	Same as above.										
9 SS	24	27 50/2	45 46 47 48 49 50 51		SM									
10 SS	24	7 50/1	52 53 54 55	**WEATHERED SANDSTONE,** 95% poorly graded medium sand, 5% fines, white to brown, well sorted and rounded, poorly cemented.										
			56	**End of boring at 56 feet.**										

WDNR_SBL_98 03024WDRY.GPJ WI_DNR98.GDT 7/18/03

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Alliant Energy - Columbia

Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.

Well Name: MW-33AR

Facility License, Permit or Monitoring No.: 03025

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat. ___° ___' ___" Long. ___° ___' ___" or

Wis. Unique Well No.: PE223

DNR Well Number: 138

Facility ID: 111049180

St. Plane 542,663 ft. N, 2,123,584 ft. E. S/C/N

Date Well Installed: 04/09/2003

Type of Well: Well Code 71/dw

Section Location of Waste/Source: NE 1/4 of SW 1/4 of Sec. 27, T. 12 N, R. 9 ☒ E ☐ W

Well Installed By: (Person's Name and Firm): R. Fischer, Boart Longyear

Distance from Waste/Source: 500 ft.

Enf. Stds. Apply ☐

Location of Well Relative to Waste/Source:
u ☐ Upgradient s ☐ Sidegradient
d ☒ Downgradient n ☐ Not Known

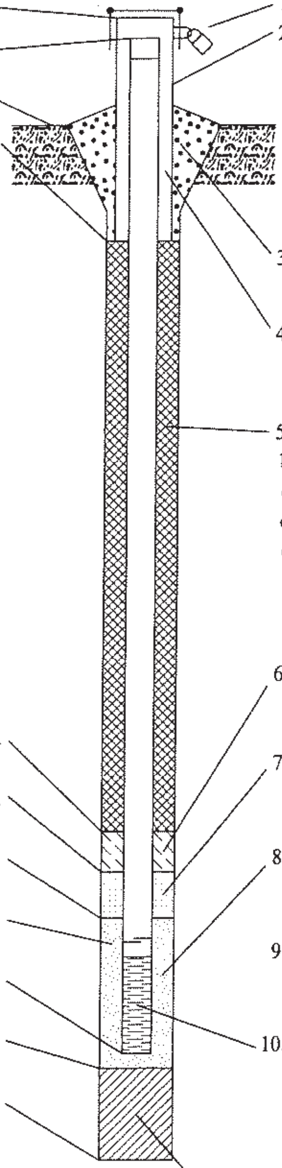
Gov. Lot Number: ____

A. Protective pipe, top elevation 808.09 ft. MSL

B. Well casing, top elevation 808.29 ft. MSL

C. Land surface elevation 805.4 ft. MSL

D. Surface seal, bottom 804.4 ft. MSL or 1.0 ft.



12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used:
Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 794.4 ft. MSL or 11.0 ft.

F. Fine sand, top 789.4 ft. MSL or 16.0 ft.

G. Filter pack, top 788.4 ft. MSL or 17.0 ft.

H. Screen joint, top 787.4 ft. MSL or 18.0 ft.

I. Well bottom 777.4 ft. MSL or 28.0 ft.

J. Filter pack, bottom 776.4 ft. MSL or 29.0 ft.

K. Borehole, bottom 776.4 ft. MSL or 29.0 ft.

L. Borehole, diameter 8.0 in.

M. O.D. well casing 2.37 in.

N. I.D. well casing 2.06 in.

1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 7.0 ft.
   c. Material: Steel ☒ 0 4
   ____ Other ☐
   d. Additional protection? ☐ Yes ☒ No
   If yes, describe: ____

3. Surface seal: Bentonite ☒ 3 0
   Concrete ☐ 0 1
   ____ Other ☐

4. Material between well casing and protective pipe:
   Bentonite ☒ 3 0
   ____ Other ☐

5. Annular space seal: a. Granular/Chipped Bentonite ☐ 3 3
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
   c. 10.5 Lbs/gal mud weight . . . Bentonite slurry ☒ 3 1
   d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
   e. 3.5 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ 0 1
   Tremie pumped ☒ 0 2
   Gravity ☐ 0 8

6. Bentonite seal: a. Bentonite granules ☒ 3 3
   b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2
   c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
   a. #7 Badger
   b. Volume added 0.5 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
   a. #40 Badger
   b. Volume added 4.5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
   Flush threaded PVC schedule 80 ☐ 2 4
   ____ Other ☐

10. Screen material: PVC
   a. Screen Type: Factory cut ☒ 1 1
   Continuous slot ☐ 0 1
   ____ Other ☐
   b. Manufacturer Boart Longyear
   c. Slot size: 0.010 in.
   d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☒ 1 4
   ____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm RMT, Inc.

Tel:
Fax:

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

WARZYN

ENGINEERING INC

LOG OF TEST BORING

Project Wisconsin Power & Light

Location Columbia Generating Station

Boring No. MW-84A

Surface Elevation 813.4

Job No. C 7134

Sheet 1 of 1

1409 EMIL STREET • P.O. BOX 9538, MADISON, WIS. 53715 • TEL. (608) 257-4848

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Type	Recovery ↓	Moisture ↓	N	Depth		Qu	W	LL	PL	D
						Dark Brown Silty SAND (SM)					
					5						
						Brown Fine to Medium SAND, Little Silt, Trace to Little Gravel and Boulders (SM)					
					10						
					15						
					20						
					25						
					30						
					35						
						End Boring at 37'					
					40	Well Installed at 37'					

WATER LEVEL OBSERVATIONS

While Drilling

Upon Completion of Drilling

Time After Drilling

Depth to Water

Depth to Cave In

GENERAL NOTES

Start 10/5/83 Complete 10/5/83

Crew Chief JVS Rig B-40

Drilling Method ED 0-37'

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☒
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name Alliant Energy - Columbia	County Columbia		Well Name MW-33AR
Facility License, Permit or Monitoring Number 03025	County Code 11	Wis. Unique Well Number PE223	DNR Well Number 138

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	4 1
surged with bailer and pumped	☒	6 1
surged with block and bailed	☐	4 2
surged with block and pumped	☐	6 2
surged with block, bailed, and pumped	☐	7 0
compressed air	☐	2 0
bailed only	☐	1 0
pumped only	☐	5 1
pumped slowly	☐	5 0
other ________	☐	

3. Time spent developing well 60 min.

4. Depth of well (from top of well casing) 31.3 ft.

5. Inside diameter of well 2.06 in.

6. Volume of water in filter pack and well casing 6.0 gal.

7. Volume of water removed from well 35.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added ________

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	23.47 ft.	23.62 ft.
Date	b.	4/10/2003	4/10/2003
Time	c.	08:50 ☒ a.m. ☐ p.m.	11:50 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☐ 1 0 Turbid ☒ 1 5 (Describe) Opaque, brown	Clear ☐ 2 0 Turbid ☒ 2 5 (Describe) Slight, tan

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	72 mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Peter M. Chase
RMT, Inc.

17. Additional comments on development:
Pumped dry 3 times.

Facility Address or Owner/Responsible Party Address
Name: Peter M. Chase
Firm: RMT, Inc.
Street: 744 Heartland Tr.
City/State/Zip: Madison, WI 53717

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature:
Print Name: Peter M. Chase
Firm: RMT, Inc.

NOTE: See instructions for more information including a list of county codes and well type codes.

DEPARTMENT OF NATURAL RESOURCES

SAMPLING POINT ID FORM
FORM 4400-40 REV. 6-79

FACILITY NAME: Wisconsin Power and Light Co. /Dry Ash

SAMPLING REQUIRED (✓ONE): ☐ YES ☐ NO

POINT (✓ONE): ☐ CAN BE SAMPLED ☐ CANNOT BE SAMPLED

COMMON NAME OF SAMPLING POINT: mw 34A

PREVIOUS COMMON NAME OF SAMPLING POINT:

FACILITY ID NO.:

POINT ID NO.:

TYPE OF POINT (✓ONE)

1 (G) GROUND WATER
- 11 ☒ MONITOR WELL
- 12 ☐ PIEZOMETER
- 13 ☐ PRIVATE WELL
- 14 ☐ LYSIMETER
- 15 ☐ SPRING
- 16 ☐ RESISTIVITY PROBE

2 (L) LEACHATE
- 21 ☐ FLOW OR SEEP
- 22 ☐ POND
- 23 ☐ COLLECTION SYSTEM

3 (S) SURFACE WATER
- 31 ☐ UPSTREAM
- 32 ☐ MID-SITE
- 33 ☐ DOWNSTREAM
- 34 ☐ RUN-OFF
- 35 ☐ IMPOUNDED

POINT LOCATION

2,155.200 FT. (+) ☒ E. (−) ☐ W.

541.740 FT. (+) ☒ N. (−) ☐ S.

FROM ☒ GRID ORIGIN ☐ BENCHMARK

DATE POINT ESTABLISHED: 09/28/77 (MON DAY YEAR)

6 COMMENTS ABOUT SAMPLING POINT:

Well depth - 38.6' Gradient from landfill- downgradient

Geologic formation of well screen- sand

Location of well seals/materials used- bentonite seal above well screen

WELL DESCRIPTION

PIPE DIAMETER 2.00 INCHES

PIPE TOP ELEVATION 806.00 FEET ☒ MSL ☐ SITE

GROUND SURFACE ELEVATION 802.70 FEET ☒ MSL ☐ SITE

TYPE OF CASING (✓ONE): ☒ 1 PLASTIC ☐ 2 STEEL

7 COMMENTS ABOUT REQUIRED SAMPLING:

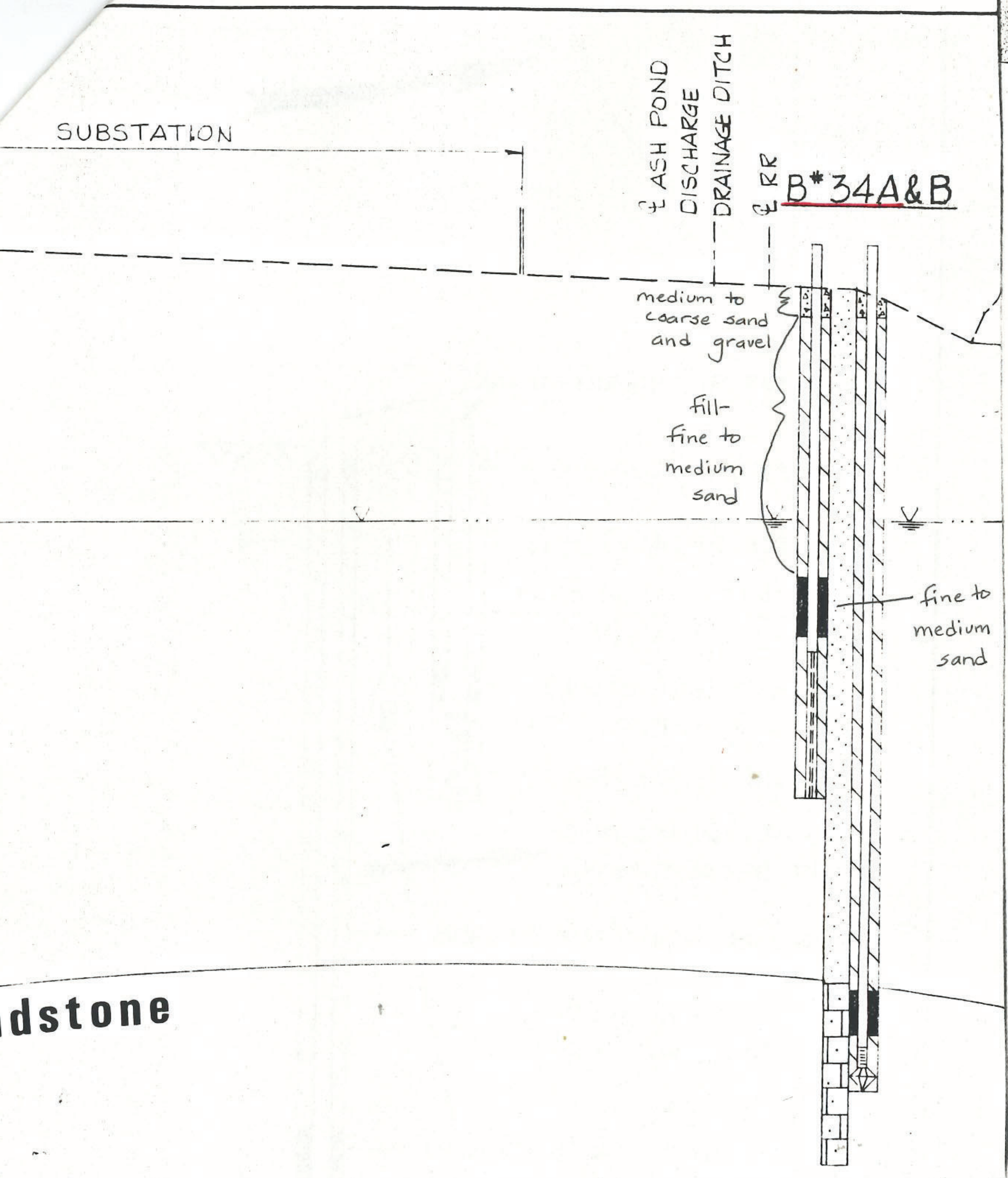
Avg. vol. of water to be bailed:

Groundwater Flow - westerly

REQUIRED SAMPLING (MG/1 except as noted)

	NO.	PARAMETERS	MONTHS OF REQUIRED SAMPLING
🟥	00410	ALKALINITY (AS CA CO$_3$)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00310	BOD (5 DAY)	1-2-3-4-5-6-7-8-9-10-11-12
☐	00916	CALCIUM	1-2-3-4-5-6-7-8-9-10-11-12
☐	00307	CHLORIDES	1-2-3-4-5-6-7-8-9-10-11-12
☐	00340	COD	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00872	CONDUCTIVITY (SU)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00277	COPPER (DISSOLVED)	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00900	HARDNESS (AS CA CO$_3$)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥	01046	IRON (DISSOLVED)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00348	MAGNESIUM	1-2-3-4-5-6-7-8-9-10-11-12
☐	00620	NITRATES (AS NO$_3$)	1-2-3-4-5-6-7-8-9-10-11-12
☐	00640	NITROGEN (TOTAL INOGRANIC N)	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00400	pH (SU)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00129	PHENOLS	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00929	SOLIUM	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥	00945	SULFATES	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00360	TOTAL DIS. SOLIDS	1-2-3-4-5-6-7-8-9-10-11-12
🟥	00842	WATER ELEVATION (FT. MSL)	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
☐	00275	ZINC (DISSOLVED)	1-2-3-4-5-6-7-8-9-10-11-12

	NO.	PARAMETERS (OTHERS)	MONTHS
🟥	01022	Boron	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥		Color	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥		odor	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥		Turbidity	1-2-[✓ 3]-4-5-[✓ 6]-7-8-[✓ 9]-10-11-[✓ 12]
🟥	01002	Arsenic	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	01007	Barium	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00312	Cadmium	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00273	Chromium	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00240	Lead	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00126	Mercury	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	00270	Selenium	1-2-3-4-5-[✓ 6]-7-8-9-10-11-12
🟥	01077	Silver	[✓ -6-]



Scale:

Horizontal 1"=100'

Vertical 1"=10'

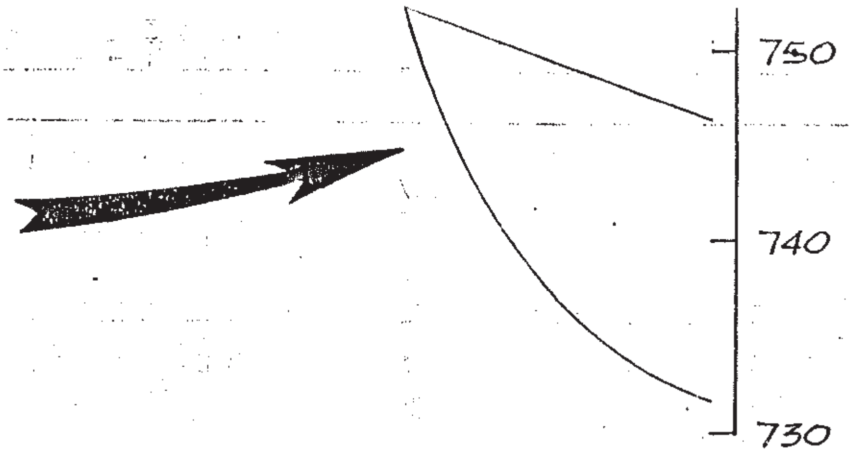
No legend available

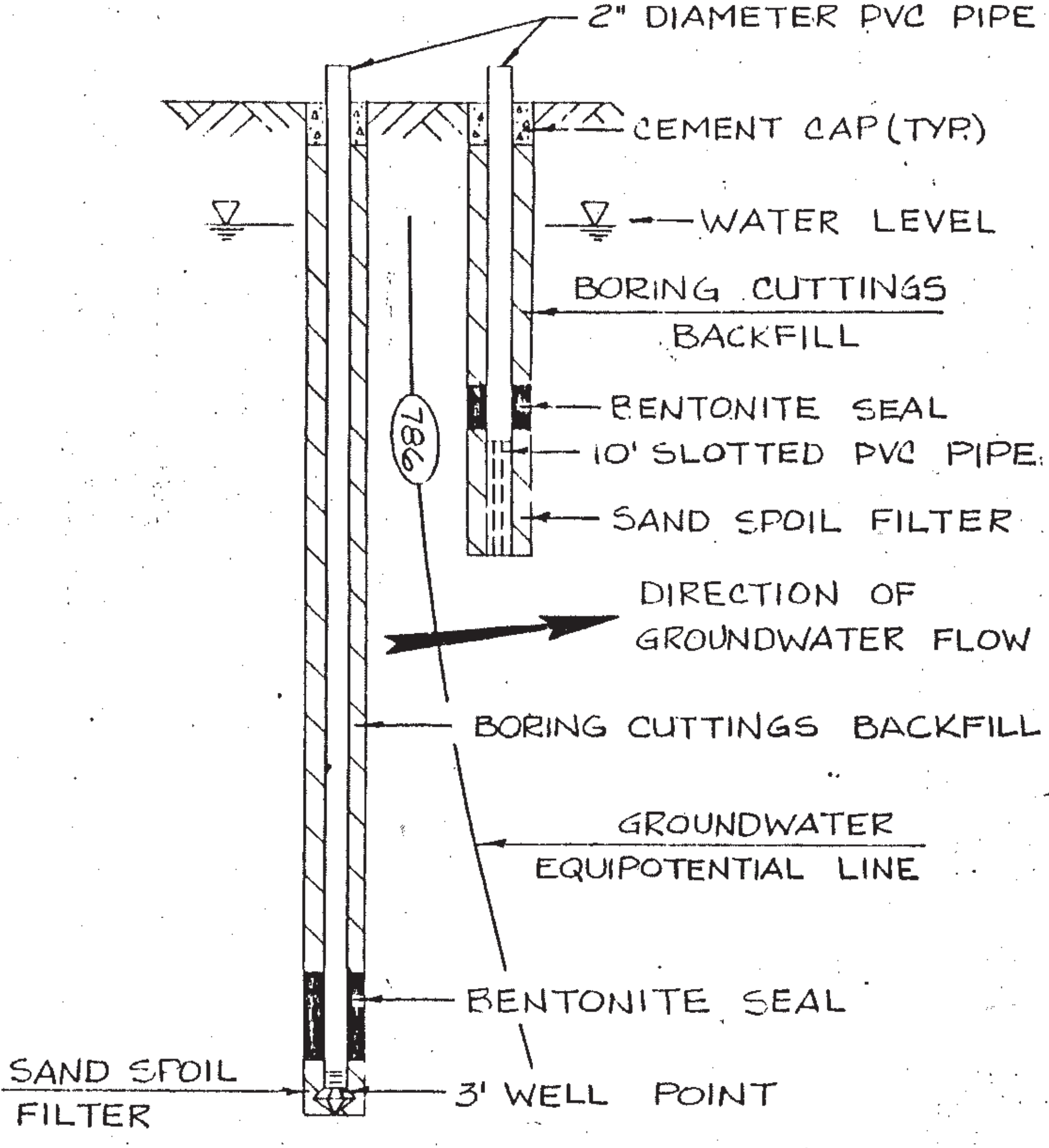
Warzyn Engineering Inc.

Geologic Cross Sections

Drawing No.C7134-11

Date 1-20-78





TYPICAL MONITORING WELL DETAIL

NOT TO SCALE

			Date- 1-20-78 Drawing No. 7134-9	
			Warzyn Engineering Inc.	

WELL DETAIL INFORMATION SHEET

JOB NO. C 7134

BORING NO. MW-84A

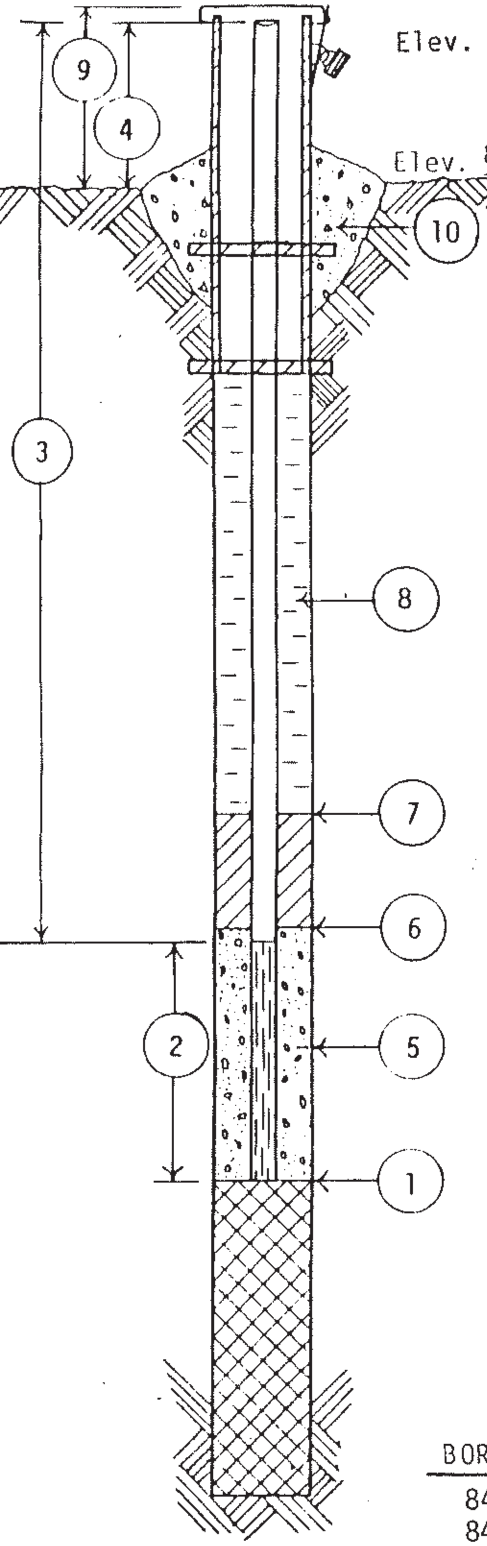
DATE 10/5/83

Elev. 814.57 Steel
814.32 PVC

CHIEF JS

LOCATION WP&L-Columbia Generating Station

Elev. 813.4



All depth measurements of well detail assumed to be from ground surface unless otherwise indicated.

① DEPTH TO BOTTOM OF BOREHOLE 37 FEET

② LENGTH OF WELL POINT, [✓ WELL SCREEN,] OR SLOTTED PIPE 10 FEET

③ TOTAL LENGTH OF SOLID PIPE 29 FEET @ 2 IN. DIAMETER

④ HEIGHT OF WELL CASING ABOVE GROUND 2 FEET

⑤ TYPE OF FILTER MATERIAL AROUND WELL POINT OR SLOTTED PIPE Flint Sand

⑥ DEPTH OF LOWER OR BOTTOM SEAL 3 FEET

⑦ DEPTH OF UPPER OR TOP SEAL 0 FEET

⑧ TYPE OF BACKFILL Spoils (Sand)

⑨ PROTECTIVE CASING [✓ YES] NO

HEIGHT ABOVE GROUND 2'

LOCKING CAP [✓ YES] NO

⑩ CONCRETE CAP [✓ YES] NO

WATER LEVEL CHECKS

* From top of casing, if protective casing higher take measurement from top of protective casing.

BORING #	DATE	TIME	DEPTH TO WATER	REMARKS
84A	10/7/83	3 days	21'	
84B	10/7/83	3 days	19'6"	

WARZY
ENGINEERING IN

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 2

Facility/Project Name: WPL-Columbia SCS#: 25215135.00
License/Permit/Monitoring Number:
Boring Number: MW-301
Boring Drilled By: Name of crew chief (first, last) and Firm: Kevin Durst, Badger State Drilling
Date Drilling Started: 11/11/2015
Date Drilling Completed: 11/11/2015
Drilling Method: hollow stem auger
WI Unique Well No.: VY701
DNR Well ID No.:
Common Well Name:
Final Static Water Level: Feet
Surface Elevation: 803.69 Feet
Borehole Diameter: 8.5 in.
Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 541562.2 N, 2025001.0 E S/C/N
1/4 of 1/4 of Section 27, T 12 N, R 9 E
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W
Facility ID:
County: Columbia
County Code: 11
Civil Town/City/ or Village: Portage

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				SILTY SAND, yellowish brown (10YR 5/6), fine to medium grained.										
			1											
S1	21	7 6 9 10	2							M				
			3											
S2	20	6 7 9 10	4	Same as above except, 10YR 5/4 (top section), 10YR 3/6 (bottom section), trace gravel.						M				
			5											
			6	Same as above except, 10YR 3/4 (bottom), 10YR 5/4 (top), trace little roots and sticks, trace gravel.										
S3	22	7 6 9 6	7		SM					M				
			8											
			9	Same as above except, 10YR (top), 10YR 4/6 (bottom), trace clay at bottom.										
S4	21	4 5 6 5	10							M				
			11	Same as above except, fine to coarse grained sand, little gravel, trace clay in top half, 10YR 3/6.										
S5	18	2 2 4 5	12							M				
			13											
			14	Same as above except, 10YR 6/8.										
S6	20	2 3 3 3	15							M				

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm SCS Engineers
2830 Dairy Drive Madison, WI 53711
Tel: (608) 224-2830
Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-301 Use only as an attachment to Form 4400-122. Page 2 of 2

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			16	SILTY SAND, yellowish brown (10YR 5/6), fine to medium grained.										
S7	20	5 4 4 3	17							M				
			18											
			19											
S8	20	2 4 4 5	20							W				
			21		SM									
S9	23	4 4 3 6	22							W				
			23											
			24	Same as above except, 10YR 6/4.										
S10	21	3 2 4 10	25							W				
			26											
			27											
			28	End of boring at 28 ft bgs.										

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Page 1 of 2

Facility/Project Name WPL-Columbia SCS#: 25215135.00	License/Permit/Monitoring Number		Boring Number MW-302
Boring Drilled By: Name of crew chief (first, last) and Firm Kevin Durst Badger State Drilling	Date Drilling Started 11/11/2015	Date Drilling Completed 11/12/2015	Drilling Method hollow stem auger

WI Unique Well No. VY702	DNR Well ID No.	Common Well Name	Final Static Water Level Feet	Surface Elevation 809.93 Feet	Borehole Diameter 8.5 in.

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Pla 541964.7 N, 2123849 E S/C/N
1/4 of 1/4 of Section 27, T 12 N, R 9 E

Lat ° ' "
Long ° ' "

Local Grid Location
Feet ☐ N ☐ S
Feet ☐ E ☐ W

Facility ID	County Columbia	County Code 11	Civil Town/City/ or Village Portage

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				SILTY SAND, fine to medium grained, trace gravel, 10YR 5/6.	SM									
			1											
S1	12	10 13 17 16	2							M				
			3											
			4	Same as above except, large gravel at bottom, trace to little gravel.										
S2	12	10 12 8 6	5							M				
			6	Same as above except, 10YR 4/6.										
S3	20	2 4 4 5	7							M				
			8											
			9	Same as above except, 10YR 5/8.										
S4	23	3 3 4 5	10							M				
			11	Same as above except, 10YR 6/6.										
S5	20	3 3 3 4	12							M				
			13											
			14	POORLY GRADED SAND, 10YR 6/6.	SP									
S6	20	3 4 4 7	15							M				

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature for Zach Watson	Firm SCS Engineers 2830 Dairy Drive Madison, WI 53711	Tel: (608) 224-2830 Fax:

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number MW-302 Use only as an attachment to Form 4400-122. Page 2 of 2

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID/FID	Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			16	POORLY GRADED SAND, light tan 10YR 8/3.										
S7	20	6 8 10 12	17							M				
			18											
			19		SP									
S8	20	5 6 8 8	20							M				
			21											
S9	19	3 3 3 2	22							M				
			23											
			24	SILTY SAND, 10YR 5/6.	SM									
S10	20	3 3 8 8		POORLY GRADED SAND, 10YR 8/3.						W				
			25											
			26	Same as above except, light tan 10YR 6/6.										
S11	23	5 9 12 12	27							W				
			28											
			29											
			30		SP									
			31											
			32											
			33											
			34											
			35	End of boring at 35 ft bgs.										

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ ____________

Facility/Project Name Alliant-Columbia	County Name Columbia		Well Name MW-301
Facility License, Permit or Monitoring Number	County Code 11	Wis. Unique Well Number VY701	DNR Well ID Number

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method
- surged with bailer and bailed ☐ 41
- surged with bailer and pumped ☒ 61
- surged with block and bailed ☐ 42
- surged with block and pumped ☐ 62
- surged with block, bailed and pumped ☐ 70
- compressed air ☐ 20
- bailed only ☐ 10
- pumped only ☐ 51
- pumped slowly ☐ 50
- Other ____________ ☐

3. Time spent developing well 120 min.

4. Depth of well (from top of well casisng) 29 . 4 ft.

5. Inside diameter of well 2 . 00 in.

6. Volume of water in filter pack and well casing 7 . 6 gal.

7. Volume of water removed from well 84 . 0 gal.

8. Volume of water added (if any) ___ . _ gal.

9. Source of water added ____________

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	21 . 72 ft.	21 . 77 ft.
Date	b.	12 / 02 / 2015 (m m d d y y y y)	12 / 02 / 2015 (m m d d y y y y)
Time	c.	08 : 30 ☒ a.m. ☐ p.m.	10 : 30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		0 . inches	0 . inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	___ . _ mg/l	___ . _ mg/l
15. COD	___ . _ mg/l	___ . _ mg/l

16. Well developed by: Name (first, last) and Firm
First Name: Gary Last Name: Sterkel
Firm: SCS ENGINEERS

17. Additional comments on development:

Name and Address of Facility Contact /Owner/Responsible Party
First Name: Nate Last Name: Sievers
Facility/Firm: Wisconsin Power and Light
Street: W8375 Murray Rd.
City/State/Zip: Pardeville, WI 53954

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: for Gary Sterkel
Print Name: Gary Sterkel
Firm: SCS ENGINEERS

NOTE: See instructions for more information including a list of county codes and well type codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 7-98

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ ______________

Facility/Project Name Alliant - Columbia	County Name Columbia		Well Name MW-302
Facility License, Permit or Monitoring Number	County Code 11	Wis. Unique Well Number VY702	DNR Well ID Number

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method
- surged with bailer and bailed ☐ 4 1
- surged with bailer and pumped ☒ 6 1
- surged with block and bailed ☐ 4 2
- surged with block and pumped ☐ 6 2
- surged with block, bailed and pumped ☐ 7 0
- compressed air ☐ 2 0
- bailed only ☐ 1 0
- pumped only ☐ 5 1
- pumped slowly ☐ 5 0
- Other ______________ ☐

3. Time spent developing well 120 min.

4. Depth of well (from top of well casisng) 33.6 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 5.4 gal.

7. Volume of water removed from well 60.0 gal.

8. Volume of water added (if any) ___.__ gal.

9. Source of water added ______________

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	28.37 ft.	28.41 ft.
Date	b.	12/02/2015 m m d d y y y y	12/02/2015 m m d d y y y y
Time	c.	02:00 ☐ a.m. ☒ p.m.	04:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		0. inches	0. inches
13. Water clarity		Clear ☐ 1 0 Turbid ☒ 1 5 (Describe)	Clear ☒ 2 0 Turbid ☐ 2 5 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Well developed by: Name (first, last) and Firm
First Name: Gary Last Name: Sterkel
Firm: SCS ENGINEERS

17. Additional comments on development:

Name and Address of Facility Contact /Owner/Responsible Party
First Name: Nate Last Name: Sievers
Facility/Firm: Wisconsin Power and Light
Street: W8375 Murray Rd.
City/State/Zip: Pardeeville, WI 53954

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: for G.S.
Print Name: Gary Sterkel
Firm: SCS ENGINEERS

NOTE: See instructions for more information including a list of county codes and well type codes.

SCS # 25215135

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐ ______

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: WPL-Columbia

Local Grid Location of Well: ______ ft. ☐N. ☐S. ______ ft. ☐E. ☐W.

Well Name: MW-301

Facility License, Permit or Monitoring No.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐
Lat. ___° ___' ______" Long. ___° ___' ______" or

Wis. Unique Well No.: VY701

DNR Well ID No.: ___

Facility ID: ______

St. Plane 541562.2 ft. N, 2125001 ft. E. S/C/N

Date Well Installed: 11 / 11 / 2015 (m m / d d / y y y y)

Section Location of Waste/Source: SW 1/4 of SE 1/4 of Sec. 27, T. 12 N, R. 9 ☒E ☐W

Type of Well: Well Code 11 / MW

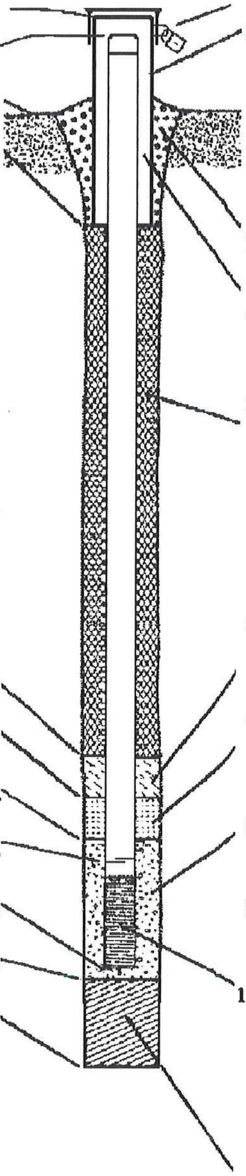
Well Installed By: Name (first, last) and Firm
Kevin Duerst
Badger State Drilling

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number ______

Distance from Waste/Source ______ ft.

Enf. Stds. Apply ☐



A. Protective pipe, top elevation 807.16 ft. MSL

B. Well casing, top elevation 806.89 ft. MSL

C. Land surface elevation 803.69 ft. MSL

D. Surface seal, bottom 791.69 ft. MSL or 12 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
Other ☐ ______

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ______

17. Source of water (attach analysis, if required): ______

E. Bentonite seal, top 803.69 ft. MSL or 0 ft.

F. Fine sand, top 791.69 ft. MSL or 12 ft.

G. Filter pack, top 789.69 ft. MSL or 14 ft.

H. Screen joint, top 787.69 ft. MSL or 16 ft.

I. Well bottom 777.69 ft. MSL or 26 ft.

J. Filter pack, bottom 776.69 ft. MSL or 27 ft.

K. Borehole, bottom 775.69 ft. MSL or 28 ft.

L. Borehole, diameter 8.5 in.

M. O.D. well casing 2.4 in.

N. I.D. well casing 2.0 in.

1. Cap and lock? ☐ Yes ☒ No

2. Protective cover pipe:
a. Inside diameter: 6 in.
b. Length: 5 ft.
c. Material: Steel ☒ 0 4
Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: bumper posts

3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
Other ☐

4. Material between well casing and protective pipe:
Bentonite ☒ 3 0
Bentonite to grade, sand above Other ☐

5. Annular space seal: a. Granular/Chipped Bentonite ☐ 3 3
b. ______ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ______ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 3 1
d. ______ % Bentonite . . . . . . Bentonite-cement grout ☐ 5 0
e. ______ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☐ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☑ 3 2
c. 4 ft3 Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. RW Sidley Inc. #7 ☐
b. Volume added 0.5 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. RW Sidley #5 ☐
b. Volume added 2 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
Other ☐

10. Screen material: PVC
a. Screen type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
Other ☐
b. Manufacturer Johnson
c. Slot size: 0.01 in.
d. Slotted length: 10 ft.

11. Backfill material (below filter pack): None ☐ 1 4
Native Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm: SCS ENGINEERS, 2830 Dairy Drive, Madison, WI 53718-6751

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

SCS # 25215135

State of Wisconsin
Department of Natural Resources

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: WPL-Columbia

Local Grid Location of Well: ______ ft. ☐ N. ☐ S. ______ ft. ☐ E. ☐ W.

Well Name: MW-302

Facility License, Permit or Monitoring No.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat. ° ' " Long. ° ' " or

Wis. Unique Well No.: VY702

DNR Well ID No.

Facility ID

St. Plane 541964.7 ft. N, 2123849 ft. E. S/C/N

Date Well Installed: 11 / 12 / 2015 (m m d d y y y y)

Type of Well

Well Code 11 / MW

Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 27, T. 12 N, R. 9 ☒ E ☐ W

Well Installed By: Name (first, last) and Firm

Kevin Duerst

Badger State Drilling

Distance from Waste/Source ______ ft.

Enf. Stds. Apply ☐

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Gov. Lot Number

A. Protective pipe, top elevation 813.19 ft. MSL

B. Well casing, top elevation 813.00 ft. MSL

C. Land surface elevation 809.93 ft. MSL

D. Surface seal, bottom 793.53 ft. MSL or 16.4 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ______

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 809.93 ft. MSL or 0 ft.

F. Fine sand, top 793.53 ft. MSL or 16.4 ft.

G. Filter pack, top 791.53 ft. MSL or 18.4 ft.

H. Screen joint, top 789.53 ft. MSL or 20.4 ft.

I. Well bottom 779.53 ft. MSL or 30.4 ft.

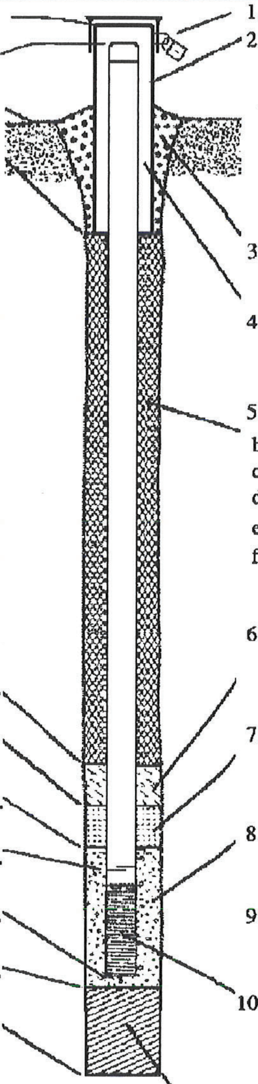
J. Filter pack, bottom 776.93 ft. MSL or 33 ft.

K. Borehole, bottom 776.93 ft. MSL or 33 ft.

L. Borehole, diameter 8.5 in.

M. O.D. well casing 2 3/8 in.

N. I.D. well casing 2 in.



1. Cap and lock? ☐ Yes ☒ No

2. Protective cover pipe:
   - a. Inside diameter: 6 in.
   - b. Length: 5 ft.
   - c. Material: Steel ☐ 0 4; Other ☐ — steel
   - d. Additional protection? ☐ Yes ☐ No
     If yes, describe: yes, bumper posts

3. Surface seal: Bentonite ☒ 3 0; Concrete ☐ 0 1; Other ☐

4. Material between well casing and protective pipe: Bentonite ☒ 3 0; Other ☐ — Bentonite to grade, sand above

5. Annular space seal:
   - a. Granular/Chipped Bentonite ☐ 3 3
   - b. ______ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
   - c. ______ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 3 1
   - d. ______ % Bentonite . . . . . . Bentonite-cement grout ☐ 5 0
   - e. ______ Ft^3 volume added for any of the above
   - f. How installed: Tremie ☐ 0 1; Tremie pumped ☐ 0 2; Gravity ☐ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
   - b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2
   - c. 4.7 ft3 Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
   - a. RW Sidley Inc. #7 ☐
   - b. Volume added 1 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
   - a. RW Sidley #5 ☐
   - b. Volume added 2.5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3; Flush threaded PVC schedule 80 ☐ 2 4; Other ☐

10. Screen material: PVC
    - a. Screen type: Factory cut ☒ 1 1; Continuous slot ☐ 0 1; Other ☐
    - b. Manufacturer Johnson
    - c. Slot size: 0.01 in.
    - d. Slotted length: 10 ft.

11. Backfill material (below filter pack): None ☐ 1 4; Other ☒ — Native

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: for Zach Watson

Firm: SCS ENGINEERS, 2830 Dairy Drive, Madison, WI 53718-6751

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

Appendix C

Laboratory Reports

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

October 30, 2023

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on October 13, 2023. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Matt Bizjack, Alliant Energy
Natalie Burris, SCS ENGINEERS
Sherren Clark, SCS Engineers
Jenny Coughlin, Alliant Energy
Tom Karwoski, SCS ENGINEERS
Ryan Matzuk, SCS Engineers
Jeff Maxted, ALLIANT ENERGY

CERTIFICATIONS

Project:	25223067 COLUMBIA CCR MOD 1-3
Pace Project No.:	40269530

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302

Florida/NELAP Certification #:	E87948
Illinois Certification #:	200050
Kentucky UST Certification #:	82
Louisiana Certification #:	04168
Minnesota Certification #:	055-999-334
New York Certification #:	12064
North Dakota Certification #:	R-150
South Carolina Certification #:	83006001
Texas Certification #:	T104704529-21-8
Virginia VELAP Certification ID:	11873
Wisconsin Certification #:	405132750
Wisconsin DATCP Certification #:	105-444
USDA Soil Permit #:	P330-21-00008
Federal Fish & Wildlife Permit #:	51774A

SAMPLE SUMMARY

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40269530001	**MW-302**	Water	10/11/23 14:20	10/13/23 09:15
40269530002	**MW-33AR**	Water	10/11/23 12:00	10/13/23 09:15
40269530003	**MW-34A**	Water	10/11/23 13:10	10/13/23 09:15
40269530004	**FIELD BLANK-MOD1-3LF**	Water	10/11/23 13:30	10/13/23 09:15

SAMPLE ANALYTE COUNT

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

Lab ID	Sample ID	Method	Analysts	Analytes Reported
40269530001	**MW-302**	EPA 6020B	KXS	2
			LB	7
		SM 2540C	TXW	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3
40269530002	**MW-33AR**	EPA 6020B	KXS	2
			LB	7
		SM 2540C	TXW	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3
40269530003	**MW-34A**	EPA 6020B	KXS	2
			LB	7
		SM 2540C	TXW	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3
40269530004	**FIELD BLANK-MOD1-3LF**	EPA 6020B	KXS	2
		SM 2540C	TXW	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3

PASI-G = Pace Analytical Services - Green Bay

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

Sample: MW-302 **Lab ID: 40269530001** Collected: 10/11/23 14:20 Received: 10/13/23 09:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**309**	ug/L	10.0	3.0	1	10/17/23 05:40	10/21/23 00:11	7440-42-8	
Calcium	**70800**	ug/L	254	76.2	1	10/17/23 05:40	10/21/23 00:11	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.40**	Std. Units			1		10/11/23 14:20		
Field Specific Conductance	**559.4**	umhos/cm			1		10/11/23 14:20		
Oxygen, Dissolved	**9.93**	mg/L			1		10/11/23 14:20	7782-44-7	
REDOX	**152.5**	mV			1		10/11/23 14:20		
Turbidity	**0.15**	NTU			1		10/11/23 14:20		
Static Water Level	**784.65**	feet			1		10/11/23 14:20		
Temperature, Water (C)	**11.8**	deg C			1		10/11/23 14:20		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**354**	mg/L	20.0	8.7	1		10/16/23 14:10		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.4**	Std. Units	0.10	0.010	1		10/18/23 16:17		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**1.6J**	mg/L	2.0	0.59	1		10/26/23 18:05	16887-00-6	
Fluoride	**0.10J**	mg/L	0.32	0.095	1		10/26/23 18:05	16984-48-8	
Sulfate	**19.9**	mg/L	2.0	0.44	1		10/26/23 18:05	14808-79-8	

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

Sample: MW-33AR **Lab ID: 40269530002** Collected: 10/11/23 12:00 Received: 10/13/23 09:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**485**	ug/L	20.0	6.1	2	10/17/23 05:40	10/21/23 00:18	7440-42-8	
Calcium	**59400**	ug/L	508	152	2	10/17/23 05:40	10/21/23 00:18	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.88**	Std. Units			1		10/11/23 12:00		
Field Specific Conductance	**691**	umhos/cm			1		10/11/23 12:00		
Oxygen, Dissolved	**9.11**	mg/L			1		10/11/23 12:00	7782-44-7	
REDOX	**131.2**	mV			1		10/11/23 12:00		
Turbidity	**0.93**	NTU			1		10/11/23 12:00		
Static Water Level	**782.57**	feet			1		10/11/23 12:00		
Temperature, Water (C)	**13.3**	deg C			1		10/11/23 12:00		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**448**	mg/L	20.0	8.7	1		10/16/23 14:10		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.7**	Std. Units	0.10	0.010	1		10/18/23 16:24		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**24.2**	mg/L	2.0	0.59	1		10/26/23 18:20	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/26/23 18:20	16984-48-8	
Sulfate	**139**	mg/L	20.0	4.4	10		10/27/23 13:07	14808-79-8	

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

Sample: MW-34A **Lab ID: 40269530003** Collected: 10/11/23 13:10 Received: 10/13/23 09:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**237**	ug/L	10.0	3.0	1	10/17/23 05:40	10/21/23 00:25	7440-42-8	
Calcium	**59000**	ug/L	254	76.2	1	10/17/23 05:40	10/21/23 00:25	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.78**	Std. Units			1		10/11/23 13:10		
Field Specific Conductance	**457.3**	umhos/cm			1		10/11/23 13:10		
Oxygen, Dissolved	**8.32**	mg/L			1		10/11/23 13:10	7782-44-7	
REDOX	**122.4**	mV			1		10/11/23 13:10		
Turbidity	**1.05**	NTU			1		10/11/23 13:10		
Static Water Level	**783.55**	feet			1		10/11/23 13:10		
Temperature, Water (C)	**13.0**	deg C			1		10/11/23 13:10		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**302**	mg/L	20.0	8.7	1		10/16/23 14:10		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.7**	Std. Units	0.10	0.010	1		10/18/23 16:27		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**2.7**	mg/L	2.0	0.59	1		10/26/23 18:34	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/26/23 18:34	16984-48-8	
Sulfate	**43.6**	mg/L	2.0	0.44	1		10/26/23 18:34	14808-79-8	

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

Sample: FIELD BLANK-MOD1-3LF **Lab ID: 40269530004** Collected: 10/11/23 13:30 Received: 10/13/23 09:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**<3.0**	ug/L	10.0	3.0	1	10/17/23 05:40	10/20/23 23:41	7440-42-8	
Calcium	**139J**	ug/L	254	76.2	1	10/17/23 05:40	10/20/23 23:41	7440-70-2	
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**14.0J**	mg/L	20.0	8.7	1		10/16/23 14:10		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**6.1**	Std. Units	0.10	0.010	1		10/18/23 16:39		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**<0.59**	mg/L	2.0	0.59	1		10/26/23 18:48	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/26/23 18:48	16984-48-8	
Sulfate	**<0.44**	mg/L	2.0	0.44	1		10/26/23 18:48	14808-79-8	

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

QC Batch: 457666
QC Batch Method: EPA 3010A
Analysis Method: EPA 6020B
Analysis Description: 6020B MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269530001, 40269530002, 40269530003, 40269530004

METHOD BLANK: 2628354 Matrix: Water
Associated Lab Samples: 40269530001, 40269530002, 40269530003, 40269530004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	<3.0	10.0	10/19/23 20:38	
Calcium	ug/L	<76.2	254	10/19/23 20:38	

LABORATORY CONTROL SAMPLE: 2628355

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	250	248	99	80-120	
Calcium	ug/L	10000	10300	103	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2628356 2628357

Parameter	Units	40269463001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	33.5	250	250	288	286	102	101	75-125	1	20	
Calcium	ug/L	156000	10000	10000	181000	164000	252	80	75-125	10	20	P6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

QC Batch: 457628
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269530001, 40269530002, 40269530003, 40269530004

METHOD BLANK: 2628234
Matrix: Water
Associated Lab Samples: 40269530001, 40269530002, 40269530003, 40269530004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	10/16/23 14:07	

LABORATORY CONTROL SAMPLE: 2628235

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	587	564	96	80-120	

SAMPLE DUPLICATE: 2628236

Parameter	Units	40269514003 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	542	550	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

QC Batch: 457892
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269530001, 40269530002, 40269530003, 40269530004

SAMPLE DUPLICATE: 2629567

Parameter	Units	40269529001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.2	7.2	0	20	H6

SAMPLE DUPLICATE: 2629568

Parameter	Units	40269609008 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.6	7.8	2	20	1q,H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40269530

QC Batch: 458622
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269530001, 40269530002, 40269530003, 40269530004

METHOD BLANK: 2633879 Matrix: Water
Associated Lab Samples: 40269530001, 40269530002, 40269530003, 40269530004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.59	2.0	10/26/23 15:42	
Fluoride	mg/L	<0.095	0.32	10/26/23 15:42	
Sulfate	mg/L	<0.44	2.0	10/26/23 15:42	

LABORATORY CONTROL SAMPLE: 2633880

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	21.9	109	90-110	
Fluoride	mg/L	2	2.2	108	90-110	
Sulfate	mg/L	20	21.7	108	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2633881 2633882

Parameter	Units	40269529001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	2.1	20	20	23.4	23.6	107	108	90-110	1	15	
Fluoride	mg/L	<0.095	2	2	2.4	2.4	115	116	90-110	1	15	M0
Sulfate	mg/L	11.8	20	20	33.6	33.6	109	109	90-110	0	15	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2633883 2633884

Parameter	Units	40269593002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	523	400	400	935	935	103	103	90-110	0	15	
Sulfate	mg/L	277	400	400	697	694	105	104	90-110	0	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25223067 COLUMBIA CCR MOD 1-3
Pace Project No.:	40269530

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

DL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

1q	Due to the sample matrix, DI water was added to this sample on a one to one basis and the sample was stirred before analysis.
H6	Analysis initiated outside of the 15 minute EPA required holding time.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project:	25223067 COLUMBIA CCR MOD 1-3
Pace Project No.:	40269530

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40269530001	**MW-302**	EPA 3010A	457666	EPA 6020B	457761
40269530002	**MW-33AR**	EPA 3010A	457666	EPA 6020B	457761
40269530003	**MW-34A**	EPA 3010A	457666	EPA 6020B	457761
40269530004	**FIELD BLANK-MOD1-3LF**	EPA 3010A	457666	EPA 6020B	457761
40269530001	**MW-302**				
40269530002	**MW-33AR**				
40269530003	**MW-34A**				
40269530001	**MW-302**	SM 2540C	457628		
40269530002	**MW-33AR**	SM 2540C	457628		
40269530003	**MW-34A**	SM 2540C	457628		
40269530004	**FIELD BLANK-MOD1-3LF**	SM 2540C	457628		
40269530001	**MW-302**	EPA 9040	457892		
40269530002	**MW-33AR**	EPA 9040	457892		
40269530003	**MW-34A**	EPA 9040	457892		
40269530004	**FIELD BLANK-MOD1-3LF**	EPA 9040	457892		
40269530001	**MW-302**	EPA 300.0	458622		
40269530002	**MW-33AR**	EPA 300.0	458622		
40269530003	**MW-34A**	EPA 300.0	458622		
40269530004	**FIELD BLANK-MOD1-3LF**	EPA 300.0	458622		

40269530

Pace

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

Page : 1 Of 1

Section A
Required Client Information:

Company: SCS ENGINEERS
Address: 2830 Dairy Drive
Madison, WI 53718
Email: mblodgett@scsengineers.com
Phone: 608-216-7362
Fax:
Requested Due Date:

Section B
Required Project Information:

Report To: Meghan Blodgett
Copy To:
Purchase Order #.
Project Name: 25223067 Columbia CCR Mod 1-3
Project #: 25223067

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote:
Pace Project Manager: dan.milewsky@pacelabs.com,
Pace Profile #: 3946-12,13

Regulatory Agency:
State / Location: WI

SAMPLE ID
One Character per box.
(A-Z, 0-9 / , -)
Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Metals(B/Ca) N	TDS and pH N	Metals (full list) N	Radium 226 N	Radium 228 N	Chloride, Fluoride, Sulfate N	Residual Chlorine (Y/N)	
1	MW-302	WT		10/11	1420				4										x	x				x		001
2	MW-33AR	WT		10/11	1200				4										x	x				x		002
3	MW-34A	WT		10/11	1310				4										x	x				x		003
4	FIELD BLANK-MOD1-3LF	WT		10/11	1350				4										x	x				x		004
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
ALL SAMPLES UNFILTERED full list metals=Sb,As,B,Ba,Be,Ca,Cd,Cr,Co,Pb,Li,Mo,Se,Tl and Hg	Bridget Russell SCS Eng	10/12	1100							
		10/13/23	0915		10/13/23	0915	1.0	Y	N	Y
							TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Bridget Russell
SIGNATURE of SAMPLER:
DATE Signed: 10/12/23

Sample Preservation Receipt Form

Client Name: SCS

Project # 40269530

All containers needing preservation have been checked and noted below: ☑Yes ☐No ☐N/A

Lab Lot# of pH paper: 1012723

Lab Std #ID of preservation (if pH adjusted):

Initial when completed:

Date/ Time:

	Glass							Plastic						Vials						Jars				General										
Pace Lab #	AG1U	BG1U	AG1H	AG4S	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	BP2Z	VG9C	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN 1	GN 2	VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
001									2		2																					X		2.5 / 5
002									2		2																					X		2.5 / 5
003									2		2																					X		2.5 / 5
004									2		2																					X		2.5 / 5
005																																		2.5 / 5
006																																		2.5 / 5
007																																		2.5 / 5
008																																		2.5 / 5
009																																		2.5 / 5
010																																		2.5 / 5
011																																		2.5 / 5
012																																		2.5 / 5
013																																		2.5 / 5
014																																		2.5 / 5
015																																		2.5 / 5
016																																		2.5 / 5
017																																		2.5 / 5
018																																		2.5 / 5
019																																		2.5 / 5
020																																		2.5 / 5

10/13/23

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:

Headspace in VOA Vials (>6mm) : ☐Yes ☐No ☒N/A *If yes look in headspace column

AG1U	1 liter amber glass
BG1U	1 liter clear glass
AG1H	1 liter amber glass HCL
AG4S	125 mL amber glass H2SO4
AG5U	100 mL amber glass unpres
AG2S	500 mL amber glass H2SO4
BG3U	250 mL clear glass unpres

BP1U	1 liter plastic unpres
BP3U	250 mL plastic unpres
BP3B	250 mL plastic NaOH
BP3N	250 mL plastic HNO3
BP3S	250 mL plastic H2SO4
BP2Z	500 mL plastic NaOH + Zn

VG9C	40 mL clear ascorbic w/ HCl
DG9T	40 mL amber Na Thio
VG9U	40 mL clear vial unpres
VG9H	40 mL clear vial HCL
VG9M	40 mL clear vial MeOH
VG9D	40 mL clear vial DI

JGFU	4 oz amber jar unpres
JG9U	9 oz amber jar unpres
WGFU	4 oz clear jar unpres
WPFU	4 oz plastic jar unpres
SP5T	120 mL plastic Na Thiosulfate
ZPLC	ziploc bag
GN 1	
GN 2	

Page 1 of 2

DC#_Title: ENV-FRM-GBAY-0014 v03_SCUR
Effective Date: 8/17/2022

Sample Condition Upon Receipt Form (SCUR)

Client Name: SCS

Project #: **WO#: 40269530**
40269530

Courier: ☑ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco ☐ Client ☐ Pace Other: ______

Tracking #: ______

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ Other ______

Thermometer Used SR - 109 **Type of Ice:** [✓ Wet] Blue Dry None ☐ Meltwater Only

Cooler Temperature Uncorr: 1.0 /Corr: 1.0

Temp Blank Present: ☑ yes ☐ no **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Person examining contents:
Date: 10/13/22 Initials: SG
Labeled By Initials: ______

Chain of Custody Present:	☑ Yes ☐ No ☐ N/A	1.
Chain of Custody Filled Out:	☑ Yes ☐ No ☐ N/A	2.
Chain of Custody Relinquished:	☑ Yes ☐ No ☐ N/A	3.
Sampler Name & Signature on COC:	☑ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time:	☑ Yes ☐ No	5.
- DI VOA Samples frozen upon receipt	☐ Yes ☐ No	Date/Time:
Short Hold Time Analysis (<72hr):	☐ Yes ☑ No	6.
Rush Turn Around Time Requested:	☐ Yes ☑ No	7.
Sufficient Volume: For Analysis: ☑ Yes ☐ No	MS/MSD: ☐ Yes ☑ No ☐ N/A	8.
Correct Containers Used: Correct Type: [✓ Pace Green Bay], Pace IR, Non-Pace	☑ Yes ☐ No	9.
Containers Intact:	☑ Yes ☐ No	10.
Filtered volume received for Dissolved tests	☐ Yes ☐ No ☑ N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: W	☑ Yes ☐ No ☐ N/A	12.
Trip Blank Present:	☐ Yes ☐ No ☑ N/A	13.
Trip Blank Custody Seals Present	☐ Yes ☐ No ☑ N/A	
Pace Trip Blank Lot # (if purchased): ______		

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: ______ Date/Time: ______

Comments/ Resolution: ______

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logi

Page 2 of 2

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

November 06, 2023

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on October 13, 2023. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay
- Pace Analytical Services - Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Matt Bizjack, Alliant Energy
Natalie Burris, SCS ENGINEERS
Sherren Clark, SCS Engineers
Jenny Coughlin, Alliant Energy
Tom Karwoski, SCS ENGINEERS
Ryan Matzuk, SCS Engineers
Jeff Maxted, ALLIANT ENERGY

CERTIFICATIONS

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
ANABISO/IEC 17025:2017 Rad Cert#: L24170
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 2950
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA010
Louisiana DEQ/TNI Certification #: 04086
Maine Certification #: 2023021
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572023-03
New Hampshire/TNI Certification #: 297622
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-015
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN02867
Texas/TNI Certification #: T104704188-22-18
Utah/TNI Certification #: PA014572223-14
USDA Soil Permit #: 525-23-67-77263
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
Texas Certification #: T104704529-21-8
Virginia VELAP Certification ID: 11873
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-21-00008
Federal Fish & Wildlife Permit #: 51774A

SAMPLE SUMMARY

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40269529001	**MW-301**	Water	10/11/23 14:15	10/13/23 09:15
40269529002	**MW-84A**	Water	10/11/23 15:00	10/13/23 09:15

SAMPLE ANALYTE COUNT

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40269529001	**MW-301**	EPA 6020B	KXS	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			LB	7	PASI-G
		EPA 903.1	LL1	1	PASI-PA
		EPA 904.0	JJS1	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C	TMK	1	PASI-G
		EPA 9040	HML	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40269529002	**MW-84A**	EPA 6020B	KXS	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			LB	7	PASI-G
		EPA 903.1	LL1	1	PASI-PA
		EPA 904.0	JJS1	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C	TMK	1	PASI-G
		EPA 9040	HML	1	PASI-G
		EPA 300.0	HMB	3	PASI-G

PASI-G = Pace Analytical Services - Green Bay
PASI-PA = Pace Analytical Services - Greensburg

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Sample: MW-301 **Lab ID: 40269529001** Collected: 10/11/23 14:15 Received: 10/13/23 09:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Antimony	**<0.15**	ug/L	1.0	0.15	1	10/17/23 06:27	10/19/23 01:12	7440-36-0	
Arsenic	**<0.28**	ug/L	1.0	0.28	1	10/17/23 06:27	10/19/23 01:12	7440-38-2	
Barium	**7.3**	ug/L	2.3	0.70	1	10/17/23 06:27	10/19/23 01:12	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	10/17/23 06:27	10/19/23 01:12	7440-41-7	
Boron	**36.2**	ug/L	10.0	3.0	1	10/17/23 06:27	10/19/23 01:12	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	10/17/23 06:27	10/19/23 01:12	7440-43-9	
Calcium	**52300**	ug/L	254	76.2	1	10/17/23 06:27	10/19/23 01:12	7440-70-2	
Chromium	**<1.0**	ug/L	3.4	1.0	1	10/17/23 06:27	10/19/23 01:12	7440-47-3	
Cobalt	**0.13J**	ug/L	1.0	0.12	1	10/17/23 06:27	10/19/23 01:12	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	10/17/23 06:27	10/19/23 01:12	7439-92-1	
Lithium	**0.43J**	ug/L	1.0	0.22	1	10/17/23 06:27	10/19/23 01:12	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	10/17/23 06:27	10/19/23 01:12	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	10/17/23 06:27	10/19/23 01:12	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	10/17/23 06:27	10/19/23 01:12	7440-28-0	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.066**	ug/L	0.20	0.066	1	10/18/23 10:55	10/19/23 06:31	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.06**	Std. Units			1		10/11/23 14:15		
Field Specific Conductance	**536**	umhos/cm			1		10/11/23 14:15		
Oxygen, Dissolved	**0.16**	mg/L			1		10/11/23 14:15	7782-44-7	
REDOX	**23.8**	mV			1		10/11/23 14:15		
Turbidity	**0.34**	NTU			1		10/11/23 14:15		
Static Water Level	**784.67**	feet			1		10/11/23 14:15		
Temperature, Water (C)	**10.7**	deg C			1		10/11/23 14:15		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**300**	mg/L	20.0	8.7	1		10/15/23 21:57		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.2**	Std. Units	0.10	0.010	1		10/18/23 16:04		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**2.1**	mg/L	2.0	0.59	1		10/26/23 16:25	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/26/23 16:25	16984-48-8	M0
Sulfate	**11.8**	mg/L	2.0	0.44	1		10/26/23 16:25	14808-79-8	

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Sample: MW-84A **Lab ID: 40269529002** Collected: 10/11/23 15:00 Received: 10/13/23 09:15 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Antimony	**<0.15**	ug/L	1.0	0.15	1	10/17/23 06:27	10/19/23 01:19	7440-36-0	
Arsenic	**<0.28**	ug/L	1.0	0.28	1	10/17/23 06:27	10/19/23 01:19	7440-38-2	
Barium	**12.7**	ug/L	2.3	0.70	1	10/17/23 06:27	10/19/23 01:19	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	10/17/23 06:27	10/19/23 01:19	7440-41-7	
Boron	**14.0**	ug/L	10.0	3.0	1	10/17/23 06:27	10/19/23 01:19	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	10/17/23 06:27	10/19/23 01:19	7440-43-9	
Calcium	**65100**	ug/L	254	76.2	1	10/17/23 06:27	10/19/23 01:19	7440-70-2	
Chromium	**1.6J**	ug/L	3.4	1.0	1	10/17/23 06:27	10/19/23 01:19	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	10/17/23 06:27	10/19/23 01:19	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	10/17/23 06:27	10/19/23 01:19	7439-92-1	
Lithium	**0.54J**	ug/L	1.0	0.22	1	10/17/23 06:27	10/19/23 01:19	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	10/17/23 06:27	10/19/23 01:19	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	10/17/23 06:27	10/19/23 01:19	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	10/17/23 06:27	10/19/23 01:19	7440-28-0	
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.066**	ug/L	0.20	0.066	1	10/18/23 10:55	10/19/23 06:33	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.51**	Std. Units			1		10/11/23 15:00		
Field Specific Conductance	**599.9**	umhos/cm			1		10/11/23 15:00		
Oxygen, Dissolved	**8.44**	mg/L			1		10/11/23 15:00	7782-44-7	
REDOX	**91.2**	mV			1		10/11/23 15:00		
Turbidity	**0.03**	NTU			1		10/11/23 15:00		
Static Water Level	**784.39**	feet			1		10/11/23 15:00		
Temperature, Water (C)	**12.3**	deg C			1		10/11/23 15:00		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**324**	mg/L	20.0	8.7	1		10/15/23 21:58		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.6**	Std. Units	0.10	0.010	1		10/18/23 16:13		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**3.1**	mg/L	2.0	0.59	1		10/26/23 17:51	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		10/26/23 17:51	16984-48-8	
Sulfate	**1.4J**	mg/L	2.0	0.44	1		10/26/23 17:51	14808-79-8	

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

QC Batch: 457855
QC Batch Method: EPA 7470
Analysis Method: EPA 7470
Analysis Description: 7470 Mercury
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269529001, 40269529002

METHOD BLANK: 2629305 Matrix: Water
Associated Lab Samples: 40269529001, 40269529002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	<0.066	0.20	10/19/23 05:49	

LABORATORY CONTROL SAMPLE: 2629306

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	5.2	105	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2629307 2629308

Parameter	Units	40269479001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	<0.066	5	5	5.2	4.9	103	98	85-115	6	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

QC Batch: 457669
QC Batch Method: EPA 3010A
Analysis Method: EPA 6020B
Analysis Description: 6020B MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269529001, 40269529002

METHOD BLANK: 2628366
Matrix: Water
Associated Lab Samples: 40269529001, 40269529002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	<0.15	1.0	10/18/23 21:17	
Arsenic	ug/L	<0.28	1.0	10/18/23 21:17	
Barium	ug/L	<0.70	2.3	10/18/23 21:17	
Beryllium	ug/L	<0.25	1.0	10/18/23 21:17	
Boron	ug/L	<3.0	10.0	10/18/23 21:17	
Cadmium	ug/L	<0.15	1.0	10/18/23 21:17	
Calcium	ug/L	<76.2	254	10/18/23 21:17	
Chromium	ug/L	<1.0	3.4	10/18/23 21:17	
Cobalt	ug/L	<0.12	1.0	10/18/23 21:17	
Lead	ug/L	<0.24	1.0	10/18/23 21:17	
Lithium	ug/L	<0.22	1.0	10/18/23 21:17	
Molybdenum	ug/L	<0.44	1.5	10/18/23 21:17	
Selenium	ug/L	<0.32	1.1	10/18/23 21:17	
Thallium	ug/L	<0.14	1.0	10/18/23 21:17	

LABORATORY CONTROL SAMPLE: 2628367

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	250	242	97	80-120	
Arsenic	ug/L	250	242	97	80-120	
Barium	ug/L	250	236	94	80-120	
Beryllium	ug/L	250	260	104	80-120	
Boron	ug/L	250	240	96	80-120	
Cadmium	ug/L	250	245	98	80-120	
Calcium	ug/L	10000	10400	104	80-120	
Chromium	ug/L	250	232	93	80-120	
Cobalt	ug/L	250	237	95	80-120	
Lead	ug/L	250	243	97	80-120	
Lithium	ug/L	250	239	95	80-120	
Molybdenum	ug/L	250	238	95	80-120	
Selenium	ug/L	250	251	100	80-120	
Thallium	ug/L	250	240	96	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2628368 2628369

Parameter	Units	40269514001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Antimony	ug/L	0.22J	250	250	240	241	96	96	75-125	0	20	
Arsenic	ug/L	0.42J	250	250	241	245	96	98	75-125	2	20	
Barium	ug/L	18.3	250	250	251	252	93	94	75-125	0	20	
Beryllium	ug/L	<0.25	250	250	254	258	102	103	75-125	2	20	
Boron	ug/L	106	250	250	338	335	93	92	75-125	1	20	
Cadmium	ug/L	<0.15	250	250	241	241	96	96	75-125	0	20	
Calcium	ug/L	110000	10000	10000	120000	121000	97	105	75-125	1	20	
Chromium	ug/L	2.3J	250	250	230	233	91	92	75-125	2	20	
Cobalt	ug/L	0.17J	250	250	228	232	91	93	75-125	2	20	
Lead	ug/L	<0.24	250	250	241	243	96	97	75-125	1	20	
Lithium	ug/L	13.9	250	250	250	252	95	95	75-125	1	20	
Molybdenum	ug/L	7.4	250	250	244	243	94	94	75-125	0	20	
Selenium	ug/L	1.4	250	250	247	252	98	100	75-125	2	20	
Thallium	ug/L	0.15J	250	250	238	242	95	97	75-125	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

QC Batch: 457507
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269529001, 40269529002

METHOD BLANK: 2627853 Matrix: Water
Associated Lab Samples: 40269529001, 40269529002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	10/15/23 21:53	

LABORATORY CONTROL SAMPLE: 2627854

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	587	580	99	80-120	

SAMPLE DUPLICATE: 2627855

Parameter	Units	40269478001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	200	214	7	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

QC Batch: 457892
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269529001, 40269529002

SAMPLE DUPLICATE: 2629567

Parameter	Units	40269529001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.2	7.2	0	20	H6

SAMPLE DUPLICATE: 2629568

Parameter	Units	40269609008 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.6	7.8	2	20	1q,H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

QC Batch: 458622
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40269529001, 40269529002

METHOD BLANK: 2633879 Matrix: Water
Associated Lab Samples: 40269529001, 40269529002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.59	2.0	10/26/23 15:42	
Fluoride	mg/L	<0.095	0.32	10/26/23 15:42	
Sulfate	mg/L	<0.44	2.0	10/26/23 15:42	

LABORATORY CONTROL SAMPLE: 2633880

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	21.9	109	90-110	
Fluoride	mg/L	2	2.2	108	90-110	
Sulfate	mg/L	20	21.7	108	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2633881 2633882

Parameter	Units	40269529001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	2.1	20	20	23.4	23.6	107	108	90-110	1	15	
Fluoride	mg/L	<0.095	2	2	2.4	2.4	115	116	90-110	1	15	M0
Sulfate	mg/L	11.8	20	20	33.6	33.6	109	109	90-110	0	15	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2633883 2633884

Parameter	Units	40269593002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	523	400	400	935	935	103	103	90-110	0	15	
Sulfate	mg/L	277	400	400	697	694	105	104	90-110	0	15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Sample: MW-301 **Lab ID: 40269529001** Collected: 10/11/23 14:15 Received: 10/13/23 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**-0.0576 ± 0.492 (1.00)** **C:NA T:85%**	pCi/L	11/01/23 14:28	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.611 ± 0.377 (0.692)** **C:84% T:85%**	pCi/L	10/25/23 14:33	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.611 ± 0.869 (1.69)**	pCi/L	11/02/23 11:24	7440-14-4	

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Sample: MW-84A **Lab ID: 40269529002** Collected: 10/11/23 15:00 Received: 10/13/23 09:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**0.292 ± 0.445 (0.766)** **C:NA T:84%**	pCi/L	11/01/23 14:28	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.552 ± 0.360 (0.676)** **C:83% T:84%**	pCi/L	10/25/23 14:33	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.844 ± 0.805 (1.44)**	pCi/L	11/02/23 11:24	7440-14-4	

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

QC Batch: 622852
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40269529001, 40269529002

METHOD BLANK: 3036014
Matrix: Water
Associated Lab Samples: 40269529001, 40269529002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.0951 ± 0.264 (0.512) C:NA T:83%	pCi/L	11/01/23 14:15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

QC Batch: 622853
QC Batch Method: EPA 904.0
Analysis Method: EPA 904.0
Analysis Description: 904.0 Radium 228
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40269529001, 40269529002

METHOD BLANK: 3036016
Matrix: Water
Associated Lab Samples: 40269529001, 40269529002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.399 ± 0.328 (0.647) C:82% T:83%	pCi/L	10/25/23 14:31	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25223067 COLUMBIA CCR BACKGRND
Pace Project No.:	40269529

DEFINITIONS

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

DL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

1q	Due to the sample matrix, DI water was added to this sample on a one to one basis and the sample was stirred before analysis.
H6	Analysis initiated outside of the 15 minute EPA required holding time.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25223067 COLUMBIA CCR BACKGRND
Pace Project No.: 40269529

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40269529001	**MW-301**	EPA 3010A	457669	EPA 6020B	457769
40269529002	**MW-84A**	EPA 3010A	457669	EPA 6020B	457769
40269529001	**MW-301**	EPA 7470	457855	EPA 7470	457902
40269529002	**MW-84A**	EPA 7470	457855	EPA 7470	457902
40269529001	**MW-301**				
40269529002	**MW-84A**				
40269529001	**MW-301**	EPA 903.1	622852		
40269529002	**MW-84A**	EPA 903.1	622852		
40269529001	**MW-301**	EPA 904.0	622853		
40269529002	**MW-84A**	EPA 904.0	622853		
40269529001	**MW-301**	Total Radium Calculation	626730		
40269529002	**MW-84A**	Total Radium Calculation	626730		
40269529001	**MW-301**	SM 2540C	457507		
40269529002	**MW-84A**	SM 2540C	457507		
40269529001	**MW-301**	EPA 9040	457892		
40269529002	**MW-84A**	EPA 9040	457892		
40269529001	**MW-301**	EPA 300.0	458622		
40269529002	**MW-84A**	EPA 300.0	458622		

40269529

Pace

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at https //info pacelabs com/hubfs/pas-standard-terms pdf

Page : 1 Of 1

Section A
Required Client Information:

Company SCS ENGINEERS
Address 2830 Dairy Drive
Madison, WI 53718
Email mblodgett@scsengineers com
Phone 608-216-7362 Fax.
Requested Due Date

Section B
Required Project Information:

Report To Meghan Blodgett
Copy To:
Purchase Order #
Project Name 25223067 Columbia CCR Background
Project # 25223067

Section C
Invoice Information:

Attention
Company Name
Address
Pace Quote
Pace Project Manager dan.milewsky@pacelabs.com,
Pace Profile #:

Regulatory Agency

State / Location
WI

MATRIX / CODE
Drinking Water DW
Water WT
Waste Water WW
Product P
Soil/Solid SL
Oil OL
Wipe WP
Air AR
Other OT
Tissue TS

SAMPLE ID — One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Radium 226 N	Radium 228 N	Metals N	TDS and pH N	Chloride, Fluoride, Sulfate N	Residual Chlorine (Y/N)	
1	MW-301	WT		10/11	1415				6										X	X	X	X	X		001
2	MW-84A	WT		10/11	1500				6										X	X	X	X	X		002
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
Full List Metals = B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li Hg, Mo, Se, Tl ALL SAMPLES UNFILTERED	Bridget Russell SCS Eng	10/12	1100							
	CS Logistics	10/13/23	0915	Pace	10/13/23	0915	1.0	Y	N	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Bridget Russell
SIGNATURE of SAMPLER: Bridget Russell
DATE Signed: 10/12/2023

DC#_Title: ENV-FRM-GBAY-0035 v03_Sample Preservation Receipt Form
Effective Date: 8/16/2022

Sample Preservation Receipt Form

Client Name: SCS

Project # 40269529

All containers needing preservation have been checked and noted below ☑Yes ☐No ☐N/A

Lab Lot# of pH paper 1012723

Lab Std #ID of preservation (if pH adjusted).

Initial when completed SG

Date/ Time.

Pace Lab #	Glass							Plastic						Vials						Jars				General				VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
	AG1U	BG1U	AG1H	AG4S	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	BP2Z	VG9C	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN 1	GN 2							
001									2		2															2						X		2.5 / 5
002									2		2															2 2						X		2.5 / 5
003																																		2.5 / 5
004																																		2.5 / 5
005																																		2.5 / 5
006																																		2.5 / 5
007																																		2.5 / 5
008																																		2.5 / 5
009																																		2.5 / 5
010																																		2.5 / 5
011																																		2.5 / 5
012																																		2.5 / 5
013																																		2.5 / 5
014																																		2.5 / 5
015																																		2.5 / 5
016																																		2.5 / 5
017																																		2.5 / 5
018																																		2.5 / 5
019																																		2.5 / 5
020																																		2.5 / 5

10/13/23 SG

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other ____________

Headspace in VOA Vials (>6mm) ☐Yes ☐No ☑N/A

*If yes look in headspace column

AG1U	1 liter amber glass	**BP1U**	1 liter plastic unpres	**VG9C**	40 mL clear ascorbic w/ HCl	**JGFU**	4 oz amber jar unpres
BG1U	1 liter clear glass	**BP3U**	250 mL plastic unpres	**DG9T**	40 mL amber Na Thio	**JG9U**	9 oz amber jar unpres
AG1H	1 liter amber glass HCL	**BP3B**	250 mL plastic NaOH	**VG9U**	40 mL clear vial unpres	**WGFU**	4 oz clear jar unpres
AG4S	125 mL amber glass H2SO4	**BP3N**	250 mL plastic HNO3	**VG9H**	40 mL clear vial HCL	**WPFU**	4 oz plastic jar unpres
AG5U	100 mL amber glass unpres	**BP3S**	250 mL plastic H2SO4	**VG9M**	40 mL clear vial MeOH	**SP5T**	120 mL plastic Na Thiosulfate
AG2S	500 mL amber glass H2SO4	**BP2Z**	500 mL plastic NaOH + Zn	**VG9D**	40 mL clear vial DI	**ZPLC**	ziploc bag
BG3U	250 mL clear glass unpres					**GN 1**	1 poly HNO3
						GN 2	

Page 1 of 2

Sample Condition Upon Receipt Form (SCUR)

Project #:

WO#: 40269529

40269529

Client Name: SLS

Courier: ☒ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco
☐ Client ☐ Pace Other:

Tracking #:

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other

Thermometer Used SR - 109 **Type of Ice:** [✓ Wet] Blue Dry None ☐ Meltwater Only

Cooler Temperature Uncorr. 1.0 /Corr: 1.0

Temp Blank Present: ☒ yes ☐ no **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice

Person examining contents:
Date: 10/13/23 Initials: SG
Labeled By Initials: EL

Chain of Custody Present: ☒Yes ☐No ☐N/A	1.
Chain of Custody Filled Out: ☒Yes ☐No ☐N/A	2.
Chain of Custody Relinquished: ☒Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC: ☒Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time: ☒Yes ☐No - DI VOA Samples frozen upon receipt ☐Yes ☐No	5. Date/Time:
Short Hold Time Analysis (<72hr): ☐Yes ☒No	6.
Rush Turn Around Time Requested: ☐Yes ☒No	7.
Sufficient Volume: For Analysis: ☒Yes ☐No MS/MSD: ☐Yes ☒No ☐N/A	8.
Correct Containers Used: ☒Yes ☐No Correct Type: [✓ Pace Green Bay], Pace IR, Non-Pace	9.
Containers Intact: ☒Yes ☐No	10.
Filtered volume received for Dissolved tests ☐Yes ☐No ☒N/A	11.
Sample Labels match COC: ☒Yes ☐No ☐N/A -Includes date/time/ID/Analysis Matrix: W	12.
Trip Blank Present: ☐Yes ☐No ☒N/A Trip Blank Custody Seals Present ☐Yes ☐No ☒N/A Pace Trip Blank Lot # (if purchased):	13.

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: Date/Time:

Comments/ Resolution:

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logi

Page 2 of 2

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

June 13, 2024

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on April 19, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay
- Pace Analytical Services - Greensburg

Report revised to include radium data for MW-84A which was missing on the original report dated May 17, 2024.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Matt Bizjack, Alliant Energy
Natalie Burris, SCS ENGINEERS
Sherren Clark, SCS Engineers
Jenny Coughlin, Alliant Energy
Tom Karwoski, SCS ENGINEERS
Ryan Matzuk, SCS Engineers
Jeff Maxted, ALLIANT ENERGY

CERTIFICATIONS

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
ANABISO/IEC 17025:2017 Rad Cert#: L24170
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 2950
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA010
Louisiana DEQ/TNI Certification #: 04086
Maine Certification #: 2023021
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification #: 9991
Missouri Certification #: 235
Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572023-03
New Hampshire/TNI Certification #: 297622
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Ohio EPA Rad Approval: #41249
Oregon/TNI Certification #: PA200002-015
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN02867
Texas/TNI Certification #: T104704188-22-18
Utah/TNI Certification #: PA014572223-14
USDA Soil Permit #: 525-23-67-77263
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Approve List for Rad

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
Texas Certification #: T104704529-21-8
Virginia VELAP Certification ID: 11873
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-21-00008
Federal Fish & Wildlife Permit #: 51774A

SAMPLE SUMMARY

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40277089001	**MW-301**	Water	04/17/24 15:20	04/19/24 08:05
40277089002	**MW-84A**	Water	04/17/24 13:50	04/19/24 08:05

SAMPLE ANALYTE COUNT

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40277089001	**MW-301**	EPA 6020B	TXW	15	PASI-G
		EPA 7470	RZA	1	PASI-G
			LB	7	PASI-G
		EPA 903.1	LL1	1	PASI-PA
		EPA 904.0	JJS1	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2320B	TMK	1	PASI-G
		SM 2540C	LMB	1	PASI-G
		SM 4500-H+B	HML	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40277089002	**MW-84A**	EPA 6020B	TXW	15	PASI-G
		EPA 7470	RZA	1	PASI-G
			LB	7	PASI-G
		EPA 903.1	LL1	1	PASI-PA
		EPA 904.0	JJS1	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2320B	TMK	1	PASI-G
		SM 2540C	LMB	1	PASI-G
		SM 4500-H+B	HML	1	PASI-G
		EPA 300.0	HMB	3	PASI-G

PASI-G = Pace Analytical Services - Green Bay
PASI-PA = Pace Analytical Services - Greensburg

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Sample: MW-301 **Lab ID: 40277089001** Collected: 04/17/24 15:20 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Antimony	**<0.15**	ug/L	1.0	0.15	1	04/23/24 07:07	04/29/24 03:14	7440-36-0	
Arsenic	**<0.28**	ug/L	1.0	0.28	1	04/23/24 07:07	04/29/24 03:14	7440-38-2	
Barium	**8.1**	ug/L	2.3	0.70	1	04/23/24 07:07	04/29/24 03:14	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	04/23/24 07:07	04/29/24 03:14	7440-41-7	
Boron	**24.9**	ug/L	10.0	3.0	1	04/23/24 07:07	04/29/24 03:14	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	04/23/24 07:07	04/29/24 03:14	7440-43-9	
Calcium	**102000**	ug/L	254	76.2	1	04/23/24 07:07	04/29/24 03:14	7440-70-2	
Chromium	**<1.0**	ug/L	3.4	1.0	1	04/23/24 07:07	04/29/24 03:14	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	04/23/24 07:07	04/29/24 03:14	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	04/23/24 07:07	04/29/24 03:14	7439-92-1	
Lithium	**0.63J**	ug/L	1.0	0.22	1	04/23/24 07:07	04/29/24 03:14	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	04/23/24 07:07	04/29/24 03:14	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	04/23/24 07:07	04/29/24 03:14	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	04/23/24 07:07	04/29/24 03:14	7440-28-0	
Total Hardness by 2340B	**455**	mg/L	1.7	0.32	1	04/23/24 07:07	04/29/24 03:14		
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.066**	ug/L	0.20	0.066	1	04/30/24 15:10	05/01/24 09:48	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.06**	Std. Units			1		04/17/24 15:20		
Field Specific Conductance	**781.0**	umhos/cm			1		04/17/24 15:20		
Oxygen, Dissolved	**2.53**	mg/L			1		04/17/24 15:20	7782-44-7	
REDOX	**17.90**	mV			1		04/17/24 15:20		
Turbidity	**0.00**	NTU			1		04/17/24 15:20		
Static Water Level	**785.27**	feet			1		04/17/24 15:20		
Temperature, Water (C)	**8.6**	deg C			1		04/17/24 15:20		
2320B Alkalinity	Analytical Method: SM 2320B Pace Analytical Services - Green Bay								
Alkalinity, Total as CaCO3	**446**	mg/L	10.0	5.0	1		04/23/24 11:46		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**458**	mg/L	20.0	8.7	1		04/23/24 14:49		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.9**	Std. Units	0.10	0.010	1		04/22/24 18:03		H6

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Sample: MW-301 **Lab ID: 40277089001** Collected: 04/17/24 15:20 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**1.6J**	mg/L	2.0	0.59	1		05/02/24 21:12	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/02/24 21:12	16984-48-8	
Sulfate	**11.5**	mg/L	2.0	0.44	1		05/02/24 21:12	14808-79-8	

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Sample: MW-84A **Lab ID: 40277089002** Collected: 04/17/24 13:50 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Antimony	**<0.15**	ug/L	1.0	0.15	1	04/23/24 07:07	04/29/24 03:19	7440-36-0	
Arsenic	**0.29J**	ug/L	1.0	0.28	1	04/23/24 07:07	04/29/24 03:19	7440-38-2	
Barium	**14.4**	ug/L	2.3	0.70	1	04/23/24 07:07	04/29/24 03:19	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	04/23/24 07:07	04/29/24 03:19	7440-41-7	
Boron	**11.9**	ug/L	10.0	3.0	1	04/23/24 07:07	04/29/24 03:19	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	04/23/24 07:07	04/29/24 03:19	7440-43-9	
Calcium	**73700**	ug/L	254	76.2	1	04/23/24 07:07	04/29/24 03:19	7440-70-2	
Chromium	**2.1J**	ug/L	3.4	1.0	1	04/23/24 07:07	04/29/24 03:19	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	04/23/24 07:07	04/29/24 03:19	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	04/23/24 07:07	04/29/24 03:19	7439-92-1	
Lithium	**0.67J**	ug/L	1.0	0.22	1	04/23/24 07:07	04/29/24 03:19	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	04/23/24 07:07	04/29/24 03:19	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	04/23/24 07:07	04/29/24 03:19	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	04/23/24 07:07	04/29/24 03:19	7440-28-0	
Total Hardness by 2340B	**337**	mg/L	1.7	0.32	1	04/23/24 07:07	04/29/24 03:19		
7470 Mercury	Analytical Method: EPA 7470 Preparation Method: EPA 7470 Pace Analytical Services - Green Bay								
Mercury	**<0.066**	ug/L	0.20	0.066	1	04/30/24 15:10	05/01/24 09:51	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.68**	Std. Units			1		04/17/24 13:50		
Field Specific Conductance	**588.1**	umhos/cm			1		04/17/24 13:50		
Oxygen, Dissolved	**7.82**	mg/L			1		04/17/24 13:50	7782-44-7	
REDOX	**0.00**	mV			1		04/17/24 13:50		
Turbidity	**0.00**	NTU			1		04/17/24 13:50		
Static Water Level	**784.90**	feet			1		04/17/24 13:50		
Temperature, Water (C)	**11.0**	deg C			1		04/17/24 13:50		
2320B Alkalinity	Analytical Method: SM 2320B Pace Analytical Services - Green Bay								
Alkalinity, Total as CaCO3	**335**	mg/L	10.0	5.0	1		04/23/24 11:57		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**322**	mg/L	20.0	8.7	1		04/23/24 14:49		
4500H+ pH, Electrometric	Analytical Method: SM 4500-H+B Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**8.2**	Std. Units	0.10	0.010	1		04/22/24 18:04		H6

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Sample: MW-84A **Lab ID: 40277089002** Collected: 04/17/24 13:50 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**3.2**	mg/L	2.0	0.59	1		05/02/24 21:26	16887-00-6	
Fluoride	**0.12J**	mg/L	0.32	0.095	1		05/02/24 21:26	16984-48-8	
Sulfate	**1.4J**	mg/L	2.0	0.44	1		05/02/24 21:26	14808-79-8	

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 473092
QC Batch Method: EPA 7470
Analysis Method: EPA 7470
Analysis Description: 7470 Mercury
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277089001, 40277089002

METHOD BLANK: 2709401
Matrix: Water
Associated Lab Samples: 40277089001, 40277089002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	<0.066	0.20	05/01/24 09:18	

LABORATORY CONTROL SAMPLE: 2709402

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	5.1	101	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2709403 2709404

Parameter	Units	40277334002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	ug/L	<0.000066 mg/L	5	5	4.9	5.0	98	100	85-115	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 472389
QC Batch Method: EPA 3010A
Analysis Method: EPA 6020B
Analysis Description: 6020B MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277089001, 40277089002

METHOD BLANK: 2705531 Matrix: Water
Associated Lab Samples: 40277089001, 40277089002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	<0.15	1.0	04/29/24 01:38	
Arsenic	ug/L	<0.28	1.0	04/29/24 01:38	
Barium	ug/L	<0.70	2.3	04/29/24 01:38	
Beryllium	ug/L	<0.25	1.0	04/29/24 01:38	
Boron	ug/L	<3.0	10.0	04/29/24 01:38	
Cadmium	ug/L	<0.15	1.0	04/29/24 01:38	
Calcium	ug/L	<76.2	254	04/29/24 01:38	
Chromium	ug/L	<1.0	3.4	04/29/24 01:38	
Cobalt	ug/L	<0.12	1.0	04/29/24 01:38	
Lead	ug/L	<0.24	1.0	04/29/24 01:38	
Lithium	ug/L	<0.22	1.0	04/29/24 01:38	
Molybdenum	ug/L	<0.44	1.5	04/29/24 01:38	
Selenium	ug/L	<0.32	1.1	04/29/24 01:38	
Thallium	ug/L	<0.14	1.0	04/29/24 01:38	
Total Hardness by 2340B	mg/L	<0.32	1.7	04/29/24 01:38	

LABORATORY CONTROL SAMPLE: 2705532

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	250	255	102	80-120	
Arsenic	ug/L	250	257	103	80-120	
Barium	ug/L	250	247	99	80-120	
Beryllium	ug/L	250	255	102	80-120	
Boron	ug/L	250	239	95	80-120	
Cadmium	ug/L	250	259	104	80-120	
Calcium	ug/L	10000	9820	98	80-120	
Chromium	ug/L	250	250	100	80-120	
Cobalt	ug/L	250	254	102	80-120	
Lead	ug/L	250	248	99	80-120	
Lithium	ug/L	250	248	99	80-120	
Molybdenum	ug/L	250	253	101	80-120	
Selenium	ug/L	250	267	107	80-120	
Thallium	ug/L	250	238	95	80-120	
Total Hardness by 2340B	mg/L		65.6			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2705533 2705534

Parameter	Units	40276984004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Antimony	ug/L	<0.30	250	250	255	259	102	103	75-125	1	20	
Arsenic	ug/L	6.9	250	250	266	268	104	105	75-125	1	20	
Barium	ug/L	293	250	250	598	603	122	124	75-125	1	20	
Beryllium	ug/L	1.3J	250	250	255	258	101	103	75-125	1	20	
Boron	ug/L	4780	250	250	4890	4930	44	63	75-125	1	20	P6
Cadmium	ug/L	<0.30	250	250	255	258	102	103	75-125	1	20	
Calcium	ug/L	278000	10000	10000	282000	286000	32	75	75-125	2	20	P6
Chromium	ug/L	42.5	250	250	294	301	101	103	75-125	2	20	
Cobalt	ug/L	13.7	250	250	250	256	95	97	75-125	2	20	
Lead	ug/L	12.0	250	250	268	275	102	105	75-125	3	20	
Lithium	ug/L	82.8	250	250	336	340	101	103	75-125	1	20	
Molybdenum	ug/L	2630	250	250	2840	2860	82	91	75-125	1	20	
Selenium	ug/L	0.95J	250	250	270	267	108	107	75-125	1	20	
Thallium	ug/L	0.32J	250	250	255	262	102	105	75-125	3	20	
Total Hardness by 2340B	mg/L	1180			1220	1240				2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 472417
QC Batch Method: SM 2320B
Analysis Method: SM 2320B
Analysis Description: 2320B Alkalinity
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277089001, 40277089002

METHOD BLANK: 2705612
Matrix: Water
Associated Lab Samples: 40277089001, 40277089002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	mg/L	<5.0	10.0	04/23/24 09:58	

LABORATORY CONTROL SAMPLE: 2705613

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	mg/L	200	198	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2705614 2705615

Parameter	Units	40276976001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Alkalinity, Total as CaCO3	mg/L	44.9	200	200	219	219	87	87	80-120	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 472469
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277089001, 40277089002

METHOD BLANK: 2706042
Matrix: Water
Associated Lab Samples: 40277089001, 40277089002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	04/23/24 14:46	

LABORATORY CONTROL SAMPLE: 2706043

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	616	572	93	80-120	

SAMPLE DUPLICATE: 2706044

Parameter	Units	40277009001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	618	610	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 472280
QC Batch Method: SM 4500-H+B
Analysis Method: SM 4500-H+B
Analysis Description: 4500H+B pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277089001, 40277089002

SAMPLE DUPLICATE: 2705157

Parameter	Units	40276865001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	8.0	8.0	0	5	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 473315
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277089001, 40277089002

METHOD BLANK: 2710784
Matrix: Water
Associated Lab Samples: 40277089001, 40277089002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.59	2.0	05/02/24 19:03	
Fluoride	mg/L	<0.095	0.32	05/02/24 19:03	
Sulfate	mg/L	<0.44	2.0	05/02/24 19:03	

LABORATORY CONTROL SAMPLE: 2710785

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	21.8	109	90-110	
Fluoride	mg/L	2	2.2	108	90-110	
Sulfate	mg/L	20	21.8	109	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2710786 2710787

Parameter	Units	40277088001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	565	1000	1000	1660	1670	110	110	90-110	1	15	
Fluoride	mg/L	<4.8	100	100	95.0	95.8	95	96	90-110	1	15	
Sulfate	mg/L	1130	1000	1000	2300	2210	117	108	90-110	4	15	M0

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2710788 2710789

Parameter	Units	40277096003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	4.6	20	20	26.1	27.2	107	113	90-110	4	15	M0
Fluoride	mg/L	0.10J	2	2	2.3	2.4	109	115	90-110	5	15	M0
Sulfate	mg/L	13.8	20	20	36.0	36.6	111	114	90-110	2	15	M0

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Sample: MW-301 **Lab ID: 40277089001** Collected: 04/17/24 15:20 Received: 04/19/24 08:05 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**0.252 ± 0.392 (1.00)** **C:NA T:87%**	pCi/L	05/10/24 13:49	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.787 ± 0.488 (1.00)** **C:83% T:84%**	pCi/L	05/02/24 15:58	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**1.04 ± 0.880 (2.00)**	pCi/L	05/16/24 15:10	7440-14-4	

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Sample: MW-84A **Lab ID: 40277089002** Collected: 04/17/24 13:50 Received: 04/19/24 08:05 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 903.1	**-0.295 ± 0.450 (1.00)** **C:NA T:90%**	pCi/L	05/10/24 13:49	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.290 ± 0.399 (1.00)** **C:77% T:84%**	pCi/L	05/02/24 15:58	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.290 ± 0.849 (2.00)**	pCi/L	05/16/24 15:10	7440-14-4	

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 664159
QC Batch Method: EPA 904.0
Analysis Method: EPA 904.0
Analysis Description: 904.0 Radium 228
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40277089001, 40277089002

METHOD BLANK: 3233909
Matrix: Water
Associated Lab Samples: 40277089001, 40277089002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.760 ± 0.454 (0.835) C:85% T:72%	pCi/L	05/02/24 15:55	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

QC Batch: 664158
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Laboratory: Pace Analytical Services - Greensburg
Associated Lab Samples: 40277089001, 40277089002

METHOD BLANK: 3233908
Matrix: Water
Associated Lab Samples: 40277089001, 40277089002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.000 ± 0.246 (0.551) C:NA T:85%	pCi/L	05/10/24 13:23	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25223067 COLUMBIA CCR BACKGROU
Pace Project No.:	40277089

DEFINITIONS

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - The reported result is an estimated value.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

DL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Analyte was not detected and is reported as less than the LOD or as defined by the customer.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25223067 COLUMBIA CCR BACKGROU
Pace Project No.: 40277089

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40277089001	**MW-301**	EPA 3010A	472389	EPA 6020B	472486
40277089002	**MW-84A**	EPA 3010A	472389	EPA 6020B	472486
40277089001	**MW-301**	EPA 7470	473092	EPA 7470	473217
40277089002	**MW-84A**	EPA 7470	473092	EPA 7470	473217
40277089001	**MW-301**				
40277089002	**MW-84A**				
40277089001	**MW-301**	EPA 903.1	664158		
40277089002	**MW-84A**	EPA 903.1	664158		
40277089001	**MW-301**	EPA 904.0	664159		
40277089002	**MW-84A**	EPA 904.0	664159		
40277089001	**MW-301**	Total Radium Calculation	669305		
40277089002	**MW-84A**	Total Radium Calculation	669305		
40277089001	**MW-301**	SM 2320B	472417		
40277089002	**MW-84A**	SM 2320B	472417		
40277089001	**MW-301**	SM 2540C	472469		
40277089002	**MW-84A**	SM 2540C	472469		
40277089001	**MW-301**	SM 4500-H+B	472280		
40277089002	**MW-84A**	SM 4500-H+B	472280		
40277089001	**MW-301**	EPA 300.0	473315		
40277089002	**MW-84A**	EPA 300.0	473315		

Samples in 4 coolers 40277089

Pace

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at https://info.pacelabs.com/hubfs/pas-standard-terms.pdf.

Page : 1 Of 1

Section A Required Client Information:		Section B Required Project Information:	Section C Invoice Information:	
Company: SCS ENGINEERS		Report To: Meghan Blodgett	Attention:	
Address: 2830 Dairy Drive		Copy To:	Company Name:	
Madison, WI 53718			Address:	Regulatory Agency
Email: mblodgett@scsengineers.com		Purchase Order #:	Pace Quote:	
Phone: 608-216-7362	Fax	Project Name: 25223067 Columbia CCR Background	Pace Project Manager: dan.milewsky@pacelabs.com,	State / Location
Requested Due Date:		Project #: 25223067	Pace Profile #:	WI

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test	Radium 226	Radium 228	Metals	TDS and pH	Chloride,Fluoride,Sulfate	Hardness	Alkalinity						Residual Chlorine (Y/N)	
																		Y/N (Requested Analysis Filtered (Y/N))	N	N	N	N	N	N	N							
1	MW-301	WT		4/17	1520														x	x	x	x	x	x	x							001
2	MW-84A	WT		4/17	1350														x	x	x	x	x	x	x							002
3																																
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
Full List Metals = B, Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Li Hg, Mo, Se, Tl ALL SAMPLES UNFILTERED		4/18	1120							
	CS Logistics	4/19/24	0805		4/19/24	0805	1.2/1.1	Y	Y	Y
							TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Bridget Russell

SIGNATURE of SAMPLER:

DATE Signed: 4/18/2024

DC#_Title: ENV-FRM-GBAY-0035 v03_Sample Preservation Receipt Form
Effective Date: 8/16/2022

Sample Preservation Receipt Form

Client Name: SCS

Project # 40277089

All containers needing preservation have been checked and noted below: ☒Yes ☐No ☐N/A

Lab Lot# of pH paper: 10D0134

Lab Std #ID of preservation (if pH adjusted):

Initial when completed: mlk

Date/ Time:

	Glass							Plastic						Vials						Jars				General										
Pace Lab #	AG1U	BG1U	AG1H	AG4S	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	BP2Z	VG9C	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN 1	GN 2	VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
001									2		1															2						X		2.5 / 5
002									2		1															2						X		2.5 / 5
003																																		2.5 / 5
004																																		2.5 / 5
005																																		2.5 / 5
006																																		2.5 / 5
007																																		2.5 / 5
008																																		2.5 / 5
009																																		2.5 / 5
010																																		2.5 / 5
011																																		2.5 / 5
012																																		2.5 / 5
013																																		2.5 / 5
014				mH 4/10/24																														2.5 / 5
015																																		2.5 / 5
016																																		2.5 / 5
017																																		2.5 / 5
018																																		2.5 / 5
019																																		2.5 / 5
020																																		2.5 / 5

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:

Headspace in VOA Vials (>6mm) : ☐Yes ☐No ☒N/A *If yes look in headspace column

AG1U	1 liter amber glass
BG1U	1 liter clear glass
AG1H	1 liter amber glass HCL
AG4S	125 mL amber glass H2SO4
AG5U	100 mL amber glass unpres
AG2S	500 mL amber glass H2SO4
BG3U	250 mL clear glass unpres

BP1U	1 liter plastic unpres
BP3U	250 mL plastic unpres
BP3B	250 mL plastic NaOH
BP3N	250 mL plastic HNO3
BP3S	250 mL plastic H2SO4
BP2Z	500 mL plastic NaOH + Zn

VG9C	40 mL clear ascorbic w/ HCl
DG9T	40 mL amber Na Thio
VG9U	40 mL clear vial unpres
VG9H	40 mL clear vial HCL
VG9M	40 mL clear vial MeOH
VG9D	40 mL clear vial DI

JGFU	4 oz amber jar unpres
JG9U	9 oz amber jar unpres
WGFU	4 oz clear jar unpres
WPFU	4 oz plastic jar unpres
SP5T	120 mL plastic Na Thiosulfate
ZPLC	ziploc bag
GN 1	1L Poly HNO3
GN 2	

Page 1 of 2

DC#_Title: ENV-FRM-GBAY-0014 v03_SCUR
Effective Date: 8/17/2022

Sample Condition Upon Receipt Form (SCUR)

Client Name: SCS

Project #:

WO# : 40277089

40277089

Courier: ☑ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco
☐ Client ☐ Pace Other:

Tracking #:

Custody Seal on Cooler/Box Present: ☑ yes ☐ no Seals intact: ☑ yes ☐ no
Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no
Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ Other
Thermometer Used SR - 120 **Type of Ice:** [✓ Wet] Blue Dry None ☐ Meltwater Only
Cooler Temperature Uncorr: 1,2,1,1 /Corr: 1,2,1,1
Temp Blank Present: ☑ yes ☐ no **Biological Tissue is Frozen:** ☐ yes ☐ no
Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Person examining contents:
Date: 4/19/24 /Initials: MH
Labeled By Initials: PV

Chain of Custody Present:	☑ Yes ☐ No ☐ N/A	1.
Chain of Custody Filled Out:	☑ Yes ☐ No ☐ N/A	2.
Chain of Custody Relinquished:	☑ Yes ☐ No ☐ N/A	3.
Sampler Name & Signature on COC:	☑ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time:	☑ Yes ☐ No	5.
- DI VOA Samples frozen upon receipt	☐ Yes ☐ No	Date/Time:
Short Hold Time Analysis (<72hr):	☐ Yes ☑ No	6.
Rush Turn Around Time Requested:	☐ Yes ☑ No	7.
Sufficient Volume: For Analysis: ☑ Yes ☐ No MS/MSD:	☐ Yes ☑ No ☐ N/A	8.
Correct Containers Used: Correct Type: [✓ Pace Green Bay], Pace IR, Non-Pace	☑ Yes ☐ No	9.
Containers Intact:	☑ Yes ☐ No	10.
Filtered volume received for Dissolved tests	☐ Yes ☐ No ☑ N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: W	☑ Yes ☐ No ☐ N/A	12.
Trip Blank Present:	☐ Yes ☐ No ☑ N/A	13.
Trip Blank Custody Seals Present	☐ Yes ☐ No ☑ N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution:
Person Contacted: Date/Time:
If checked, see attached form for additional comments ☐
Comments/ Resolution:

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logi

Page 2 of 2

Qualtrax ID: 41292

Pace® Analytical Services, LLC

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

May 07, 2024

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on April 19, 2024. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Green Bay

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dan Milewsky

Dan Milewsky
dan.milewsky@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: Matt Bizjack, Alliant Energy
Natalie Burris, SCS ENGINEERS
Sherren Clark, SCS Engineers
Jenny Coughlin, Alliant Energy
Tom Karwoski, SCS ENGINEERS
Ryan Matzuk, SCS Engineers
Jeff Maxted, ALLIANT ENERGY

CERTIFICATIONS

Project:	25223067 COLUMBIA CCRMOD1-3
Pace Project No.:	40277094

Pace Analytical Services Green Bay

1241 Bellevue Street, Green Bay, WI 54302

Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
Texas Certification #: T104704529-21-8
Virginia VELAP Certification ID: 11873
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-21-00008
Federal Fish & Wildlife Permit #: 51774A

SAMPLE SUMMARY

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40277094001	**MW-302**	Water	04/17/24 16:25	04/19/24 08:05
40277094002	**MW-33AR**	Water	04/17/24 14:50	04/19/24 08:05
40277094003	**MW-34A**	Water	04/17/24 14:00	04/19/24 08:05
40277094004	**FIELD BLANK-MOD1-3LF**	Water	04/17/24 14:40	04/19/24 08:05

SAMPLE ANALYTE COUNT

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

Lab ID	Sample ID	Method	Analysts	Analytes Reported
40277094001	**MW-302**	EPA 6020B	TXW	3
			LB	7
		SM 2540C	LMB	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3
		EPA 310.2	MT	1
40277094002	**MW-33AR**	EPA 6020B	TXW	3
			LB	7
		SM 2540C	LMB	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3
		EPA 310.2	MT	1
40277094003	**MW-34A**	EPA 6020B	TXW	3
			LB	7
		SM 2540C	LMB	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3
		EPA 310.2	MT	1
40277094004	**FIELD BLANK-MOD1-3LF**	EPA 6020B	TXW	3
		SM 2540C	LMB	1
		EPA 9040	HML	1
		EPA 300.0	HMB	3
		EPA 310.2	MT	1

PASI-G = Pace Analytical Services - Green Bay

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

Sample: MW-302 **Lab ID: 40277094001** Collected: 04/17/24 16:25 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**442**	ug/L	10.0	3.0	1	04/22/24 06:49	04/28/24 18:52	7440-42-8	
Calcium	**77800**	ug/L	254	76.2	1	04/22/24 06:49	04/28/24 18:52	7440-70-2	
Total Hardness by 2340B	**337**	mg/L	1.7	0.32	1	04/22/24 06:49	04/28/24 18:52		
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.67**	Std. Units			1		04/17/24 16:25		
Field Specific Conductance	**606.6**	umhos/cm			1		04/17/24 16:25		
Oxygen, Dissolved	**8.58**	mg/L			1		04/17/24 16:25	7782-44-7	
REDOX	**29.60**	mV			1		04/17/24 16:25		
Turbidity	**4.17**	NTU			1		04/17/24 16:25		
Static Water Level	**784.49**	feet			1		04/17/24 16:25		
Temperature, Water (C)	**10.2**	deg C			1		04/17/24 16:25		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**344**	mg/L	20.0	8.7	1		04/23/24 14:51		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**8.5**	Std. Units	0.10	0.010	1		05/02/24 18:28		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**1.1J**	mg/L	2.0	0.59	1		05/03/24 00:33	16887-00-6	
Fluoride	**0.12J**	mg/L	0.32	0.095	1		05/03/24 00:33	16984-48-8	
Sulfate	**26.8**	mg/L	2.0	0.44	1		05/03/24 00:33	14808-79-8	
310.2 Alkalinity	Analytical Method: EPA 310.2 Pace Analytical Services - Green Bay								
Alkalinity, Total as CaCO3	**312**	mg/L	25.0	7.4	1		04/23/24 14:57		

ANALYTICAL RESULTS

Project:	25223067 COLUMBIA CCRMOD1-3
Pace Project No.:	40277094

Sample: MW-33AR **Lab ID: 40277094002** Collected: 04/17/24 14:50 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**531**	ug/L	10.0	3.0	1	04/22/24 06:49	04/28/24 18:57	7440-42-8	
Calcium	**64200**	ug/L	254	76.2	1	04/22/24 06:49	04/28/24 18:57	7440-70-2	
Total Hardness by 2340B	**289**	mg/L	1.7	0.32	1	04/22/24 06:49	04/28/24 18:57		
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.58**	Std. Units			1		04/17/24 14:50		
Field Specific Conductance	**706.0**	umhos/cm			1		04/17/24 14:50		
Oxygen, Dissolved	**9.50**	mg/L			1		04/17/24 14:50	7782-44-7	
REDOX	**40.40**	mV			1		04/17/24 14:50		
Turbidity	**1.47**	NTU			1		04/17/24 14:50		
Static Water Level	**783.02**	feet			1		04/17/24 14:50		
Temperature, Water (C)	**11.0**	deg C			1		04/17/24 14:50		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**452**	mg/L	20.0	8.7	1		04/23/24 14:51		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**8.6**	Std. Units	0.10	0.010	1		05/02/24 18:31		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**22.8**	mg/L	2.0	0.59	1		05/03/24 00:48	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/03/24 00:48	16984-48-8	
Sulfate	**165**	mg/L	20.0	4.4	10		05/03/24 13:43	14808-79-8	
310.2 Alkalinity	Analytical Method: EPA 310.2 Pace Analytical Services - Green Bay								
Alkalinity, Total as CaCO3	**210**	mg/L	25.0	7.4	1		04/23/24 14:58		

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

Sample: MW-34A **Lab ID: 40277094003** Collected: 04/17/24 14:00 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**265**	ug/L	10.0	3.0	1	04/22/24 06:49	04/28/24 19:03	7440-42-8	
Calcium	**58500**	ug/L	254	76.2	1	04/22/24 06:49	04/28/24 19:03	7440-70-2	
Total Hardness by 2340B	**262**	mg/L	1.7	0.32	1	04/22/24 06:49	04/28/24 19:03		
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.40**	Std. Units			1		04/17/24 14:00		
Field Specific Conductance	**472.6**	umhos/cm			1		04/17/24 14:00		
Oxygen, Dissolved	**8.57**	mg/L			1		04/17/24 14:00	7782-44-7	
REDOX	**44.40**	mV			1		04/17/24 14:00		
Turbidity	**3.65**	NTU			1		04/17/24 14:00		
Static Water Level	**784.14**	feet			1		04/17/24 14:00		
Temperature, Water (C)	**11.3**	deg C			1		04/17/24 14:00		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**278**	mg/L	20.0	8.7	1		04/23/24 14:52		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**8.6**	Std. Units	0.10	0.010	1		05/02/24 18:33		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**2.2**	mg/L	2.0	0.59	1		05/03/24 01:02	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/03/24 01:02	16984-48-8	
Sulfate	**51.5**	mg/L	2.0	0.44	1		05/03/24 01:02	14808-79-8	
310.2 Alkalinity	Analytical Method: EPA 310.2 Pace Analytical Services - Green Bay								
Alkalinity, Total as CaCO3	**208**	mg/L	25.0	7.4	1		04/23/24 14:59		

ANALYTICAL RESULTS

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

Sample: FIELD BLANK-MOD1-3LF **Lab ID: 40277094004** Collected: 04/17/24 14:40 Received: 04/19/24 08:05 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6020B MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A Pace Analytical Services - Green Bay								
Boron	**<3.0**	ug/L	10.0	3.0	1	04/22/24 06:49	04/28/24 17:00	7440-42-8	
Calcium	**<76.2**	ug/L	254	76.2	1	04/22/24 06:49	04/28/24 17:00	7440-70-2	
Total Hardness by 2340B	**<0.32**	mg/L	1.7	0.32	1	04/22/24 06:49	04/28/24 17:00		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**<8.7**	mg/L	20.0	8.7	1		04/23/24 14:52		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**6.8**	Std. Units	0.10	0.010	1		05/02/24 18:45		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**<0.59**	mg/L	2.0	0.59	1		05/03/24 01:16	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/03/24 01:16	16984-48-8	
Sulfate	**<0.44**	mg/L	2.0	0.44	1		05/03/24 01:16	14808-79-8	
310.2 Alkalinity	Analytical Method: EPA 310.2 Pace Analytical Services - Green Bay								
Alkalinity, Total as CaCO3	**<7.4**	mg/L	25.0	7.4	1		04/23/24 15:03		

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

QC Batch: 472228
QC Batch Method: EPA 3010A
Analysis Method: EPA 6020B
Analysis Description: 6020B MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

METHOD BLANK: 2705023
Matrix: Water
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	<3.0	10.0	04/28/24 16:38	
Calcium	ug/L	<76.2	254	04/28/24 16:38	
Total Hardness by 2340B	mg/L	<0.32	1.7	04/28/24 16:38	

LABORATORY CONTROL SAMPLE: 2705024

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	ug/L	250	254	102	80-120	
Calcium	ug/L	10000	10800	108	80-120	
Total Hardness by 2340B	mg/L		70.5			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2705025 2705026

Parameter	Units	40277042001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	ug/L	131	250	250	391	377	104	98	75-125	4	20	
Calcium	ug/L	24400	10000	10000	33300	34000	90	96	75-125	2	20	
Total Hardness by 2340B	mg/L	165			236	235				0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

QC Batch: 472469
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

METHOD BLANK: 2706042 Matrix: Water
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	04/23/24 14:46	

LABORATORY CONTROL SAMPLE: 2706043

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	616	572	93	80-120	

SAMPLE DUPLICATE: 2706044

Parameter	Units	40277009001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	618	610	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

QC Batch: 473367
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

SAMPLE DUPLICATE: 2711047

Parameter	Units	40277042003 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	8.5	8.5	0	20	H6

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

QC Batch: 473315
QC Batch Method: EPA 300.0
Analysis Method: EPA 300.0
Analysis Description: 300.0 IC Anions
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

METHOD BLANK: 2710784
Matrix: Water
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.59	2.0	05/02/24 19:03	
Fluoride	mg/L	<0.095	0.32	05/02/24 19:03	
Sulfate	mg/L	<0.44	2.0	05/02/24 19:03	

LABORATORY CONTROL SAMPLE: 2710785

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	21.8	109	90-110	
Fluoride	mg/L	2	2.2	108	90-110	
Sulfate	mg/L	20	21.8	109	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2710786 2710787

Parameter	Units	40277088001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	565	1000	1000	1660	1670	110	110	90-110	1	15	
Fluoride	mg/L	<4.8	100	100	95.0	95.8	95	96	90-110	1	15	
Sulfate	mg/L	1130	1000	1000	2300	2210	117	108	90-110	4	15	M0

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2710788 2710789

Parameter	Units	40277096003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	4.6	20	20	26.1	27.2	107	113	90-110	4	15	M0
Fluoride	mg/L	0.10J	2	2	2.3	2.4	109	115	90-110	5	15	M0
Sulfate	mg/L	13.8	20	20	36.0	36.6	111	114	90-110	2	15	M0

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

QC Batch: 472319
QC Batch Method: EPA 310.2
Analysis Method: EPA 310.2
Analysis Description: 310.2 Alkalinity
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

METHOD BLANK: 2705335 Matrix: Water
Associated Lab Samples: 40277094001, 40277094002, 40277094003, 40277094004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Alkalinity, Total as CaCO3	mg/L	<7.4	25.0	04/23/24 14:33	

LABORATORY CONTROL SAMPLE: 2705336

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO3	mg/L	100	99.3	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2705337 2705338

Parameter	Units	40277058002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Alkalinity, Total as CaCO3	mg/L	191	100	100	294	293	103	102	90-110	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2705339 2705340

Parameter	Units	40277118020 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Alkalinity, Total as CaCO3	mg/L	660	200	200	869	867	105	104	90-110	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALIFIERS

Project:	25223067 COLUMBIA CCRMOD1-3
Pace Project No.:	40277094

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - The reported result is an estimated value.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

DL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Analyte was not detected and is reported as less than the LOD or as defined by the customer.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

H6	Analysis initiated outside of the 15 minute EPA required holding time.
M0	Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25223067 COLUMBIA CCRMOD1-3
Pace Project No.: 40277094

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40277094001	**MW-302**	EPA 3010A	472228	EPA 6020B	472330
40277094002	**MW-33AR**	EPA 3010A	472228	EPA 6020B	472330
40277094003	**MW-34A**	EPA 3010A	472228	EPA 6020B	472330
40277094004	**FIELD BLANK-MOD1-3LF**	EPA 3010A	472228	EPA 6020B	472330
40277094001	**MW-302**				
40277094002	**MW-33AR**				
40277094003	**MW-34A**				
40277094001	**MW-302**	SM 2540C	472469		
40277094002	**MW-33AR**	SM 2540C	472469		
40277094003	**MW-34A**	SM 2540C	472469		
40277094004	**FIELD BLANK-MOD1-3LF**	SM 2540C	472469		
40277094001	**MW-302**	EPA 9040	473367		
40277094002	**MW-33AR**	EPA 9040	473367		
40277094003	**MW-34A**	EPA 9040	473367		
40277094004	**FIELD BLANK-MOD1-3LF**	EPA 9040	473367		
40277094001	**MW-302**	EPA 300.0	473315		
40277094002	**MW-33AR**	EPA 300.0	473315		
40277094003	**MW-34A**	EPA 300.0	473315		
40277094004	**FIELD BLANK-MOD1-3LF**	EPA 300.0	473315		
40277094001	**MW-302**	EPA 310.2	472319		
40277094002	**MW-33AR**	EPA 310.2	472319		
40277094003	**MW-34A**	EPA 310.2	472319		
40277094004	**FIELD BLANK-MOD1-3LF**	EPA 310.2	472319		

40277094

Samples in 4 coolers

Pace

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at https //info.pacelabs.com/hubfs/pas-standard-terms pdf

Page : 1 Of 1

Section A
Required Client Information:

Company SCS ENGINEERS
Address 2830 Dairy Drive
Madison, WI 53718
Email mblodgett@scsengineers com
Phone 608-216-7362 Fax
Requested Due Date

Section B
Required Project Information:

Report To Meghan Blodgett
Copy To
Purchase Order #
Project Name 25223067 Columbia CCR Mod 1-3
Project # 25223067

Section C
Invoice Information:

Attention
Company Name
Address
Pace Quote
Pace Project Manager. dan milewsky@pacelabs com,
Pace Profile #: 3946-12,13

Regulatory Agency

State / Location
WI

SAMPLE ID
One Character per box.
(A-Z, 0-9 / , -)
Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Requested Analysis Filtered (Y/N) N Metals(B/Ca)	N TDS and pH	N Metals (full list)	N Radium 226	N Radium 228	N Chloride, Fluoride, Sulfate	N Alkalinity	N Hardness					Residual Chlorine (Y/N)	
1	MW-302	WT		4/17	1625														X	X				X	X	X						001
2	MW-33AR	WT		4/17	1450														X	X				X	X	X						002
3	MW-34A	WT		4/17	1400														X	X				X	X	X						003
4	FIELD BLANK-MOD1-3LF	WT		4/17	1440														X	X				X	X	X						004
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
ALL SAMPLES UNFILTERED full list metals=Sb,As,B,Ba,Be,Ca,Cd,Cr,Co,Pb,Li,Mo,Se,Tl and Hg	SCS	4/18	1120							
	CJ Logistics	4/19/24	0805		4/19/24	0805	12.1.1	Y	Y	Y
							TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Bridget Russell

SIGNATURE of SAMPLER: Bridget Russell

DATE Signed: 4/18/2024

DC#_Title: ENV-FRM-GBAY-0035 v03_Sample Preservation Receipt Form
Effective Date: 8/16/2022

Client Name: SCS

Sample Preservation Receipt Form

Project # 40277094

All containers needing preservation have been checked and noted below: ☑ Yes ☐ No ☐ N/A

Lab Lot# of pH paper: 10D0134

Lab Std #ID of preservation (if pH adjusted):

Initial when completed: mlk

Date/ Time:

	Glass							Plastic						Vials						Jars				General										
Pace Lab #	AG1U	BG1U	AG1H	AG4S	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	BP2Z	VG9C	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN 1	GN 2	VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
001									2		1																					X		2.5 / 5
002									2		1																					X		2.5 / 5
003									2		1																					X		2.5 / 5
004									2		1																					X		2.5 / 5
005																																		2.5 / 5
006																																		2.5 / 5
007																																		2.5 / 5
008																																		2.5 / 5
009																																		2.5 / 5
010																																		2.5 / 5
011																																		2.5 / 5
012																																		2.5 / 5
013																																		2.5 / 5
014																																		2.5 / 5
015																																		2.5 / 5
016																																		2.5 / 5
017																																		2.5 / 5
018																																		2.5 / 5
019																																		2.5 / 5
020																																		2.5 / 5

mlk 4/11/24

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:

Headspace in VOA Vials (>6mm) : ☐ Yes ☐ No ☑ N/A *If yes look in headspace column

AG1U	1 liter amber glass
BG1U	1 liter clear glass
AG1H	1 liter amber glass HCL
AG4S	125 mL amber glass H2SO4
AG5U	100 mL amber glass unpres
AG2S	500 mL amber glass H2SO4
BG3U	250 mL clear glass unpres

BP1U	1 liter plastic unpres
BP3U	250 mL plastic unpres
BP3B	250 mL plastic NaOH
BP3N	250 mL plastic HNO3
BP3S	250 mL plastic H2SO4
BP2Z	500 mL plastic NaOH + Zn

VG9C	40 mL clear ascorbic w/ HCl
DG9T	40 mL amber Na Thio
VG9U	40 mL clear vial unpres
VG9H	40 mL clear vial HCL
VG9M	40 mL clear vial MeOH
VG9D	40 mL clear vial DI

JGFU	4 oz amber jar unpres
JG9U	9 oz amber jar unpres
WGFU	4 oz clear jar unpres
WPFU	4 oz plastic jar unpres
SP5T	120 mL plastic Na Thiosulfate
ZPLC	ziploc bag
GN 1	
GN 2	

Page 1 of 2

Qualtrax ID: 41307

Pace® Analytical Services, LLC

DC#_Title: ENV-FRM-GBAY-0014 v03_SCUR
Effective Date: 8/17/2022

Sample Condition Upon Receipt Form (SCUR)

Client Name: SCS

Project #:

WO#: 40277094
40277094

Courier: ☑ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco
☐ Client ☐ Pace Other:

Tracking #:

Custody Seal on Cooler/Box Present: ☑ yes ☐ no Seals intact: ☑ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ Other

Thermometer Used SR- 120 **Type of Ice:** [✓ Wet] Blue Dry None ☐ Meltwater Only

Cooler Temperature Uncorr: 1,2,1,1 /Corr: 1,2,1,1

Temp Blank Present: ☑ yes ☐ no **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C if shipped on Dry Ice.

Person examining contents:
Date: 4/19/24 /Initials: MH

Labeled By Initials: YA

Chain of Custody Present:	☑ Yes ☐ No ☐ N/A	1.
Chain of Custody Filled Out:	☑ Yes ☐ No ☐ N/A	2.
Chain of Custody Relinquished:	☑ Yes ☐ No ☐ N/A	3.
Sampler Name & Signature on COC:	☑ Yes ☐ No ☐ N/A	4.
Samples Arrived within Hold Time:	☑ Yes ☐ No	5.
- DI VOA Samples frozen upon receipt	☐ Yes ☐ No	Date/Time:
Short Hold Time Analysis (<72hr):	☐ Yes ☑ No	6.
Rush Turn Around Time Requested:	☐ Yes ☑ No	7.
Sufficient Volume: For Analysis: ☑ Yes ☐ No MS/MSD:	☐ Yes ☑ No ☐ N/A	8.
Correct Containers Used: Correct Type: [✓ Pace Green Bay], Pace IR, Non-Pace	☑ Yes ☐ No	9.
Containers Intact:	☑ Yes ☐ No	10.
Filtered volume received for Dissolved tests	☐ Yes ☐ No ☑ N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: W	☐ Yes ☑ No ☐ N/A	12. 004 ID is field blank MOD1-3 MH 4/19/24
Trip Blank Present:	☐ Yes ☐ No ☑ N/A	13.
Trip Blank Custody Seals Present	☐ Yes ☐ No ☑ N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: Date/Time:

Comments/ Resolution:

PM Review is documented electronically in LIMs. By releasing the project, the PM acknowledges they have reviewed the sample logi

Page 2 of 2

Appendix D

Historical Monitoring Results

Single Location
Name: WPL - Columbia

Location ID: MW-84A
Number of Sampling Dates: 26

Parameter Name	Units	12/22/2015	4/5/2016	7/8/2016	7/28/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/8/2017	10/24/2017	4/25/2018	8/8/2018	10/24/2018	4/3/2019	10/9/2019
Boron	ug/L	11.9	14	14.7	--	11.1	14.7	16.1	12.9	14.8	22.9	13.8	25	12.8	10.1	13.6	12
Calcium	ug/L	74000	72200	67600	--	74000	76000	70800	73200	76100	74900	77500	76600	76000	74000	80100	73500
Chloride	mg/L	4.9	4.7	5.1	--	4.3	4.7	4.6	4.9	5.5	5.5	5.1	4.8	4.9	4.2	3.6	3.9
Fluoride	mg/L	<0.2	<0.2	<0.2	--	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Field pH	Std. Units	7.6	7.61	7.45	7.34	7.91	7.25	6.99	7.8	7.28	7.23	7.68	7.45	7.38	7.24	7.03	7.23
Sulfate	mg/L	4.9	4.3	3.7	--	2.6	2.7	3	2.8	2.7	2	2.2	2.8	1.9	1.6	1.4	1.3
Total Dissolved Solids	mg/L	316	322	316	--	324	316	328	342	344	342	314	328	372	330	318	310
Antimony	ug/L	<0.073	0.084	0.1	--	<0.073	<0.073	<0.073	<0.073	<0.15	<0.15	--	<0.15	<0.15	<0.15	<0.15	<0.15
Arsenic	ug/L	0.15	0.29	0.14	--	0.35	0.19	0.35	<0.099	<0.28	0.28	--	<0.28	<0.28	0.33	<0.28	0.46
Barium	ug/L	15.3	12.7	12.2	--	14.2	18.4	13.8	14.1	13.4	14	--	14.6	13.7	14.5	14.7	13.2
Beryllium	ug/L	<0.13	<0.13	<0.13	--	<0.13	<0.13	<0.13	<0.13	<0.18	<0.18	--	<0.18	<0.18	<0.18	<0.18	<0.25
Cadmium	ug/L	<0.089	<0.089	<0.089	--	<0.089	<0.089	<0.089	<0.089	<0.081	<0.081	--	<0.081	--	<0.15	<0.15	<0.15
Chromium	ug/L	2.5	1.9	1.8	--	2	2	1.9	2.4	2	1.6	--	2.4	1.5	1.6	1.8	1.6
Cobalt	ug/L	0.095	<0.036	0.053	--	<0.036	<0.036	<0.036	<0.036	<0.085	<0.085	--	<0.085	<0.085	<0.12	<0.12	<0.12
Lead	ug/L	0.16	<0.04	0.39	--	0.049	0.11	<0.04	0.041	<0.2	<0.2	--	<0.2	--	<0.24	<0.24	<0.24
Lithium	ug/L	0.72	0.44	0.5	--	0.56	0.56	0.56	0.55	0.46	0.58	--	0.5	0.4	0.49	0.56	0.52
Mercury	ug/L	<0.1	<0.1	<0.13	--	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	--	<0.13	--	<0.084	<0.084	<0.084
Molybdenum	ug/L	<0.07	<0.07	0.073	--	0.12	<0.07	<0.07	<0.07	<0.44	<0.44	--	<0.44	<0.44	<0.44	<0.44	<0.44
Selenium	ug/L	<0.21	<0.21	<0.21	--	<0.21	<0.21	<0.21	<0.21	<0.32	<0.32	--	<0.32	<0.32	<0.32	<0.32	<0.32
Thallium	ug/L	<0.14	<0.14	<0.14	--	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	--	<0.14	<0.14	<0.14	<0.14	<0.14
Total Radium	pCi/L	0.593	0.0809	--	1.37	0.825	0.404	1.39	0.0929	0.676	0.509	--	0.526	0.529	0.62	0.681	0.247
Radium-226	pCi/L	0.156	-0.088	--	-0.058	0.132	0.168	0.624	0.0768	0.27	0.242	--	0.155	-0.203	0.313	0.199	0.247
Radium-228	pCi/L	0.437	0.0809	--	1.37	0.693	0.236	0.766	0.0161	0.406	0.267	--	0.371	0.529	0.307	0.482	-0.024
Field Specific Conductance	umhos/cm	599	427	574.8	579.3	1002	578.2	489	948	535.3	557.2	491	581.7	617.1	609	637.2	614.1
Oxygen, Dissolved	mg/L	9.7	9.37	3.78	5.11	9.61	8.94	6.48	9.28	9.46	7.5	9.3	3.94	8.84	10.01	9.49	11.36
Field Oxidation Potential	mV	154	165.1	139.9	138.3	82.7	87	192.9	102	123.6	204.7	210	53.3	142.7	71.5	103.4	181.7
Groundwater Elevation	feet	785.31	786.3	785.89	785.61	787.22	786.63	786.7	787.16	787.63	786.68	785.32	785.88	786.55	788.32	787.35	787.79
Temperature	deg C	10.4	10.2	11.3	11	11.5	10.8	10.9	10.6	11.3	11.2	11.1	10.2	12	11.6	10.2	11.8
Turbidity	NTU	--	0.86	2.75	0.17	0.3	0.25	0.33	0.04	0.56	0.08	2.93	0.81	0.71	3.79	1.9	2.41
pH at 25 Degrees C	Std. Units	7.5	7.4	7.4	--	7.3	7.4	7.3	7.7	7.6	7.4	7.6	7.6	7.4	7.5	7.4	7.5

Single Location
Name: WPL - Columbia

Location ID: MW-84A

Number of Sampling Dates: 26

Parameter Name	Units	2/3/2020	5/29/2020	10/8/2020	4/14/2021	10/14/2021	4/13/2022	10/27/2022	4/27/2023	10/11/2023	4/17/2024
Boron	ug/L	15.7	10	9.7	14.3	11.1	10.5	12.2	10.3	14	11.9
Calcium	ug/L	72700	77600	69200	69100	75300	75100	78400	68600	65100	73700
Chloride	mg/L	3.7	3.7	4.3	4.4	3.5	5.2	3.4	3	3.1	3.2
Fluoride	mg/L	--	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	0.12
Field pH	Std. Units	7.51	7.34	7.49	7.34	7.42	7.34	7.31	7.01	7.51	7.68
Sulfate	mg/L	<2.2	1.5	1.3	1.4	1.3	1.4	1.1	1.3	1.4	1.4
Total Dissolved Solids	mg/L	316	340	320	328	326	334	302	326	324	322
Antimony	ug/L	--	<0.15	<0.15	0.55	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Arsenic	ug/L	0.38	0.34	0.49	0.91	0.41	0.31	0.72	<0.28	<0.28	0.29
Barium	ug/L	14	13.9	12.6	13.4	12.9	13.5	13.7	12.6	12.7	14.4
Beryllium	ug/L	--	<0.25	<0.25	0.47	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Cadmium	ug/L	--	<0.15	<0.15	0.53	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Chromium	ug/L	1.6	1.7	1.6	2.6	1.9	2.2	2.2	1.7	1.6	2.1
Cobalt	ug/L	<0.12	<0.12	<0.12	0.52	0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Lead	ug/L	--	<0.24	<0.24	0.55	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
Lithium	ug/L	0.58	0.4	0.39	1	0.28	0.36	0.41	0.71	0.54	0.67
Mercury	ug/L	--	<0.084	<0.066	<0.066	<0.093	<0.066	<0.066	<0.066	<0.066	<0.066
Molybdenum	ug/L	<0.44	<0.44	<0.44	0.62	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44
Selenium	ug/L	<0.32	<0.32	<0.32	0.48	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32
Thallium	ug/L	<0.14	<0.14	<0.14	0.66	0.19	<0.14	<0.14	<0.14	<0.14	<0.14
Total Radium	pCi/L	0.1	0.395	0.39	0.285	0.243	0.611	0.673	0.326	0.844	--
Radium-226	pCi/L	0.1	0.368	0	-0.289	0	0.254	0.267	0	0.292	--
Radium-228	pCi/L	-0.153	0.0273	0.39	0.285	0.243	0.357	0.406	0.326	0.552	--
Field Specific Conductance	umhos/cm	618.4	613.7	610.1	610.9	598.9	600.2	585.2	556.6	599.9	588.1
Oxygen, Dissolved	mg/L	8.43	9.81	9.39	9.8	9.25	9.33	8.31	9.37	8.44	7.82
Field Oxidation Potential	mV	121.5	135	153.2	95.6	89.7	200.6	39.9	103.4	91.2	0
Groundwater Elevation	feet	786.5	787.02	786.1	785.84	784.96	785.02	784.57	786.97	784.39	784.9
Temperature	deg C	10.3	10.6	11.9	10.2	12.5	9.9	11.7	10.7	12.3	11
Turbidity	NTU	1.23	2.15	0	2.45	3.41	0	0	0.72	0.03	0
pH at 25 Degrees C	Std. Units	7.4	7.6	7.6	7.6	7.8	7.6	7.4	7.6	7.6	8.2

Single Location

Name: WPL - Columbia

Location ID: MW-301
Number of Sampling Dates: 25

Parameter Name	Units	12/22/2015	4/5/2016	7/8/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/8/2017	10/23/2017	4/25/2018	8/8/2018	10/24/2018	4/2/2019	10/9/2019	2/3/2020
Boron	ug/L	26.5	25.2	23.6	30.6	32.8	32.6	28.8	21.3	30.6	34.3	24.3	22.8	27.8	26.9	35.9	27.9
Calcium	ug/L	126000	115000	108000	118000	129000	124000	120000	111000	108000	87200	112000	105000	101000	126000	114000	113000
Chloride	mg/L	3.7	4	3.5	2.2	2	1.5	2	3.5	5.5	4	2.3	5.2	3.2	0.79	1.7	1.3
Fluoride	mg/L	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--
Field pH	Std. Units	6.85	7.01	6.87	7.28	6.63	7.1	7.11	6.7	6.75	7.37	6.76	6.91	6.79	6.62	6.67	6.89
Sulfate	mg/L	9.3	15.3	15	13.9	12.3	6.5	10.3	17.1	31.6	27.5	8.6	21.6	19.2	4.4	8.4	7.2
Total Dissolved Solids	mg/L	478	486	464	490	444	514	502	458	462	362	464	502	424	462	418	462
Antimony	ug/L	0.15	0.094	0.13	<0.073	0.4	<0.073	<0.073	<0.15	<0.15	--	<0.15	0.36	<0.15	0.32	<0.15	--
Arsenic	ug/L	0.26	0.26	0.19	0.24	0.4	0.13	0.18	<0.28	<0.28	--	<0.28	0.45	<0.28	0.4	0.42	<0.28
Barium	ug/L	20.2	11.1	11.6	15.6	15	13.5	13.2	11.3	11.8	--	9.3	10.2	11.5	11.8	10	10.9
Beryllium	ug/L	<0.13	<0.13	<0.13	<0.13	0.19	<0.13	<0.13	<0.18	<0.18	--	<0.18	0.37	<0.18	0.28	<0.25	--
Cadmium	ug/L	<0.089	<0.089	<0.089	<0.089	0.32	<0.089	<0.089	<0.081	<0.081	--	<0.081	--	<0.15	0.21	<0.15	--
Chromium	ug/L	2.1	0.58	0.59	<0.39	0.7	0.53	0.7	2.3	<1	--	<1	<1	<1	<1	<1	<1
Cobalt	ug/L	1.4	0.25	0.22	0.041	0.38	0.071	0.064	0.13	0.12	--	<0.085	0.28	<0.12	0.35	<0.12	0.17
Lead	ug/L	0.9	0.077	0.48	<0.04	0.34	<0.04	<0.04	<0.2	<0.2	--	<0.2	--	<0.24	0.3	<0.24	--
Lithium	ug/L	1.3	0.58	0.69	0.6	0.87	0.67	0.68	0.62	0.6	--	0.55	0.85	0.52	0.9	0.61	0.67
Mercury	ug/L	<0.1	<0.1	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	--	<0.13	--	<0.084	<0.084	<0.084	--
Molybdenum	ug/L	0.35	0.15	0.14	0.12	0.38	<0.07	<0.07	<0.44	<0.44	--	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44
Selenium	ug/L	0.3	0.21	0.39	<0.21	0.26	<0.21	<0.21	<0.32	<0.32	--	<0.32	0.71	<0.32	0.49	<0.32	<0.32
Thallium	ug/L	<0.14	<0.14	<0.14	<0.14	0.48	<0.14	<0.14	<0.14	<0.14	--	<0.14	0.3	<0.14	0.48	<0.14	<0.14
Total Radium	pCi/L	1.31	1.11	0.89	0.631	1.01	2.42	1.35	1.3	1.74	--	0.882	0.0351	0.652	0.552	0.701	0.502
Radium-226	pCi/L	0.655	0.294	0.404	-0.067	0.108	1.46	0.513	0.287	1.09	--	0.122	-0.06	0.247	0	0.252	0.136
Radium-228	pCi/L	0.651	0.82	0.486	0.631	0.905	0.964	0.833	1.01	0.647	--	0.76	0.0351	0.405	0.552	0.449	0.366
Field Specific Conductance	umhos/cm	897	573	796	1464	859	1018	1354	698.4	691.7	561	774	799	767	883	801	868
Oxygen, Dissolved	mg/L	1.7	2.71	1.47	1.99	1.34	1.24	1.44	1.81	1.43	1.1	2.35	2.14	2.49	2.2	1.67	1.07
Field Oxidation Potential	mV	135	123.7	133.9	100.8	95.8	226.1	100.9	115.1	187.4	204	74.3	126.5	77.9	152.1	173	132.3
Groundwater Elevation	feet	785.56	768.12	786.31	787.64	787.37	787.27	787.89	788.25	787.34	785.89	785.29	787.06	788.98	787.04	788.47	787.24
Temperature	deg C	9.7	7.7	10	11.2	10.1	8.8	7.7	8.9	10.2	11.1	7.4	10.6	11.1	7.5	11.3	8.5
Turbidity	NTU	--	1.52	3.89	0.59	0.74	0.42	0.1	0.22	0.18	1.52	1.12	0.46	3.3	2.02	2.12	1.41
pH at 25 Degrees C	Std. Units	7	7	6.8	6.8	6.9	6.9	7.1	7	7	7.3	7	7	7.1	6.8	7	6.8

Single Location
Name: WPL - Columbia

Location ID: MW-301
Number of Sampling Dates: 25

Parameter Name	Units	5/29/2020	10/8/2020	4/14/2021	10/14/2021	4/13/2022	10/27/2022	4/27/2023	10/11/2023	4/17/2024
Boron	ug/L	21.3	28.8	22.2	31.4	28.7	37.5	20.1	36.2	24.9
Calcium	ug/L	112000	93000	117000	67800	97300	62800	120000	52300	102000
Chloride	mg/L	2	3.4	1.5	2.7	1.9	2.3	1.5	2.1	1.6
Fluoride	mg/L	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095
Field pH	Std. Units	6.73	6.95	6.66	7.01	6.6	6.8	6.65	7.06	7.06
Sulfate	mg/L	11.5	25.1	8.5	17.4	12.7	11.6	12.3	11.8	11.5
Total Dissolved Solids	mg/L	452	412	472	334	422	282	526	300	458
Antimony	ug/L	<0.15	0.33	<0.15	<0.15	0.31	<0.15	<0.15	<0.15	<0.15
Arsenic	ug/L	0.33	0.62	<0.28	0.35	0.47	0.3	<0.28	<0.28	<0.28
Barium	ug/L	9.8	9.4	8.9	7.7	7.8	7.5	9.8	7.3	8.1
Beryllium	ug/L	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Cadmium	ug/L	<0.15	0.19	<0.15	<0.15	0.3	<0.15	<0.15	<0.15	<0.15
Chromium	ug/L	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	ug/L	<0.12	0.29	<0.12	0.34	0.32	0.52	<0.12	0.13	<0.12
Lead	ug/L	<0.24	0.25	<0.24	<0.24	3.1	<0.24	<0.24	<0.24	<0.24
Lithium	ug/L	0.47	0.46	0.58	0.46	0.56	0.37	0.62	0.43	0.63
Mercury	ug/L	<0.084	<0.066	<0.066	<0.093	<0.066	<0.066	<0.066	<0.066	<0.066
Molybdenum	ug/L	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44
Selenium	ug/L	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32
Thallium	ug/L	<0.14	0.3	<0.14	0.17	0.32	<0.14	<0.14	<0.14	<0.14
Total Radium	pCi/L	0.193	0.38	1.16	0.172	0.179	0.00292	0.417	0.611	1.04
Radium-226	pCi/L	0	0.0511	0.418	0.172	0	-0.169	0	-0.0576	0.252
Radium-228	pCi/L	0.193	0.329	0.739	-0.0327	0.179	0.00292	0.417	0.611	0.787
Field Specific Conductance	umhos/cm	797	760	857	597.2	747	507.5	857	536	781
Oxygen, Dissolved	mg/L	2	1.22	3.9	0.25	2.47	0.1	6.5	0.16	2.53
Field Oxidation Potential	mV	118.7	183.9	102.9	57.8	207.5	80.9	95.3	23.8	17.9
Groundwater Elevation	feet	787.77	786.53	786.5	785.28	785.44	784.91	787.57	784.67	785.27
Temperature	deg C	8.1	11	7.4	11.1	7.1	10.8	8	10.7	8.6
Turbidity	NTU	0	0	2.41	3.21	0	0	0	0.34	0
pH at 25 Degrees C	Std. Units	7	7.2	6.9	7.3	7	7.1	6.9	7.2	7.9

Single Location

Name: WPL - Columbia

Location ID: MW-33AR
Number of Sampling Dates: 25

Parameter Name	Units	12/21/2015	4/5/2016	7/7/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/7/2017	10/24/2017	4/24/2018	9/21/2018	10/22/2018	4/2/2019	10/8/2019	5/28/2020
Boron	ug/L	954	813	794	827	812	763	760	692	697	678	601	683	682	568	548	566
Calcium	ug/L	50000	48900	50500	79000	63100	57500	66800	80700	84800	98200	99800	--	66900	131000	121000	58400
Chloride	mg/L	10.6	12.5	12.5	52.5	39.6	41.4	47.1	68.1	105	119	188	32.6	14.4	229	153	15.9
Fluoride	mg/L	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.095
Field pH	Std. Units	7.87	8.08	7.68	8.23	7.63	8.62	8.19	7.78	7.47	7.81	7.74	8.16	7.69	7.72	7.74	7.59
Sulfate	mg/L	96.2	91.5	99.2	124	132	133	139	151	164	175	163	124	112	201	182	104
Total Dissolved Solids	mg/L	356	354	364	456	440	426	446	492	598	606	692	466	388	784	634	376
Antimony	ug/L	0.14	0.11	0.18	0.79	0.11	0.12	<0.073	<0.15	0.35	--	--	--	--	--	--	--
Arsenic	ug/L	0.46	0.38	0.52	1.2	0.32	0.45	0.31	0.36	0.59	--	--	--	--	--	--	--
Barium	ug/L	25.8	24.8	26.8	47.7	37.8	33.8	35.1	37.7	42.4	--	--	--	--	--	--	--
Beryllium	ug/L	<0.13	<0.13	<0.13	0.28	<0.13	<0.13	<0.13	<0.18	0.19	--	--	--	--	--	--	--
Cadmium	ug/L	<0.089	<0.089	0.11	0.66	<0.089	<0.089	<0.089	<0.081	0.22	--	--	--	--	--	--	--
Chromium	ug/L	2.3	2.1	1.9	2.2	1.9	2	2.4	1.5	1.7	--	--	--	--	--	--	--
Cobalt	ug/L	<0.036	<0.036	0.13	0.68	0.039	0.065	<0.036	<0.085	0.23	--	--	--	--	--	--	--
Lead	ug/L	<0.04	<0.04	0.14	0.73	<0.04	0.046	<0.04	<0.2	0.35	--	--	--	--	--	--	--
Lithium	ug/L	1.3	1.3	1.1	2.8	1.4	1.3	1.2	1.4	1.4	--	--	--	--	--	--	--
Mercury	ug/L	<0.1	<0.1	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	--	--	--	--	--	--	--
Molybdenum	ug/L	4.7	4.1	4.4	2.4	3.8	3.6	3	1.3	2.1	--	--	--	--	--	--	--
Selenium	ug/L	2.2	2	2.1	2.9	2	2.3	2.3	1.9	2.4	--	--	--	--	--	--	--
Thallium	ug/L	<0.14	<0.14	0.17	0.76	<0.14	<0.14	<0.14	<0.14	0.31	--	--	--	--	--	--	--
Total Radium	pCi/L	0.76	0.852	1.79	1.01	1.53	0.556	0.313	0.829	1.12	--	--	--	--	--	--	--
Radium-226	pCi/L	0.202	0.709	0.835	-0.209	0.834	0.314	0.166	0.3	0.426	--	--	--	--	--	--	--
Radium-228	pCi/L	0.558	0.143	0.951	1.01	0.698	0.242	0.147	0.529	0.698	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	607	417.6	583.4	1255	702	797	1165	689	823	804	1079	632	618.4	1312	1102	633.4
Oxygen, Dissolved	mg/L	10.6	9.67	3.82	9.98	9.41	6.46	9.98	10.7	8.1	9.5	3	10.33	9.88	10.22	12.19	10.35
Field Oxidation Potential	mV	269	176	39.9	67.7	73.5	193.9	833	101.5	152.1	191	33.8	2.9	136.9	129	165.1	199.4
Groundwater Elevation	feet	783.77	763.29	785.19	787.36	785.66	785.88	786.39	787.27	786.11	784.13	783.09	787.9	788.77	786.63	788.26	786.01
Temperature	deg C	11.6	10.1	11.9	13.2	12.2	11.3	10.3	10.9	12.3	12.5	10.9	13.8	13.6	10.3	12.8	10.7
Turbidity	NTU	--	1.37	0.57	0.45	0.44	0.23	0.45	0.68	0.32	3.24	0.61	3.79	4.69	2.71	2.13	0
pH at 25 Degrees C	Std. Units	7.8	7.8	7.7	7.6	7.6	7.6	8	7.8	7.4	7.7	7.7	7.8	7.8	7.6	7.6	7.6

Single Location
Name: WPL - Columbia

Location ID: MW-33AR

Number of Sampling Dates: 25

Parameter Name	Units	10/8/2020	4/13/2021	6/11/2021	10/12/2021	4/12/2022	10/27/2022	4/27/2023	10/11/2023	4/17/2024
Boron	ug/L	569	473	--	564	558	586	532	485	531
Calcium	ug/L	57100	51600	--	53700	80000	77000	55300	59400	64200
Chloride	mg/L	27.3	26.9	--	22.6	59	40.5	19	24.2	22.8
Fluoride	mg/L	<0.095	<0.095	--	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095
Field pH	Std. Units	7.7	8.78	7.71	7.59	7.6	7.54	7.61	7.88	7.58
Sulfate	mg/L	97.4	94.3	--	96.4	155	153	104	139	165
Total Dissolved Solids	mg/L	270	362	--	374	506	440	394	448	452
Antimony	ug/L	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	--	--	--	--	--	--	--	--	--
Barium	ug/L	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	--	--	--	--	--	--	--	--	--
Chromium	ug/L	--	--	--	--	--	--	--	--	--
Cobalt	ug/L	--	--	--	--	--	--	--	--	--
Lead	ug/L	--	--	--	--	--	--	--	--	--
Lithium	ug/L	--	--	--	--	--	--	--	--	--
Mercury	ug/L	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	--	--	--	--	--	--	--	--	--
Selenium	ug/L	--	--	--	--	--	--	--	--	--
Thallium	ug/L	--	--	--	--	--	--	--	--	--
Total Radium	pCi/L	--	--	--	--	--	--	--	--	--
Radium-226	pCi/L	--	--	--	--	--	--	--	--	--
Radium-228	pCi/L	--	--	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	623.5	622	609	623.2	847	737	609.3	691	706
Oxygen, Dissolved	mg/L	9.31	10.11	11.42	--	9.62	8.91	11.71	9.11	9.5
Field Oxidation Potential	mV	160.4	125.3	85.3	90	198.2	101.2	176.7	131.2	40.4
Groundwater Elevation	feet	785.91	784.27	784.19	783.73	783.27	781.94	785.79	782.57	783.02
Temperature	deg C	13.8	9.8	12.7	13.5	10.6	12.7	10.2	13.3	11
Turbidity	NTU	0	0.63	0	0	0	0	0.2	0.93	1.47
pH at 25 Degrees C	Std. Units	7.8	7.8	--	8	7.7	7.9	7.8	7.7	8.6

Single Location
Name: WPL - Columbia

Location ID: MW-34A
Number of Sampling Dates: 28

Parameter Name	Units	12/21/2015	4/5/2016	7/7/2016	7/28/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/7/2017	10/24/2017	4/24/2018	9/21/2018	10/22/2018	4/2/2019	10/8/2019
Boron	ug/L	230/205	220	216	--	212	224	214	214	201	205	208	209	241	233	204	207
Calcium	ug/L	65300/65200	63500	60000	--	55600	62800	58900	66300	66900	67300	69600	69600	--	70100	67500	78800
Chloride	mg/L	4.9/4.8	5.1	5.6	--	6.8	7.1	7.2	6.2	7.8	7.4	7.6	8.2	17.1	19.9	18.7	57.9
Fluoride	mg/L	<0.2/<0.2	<0.2	<0.2	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1
Field pH	Std. Units	7.91	7.92	7.52	7.4	8.19	7.43	7.71	8.03	7.57	7.39	7.67	7.8	8.12	7.64	7.73	7.79
Sulfate	mg/L	69.9/71.3	71.6	63.4	--	54.8	63.9	71.2	87.6	106	105	98	144	141	123	70.4	39.8
Total Dissolved Solids	mg/L	300/324	298	304	--	288	242	310	330	366	358	340	412	460	392	310	314
Antimony	ug/L	<0.073/<0.073	<0.073	<0.073	--	0.59	<0.073	<0.073	<0.073	<0.15	<0.15	--	--	--	--	--	--
Arsenic	ug/L	0.2/0.2	0.35	0.26	--	0.87	0.23	0.36	0.29	<0.28	0.36	--	--	--	--	--	--
Barium	ug/L	15.8/11.1	9.1	9.4	--	9.9	9.5	8.9	11.6	9.9	10.2	--	--	--	--	--	--
Beryllium	ug/L	<0.13/<0.13	<0.13	<0.13	--	0.28	<0.13	<0.13	<0.13	<0.18	<0.18	--	--	--	--	--	--
Cadmium	ug/L	<0.089/<0.089	<0.089	<0.089	--	0.51	<0.089	<0.089	<0.089	<0.081	0.089	--	--	--	--	--	--
Chromium	ug/L	2.5/2.2	2	2.2	--	2.2	1.8	1.8	2.4	1.7	1.5	--	--	--	--	--	--
Cobalt	ug/L	0.29/0.13	0.048	0.16	--	0.53	<0.036	<0.036	0.18	<0.085	0.13	--	--	--	--	--	--
Lead	ug/L	0.38/0.18	0.046	0.18	--	0.61	0.049	<0.04	0.18	<0.2	<0.2	--	--	--	--	--	--
Lithium	ug/L	0.7/0.64	0.4	0.56	--	0.8	0.51	0.46	0.57	0.45	0.62	--	--	--	--	--	--
Mercury	ug/L	<0.1/<0.1	<0.1	<0.13	--	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	--	--	--	--	--	--
Molybdenum	ug/L	1.1/1.1	1.1	1.1	--	1.7	1.1	1	1.1	0.93	1.1	--	--	--	--	--	--
Selenium	ug/L	0.77/1	0.78	0.71	--	1.2	0.45	0.82	1.2	0.77	1.2	--	--	--	--	--	--
Thallium	ug/L	<0.14/<0.14	<0.14	<0.14	--	0.68	<0.14	<0.14	<0.14	<0.14	0.24	--	--	--	--	--	--
Total Radium	pCi/L	0.689 /0.696	0.869	--	0.788	0.602	0.509	0.477	0.215	0.373	0.348	--	--	--	--	--	--
Radium-226	pCi/L	0.585 /0.198	0.869	--	-0.132	0.256	-0.235	0.477	0	-0.29	0.0539	--	--	--	--	--	--
Radium-228	pCi/L	0.104 /0.498	-0.021	--	0.788	0.346	0.509	-0.459	0.215	0.373	0.294	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	517	386.9	494.3	503.6	819	490	470.9	843	499.1	510.6	454	581.4	578	607.7	531.7	572.9
Oxygen, Dissolved	mg/L	10	9.38	3.96	5.11	10.33	9.9	9.83	9.96	10.27	8.02	9.9	2.45	10.54	10.62	10.22	11.71
Field Oxidation Potential	mV	255	163.5	28.8	130.8	77.5	72.9	17.9	82.5	109.3	144.8	207	38.3	-2.6	118.8	104.4	150.9
Groundwater Elevation	feet	783.5	795.16	785.05	784.86	786.45	785.72	785.98	786.3	786.66	785.81	784.5	781.77	787.01	787.88	786.82	787.92
Temperature	deg C	11.7	10.9	10.8	10.9	12.2	12.3	12.3	11	11	11.5	11.7	11	12.45	12.7	10.6	13.4
Turbidity	NTU	--	4.08	6.3	4.96	2.27	0.95	2.09	15.96	3.7	2.68	14.34	2.72	24.9	9.32	64.77	52.88
pH at 25 Degrees C	Std. Units	7.7/7.7	7.7	7.4	--	7.6	7.4	7.3	7.9	7.7	7.8	7.7	7.7	7.7	7.8	7.7	7.7

Single Location
Name: WPL - Columbia

Location ID: MW-34A
Number of Sampling Dates: 28

Parameter Name	Units	5/28/2020	10/8/2020	2/25/2021	4/13/2021	6/11/2021	10/12/2021	4/12/2022	10/27/2022	4/26/2023	10/11/2023	4/17/2024	7/29/2024
Boron	ug/L	210	213	--	203	--	212	237	264	220	237	265	214
Calcium	ug/L	58700	61300	--	61600	--	58100	77000	87300	49600	59000	58500	--
Chloride	mg/L	3.9	2.1	--	2.3	--	1.9	2.2	2.2	2	2.7	2.2	--
Fluoride	mg/L	<0.095	<0.095	--	<0.095	--	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	--
Field pH	Std. Units	7.4	7.81	7.57	7.93	7.61	7.68	8.34	7.53	7.53	7.78	7.4	7.69
Sulfate	mg/L	44.4	58.7	--	59.3	--	56.1	146	169	48.4	43.6	51.5	--
Total Dissolved Solids	mg/L	284	306	--	290	--	278	402	436	302	302	278	--
Antimony	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Barium	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Lead	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	ug/L	--	--	--	--	--	--	--	--	--	--	--	--
Total Radium	pCi/L	--	--	--	--	--	--	--	--	--	--	--	--
Radium-226	pCi/L	--	--	--	--	--	--	--	--	--	--	--	--
Radium-228	pCi/L	--	--	--	--	--	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	459	464.2	--	472.6	472.7	478.1	577	648	465.8	457.3	472.6	470.6
Oxygen, Dissolved	mg/L	10.12	9.88	--	10.47	11.77	10.1	7.82	8.46	9.87	8.32	8.57	9.69
Field Oxidation Potential	mV	198.5	143.2	--	118.8	73.4	72.6	112.6	38.8	124.4	122.4	44.4	96.7
Groundwater Elevation	feet	785.98	785.7	--	784.77	784.66	784.42	784.3	783.61	786.22	783.55	784.14	787.29
Temperature	deg C	11.1	12.9	--	10.3	12.2	13	11.4	12.6	10.9	13	11.3	11.7
Turbidity	NTU	84.51	55	--	36.34	9.72	21.13	4.39	1.76	2.11	1.05	3.65	2.44
pH at 25 Degrees C	Std. Units	7.6	7.7	--	7.8	--	7.8	7.8	7.7	7.8	7.7	8.6	--

Single Location
Name: WPL - Columbia

Location ID: MW-302
Number of Sampling Dates: 25

Parameter Name	Units	12/22/2015	4/5/2016	7/7/2016	10/13/2016	12/29/2016	1/25/2017	4/11/2017	6/6/2017	8/8/2017	10/24/2017	4/24/2018	9/21/2018	10/22/2018	4/2/2019	10/9/2019	5/29/2020
Boron	ug/L	80	78.8	134	132	106	149	322	671	833	691	1950	203	296	254	246	611
Calcium	ug/L	68800	65900	66900	71700	76100	75400	79600	88900	87100	94400	110000	--	56900	62400	61400	90500
Chloride	mg/L	4.2	4.1	3.1	1.1	1.2	1.6	1.6	3.5	4.5	6.9	15	1.7	1.8	1.5	1.1	1.2
Fluoride	mg/L	<0.2	<0.2	<0.2	<0.1	<0.1	0.13	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.095
Field pH	Std. Units	7.63	7.7	7.29	7.72	7.12	8.21	7.63	7.16	7.04	8.23	7.21	7.74	7.22	7.32	7.08	7.2
Sulfate	mg/L	37.4	55.6	35.4	64.7	56.4	61.6	81.3	84.6	79	78.4	109	30	26.9	25.2	16.7	34.6
Total Dissolved Solids	mg/L	312	312	344	360	330	384	436	466	470	446	598	280	288	290	274	404
Antimony	ug/L	0.17	0.092	0.2	0.14	0.14	0.17	<0.073	<0.15	<0.15	--	--	--	--	--	--	--
Arsenic	ug/L	<0.099	0.17	0.23	0.2	<0.099	0.24	<0.099	<0.28	<0.28	--	--	--	--	--	--	--
Barium	ug/L	14.3	9.7	14.6	16.4	16.9	17.8	20.3	22	22.2	--	--	--	--	--	--	--
Beryllium	ug/L	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.18	<0.18	--	--	--	--	--	--	--
Cadmium	ug/L	<0.089	<0.089	0.14	<0.089	<0.089	<0.089	<0.089	<0.081	<0.081	--	--	--	--	--	--	--
Chromium	ug/L	2.3	3.3	2.7	1.7	2.4	2.6	2.7	2.3	2	--	--	--	--	--	--	--
Cobalt	ug/L	0.11	0.11	0.2	<0.036	0.079	0.083	0.08	<0.085	<0.085	--	--	--	--	--	--	--
Lead	ug/L	0.1	0.084	0.24	<0.04	0.073	0.075	0.047	<0.2	<0.2	--	--	--	--	--	--	--
Lithium	ug/L	17.1	13.7	4.5	3	3.3	3.2	2.7	2.2	2.4	--	--	--	--	--	--	--
Mercury	ug/L	<0.1	<0.1	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	--	--	--	--	--	--	--
Molybdenum	ug/L	8.9	8	2.4	1.6	1.6	1.6	1.5	1.3	1.6	--	--	--	--	--	--	--
Selenium	ug/L	2.8	2.7	1.8	1.2	2	1.6	2.5	2	2.4	--	--	--	--	--	--	--
Thallium	ug/L	<0.14	<0.14	0.24	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	--	--	--	--	--	--	--
Total Radium	pCi/L	0.184	0.505	1.21	0.4	0.252	2.6	0.555	1.45	0.731	--	--	--	--	--	--	--
Radium-226	pCi/L	0.184	0.1	-0.358	0.208	-0.103	1.37	0.077	0.649	0.193	--	--	--	--	--	--	--
Radium-228	pCi/L	-0.028	0.405	1.21	0.192	0.252	1.23	0.478	0.802	0.538	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	566	383.6	578	1006	588.9	726	1114	641.8	679	596	894	461	507.6	538.6	515.4	694.7
Oxygen, Dissolved	mg/L	6.8	9.7	3.7	9.37	8.5	6.22	9.53	9.91	7.4	8.7	2.8	9.82	9.34	9.65	11.38	10
Field Oxidation Potential	mV	132	198.6	80	96.3	88.9	223.4	107.4	130.4	191.1	220	49.1	56	135.1	126.7	134.5	169.2
Groundwater Elevation	feet	784.78	778.91	786.28	787.76	787.05	786.89	787.55	788.37	787.55	785.94	784.37	788.37	789.16	787.56	788.31	787.29
Temperature	deg C	10.6	9.8	11.2	12.2	11.1	10.4	9.5	10.1	11.4	11.4	10.7	12.45	13.1	9.8	12.6	9.8
Turbidity	NTU	--	9.69	2.08	0.81	1.78	1.26	1.68	1.9	0.83	2.61	3.42	5.26	5.23	9.72	2.01	2.88
pH at 25 Degrees C	Std. Units	7.5	7.6	7.3	7.2	7.1	7.8	7.6	7.5	7.4	7.2	7.4	7.4	7.3	7.4	7.4	7.4

Single Location
Name: WPL - Columbia

Location ID: MW-302

Number of Sampling Dates: 25

Parameter Name	Units	10/8/2020	4/13/2021	10/14/2021	4/12/2022	10/27/2022	4/27/2023	8/31/2023	10/11/2023	4/17/2024
Boron	ug/L	648	521	495	389	374	541	--	309	442
Calcium	ug/L	80600	82400	84100	91600	91200	66500	--	70800	77800
Chloride	mg/L	1.1	1.4	1.3	0.79	2.1	1.3	--	1.6	1.1
Fluoride	mg/L	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	--	0.1	0.12
Field pH	Std. Units	7.21	7.51	7.07	7.21	7.25	7.36	7.33	7.4	7.67
Sulfate	mg/L	36.5	36.9	37.8	22.1	30.3	36.6	--	19.9	26.8
Total Dissolved Solids	mg/L	378	370	394	398	348	352	--	354	344
Antimony	ug/L	--	--	--	--	--	--	--	--	--
Arsenic	ug/L	--	--	--	--	--	--	--	--	--
Barium	ug/L	--	--	--	--	--	--	--	--	--
Beryllium	ug/L	--	--	--	--	--	--	--	--	--
Cadmium	ug/L	--	--	--	--	--	--	--	--	--
Chromium	ug/L	--	--	--	--	--	--	--	--	--
Cobalt	ug/L	--	--	--	--	--	--	--	--	--
Lead	ug/L	--	--	--	--	--	--	--	--	--
Lithium	ug/L	--	--	--	--	--	--	3.3	--	--
Mercury	ug/L	--	--	--	--	--	--	--	--	--
Molybdenum	ug/L	--	--	--	--	--	--	--	--	--
Selenium	ug/L	--	--	--	--	--	--	--	--	--
Thallium	ug/L	--	--	--	--	--	--	--	--	--
Total Radium	pCi/L	--	--	--	--	--	--	--	--	--
Radium-226	pCi/L	--	--	--	--	--	--	--	--	--
Radium-228	pCi/L	--	--	--	--	--	--	--	--	--
Field Specific Conductance	umhos/cm	643.1	661.3	663.7	677.1	616.1	605.2	566.8	559.4	606.6
Oxygen, Dissolved	mg/L	9.21	9.92	8.07	8.74	8.6	10.91	11.98	9.93	8.58
Field Oxidation Potential	mV	152.7	127	149.1	197.1	38.2	144.7	259	152.5	29.6
Groundwater Elevation	feet	786.74	785.77	785.09	784.42	784.62	786.87	785.3	784.65	784.49
Temperature	deg C	11.8	9.6	11.5	9.5	11.6	9.7	11.9	11.8	10.2
Turbidity	NTU	0	2.6	2.54	3.92	0	1.82	3.87	0.15	4.17
pH at 25 Degrees C	Std. Units	7.6	7.4	7.7	7.4	7.4	7.7	--	7.4	8.5

Appendix E

Alternative Source Demonstrations

E1 October 2023 Detection Monitoring Alternative Source Demonstration

Alternative Source Demonstration October 2023 Detection Monitoring

Dry Ash Disposal Facility, Modules 1-3
Columbia Energy Center
Pardeeville, Wisconsin

Prepared for:

Alliant Energy

SCS ENGINEERS

25224067.00 | May 2, 2024

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

Table of Contents

Section Page

Tables

Figures

Appendices

I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\240502_COL_1-3 LF_Oct 2023 ASD_Final.docx

PE CERTIFICATION

Sherren C. Clark E-29863 Madison, Wis.	I, Sherren Clark, hereby certify that the information in this alternative source demonstration is accurate and meets the requirements of 40 CFR 257.94(e)(2). This certification is based on my review of the groundwater data and related site information available for the Columbia Energy Center Dry Ash Disposal Facility. I am a duly licensed Professional Engineer under the laws of the State of Wisconsin. 5/1/2024
	(signature) (date) Sherren Clark, PE
	(printed or typed name) License number E-29863 My license renewal date is July 31, 2024. Pages or sheets covered by this seal: Alternative Source Demonstration, October 2023 Detection
	Monitoring, Dry Ash Disposal Facility, Modules 1-3,
	Columbia Energy Center, Pardeeville, Wisconsin

[This page left blank intentionally]

1.0 INTRODUCTION

This Alternative Source Demonstration (ASD) was prepared to support compliance with the groundwater monitoring requirements of the “Coal Combustion Residuals (CCR) Final Rule” published by the U.S. Environmental Protection Agency (U.S. EPA) in the *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule*, dated April 17, 2015 (U.S. EPA, 2015), and subsequent amendments. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.94(e)(2). The applicable sections of the Rule are provided below in *italics*.

1.1 §257.94(E)(2) ALTERNATIVE SOURCE DEMONSTRATION REQUIREMENTS

The owner and operator may demonstrate that a source other than the CCR Unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels.

An ASD is completed when there are exceedances of one or more benchmarks established within the groundwater monitoring program to determine if any other sources are likely causes of the identified exceedance(s) of established benchmark(s) at the site. This ASD was performed in response to results indicating a statistically significant increase (SSI) over background levels during detection monitoring under the CCR Rule.

This ASD report evaluates the SSIs observed in the statistical evaluation of the October 2023 detection monitoring event at the Columbia Energy Center (COL) Dry Ash Disposal Facility (ADF), Modules 1-3 CCR Unit. The first ASD was prepared for this facility evaluating the SSIs observed in the statistical evaluation of the October 2017 detection monitoring event (SCS Engineers [SCS], 2018). The October 2017 ASD and subsequent semiannual updates have provided several lines of evidence demonstrating that SSIs reported for boron, chloride, field pH, and sulfate concentrations in the downgradient monitoring wells were likely due to man-made sources other than the CCR Units and/or naturally occurring constituents in the alluvial aquifer.

As discussed in more detail in **Section 4.2** of this ASD, the findings for the October 2023 monitoring event were consistent with those for the previous events.

1.2 SITE INFORMATION AND MAP

The COL site is located at W8375 Murray Road, Pardeeville, Columbia County, Wisconsin (**Figure 1**). The COL site is an active coal-burning generating station, which has been burning coal and disposing of CCR on site since the mid-1970s. The layout of the site is shown on **Figure 2**. The COL property includes two areas of CCR storage and disposal. These are the ADF and the Ash Ponds Facility. This ASD will evaluate the conditions at the site for Modules 1-3 of the ADF only. The ADF is operated under the Wisconsin Department of Natural Resources (WDNR) License No. 3025.

The groundwater monitoring system monitors the following CCR Unit:

- COL Dry ADF – Modules 1-3 (existing CCR Landfill)

Modules 1-3 were originally described as separate existing CCR landfills, although they are contiguous and are managed as a single landfill by the facility and by the WDNR. Wisconsin Power and Light Company (WPL) subsequently clarified that Modules 1-3 are one existing CCR landfill under the federal CCR Rule, and this report reflects WPL's clarification.

A map showing the CCR Unit and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR groundwater monitoring program and the state monitoring program is provided as **Figure 2.** Separate monitoring systems have been established for the other CCR Units at COL, which include Modules 4-6 of the COL ADF, Modules 10-11 of the COL ADF, the Primary Ash Pond, and the Secondary Ash Pond.

1.3 STATISTICALLY SIGNIFICANT INCREASES IDENTIFIED

SSIs were identified by comparing the monitoring results to Upper Prediction Limits (UPLs) established in accordance with 40 CFR 257.93(f)(3) and the statistical method previously selected for the CCR Unit. The UPLs are based on an interwell approach using two background monitoring wells: MW-84A and MW-301. The interwell UPLs were calculated based on a 1-of-2 resampling approach. The UPLs and results for the October 2023 monitoring event are summarized in **Table 1.**

The October 2023 SSIs include the following parameters and wells:

- Boron: MW-33AR, MW-34A, MW-302
- Chloride: MW-33AR
- Sulfate: MW-33AR, MW-34A

Concentration trends for the parameters with SSIs are shown in **Appendix A.**

1.4 OVERVIEW OF ALTERNATIVE SOURCE DEMONSTRATION

This ASD report includes:

- Background information (**Section 2.0**).
- Evaluation of potential that SSIs are due to methodology or analysis (**Section 3.0**).
- Evaluation of potential that SSIs are due to natural sources or man-made sources other than the CCR Units (**Section 4.0**).
- ASD conclusions (**Section 5.0**).
- Monitoring recommendations (**Section 6.0**).

The CCR Rule constituent results from background and compliance sampling for parameters with SSIs are provided in **Table 2.** The laboratory reports for the October 2023 detection monitoring event will be included in the 2024 Annual Groundwater Monitoring and Corrective Action Report to be completed in January 2025. Complete laboratory reports for the background monitoring events and the previous detection monitoring events were included in previous annual groundwater monitoring and corrective action reports.

2.0 BACKGROUND

To provide context for the ASD evaluation, the following background information is provided in this section of the report, prior to the ASD evaluation sections:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system
- Other monitoring wells

A more detailed discussion of the background information for the site is provided in the ASD for the October 2017 event (SCS, 2018).

2.1 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.1.1 Regional Information

For the purposes of groundwater monitoring, the surficial sand and gravel aquifer is considered the uppermost aquifer, as defined under 40 CFR 257.53. Immediately underlying the surficial sand and gravel aquifer is the Cambrian-Ordovician sandstone aquifer.

Additional details on the regional geology and hydrogeology were provided in the October 2017 ASD (SCS, 2018).

2.1.2 Site Information

Soils at the site are primarily sand to a depth of approximately 50 to 100 feet, and overlie sandstone bedrock. Soils encountered during the site feasibility study for the COL ADF were described as generally sandy with interbedded silty clay lenses up to 20 feet thick (Warzyn Engineering, Inc. [Warzyn], 1978). During drilling of CCR wells MW-301 and MW-302, the unconsolidated materials were identified as consisting primarily of silty sand and sand. Boring logs for previously installed monitoring wells MW-33AR, MW-34A, MW-84A, and MW-1AR (abandoned) show silty sand and sand as the primary unconsolidated materials at these locations. All CCR monitoring wells are screened within the unconsolidated sand unit.

Shallow groundwater at the site generally flows to the north and west across the existing landfill Modules 1-3 area, then generally flows west toward the Wisconsin River. The groundwater flow map for October 2023 is shown on **Figure 3**. Historically, localized groundwater mounding was associated with the ash ponds; however, flow in the ash pond area changed in 2022 and 2023 as the ponds were closed and CCR was removed. In 2022, dewatering wells located around the Secondary Pond lowered the water table near the Secondary Ash Pond and discharged groundwater to the Primary Ash Pond. Beginning in spring 2023, dewatering activities switched to the Primary Ash Pond area, and groundwater pumped from dewatering wells around the Primary Ash Pond was discharged to the large cooling pond south of the generating station. Dewatering activities ceased in September 2023. The October 2023 groundwater flow map shows flow toward the east end of the Primary Pond, which may reflect the recently terminated dewatering activities, and flow to the west from the west end of the Primary Pond. These temporary changes may have had some impact on flow directions in the Modules 1-3 area, but the general flow directions to the north and/or west did not change. The groundwater elevation data for the CCR monitoring wells and state monitoring program wells are provided in **Table 3**.

2.2 CCR RULE MONITORING SYSTEM

The groundwater monitoring system established in accordance with the CCR Rule consists of two upgradient (background) monitoring wells and three downgradient monitoring wells (**Table 1** and **Figure 2**). The background wells include MW-301 and MW-84A. The downgradient wells include MW-302, MW-33AR, and MW-34A. The CCR Rule wells are installed within the sand and gravel aquifer. Well depths range from approximately 29 to 51 feet, measured from the top of the well casing.

2.3 OTHER MONITORING WELLS

Additional groundwater monitoring wells currently exist at COL as part of the monitoring systems developed for the state monitoring program and for the other CCR Units.

Monitoring wells for the state monitoring program are installed in the unconsolidated sand and gravel unit, which is the uppermost aquifer as defined under 40 CFR 257.53. This shallow monitoring system includes water table wells and mid-depth piezometers. Well depths range from approximately 14 to 76 feet, measured from the top of the well casing.

3.0 METHODOLOGY AND ANALYSIS REVIEW

To evaluate the potential that an SSI is due to a source other than the regulated CCR Unit, SCS used a two-step evaluation process. First, the sample collection, field and laboratory analysis, and statistical evaluation were reviewed to identify any potential error or analysis that led to exceedance of the benchmark. Second, potential alternative sources, including natural variation and man-made sources other than the CCR Unit, were evaluated. This section of the report provides the findings of the methodology and analysis review. **Section 4.0** of the report addresses the potential alternative sources.

3.1 SAMPLING AND FIELD ANALYSIS

Field notes and sampling results were reviewed to determine if any sampling error may have caused or contributed to the observed SSIs. Potential field sampling errors or issues could include mislabeling of samples, improper sample handling, missed holding times, cross-contamination during sampling, or other field error. Field blank sample results were also reviewed for any indication of potential contamination from sampling equipment or containers.

SCS did not identify any sampling errors that may have caused or contributed to observed SSIs.

The October 2023 monitoring event was completed in accordance with the Sampling and Analysis Plan for the monitoring system.

3.2 LABORATORY ANALYSIS REVIEW

The laboratory reports for the October 2023 detection monitoring event were reviewed to determine if any laboratory analysis error or issue may have caused or contributed to an observed SSI for boron, chloride, or sulfate. The laboratory report review included reviewing the laboratory quality control flags and narrative, verifying that correct methods were used and desired detection limits were achieved, and checking the field and laboratory blank sample results.

Based on the review of the laboratory reports, SCS did not identify any laboratory analysis issues that could have caused or contributed to the observed SSIs for boron, chloride, and sulfate.

Time series plots of the SSI constituent analytical data were also reviewed for any anomalous results that might indicate a possible sampling or laboratory error (e.g., dilution error or incorrect sample labeling). The time series plots are provided in **Appendix A.** The concentrations observed are similar to historical concentrations for sulfate, boron, and chloride.

3.3 STATISTICAL EVALUATION REVIEW

The review of the statistical results and methods included a quality control check of the following:

- Input analytical data vs. laboratory analytical reports
- Statistical method and process for each SSI

Based on the review of the statistical evaluation, SCS did not identify any errors or issues in the statistical evaluation that caused or contributed to the determination of interwell SSIs for the October 2023 detection monitoring event.

3.4 SUMMARY OF METHODOLOGY AND ANALYSIS REVIEW FINDINGS

In summary, there were no changes to the SSI determinations for the October 2023 monitoring event based on the methodology and analysis review. No other errors or issues causing or contributing to the reported SSIs were identified.

4.0 ALTERNATIVE SOURCES

This section of the report discusses the potential alternative sources for the boron, chloride, and sulfate SSIs at the downgradient monitoring wells; identifies the most likely alternative source(s); and presents the lines of evidence indicating that an alternative source is the most likely cause of the observed SSIs.

4.1 POTENTIAL CAUSES OF SSI

4.1.1 Natural Variation

The statistical analysis was completed using an interwell approach, comparing the October 2023 detection monitoring results to the UPLs calculated based on the sampling of the background wells (MW-84A and MW-301). If concentrations of a constituent that is naturally present in the aquifer vary spatially, then the potential exists that the downgradient concentrations may be higher than upgradient concentrations due to natural variation. Previous monitoring results for boron, chloride, and sulfate at COL Modules 1-3 landfill are shown in **Table 2**.

Although natural variation is present in the shallow aquifer, it does not appear likely that natural variation is the primary source causing the boron, chloride, and sulfate SSIs.

4.1.2 Man-Made Alternative Sources

Man-made alternative sources that could potentially contribute to the boron, chloride, and sulfate SSIs could include the closed ash pond landfill, the active and inactive ash ponds, the former ash pond effluent ditch, the coal storage area, road salt use, railroad operations, or other plant operations.

Based on the groundwater flow directions and on previous investigations at the site, the former ash pond effluent ditch, a non-CCR alternative source, appears to be the most likely cause of the boron and/or sulfate SSIs for wells MW-33AR, MW-34A, and MW-302. The ash pond effluent ditch may also have contributed to the chloride SSI at MW-33AR.

4.2 LINES OF EVIDENCE

The lines of evidence indicating that the SSIs for boron, chloride, and sulfate in compliance wells MW-33AR, MW-34A, and MW-302, relative to the background wells, are due to an alternative source include:

1. Elevated levels of boron, chloride, and sulfate were present in the area west of the landfill, where the three compliance wells are located before the landfill was constructed.

2. Monitoring performed under the state program documents that the concentrations of boron, chloride, and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation.

3. Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing west and/or north.

4. The variations in chloride results for well MW-33AR since detection monitoring was initiated have not correlated with boron concentrations, as would be expected for a CCR leachate source; therefore, an alternative source is more likely.

4.2.1 Pre-Landfill Water Quality

Elevated levels of boron, chloride, and sulfate were present in the area west of the landfill, where the three compliance wells are located, before the landfill was constructed. Groundwater monitoring performed in 1977 and 1978 as part of the Feasibility Study for the landfill permitting showed that wells located along the west side of the future landfill footprint, where the current compliance wells are located, had elevated results for sulfate, chloride, and specific conductance. The 1978 Feasibility Study (Warzyn, 1978) for the Dry ADF discusses the influence of the ash pond effluent ditch on groundwater west of the proposed site. The former ash pond effluent ditch carried effluent from the ash ponds located north of the plant, and flowed south between the west side of the current landfill and the substation. Groundwater monitoring in December 1977 indicated that sulfate was present at 1,200 milligrams per liter (mg/L) in MW-33A, which was located near the point where the ash pond effluent discharged from a culvert into the effluent ditch. The sulfate concentration at this well decreased to 830 mg/L in the December 1978 sampling (Warzyn, 1979). Current concentrations of sulfate in this area, while above background, are much lower. The October 2023 sulfate result for MW-33AR (installed to replace MW-33A) was 139 mg/L, for MW-34A was 43.6 mg/L, and for MW-302 was 19.9 mg/L (**Table 1**).

Selected text and tables from the 1978 Feasibility Study and the 1979 Supplementary Feasibility Study Report are included in **Appendix B**.

4.2.2 Long-Term Concentration Trends

Monitoring performed under the state program documents that the concentrations of boron and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation. Routine groundwater monitoring for the COL ADF began after the Plan of Operation was approved and prior to initial CCR disposal. The earliest data available from the WDNR Groundwater Environmental Monitoring System (GEMS) database is from September 1984. Initial placement of CCR in test plots in Module 1 of the ADF was approved in October 1984, and CCR disposal began sometime after that. Therefore, the initial groundwater monitoring results in the GEMS database represent pre-disposal conditions for the landfill.

The earliest historic monitoring data show that before CCR disposal in the landfill began, concentrations of boron and sulfate were significantly higher than current concentrations in the area west of the landfill where the compliance wells are located. Graphs of historical concentrations are provided in **Appendix C**. Results for compliance well MW-34A show that current concentrations of boron, chloride, and sulfate are much lower now than when the landfill was constructed. Results for compliance well MW-302 are plotted with results from monitoring well MW-85, which was located near the current MW-302 location (see **Figure 2**) and was monitored from September 1984 through September 1995. Results for compliance well MW-33AR are plotted with results from well MW-33A. MW-33AR was a replacement well for MW-33A at a slightly different location and depth. The well screen was installed approximately 10 feet higher in MW-33AR than in MW-33A, intersecting the water table, which may explain the increase in concentration that occurred with the well replacement.

The recent boron concentrations are consistent with generally decreasing or stable historical concentrations at MW-33AR and MW-34A (**Appendix A** and **Appendix C**). Recent boron concentrations at MW-302 have been variable, but remain well below the concentrations observed in samples from MW-85 prior to CCR disposal in the landfill.

4.2.3 Groundwater Flow Direction Changes

Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing north and/or west. The 1978 Feasibility Study report states that the southern 2/3 of the proposed fill area (including the area of the active CCR landfill phases) exhibits a southeast and southerly groundwater flow direction, toward an agricultural drainage ditch southeast and south of the landfill area. The 1981 Plan of Operation indicates that flow in the landfill area is to the east-southeast. A water table map prepared by RMT, based on October 2002 water level measurements, shows flow under the landfill generally to the east and northeast from a groundwater high near the effluent ditch and Wisconsin Pollutant Discharge Elimination System (WPDES) pond between the landfill and the substation. The 1981 and 2002 water table maps are provided in **Appendix D**.

Under current conditions, groundwater flow below the active landfill area is generally to the north and northwest. The flow changes with time reflect the termination of discharge to the ash pond effluent ditch in the mid-2000s. When discharge via this ditch was active, the ditch was a source of recharge to the groundwater and created a high groundwater area with flow moving away from the ditch to the east. After discharge to the ditch was terminated, water levels in this area decreased significantly and the groundwater flow direction changed.

With the changes in groundwater flow, historically impacted groundwater moved in alternating directions. While the effluent ditch was active, impacted groundwater likely moved eastward past the current compliance wells, as indicated by the long-term concentration data. Although the compliance wells on the west side of Modules 1-3 are downgradient from the landfill under current flow conditions, the observed groundwater impacts may be residual from the past when the wells were downgradient from the effluent ditch.

4.2.4 Chloride and Boron Concentrations

The variations in chloride results for well MW-33AR since detection monitoring was initiated have not correlated with boron concentrations, as would be expected for a CCR leachate source; therefore, an alternative source is more likely. The chloride results for well MW-33AR increased beginning in 2016, peaked in April 2018 and April 2019, decreased significantly in May 2020, and have remained relatively low since then. The 2022 and 2023 concentrations exceeded the interwell UPL but were significantly lower than the values observed in 2019 (**Table 2** and **Appendix A**). Current chloride concentrations at MW-33AR are similar to those reported for samples from MW-33A prior to CCR disposal in the landfill (**Appendix B**).

Over the time period since 2016, when chloride concentrations at MW-33AR were highly variable, boron concentrations at MW-33AR have been generally following a long, steady decreasing trend. The lack of correlation with boron indicates the source of the increase and subsequent decrease in chloride is not likely the CCR landfill.

Sampling of the landfill leachate pond and lysimeters LS-1 and LS-3R, located on the western and southern edges of Modules 1-3, indicates that boron and chloride concentrations are generally both higher than background (**Table 4**); therefore, a leachate source would tend to influence concentrations of both parameters. Furthermore, the peak chloride concentrations in the groundwater samples from MW-33AR in 2018 and 2019 exceeded the chloride concentrations measured in the leachate at that time, indicating the leachate was not the source of chloride at this location (**Table 2**, **Table 4**, and **Appendix A**). Recent samples from the leachate pond have shown increased concentrations of chloride, but this increase does not correlate with results at MW-33AR, which have decreased, or with chloride results from the lysimeters, which remain low. Based on the comparison of groundwater and leachate chloride results, an alternative man-made source, such as road salt, is a more likely source of chloride than the CCR Unit.

5.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSIONS

The lines of evidence discussed above regarding the SSIs reported for boron, chloride, and sulfate concentrations in downgradient monitoring wells MW-33AR, MW-34A, and/or MW-302 demonstrate that the SSIs are likely primarily due to sources other than the CCR Unit. Boron and sulfate concentrations were elevated prior to disposal of CCR in the landfill and are associated with historical discharges from the ash ponds via the effluent ditch located west of the landfill. Pre-landfill chloride concentrations at MW-33A were also similar to current concentrations at MW-33AR and historic impacts may have contributed to the SSI for chloride. However, based on more recent higher concentrations of chloride, elevated chloride concentrations detected at well MW-33AR appear more likely to be related to an alternative non-CCR source, such as salt.

6.0 SITE GROUNDWATER MONITORING RECOMMENDATIONS

In accordance with section 257.94(e)(2) of the CCR Rule, the COL Modules 1-3 CCR Units may continue with detection monitoring based on this ASD. The ASD report will be included in the 2024 Annual Report due January 31, 2025.

7.0 REFERENCES

SCS Engineers, 2018, Alternative Source Demonstration, October 2017 Detection Monitoring, Columbia Energy Center Dry Ash Disposal Facility, April 2018.

U.S. EPA, 2015, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, April 2015.

Warzyn Engineering, Inc., 1978, Feasibility Study, Proposed Fly Ash and/or Scrubber Sludge Disposal Facility – Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

Warzyn Engineering, Inc., 1979, and Preliminary Engineering Concepts, Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

[This page left blank intentionally]

Tables

Table 1. Groundwater Analytical Results Summary -
Columbia Ash Disposal Facility MOD 1-3 / SCS Engineers Project #25224067.00

			Background Wells		Compliance Wells		
Parameter Name	**UPL Method**	**UPL**	**MW-84A**	**MW-301**	**MW-33AR**	**MW-34A**	**MW-302**
			10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Groundwater Elevation, ft amsl			784.39	784.67	782.57	783.55	784.65
Appendix III							
Boron, ug/L	P	35.6	14.0	36.2	485	237	309
Calcium, ug/L	NP	129,000	65,100	52,300	59,400	59,000	70,800
Chloride, mg/L	P	6.2	3.1	2.1	24.2	2.7	1.6 J
Fluoride, mg/L	DQ	DQ	<0.095	<0.095 M0	<0.095	<0.095	0.10 J
Field pH, Std. Units	P	7.78	7.51	7.06	7.88	7.78	7.40
Sulfate, mg/L	P	30.3	1.4 J	11.8	139	43.6	19.9
Total Dissolved Solids, mg/L	NP	514	324	300	448	302	354

4.4 Blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

Abbreviations:

UPL = Upper Prediction Limit
DQ = Double Qualification
SSI = Statistically Significant Increase
-- = Not Measured
μg/L = micrograms per liter
NP = Nonparametric UPL with 1-of-2 retesting
P = Parametric UPL with 1-of-2 retesting
LOQ = Limit of Quantitation
LOD = Limit of Detection
mg/L = milligrams per liter

J = Estimated concentration at or above the LOD and below the LOQ.
M0 = Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits

Notes:

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-84A and MW-301. Interwell UPLs based on 1-of-2 retesting approach. UPLs updated in January 2021 based on background well results through October 2019.

Created by: NDK Date: 12/2/2022
Last revision by: RM Date: 11/7/2023
Checked by: NLB Date: 11/14/2023
Scientist/Proj Mgr QA/QC: TK Date: 1/9/2024

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Sulfate (mg/L)
Background	MW-301	12/22/2015	26.5	3.70 J	9.30
		4/5/2016	25.2	4.00	15.3
		7/8/2016	23.6	3.50 J	15.0
		10/13/2016	30.6	2.20	13.9
		12/29/2016	32.8	2.00 J	12.3 J
		1/25/2017	32.6	1.50 J	6.50
		4/11/2017	28.8	2.00	10.3
		6/6/2017	21.3	3.50	17.1
		8/8/2017	30.6	5.50	31.6
		10/23/2017	34.3	4.00	27.5
		4/25/2018	24.3	2.30	8.60
		8/8/2018	22.8	--	--
		10/22/2018	27.8	3.20	19.2
		4/3/2019	26.9	2.90 J, B	5.30 J
		10/9/2019	35.9	1.70	8.40
		5/29/2020	21.3	2.00 J	11.5 J
		10/8/2020	28.8	3.40	25.1
		4/13/2021	22.2	1.50 J	8.5
		10/14/2021	31.4	2.70	17.4
		4/13/2022	28.7	1.90 J	12.7
		10/27/2022	37.5	2.3	11.6
		4/27/2023	20.1	1.5 J	12.3
		10/11/2023	36.2	2.1	11.8
	MW-84A	12/22/2015	11.9	4.90	4.90
		4/5/2016	14.0	4.70	4.30
		7/8/2016	14.7	5.10	3.70 J
		7/28/2016	--	--	--
		10/13/2016	11.1	4.30	2.60 J
		12/29/2016	14.7	4.70	2.70 J
		1/25/2017	16.1	4.60	3.00
		4/11/2017	12.9	4.90	2.80 J
		6/6/2017	14.8	5.50	2.70 J
		8/8/2017	22.9	5.50	2.00 J
		10/24/2017	13.8	5.10	2.20 J
		4/25/2018	25.0	4.80	2.80 J
		8/8/2018	12.8	--	--
		10/22/2018	10.1 J	4.20	1.60 J
		4/3/2019	13.6	3.60 B	1.40 J
		10/9/2019	12.0	3.90	1.30 J
		5/29/2020	10.0	3.70	1.50 J
		10/8/2020	9.7 J	4.30	1.30 J
		4/13/2021	14.3	4.40	1.40 J
		10/14/2021	11.1	3.50	17.4
		4/13/2022	10.5	5.20	1.40 J, M0
		10/27/2022	12.2	3.4	1.1 J
		4/27/2023	10.3	3.0	1.3 J
		10/11/2023	14.0	3.1	1.4 J

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Sulfate (mg/L)
Compliance	MW-302	12/22/2015	80.0	4.20	37.4
		4/5/2016	78.8	4.10	55.6
		7/7/2016	134	3.10 J	35.4
		10/13/2016	132	1.10 J	64.7
		12/29/2016	106	1.20 J	56.4
		1/25/2017	149	1.60 J	61.6
		4/11/2017	322	1.60 J	81.3
		6/6/2017	671	3.50	84.6
		8/8/2017	833	4.50	79.0
		10/24/2017	691	6.90	78.4
		4/24/2018	1,950	15.0	109
		9/21/2018	203	1.70 J	30.0
		10/22/2018	296	1.80 J	26.9
		4/2/2019	254	1.50 J	25.2
		10/9/2019	246	1.10 J	16.7
		5/29/2020	611	1.20 J	34.6
		10/8/2020	648	1.10 J	36.5
		4/13/2021	521	1.40 J	36.9
		10/14/2021	495	1.30 J	37.8
		4/12/2022	389	0.79 J	22.1 M0
		10/27/2022	374	2.1	30.3
		4/27/2023	541	1.3 J	36.6
		10/11/2023	309	1.6 J	19.9
	MW-33AR	12/21/2015	954	10.6	96.2
		4/5/2016	813	12.5	91.5
		7/7/2016	794	12.5	99.2
		10/13/2016	827	52.5	124
		12/29/2016	812	39.6	132
		1/25/2017	763	41.4	133
		4/11/2017	760	47.1	139
		6/6/2017	692	68.1	151
		8/7/2017	697	105	164
		10/24/2017	678	119	175
		4/24/2018	601	188	163
		9/21/2018	683	32.6	124
		10/22/2018	682	14.4	112
		4/2/2019	568	229	201
		10/8/2019	548	153	182
		5/28/2020	566	15.9	104
		10/8/2020	569	27.3	97.4
		4/13/2021	473	26.9	94.3
		6/11/2021	--	--	--
		10/12/2021	564	22.6	96.4
		4/12/2022	558	59.0	155
		10/27/2022	586	40.5	153
		4/27/2023	532	19.0	104
		10/11/2023	485	24.2	139

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Sulfate (mg/L)
Compliance	MW-34A	12/21/2015	230	4.90	69.9
		4/5/2016	220	5.10	71.6
		7/7/2016	216	5.60	63.4
		7/28/2016	--	--	--
		10/13/2016	212	6.80	54.8
		12/29/2016	224	7.10	63.9
		1/25/2017	214	7.20	71.2
		4/11/2017	214	6.20	87.6
		6/6/2017	201	7.80	106
		8/7/2017	205	7.40	105
		10/24/2017	208	7.60	98.0
		4/24/2018	209	8.20	144
		9/21/2018	241	17.1	141
		10/22/2018	233	19.9	123
		4/4/2019	204	18.7	70.4
		10/8/2019	207	57.9	39.8
		5/28/2020	210	3.90	44.4
		10/8/2020	213	2.10	58.7
		4/13/2021	203	2.30	59.3
		6/11/2022	--	--	--
		10/12/2021	212	1.90 J, M0	56.1
		4/12/2022	237	2.20	146
		10/27/2022	264	2.20	169
		4/28/2023	220	2.0	48.4
		10/11/2023	237	2.7	43.6
	MW-1AR[2]	4/14/2021	16.1	1.50 J	4.40 M0
		10/14/2021	12.4	1.20 J	3.10

Abbreviations:
µg/L = micrograms per liter or parts per billion (ppb)
mg/L = milligrams per liter or parts per million (ppm)
J = Estimated value below the laboratory's limit of quantitation
B = Analyte was detected in the associated Method Blank.
M0 = matrix spike recovery and/or matrix spike duplicate recovery outside of laboratory control limits.

Notes:
(1) Analytical laboratory reports provided in the Annual Groundwater Monitoring and Corrective Action Reports.
(2) MW-1AR was added to the sampling network in 2021 to provide additional evaluation of site conditions in the CCR unit. MW-1AR was abandoned in March of 2022.

Created by: NDK Date: 3/19/2020
Last revision by: RM Date: 4/18/2024
Checked by: LH Date: 4/15/2024
PM/Scientist Check: TK Date: 4/18/2024

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

Dry Ash Facility (Facility ID #03025)	**Well Number**	**MW-1AR**	**MW-4**	**MW-5R**	**MW-33AR**	**MW-33BR**	**MW-34A**	**MW-34B**	**MW-37A**	**MW-83**	**MW-84A**	**MW-84B**	**MW-86**	**MW-91AR**	**MW-91B**	**MW-92A**	**MW-92B**	**MW-93A**	**MW-93B**	**MW-312**
	Top of Casing Elevation (feet amsl)	822.55	819.74	805.44	808.29	808.39	805.95	806.05	813.04	807.96	814.28	814.26	824.79	809.03	808.45	808.47	808.41	827.89	827.71	826.79
	Screen Length (ft)																	10	5	10
	Total Depth (ft from top of casing)	44.40	39.58	25.97	31.08	57.50	35.43	56.95	31.80	25.42	40.21	52.02	45.43	32.90	52.38	28.94	51.75	50.7	82.5	52.5
	Top of Well Screen Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66	787.19	750.21	784.29
	Measurement Date																			
	October 2, 2012	783.41	783.70	784.96	782.38	782.23	783.03	782.99	782.66	dry	783.84	783.94	783.81	784.09	783.90	784.49	784.06	NI	NI	NI
	April 15, 2013	785.44	784.02	786.09	784.16	784.14	784.74	784.79	783.87	784.49	785.83	785.76	785.22	785.14	785.01	785.75	785.34	NI	NI	NI
	October 8, 2013													785.66	785.42	785.97	785.52	NI	NI	NI
	October 15, 2013	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.66	785.42	785.97	785.52	NI	NI	NI
	April 14, 2014	784.95	784.09	785.63	783.74	783.91	784.63	784.70	783.45	783.73	785.58	785.52	784.96	785.04	784.96	785.99	785.54	NI	NI	NI
	October 2-3, 2014	785.03	785.39	786.08	784.37	784.28	784.57	784.54	784.56	dry	785.24	785.18	785.19	785.47	785.28	785.75	785.33	NI	NI	NI
	April 13-14, 2015	783.96	783.63	785.25	783.01	782.74	783.65	783.95	782.87	dry	784.43	784.51	784.17	784.48	784.37	785.07	784.66	NI	NI	NI
	October 6-7, 2015	784.28	784.44	785.72	783.68	783.33	784.05	784.02	783.66	dry	784.80	784.76	784.66	784.89	784.70	785.20	784.76	NI	NI	NI
	April 4-6, 2016	785.82	aband	787.02	785.29	785.07	785.63	785.67	784.76	785.43	786.37	786.26	785.89	786.05	785.95	786.61	786.21	NI	NI	NI
	October 11-13, 2016	786.64	aband	788.00	787.36	786.46	786.45	786.32	786.40	786.81	787.22	787.11	786.96	787.17	786.81	787.68	787.25	NI	NI	NI
	April 10-13, 2017	786.96	aband	788.13	786.39	785.99	786.30	786.28	786.34	786.23	787.16	787.06	786.96	787.24	787.03	787.90	787.60	NI	NI	NI
	October 3-5, 2017	785.48	aband	786.66	784.51	784.22	784.67	784.63	784.86	784.29	NM	786.49	785.58	786.08	785.83	786.47	786.02	NI	NI	NI
	October 9-10, 2017	NM	aband	NM	NM	NM	NM	NM	NM	NM	785.56 (6)	NM	NM	NM	NM	NM	NM	NI	NI	NI
	February 21, 2018	783.97	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.68	784.46	NM	NM	NI	NI	NI
	April 23-25, 2018	783.99	aband	785.36	783.09	786.36	781.77	780.79	783.28	783.32	785.88	784.91	782.54	784.71	784.53	785.23	784.81	NI	NI	NI
	October 23-25, 2018	788.25	aband	789.71	788.77	787.96	787.88	787.73	787.62	788.26	788.32	788.19	788.21	788.59	788.31	789.32	788.87	NI	NI	NI
	April 1-4, 2019	787.05	aband	788.64	786.63	786.54	786.82	786.92	786.47	786.78	787.35	787.34	787.16	787.45	787.18	788.04	787.63	NI	NI	NI
	October 7-9, 2019	787.26	aband	789.23	788.26	787.64	787.92	787.74	786.77	788.90	787.79	787.73	787.44	787.78	787.62	788.63	788.17	NI	NI	NI
	May 27-28, 2020	786.92	aband	788.34	786.01	785.75	785.98	785.99	786.22	786.03	787.02	786.99	786.94	787.26	787.05	787.86	787.47	NI	NI	NI
	October 7-8, 2020	785.95	aband	787.76	785.91	785.45	785.70	785.68	785.52	785.72	786.10	786.06	786.10	786.55	786.33	786.85	786.38	NI	NI	NI
	February 25, 2021	NM	aband	NM	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	April 14, 2021	778.12	aband	787.29	784.27	784.05	784.77	784.77	784.46	c	785.84	785.81	785.60	785.86	785.69	786.47	786.06	NI	NI	NI
	June 11, 2021	NM	aband	NM	784.19	NM	784.66	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	October 11-12, 14, 2021	784.47	aband	786.78	783.73	783.60	784.42	784.41	783.88	783.87	784.96	784.88	784.79	785.14	784.94	785.55	785.11	NI	NI	NI
	October 17, 2021	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	April 1, 2022	aband	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 11-13, 2022	aband	aband	785.52	783.27	783.45	784.30	784.42	783.26	783.78	785.02	785.00	784.70	784.83	784.72	785.45	785.02	783.99	783.97	783.73
	October 24-28, 2022	aband	aband	785.43	781.94	781.61	783.61	783.61	782.28	dry	784.57	784.54	784.38	784.64	784.47	785.05	784.62	783.74	782.76	783.50
	February 20-23, 2023	aband	aband	NM	783.57	NM	784.48	NM	NM	NM	785.25	NM	NM	NM	NM	NM	NM	NM	NM	NM
	March 27-28, 2023	aband	aband	NM	784.52	NM	785.23	NM	NM	NM	786.21	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 24-27, 2023	aband	aband	787.76	785.79	785.35	786.22	786.12	784.99	786.05	786.97	786.86	786.67	786.76	786.59	787.53	787.11	785.87	785.85	785.55
	May 16, 2023	aband	aband	787.79	785.64	785.25	786.06	786.05	785.39	785.77	786.88	786.79	786.74	786.95	786.75	787.47	787.05	786.23	786.21	785.97
	May 30-31, 2023	aband	aband	NM	785.23	NM	785.70	NM	NM	NM	786.57	NM	NM	NM	NM	NM	NM	NM	NM	NM
	October 9-11, 2023	aband	aband	785.33	782.57	782.39	783.55	783.40	782.94	dry	784.39	784.31	784.24	784.63	784.36	784.89	784.36	783.86	783.59	783.69
	Bottom of Well Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66	777.19	745.21	774.29

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

	Well Number	**M-3**	**M-4R**	**MW-39A**	**MW-39B**	**MW-48A**	**MW-48B**	**MW-57**	**MW-59**	**MW-216R**	**MW-217**	**MW-220RR**
Ash Pond Facility (Facility ID #02325)	**Top of Casing Elevation (feet amsl)**	788.23	806.10	809.62	809.50	828.86	828.84	786.29	815.48	814.21	791.55	792.90
	Screen Length (ft)											
	Total Depth (ft from top of casing)	16.90	25.55	34.80	76.07	51.88	75.80	14.40	38.50	37.85	37.37	18.96
	Top of Well Screen Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94
	Measurement Date											
	October 2, 2012	780.13	786.76	781.49	781.34	782.03	781.93	780.58	779.88	781.91	780.95	780.55
	April 15, 2013	785.16	788.39	783.97	784.00	783.77	783.78	784.69	783.66	784.09	784.75	785.02
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM
	April 14, 2014	786.04	788.96	783.57	783.68	783.56	783.57	785.51	783.41	783.73	785.25	785.87
	October 1-3, 2014	781.16	787.55	783.42	783.32	784.05	783.94	782.32	783.55	783.79	782.63	783.03
	April 13-14, 2015	783.08	786.83	782.77	782.68	782.80	782.82	782.81	782.83	782.93	783.34	783.42
	October 6-7, 2015	780.66	786.12	782.97	782.81	783.10	783.01	781.82	783.25	783.18	781.95	782.26
	April 4-6, 2016	784.21	789.09	785.27	785.27	784.79	784.76	783.21	784.97	785.68	785.02	784.36
	October 11-13, 2016	781.88	787.88	785.75	785.52	785.73	785.61	783.12	786.51	786.16	783.75	784.09
	April 10-13, 2017	782.94	787.95	785.44	785.20	785.82	785.69	782.77	786.09	785.95	784.29	784.09
	October 3-5, 2017	780.93	787.04	783.35	783.18	784.30	784.19	782.37	784.23	783.89	782.48	782.61
	April 23-25, 2018	782.89	790.43	782.86	782.87	783.14	783.09	783.04	783.02	783.23	783.26	783.45
	October 23-25, 2018	782.95	788.47	787.12	786.88	787.12	786.99	783.48	787.73	787.49	784.90	784.52
	April 1-4, 2019	785.68	789.44	786.28	786.31	786.56	786.45	785.27	787.39	786.53	786.33	785.46
	October 7-9, 2019	785.33	790.65	787.10	787.02	786.68	786.65	785.29	786.68	787.07	786.01	785.42
	May 27-29, 2020	781.80	787.73	785.12	784.92	785.74	785.59	783.11	785.89	785.60	783.41	783.89
	October 7-8 &17, 2020	781.42	787.74	784.74	784.64	785.03	784.96	782.83	785.43	785.10	783.06	783.49
	April 12, 2021	782.30	786.34	783.66	783.65	784.13	784.08	782.79	784.08	783.97	783.15	783.49
	October 11-12, 14, 2021	781.03	786.33	782.94	782.85	783.09	783.03	781.94	783.11	783.04	782.15	782.66
	April 11-13, 2022	783.95	788.26	783.37	783.34	783.10	783.10	NM	782.99	783.40	783.93	783.83
	June 3, 2022	NM	NM	NM	NM	NM	NM	782.13	NM	NM	NM	NM
	October 25, 26, 28, 2022	780.41	783.85	780.76	780.66	779.57	779.55	779.23	778.98	778.61	780.33	781.49
	March 27-28, 2023	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 24-27, 2023	785.18	782.59	785.38	785.19	784.55	784.51	NM	784.83	784.46	783.78	785.30
	May 16, 2023	782.79	781.64	784.70	784.58	784.60	784.49	782.80	784.68	783.94	782.07	784.03
	October 9-11, 2023	779.65	780.54	781.50	781.30	781.94	781.69	780.26	781.95	781.21	779.89	780.43
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

CCR Rule Wells	Well Number	MW-301	MW-302	MW-303	MW-304	MW-305	M-4R	MW-33AR	MW-34A	MW-84A	MW-306	MW-307	MW-308	MW-309	MW-310	MW-311	MW-312	MW-313	MW-314	MW-315	MW-316
	Top of Casing Elevation (feet amsl)	806.89	813.00	815.72	805.42	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74	826.786	820.3	821.57	819.78	808.49
	Screen Length (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Total Depth (ft from top of casing)	29.40	33.6	35.80	25.7	25.6	39.58	31.08	35.43	40.21	27	26.5	28	37.67	38.41	36.19	52.5				43.7
	Top of Well Screen Elevation (ft)	787.49	789.40	785.72	789.72	790.72	776.52	787.21	780.52	784.07	790.63	790.39	788.90	785.60	785.21	783.55	784.29				774.79
	Measurement Date																				
	December 21-22, 2015	785.56	784.78	784.11	786.13	788.96	787.58	783.77	783.50	785.31	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
	April 4-5, 2016	786.78	785.81	785.48	788.08	789.61	789.09	785.29	785.63	786.37	--	--	--	--	--	--	NI	NI	NI	NI	NI
	July 7-8, 2016	786.31	786.28	784.60	787.36	789.26	787.43	785.19	785.05	785.89	--	--	--	--	--	--	NI	NI	NI	NI	NI
	July 28, 2016	NM	NM	784.35	NM	NM	NM	NM	784.86	785.61	--	--	--	--	--	--	NI	NI	NI	NI	NI
	October 11-13, 2016	787.64	787.76	786.18	788.18	789.78	787.88	787.36	786.45	787.22	--	--	--	--	--	--	NI	NI	NI	NI	NI
	December 29, 2016	787.37	787.05	NM	NM	NM	NM	785.66	785.72	786.63	--	--	--	--	--	--	NI	NI	NI	NI	NI
	January 25-26, 2017	787.27	786.89	785.28	789.34	789.36	789.64	785.88	785.98	786.70	785.50	785.36	785.73	--	--	--	NI	NI	NI	NI	NI
	April 10 & 11, 2017	787.89	787.55	786.00	788.22	789.57	787.95	786.39	786.30	787.16	786.22	785.64	786.51	--	--	--	NI	NI	NI	NI	NI
	June 6, 2017	788.25	788.37	786.49	788.58	789.79	787.83	787.27	786.66	787.63	786.85	786.07	786.46	--	--	--	NI	NI	NI	NI	NI
	August 7-9, 2017	787.34	787.55	785.42	789.52	789.30	788.54	786.11	785.81	786.68	785.69	785.19	785.37	--	--	--	NI	NI	NI	NI	NI
	October 23-24, 2017	785.89	785.94	783.92	788.97	788.14	788.00	784.13	784.50	785.32	783.97	784.79	784.17	--	--	--	NI	NI	NI	NI	NI
	February 21, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.19	783.05	783.02	NI	NI	NI	NI	NI
	March 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.10	783.10	783.00	NI	NI	NI	NI	NI
	April 23-25, 2018	785.29	784.37	783.27	789.69	787.67	790.43	783.09	781.77	785.88	783.24	783.65	782.65	783.07	782.97	781.83	NI	NI	NI	NI	NI
	May 24, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.79	785.09	NM	785.45	785.97	786.11	NI	NI	NI	NI	NI
	June 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.03	786.64	786.47	NI	NI	NI	NI	NI
	July 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.27	786.35	786.55	NI	NI	NI	NI	NI
	August 7, 2018	787.06	NM	785.20	788.25	788.56	787.63	NM	NM	786.55	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI
	August 22, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.54	785.40	785.46	NI	NI	NI	NI	NI
	September 21, 2018	NM	788.37	786.50	NM	NM	NM	787.90	787.01	NM	NM	NM	NM	787.08	787.24	787.66	NI	NI	NI	NI	NI
	October 22-24, 2018	788.98	789.16	787.51	789.05	790.04	788.47	788.77	787.88	788.32	787.66	786.57	787.81	787.99	788.18	788.64	NI	NI	NI	NI	NI
	April 1-4, 2019	787.04	787.56	786.52	789.72	790.07	789.44	786.63	786.82	787.35	786.72	786.71	787.53	786.30	786.38	786.38	NI	NI	NI	NI	NI
	June 12, 2019	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	787.25	NM	NI	NI	NI	NI	NI
	June 19, 2019	NM	NM	786.81	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI
	October 7-9, 2019	788.47	788.31	787.02	790.41	790.36	790.65	NM	NM	NM	787.47	786.99	787.18	787.26	787.94	787.64	NI	NI	NI	NI	NI
	December 13, 2019	--	--	--	--	--	--	--	--	--	787.03	785.68	786.43	--	--	--	NI	NI	NI	NI	NI
	December 23, 2019	--	--	--	--	--	--	--	--	--	--	--	--	--	775.22	--	NI	NI	NI	NI	NI
	January 17, 2020	--	--	785.58	--	--	--	--	--	--	--	--	--	--	--	--	NI	NI	NI	NI	NI
	February 3, 2020	787.24	NM	NM	NM	NM	NM	NM	NM	786.50	785.77	785.57	786.48	NM	NM	NM	NI	NI	NI	NI	NI
	May 27-29, 2020	787.77	787.29	785.56	789.30	787.78	787.73	786.01	785.98	787.02	785.77	785.35	786.28	785.98	785.81	785.85	NI	NI	NI	NI	NI
	June 30, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM	NI	NI	NI	NI	NI
	August 6, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM	NI	NI	NI	NI	NI
	October 7-8, 2020	786.53	786.74	785.16	788.52	787.96	787.74	785.91	785.70	786.10	785.39	784.71	785.68	785.47	785.56	785.83	NI	NI	NI	NI	NI
	December 11, 2020	NM	NM	NM	NM	788.19	NM	NM	NM	NM	NM	NM	NM	785.26	785.26	NM	NI	NI	NI	NI	NI
	February 25, 2021	NM	NM	784.27	NM	788.36	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI
	April 12, 2021	786.50	785.77	784.07	787.99	788.11	786.34	784.27	784.77	785.84	784.32	784.21	785.55	784.29	784.24	784.15	NI	NI	NI	NI	NI
	June 11, 2021	NM	NM	NM	NM	NM	NM	784.19	784.66	NM	NM	NM	NM	784.20	784.05	NM	NI	NI	NI	NI	NI
	July 20, 2021	NM	NM	783.64	NM	788.39	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI
	October 11-12, 14, 2021	785.28	785.09	783.09	787.78	787.75	786.33	783.73	784.42	784.96	782.93	782.44	783.76	783.65	783.48	783.48	NI	NI	NI	NI	NI
	December 21, 2021	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	782.93	NM	NM	NI	NI	NI	NI	NI
	February 24, 2022	NM	NM	782.34	NM	786.49	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI
	April 11-13, 2022	785.44	784.42	783.40	788.20	787.87	788.26	783.27	784.30	785.02	783.11	783.32	784.19	783.14	783.19	783.04	NI	NI	NI	NI	NI
	July 27, 2022	NM	NM	783.07	NM	787.03	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI
	October 25-27, 2022	784.91	784.62	778.94	781.79	784.97	783.85	781.94	783.61	784.57	778.32	777.89	784.16	781.50	780.96	781.23	NI	NI	NI	NI	NI
	November 30, 2022	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	781.62	781.14	781.15	NI	NI	NI	NI	NI
	December 2, 2022	785.12	784.48	NM	783.97	NM	NM	781.91	783.71	784.76	778.52	779.54	NM	NM	NM	NM	NI	NI	NI	NI	NI
	January 12-13, 2023	785.20	784.55	NM	NM	NM	NM	782.75	784.10	784.88	NM	NM	NM	782.57	782.45	782.32	NI	NI	NI	NI	NI
	January 20, 2023	NM	NM	NM	788.08	NM	NM	NM	NM	NM	782.15	782.11	784.98	NM	NM	NM	NM	NM	NM	NM	NI
	January 24, 2023	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.73	783.36	783.63	783.77	NI
	February 20-23, 2023	785.56	784.98	NM	NM	NM	NM	NM	NM	NM	783.04	782.91	785.32	783.31	783.34	783.40	783.50	783.59	783.82	783.96	NI
	March 27-28, 2023	786.83	785.87	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.84	783.98	784.43	NM	784.12	784.41	784.57	NI
	April 24-27, 2023	787.57	786.87	784.38	784.03	NM	782.59	785.79	786.22	786.97	784.82	784.25	787.75	785.05	785.18	785.69	NM	785.21	785.43	785.59	NI
	May 5, 2023	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.55	NM	NM	NM	780.49
	May 16, 2023	787.43	787.07	783.88	784.12	dry	781.64	785.64	786.06	786.88	784.65	783.89	786.88	785.15	785.11	785.39	785.97	785.46	785.68	785.88	780.48
	May 30-31, 2023	787.04	786.89	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.90	784.69	784.97	NM	785.24	785.55	785.77	NM
	June 29-30, 2023	786.32	786.39	NM	NM	NM	NM	784.32	785.04	785.92	NM	NM	NM	784.12	783.84	783.97	NM	784.67	784.95	785.17	NM
	July 31, 2023	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.96	784.26	784.49	NM
	August 31, 2023	NM	785.30	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	782.47	NM	NM	783.55	783.83	783.97	NM
	October 9-11, 2023	784.67	784.65	781.21	780.09	779.93	780.54	782.57	783.55	784.39	NM	NM	783.09	782.58	782.32	782.22	783.69	783.10	783.33	783.59	780.30
	Bottom of Well Elevation (ft)	777.49	779.40	775.72	779.72	780.72	766.52	777.21	770.52	774.07	780.63	780.39	778.90	775.60	775.21	773.55	774.29	820.30	821.57	819.78	764.79

Notes:
NM = not measured
(1) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5, 2017 sampling event. The level was allowed to return to static and was measured on October 10, 2017.
(2) MW-303 was extended in 2022 due to regrading. Prior to October 2022, the TOC elevation was 811.52'. For events in October 2022 and later, the TOC elevation is 815.72'.

Created by: MDB Date: 5/6/2013
Last revision by: NLB Date: 11/29/2023
Checked by: RM Date: 11/29/2023
Proj Mgr QA/QC: TK Date: 4/18/2024

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25224067.00

Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LS-1	2015-Apr	DRY	--	--	--
	2015-Oct	BROKEN	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	--	6,530	12.3	789
	2017-Apr	--	6,510	20.7 J	814
	2017-Oct	--	6,200	14.2 J	764
	2018-Apr	--	5,920	16.0 J	856
	2018-Oct	DRY	--	--	--
	2019-Apr	--	5,640	22.0 J	911
	2019-Oct	--	6,180	19.2 J	861
	2020-May	--	6,180	25.4 J	1,040
	2020-Oct	--	5,640	27.2 J	950
	2021-Apr	--	6,010	21.1 J	976
	2021-Oct	--	6,230	14.3 J	987
	2022-Apr	--	6,140	13.3 J	1,040
	2022-Oct	--	6,000	16.7 J	898
	2023-Apr	--	6,200	27.1 J	969
	2023-Oct	--	6,330	<11.8 D3	1,050
LS-3R	2015-Apr	--	6,480	20.6 B	807
	2015-Oct	DRY	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	DRY	--	--	--
	2017-Apr	DRY	--	--	--
	2017-Oct	DRY	--	--	--
	2018-Apr	DRY	--	--	--
	2018-Oct	--	6,180	26.2 J	841
	2019-Apr	DRY	--	--	--
	2019-Oct	DRY	--	--	--
	2020-May	DRY	--	--	--
	2020-Oct	DRY	--	--	--
	2021-Apr	DRY	--	--	--
	2021-Oct	DRY	--	--	--
	2022-Apr	DRY	--	--	--
	2022-Oct	DRY	--	--	--
	2023-Apr	DRY	--	--	--
	2023-Oct	DRY	--	--	--

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25224067.00

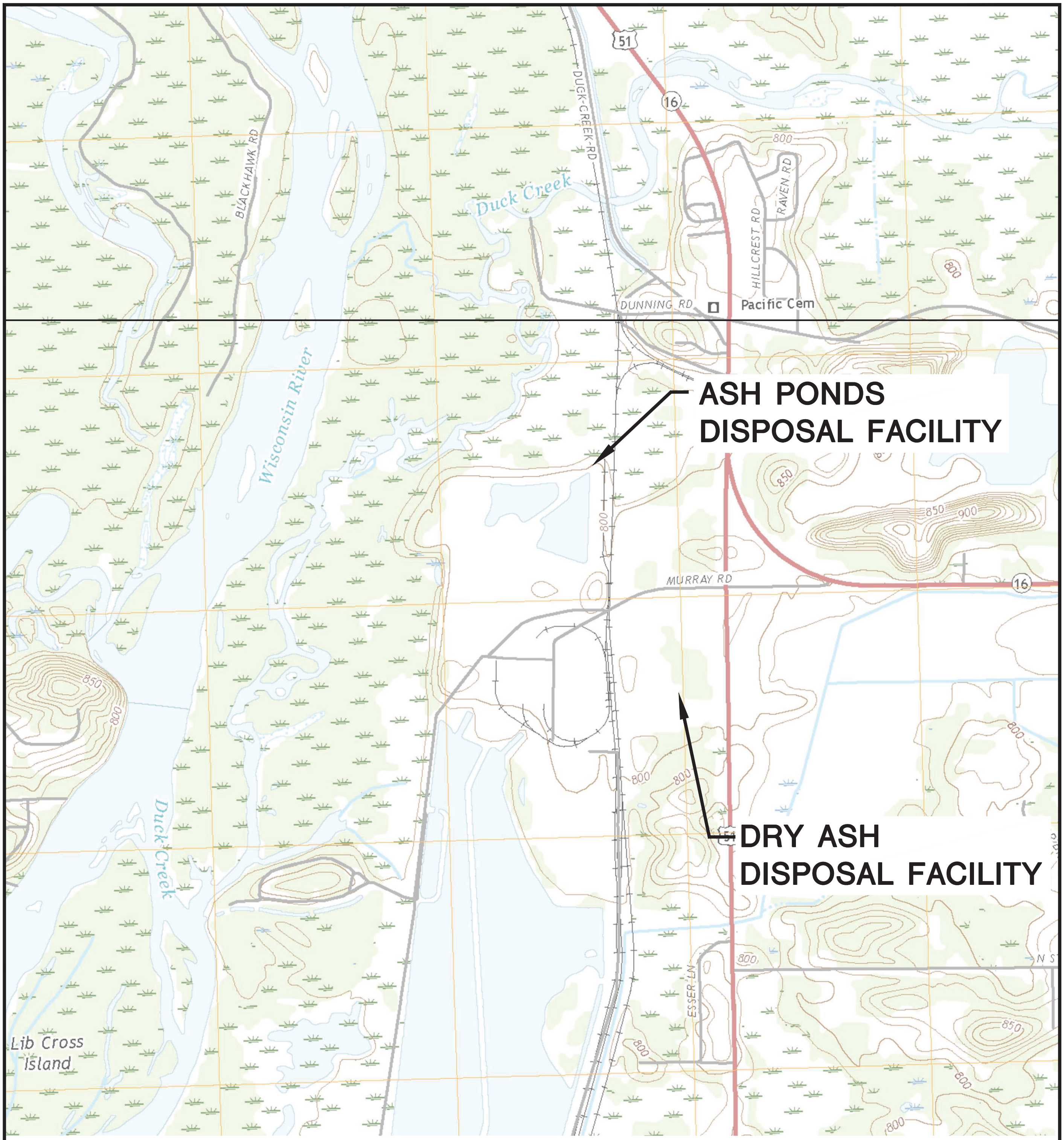
Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LP-1	2015-Apr	--	4,060	27.8	734
	2015-Oct	--	4,300	37.1	820
	2016-Apr	--	1,830	26.8	416
	2016-Oct	--	4,610	71.5	835
	2017-Apr	--	2,690	66.3	587
	2017-Oct	--	4,970	91.7	739
	2018-Apr	--	2,060	63.2	634
	2018-Oct	--	2,630	151	907
	2019-Apr	--	570	35.1	249
	2019-Oct	--	1,270	63.9	602
	2020-May	--	2,460	179	952
	2020-Oct	--	2,710	243	1,160
	2021-Apr	--	3,340	319	1,180
	2021-Oct	--	3,440	299	1,470
	2022-Apr	--	1,030	89.2	506
	2022-Oct	--	2,040	175	752
	2023-Apr	--	2,110	404	856
	2023-Oct	--	2,640	726	1,350

Abbreviations:
µg/L = micrograms per liter
mg/L = milligrams per liter
-- = not analyzed

Notes:
B = Analyte was detected in the associated method blank.
J = Estimated concentration at or above the Limit of Detection (LOD) and below the Limit of Quantitation (LOQ).
D3 = Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

Created by: MDB Date: 12/1/2014
Last revision by: RM Date: 4/15/2024
Checked by: LH Date: 4/15/2024

Figures



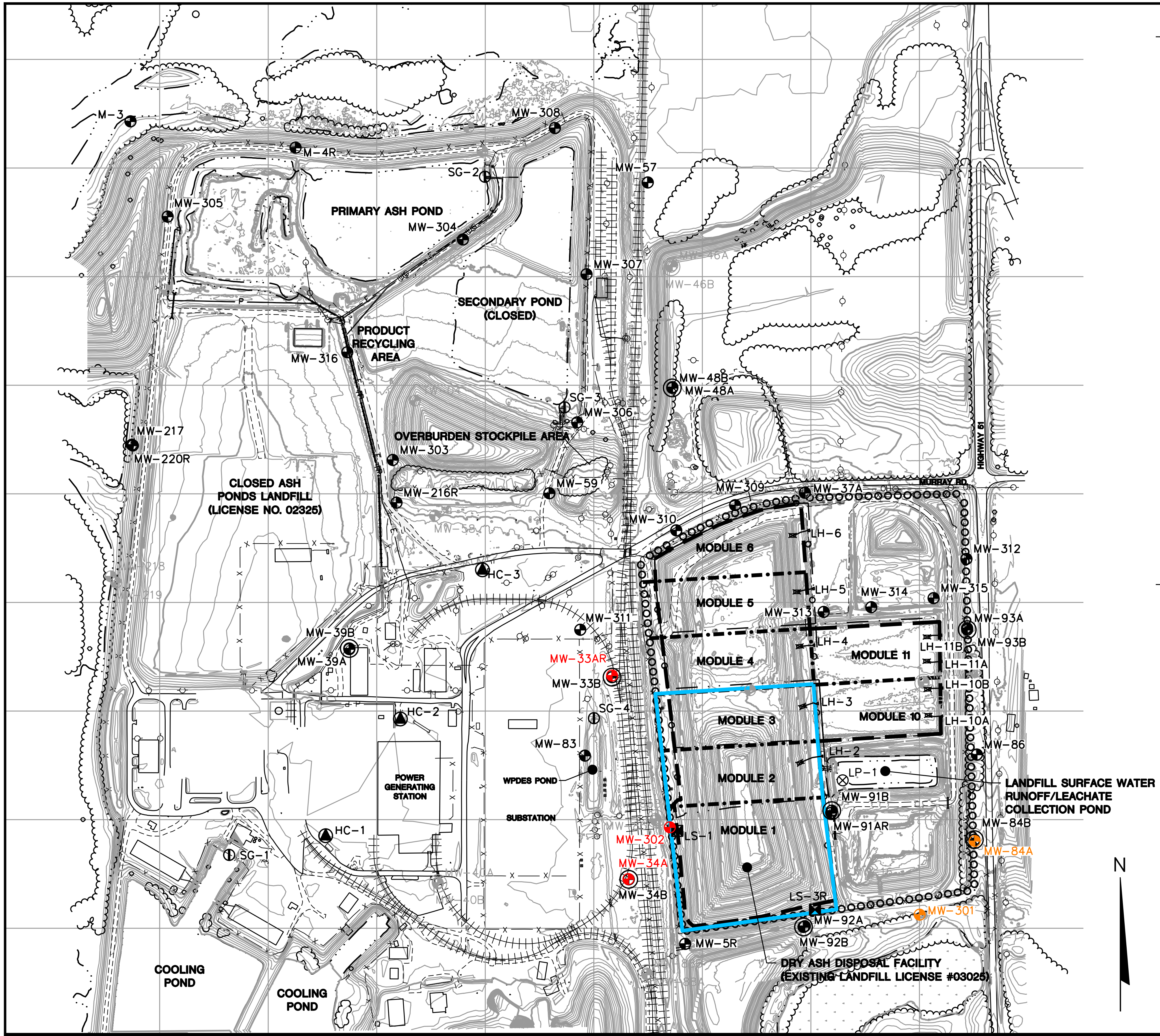
N

POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'

CLIENT	SITE	
ALLIANT ENERGY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	ALLIANT ENERGY COLUMBIA ENERGY CENTER PARDEEVILLE, WI	SITE LOCATION MAP

				ENGINEER	FIGURE
PROJECT NO.	25223067.00	DRAWN BY:	BSS	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718–6751 PHONE: (608) 224–2830	1
DRAWN:	12/02/2019	CHECKED BY:	TK		
REVISED:	05/01/2023	APPROVED BY:	TK 11/11/2023		

I:\25223067.00\Drawings\Site Location Map.dwg, 10/12/2023 9:55:52 AM



LEGEND

───	EXISTING MAJOR CONTOUR (10' INTERVAL)
───	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—	EXISTING FENCELINE
++++++++++	EXISTING TRACKS
═══	EXISTING PAVED ROAD
=======	EXISTING UNPAVED ROAD
—··—	EDGE OF WATER
○○○○○○○○	DRY ASH DISPOSAL FACILITY LIMITS
▬ ▬ ▬	LIMITS OF WASTE
▬·▬·▬	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
◕	WATER TABLE WELL
◉	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
⧗	LYSIMETER
◕	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
↗	LEACHATE HEADWELL
───	CCR UNIT
🔴	CCR MONITORING WELL
🟠	CCR BACKGROUND MONITORING WELL

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016, AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. MONITORING WELLS MW-93A, MW-93B, AND MW-312 WERE INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 23-28, 2022.
8. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON DECEMBER 12 AND 19, 2022.
9. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
10. BACKGROUND MONITORING WELLS FOR THE MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.

500 0 500

SCALE: 1" = 500'

PROJECT NO.	25224067.00	DRAWN BY:	KP
DRAWN:	12/02/2019	CHECKED BY:	RM
REVISED:	04/24/2024	APPROVED BY:	TK 05/01/2024

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

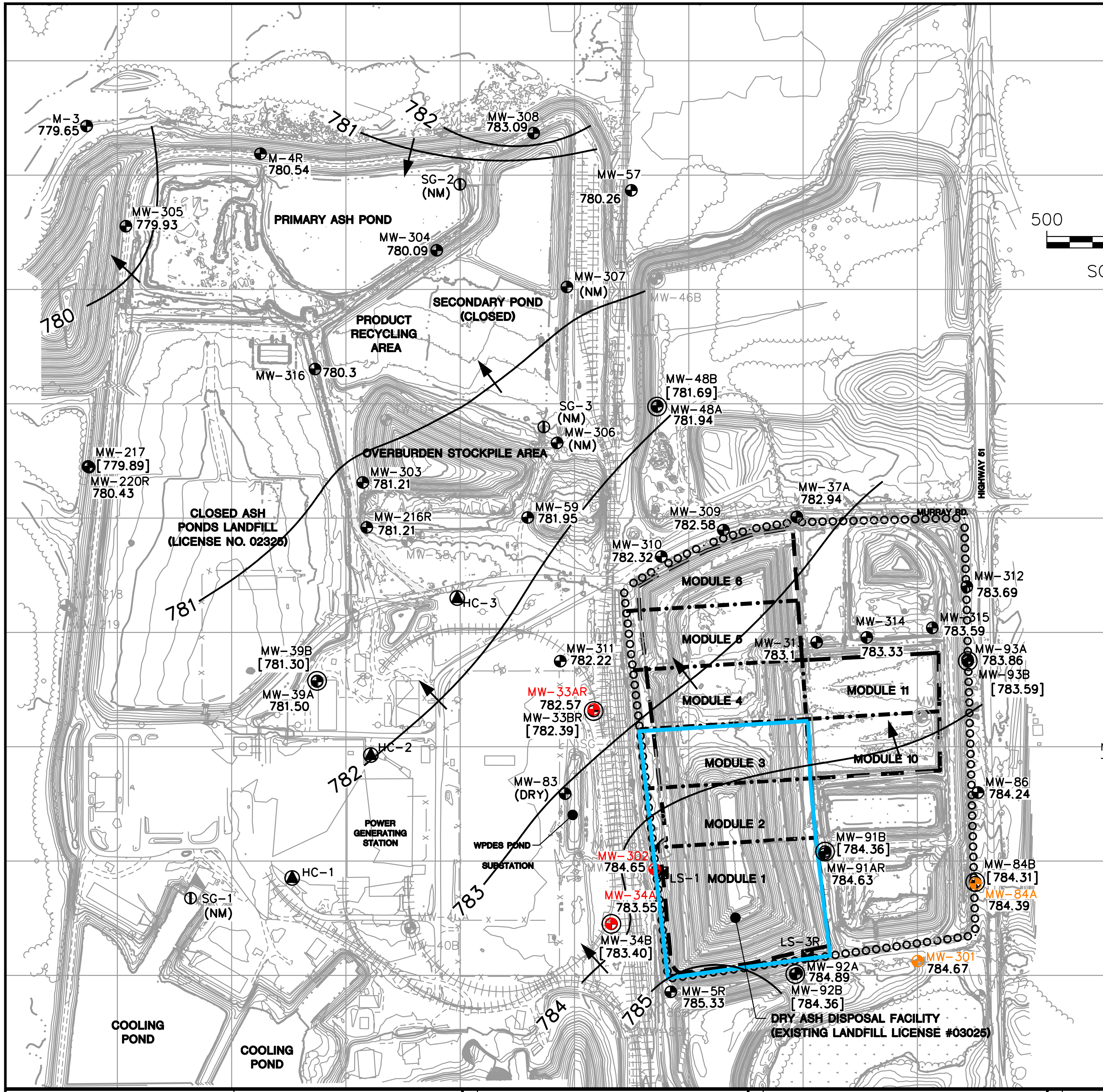
SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULES 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE
2

I:\25224067.00\Drawings\Modules 1-3\Site Plan and Monitoring Well Locations.dwg, 4/25/2024 6:48:46 AM



N

500 0 500

SCALE: 1" = 500'

LEGEND

——	EXISTING MAJOR CONTOUR (10' INTERVAL)
——	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—	EXISTING FENCELINE
┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
- - - -	EXISTING UNPAVED ROAD
—··—	EDGE OF WATER
○○○○○○○○	DRY ASH DISPOSAL FACILITY LIMITS
— — —	LIMITS OF WASTE
—·—·—	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
◐	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
——	CCR UNIT
●	CCR MONITORING WELL
●	CCR BACKGROUND MONITORING WELL
787.62	WATER TABLE ELEVATION
[788.87]	POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
(NM)	NOT MEASURED
——	WATER TABLE CONTOUR
→	APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. BACKGROUND MONITORING WELLS FOR THE MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.
8. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
9. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON DECEMBER 12 AND 19, 2022.
10. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
11. GROUNDWATER AND SURFACE WATER ELEVATIONS WERE MEASURED OCTOBER 2023.
12. DEWATERING PUMPING WAS STOPPED BY SEPTEMBER 11, 2023.

PROJECT NO.	25224067.00	DRAWN BY:	KP
DRAWN:	11/13/2023	CHECKED BY:	RM
REVISED:	04/24/2024	APPROVED BY:	TK 05/01/2024

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULES 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

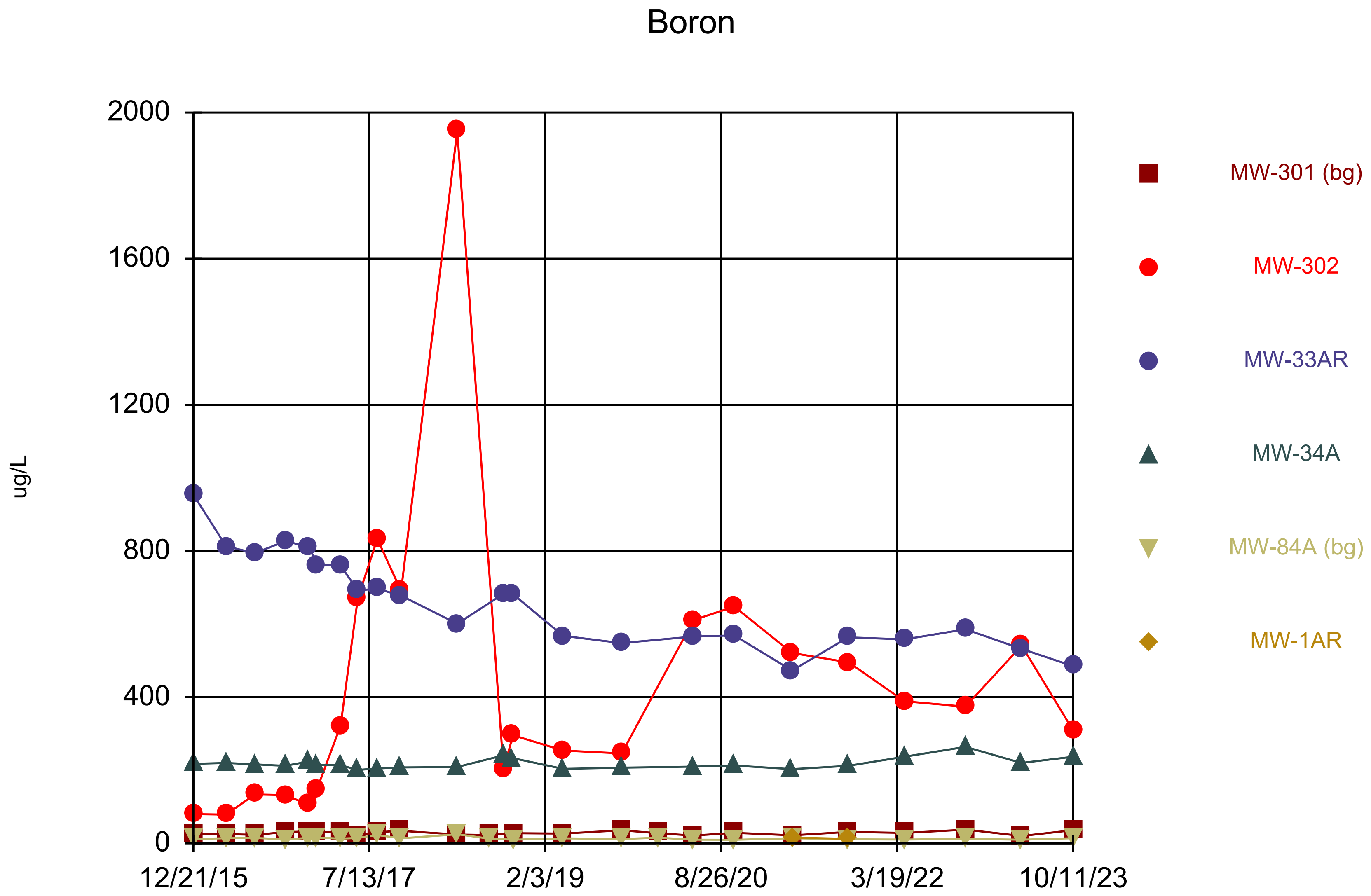
WATER TABLE MAP
OCTOBER 2023

FIGURE
3

I:\25224067.00\Drawings\Modules 1-3\Water Table Map-October 2023.dwg, 4/25/2024 7:01:59 AM

Appendix A

Trend Plots for CCR Wells



Time Series Analysis Run 4/15/2024 9:23 AM View: MOD 1-3 LF

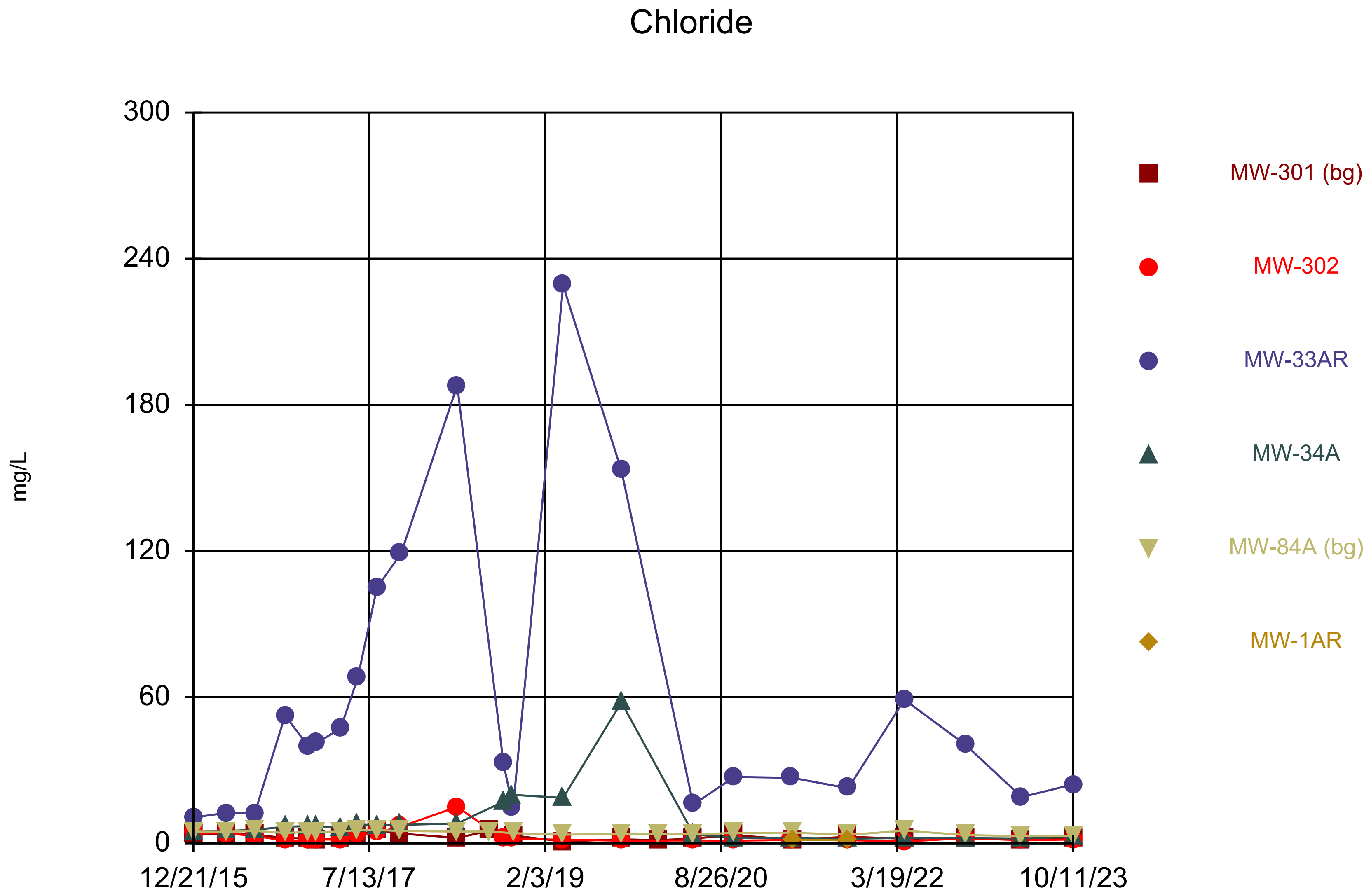
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

Constituent: Boron (ug/L)   Analysis Run 4/15/2024 9:24 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	MW-1AR
12/21/2015			954	217.5 (D)		
12/22/2015	26.5	80			11.9	
4/5/2016	25.2	78.8	813	220	14	
7/7/2016		134	794	216		
7/8/2016	23.6				14.7	
10/13/2016	30.6	132	827	212	11.1	
12/29/2016	32.8	106	812	224	14.7	
1/25/2017	32.6	149	763	214	16.1	
4/11/2017	28.8	322	760	214	12.9	
6/6/2017	21.3	671	692	201	14.8	
8/7/2017			697	205		
8/8/2017	30.6	833			22.9	
10/23/2017	34.3					
10/24/2017		691	678	208	13.8	
4/24/2018		1950	601	209		
4/25/2018	24.3				25	
8/8/2018	22.8				12.8	
9/21/2018		203	683	241		
10/22/2018		296	682	233		
10/24/2018	27.8				10.1 (J)	
4/2/2019	26.9	254	568	204		
4/3/2019					13.6	
10/8/2019			548	207		
10/9/2019	35.9	246			12	
2/3/2020	27.9				15.7	
5/28/2020			566	210		
5/29/2020	21.3	611			10	
10/8/2020	28.8	648	569	213	9.7 (J)	
4/13/2021		521	473	203		
4/14/2021	22.2				14.3	16.1
10/12/2021			564	212		
10/14/2021	31.4	495			11.1	12.4
4/12/2022		389	558	237		
4/13/2022	28.7				10.5	
10/27/2022	37.5	374	586	264	12.2	
4/26/2023				220		
4/27/2023	20.1	541	532		10.3	
10/11/2023	36.2	309	485	237	14	



Time Series Analysis Run 4/15/2024 9:23 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

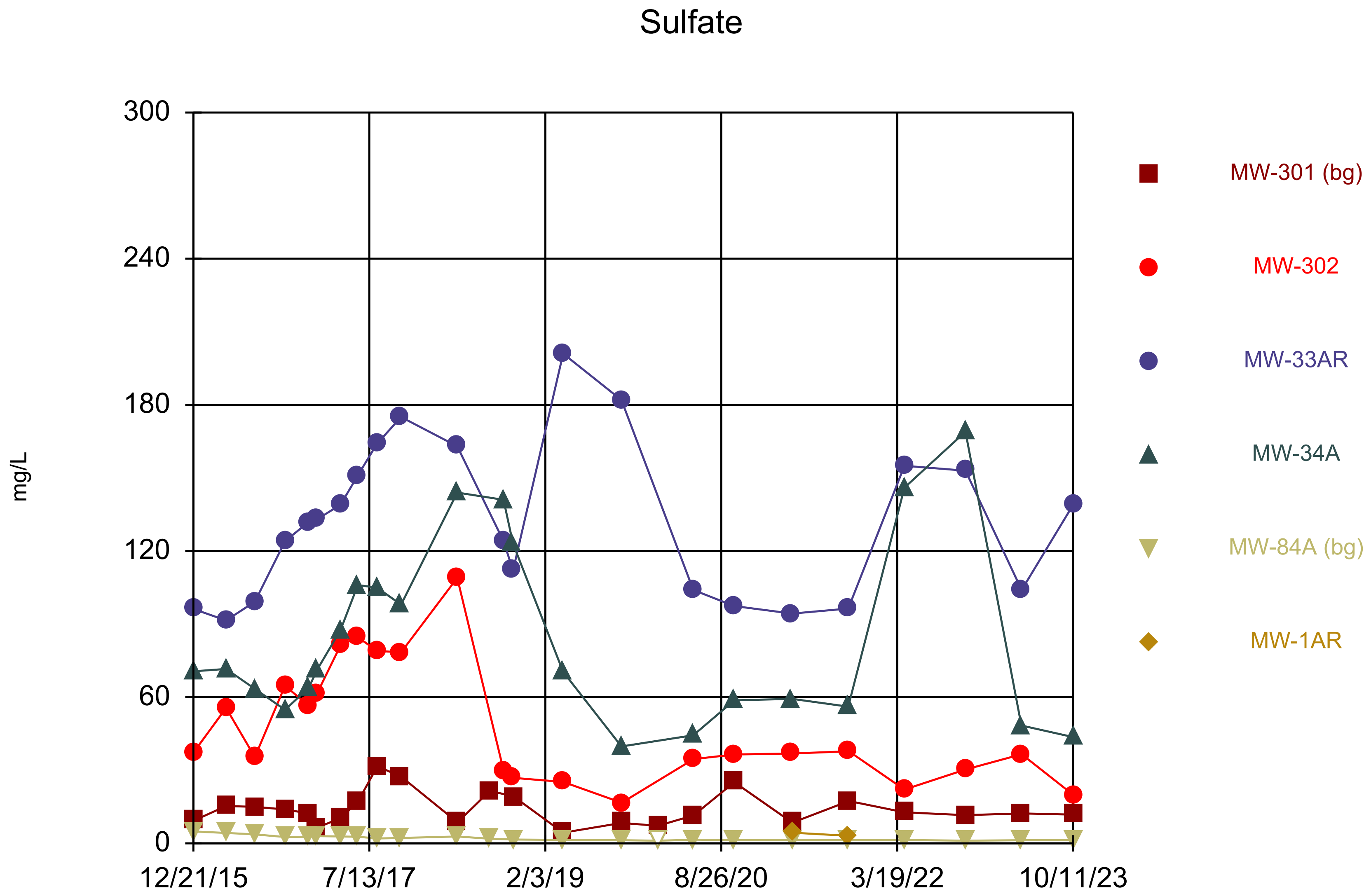
Time Series

Constituent: Chloride (mg/L) Analysis Run 4/15/2024 9:24 AM View: MOD 1-3 LF
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	MW-1AR
12/21/2015			10.6	4.85 (D)		
12/22/2015	3.7 (J)	4.2			4.9	
4/5/2016	4	4.1	12.5	5.1	4.7	
7/7/2016		3.1 (J)	12.5	5.6		
7/8/2016	3.5 (J)				5.1	
10/13/2016	2.2	1.1 (J)	52.5	6.8	4.3	
12/29/2016	2 (J)	1.2 (J)	39.6	7.1	4.7	
1/25/2017	1.5 (J)	1.6 (J)	41.4	7.2	4.6	
4/11/2017	2	1.6 (J)	47.1	6.2	4.9	
6/6/2017	3.5	3.5	68.1	7.8	5.5	
8/7/2017			105	7.4		
8/8/2017	5.5	4.5			5.5	
10/23/2017	4					
10/24/2017		6.9	119	7.6	5.1	
4/24/2018		15	188	8.2		
4/25/2018	2.3				4.8	
8/8/2018	5.2				4.9	
9/21/2018		1.7 (J)	32.6	17.1		
10/22/2018		1.8 (J)	14.4	19.9		
10/24/2018	3.2				4.2	
4/2/2019	0.79 (J)	1.5 (J)	229	18.7		
4/3/2019					3.6	
10/8/2019			153	57.9		
10/9/2019	1.7 (J)	1.1 (J)			3.9	
2/3/2020	1.3 (J)				3.7	
5/28/2020			15.9	3.9		
5/29/2020	2 (J)	1.2 (J)			3.7	
10/8/2020	3.4	1.1 (J)	27.3	2.1	4.3	
4/13/2021		1.4 (J)	26.9	2.3		
4/14/2021	1.5 (J)				4.4	1.5 (J)
10/12/2021			22.6	1.9 (J)		
10/14/2021	2.7	1.3 (J)			3.5	1.2 (J)
4/12/2022		0.79 (J)	59	2.2		
4/13/2022	1.9 (J)				5.2	
10/27/2022	2.3	2.1	40.5	2.2	3.4	
4/26/2023				2		
4/27/2023	1.5 (J)	1.3 (J)	19		3	
10/11/2023	2.1	1.6 (J)	24.2	2.7	3.1	

Sanitas™ v.10.0.16 Software licensed to SCS Engineers. UG

Hollow symbols indicate censored values.



Time Series Analysis Run 4/15/2024 9:23 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

Constituent: Sulfate (mg/L)   Analysis Run 4/15/2024 9:24 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	MW-1AR
12/21/2015			96.2	70.6 (D)		
12/22/2015	9.3	37.4			4.9	
4/5/2016	15.3	55.6	91.5	71.6	4.3	
7/7/2016		35.4	99.2	63.4		
7/8/2016	15				3.7 (J)	
10/13/2016	13.9	64.7	124	54.8	2.6 (J)	
12/29/2016	12.3 (J)	56.4	132	63.9	2.7 (J)	
1/25/2017	6.5	61.6	133	71.2	3	
4/11/2017	10.3	81.3	139	87.6	2.8 (J)	
6/6/2017	17.1	84.6	151	106	2.7 (J)	
8/7/2017			164	105		
8/8/2017	31.6	79			2 (J)	
10/23/2017	27.5					
10/24/2017		78.4	175	98	2.2 (J)	
4/24/2018		109	163	144		
4/25/2018	8.6				2.8 (J)	
8/8/2018	21.6				1.9 (J)	
9/21/2018		30	124	141		
10/22/2018		26.9	112	123		
10/24/2018	19.2				1.6 (J)	
4/2/2019	4.4	25.2	201	70.4		
4/3/2019					1.4 (J)	
10/8/2019			182	39.8		
10/9/2019	8.4	16.7			1.3 (J)	
2/3/2020	7.2				<2.2 (U)	
5/28/2020			104	44.4		
5/29/2020	11.5	34.6			1.5 (J)	
10/8/2020	25.1	36.5	97.4	58.7	1.3 (J)	
4/13/2021		36.9	94.3	59.3		
4/14/2021	8.5				1.4 (J)	4.4
10/12/2021			96.4	56.1		
10/14/2021	17.4	37.8			1.3 (J)	3.1
4/12/2022		22.1	155	146		
4/13/2022	12.7				1.4 (J)	
10/27/2022	11.6	30.3	153	169	1.1 (J)	
4/26/2023				48.4		
4/27/2023	12.3	36.6	104		1.3 (J)	
10/11/2023	11.8	19.9	139	43.6	1.4 (J)	

ND substitution: RL or RL/2 if <15% NDs.

Appendix B

Feasibility Study Water Quality Information

1370

FEASIBILITY STUDY
PROPOSED FLY ASH AND/OR SCRUBBER SLUDGE DISPOSAL FACILITY-COLUMBIA SITE

WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

Jan 78

C 7134

conceivable that groundwater flow in the area north of Murray Road may be altered such that contaminants derived from the present ash settling basin might be diverted southerly towards the homes along Murray Road. These questions would have to be addressed in greater detail, consistent with the goals of Wisconsin Power and Light Company.

WATER QUALITY

During the first two weeks of December, 1977, 64 water samples were obtained from surface waters and groundwater monitoring wells at the Columbia Energy Center. The purpose of the sampling was to assess background water quality in the vicinity of the proposed disposal site. The sampling stations included 59 monitoring wells, the cooling lake, ash settling pond, the drainage ditch carrying the ash pond discharge waters and the agricultural drainage ditch along the southern boundary of the site. Due to the large number of sampling stations, the analyses were limited to pH, specific conductance, iron, calcium, magnesium, sulfate and chloride. The analytical data is contained in Appendix F and is discussed below.

pH

Most groundwaters found in the United States have pH values ranging from around 6.0 to 8.5. The pH of a water represents the result of a number of interrelated chemical equilibria. This equilibria can be altered shortly after sampling by gains or losses of carbon dioxide, the oxidation of ferrous iron and numerous other chemical reactions. Thus, pH measurements must be taken shortly after obtaining the sample. For this study, the pH of samples was determined immediately upon return to the laboratory.

Within the proposed site boundaries at the Columbia Energy Center, pH values ranged between 6.3 and 8.1 and averaged 7.5. Typically, the lower pH values were observed in the lowland areas and wetlands, probably as a result of acidic organic soils. The pH of water in the ash disposal settling pond and the cooling lake was 11.4 and 8.3, respectively.

SPECIFIC CONDUCTANCE

Specific conductance, or conductivity, is the ability of a substance to conduct an electric current. The conductance determination is correlative with the dissolved-solids concentration. Conductivity, however, is temperature dependent and thus requires the reference of specific conductance measurements to a standard temperature. The values discussed here are referred to 25°C.

The specific conductance of groundwater in the study area ranged from 220 umhos/cm to a maximum of 2600 umhos/cm. The highest conductivity readings were observed in monitoring wells located along the coal storage area and the drainage ditch carrying the ash pond discharge where values up to 2600 umhos/cm were measured. The conductivity of the ash pond effluent was 1380 umhos/cm. This data appears to confirm earlier speculation of infiltration of effluent from the ash pond discharge channel and from the coal storage area into the groundwater. Conductance within the proposed site boundaries averaged approximately 465 umhos/cm.

Conductivity in the ash disposal settling pond was measured at 1510 umhos/cm. Shallow monitoring wells M-6 and 39A, located adjacent to the pond also exhibited elevated values of 1160 umhos/cm and 1800 umhos/cm, respectively.

High conductivities were also observed along U. S. Highway 51 at monitoring wells 51A and 51B. The chloride data, discussed below, indicates infiltration of road salt has probably occurred at this location.

Specific conductance measurements obtained in the vicinity of the proposed disposal site are shown on Drawing C 7134-15.

IRON

The element iron is an abundant element found in most rocks and soil. It generally occurs as sulfides and oxides in igneous and metamorphic rocks and as iron oxide and hydroxide cementing materials in coarse-grained sedimentary rocks.

Ferrous iron is unstable in the presence of oxygen where it is bound to hydroxide anions as $2Fe(OH)_3$.

$$2Fe^{++} + 4HCO_3^- + H_2O \rightleftharpoons 2Fe(OH)_3 + 4CO_2$$

If subjected to a strong reducing environment, such as a marsh, the reaction is reversed and iron goes back into solution. The amount which dissolves is related to a number of variables including the velocity with which water moves through this environment.

The U. S. Public Health Service recommends an iron concentration of less than 0.3 mg/l in water used for drinking and culinary purposes. Laundry and porcelain tend to be stained when concentrations reach 0.5 to 1.0 mg/l. At this level it can also be tasted.

The presence of iron under the proposed disposal area in the majority of cases was below the detection limit of 0.1 mg/l. In monitoring wells 5 and 18, located in or near the central marsh area, iron increased to 10 mg/l and 5.7 mg/l, respectively. In the southern marsh, monitoring wells exhibited concentrations between 0.5 mg/l and 6.1 mg/l. Although the iron concentration in the cooling lake was below the detection limit, down-gradient wells 44 and 30A located on the cooling lake dike yielded values of 11 mg/l and 26 mg/l iron respectively. Boring logs indicated trace amounts of organic material at the base of the dike which is probably the reason for the high concentrations observed. At the same location, iron in well 30B installed to a depth of 100 feet below the surface was below 0.1 mg/l. Thus, the occurrence of high iron concentrations in this area appears restricted to groundwater in the upper portion of the aquifer where organic material is present and conditions are favorable for the dissolution of iron.

The ash pond discharge in the drainage ditch paralleling the west site boundary showed an iron concentration of 3.7 mg/l. Shallow monitoring wells 33A and 34A adjacent to the ditch indicated less than 0.1 mg/l iron.

North of Murray Road the iron concentration in monitoring wells in the marsh and uplands were typically less than 0.1 mg/l. Although the ash basin had less than 0.1 mg/l iron, several wells along cross-section F-F' showed anomalously high values (#M6-2.3 mg/l; #47-16 mg/l; #51B-21 mg/l).

CALCIUM

Calcium, because of its relative abundance and mobility, is the principle cation in most natural fresh water. Calcium is a constituent of many rock types but is found in greatest quantities in waters leaching deposits of limestone and dolomite. In sandstone and other detrital rock, calcium carbonate is a common cement between grains.

Monitoring wells located within the site boundaries exhibited calcium concentrations between 30 mg/l and 66 mg/l and averaged about 42 mg/l. Similar to iron, the concentrations of calcium in monitoring wells along cross-section F-F' were anomalously high, up to 150 mg/l calcium. Water table wells along the drainage ditch carrying the ash pond discharge averaged 83 mg/l while the ash pond effluent contained 28 mg/l. Generally the amount of calcium in groundwater decreased with depth. Nested monitoring wells typically showed somewhat lower concentrations of calcium in the deeper wells.

MAGNESIUM

As a relatively abundant element on the earth's crust, the principle sources of magnesium in natural waters are considered to be ferromagnesian minerals in igneous rocks and magnesium carbonate in carbonate rocks (limestone and dolomite). Waters in which magnesium is the predominant cation are somewhat unusual. Like calcium, magnesium imparts the property of hardness to water and is, therefore, of concern to industrial users.

Generally, concentrations of magnesium were 1/3 to 1/2 of the calcium levels. Magnesium concentrations within the site boundaries ranged between 10 mg/l and 36 mg/l and averaged 27 mg/l. Similar to calcium and iron, higher magnesium values were observed, in general, north of Murray Road and especially in monitoring wells along cross-section F-F'.

SULFATE

Sulphur is widely distributed in reduced form in both igneous and sedimentary rocks as metallic sulfides and when present in sufficient concentrations, constitutes ore of economic importance. During weathering processes with aerated water, the sulfides are oxidized to sulfate ions and are dissolved into water. Pyrite (FeS_2) crystals often occur in sedimentary rocks and are particularly associated with biogenic deposits such as coal which were deposited under strongly reducing conditions.

The concentrations of sulfate in groundwater in the vicinity of the proposed disposal site ranged from less than 1 mg./l to 1,200 mg./l of sulfate. (Refer to Drawing C 7134-15.) Typically, within the site boundaries concentrations averaged approximately 12 mg./l. Near the coal storage area, however, significant increases were observed. Observation wells 26A, 26B, and 42 exhibited concentrations between 900 and 1100 mg./l. The depth of sulfate enrichment in groundwater, near the coal pile, appears to extend to considerable depths, indicated by relatively high sulfate concentrations in Well 26B sealed 100 feet below ground surface. The oxidation of pyrite minerals in the coal leaching into the groundwater is probably the major source of the high concentrations observed.

Sulfate concentrations in the ash disposal settling pond were 520 mg./l. In the ditch carrying the ash pond discharge, the effluent is treated with sulfuric acid which results in precipitation of barium sulfate and aluminum hydroxide (personal communication, Merlin Horn, 1978). Consequently, the sulfate concentration of the effluent waters is lowered considerably to 13 mg./l. Well 33A, however, located near the point of effluent discharge, exhibited 1200 mg./l sulfates.

CHLORIDE

Chloride is generally present in much lower concentrations in rocks than many of the other major constituents of natural water. Important sources, however, are associated with sedimentary rocks, particularly the evaporites. The chemical behavior of chloride in natural water is relatively inert compared to the other major ions. There are few oxidation-reduction reactions and no significant chemical complexing reactions which chloride enters into. In addition, chloride ions are not significantly adsorbed on mineral surfaces. For these reasons, chloride is commonly used as a tracer in groundwater.

Chloride concentrations in groundwater in the vicinity of the Columbia Energy Center typically range between 0.5 mg./l and 30 mg./l. The highest concentrations in monitoring wells tended to be located adjacent to U. S. Highway 51 where the use of road salt has resulted in the percolation of chloride into the groundwater. Monitoring Wells 51A and 51B located in a low area north of Murray Road along U. S. Highway 51, yielded chloride concentrations in excess of 200 mg./l. Two other wells, 52A and 19, also located along U. S. Highway 51, yielded values of 30 mg./l and 42.5 mg./l chloride, respectively.

Within the proposed site boundaries, the chloride concentration averaged 7.1 mg./l. Excluding the few wells adjacent to U. S. Highway 51 exhibiting elevated concentrations, no other significant trends in the occurrence of chloride were observed.

SUMMARY

In summary, the groundwater in the vicinity of the proposed disposal site exhibited a somewhat alkaline pH. In lowland areas, the pH was typically below 7.0, probably a result of the presence of acidic organic soils.

Specific conductance within the proposed site averaged 465 umhos/cm. Conductivities up to 2600 umhos/cm were observed, however, in the vicinity of the coal storage area, the present ash disposal pond and ash pond effluent channel where infilatration of water from these sources is occurring into the groundwater system.

The groundwater typically exhibted relatively low iron concentrations although, locally, concentrations in excess of drinking water standards were observed in about 20% of the wells. The occurrence of the higher iron concentrations appears to be related to the presence of organic soils.

Groundwater at the proposed site also tended to exhibit high calculated hardness (216 mg./l) based on average observed values for calcium (42 mg./l) and magnesium (27 mg./l). Dissolution of limestone and dolomite rocks in the glacial drift are the probable sources of these elements in the groundwater.

Enrichment of sulfate in groundwater has occurred as a result of leaching of pyrite (FeS_2) minerals from the coal storage area where concentrations up to 1200 mg./l were observed. The depth of this enrichment appears to extend beyond the maximum depth into the aquifer investigated. Sulfate concentrations decreased rapidly away from the coal storage area to an average of 12 mg./l within the proposed site boundaries. Other local sources of sulfate in groundwater appear to be related to the present ash settling pond.

The concentration of chloride within the proposed site averaged 7.1 mg./l. Higher levels were generally observed in wells adjacent to U. S. Highway 51 where the infiltration of road salt has locally raised chloride concentrations.

The above interpretations are based on one round of water quality sampling only and should be considered as preliminary in nature. High sulfate and chloride concentrations observed at greater depths may be a temporary condition resulting from contamination of spoil backfill materials with coal dust or salt, respectively, during installation of the monitoring well. Future sampling of these monitoring wells will help to distinguish short term contamination from actual conditions existing in the aquifer.

APPENDIX F
WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
1A	7.6	550	17.	6.5	52	37	<0.1
1B	8.05	460	16.	10.5	39	31	<0.1
2	7.8	527	14.	2.5	45	32	<0.1
3A	7.5	548	13.	2.5	58	36	<0.1
3B	8.1	506	14.	7.0	50	34	<0.1
4	7.8	580	10.	4.0	59	34	<0.1
5	6.3	560	210.	12.5	13	29	10
16	7.6	408	12.	1.5	42	28	<0.1
17	6.45	350	30.	16.5	16	13	0.6
18	6.45	380	4.	4.5	33	22	5.7
19	7.9	570	10.	42.5	44	24	<0.1
20	8.0	340	10.	5.0	36	24	<0.1
21	6.9	220	20.	4.5	23	10	0.1
24A	7.45	775	18.	6.0	76	52	0.1
24B	7.85	440	15.	6.0	43	31	0.1
25	8.1	300	10.	2.5	29	20	<0.1
26A	7.2	2100	900	17.0	140	48	1.5
26B	7.5	2600	1100	16.5	43	7.0	0.2
27	7.15	400	6.	8.0	23	18	<0.1
28A	7.75	500	3.	0.5	48	31	<0.1
28B	7.6	480	4.	3.5	39	28	<0.1
29A	7.8	330	16.	1.5	33	21	0.5
30A	6.75	920	64.	11.0	38	30	26
30B	7.6	770	210	21.0	37	19	<0.1
33A	8.2	2500	1200	24.0	83	50	<0.1
33B	7.9	390	22.	6.5	31	27	0.2
34A	7.7	680	140.	10.0	58	45	0.1
34B	7.7	1700	660	15.0	48	22	<0.1
35	6.8	740	<1.0	4.0	66	33	2.9
36	6.8	740	<1.0	3.5	53	35	6.1
37A	7.7	460	9.	4.0	48	31	0.8
37B	7.5	630	73.	7.5	71	35	<0.1
39A	7.5	1800	350	22.0	180	100	0.1
39B	7.9	330	560	20.5	31	22	0.1
40A	8.0	630	140	8.5	43	29	<0.1
40B	8.1	330	17.	3.0	31	22	<0.1
41	6.8	590	16.	11.0	58	27	9.3

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
42	7.4	2400	900	17.5	50	12	0.5
44	6.9	490	<1.	16.5	39	23	11
45	7.6	390	14.	3.0	40	25	<0.1
46A	7.3	1100	21.	15.5	140	82	<0.1
46B	7.8	470	25.	17.5	40	26	<0.1
47	6.6	1200	3.	8.0	140	40	16
48A	7.3	620	15.	8.0	62	37	<0.1
48B	7.1	520	22.	20.0	43	29	0.2
49	7.15	730	6.	3.5	75	41	<0.1
50A	7.6	520	28.	15.5	51	34	<0.1
50B	7.5	410	21.	18.0	31	21	<0.1
51A	6.1	1850	8.	205.	65	40	<0.1
51B	7.2	1250	23.	275.	57	36	21
52A	7.7	450	16.	30.5	36	17	<0.1
52B	7.4	430	40.	17.5	32	20	<0.1
53	7.75	450	27.	10.5	39	28	<0.1
54A	7.8	350	12.	4.0	34	21	0.1
54B	7.55	390	15.	5.5	40	24	0.1
55B	7.9	340	23.	17.5	32	22	0.1
56	7.8	450	22.	9.5	43	28	0.1
57	7.85	380	17.	7.0	38	24	0.1
M-6	7.0	1160	5.	7.0	150	91	2.3
Cooling Lake	8.3	370	31.	18.0	34	21	<0.1
Ash Pond Effluent	7.45	1380	13.	4.0	28	1.2	3.7
Ash Pond	11.4	1510	520.	23.5	29	0.2	<0.1
Drainage Ditch (A)	7.8	500	21.	7.0	43	29	<0.1
Drainage Ditch (B)	9.05	1780	750	14.0	42	5.4	<0.1

DEC 19 1979

APPENDICES TO

SUPPLEMENTARY FEASIBILITY STUDY REPORT
AND PRELIMINARY ENGINEERING CONCEPTS
COLUMBIA SITE
WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

D. N. R. APPROVED
DATE 9/3/80
Nile Ostenso, Hydro

WARZYN
ENGINEERING INC

APPENDIX I

WATER QUALITY DATA - DECEMBER 1978

WARZYN
ENGINEERING INC

12/78

C 7134

WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
1A	7.3	530	30	3.1	54	35	<0.1	-
1B	7.0	470	67	6.1	49	30	<0.1	-
2	7.25	458	91	<.5	48	24	<0.1	-
3A	7.0	560	36	<.5	61	31	<0.1	-
3B	7.15	530	52	35.7	37	33	<0.1	-
4	7.2	750	69	5.8	49	30	<0.1	-
5	6.35	1,650	670	14.1	14	13	1.7	-
16	6.9	390	69	1.0	49	23	<0.1	-
17	5.55	295	57	16.3	14	8.6	0.2	-
18	5.9	430	10	4.2	47	21	1.1	-
19	7.4	765	75	4.2	51	28	<0.1	-
20	7.4	380	26	1.6	39	26	<0.1	-
21	5.7	250	54	10.4	15	8.3	0.2	-
24A	7.2	730	36	1.6	65	42	<0.1	-
24B	7.2	470	10	7.3	42	28	<0.1	-
25	7.0	335	29	7.8	39	21	0.2	-
26A	7.4	2,250	650	12.6	32	8.6	<0.1	-
26B	6.8	2,530	840	20.8	49	18	<0.1	-
27	6.9	410	24	4.2	40	24	0.4	-
28A	7.2	500	61	0.5	45	28	<0.1	-
28B	7.0	465	6	2.1	39	26	0.1	-
29A	7.1	410	24	3.6	31	22	0.1	-
30A near ditch	5.8	1,140	15	<0.5	97	56	38	-
30B in wash	6.65	835	160	14.6	37	20	<0.1	-
33A near ditch	7.8	1,970	830	16.7	21	8.9	<0.1	-
33B	7.5	380	31	7.3	24	27	<0.1	-
34A	7.25	560	46	4.2	53	33	<0.1	-
34B	8.5	1,575	730	21.9	28	29	0.1	-
35	6.7	545	61	3.6	60	26	1.0	-
36	6.4	515	5.0	2.6	43	24	4.8	-
37A	7.05	438	30	3.7	50	28	<0.1	-
37B	6.7	325	18	7.3	1.0	0.5	<0.1	-
39A	6.35	1,260	33	13.6	70	7.6	0.1	-
39B	6.7	385	25	4.2	30	21	<0.1	<.05
40A	7.35	483	40	<0.5	48	24	<0.1	-
40B	7.25	343	4	4.2	21	14	<0.1	-
41	6.1	640	54	19.8	43	32	<0.1	-

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25^{O}C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
42	7.15	2,050	910	15.6	23	7.5	0.1	-
44	6.15	710	6	0.5	56	27	3.5	-
45	7.2	420	32	1.0	44	26	<0.1	-
46A	7.0	560	93	<0.5	130	75	<0.1	<0.05
46B	6.5	1,290	170	20.8	46	30	<0.1	<0.05
47	7.3	958	120	<0.5	110	48	<0.1	-
48A	6.15	640	59	<0.5	42	51	<0.1	<0.05
48B	6.8	450	23	5.2	40	27	<0.1	<0.05
49	7.0	880	26	2.1	93	58	0.1	-
50A	7.4	660	25	17.7	60	36	<0.1	-
50B	7.1	405	16	17.7	38	23	<0.1	-
51A	7.0	1,170	57	135	66	31	<0.1	-
51B	7.3	1,410	22	330	46	39	<0.1	-
52A	7.0	370	110	18.5	35	10	<0.1	-
52B	7.0	595	43	52.5			0.1	-
53	Frozen							
54A	7.5	345	10	1.0	36	22	<0.1	<0.05
54B	Frozen							
55B	7.3	505	26	15.6	52	29	<0.1	<0.05
56	Frozen							
57	Frozen							
M-6								
58	6.55	1,265	140	<0.5	110	65	0.1	-
59	6.8	925	40	<0.5	86	60	<0.1	-
60	7.2	1,510	54	4.7	130	85	<0.1	-
61A	6.85	590	39	30.2	58	31	<0.1	-
61B	7.2	505	6	13.5	48	29	<0.1	-
62	6.7	1,517	72	178	120	53	<0.1	-
64	6.9	670	100	26.8	63	36	0.8	-
65	7.2	830	57	17.8	78	50	<0.1	-
66	6.5	680	55	40	66	24	3.6	-

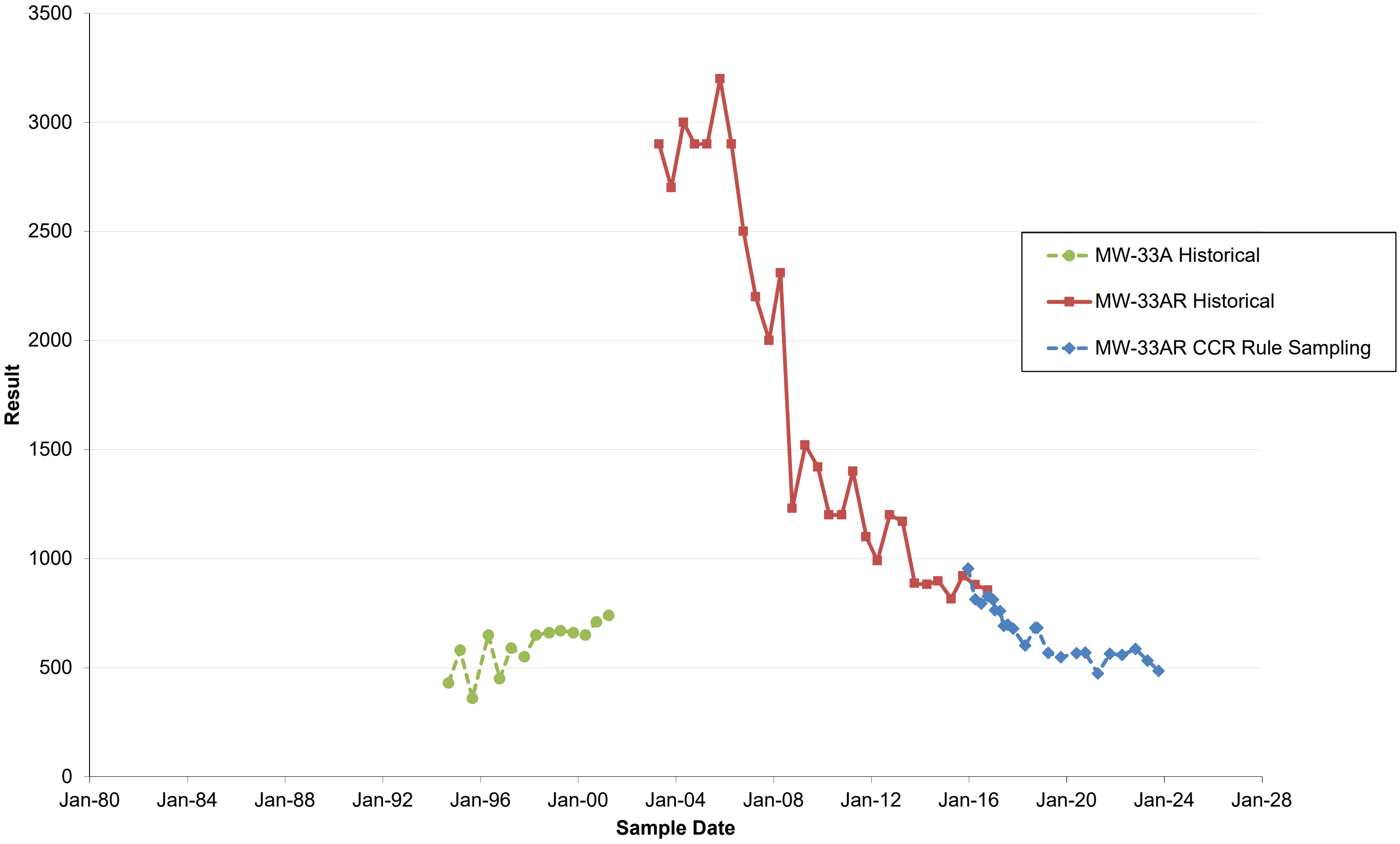
C 7134

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
67	7.0	560	100	1.0	57	32	1.0	-
68A ←	7.6	440	32	2.1	40	27	<0.1	-
68B ←	7.2	400	36	1.0	42	25	<0.1	-
70A [illegible]	7.5	440	20	<0.5	27	37	<0.1	-
70B	7.3	520	25	5.2	51	34	<0.1	-
72A Martin Marietta	6.45	860	11	<0.5	100	41	1.8	-
72B	8.4	230	45	<0.5	17	19	<0.1	-
M-4	7.6	864	180	26.1	20	11	<0.1	0.39
MM-4			2	2.6	14	21	0.9	-
Cooling Lake at 1	7.7	355	36	13.6	31	21.2	<0.1	-
Ash Pond at 2	11.4	3,210	1,100	22.9	34	<0.1	<0.1	-
Ash Pond at 3	8.7	725	34	21.9	48	16	<0.1	-
Ash Pond Effluent at 4	6.7	3,090	1,400	25.0	39	0.4	<0.1	-
Drainage Ditch at 5	7.2	730	74	33.9	56	38	<0.1	-
Drainage Ditch at 6	7.35	2,750	640	18.8	34	7.5	<0.1	-
Drainage Ditch at 7	8.05	1,780	740	27.1	31	0.2	<0.1	-

Appendix C

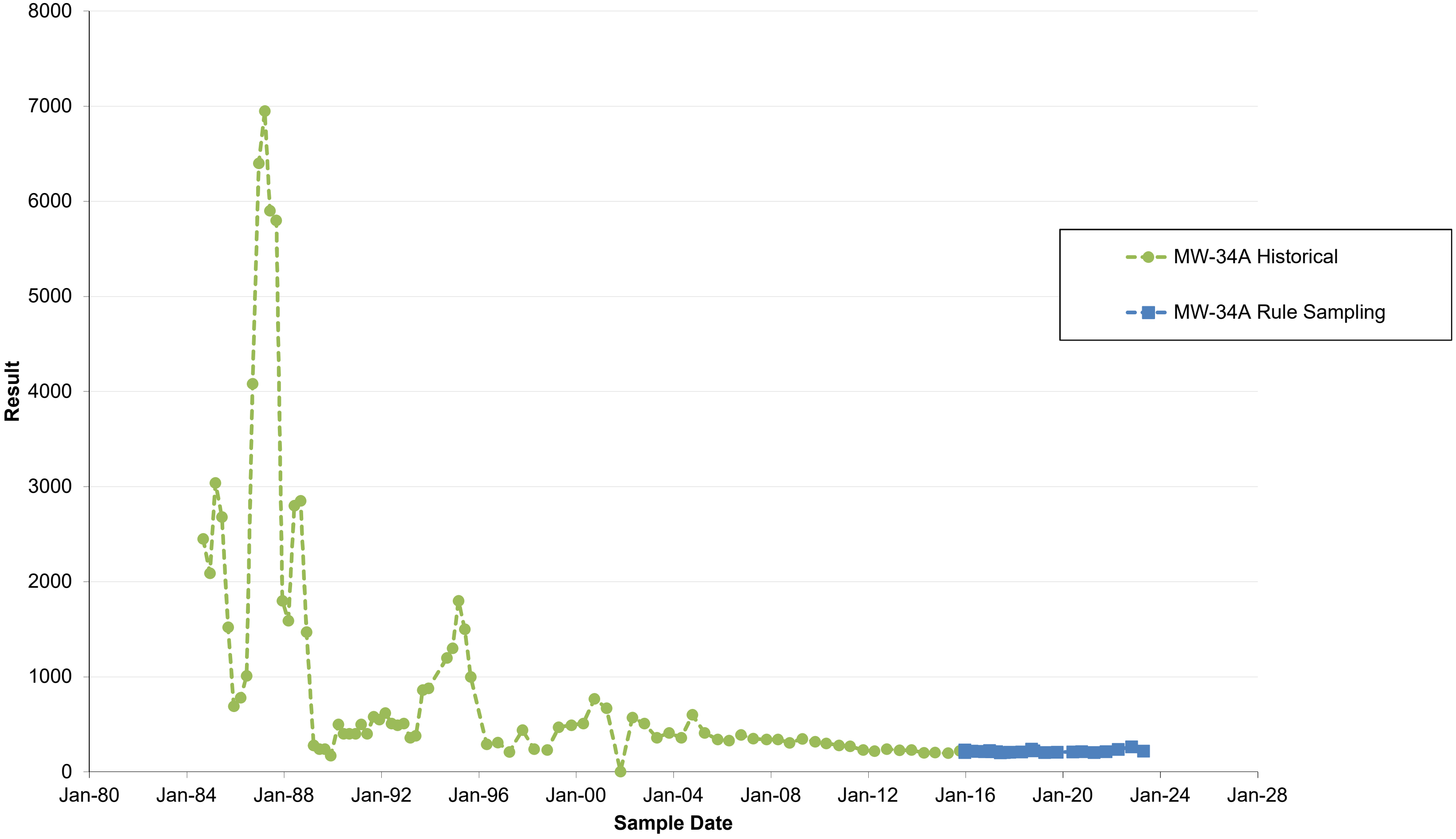
Long-Term Concentration Trend Plots

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33A and MW-33AR - Boron (µg/l as B)



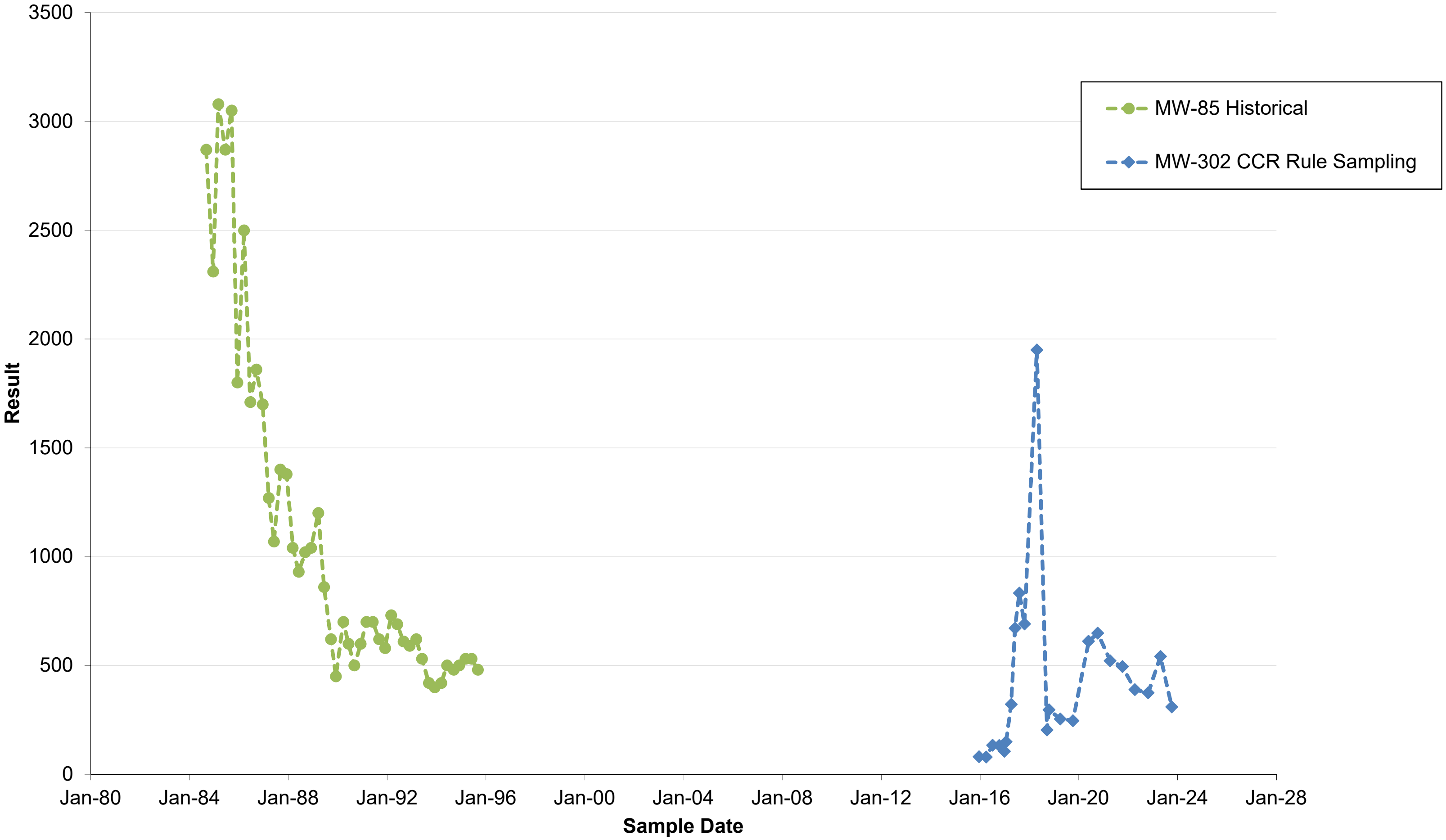
I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\Graphs_do not print\[Bo_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Boron (µg/l as B)



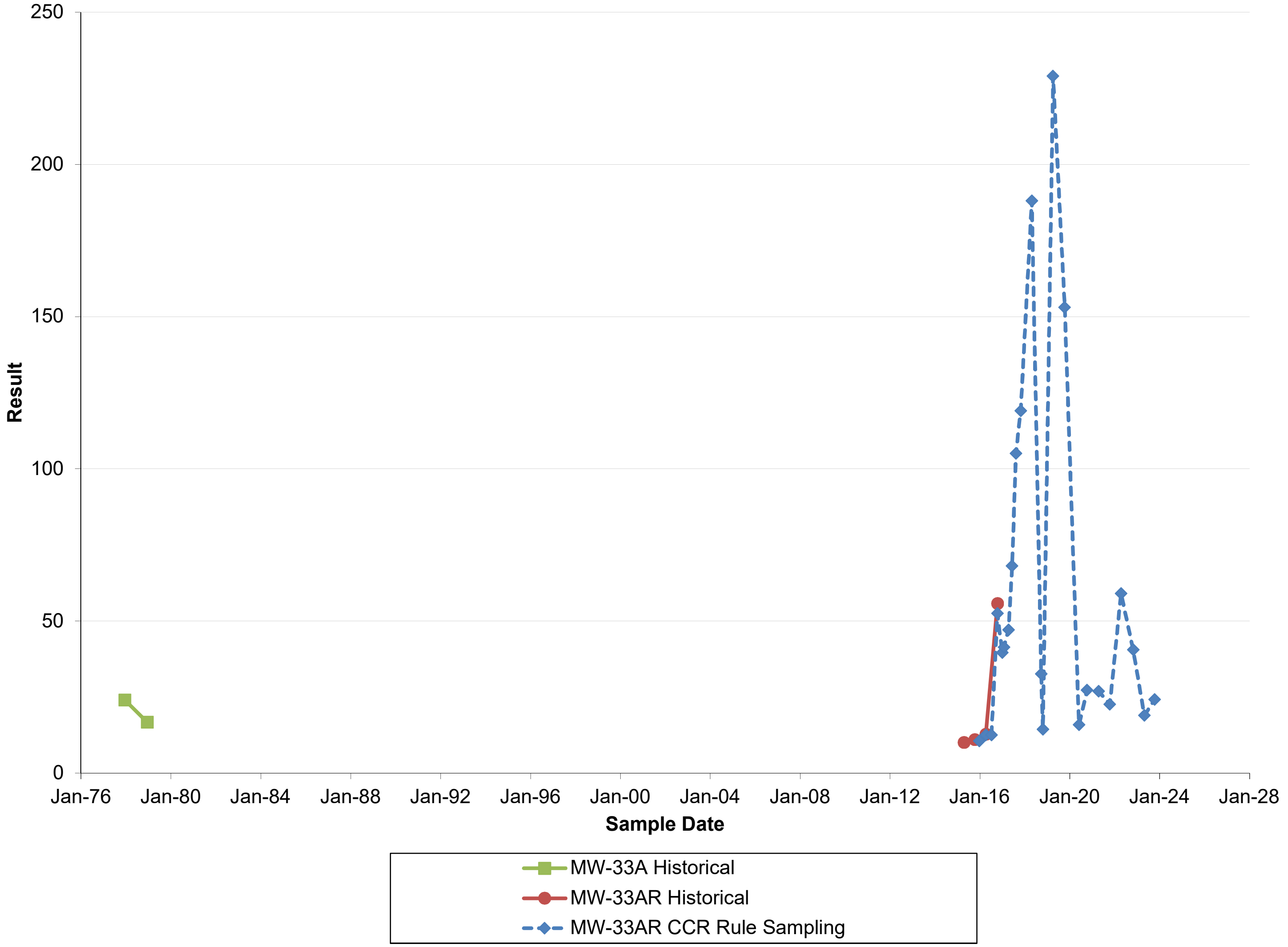
I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\Graphs_do not print\[Bo_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-302 and MW-85 - Boron (µg/l as B)



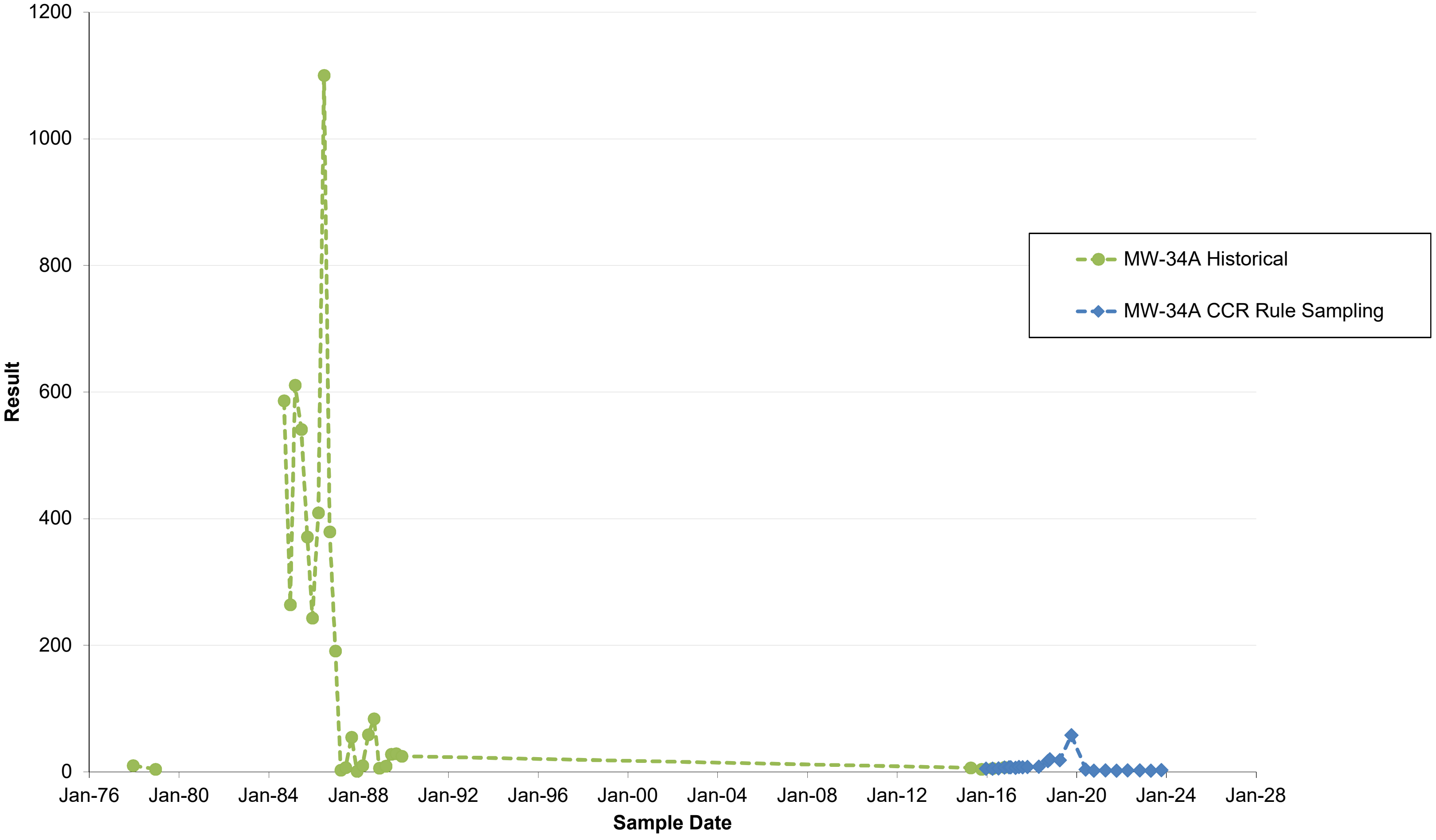
I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\Graphs_do not print\[Bo_COL Dry.xlsx]MW-85_MW-302

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Chloride (mg/l as Cl)



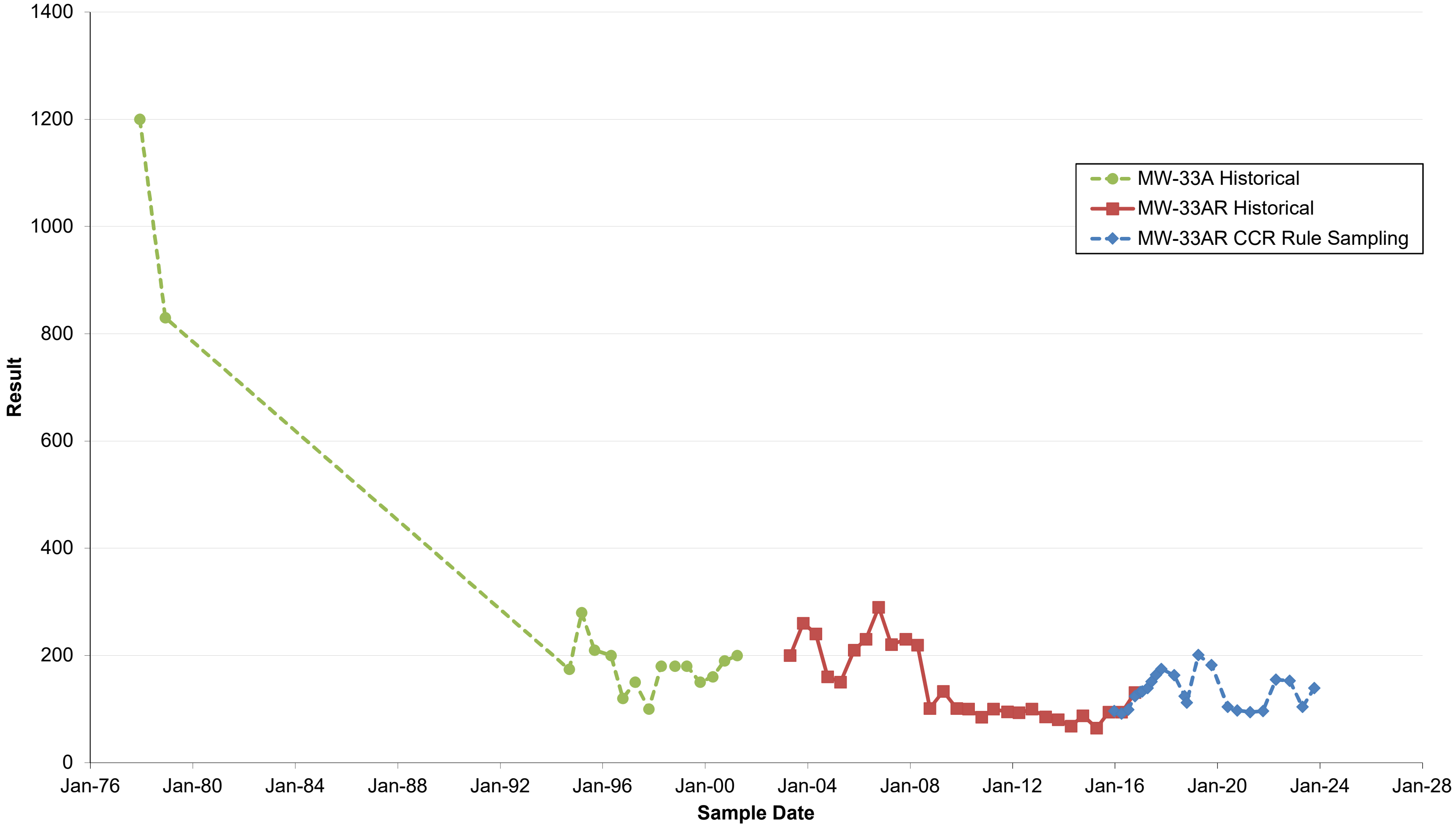
I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\Graphs\[Cl_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Chloride (mg/l as Cl)

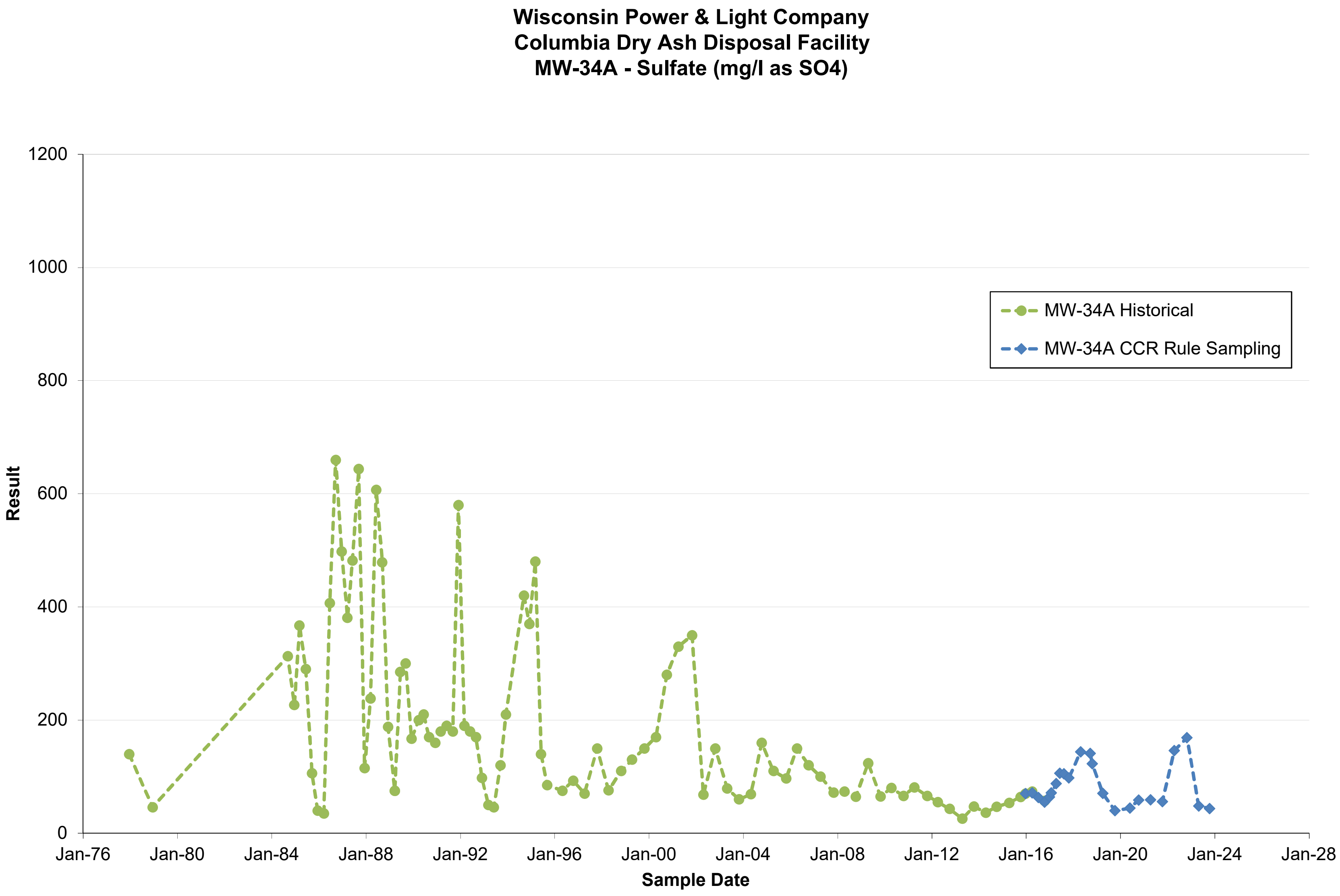


I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\Graphs\[Cl_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Sulfate (mg/l as SO4)

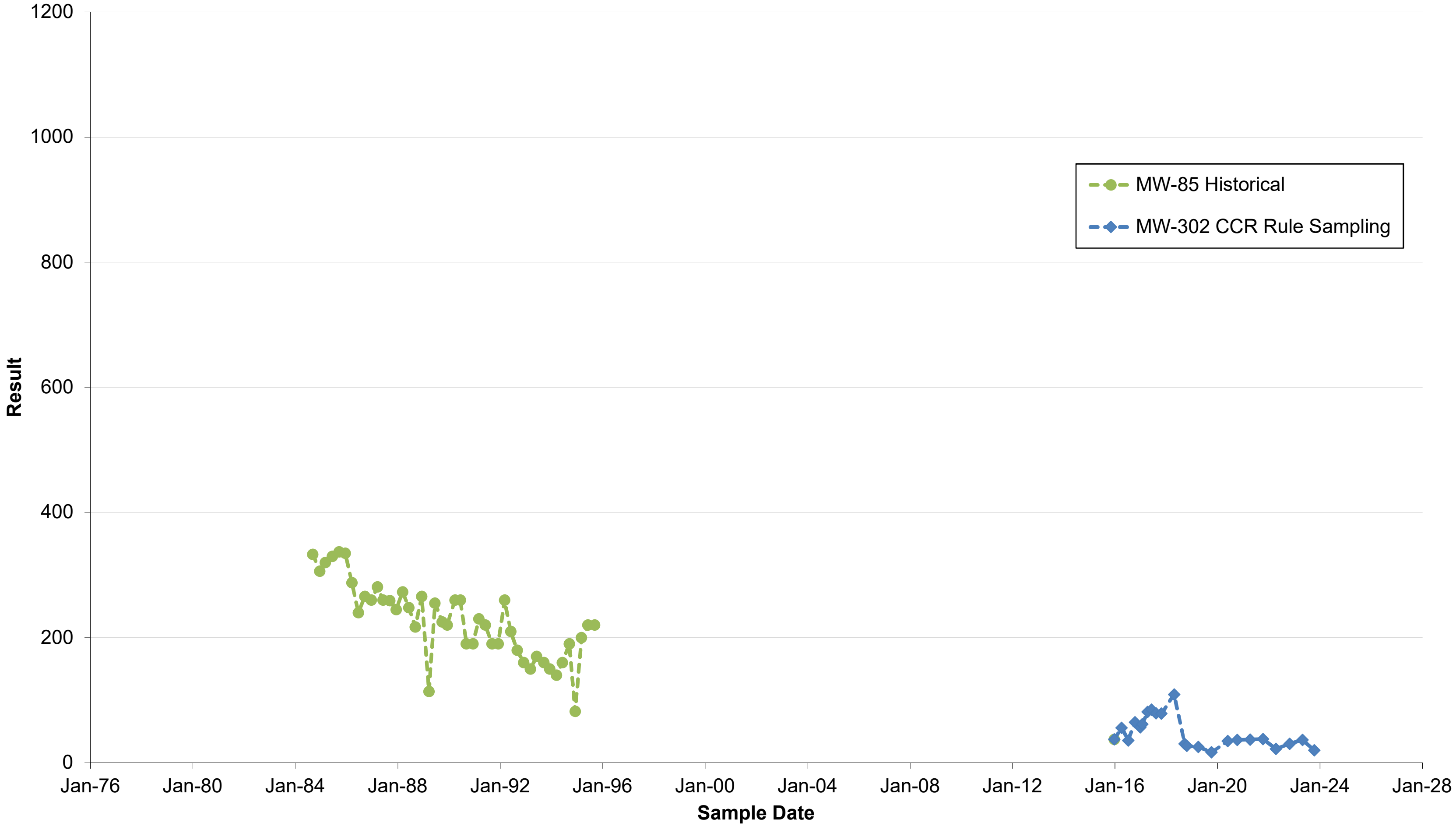


I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\Graphs\[SO4_COL Dry.xlsx]MW-33AR CCR



I:\25224067.00\Deliverables\COL Mod 1-3 - Oct 2023 ASD\Graphs\[SO4_COL Dry.xlsx]MW-34A CCR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-85 and MW-302 - Sulfate (mg/l as SO4)



Appendix D

Historical Groundwater Flow Maps

LEGEND

…………	PROPOSED PROJECT AREA
63 720.29	OBSERVATION WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION
	BORING LOCATION AND NUMBER
	WETLANDS
760	TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL: 20 FT.)
■	PRIVATE RESIDENCES (ASSUMED LOCATIONS OF PRIVATE WATER SUPPLY WELLS)
▨	COMMERCIAL BUILDINGS (ASSUMED LOCATIONS OF POSSIBLE PUBLIC WATER SUPPLY WELLS)
→…	SURFACE WATERS (STREAMS OR DRAINAGE DITCHES) ARROWS INDICATE DIRECTION OF FLOW
□	OTHER BUILDINGS (GARAGES, BARNS, ETC.)
	HIGH CAPICITY WELLS
—790—	WATER TABLE CONTOURS (CONTOUR INTERVAL: 1 FT.)
➔	DIRECTION OF GROUNDWATER FLOW

NO	BY	DATE	REVISION	APP'D

WATER TABLE CONTOUR MAP 2/4/81

PLAN OF OPERATION – ASH DISPOSAL FACILITY
COLUMBIA SITE
WISCONSIN POWER & LIGHT COMPANY
PART OF SECTIONS 27 & 34, T12N, R9E
TOWN OF PACIFIC COLUMBIA CO. WISCONSIN

WARZYN ENGINEERING INC	DRAWN TDH	SCALE 1"=300'	SHEET 39 OF 39
	CHECKED RJK	DATE 2/10/81	DRAWING NO. C7134-94
	APPROVED		
	REFERENCE		PRINTED 8/3/88

NOTES

1. BASE MAP IS PROVIDED BY WISCONSIN POWER & LIGHT CO. AND IS BASED ON PHOTOS TAKEN ON APRIL 6, 1995 BY AERO-METRIC ENGINEERING, SHEBOYGAN, WI.
2. HORIZONTAL DATUM IS BASED ON THE WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE - DATUM: NAD 83(91).
3. VERTICAL DATUM IS REFERENCED TO U.S.G.S. MEAN SEA LEVEL (MSL). TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
4. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER & LIGHT CO. IN DECEMBER 1994 & NOVEMBER 1996.
5. THE LOCATION OF THE DESIGN MANAGEMENT ZONE DEMARCATION LINE IS APPROXIMATE.
6. WATER ELEVATION USED TO PREPARE THIS MAP WERE MEASURED ON OCTOBER 24, 2002.
7. THE WATER LEVEL AT MW 33A AND MW 33B COULD NOT BE MEASURED DURING OCTOBER 2002 DUE TO AN OBSTRUCTION IN THE WELL CASING.

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT:
ALLIANT ENERGY - WP&L
COLUMBIA ASH PONDS & DRY ASH
DISPOSAL FACILITY

SHEET TITLE:
WATER TABLE MAP
(OCTOBER 2002)

DRAWN BY: defoej	SCALE: 1"=200'	PROJ. NO. 3024.28
CHECKED BY: JMR		FILE NO. WATERTBL.PLT
APPROVED BY: JCO	DATE PRINTED:	**FIGURE 3**
DATE: JANUARY 2003		

RMT®

744 Heartland Trail
Madison, WI 53717-1934

P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

E2 April 2024 Detection Monitoring Alternative Source Demonstration

Alternative Source Demonstration April 2024 Detection Monitoring

Dry Ash Disposal Facility, Modules 1-3
Columbia Energy Center
Pardeeville, Wisconsin

Prepared for:

Alliant Energy

SCS ENGINEERS

25224067.00 | December 10, 2024

2830 Dairy Drive
Madison, WI 53718-6751
608-224-2830

Table of Contents

Section Page

Tables

Figures

Appendices

I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\241210_COL_1-3 LF_Apr 2024 ASD_Final.docx

PE CERTIFICATION

Sherren C.
Clark
E-29863
Madison,
Wis.

I, Sherren Clark, hereby certify that the information in this alternative source demonstration is accurate and meets the requirements of 40 CFR 257.94(e)(2). This certification is based on my review of the groundwater data and related site information available for the Columbia Energy Center Dry Ash Disposal Facility. I am a duly licensed Professional Engineer under the laws of the State of Wisconsin.

December 10, 2024
(signature) (date)

Sherren Clark, PE
(printed or typed name)

License number E-29863

My license renewal date is: July 31, 2026.

Pages or sheets covered by this seal:
Alternative Source Demonstration, April 2024 Detection
Monitoring, Dry Ash Disposal Facility, Modules 1-3,
Columbia Energy Center, Pardeeville, Wisconsin

[This page left blank intentionally]

1.0 INTRODUCTION

This Alternative Source Demonstration (ASD) was prepared to support compliance with the groundwater monitoring requirements of the "Coal Combustion Residuals (CCR) Final Rule" published by the U.S. Environmental Protection Agency (U.S. EPA) in the *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule*, dated April 17, 2015 (U.S. EPA, 2015), and subsequent amendments. Specifically, this report was prepared to fulfill the requirements of 40 CFR 257.94(e)(2). The applicable sections of the Rule are provided below in *italics*.

1.1 §257.94(E)(2) ALTERNATIVE SOURCE DEMONSTRATION REQUIREMENTS

The owner and operator may demonstrate that a source other than the CCR Unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels.

An ASD is completed when there are exceedances of one or more benchmarks established within the groundwater monitoring program to determine if any other sources are likely causes of the identified exceedance(s) of established benchmark(s) at the site. This ASD was performed in response to results indicating a statistically significant increase (SSI) over background levels during detection monitoring under the CCR Rule.

This ASD report evaluates the SSIs observed in the statistical evaluation of the April 2024 detection monitoring event at the Columbia Energy Center (COL) Dry Ash Disposal Facility (ADF), Modules 1-3 CCR Unit. The first ASD was prepared for this facility evaluating the SSIs observed in the statistical evaluation of the October 2017 detection monitoring event (SCS Engineers [SCS], 2018). The October 2017 ASD and subsequent semiannual updates have provided several lines of evidence demonstrating that SSIs reported for boron, chloride, field pH, and sulfate concentrations in the downgradient monitoring wells were likely due to man-made sources other than the CCR Units and/or naturally occurring constituents in the alluvial aquifer.

As discussed in more detail in **Section 4.2** of this ASD, the findings for the April 2024 monitoring event were consistent with those for the previous events.

1.2 SITE INFORMATION AND MAP

The COL site is located at W8375 Murray Road, Pardeeville, Columbia County, Wisconsin (**Figure 1**). The COL site is an active coal-burning generating station, which has been burning coal and disposing of CCR on site since the mid-1970s. The layout of the site is shown on **Figure 2**. The COL property includes two areas of CCR storage and disposal. These are the ADF and the Ash Ponds Facility. This ASD will evaluate the conditions at the site for Modules 1-3 of the ADF only. The ADF is operated under the Wisconsin Department of Natural Resources (DNR) License No. 3025.

The groundwater monitoring system monitors the following CCR Unit:

- COL Dry ADF – Modules 1-3 (existing CCR Landfill)

Modules 1-3 were originally described as separate existing CCR landfills, although they are contiguous and are managed as a single landfill by the facility and by the DNR. Wisconsin Power and Light Company (WPL) subsequently clarified that Modules 1-3 are one existing CCR landfill under the federal CCR Rule, and this report reflects WPL's clarification.

A map showing the CCR Unit and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR groundwater monitoring program and the state monitoring program is provided as **Figure 2.** Separate monitoring systems have been established for the other CCR Units at COL, which include Modules 4-6 of the COL ADF, Modules 10-11 of the COL ADF, the former Primary Ash Pond, and the former Secondary Ash Pond.

1.3 STATISTICALLY SIGNIFICANT INCREASES IDENTIFIED

SSIs were identified by comparing the monitoring results to Upper Prediction Limits (UPLs) established in accordance with 40 CFR 257.93(f)(3) and the statistical method previously selected for the CCR Unit. The UPLs are based on an interwell approach using two background monitoring wells: MW-84A and MW-301. The interwell UPLs were calculated based on a 1-of-2 resampling approach. The UPLs and results for the April 2024 monitoring event are summarized in **Table 1.**

The April 2024 SSIs include the following parameters and wells:

- Boron: MW-33AR, MW-34A, MW-302
- Chloride: MW-33AR
- Sulfate: MW-33AR, MW-34A

Concentration trends for the parameters with SSIs are shown in **Appendix A.**

1.4 OVERVIEW OF ALTERNATIVE SOURCE DEMONSTRATION

This ASD report includes:

- Background information (**Section 2.0**).
- Evaluation of potential that SSIs are due to methodology or analysis (**Section 3.0**).
- Evaluation of potential that SSIs are due to natural sources or man-made sources other than the CCR Units (**Section 4.0**).
- ASD conclusions (**Section 5.0**).
- Monitoring recommendations (**Section 6.0**).

The CCR Rule constituent results from background and compliance sampling for parameters with SSIs are provided in **Table 2.** The laboratory reports for the April 2024 detection monitoring event will be included in the 2024 Annual Groundwater Monitoring and Corrective Action Report to be completed in January 2025. Complete laboratory reports for the background monitoring events and the previous detection monitoring events were included in previous annual groundwater monitoring and corrective action reports.

2.0 BACKGROUND

To provide context for the ASD evaluation, the following background information is provided in this section of the report, prior to the ASD evaluation sections:

- Geologic and hydrogeologic setting
- CCR Rule monitoring system
- Other monitoring wells

A more detailed discussion of the background information for the site is provided in the ASD for the October 2017 event (SCS, 2018).

2.1 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.1.1 Regional Information

For the purposes of groundwater monitoring, the surficial sand and gravel aquifer is considered the uppermost aquifer, as defined under 40 CFR 257.53. Immediately underlying the surficial sand and gravel aquifer is the Cambrian-Ordovician sandstone aquifer.

Additional details on the regional geology and hydrogeology were provided in the October 2017 ASD (SCS, 2018).

2.1.2 Site Information

Soils at the site are primarily sand to a depth of approximately 50 to 100 feet, and overlie sandstone bedrock. Soils encountered during the site feasibility study for the COL ADF were described as generally sandy with interbedded silty clay lenses up to 20 feet thick (Warzyn Engineering, Inc. [Warzyn], 1978). During drilling of CCR wells MW-301 and MW-302, the unconsolidated materials were identified as consisting primarily of silty sand and sand. Boring logs for previously installed monitoring wells MW-33AR, MW-34A, MW-84A, and MW-1AR (abandoned) show silty sand and sand as the primary unconsolidated materials at these locations. All CCR monitoring wells are screened within the unconsolidated sand unit.

Shallow groundwater at the site generally flows to the north and west across the existing landfill Modules 1-3 area, then generally flows west toward the Wisconsin River. The groundwater flow map for April 2024 is shown on **Figure 3**. Historically, localized groundwater mounding was associated with the ash ponds; however, flow in the ash pond area changed in 2022 and 2023 as the ponds were closed and CCR was removed. In 2022, dewatering wells located around the Secondary Pond lowered the water table near the Secondary Ash Pond and discharged groundwater to the Primary Ash Pond. Beginning in spring 2023, dewatering activities switched to the Primary Ash Pond area, and groundwater pumped from dewatering wells around the Primary Ash Pond was discharged to the large cooling pond south of the generating station. Dewatering activities ceased in September 2023. The temporary dewatering may have had some impact on flow directions in the Modules 1-3 area, but the general flow directions to the north and/or west did not change. The groundwater elevation data for the CCR monitoring wells and state monitoring program wells are provided in **Table 3.**

2.2 CCR RULE MONITORING SYSTEM

The groundwater monitoring system established in accordance with the CCR Rule consists of two upgradient (background) monitoring wells and three downgradient monitoring wells (**Table 1** and

Figure 2). The background wells include MW-301 and MW-84A. The downgradient wells include MW-302, MW-33AR, and MW-34A. The CCR Rule wells are installed within the sand and gravel aquifer. Well depths range from approximately 29 to 51 feet, measured from the top of the well casing.

2.3 OTHER MONITORING WELLS

Additional groundwater monitoring wells currently exist at COL as part of the monitoring systems developed for the state monitoring program and for the other CCR Units.

Monitoring wells for the state monitoring program are installed in the unconsolidated sand and gravel unit, which is the uppermost aquifer as defined under 40 CFR 257.53. This shallow monitoring system includes water table wells and mid-depth piezometers. Well depths range from approximately 14 to 76 feet, measured from the top of the well casing.

3.0 METHODOLOGY AND ANALYSIS REVIEW

To evaluate the potential that an SSI is due to a source other than the regulated CCR Unit, SCS used a two-step evaluation process. First, the sample collection, field and laboratory analysis, and statistical evaluation were reviewed to identify any potential error or analysis that led to exceedance of the benchmark. Second, potential alternative sources, including natural variation and man-made sources other than the CCR Unit, were evaluated. This section of the report provides the findings of the methodology and analysis review. **Section 4.0** of the report addresses the potential alternative sources.

3.1 SAMPLING AND FIELD ANALYSIS

Field notes and sampling results were reviewed to determine if a sampling error may have caused or contributed to the observed SSIs. Potential field sampling errors or issues could include mislabeling of samples, improper sample handling, missed holding times, cross-contamination during sampling, or other field error. Field blank sample results were also reviewed for evidence of potential contamination from sampling equipment or containers.

SCS did not identify any sampling errors that may have caused or contributed to observed SSIs.

The April 2024 monitoring event was completed in accordance with the Sampling and Analysis Plan for the monitoring system.

3.2 LABORATORY ANALYSIS REVIEW

The laboratory reports for the April 2024 detection monitoring event were reviewed to determine if a laboratory analysis error or issue may have caused or contributed to an observed SSI for boron, chloride, or sulfate. The laboratory report review included reviewing the laboratory quality control flags and narrative, verifying that correct methods were used and desired detection limits were achieved, and checking the field and laboratory blank sample results.

Based on the review of the laboratory reports, SCS did not identify any laboratory analysis issues that could have caused or contributed to the observed SSIs for boron, chloride, and sulfate.

Time series plots of the SSI constituent analytical data were also reviewed for anomalous results that might indicate a possible sampling or laboratory error (e.g., dilution error or incorrect sample labeling). The time series plots are provided in **Appendix A**. The concentrations observed are similar to historical concentrations for sulfate, boron, and chloride.

3.3 STATISTICAL EVALUATION REVIEW

The review of the statistical results and methods included a quality control check of the following:

- Input analytical data vs. laboratory analytical reports
- Statistical method and process for each SSI

Based on the review of the statistical evaluation, SCS did not identify any errors or issues in the statistical evaluation that caused or contributed to the determination of interwell SSIs for the April 2024 detection monitoring event.

3.4 SUMMARY OF METHODOLOGY AND ANALYSIS REVIEW FINDINGS

In summary, there were no changes to the SSI determinations for the April 2024 monitoring event based on the methodology and analysis review. No other errors or issues causing or contributing to the reported SSIs were identified.

4.0 ALTERNATIVE SOURCES

This section of the report discusses the potential alternative sources for the boron, chloride, and sulfate SSIs at the downgradient monitoring wells; identifies the most likely alternative source(s); and presents the lines of evidence indicating that an alternative source is the most likely cause of the observed SSIs.

4.1 POTENTIAL CAUSES OF SSI

4.1.1 Natural Variation

The statistical analysis was completed using an interwell approach, comparing the April 2024 detection monitoring results to the UPLs calculated based on the sampling of the background wells (MW-84A and MW-301). If concentrations of a constituent that is naturally present in the aquifer vary spatially, then the potential exists that the downgradient concentrations may be higher than upgradient concentrations due to natural variation. Previous monitoring results for boron, chloride, and sulfate at COL Modules 1-3 landfill are shown in **Table 2**.

Although natural variation is present in the shallow aquifer, it does not appear likely that natural variation is the primary source causing the boron, chloride, and sulfate SSIs.

4.1.2 Man-Made Alternative Sources

Man-made alternative sources that could potentially contribute to the boron, chloride, and sulfate SSIs could include the closed ash pond landfill, the former ash pond operations, the former ash pond effluent ditch, the coal storage area, road salt use, railroad operations, or other plant operations.

Based on the groundwater flow directions and on previous investigations at the site, the former ash pond effluent ditch, a non-CCR alternative source, appears to be the most likely cause of the boron and/or sulfate SSIs for wells MW-33AR, MW-34A, and MW-302. The ash pond effluent ditch may also have contributed to the chloride SSI at MW-33AR.

4.2 LINES OF EVIDENCE

The lines of evidence indicating that the SSIs for boron, chloride, and sulfate in compliance wells MW-33AR, MW-34A, and MW-302, relative to the background wells, are due to an alternative source include:

1. Elevated levels of boron, chloride, and sulfate were present in the area west of the landfill, where the three compliance wells are located before the landfill was constructed.

2. Monitoring performed under the state program documents that the concentrations of boron, chloride, and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation.

3. Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing west and/or north.

4. The variations in chloride results for well MW-33AR since detection monitoring was initiated have not correlated with boron concentrations, as would be expected for a CCR leachate source; therefore, an alternative source is more likely.

4.2.1 Pre-Landfill Water Quality

Elevated levels of boron, chloride, and sulfate were present in the area west of the landfill, where the three compliance wells are located, before the landfill was constructed.

Groundwater monitoring performed in 1977 and 1978 as part of the Feasibility Study for the landfill permitting showed that wells located along the west side of the future landfill footprint, where the current compliance wells are located, had elevated results for sulfate, chloride, and specific conductance. The 1978 Feasibility Study (Warzyn, 1978) for the Dry ADF discusses the influence of the ash pond effluent ditch on groundwater west of the proposed site. The former ash pond effluent ditch carried effluent from the ash ponds located north of the plant, and flowed south between the west side of the current landfill and the substation. Groundwater monitoring in December 1977 indicated that sulfate was present at 1,200 milligrams per liter (mg/L) in MW-33A, which was located near the point where the ash pond effluent discharged from a culvert into the effluent ditch. The sulfate concentration at this well decreased to 830 mg/L in the December 1978 sampling (Warzyn, 1979). Current concentrations of sulfate in this area, while above background, are much lower. The April 2024 sulfate result for MW-33AR (installed to replace MW-33A) was 165 mg/L, for MW-34A was 51.5 mg/L, and for MW-302 was 26.8 mg/L (**Table 1**).

For chloride, the April 2024 concentration at MW-33AR (22.8 mg/L) is slightly lower than the concentration reported for MW-33A when it was sampled in December 1977 (24 mg/L).

Boron was not included in the 1977 and 1978 Feasibility Study monitoring at the wells located west of the landfill; however, as discussed in **Section 4.2.2**, the initial landfill monitoring data collected in 1984, prior to CCR disposal, shows elevated boron concentrations.

Selected text and tables from the 1978 Feasibility Study and the 1979 Supplementary Feasibility Study Report are included in **Appendix B**.

4.2.2 Long-Term Concentration Trends

Monitoring performed under the state program documents that concentrations of boron and sulfate were elevated before CCR disposal in the landfill began, and have decreased since the landfill has been in operation. Routine groundwater monitoring for the COL ADF began after the Plan of Operation was approved and prior to initial CCR disposal. The earliest data available from the DNR Groundwater Environmental Monitoring System (GEMS) database is from September 1984. Initial placement of CCR in test plots in Module 1 of the ADF was approved in October 1984, and CCR disposal began sometime after that. Therefore, the initial groundwater monitoring results in the GEMS database represent pre-disposal conditions for the landfill.

The earliest historic monitoring data show that before CCR disposal in the landfill began, concentrations of boron and sulfate were significantly higher than current concentrations in the area west of the landfill where the compliance wells are located. Graphs of historical concentrations are provided in **Appendix C**. Results for compliance well MW-34A show that current concentrations of boron, chloride, and sulfate are much lower now than when the landfill was constructed. Results for compliance well MW-302 are plotted with results from monitoring well MW-85, which was located near the current MW-302 location (see **Figure 2**) and was monitored from September 1984 through September 1995. Results for compliance well MW-33AR are plotted with results from well MW-33A. MW-33AR was a replacement well for MW-33A at a slightly different location and depth. The well screen was installed approximately 10 feet higher in MW-33AR than in MW-33A, intersecting the water table, which may explain the increase in concentration that occurred with the well replacement.

The recent boron concentrations are consistent with generally decreasing or stable historical concentrations at MW-33AR and MW-34A (**Appendix A** and **Appendix C**). Recent boron concentrations at MW-302 have been variable, but remain well below the concentrations observed in samples from MW-85 prior to CCR disposal in the landfill.

4.2.3 Groundwater Flow Direction Changes

Groundwater flow directions have changed through time due to changes in water management at the plant, so that groundwater impacted by the effluent ditch formerly flowed to the east, under the landfill, and is now flowing north and/or west. The 1978 Feasibility Study report states that the southern 2/3 of the proposed fill area (including the area of the active CCR landfill phases) exhibits a southeast and southerly groundwater flow direction, toward an agricultural drainage ditch southeast and south of the landfill area. The 1981 Plan of Operation indicates that flow in the landfill area is to the east-southeast. A water table map prepared by RMT, based on October 2002 water level measurements, shows flow under the landfill generally to the east and northeast from a groundwater high near the effluent ditch and the Wisconsin Pollutant Discharge Elimination System (WPDES) pond between the landfill and the substation. The 1981 and 2002 water table maps are provided in **Appendix D**.

Under current conditions, groundwater flow below the active landfill area is generally to the north and northwest. The flow changes with time reflect the termination of discharge to the ash pond effluent ditch in the mid-2000s. When discharge via this ditch was active, the ditch was a source of recharge to the groundwater and created a high groundwater area with flow moving away from the ditch to the east. After discharge to the ditch was terminated, water levels in this area decreased significantly and the groundwater flow direction changed.

With the changes in groundwater flow, historically impacted groundwater moved in alternating directions. While the effluent ditch was active, impacted groundwater likely moved eastward past the current compliance wells, as indicated by the long-term concentration data. Although the compliance wells on the west side of Modules 1-3 are downgradient from the landfill under current flow conditions, the observed groundwater impacts may be residual from the past when the wells were downgradient from the effluent ditch.

4.2.4 Chloride and Boron Concentrations

The variations in chloride results for well MW-33AR since detection monitoring was initiated have not correlated with boron concentrations, as would be expected for a CCR leachate source; therefore, an alternative source is more likely. The chloride results for well MW-33AR increased beginning in 2016, peaked in April 2018 and April 2019, decreased significantly in May 2020, and have remained relatively low since then. The concentrations observed from May 2020 through April 2024 exceeded the interwell UPL but were significantly lower than the values observed in April and October 2019 (**Table 2** and **Appendix A**). As discussed in **Section 4.2.1**, current chloride concentrations at MW-33AR are similar to those reported for samples from MW-33A prior to CCR disposal in the landfill (**Appendix B**).

Over the time period since 2016, when chloride concentrations at MW-33AR were highly variable, boron concentrations at MW-33AR have been generally following a long, steady decreasing trend. The lack of correlation with boron indicates the source of the increase and subsequent decrease in chloride is not likely the CCR landfill.

Sampling of the landfill leachate pond and lysimeters LS-1 and LS-3R, located on the western and southern edges of Modules 1-3, indicates that boron and chloride concentrations are generally both higher than background (**Table 4**); therefore, a leachate source would tend to influence concentrations of both parameters. Furthermore, the peak chloride concentrations in the groundwater samples from MW-33AR in 2018 and 2019 exceeded the chloride concentrations measured in the leachate at that time, indicating the leachate was not the source of chloride at this location (**Table 2**, **Table 4**, and **Appendix A**). Recent samples from the leachate pond have shown increased concentrations of chloride, but this increase does not correlate with results at MW-33AR, which have decreased, or with chloride results from the lysimeters, which remain low. Based on the comparison of groundwater and leachate chloride results, an alternative man-made source, such as road salt, is a more likely source of chloride than the CCR Unit.

5.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSIONS

The lines of evidence discussed above regarding the SSIs reported for boron, chloride, and sulfate concentrations in downgradient monitoring wells MW-33AR, MW-34A, and/or MW-302 demonstrate that the SSIs are likely primarily due to sources other than the CCR Unit. Boron and sulfate concentrations were elevated prior to disposal of CCR in the landfill and are associated with historical discharges from the ash ponds via the effluent ditch located west of the landfill. Pre-landfill chloride concentrations at MW-33A were also similar to current concentrations at MW-33AR and historic impacts may have contributed to the SSI for chloride. However, based on more recent higher concentrations of chloride, elevated chloride concentrations detected at well MW-33AR appear more likely to be related to an alternative non-CCR source, such as salt.

6.0 SITE GROUNDWATER MONITORING RECOMMENDATIONS

In accordance with section 257.94(e)(2) of the CCR Rule, the COL Modules 1-3 CCR Units may continue with detection monitoring based on this ASD. The ASD report will be included in the 2024 Annual Report due January 31, 2025.

7.0 REFERENCES

SCS Engineers, 2018, Alternative Source Demonstration, October 2017 Detection Monitoring, Columbia Energy Center Dry Ash Disposal Facility, April 2018.

U.S. EPA, 2015, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, April 2015.

Warzyn Engineering, Inc., 1978, Feasibility Study, Proposed Fly Ash and/or Scrubber Sludge Disposal Facility – Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

Warzyn Engineering, Inc., 1979, and Preliminary Engineering Concepts, Columbia Site, Wisconsin Power and Light Company, Town of Pacific, Columbia County, WI, January 1978.

[This page left blank intentionally]

Tables

Table 1. Groundwater Analytical Results Summary -
Columbia Ash Disposal Facility MOD 1-3 / SCS Engineers Project #25224067.00

			Background Wells		Compliance Wells		
Parameter Name	**UPL Method**	**UPL**	**MW-84A**	**MW-301**	**MW-33AR**	**MW-34A**	**MW-302**
			4/17/2024	4/17/2024	4/17/2024	4/17/2024	4/17/2024
Groundwater Elevation, ft amsl			784.90	785.27	783.02	784.14	784.49
Appendix III							
Boron, ug/L	NP	36.2	11.9	24.9	531	265	442
Calcium, ug/L	NP	126,000	73,700	102,000	64,200	58,500	77,800
Chloride, mg/L	P	5.76	3.2	1.6 J	22.8	2.2	1.1 J
Fluoride, mg/L	DQ	DQ	0.12 J	<0.095	<0.095	<0.095	0.12 J
Field pH, Std. Units	P	7.71	7.68	7.06	7.58	7.40	7.67
Sulfate, mg/L	NP	27.5	1.4 J	11.5	165	51.5	26.8
Total Dissolved Solids, mg/L	NP	514	322	458	452	278	344

4.4 Blue shaded cell indicates the compliance well result exceeds the UPL (background) and the Limit of Quantitation (LOQ).

Abbreviations:

UPL = Upper Prediction Limit
DQ = Double Qualification
SSI = Statistically Significant Increase
μg/L = micrograms per liter
mg/L = milligrams per liter

NP = Nonparametric UPL with 1-of-2 retesting
P = Parametric UPL with 1-of-2 retesting
LOQ = Limit of Quantitation
LOD = Limit of Detection

J = Estimated concentration at or above the LOD and below the LOQ.

Notes:

1. An individual result above the UPL does not constitute an SSI above background. See the accompanying report text for identification of statistically significant results.
2. Interwell UPLs calculated based on results from background wells MW-84A and MW-301. Interwell UPLs based on 1-of-2 retesting approach. UPLs updated in August 2024 based on background well results through October 2023.

Created by: NDK Date: 12/2/2022
Last revision by: SCC Date: 8/20/2024
Checked by: RM Date: 8/26/2024

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Sulfate (mg/L)
Background	MW-301	12/22/2015	26.5	3.70 J	9.30
		4/5/2016	25.2	4.00	15.3
		7/8/2016	23.6	3.50 J	15.0
		10/13/2016	30.6	2.20	13.9
		12/29/2016	32.8	2.00 J	12.3 J
		1/25/2017	32.6	1.50 J	6.50
		4/11/2017	28.8	2.00	10.3
		6/6/2017	21.3	3.50	17.1
		8/8/2017	30.6	5.50	31.6
		10/23/2017	34.3	4.00	27.5
		4/25/2018	24.3	2.30	8.60
		8/8/2018	22.8	--	--
		10/22/2018	27.8	3.20	19.2
		4/3/2019	26.9	2.90 J, B	5.30 J
		10/9/2019	35.9	1.70	8.40
		5/29/2020	21.3	2.00 J	11.5 J
		10/8/2020	28.8	3.40	25.1
		4/13/2021	22.2	1.50 J	8.5
		10/14/2021	31.4	2.70	17.4
		4/13/2022	28.7	1.90 J	12.7
		10/27/2022	37.5	2.3	11.6
		4/27/2023	20.1	1.5 J	12.3
		10/11/2023	36.2	2.1	11.8
		4/17/2024	24.9	1.6 J	11.5
	MW-84A	12/22/2015	11.9	4.90	4.90
		4/5/2016	14.0	4.70	4.30
		7/8/2016	14.7	5.10	3.70 J
		7/28/2016	--	--	--
		10/13/2016	11.1	4.30	2.60 J
		12/29/2016	14.7	4.70	2.70 J
		1/25/2017	16.1	4.60	3.00
		4/11/2017	12.9	4.90	2.80 J
		6/6/2017	14.8	5.50	2.70 J
		8/8/2017	22.9	5.50	2.00 J
		10/24/2017	13.8	5.10	2.20 J
		4/25/2018	25.0	4.80	2.80 J
		8/8/2018	12.8	--	--
		10/22/2018	10.1 J	4.20	1.60 J
		4/3/2019	13.6	3.60 B	1.40 J
		10/9/2019	12.0	3.90	1.30 J
		5/29/2020	10.0	3.70	1.50 J
		10/8/2020	9.7 J	4.30	1.30 J
		4/13/2021	14.3	4.40	1.40 J
		10/14/2021	11.1	3.50	17.4
		4/13/2022	10.5	5.20	1.40 J, M0
		10/27/2022	12.2	3.4	1.1 J
		4/27/2023	10.3	3.0	1.3 J
		10/11/2023	14.0	3.1	1.4 J
		4/17/2024	11.9	3.2	1.4 J

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Sulfate (mg/L)
Compliance	MW-302	12/22/2015	80.0	4.20	37.4
		4/5/2016	78.8	4.10	55.6
		7/7/2016	134	3.10 J	35.4
		10/13/2016	132	1.10 J	64.7
		12/29/2016	106	1.20 J	56.4
		1/25/2017	149	1.60 J	61.6
		4/11/2017	322	1.60 J	81.3
		6/6/2017	671	3.50	84.6
		8/8/2017	833	4.50	79.0
		10/24/2017	691	6.90	78.4
		4/24/2018	1,950	15.0	109
		9/21/2018	203	1.70 J	30.0
		10/22/2018	296	1.80 J	26.9
		4/2/2019	254	1.50 J	25.2
		10/9/2019	246	1.10 J	16.7
		5/29/2020	611	1.20 J	34.6
		10/8/2020	648	1.10 J	36.5
		4/13/2021	521	1.40 J	36.9
		10/14/2021	495	1.30 J	37.8
		4/12/2022	389	0.79 J	22.1 M0
		10/27/2022	374	2.1	30.3
		4/27/2023	541	1.3 J	36.6
		10/11/2023	309	1.6 J	19.9
		4/17/2024	442	1.1 J	26.8
	MW-33AR	12/21/2015	954	10.6	96.2
		4/5/2016	813	12.5	91.5
		7/7/2016	794	12.5	99.2
		10/13/2016	827	52.5	124
		12/29/2016	812	39.6	132
		1/25/2017	763	41.4	133
		4/11/2017	760	47.1	139
		6/6/2017	692	68.1	151
		8/7/2017	697	105	164
		10/24/2017	678	119	175
		4/24/2018	601	188	163
		9/21/2018	683	32.6	124
		10/22/2018	682	14.4	112
		4/2/2019	568	229	201
		10/8/2019	548	153	182
		5/28/2020	566	15.9	104
		10/8/2020	569	27.3	97.4
		4/13/2021	473	26.9	94.3
		6/11/2021	--	--	--
		10/12/2021	564	22.6	96.4
		4/12/2022	558	59.0	155
		10/27/2022	586	40.5	153
		4/27/2023	532	19.0	104
		10/11/2023	485	24.2	139
		4/17/2024	531	22.8	165

Table 2. Historical Analytical Results for Parameters with SSIs
Columbia Dry ADF, Modules 1-3

Well Group	Well	Collection Date	Boron (µg/L)	Chloride (mg/L)	Sulfate (mg/L)
Compliance	MW-34A	12/21/2015	230	4.90	69.9
		4/5/2016	220	5.10	71.6
		7/7/2016	216	5.60	63.4
		7/28/2016	--	--	--
		10/13/2016	212	6.80	54.8
		12/29/2016	224	7.10	63.9
		1/25/2017	214	7.20	71.2
		4/11/2017	214	6.20	87.6
		6/6/2017	201	7.80	106
		8/7/2017	205	7.40	105
		10/24/2017	208	7.60	98.0
		4/24/2018	209	8.20	144
		9/21/2018	241	17.1	141
		10/22/2018	233	19.9	123
		4/4/2019	204	18.7	70.4
		10/8/2019	207	57.9	39.8
		5/28/2020	210	3.90	44.4
		10/8/2020	213	2.10	58.7
		4/13/2021	203	2.30	59.3
		6/11/2022	--	--	--
		10/12/2021	212	1.90 J, M0	56.1
		4/12/2022	237	2.20	146
		10/27/2022	264	2.20	169
		4/28/2023	220	2.0	48.4
		10/11/2023	237	2.7	43.6
		4/17/2024	265	2.2	51.5
	MW-1AR(2)	4/14/2021	16.1	1.50 J	4.40 M0
		10/14/2021	12.4	1.20 J	3.10

Abbreviations:
µg/L = micrograms per liter or parts per billion (ppb)
mg/L = milligrams per liter or parts per million (ppm)
J = Estimated value below the laboratory's limit of quantitation
B = Analyte was detected in the associated Method Blank.
M0 = matrix spike recovery and/or matrix spike duplicate recovery outside of laboratory control limits.

Notes:
(1) Analytical laboratory reports provided in the Annual Groundwater Monitoring and Corrective Action Reports.
(2) MW-1AR was added to the sampling network in 2021 to provide additional evaluation of site conditions in the CCR unit. MW-1AR was abandoned in March of 2022.

Created by:	NDK	Date:	3/19/2020
Last revision by:	RM	Date:	11/18/2024
Checked by:	JSN	Date:	9/20/2024
PM/Scientist Check:	TK	Date:	11/18/2024

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

	Well Number	**MW-1AR**	**MW-4**	**MW-5R**	**MW-33AR**	**MW-33BR**	**MW-34A**	**MW-34B**	**MW-37A**	**MW-83**	**MW-84A**	**MW-84B**	**MW-86**	**MW-91AR**	**MW-91B**	**MW-92A**	**MW-92B**	**MW-93A**	**MW-93B**	**MW-312**
Dry Ash Facility (Facility ID #03025	**Top of Casing Elevation (feet amsl)**	822.55	819.74	805.44	808.29	808.39	805.95	806.05	813.04	807.96	814.28	814.26	824.79	809.03	808.45	808.47	808.41	827.89	827.71	826.79
	Screen Length (ft)																	10	5	10
	Total Depth (ft from top of casing)	44.40	39.58	25.97	31.08	57.50	35.43	56.95	31.80	25.42	40.21	52.02	45.43	32.90	52.38	28.94	51.75	50.7	82.5	52.5
	Top of Well Screen Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66	787.19	750.21	784.29
	Measurement Date																			
	October 2, 2012	783.41	783.70	784.96	782.38	782.23	783.03	782.99	782.66	dry	783.84	783.94	783.81	784.09	783.90	784.49	784.06	NI	NI	NI
	April 15, 2013	785.44	784.02	786.09	784.16	784.14	784.74	784.79	783.87	784.49	785.83	785.76	785.22	785.14	785.01	785.75	785.34	NI	NI	NI
	October 8, 2013													785.66	785.42	785.97	785.52	NI	NI	NI
	October 15, 2013	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.66	785.42	785.97	785.52	NI	NI	NI
	April 14, 2014	784.95	784.09	785.63	783.74	783.91	784.63	784.70	783.45	783.73	785.58	785.52	784.96	785.04	784.96	785.99	785.54	NI	NI	NI
	October 2-3, 2014	785.03	785.39	786.08	784.37	784.28	784.57	784.54	784.56	dry	785.24	785.18	785.19	785.47	785.28	785.75	785.33	NI	NI	NI
	April 13-14, 2015	783.96	783.63	785.25	783.01	782.74	783.65	783.95	782.87	dry	784.43	784.51	784.17	784.48	784.37	785.07	784.66	NI	NI	NI
	October 6-7, 2015	784.28	784.44	785.72	783.68	783.33	784.05	784.02	783.66	dry	784.80	784.76	784.66	784.89	784.70	785.20	784.76	NI	NI	NI
	April 4-6, 2016	785.82	aband	787.02	785.29	785.07	785.63	785.67	784.76	785.43	786.37	786.26	785.89	786.05	785.95	786.61	786.21	NI	NI	NI
	October 11-13, 2016	786.64	aband	788.00	787.36	786.46	786.45	786.32	786.40	786.81	787.22	787.11	786.96	787.17	786.81	787.68	787.25	NI	NI	NI
	April 10-13, 2017	786.96	aband	788.13	786.39	785.99	786.30	786.28	786.34	786.23	787.16	787.06	786.96	787.24	787.03	787.90	787.60	NI	NI	NI
	October 3-5, 2017	785.48	aband	786.66	784.51	784.22	784.67	784.63	784.86	784.29	NM	786.49	785.58	786.08	785.83	786.47	786.02	NI	NI	NI
	October 9-10, 2017	NM	aband	NM	NM	NM	NM	NM	NM	NM	785.56 (6)	NM	NM	NM	NM	NM	NM	NI	NI	NI
	February 21, 2018	783.97	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.68	784.46	NM	NM	NI	NI	NI
	April 23-25, 2018	783.99	aband	785.36	783.09	786.36	781.77	780.79	783.28	783.32	785.88	784.91	782.54	784.71	784.53	785.23	784.81	NI	NI	NI
	October 23-25, 2018	788.25	aband	789.71	788.77	787.96	787.88	787.73	787.62	788.26	788.32	788.19	788.21	788.59	788.31	789.32	788.87	NI	NI	NI
	April 1-4, 2019	787.05	aband	788.64	786.63	786.54	786.82	786.92	786.47	786.78	787.35	787.34	787.16	787.45	787.18	788.04	787.63	NI	NI	NI
	October 7-9, 2019	787.26	aband	789.23	788.26	787.64	787.92	787.74	786.77	788.90	787.79	787.73	787.44	787.78	787.62	788.63	788.17	NI	NI	NI
	May 27-28, 2020	786.92	aband	788.34	786.01	785.75	785.98	785.99	786.22	786.03	787.02	786.99	786.94	787.26	787.05	787.86	787.47	NI	NI	NI
	October 7-8, 2020	785.95	aband	787.76	785.91	785.45	785.70	785.68	785.52	785.72	786.10	786.06	786.10	786.55	786.33	786.85	786.38	NI	NI	NI
	February 25, 2021	NM	aband	NM	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	April 14, 2021	778.12	aband	787.29	784.27	784.05	784.77	784.77	784.46	c	785.84	785.81	785.60	785.86	785.69	786.47	786.06	NI	NI	NI
	June 11, 2021	NM	aband	NM	784.19	NM	784.66	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	October 11-12, 14, 2021	784.47	aband	786.78	783.73	783.60	784.42	784.41	783.88	783.87	784.96	784.88	784.79	785.14	784.94	785.55	785.11	NI	NI	NI
	October 17, 2021	NM	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	April 1, 2022	aband	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 11-13, 2022	aband	aband	785.52	783.27	783.45	784.30	784.42	783.26	783.78	785.02	785.00	784.70	784.83	784.72	785.45	785.02	783.99	783.97	783.73
	October 24-28, 2022	aband	aband	785.43	781.94	781.61	783.61	783.61	782.28	dry	784.57	784.54	784.38	784.64	784.47	785.05	784.62	783.74	782.76	783.50
	February 20-23, 2023	aband	aband	NM	783.57	NM	784.48	NM	NM	NM	785.25	NM	NM	NM	NM	NM	NM	NM	NM	NM
	March 27-28, 2023	aband	aband	NM	784.52	NM	785.23	NM	NM	NM	786.21	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 24-27, 2023	aband	aband	787.76	785.79	785.35	786.22	786.12	784.99	786.05	786.97	786.86	786.67	786.76	786.59	787.53	787.11	785.87	785.85	785.55
	May 16, 2023	aband	aband	787.79	785.64	785.25	786.06	786.05	785.39	785.77	786.88	786.79	786.74	786.95	786.75	787.47	787.05	786.23	786.21	785.97
	May 30-31, 2023	aband	aband	NM	785.23	NM	785.70	NM	NM	NM	786.57	NM	NM	NM	NM	NM	NM	NM	NM	NM
	October 9-11, 2023	aband	aband	785.33	782.57	782.39	783.55	783.40	782.94	dry	784.39	784.31	784.24	784.63	784.36	784.89	784.36	783.86	783.59	783.69
	April 15-17, 2024	aband	aband	dry	783.02	782.94	784.14	784.11	782.95	783.41	784.90	784.84	784.54	784.61	784.57	785.19	784.75	783.88	783.87	783.59
	April 19, 2024	aband	aband	785.47	783.06	783.02	784.28	784.30	783.05	dry	785.05	785.01	784.67	784.74	784.62	785.63	785.16	783.95	783.95	783.68
	Bottom of Well Elevation (ft)	778.15	780.16	779.47	777.21	750.89	770.52	749.10	781.24	782.54	774.07	762.24	779.36	776.13	756.07	779.53	756.66	777.19	745.21	774.29

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

Ash Pond Facility (Facility ID #02325)	**Well Number**	**M-3**	**M-4R**	**MW-39A**	**MW-39B**	**MW-48A**	**MW-48B**	**MW-57**	**MW-59**	**MW-216R**	**MW-217**	**MW-220RR**
	Top of Casing Elevation (feet amsl)	788.23	806.10	809.62	809.50	828.86	828.84	786.29	815.48	814.21	791.55	792.90
	Screen Length (ft)											
	Total Depth (ft from top of casing)	16.90	25.55	34.80	76.07	51.88	75.80	14.40	38.50	37.85	37.37	18.96
	Top of Well Screen Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	754.18	773.94
	Measurement Date											
	October 2, 2012	780.13	786.76	781.49	781.34	782.03	781.93	780.58	779.88	781.91	780.95	780.55
	April 15, 2013	785.16	788.39	783.97	784.00	783.77	783.78	784.69	783.66	784.09	784.75	785.02
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM
	April 14, 2014	786.04	788.96	783.57	783.68	783.56	783.57	785.51	783.41	783.73	785.25	785.87
	October 1-3, 2014	781.16	787.55	783.42	783.32	784.05	783.94	782.32	783.55	783.79	782.63	783.03
	April 13-14, 2015	783.08	786.83	782.77	782.68	782.80	782.82	782.81	782.83	782.93	783.34	783.42
	October 6-7, 2015	780.66	786.12	782.97	782.81	783.10	783.01	781.82	783.25	783.18	781.95	782.26
	April 4-6, 2016	784.21	789.09	785.27	785.27	784.79	784.76	783.21	784.97	785.68	785.02	784.36
	October 11-13, 2016	781.88	787.88	785.75	785.52	785.73	785.61	783.12	786.51	786.16	783.75	784.09
	April 10-13, 2017	782.94	787.95	785.44	785.20	785.82	785.69	782.77	786.09	785.95	784.29	784.09
	October 3-5, 2017	780.93	787.04	783.35	783.18	784.30	784.19	782.37	784.23	783.89	782.48	782.61
	April 23-25, 2018	782.89	790.43	782.86	782.87	783.14	783.09	783.04	783.02	783.23	783.26	783.45
	October 23-25, 2018	782.95	788.47	787.12	786.88	787.12	786.99	783.48	787.73	787.49	784.90	784.52
	April 1-4, 2019	785.68	789.44	786.28	786.31	786.56	786.45	785.27	787.39	786.53	786.33	785.46
	October 7-9, 2019	785.33	790.65	787.10	787.02	786.68	786.65	785.29	786.68	787.07	786.01	785.42
	May 27-29, 2020	781.80	787.73	785.12	784.92	785.74	785.59	783.11	785.89	785.60	783.41	783.89
	October 7-8 &17, 2020	781.42	787.74	784.74	784.64	785.03	784.96	782.83	785.43	785.10	783.06	783.49
	April 12, 2021	782.30	786.34	783.66	783.65	784.13	784.08	782.79	784.08	783.97	783.15	783.49
	October 11-12, 14, 2021	781.03	786.33	782.94	782.85	783.09	783.03	781.94	783.11	783.04	782.15	782.66
	April 11-13, 2022	783.95	788.26	783.37	783.34	783.10	783.10	NM	782.99	783.40	783.93	783.83
	June 3, 2022	NM	NM	NM	NM	NM	NM	782.13	NM	NM	NM	NM
	October 25, 26, 28, 2022	780.41	783.85	780.76	780.66	779.57	779.55	779.23	778.98	778.61	780.33	781.49
	March 27-28, 2023	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	April 24-27, 2023	785.18	782.59	785.38	785.19	784.55	784.51	NM	784.83	784.46	783.78	785.30
	May 16, 2023	782.79	781.64	784.70	784.58	784.60	784.49	782.80	784.68	783.94	782.07	784.03
	October 9-11, 2023	779.65	780.54	781.50	781.30	781.94	781.69	780.26	781.95	781.21	779.89	780.43
	April 15-17, 2024	781.73	781.38	782.58	782.51	782.42	782.35	781.82	782.23	782.17	781.47	783.40
	April 19, 2024	NM	dry	782.78	782.80	782.57	782.56	NM	782.35	782.29	781.65	783.48

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25224067.00

	Well Number	MW-301	MW-302	MW-303	MW-304	MW-304R	MW-305	M-4R	MW-33AR	MW-34A	MW-84A	MW-306	MW-307	MW-308	MW-309	MW-310	MW-311	MW-312	MW-313	MW-314	MW-315	MW-316	MW-317	MW-318	MW-319
CCR Rule Wells	**Top of Casing Elevation (feet amsl)**	806.89	813.00	815.72	805.42	804.34	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74	826.786	820.3	821.57	819.78	808.49	819.36	820.94	828.77
	Screen Length (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Total Depth (ft from top of casing)	29.40	33.6	35.80	25.7	30.73	25.6	39.58	31.08	35.43	40.21	27	26.5	28	37.67	38.41	36.19	52.5	46.2	45.0	45.6	43.7	44.3	43	47.6
	Top of Well Screen Elevation (ft)	787.49	789.40	785.72	789.72	783.61	790.72	776.52	787.21	780.52	784.07	790.63	790.39	788.90	785.60	785.21	783.55	784.29	784.1	786.6	784.2	774.79	785.1	787.9	791.2
	Measurement Date																								
	December 21-22, 2015	785.56	784.78	784.11	786.13	NI	788.96	787.58	783.77	783.50	785.31	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
	April 4-5, 2016	786.78	785.81	785.48	788.08	NI	789.61	789.09	785.29	785.63	786.37	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	July 7-8, 2016	786.31	786.28	784.60	787.36	NI	789.26	787.43	785.19	785.05	785.89	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	July 28, 2016	NM	NM	784.35	NM	NI	NM	NM	NM	784.86	785.61	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	October 11-13, 2016	787.64	787.76	786.18	788.18	NI	789.78	787.88	787.36	786.45	787.22	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	December 29, 2016	787.37	787.05	NM	NM	NI	NM	NM	785.66	785.72	786.63	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	January 25-26, 2017	787.27	786.89	785.28	789.34	NI	789.36	789.64	785.88	785.98	786.70	785.50	785.36	785.73	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	April 10 & 11, 2017	787.89	787.55	786.00	788.22	NI	789.57	787.95	786.39	786.30	787.16	786.22	785.64	786.51	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	June 6, 2017	788.25	788.37	786.49	788.58	NI	789.79	787.83	787.27	786.66	787.63	786.85	786.07	786.46	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	August 7-9, 2017	787.34	787.55	785.42	789.52	NI	789.30	788.54	786.11	785.81	786.68	785.69	785.19	785.37	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	October 23-24, 2017	785.89	785.94	783.92	788.97	NI	788.14	788.00	784.13	784.50	785.32	783.97	784.79	784.17	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	February 21, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	783.19	783.05	783.02	NI	NI	NI	NI	NI	NI	NI	NI
	March 23, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	783.10	783.10	783.00	NI	NI	NI	NI	NI	NI	NI	NI
	April 23-25, 2018	785.29	784.37	783.27	789.69	NI	787.67	790.43	783.09	781.77	785.88	783.24	783.65	782.65	783.07	782.97	781.83	NI	NI	NI	NI	NI	NI	NI	NI
	May 24, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	785.79	785.09	NM	785.45	785.97	786.11	NI	NI	NI	NI	NI	NI	NI	NI
	June 23, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	786.03	786.64	786.47	NI	NI	NI	NI	NI	NI	NI	NI
	July 23, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	786.27	786.35	786.55	NI	NI	NI	NI	NI	NI	NI	NI
	August 7, 2018	787.06	NM	785.20	788.25	NI	788.56	787.63	NM	NM	786.55	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	August 22, 2018	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	785.54	785.40	785.46	NI	NI	NI	NI	NI	NI	NI	NI
	September 21, 2018	NM	788.37	786.50	NM	NI	NM	NM	787.90	787.01	NM	NM	NM	NM	787.08	787.24	787.66	NI	NI	NI	NI	NI	NI	NI	NI
	October 22-24, 2018	788.98	789.16	787.51	789.05	NI	790.04	788.47	788.77	787.88	788.32	787.66	786.57	787.81	787.99	788.18	788.64	NI	NI	NI	NI	NI	NI	NI	NI
	April 1-4, 2019	787.04	787.56	786.52	789.72	NI	790.07	789.44	786.63	786.82	787.35	786.72	786.71	787.53	786.30	786.38	786.38	NI	NI	NI	NI	NI	NI	NI	NI
	June 12, 2019	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	787.25	NM	NI	NI	NI	NI	NI	NI	NI	NI
	June 19, 2019	NM	NM	786.81	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 7-9, 2019	788.47	788.31	787.02	790.41	NI	790.36	790.65	NM	NM	NM	787.47	786.99	787.18	787.26	787.94	787.64	NI	NI	NI	NI	NI	NI	NI	NI
	December 13, 2019	--	--	--	--	NI	--	--	--	--	--	787.03	785.68	786.43	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	December 23, 2019	--	--	--	--	NI	--	--	--	--	--	--	--	--	--	775.22	--	NI	NI	NI	NI	NI	NI	NI	NI
	January 17, 2020	--	--	785.58	--	NI	--	--	--	--	--	--	--	--	--	--	--	NI	NI	NI	NI	NI	NI	NI	NI
	February 3, 2020	787.24	NM	NM	NM	NI	NM	NM	NM	NM	786.50	785.77	785.57	786.48	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	May 27-29, 2020	787.77	787.29	785.56	789.30	NI	787.78	787.73	786.01	785.98	787.02	785.77	785.35	786.28	785.98	785.81	785.85	NI	NI	NI	NI	NI	NI	NI	NI
	June 30, 2020	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	August 6, 2020	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 7-8, 2020	786.53	786.74	785.16	788.52	NI	787.96	787.74	785.91	785.70	786.10	785.39	784.71	785.68	785.47	785.56	785.83	NI	NI	NI	NI	NI	NI	NI	NI
	December 11, 2020	NM	NM	NM	NM	NI	788.19	NM	NM	NM	NM	NM	NM	NM	785.26	785.26	NM	NI	NI	NI	NI	NI	NI	NI	NI
	February 25, 2021	NM	NM	784.27	NM	NI	788.36	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	April 12, 2021	786.50	785.77	784.07	787.99	NI	788.11	786.34	784.27	784.77	785.84	784.32	784.21	785.55	784.29	784.24	784.15	NI	NI	NI	NI	NI	NI	NI	NI
	June 11, 2021	NM	NM	NM	NM	NI	NM	NM	784.19	784.66	NM	NM	NM	NM	784.20	784.05	NM	NI	NI	NI	NI	NI	NI	NI	NI
	July 20, 2021	NM	NM	783.64	NM	NI	788.39	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 11-12, 14, 2021	785.28	785.09	783.09	787.78	NI	787.75	786.33	783.73	784.42	784.96	782.93	782.44	783.76	783.65	783.48	783.48	NI	NI	NI	NI	NI	NI	NI	NI
	December 21, 2021	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	782.93	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	February 24, 2022	NM	NM	782.34	NM	NI	786.49	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	April 11-13, 2022	785.44	784.42	783.40	788.20	NI	787.87	788.26	783.27	784.30	785.02	783.11	783.32	784.19	783.14	783.19	783.04	NI	NI	NI	NI	NI	NI	NI	NI
	July 27, 2022	NM	NM	783.07	NM	NI	787.03	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	October 25-27, 2022	784.91	784.62	778.94	781.79	NI	784.97	783.85	781.94	783.61	784.57	778.32	777.89	784.16	781.50	780.96	781.23	NI	NI	NI	NI	NI	NI	NI	NI
	November 30, 2022	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	781.62	781.14	781.15	NI	NI	NI	NI	NI	NI	NI	NI
	December 2, 2022	785.12	784.48	NM	783.97	NI	NM	NM	781.91	783.71	784.76	778.52	779.54	NM	NM	NM	NM	NI	NI	NI	NI	NI	NI	NI	NI
	January 12-13, 2023	785.20	784.55	NM	NM	NI	NM	NM	782.75	784.10	784.88	NM	NM	NM	782.57	782.45	782.32	NI	NI	NI	NI	NI	NI	NI	NI
	January 20, 2023	NM	NM	NM	788.08	NI	NM	NM	NM	NM	NM	782.15	782.11	784.98	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NI
	January 24, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.73	783.36	783.63	783.77	NI	NI	NI	NI
	February 20-23, 2023	785.56	784.98	NM	NM	NI	NM	NM	NM	NM	NM	783.04	782.91	785.32	783.31	783.34	783.40	783.50	783.59	783.82	783.96	NI	NI	NI	NI
	March 27-28, 2023	786.83	785.87	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	783.84	783.98	784.43	NM	784.12	784.41	784.57	NI	NI	NI	NI
	April 24-27, 2023	787.57	786.87	784.38	784.03	NI	NM	782.59	785.79	786.22	786.97	784.82	784.25	787.75	785.05	785.18	785.69	NM	785.21	785.43	785.59	NI	NI	NI	NI
	May 5, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.55	NM	NM	NM	780.49	NI	NI	NI
	May 16, 2023	787.43	787.07	783.88	784.12	NI	dry	781.64	785.64	786.06	786.88	784.65	783.89	786.88	785.15	785.11	785.39	785.97	785.46	785.68	785.88	780.48	NI	NI	NI
	May 30-31, 2023	787.04	786.89	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	784.90	784.69	784.97	NM	785.24	785.55	785.77	NM	NI	NI	NI
	June 29-30, 2023	786.32	786.39	NM	NM	NI	NM	NM	784.32	785.04	785.92	NM	NM	NM	784.12	783.84	783.97	NM	784.67	784.95	785.17	NM	NI	NI	NI
	July 31, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.96	784.26	784.49	NM	NI	NI	NI
	August 31, 2023	NM	785.30	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	782.47	NM	NM	783.55	783.83	783.97	NM	NI	NI	NI
	October 9-11, 2023	784.67	784.65	781.21	780.09	NI	779.93	780.54	782.57	783.55	784.39	NM	NM	783.09	782.58	782.32	782.22	783.69	783.10	783.33	783.59	780.30	NI	NI	NI
	November 9, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	782.76	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	November 20, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	781.97	781.45	782.85	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI
	December 27, 2023	NM	NM	NM	NM	NI	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.18	783.36	NM	NI	NI	NI
	April 15-17, 2024	785.27	784.49	782.16	aband	782.17	780.80	781.38	783.02	784.14	784.90	782.40	782.24	784.51	782.79	782.68	782.64	783.59	783.16	783.42	783.53	782.09	783.60	783.62	785.76
	April 19, 2024	785.51	784.55	782.26	aband	782.23	dry	dry	783.06	784.28	785.05	NM	782.64	784.69	782.90	782.82	782.74	783.68	783.30	783.49	783.62	782.15	NM	NM	NM
	Bottom of Well Elevation (ft)	777.49	779.40	775.72	779.72	773.61	780.72	766.52	777.21	770.52	774.07	780.63	780.39	778.90	775.60	775.21	773.55	774.29	774.10	776.61	774.18	764.79	775.06	777.94	781.17

Notes:
NM = not measured
NI = not installed
aband = abandoned
(1) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5, 2017 sampling event. The level was allowed to return to static and was measured on October 10, 2017.
(2) MW-303 was extended in 2022 due to regrading. Prior to October 2022, the TOC elevation was 811.52'. For events in October 2022 and later, the TOC elevation is 815.72'.
(3) A supplemental water level measurement event was conducted on April 19, 2024.

Created by: MDB Date: 5/6/2013
Last revision by: RM Date: 8/19/2024
Checked by: BLR Date: 8/21/2024

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25224067.00

Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LS-1	2015-Apr	DRY	--	--	--
	2015-Oct	BROKEN	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	--	6,530	12.3	789
	2017-Apr	--	6,510	20.7 J	814
	2017-Oct	--	6,200	14.2 J	764
	2018-Apr	--	5,920	16.0 J	856
	2018-Oct	DRY	--	--	--
	2019-Apr	--	5,640	22.0 J	911
	2019-Oct	--	6,180	19.2 J	861
	2020-May	--	6,180	25.4 J	1,040
	2020-Oct	--	5,640	27.2 J	950
	2021-Apr	--	6,010	21.1 J	976
	2021-Oct	--	6,230	14.3 J	987
	2022-Apr	--	6,140	13.3 J	1,040
	2022-Oct	--	6,000	16.7 J	898
	2023-Apr	--	6,200	27.1 J	969
	2023-Oct	--	6,330	<11.8 D3	1,050
	2024-Apr	--	6,020	20.1 J, D3	1,040
LS-3R	2015-Apr	--	6,480	20.6 B	807
	2015-Oct	DRY	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	DRY	--	--	--
	2017-Apr	DRY	--	--	--
	2017-Oct	DRY	--	--	--
	2018-Apr	DRY	--	--	--
	2018-Oct	--	6,180	26.2 J	841
	2019-Apr	DRY	--	--	--
	2019-Oct	DRY	--	--	--
	2020-May	DRY	--	--	--
	2020-Oct	DRY	--	--	--
	2021-Apr	DRY	--	--	--
	2021-Oct	DRY	--	--	--
	2022-Apr	DRY	--	--	--
	2022-Oct	DRY	--	--	--
	2023-Apr	DRY	--	--	--
	2023-Oct	DRY	--	--	--
	2024-Apr	DRY	--	--	--

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25224067.00

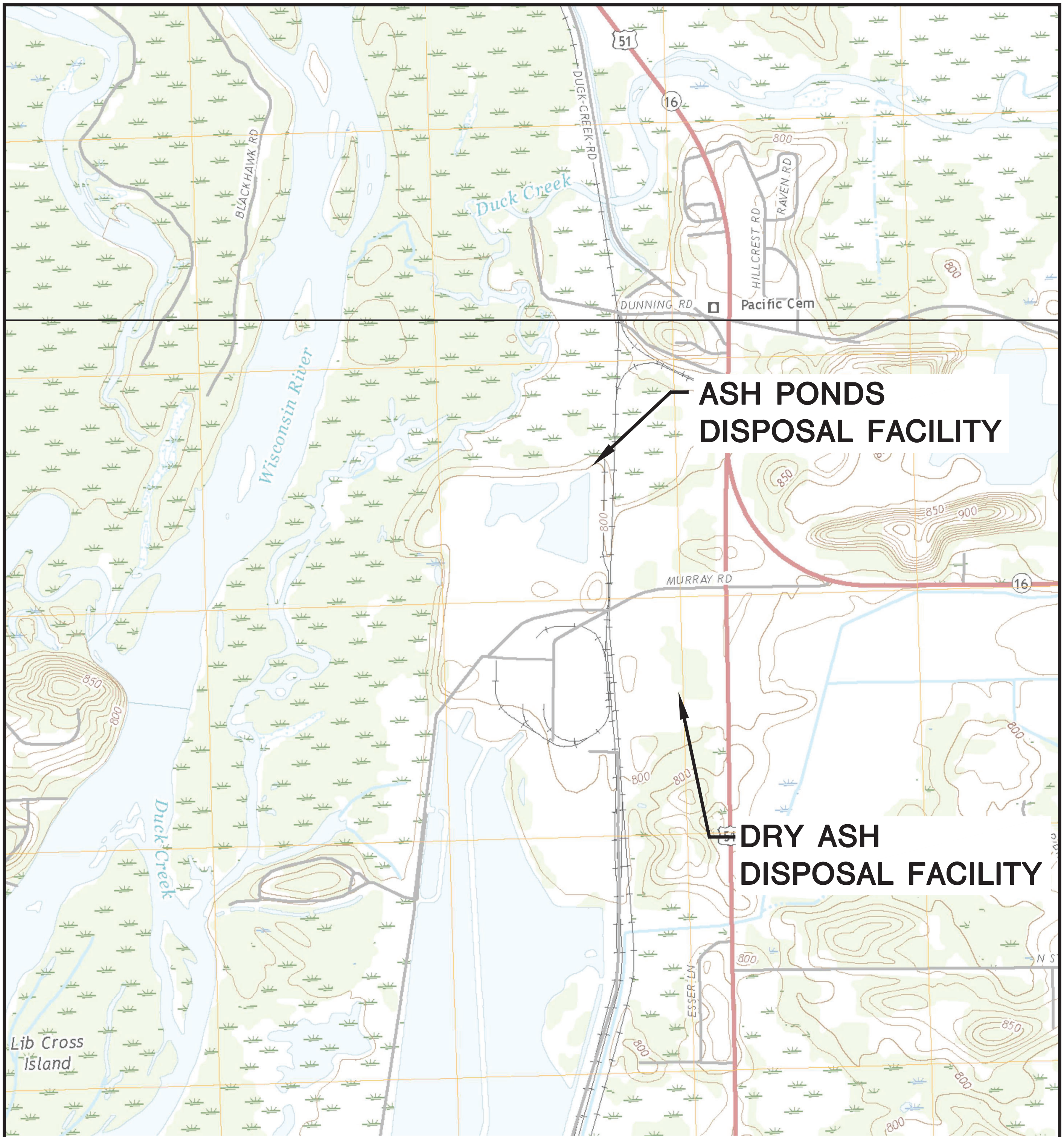
Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LP-1	2015-Apr	--	4,060	27.8	734
	2015-Oct	--	4,300	37.1	820
	2016-Apr	--	1,830	26.8	416
	2016-Oct	--	4,610	71.5	835
	2017-Apr	--	2,690	66.3	587
	2017-Oct	--	4,970	91.7	739
	2018-Apr	--	2,060	63.2	634
	2018-Oct	--	2,630	151	907
	2019-Apr	--	570	35.1	249
	2019-Oct	--	1,270	63.9	602
	2020-May	--	2,460	179	952
	2020-Oct	--	2,710	243	1,160
	2021-Apr	--	3,340	319	1,180
	2021-Oct	--	3,440	299	1,470
	2022-Apr	--	1,030	89.2	506
	2022-Oct	--	2,040	175	752
	2023-Apr	--	2,110	404	856
	2023-Oct	--	2,640	726	1,350
	2024-Apr	--	1,900	442	923

Abbreviations:
µg/L = micrograms per liter
mg/L = milligrams per liter
-- = not analyzed

Notes:
B = Analyte was detected in the associated method blank.
J = Estimated concentration at or above the Limit of Detection (LOD) and below the Limit of Quantitation (LOQ).
D3 = Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

Created by: MDB Date: 12/1/2014
Last revision by: RM Date: 9/20/2024
Checked by: JSN Date: 9/20/2024

Figures

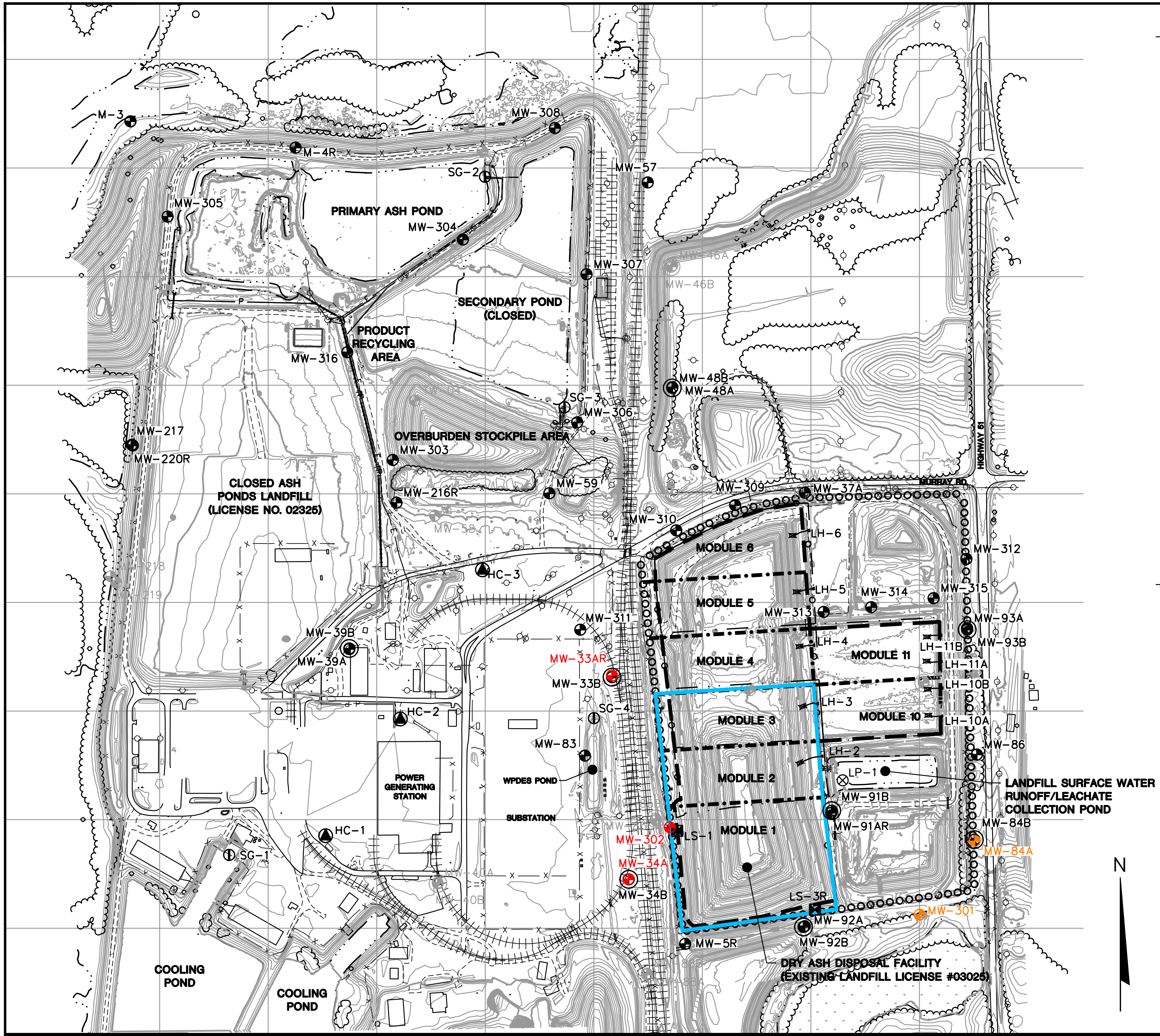


POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'

N

CLIENT	ALLIANT ENERGY COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WI 53954	SITE	ALLIANT ENERGY COLUMBIA ENERGY CENTER PARDEEVILLE, WI	SITE LOCATION MAP	

PROJECT NO.	25223067.00	DRAWN BY:	BSS	ENGINEER	SCS ENGINEERS 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	FIGURE
DRAWN:	12/02/2019	CHECKED BY:	TK			1
REVISED:	05/01/2023	APPROVED BY:	TK 11/11/2023			



LEGEND

───	EXISTING MAJOR CONTOUR (10' INTERVAL)
───	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—	EXISTING FENCELINE
┼┼┼┼┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
=========	EXISTING UNPAVED ROAD
—···—	EDGE OF WATER
·OOOOOOOO	DRY ASH DISPOSAL FACILITY LIMITS
— — —	LIMITS OF WASTE
—·—·—	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
⊗	SURFACE WATER SAMPLE LOCATION
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
↗	LEACHATE HEADWELL
───	CCR UNIT
🔴	CCR MONITORING WELL
🟠	CCR BACKGROUND MONITORING WELL

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016, AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. MONITORING WELLS MW-93A, MW-93B, AND MW-312 WERE INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 23-28, 2022.
8. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON DECEMBER 12 AND 19, 2022.
9. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
10. BACKGROUND MONITORING WELLS FOR THE MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.

500 0 500

SCALE: 1" = 500'

PROJECT NO.	25224067.00	DRAWN BY:	KP
DRAWN:	12/02/2019	CHECKED BY:	RM
REVISED:	04/24/2024	APPROVED BY:	TK 05/01/2024

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

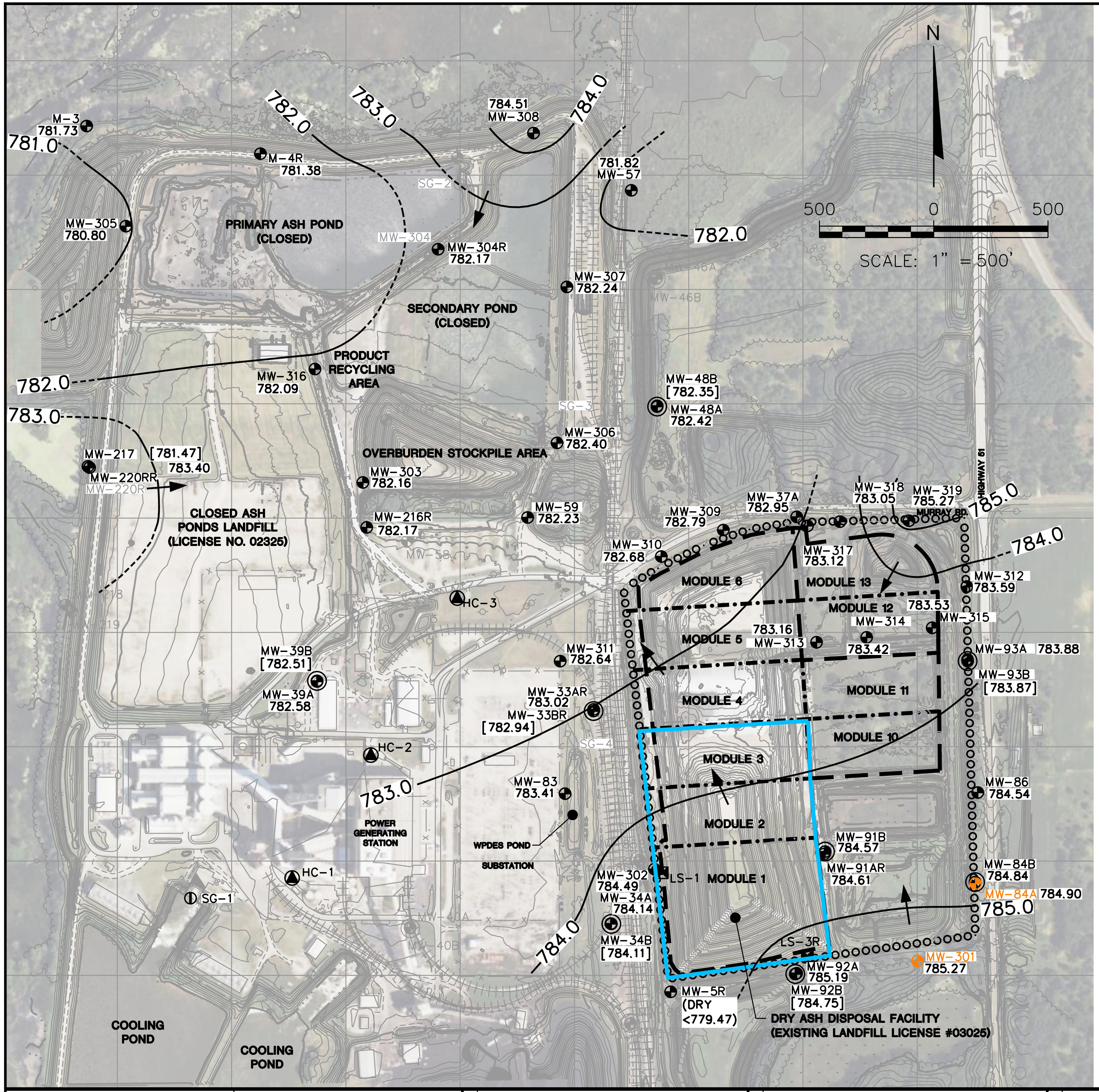
SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULES 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE
2

I:\25224067.00\Drawings\Modules 1-3\Site Plan and Monitoring Well Locations.dwg, 4/25/2024 6:48:46 AM



LEGEND

───	EXISTING MAJOR CONTOUR (10' INTERVAL)
───	EXISTING MINOR CONTOUR (2' CONTOUR)
—x—x—	EXISTING FENCELINE
┼┼┼┼┼┼	EXISTING TRACKS
═══	EXISTING PAVED ROAD
======	EXISTING UNPAVED ROAD
— · · · —	EDGE OF WATER
·○○○○○○○○	DRY ASH DISPOSAL FACILITY LIMITS
—·—·—	LINER PHASE/MODULE LIMITS
▲	WATER SUPPLY WELL
⦶	STAFF GAUGE
●	WATER TABLE WELL
◉	PIEZOMETER
☒	LYSIMETER
●	ABANDONED WATER TABLE WELL
◉	ABANDONED PIEZOMETER
●	CCR MONITORING WELL
●	CCR BACKGROUND MONITORING WELL
783.88	WATER TABLE ELEVATION
[781.47]	POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
(DRY)	SURFACE WATER ELEVATION (NOT CONTOURED)
——— — —	WATER TABLE CONTOUR (1-FOOT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
⟶	APPROXIMATE GROUNDWATER FLOW DIRECTION
───	CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. GROUNDWATER AND SURFACE WATER ELEVATIONS WERE MEASURED ON APRIL 12-14, 2021.
8. BACKGROUND MONITORING WELLS FOR THE PRIMARY ASH POND ARE: MW-301 AND MW-84A.
9. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
8. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON DECEMBER 12 AND 19, 2022.
9. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
10. MONITORING WELLS MW-317, MW-318 AND MW-319 WERE INSTALLED BY HORIZON CONSTRUCTION 7 EXPLORATION ON APRIL 9 THROUGH 11, 2024.

PROJECT NO.	25224067.00	DRAWN BY:	SB
DRAWN:	11/05/2024	CHECKED BY:	NLB/BRK
REVISED:	10/25/2024	APPROVED BY:	BRK (10/30/2024)

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE

ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PRIMARY ASH POND
PARDEEVILLE, WI

WATER TABLE CONTOUR MAP
APRIL 15-17, 2024
MODULES 1-3

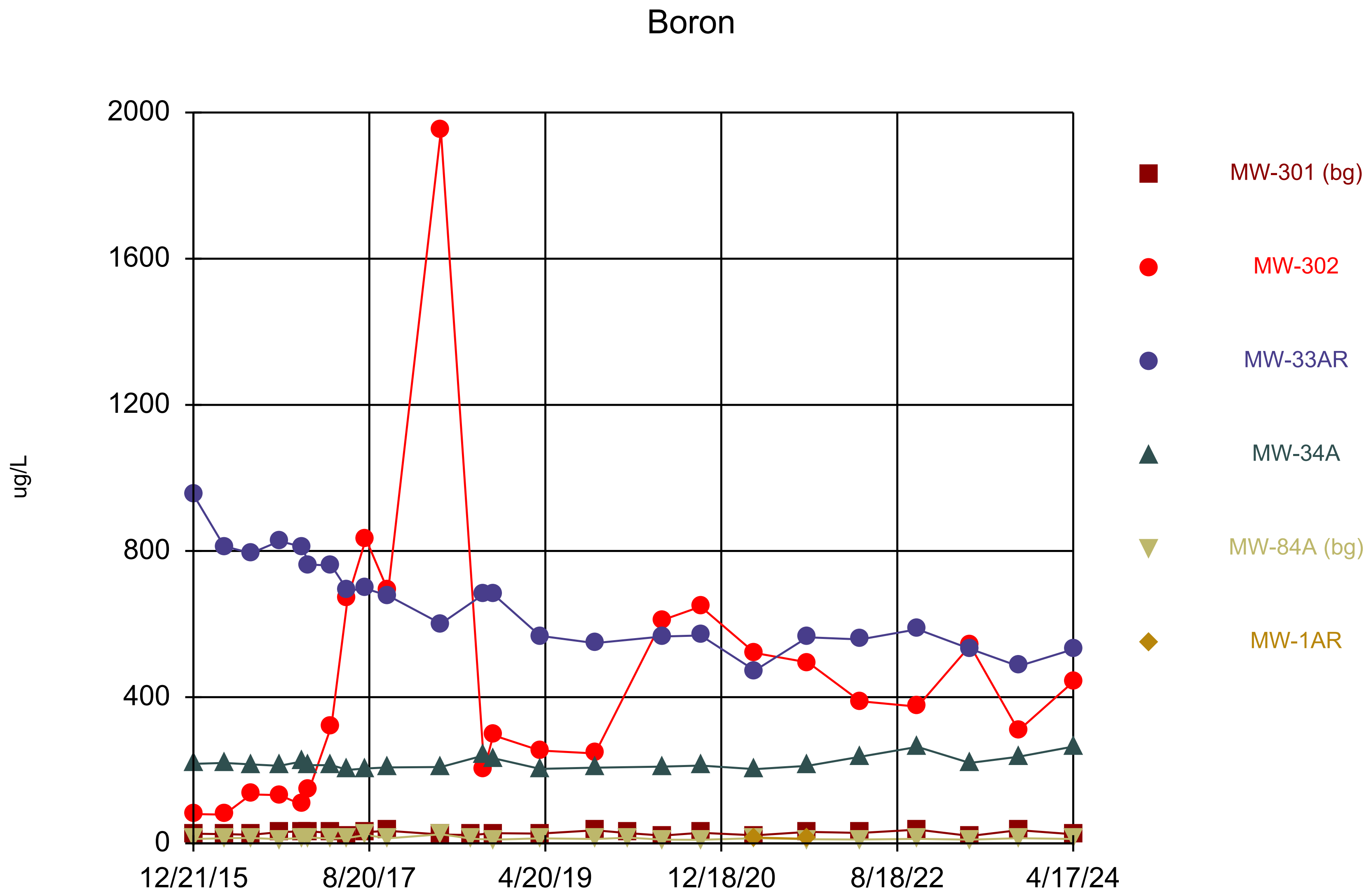
FIGURE
3

I:\25224067.00\Drawings\COL April 2024 WTBL CCR Units.dwg, 11/5/2024 1:00:46 PM

Appendix A

Trend Plots for CCR Wells

Sanitas™ v.10.0.20 Software licensed to SCS Engineers. UG



Time Series Analysis Run 8/30/2024 8:52 AM View: MOD 1-3 LF

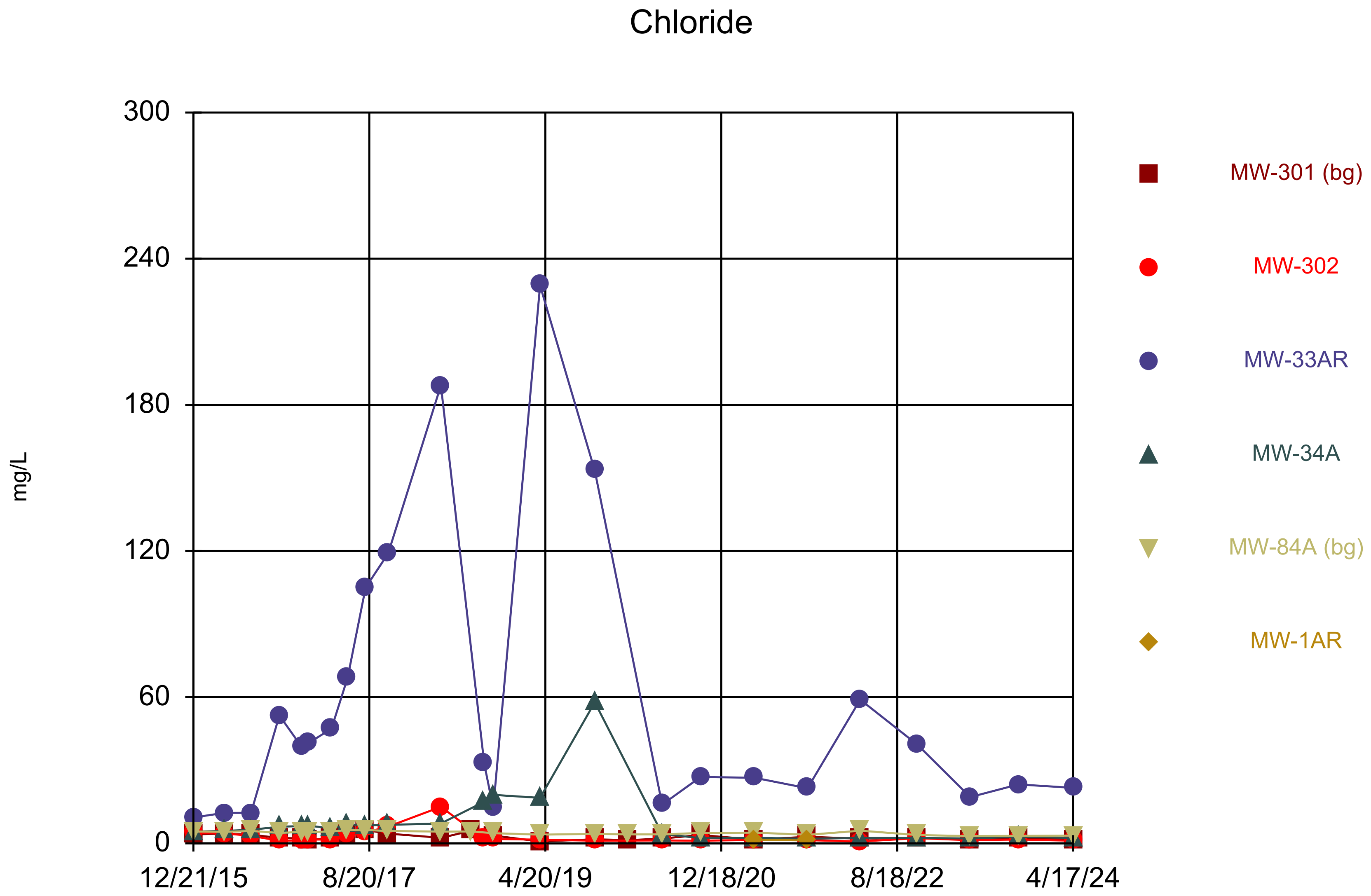
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

Constituent: Boron (ug/L)   Analysis Run 8/30/2024 8:53 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	MW-1AR
12/21/2015			954	217.5 (D)		
12/22/2015	26.5	80			11.9	
4/5/2016	25.2	78.8	813	220	14	
7/7/2016		134	794	216		
7/8/2016	23.6				14.7	
10/13/2016	30.6	132	827	212	11.1	
12/29/2016	32.8	106	812	224	14.7	
1/25/2017	32.6	149	763	214	16.1	
4/11/2017	28.8	322	760	214	12.9	
6/6/2017	21.3	671	692	201	14.8	
8/7/2017			697	205		
8/8/2017	30.6	833			22.9	
10/23/2017	34.3					
10/24/2017		691	678	208	13.8	
4/24/2018		1950	601	209		
4/25/2018	24.3				25	
8/8/2018	22.8				12.8	
9/21/2018		203	683	241		
10/22/2018		296	682	233		
10/24/2018	27.8				10.1 (J)	
4/2/2019	26.9	254	568	204		
4/3/2019					13.6	
10/8/2019			548	207		
10/9/2019	35.9	246			12	
2/3/2020	27.9				15.7	
5/28/2020			566	210		
5/29/2020	21.3	611			10	
10/8/2020	28.8	648	569	213	9.7 (J)	
4/13/2021		521	473	203		
4/14/2021	22.2				14.3	16.1
10/12/2021			564	212		
10/14/2021	31.4	495			11.1	12.4
4/12/2022		389	558	237		
4/13/2022	28.7				10.5	
10/27/2022	37.5	374	586	264	12.2	
4/26/2023				220		
4/27/2023	20.1	541	532		10.3	
10/11/2023	36.2	309	485	237	14	
4/17/2024	24.9	442	531	265	11.9	



Time Series Analysis Run 8/30/2024 8:52 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

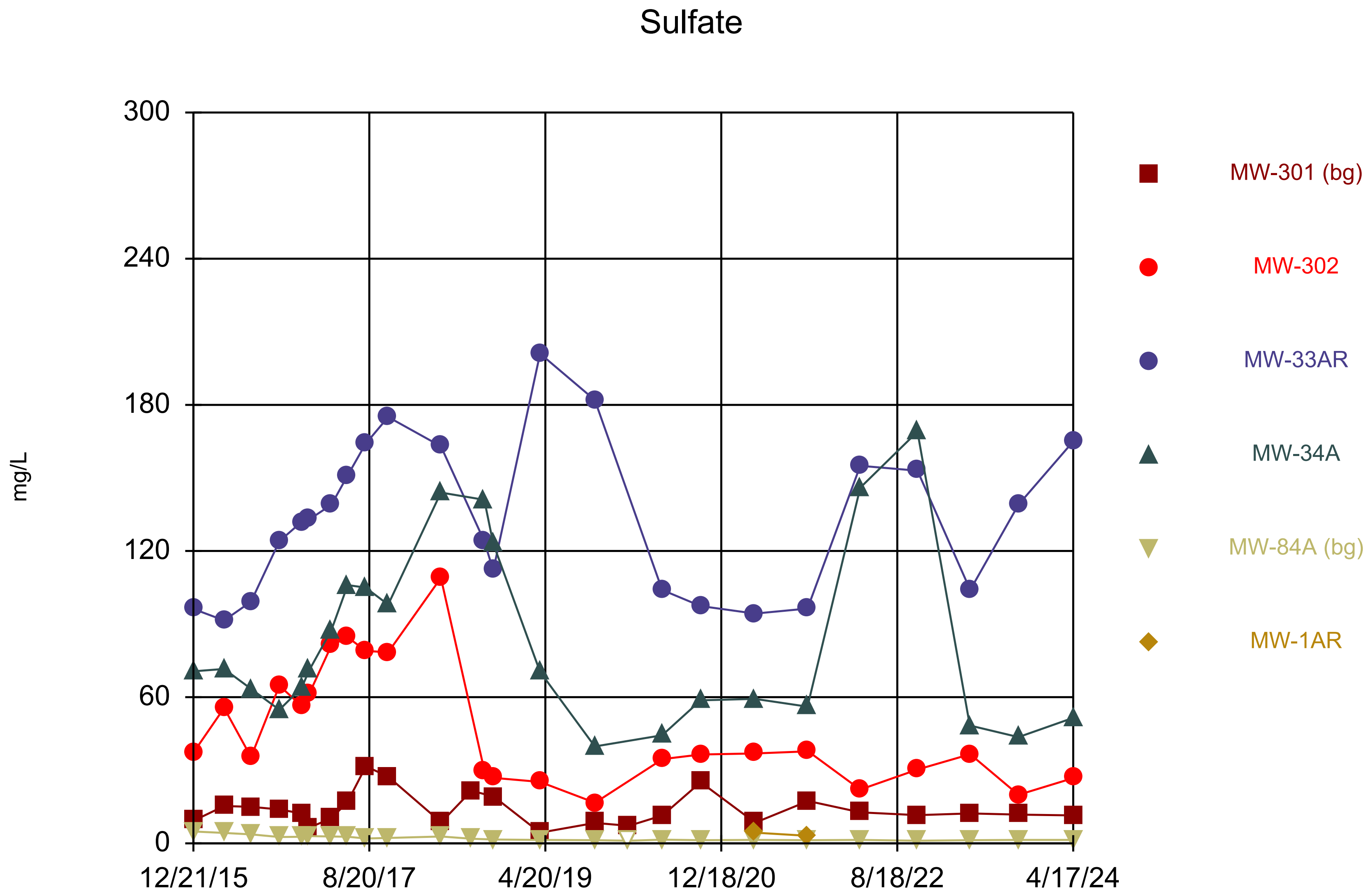
Constituent: Chloride (mg/L) Analysis Run 8/30/2024 8:53 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	MW-1AR
12/21/2015			10.6	4.85 (D)		
12/22/2015	3.7 (J)	4.2			4.9	
4/5/2016	4	4.1	12.5	5.1	4.7	
7/7/2016		3.1 (J)	12.5	5.6		
7/8/2016	3.5 (J)				5.1	
10/13/2016	2.2	1.1 (J)	52.5	6.8	4.3	
12/29/2016	2 (J)	1.2 (J)	39.6	7.1	4.7	
1/25/2017	1.5 (J)	1.6 (J)	41.4	7.2	4.6	
4/11/2017	2	1.6 (J)	47.1	6.2	4.9	
6/6/2017	3.5	3.5	68.1	7.8	5.5	
8/7/2017			105	7.4		
8/8/2017	5.5	4.5			5.5	
10/23/2017	4					
10/24/2017		6.9	119	7.6	5.1	
4/24/2018		15	188	8.2		
4/25/2018	2.3				4.8	
8/8/2018	5.2				4.9	
9/21/2018		1.7 (J)	32.6	17.1		
10/22/2018		1.8 (J)	14.4	19.9		
10/24/2018	3.2				4.2	
4/2/2019	0.79 (J)	1.5 (J)	229	18.7		
4/3/2019					3.6	
10/8/2019			153	57.9		
10/9/2019	1.7 (J)	1.1 (J)			3.9	
2/3/2020	1.3 (J)				3.7	
5/28/2020			15.9	3.9		
5/29/2020	2 (J)	1.2 (J)			3.7	
10/8/2020	3.4	1.1 (J)	27.3	2.1	4.3	
4/13/2021		1.4 (J)	26.9	2.3		
4/14/2021	1.5 (J)				4.4	1.5 (J)
10/12/2021			22.6	1.9 (J)		
10/14/2021	2.7	1.3 (J)			3.5	1.2 (J)
4/12/2022		0.79 (J)	59	2.2		
4/13/2022	1.9 (J)				5.2	
10/27/2022	2.3	2.1	40.5	2.2	3.4	
4/26/2023				2		
4/27/2023	1.5 (J)	1.3 (J)	19		3	
10/11/2023	2.1	1.6 (J)	24.2	2.7	3.1	
4/17/2024	1.6 (J)	1.1 (J)	22.8	2.2	3.2	

Sanitas™ v.10.0.20 Software licensed to SCS Engineers. UG

Hollow symbols indicate censored values.



Time Series Analysis Run 8/30/2024 8:52 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

Constituent: Sulfate (mg/L) Analysis Run 8/30/2024 8:53 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	MW-1AR
12/21/2015			96.2	70.6 (D)		
12/22/2015	9.3	37.4			4.9	
4/5/2016	15.3	55.6	91.5	71.6	4.3	
7/7/2016		35.4	99.2	63.4		
7/8/2016	15				3.7 (J)	
10/13/2016	13.9	64.7	124	54.8	2.6 (J)	
12/29/2016	12.3 (J)	56.4	132	63.9	2.7 (J)	
1/25/2017	6.5	61.6	133	71.2	3	
4/11/2017	10.3	81.3	139	87.6	2.8 (J)	
6/6/2017	17.1	84.6	151	106	2.7 (J)	
8/7/2017			164	105		
8/8/2017	31.6	79			2 (J)	
10/23/2017	27.5					
10/24/2017		78.4	175	98	2.2 (J)	
4/24/2018		109	163	144		
4/25/2018	8.6				2.8 (J)	
8/8/2018	21.6				1.9 (J)	
9/21/2018		30	124	141		
10/22/2018		26.9	112	123		
10/24/2018	19.2				1.6 (J)	
4/2/2019	4.4	25.2	201	70.4		
4/3/2019					1.4 (J)	
10/8/2019			182	39.8		
10/9/2019	8.4	16.7			1.3 (J)	
2/3/2020	7.2				<2.2 (U)	
5/28/2020			104	44.4		
5/29/2020	11.5	34.6			1.5 (J)	
10/8/2020	25.1	36.5	97.4	58.7	1.3 (J)	
4/13/2021		36.9	94.3	59.3		
4/14/2021	8.5				1.4 (J)	4.4
10/12/2021			96.4	56.1		
10/14/2021	17.4	37.8			1.3 (J)	3.1
4/12/2022		22.1	155	146		
4/13/2022	12.7				1.4 (J)	
10/27/2022	11.6	30.3	153	169	1.1 (J)	
4/26/2023				48.4		
4/27/2023	12.3	36.6	104		1.3 (J)	
10/11/2023	11.8	19.9	139	43.6	1.4 (J)	
4/17/2024	11.5	26.8	165	51.5	1.4 (J)	

ND substitution: RL or RL/2 if <15% NDs.

Appendix B

Feasibility Study Water Quality Information

1370

FEASIBILITY STUDY
PROPOSED FLY ASH AND/OR SCRUBBER SLUDGE DISPOSAL FACILITY-COLUMBIA SITE

WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

Jan 78

C 7134

conceivable that groundwater flow in the area north of Murray Road may be altered such that contaminants derived from the present ash settling basin might be diverted southerly towards the homes along Murray Road. These questions would have to be addressed in greater detail, consistent with the goals of Wisconsin Power and Light Company.

WATER QUALITY

During the first two weeks of December, 1977, 64 water samples were obtained from surface waters and groundwater monitoring wells at the Columbia Energy Center. The purpose of the sampling was to assess background water quality in the vicinity of the proposed disposal site. The sampling stations included 59 monitoring wells, the cooling lake, ash settling pond, the drainage ditch carrying the ash pond discharge waters and the agricultural drainage ditch along the southern boundary of the site. Due to the large number of sampling stations, the analyses were limited to pH, specific conductance, iron, calcium, magnesium, sulfate and chloride. The analytical data is contained in Appendix F and is discussed below.

pH

Most groundwaters found in the United States have pH values ranging from around 6.0 to 8.5. The pH of a water represents the result of a number of interrelated chemical equilibria. This equilibria can be altered shortly after sampling by gains or losses of carbon dioxide, the oxidation of ferrous iron and numerous other chemical reactions. Thus, pH measurements must be taken shortly after obtaining the sample. For this study, the pH of samples was determined immediately upon return to the laboratory.

Within the proposed site boundaries at the Columbia Energy Center, pH values ranged between 6.3 and 8.1 and averaged 7.5. Typically, the lower pH values were observed in the lowland areas and wetlands, probably as a result of acidic organic soils. The pH of water in the ash disposal settling pond and the cooling lake was 11.4 and 8.3, respectively.

SPECIFIC CONDUCTANCE

Specific conductance, or conductivity, is the ability of a substance to conduct an electric current. The conductance determination is correlative with the dissolved-solids concentration. Conductivity, however, is temperature dependent and thus requires the reference of specific conductance measurements to a standard temperature. The values discussed here are referred to 25°C.

The specific conductance of groundwater in the study area ranged from 220 umhos/cm to a maximum of 2600 umhos/cm. The highest conductivity readings were observed in monitoring wells located along the coal storage area and the drainage ditch carrying the ash pond discharge where values up to 2600 umhos/cm were measured. The conductivity of the ash pond effluent was 1380 umhos/cm. This data appears to confirm earlier speculation of infiltration of effluent from the ash pond discharge channel and from the coal storage area into the groundwater. Conductance within the proposed site boundaries averaged approximately 465 umhos/cm.

Conductivity in the ash disposal settling pond was measured at 1510 umhos/cm. Shallow monitoring wells M-6 and 39A, located adjacent to the pond also exhibited elevated values of 1160 umhos/cm and 1800 umhos/cm, respectively.

High conductivities were also observed along U. S. Highway 51 at monitoring wells 51A and 51B. The chloride data, discussed below, indicates infiltration of road salt has probably occurred at this location.

Specific conductance measurements obtained in the vicinity of the proposed disposal site are shown on Drawing C 7134-15.

IRON

The element iron is an abundant element found in most rocks and soil. It generally occurs as sulfides and oxides in igneous and metamorphic rocks and as iron oxide and hydroxide cementing materials in coarse-grained sedimentary rocks.

Ferrous iron is unstable in the presence of oxygen where it is bound to hydroxide anions as $2Fe(OH)_3$.

$$2Fe^{++} + 4HCO_3^- + H_2O \rightleftharpoons 2Fe(OH)_3 + 4CO_2$$

If subjected to a strong reducing environment, such as a marsh, the reaction is reversed and iron goes back into solution. The amount which dissolves is related to a number of variables including the velocity with which water moves through this environment.

The U. S. Public Health Service recommends an iron concentration of less than 0.3 mg/l in water used for drinking and culinary purposes. Laundry and porcelain tend to be stained when concentrations reach 0.5 to 1.0 mg/l. At this level it can also be tasted.

The presence of iron under the proposed disposal area in the majority of cases was below the detection limit of 0.1 mg/l. In monitoring wells 5 and 18, located in or near the central marsh area, iron increased to 10 mg/l and 5.7 mg/l, respectively. In the southern marsh, monitoring wells exhibited concentrations between 0.5 mg/l and 6.1 mg/l. Although the iron concentration in the cooling lake was below the detection limit, downgradient wells 44 and 30A located on the cooling lake dike yielded values of 11 mg/l and 26 mg/l iron respectively. Boring logs indicated trace amounts of organic material at the base of the dike which is probably the reason for the high concentrations observed. At the same location, iron in well 30B installed to a depth of 100 feet below the surface was below 0.1 mg/l. Thus, the occurrence of high iron concentrations in this area appears restricted to groundwater in the upper portion of the aquifer where organic material is present and conditions are favorable for the dissolution of iron.

The ash pond discharge in the drainage ditch paralleling the west site boundary showed an iron concentration of 3.7 mg/l. Shallow monitoring wells 33A and 34A adjacent to the ditch indicated less than 0.1 mg/l iron.

North of Murray Road the iron concentration in monitoring wells in the marsh and uplands were typically less than 0.1 mg/l. Although the ash basin had less than 0.1 mg/l iron, several wells along cross-section F-F' showed anomalously high values (#M6-2.3 mg/l; #47-16 mg/l; #51B-21 mg/l).

CALCIUM

Calcium, because of its relative abundance and mobility, is the principle cation in most natural fresh water. Calcium is a constituent of many rock types but is found in greatest quantities in waters leaching deposits of limestone and dolomite. In sandstone and other detrital rock, calcium carbonate is a common cement between grains.

Monitoring wells located within the site boundaries exhibited calcium concentrations between 30 mg/l and 66 mg/l and averaged about 42 mg/l. Similar to iron, the concentrations of calcium in monitoring wells along cross-section F-F' were anomalously high, up to 150 mg/l calcium. Water table wells along the drainage ditch carrying the ash pond discharge averaged 83 mg/l while the ash pond effluent contained 28 mg/l. Generally the amount of calcium in groundwater decreased with depth. Nested monitoring wells typically showed somewhat lower concentrations of calcium in the deeper wells.

MAGNESIUM

As a relatively abundant element on the earth's crust, the principle sources of magnesium in natural waters are considered to be ferromagnesian minerals in igneous rocks and magnesium carbonate in carbonate rocks (limestone and dolomite). Waters in which magnesium is the predominant cation are somewhat unusual. Like calcium, magnesium imparts the property of hardness to water and is, therefore, of concern to industrial users.

Generally, concentrations of magnesium were 1/3 to 1/2 of the calcium levels. Magnesium concentrations within the site boundaries ranged between 10 mg/l and 36 mg/l and averaged 27 mg/l. Similar to calcium and iron, higher magnesium values were observed, in general, north of Murray Road and especially in monitoring wells along cross-section F-F'.

SULFATE

Sulphur is widely distributed in reduced form in both igneous and sedimentary rocks as metallic sulfides and when present in sufficient concentrations, constitutes ore of economic importance. During weathering processes with aerated water, the sulfides are oxidized to sulfate ions and are dissolved into water. Pyrite (FeS_2) crystals often occur in sedimentary rocks and are particularly associated with biogenic deposits such as coal which were deposited under strongly reducing conditions.

The concentrations of sulfate in groundwater in the vicinity of the proposed disposal site ranged from less than 1 mg./l to 1,200 mg./l of sulfate. (Refer to Drawing C 7134-15.) Typically, within the site boundaries concentrations averaged approximately 12 mg./l. Near the coal storage area, however, significant increases were observed. Observation wells 26A, 26B, and 42 exhibited concentrations between 900 and 1100 mg./l. The depth of sulfate enrichment in groundwater, near the coal pile, appears to extend to considerable depths, indicated by relatively high sulfate concentrations in Well 26B sealed 100 feet below ground surface. The oxidation of pyrite minerals in the coal leaching into the groundwater is probably the major source of the high concentrations observed.

Sulfate concentrations in the ash disposal settling pond were 520 mg./l. In the ditch carrying the ash pond discharge, the effluent is treated with sulfuric acid which results in precipitation of barium sulfate and aluminum hydroxide (personal communication, Merlin Horn, 1978). Consequently, the sulfate concentration of the effluent waters is lowered considerably to 13 mg./l. Well 33A, however, located near the point of effluent discharge, exhibited 1200 mg./l sulfates.

CHLORIDE

Chloride is generally present in much lower concentrations in rocks than many of the other major constituents of natural water. Important sources, however, are associated with sedimentary rocks, particularly the evaporites. The chemical behavior of chloride in natural water is relatively inert compared to the other major ions. There are few oxidation-reduction reactions and no significant chemical complexing reactions which chloride enters into. In addition, chloride ions are not significantly adsorbed on mineral surfaces. For these reasons, chloride is commonly used as a tracer in groundwater.

Chloride concentrations in groundwater in the vicinity of the Columbia Energy Center typically range between 0.5 mg./l and 30 mg./l. The highest concentrations in monitoring wells tended to be located adjacent to U. S. Highway 51 where the use of road salt has resulted in the percolation of chloride into the groundwater. Monitoring Wells 51A and 51B located in a low area north of Murray Road along U. S. Highway 51, yielded chloride concentrations in excess of 200 mg./l. Two other wells, 52A and 19, also located along U. S. Highway 51, yielded values of 30 mg./l and 42.5 mg./l chloride, respectively.

Within the proposed site boundaries, the chloride concentration averaged 7.1 mg./l. Excluding the few wells adjacent to U. S. Highway 51 exhibiting elevated concentrations, no other significant trends in the occurrence of chloride were observed.

SUMMARY

In summary, the groundwater in the vicinity of the proposed disposal site exhibited a somewhat alkaline pH. In lowland areas, the pH was typically below 7.0, probably a result of the presence of acidic organic soils.

Specific conductance within the proposed site averaged 465 umhos/cm. Conductivities up to 2600 umhos/cm were observed, however, in the vicinity of the coal storage area, the present ash disposal pond and ash pond effluent channel where infilatration of water from these sources is occurring into the groundwater system.

The groundwater typically exhibted relatively low iron concentrations although, locally, concentrations in excess of drinking water standards were observed in about 20% of the wells. The occurrence of the higher iron concentrations appears to be related to the presence of organic soils.

Groundwater at the proposed site also tended to exhibit high calculated hardness (216 mg./l) based on average observed values for calcium (42 mg./l) and magnesium (27 mg./l). Dissolution of limestone and dolomite rocks in the glacial drift are the probable sources of these elements in the groundwater.

Enrichment of sulfate in groundwater has occurred as a result of leaching of pyrite (FeS_2) minerals from the coal storage area where concentrations up to 1200 mg./l were observed. The depth of this enrichment appears to extend beyond the maximum depth into the aquifer investigated. Sulfate concentrations decreased rapidly away from the coal storage area to an average of 12 mg./l within the proposed site boundaries. Other local sources of sulfate in groundwater appear to be related to the present ash settling pond.

The concentration of chloride within the proposed site averaged 7.1 mg./l. Higher levels were generally observed in wells adjacent to U. S. Highway 51 where the infiltration of road salt has locally raised chloride concentrations.

The above interpretations are based on one round of water quality sampling only and should be considered as preliminary in nature. High sulfate and chloride concentrations observed at greater depths may be a temporary condition resulting from contamination of spoil backfill materials with coal dust or salt, respectively, during installation of the monitoring well. Future sampling of these monitoring wells will help to distinguish short term contamination from actual conditions existing in the aquifer.

APPENDIX F
WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
1A	7.6	550	17.	6.5	52	37	<0.1
1B	8.05	460	16.	10.5	39	31	<0.1
2	7.8	527	14.	2.5	45	32	<0.1
3A	7.5	548	13.	2.5	58	36	<0.1
3B	8.1	506	14.	7.0	50	34	<0.1
4	7.8	580	10.	4.0	59	34	<0.1
5	6.3	560	210.	12.5	13	29	10
16	7.6	408	12.	1.5	42	28	<0.1
17	6.45	350	30.	16.5	16	13	0.6
18	6.45	380	4.	4.5	33	22	5.7
19	7.9	570	10.	42.5	44	24	<0.1
20	8.0	340	10.	5.0	36	24	<0.1
21	6.9	220	20.	4.5	23	10	0.1
24A	7.45	775	18.	6.0	76	52	0.1
24B	7.85	440	15.	6.0	43	31	0.1
25	8.1	300	10.	2.5	29	20	<0.1
26A	7.2	2100	900	17.0	140	48	1.5
26B	7.5	2600	1100	16.5	43	7.0	0.2
27	7.15	400	6.	8.0	23	18	<0.1
28A	7.75	500	3.	0.5	48	31	<0.1
28B	7.6	480	4.	3.5	39	28	<0.1
29A	7.8	330	16.	1.5	33	21	0.5
30A	6.75	920	64.	11.0	38	30	26
30B	7.6	770	210	21.0	37	19	<0.1
33A	8.2	2500	1200	24.0	83	50	<0.1
33B	7.9	390	22.	6.5	31	27	0.2
34A	7.7	680	140.	10.0	58	45	0.1
34B	7.7	1700	660	15.0	48	22	<0.1
35	6.8	740	<1.0	4.0	66	33	2.9
36	6.8	740	<1.0	3.5	53	35	6.1
37A	7.7	460	9.	4.0	48	31	0.8
37B	7.5	630	73.	7.5	71	35	<0.1
39A	7.5	1800	350	22.0	180	100	0.1
39B	7.9	330	560	20.5	31	22	0.1
40A	8.0	630	140	8.5	43	29	<0.1
40B	8.1	330	17.	3.0	31	22	<0.1
41	6.8	590	16.	11.0	58	27	9.3

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)
42	7.4	2400	900	17.5	50	12	0.5
44	6.9	490	<1.	16.5	39	23	11
45	7.6	390	14.	3.0	40	25	<0.1
46A	7.3	1100	21.	15.5	140	82	<0.1
46B	7.8	470	25.	17.5	40	26	<0.1
47	6.6	1200	3.	8.0	140	40	16
48A	7.3	620	15.	8.0	62	37	<0.1
48B	7.1	520	22.	20.0	43	29	0.2
49	7.15	730	6.	3.5	75	41	<0.1
50A	7.6	520	28.	15.5	51	34	<0.1
50B	7.5	410	21.	18.0	31	21	<0.1
51A	6.1	1850	8.	205.	65	40	<0.1
51B	7.2	1250	23.	275.	57	36	21
52A	7.7	450	16.	30.5	36	17	<0.1
52B	7.4	430	40.	17.5	32	20	<0.1
53	7.75	450	27.	10.5	39	28	<0.1
54A	7.8	350	12.	4.0	34	21	0.1
54B	7.55	390	15.	5.5	40	24	0.1
55B	7.9	340	23.	17.5	32	22	0.1
56	7.8	450	22.	9.5	43	28	0.1
57	7.85	380	17.	7.0	38	24	0.1
M-6	7.0	1160	5.	7.0	150	91	2.3
Cooling Lake	8.3	370	31.	18.0	34	21	<0.1
Ash Pond Effluent	7.45	1380	13.	4.0	28	1.2	3.7
Ash Pond	11.4	1510	520.	23.5	29	0.2	<0.1
Drainage Ditch (A)	7.8	500	21.	7.0	43	29	<0.1
Drainage Ditch (B)	9.05	1780	750	14.0	42	5.4	<0.1

DEC 19 1979

APPENDICES TO

SUPPLEMENTARY FEASIBILITY STUDY REPORT
AND PRELIMINARY ENGINEERING CONCEPTS
COLUMBIA SITE
WISCONSIN POWER AND LIGHT COMPANY
TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

D. N. R. APPROVED
DATE 9/3/80
Nile Ostenso, Hydro

WARZYN
ENGINEERING INC

APPENDIX I

WATER QUALITY DATA - DECEMBER 1978

12/76

C 7134

WATER QUALITY DATA

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25^{o}C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
1A	7.3	530	30	3.1	54	35	<0.1	-
1B	7.0	470	67	6.1	49	30	<0.1	-
2	7.25	458	91	<.5	48	24	<0.1	-
3A	7.0	560	36	<.5	61	31	<0.1	-
3B	7.15	530	52	35.7	37	33	<0.1	-
4	7.2	750	69	5.8	49	30	<0.1	-
5 [illegible]	6.35	1,650	670	14.1	14	13	<0.1	-
16	6.9	390	69	1.0	49	23	1.7	-
17	5.55	295	57	16.3	14	8.6	<0.1	-
18	5.9	430	10	4.2	47	21	0.2	-
19	7.4	765	75	4.2	51	28	1.1	-
20	7.4	380	26	1.6	39	26	<0.1	-
21	5.7	250	54	10.4	15	8.3	<0.1	-
24A	7.2	730	36	1.6	65	42	0.2	-
24B	7.2	470	10	7.3	42	28	<0.1	-
25	7.0	335	29	7.8	39	21	<0.1	-
26A [illegible]	7.4	2,250	650	12.6	32	8.6	0.2	-
26B	6.8	2,530	840	20.8	49	18	<0.1	-
27	6.9	410	24	4.2	40	24	<0.1	-
28A	7.2	500	61	0.5	45	28	0.4	-
28B	7.0	465	6	2.1	39	26	<0.1	-
29A	7.1	410	24	3.6	31	22	0.1	-
30A near ditch	5.8	1,140	15	<0.5	97	56	0.1	-
30B in [illegible]	6.65	835	160	14.6	37	20	38	-
33A near ditch	7.8	1,970	830	16.7	21	8.9	<0.1	-
33B [illegible]	7.5	380	31	7.3	24	27	<0.1	-
34A near ditch	7.25	560	46	4.2	53	33	<0.1	-
34B [illegible]	8.5	1,575	730	21.9	28	29	<0.1	-
35	6.7	545	61	3.6	60	26	0.1	-
36	6.4	515	5.0	2.6	43	24	1.0	-
37A	7.05	438	30	3.7	50	28	4.8	-
37B	6.7	325	18	7.3	1.0	0.5	<0.1	-
39A	6.35	1,260	33	13.6	70	7.6	<0.1	-
39B	6.7	385	25	4.2	30	21	0.1	-
40A [illegible]	7.35	483	40	<0.5	48	24	<0.1	<.05
40B	7.25	343	4	4.2	21	14	<0.1	-
41	6.1	640	54	19.8	43	32	<0.1	-

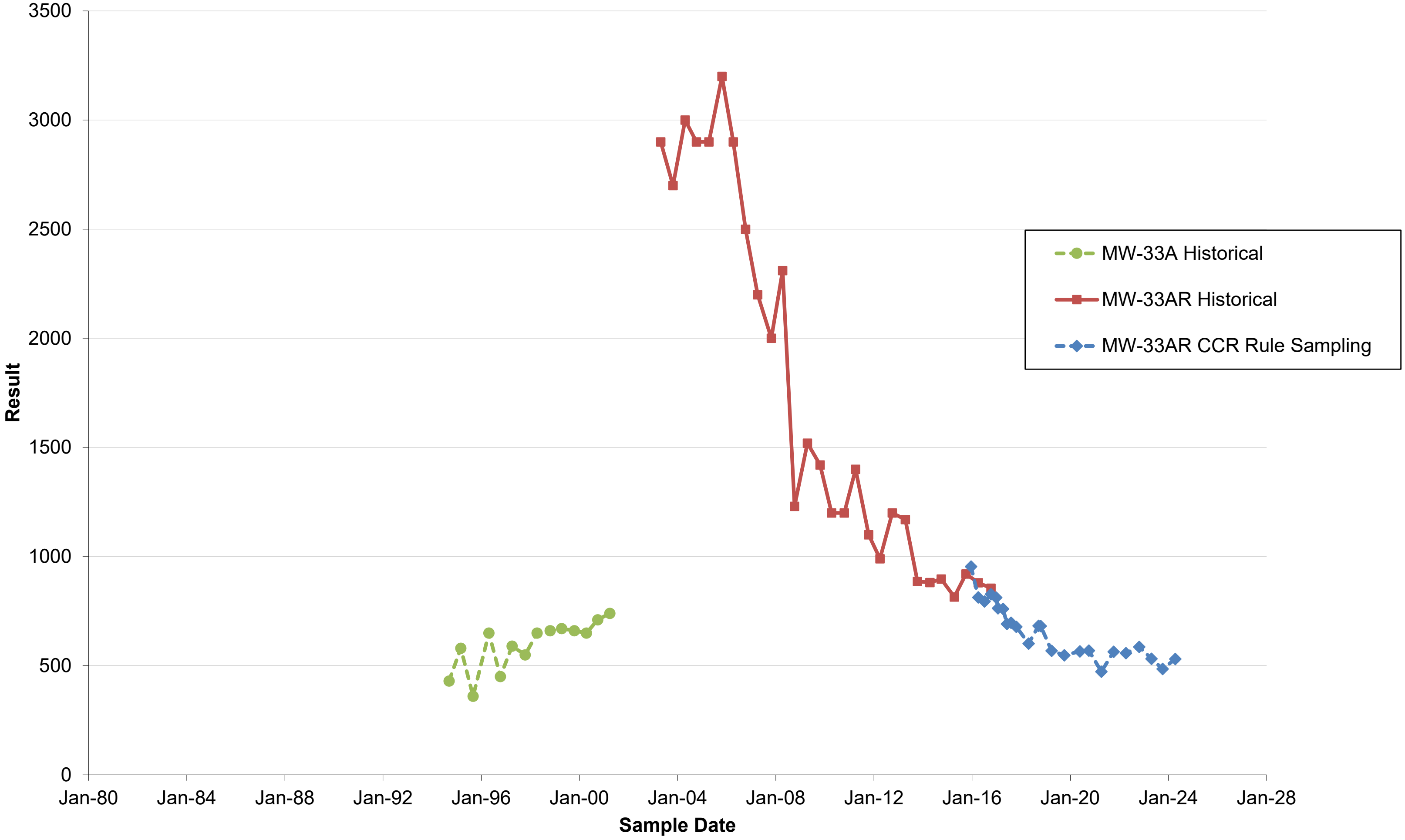
WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
42 near ditch [illegible]	7.15	2,050	910	15.6	23	7.5	0.1	-
44 near Cooling Lake	6.15	710	6	0.5	56	27	3.5	-
45	7.2	420	32	1.0	44	26	<0.1	-
46A [illegible]	7.0	560	93	<0.5	130	75	<0.1	<0.05
46B [illegible]	6.5	1,290	170	20.8	46	30	<0.1	<0.05
47 [illegible]	7.3	958	120	<0.5	110	48	<0.1	-
48A [illegible]	6.15	640	59	<0.5	42	51	<0.1	<0.05
48B [illegible]	6.8	450	23	5.2	40	27	<0.1	<0.05
49	7.0	880	26	2.1	93	58	0.1	-
50A	7.4	660	25	17.7	60	36	<0.1	-
50B	7.1	405	16	17.7	38	23	<0.1	-
51A [illegible]	7.0	1,170	57	135	66	31	<0.1	-
51B [illegible]	7.3	1,410	22	330	46	39	<0.1	-
52A	7.0	370	110	18.5	35	10	<0.1	-
52B	7.0	595	43	52.5			0.1	-
53	Frozen							
54A	7.5	345	10	1.0	36	22	<0.1	<0.05
54B	Frozen							
55B	7.3	505	26	15.6	52	29	<0.1	<0.05
56	Frozen							
57	Frozen							
M-6								
58 [illegible] old	6.55	1,265	140	<0.5	110	65	0.1	-
59 [illegible]	6.8	925	40	<0.5	86	60	<0.1	-
60 Hwy [illegible]	7.2	1,510	54	4.7	130	85	<0.1	-
61A [illegible]	6.85	590	39	30.2	58	31	<0.1	-
61B	7.2	505	6	13.5	48	29	<0.1	-
62 Diesel Hwy/[illegible]	6.7	1,517	72	178	120	53	<0.1	-
64	6.9	670	100	26.8	63	36	0.8	-
65 Hwy?	7.2	830	57	17.8	78	50	<0.1	-
66	6.5	680	55	40	66	24	3.6	-

WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
67	7.0	560	100	1.0	57	32	1.0	-
68A	7.6	440	32	2.1	40	27	<0.1	-
68B	7.2	400	36	1.0	42	25	<0.1	-
70A Martin Marietta	7.5	440	20	<0.5	27	37	<0.1	-
70B	7.3	520	25	5.2	51	34	<0.1	-
72A Martin Marietta	6.45	860	11	<0.5	100	41	1.8	-
72B	8.4	230	45	<0.5	17	19	<0.1	-
M-4	7.6	864	180	26.1	20	11	<0.1	0.39
MM-4			2	2.6	14	21	0.9	-
Cooling Lake at 1	7.7	355	36	13.6	31	21.2	<0.1	-
Ash Pond at 2	11.4	3,210	1,100	22.9	34	<0.1	<0.1	-
Ash Pond at 3	8.7	725	34	21.9	48	16	<0.1	-
Ash Pond Effluent at 4	6.7	3,090	1,400	25.0	39	0.4	<0.1	-
Drainage Ditch at 5	7.2	730	74	33.9	56	38	<0.1	-
Drainage Ditch at 6	7.35	2,750	640	18.8	34	7.5	<0.1	-
Drainage Ditch at 7	8.05	1,780	740	27.1	31	0.2	<0.1	-

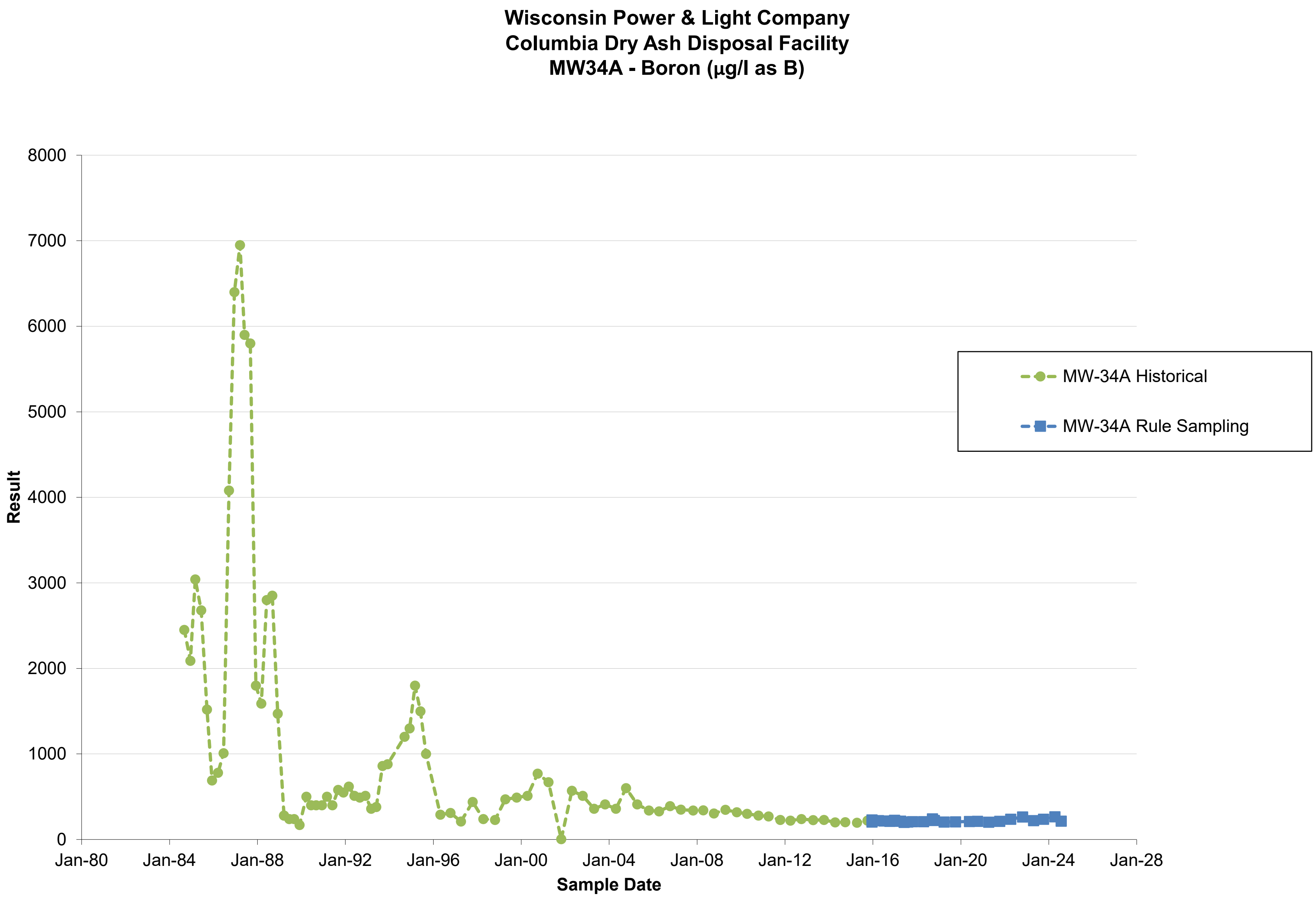
Appendix C

Long-Term Concentration Trend Plots

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33A and MW-33AR - Boron (µg/l as B)

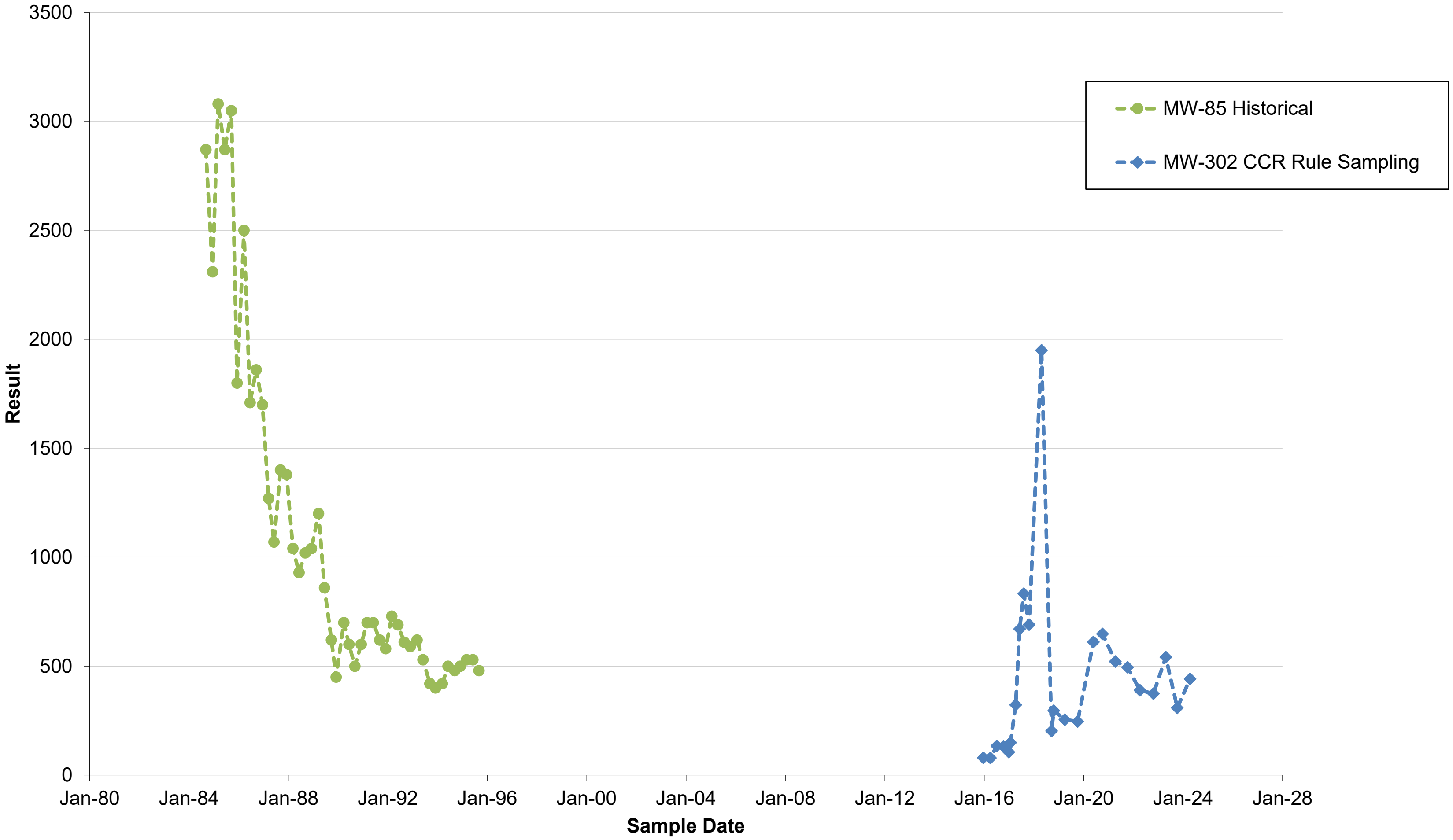


I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\Graphs_do not print\[Bo_COL Dry.xlsx]MW-33AR



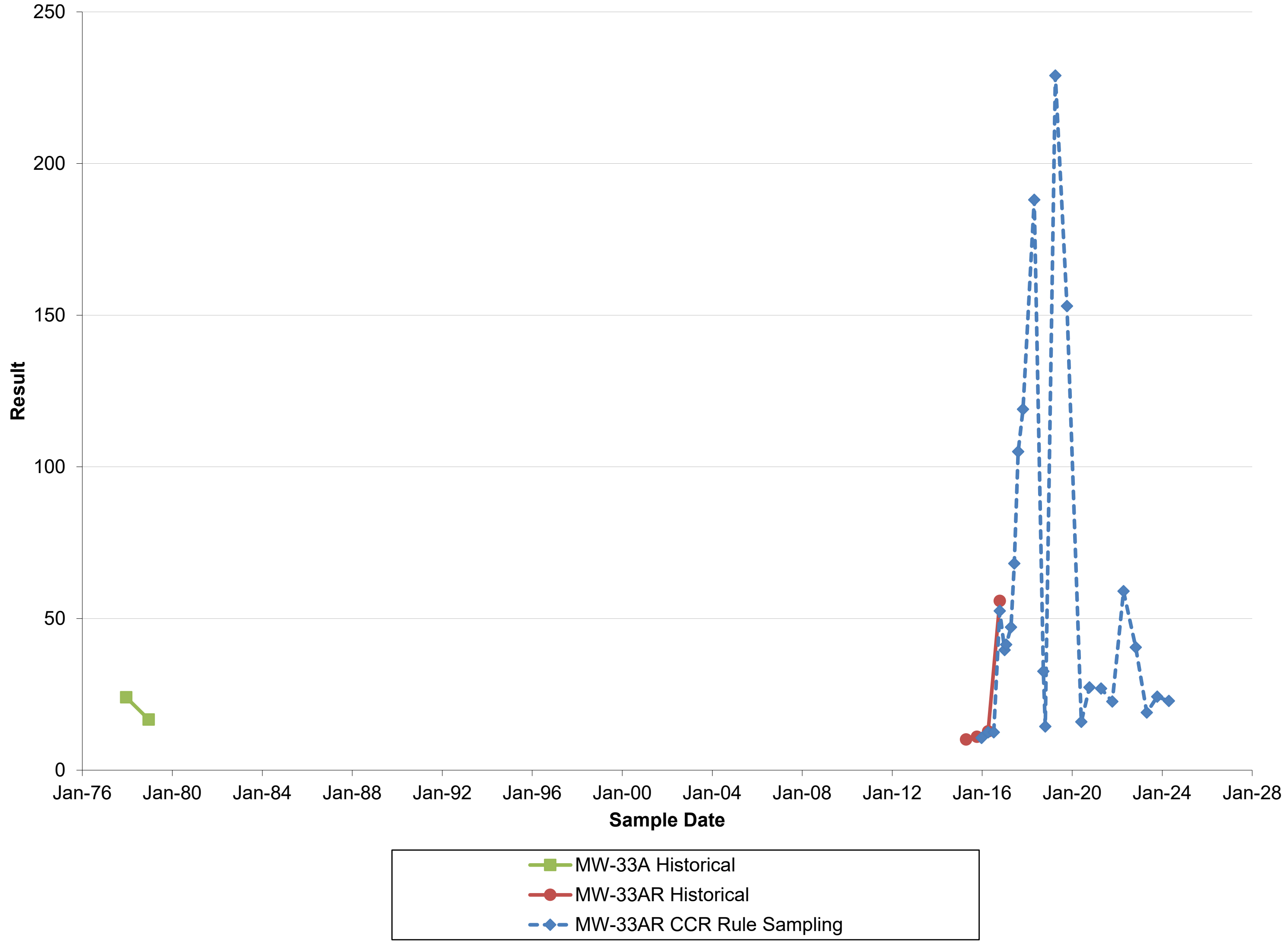
I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\Graphs_do not print\[Bo_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-302 and MW-85 - Boron (µg/l as B)



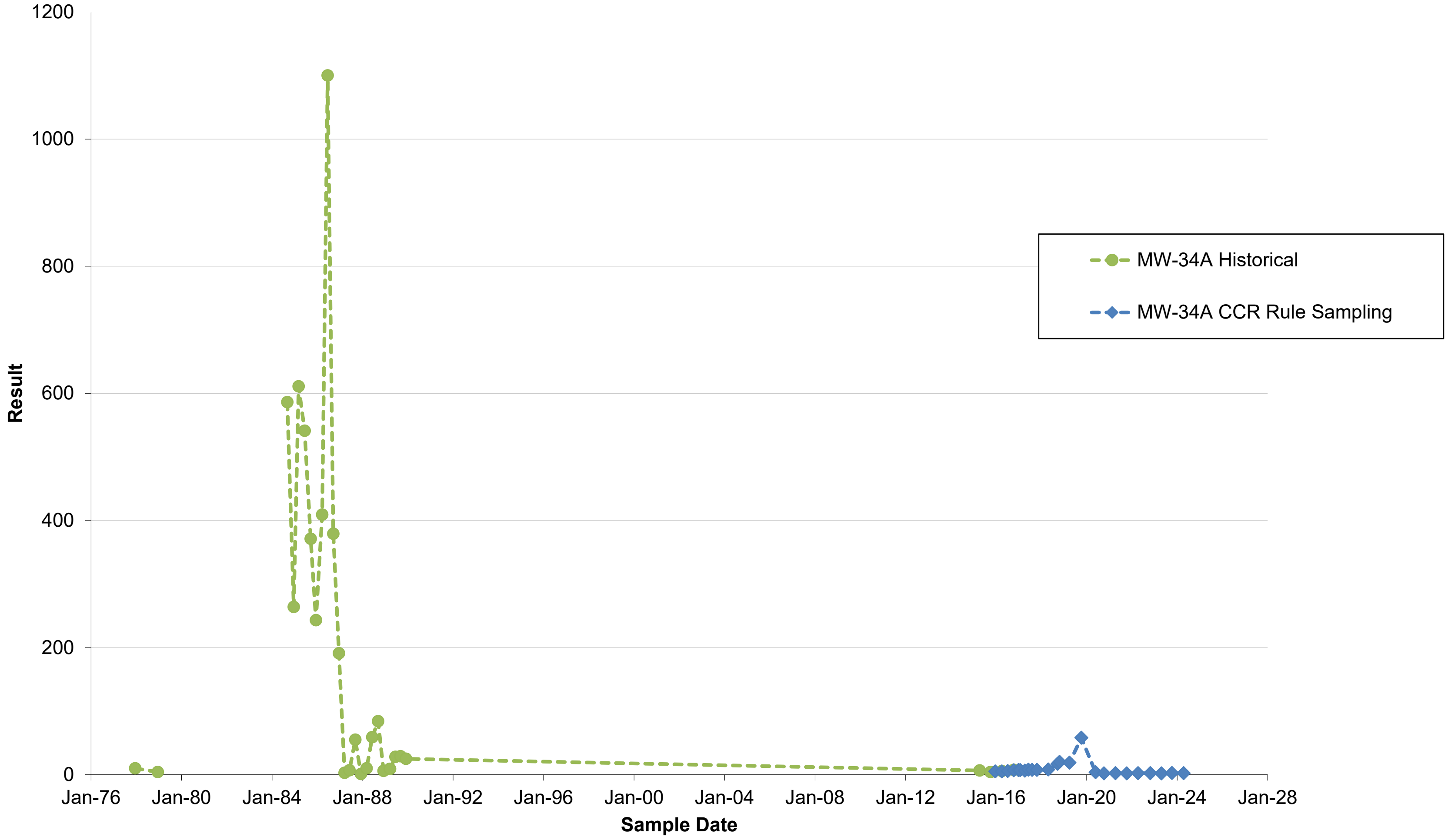
I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\Graphs_do not print\[Bo_COL Dry.xlsx]MW-85_MW-302

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Chloride (mg/l as Cl)



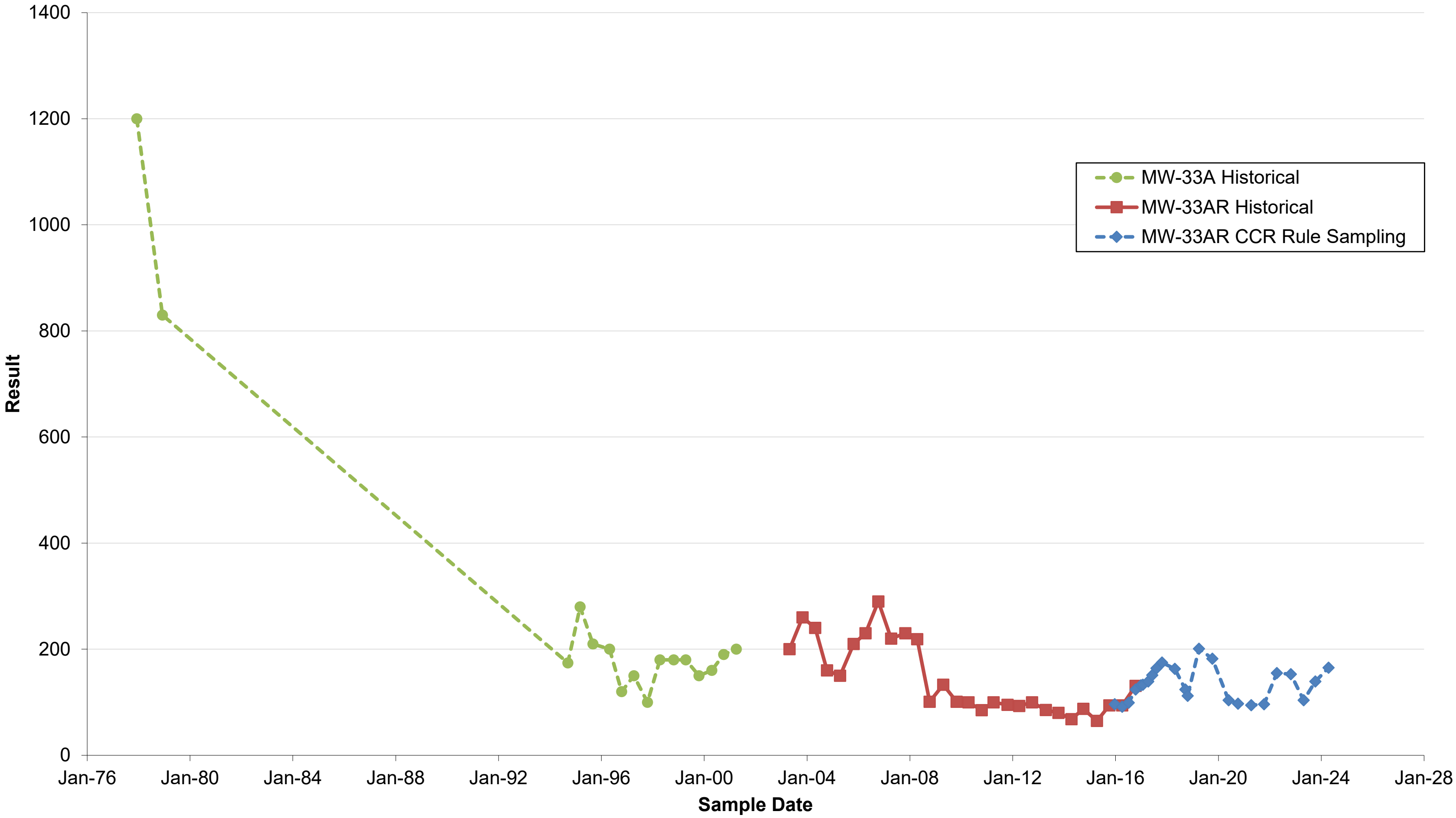
I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\Graphs_do not print\[Cl_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Chloride (mg/l as Cl)

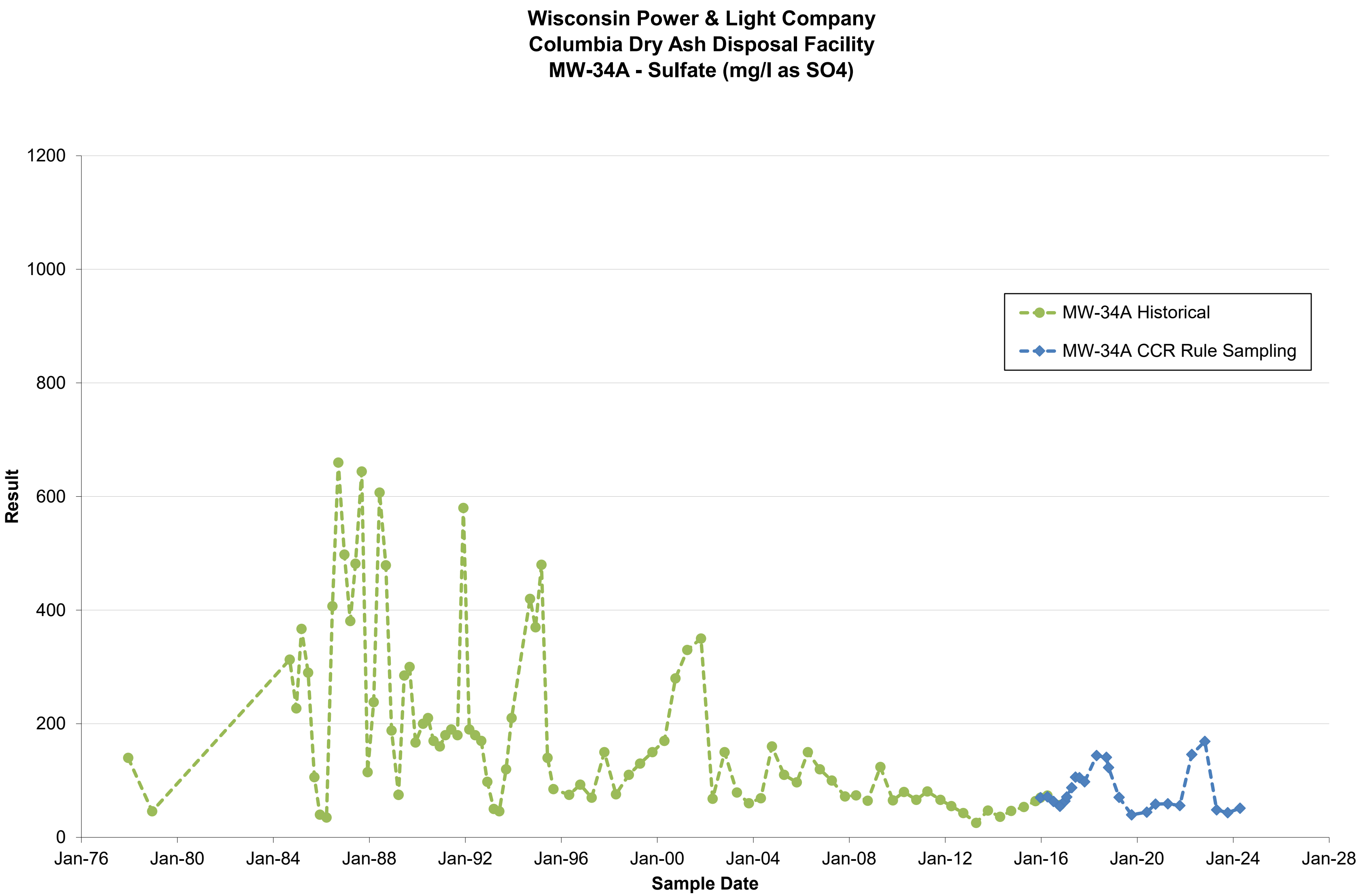


I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\Graphs_do not print\[Cl_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Sulfate (mg/l as SO4)

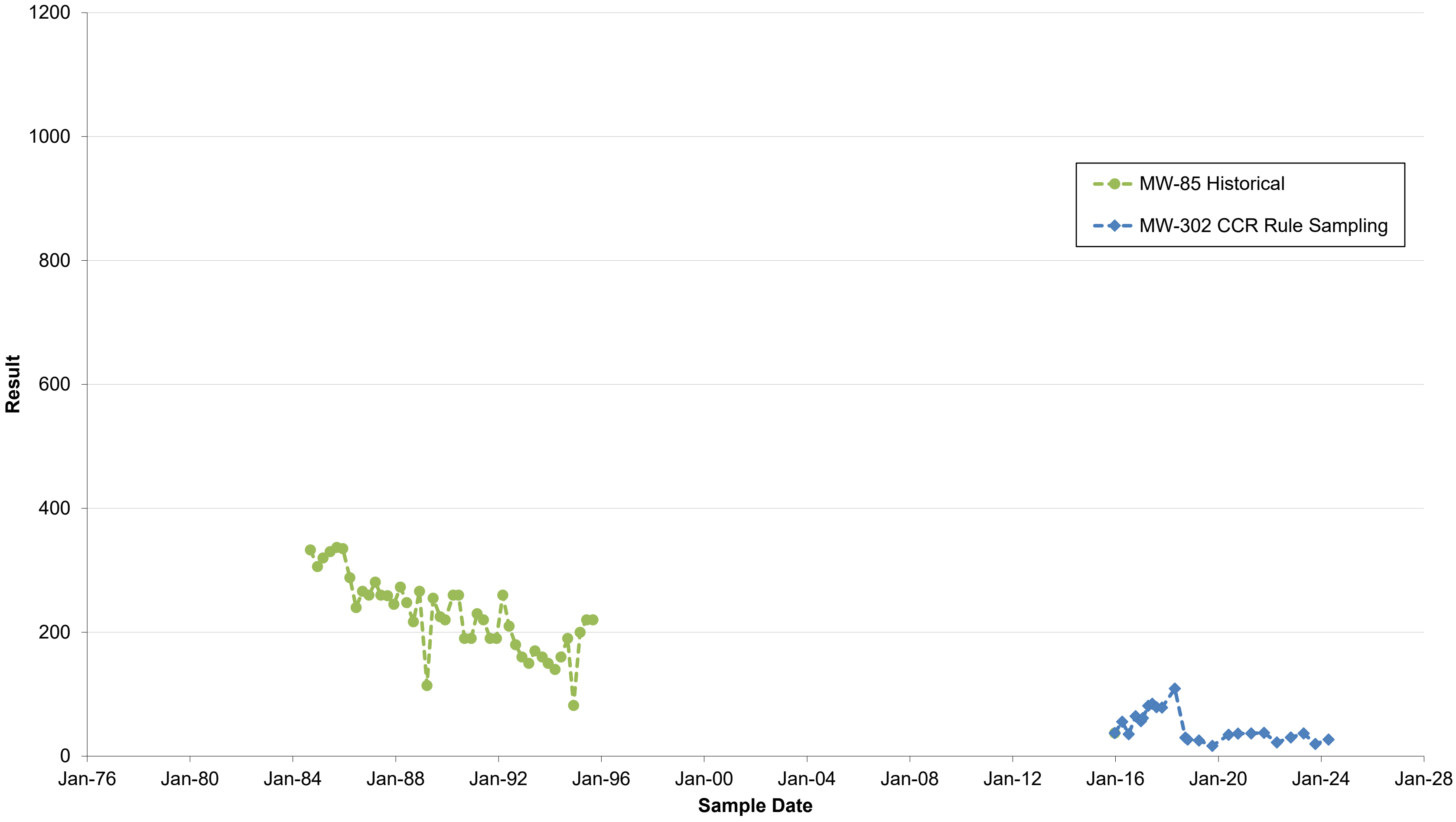


I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\Graphs_do not print\[SO4_COL Dry.xlsx]MW-33AR CCR



I:\25224067.00\Deliverables\2024 April COL Mod 1-3 ASD\Graphs_do not print\[SO4_COL Dry.xlsx]MW-34A CCR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-85 and MW-302 - Sulfate (mg/l as SO4)



Appendix D

Historical Groundwater Flow Maps

LEGEND

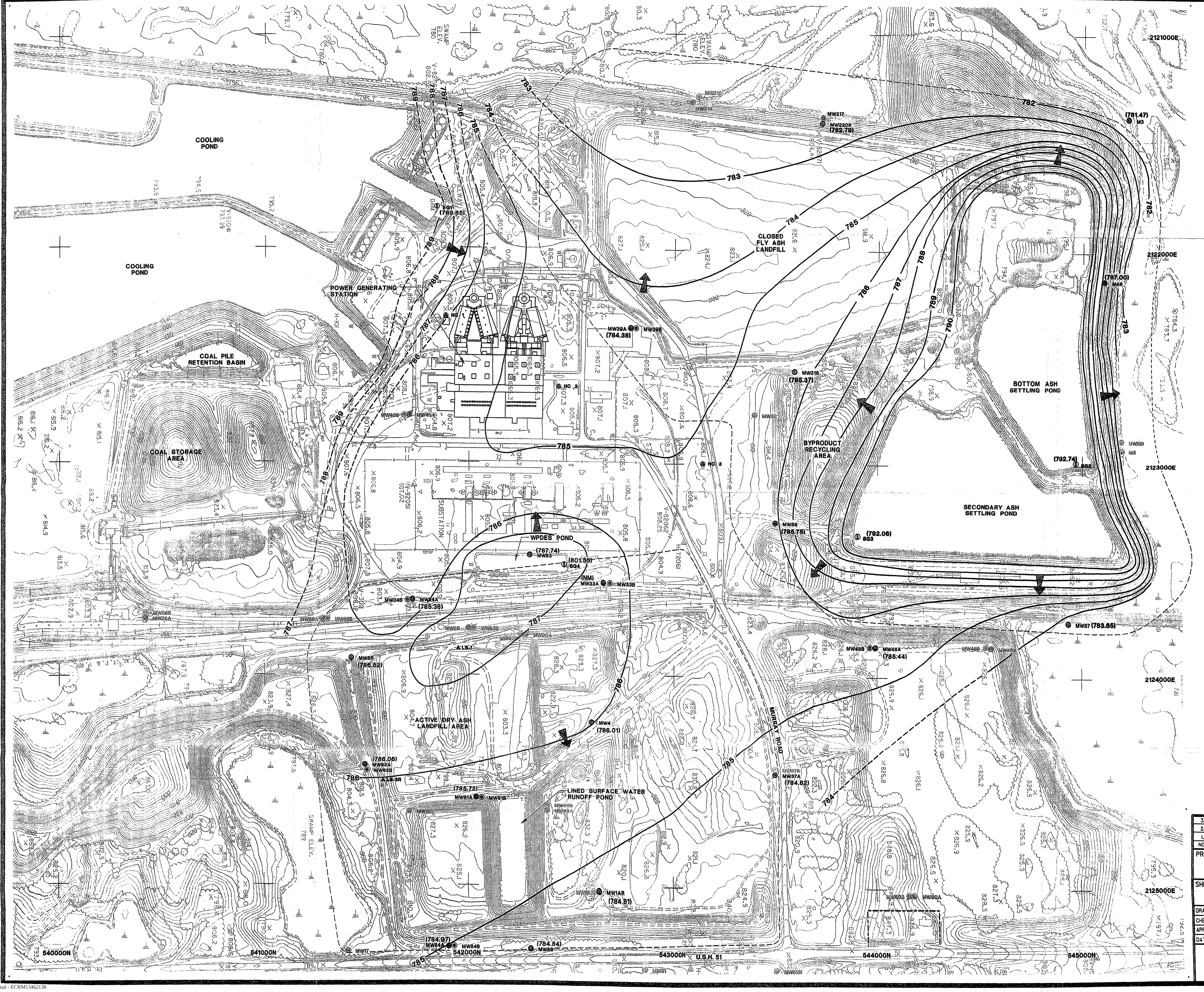
········	PROPOSED PROJECT AREA
✚ 63 720.29	OBSERVATION WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION
✚	BORING LOCATION AND NUMBER
ᛘ	WETLANDS
—	TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL: 20 FT.)
■	PRIVATE RESIDENCES (ASSUMED LOCATIONS OF PRIVATE WATER SUPPLY WELLS)
▨	COMMERCIAL BUILDINGS (ASSUMED LOCATIONS OF POSSIBLE PUBLIC WATER SUPPLY WELLS)
—→—	SURFACE WATERS (STREAMS OR DRAINAGE DITCHES) ARROWS INDICATE DIRECTION OF FLOW
□	OTHER BUILDINGS (GARAGES, BARNS, ETC.)
✚	HIGH CAPACITY WELLS
—790—	WATER TABLE CONTOURS (CONTOUR INTERVAL: 1 FT.)
➡	DIRECTION OF GROUNDWATER FLOW

NO	BY	DATE	REVISION	APP'D

WATER TABLE CONTOUR MAP 2/4/81

PLAN OF OPERATION – ASH DISPOSAL FACILITY
COLUMBIA SITE
WISCONSIN POWER & LIGHT COMPANY
PART OF SECTIONS 27 & 34, T12N, R9E
TOWN OF PACIFIC COLUMBIA CO. WISCONSIN

WARZYN ENGINEERING INC	DRAWN TDH	SCALE 1"=300'	SHEET 39 OF 39
	CHECKED RJK	DATE 2/10/81	DRAWING NO. C7134-94
	APPROVED		
	REFERENCE		PRINTED 8/3/88



LEGEND

- PROPERTY LINE
- EXISTING RAILROAD TRACKS
- EXISTING GROUND CONTOUR
- CONTOUR DEPRESSION
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING FENCE
- EXISTING BUILDING
- EXISTING SPOT ELEVATION
- TREES AND/OR BRUSH
- WETLAND AREA
- EDGE OF WATER
- HC 1 WATER SUPPLY WELL
- MW91A WATER TABLE WELL
- MW91B PIEZOMETER
- ABANDONED WATER TABLE WELL
- ABANDONED PIEZOMETER
- SG1 STAFF GAUGE
- LS-1 LYSIMETER
- DESIGN MANAGEMENT ZONE
- PROPERTY LINE
- O.S. OPEN STORAGE
- O.H. OVERHEAD STRUCTURE
- E.P.S. ELECTRICAL POWER STATION
- T TANK
- W WALL
- (785.31) WATER TABLE ELEVATION (FT-MSL) (N.M. = NOT MEASURED)
- 786 GROUNDWATER CONTOUR LINE (1FT INTERVAL- FT. M.S.L.) (DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IS PROVIDED BY WISCONSIN POWER & LIGHT CO. AND IS BASED ON PHOTOS TAKEN ON APRIL 6, 1995 BY AERO-METRIC ENGINEERING, SHEBOYGAN, WI.
2. HORIZONTAL DATUM IS BASED ON THE WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE - DATUM: NAD 83(91).
3. VERTICAL DATUM IS REFERENCED TO U.S.G.S. MEAN SEA LEVEL (MSL). TOPOGRAPHIC CONTOUR INTERVAL IS TWO FEET.
4. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER & LIGHT CO. IN DECEMBER 1994 & NOVEMBER 1996.
5. THE LOCATION OF THE DESIGN MANAGEMENT ZONE DEMARCATION LINE IS APPROXIMATE.
6. WATER ELEVATION USED TO PREPARE THIS MAP WERE MEASURED ON OCTOBER 24, 2002.
7. THE WATER LEVEL AT MW 33A AND MW 33B COULD NOT BE MEASURED DURING OCTOBER 2002 DUE TO AN OBSTRUCTION IN THE WELL CASING.

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT:
ALLIANT ENERGY - WP&L
COLUMBIA ASH PONDS & DRY ASH
DISPOSAL FACILITY

SHEET TITLE:
WATER TABLE MAP
(OCTOBER 2002)

DRAWN BY: defoej	SCALE: 1"=200'	PROJ. NO. 3024.28
CHECKED BY: JMR		FILE NO. WATERTBL.PLT
APPROVED BY: JCO	DATE PRINTED:	FIGURE 3
DATE: JANUARY 2003		

RMT

744 Heartland Trail
Madison, WI 53717-1934

P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

Appendix F

Updated UPL Memorandum

SCS ENGINEERS Environmental Consultants & Contractors

August 27, 2024
File No. 25224067.00

TECHNICAL MEMORANDUM

SUBJECT: Statistical Evaluation of Groundwater Monitoring Results
Columbia Dry Ash Disposal Facility Modules 1-3 Landfill

PREPARED BY: Ryan Matzuk

CHECKED BY: Sherren Clark

This memorandum and the attachments provide an update to the upper prediction limits (UPLs) calculated for the groundwater monitoring system at the Columbia (COL) Dry Ash Disposal Facility Modules 1 to 3 coal combustion residual (CCR) Unit. As part of the evaluation of the April 2024 monitoring results, the background data set for the UPL calculations is being updated to include data from the background wells collected through October 2023. The previous update was completed in January 2020 and included data from the background wells collected through October 2019. This memo addresses updated UPLs for Appendix III parameters.

STATISTICAL METHOD

Groundwater monitoring data for the COL Dry Ash Disposal Facility Modules 1 to 3 CCR Unit is evaluated in accordance with 40 CFR 257.93(f)(3), using a prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the UPL.

The statistical analysis is performed using commercially available software (*Sanitas for Groundwater*© or similar) in general accordance with the U.S. Environmental Protection Agency's (U.S. EPA's) *Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* dated March 2009 (Unified Guidance) (U.S. EPA, 2009) and generally accepted procedures. For the prediction interval evaluation, interwell testing was selected based on the considerations outlined in Chapter 6 of the Unified Guidance. The statistical program used to calculate the interwell prediction interval evaluation is Sanitas™ (v.10.0.15).

Under the interwell approach, detection monitoring results are compared to UPLs calculated based on background monitoring results from the two background wells: MW-84A and MW-301. The background wells are shared with other CCR units at COL. Compliance wells for Modules 1 to 3 include MW-33AR, MW-34A, and MW-302.

Nine rounds of background monitoring were performed prior to the initiation of compliance monitoring, from December 2015 through August 2017. Since then, additional rounds of monitoring for Appendix III parameters have been performed at the background wells. As part of the 2024 statistical update for detection monitoring parameter UPLs, the background data set for the UPL calculations is being updated to include data from the background wells collected through October 2023.

TIME SERIES PLOTS

Time series plots were prepared for the required detection monitoring parameters to show the concentration variations over time, and are included in **Attachment A**. The time series plots include the three compliance wells and two background wells for Mod 1 to 3.

OUTLIER ANALYSIS

For the interwell evaluation, an outlier analysis was performed for the background monitoring results at each of the two background wells. A statistical outlier is a value that is extremely different from the other values in the data set. The Sanitas outlier tests identify data points that do not appear to fit the distribution of the rest of the data set and determine if they differ significantly from the rest of the data. The outlier analysis performed in Sanitas includes the following steps:

1) Run normality test (Shapiro Wilk):
    a) If not normal, transform to natural log and test for lognormal distribution.

2) If normally or lognormally distributed, run U.S. EPA's 1989 Outlier Test to identify suspected outliers:
    a) If number of background samples is less than or equal to 25, run Dixon's test for suspected outliers.
    b) If number of background samples is more than 25, run Rosner's test for suspected outliers.

3) If not normally distributed, run Tukey's test for outliers.

4) Review data flagged as possible outliers to evaluate whether they should be removed from the background data set. Also review time series plots for possible outliers that were not picked up in the statistical evaluation (e.g., outlier test may not identify outliers when two values are similar to each other, but very different from all other data).

The Sanitas output for the outlier analysis is provided in **Attachment B**.

Results identified as statistical outliers are checked for possible lab instrument failure, field collection problems, or data entry errors. However, outliers may exist naturally in the data if there is an extremely wide inherent or temporal variability in the data. The Unified Guidance states that unless a likely error can be identified, the outlier should not be removed.

For the 2024 statistical update, the following background values were identified as potential outliers and handled as described:

- **Boron (MW-84A)**: Two high results from the August 2017 and April 2018 sampling events were flagged by Sanitas as statistical outliers. These results were kept in the dataset because there was no known explanation for the varying results, and the results (22.9 ug/L and 25 ug/L, respectively) fall within a reasonable range for this parameter.

- **Calcium (MW-301):** Three low results from the October 2021, October 2022, and October 2023 sampling events were flagged as statistical outliers. These results were not removed from the dataset because the results appear to represent seasonal variation.

- **Total Dissolved Solids (MW-301):** Three low results from the October 2021, October 2022, and October 2023 sampling events were flagged as statistical outliers. These results were left in the dataset because the results appear to represent seasonal variation.

- **Total Dissolved Solids (MW-84A):** One high result from the August 2018 sampling event was flagged as a statistical outlier. This result was left in the dataset because there was no known reason for the high result and the result was within the range of potential natural variation.

BACKGROUND UPDATE

The background data pool was updated in accordance with the Unified Guidance, which recommends updating background every 2 to 3 years for semiannual sampling. Prior to expanding the data pool, the original background data set (12/2015 through 10/2019) and the data to be added (12/2019 through 10/2023) were compared. The Unified Guidance states that recently collected measurements from the background wells can be added to the existing pool if a Student's t-test (Welch's t-test in Sanitas) or Wilcoxon rank-sum test (also known as the Mann-Whitney test) finds no significant difference between the two groups at the 1 percent level of significance. If a difference is noted, the background sample data should be reviewed to evaluate which data to include in the data set for calculating prediction limits.

The Welch' t-test/Mann-Whitney rank-sum analysis for the COL background data sets is included in **Attachment C.** To consider both increases and decreases in background concentrations, the tests were run in the two-tailed mode. The results indicated the following signficant changes at the 1 percent level:

- Chloride decrease at MW-84A

- Fluoride decrease at MW-84A and MW-301

- Sulfate decrease at MW-84A

Following review of the data, the complete background datasets for chloride and sulfate were retained for the UPL analysis. All concentrations of chloride and sulfate in the MW-84A samples were less than 5 milligrams per liter (mg/L), the well is upgradient from the CCR unit, and the complete datset appears to represent a reasonable range of temporal variability in background conditions.

The decrease reported for fluoride reflects a decrease in detection limits, with all of the results in the more recent data being below the detection limit. No fluoride results have been reported above the quantitation limit at either background well since monitoring began. Based on these results, no UPL will be calculated and the Double Quantification Rule will be used to evaluate fluoride results.

INTERWELL PREDICTION LIMITS

Interwell UPLs were calculated using background data from the background wells for each monitored constituent, with outliers handled as noted above. The prediction limit analysis performed in Sanitas includes the following steps:

1) If more than 50 percent of results are non-detect, apply a non-parametric UPL. For small background sample sizes, the non-parametric UPL is the highest background value. For a parameter with 100 percent non-detects in the background values, the Double Quanitification rule applies, which says that a statistically significant increase (SSI) occurs when two results exceeding the quantification limit are reported for a compliance well.

2) If 50 percent or fewer of the results are non-detect, run normality test (Shapiro Wilk/Francia) to assess whether the data fit a normal distribution or can be transformed to fit a normal distribution (e.g., lognormal).

3) If normal or transformed normal, calculate parametric UPL.

4) If not normal or transformed normal, calculate non-parametric UPL.

Consistent with the Unified Guidance, parametric prediction limits were calculated based on a 1-of-2 retesting protocol and a target 10 percent annual site-wide false positive rate. Sanitas establishes the per-test significance level based on user inputs of the number of events per year, number of constituents being evaluated, and number of compliance wells. For the October 2023 event, the following values were used:

Parameter	**Value**	**Comments**
Evaluations per year	2	April and October events
Constituents analyzed	6	Total of seven constituents analyzed for detection monitoring. Fluoride not counted because all but one background results were non-detect and all were below limit of quantification. Double Quantification rule will apply.
Compliance wells	3	MW-33AR, MW-34A, MW-302

Non-parametric prediction limits are also based on a 1-of-2 retesting protocol. The non-parametric limit is the second-highest value in the background dataset. For the current background sample size, the second-highest value provides a false positive rate for the non-parametric tests that is similar to the false positive rate for the parametric tests, to achieve the overall target site-wide false positive rate (SWFPR) of 10 percent.

For results with 100 percent non-detects in the background data, evaluation under the Double Quantification Rule means that an SSI has not occurred for a compliance well unless two sample results from the well exceed the laboratory's reporting limit or quanitification limit. For evaluation of parameters with less than 100 percent non-detects in the background sampling, the non-detects were replaced with a value of one-half the detection limit. For all parameters, only results at or above the laboratory's reporting limit or quanitification limit are compared to the UPL for SSI determination.

Interwell prediction limit analysis results are included in **Attachment D**.

Encl. Attachments A through D

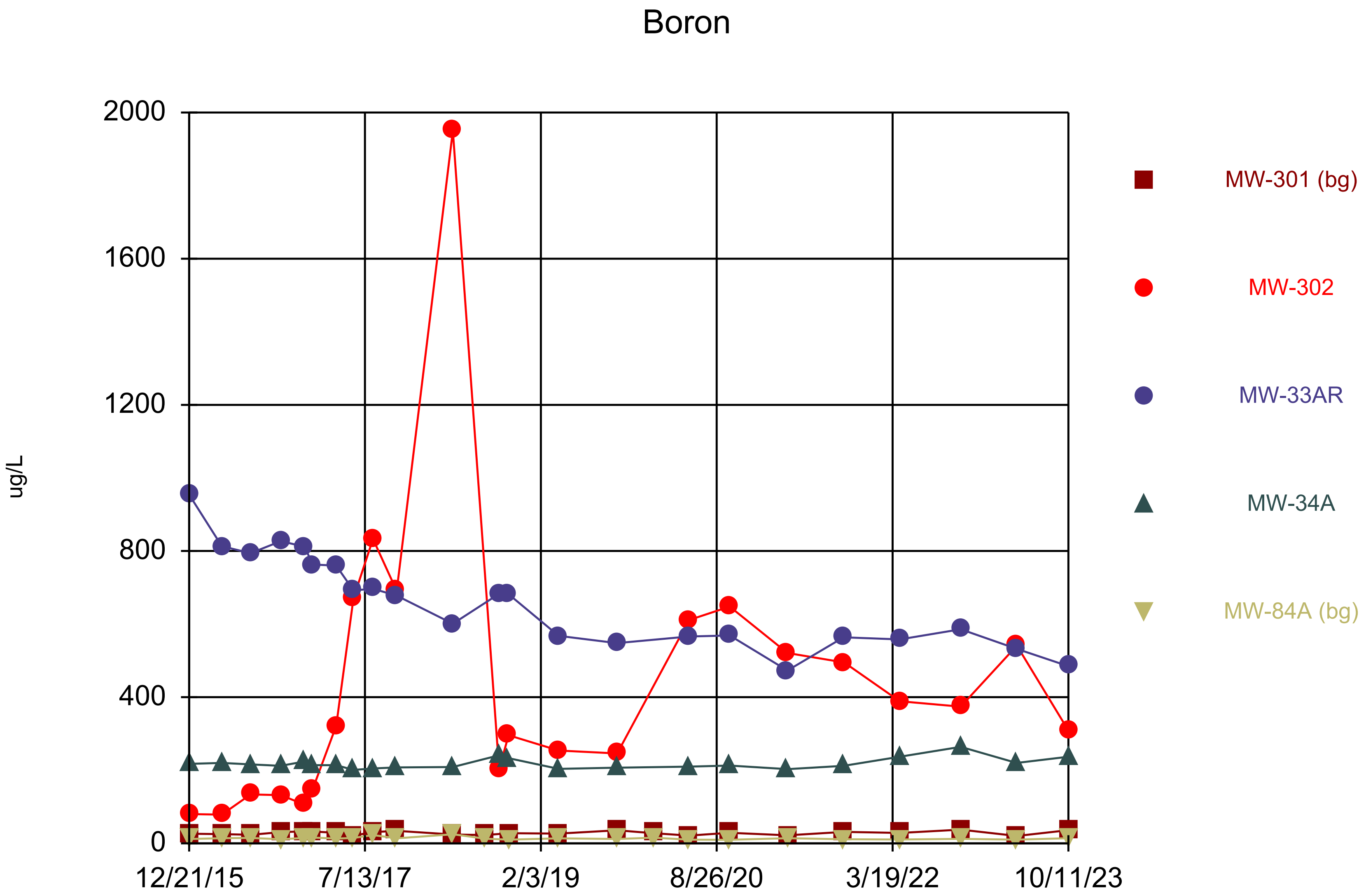
RM/AJR/SCC

I:\25223067.00\Data and Calculations\Sanitas\UPL and Stats Memos_COL\MOD1-3\240827_COL Mod 1-3_August 2024_Stats Memo_Interwell.docx

Attachment A

Time Series Plots

Sanitas™ v.10.0.15 Software licensed to SCS Engineers. UG



Time Series   Analysis Run 1/31/2024 3:48 PM   View: MOD 1-3 LF

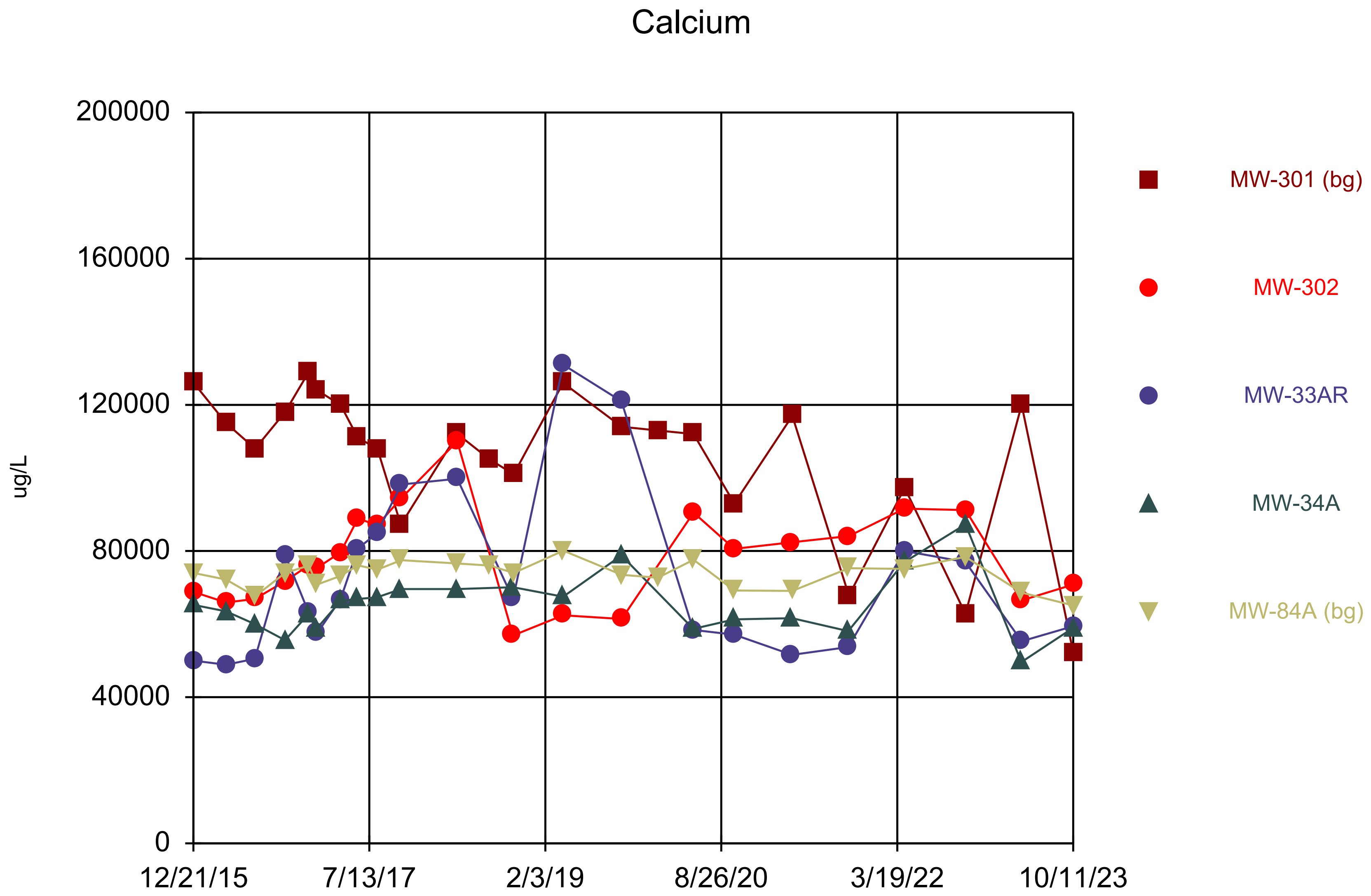
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Time Series

Constituent: Boron (ug/L)   Analysis Run 1/31/2024 3:50 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			954	217.5 (D)	
12/22/2015	26.5	80			11.9
4/5/2016	25.2	78.8	813	220	14
7/7/2016		134	794	216	
7/8/2016	23.6				14.7
10/13/2016	30.6	132	827	212	11.1
12/29/2016	32.8	106	812	224	14.7
1/25/2017	32.6	149	763	214	16.1
4/11/2017	28.8	322	760	214	12.9
6/6/2017	21.3	671	692	201	14.8
8/7/2017			697	205	
8/8/2017	30.6	833			22.9
10/23/2017	34.3				
10/24/2017		691	678	208	13.8
4/24/2018		1950	601	209	
4/25/2018	24.3				25
8/8/2018	22.8				12.8
9/21/2018		203	683	241	
10/22/2018		296	682	233	
10/24/2018	27.8				10.1 (J)
4/2/2019	26.9	254	568	204	
4/3/2019					13.6
10/8/2019			548	207	
10/9/2019	35.9	246			12
2/3/2020	27.9				15.7
5/28/2020			566	210	
5/29/2020	21.3	611			10
10/8/2020	28.8	648	569	213	9.7 (J)
4/13/2021		521	473	203	
4/14/2021	22.2				14.3
10/12/2021			564	212	
10/14/2021	31.4	495			11.1
4/12/2022		389	558	237	
4/13/2022	28.7				10.5
10/27/2022	37.5	374	586	264	12.2
4/26/2023				220	
4/27/2023	20.1	541	532		10.3
10/11/2023	36.2	309	485	237	14



Time Series Analysis Run 1/31/2024 3:48 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

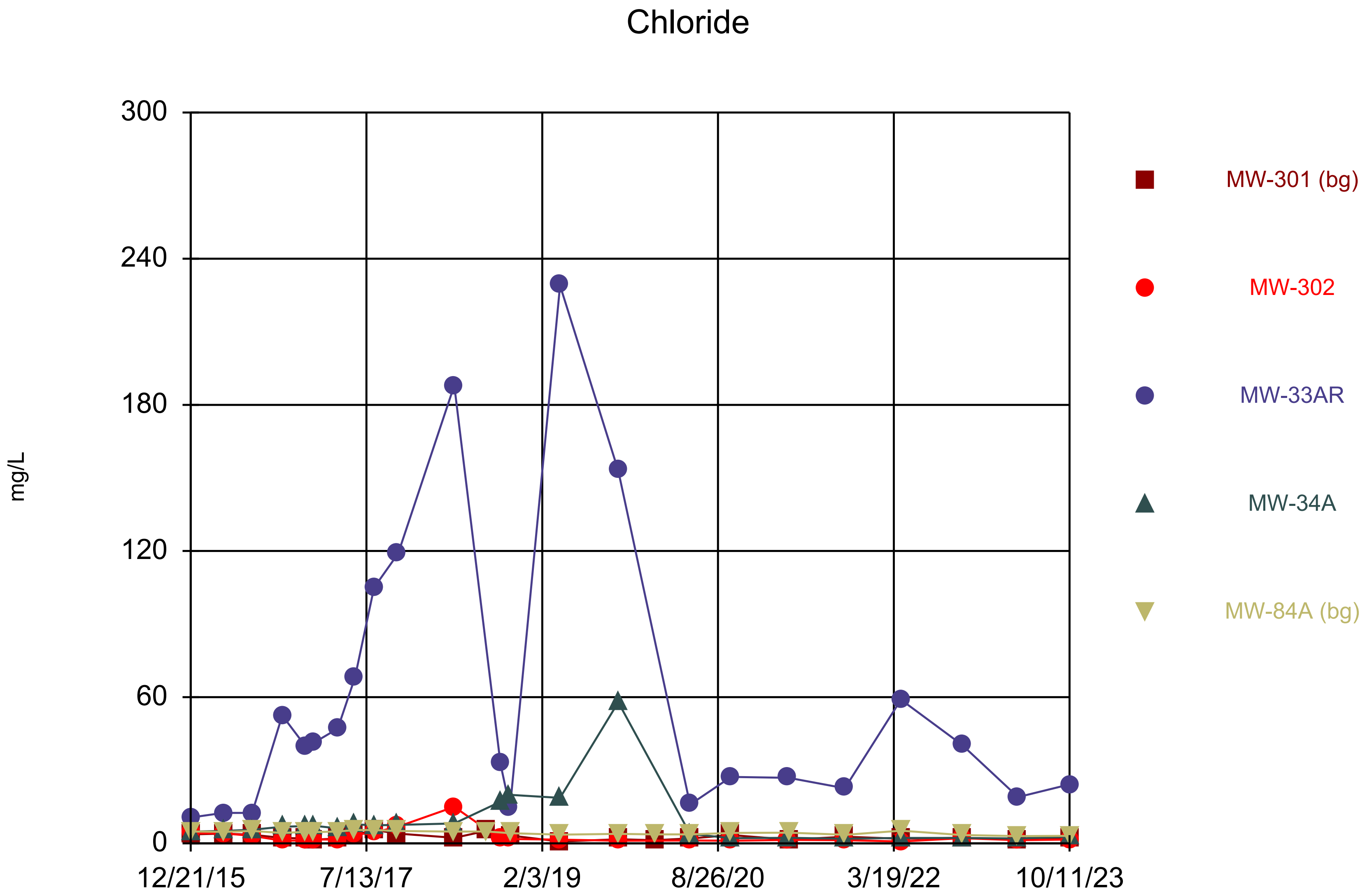
Time Series

Constituent: Calcium (ug/L) Analysis Run 1/31/2024 3:50 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			50000	65250 (D)	
12/22/2015	126000	68800			74000
4/5/2016	115000	65900	48900	63500	72200
7/7/2016		66900	50500	60000	
7/8/2016	108000				67600
10/13/2016	118000	71700	79000	55600	74000
12/29/2016	129000	76100	63100	62800	76000
1/25/2017	124000	75400	57500	58900	70800
4/11/2017	120000	79600	66800	66300	73200
6/6/2017	111000	88900	80700	66900	76100
8/7/2017			84800	67300	
8/8/2017	108000	87100			74900
10/23/2017	87200				
10/24/2017		94400	98200	69600	77500
4/24/2018		110000	99800	69600	
4/25/2018	112000				76600
8/8/2018	105000				76000
10/22/2018		56900	66900	70100	
10/24/2018	101000				74000
4/2/2019	126000	62400	131000	67500	
4/3/2019					80100
10/8/2019			121000	78800	
10/9/2019	114000	61400			73500
2/3/2020	113000				72700
5/28/2020			58400	58700	
5/29/2020	112000	90500			77600
10/8/2020	93000	80600	57100	61300	69200
4/13/2021		82400	51600	61600	
4/14/2021	117000				69100
10/12/2021			53700	58100	
10/14/2021	67800	84100			75300
4/12/2022		91600	80000	77000	
4/13/2022	97300				75100
10/27/2022	62800	91200	77000	87300	78400
4/26/2023				49600	
4/27/2023	120000	66500	55300		68600
10/11/2023	52300	70800	59400	59000	65100

Sanitas™ v.10.0.15 Software licensed to SCS Engineers. UG



Time Series Analysis Run 1/31/2024 3:48 PM View: MOD 1-3 LF

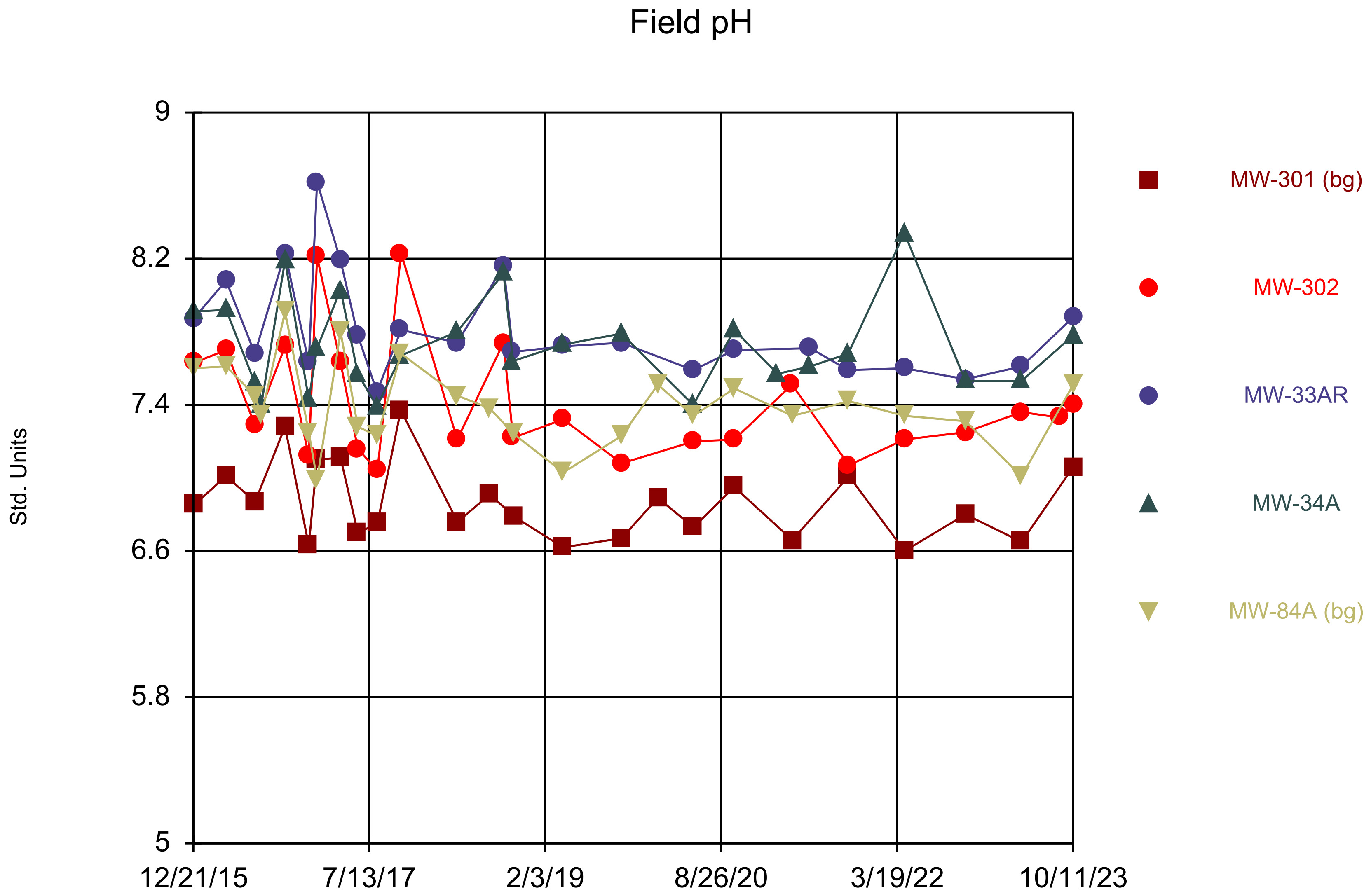
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

Constituent: Chloride (mg/L) Analysis Run 1/31/2024 3:50 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			10.6	4.85 (D)	
12/22/2015	3.7 (J)	4.2			4.9
4/5/2016	4	4.1	12.5	5.1	4.7
7/7/2016		3.1 (J)	12.5	5.6	
7/8/2016	3.5 (J)				5.1
10/13/2016	2.2	1.1 (J)	52.5	6.8	4.3
12/29/2016	2 (J)	1.2 (J)	39.6	7.1	4.7
1/25/2017	1.5 (J)	1.6 (J)	41.4	7.2	4.6
4/11/2017	2	1.6 (J)	47.1	6.2	4.9
6/6/2017	3.5	3.5	68.1	7.8	5.5
8/7/2017			105	7.4	
8/8/2017	5.5	4.5			5.5
10/23/2017	4				
10/24/2017		6.9	119	7.6	5.1
4/24/2018		15	188	8.2	
4/25/2018	2.3				4.8
8/8/2018	5.2				4.9
9/21/2018		1.7 (J)	32.6	17.1	
10/22/2018		1.8 (J)	14.4	19.9	
10/24/2018	3.2				4.2
4/2/2019	0.79 (J)	1.5 (J)	229	18.7	
4/3/2019					3.6
10/8/2019			153	57.9	
10/9/2019	1.7 (J)	1.1 (J)			3.9
2/3/2020	1.3 (J)				3.7
5/28/2020			15.9	3.9	
5/29/2020	2 (J)	1.2 (J)			3.7
10/8/2020	3.4	1.1 (J)	27.3	2.1	4.3
4/13/2021		1.4 (J)	26.9	2.3	
4/14/2021	1.5 (J)				4.4
10/12/2021			22.6	1.9 (J)	
10/14/2021	2.7	1.3 (J)			3.5
4/12/2022		0.79 (J)	59	2.2	
4/13/2022	1.9 (J)				5.2
10/27/2022	2.3	2.1	40.5	2.2	3.4
4/26/2023				2	
4/27/2023	1.5 (J)	1.3 (J)	19		3
10/11/2023	2.1	1.6 (J)	24.2	2.7	3.1



Time Series Analysis Run 1/31/2024 3:48 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

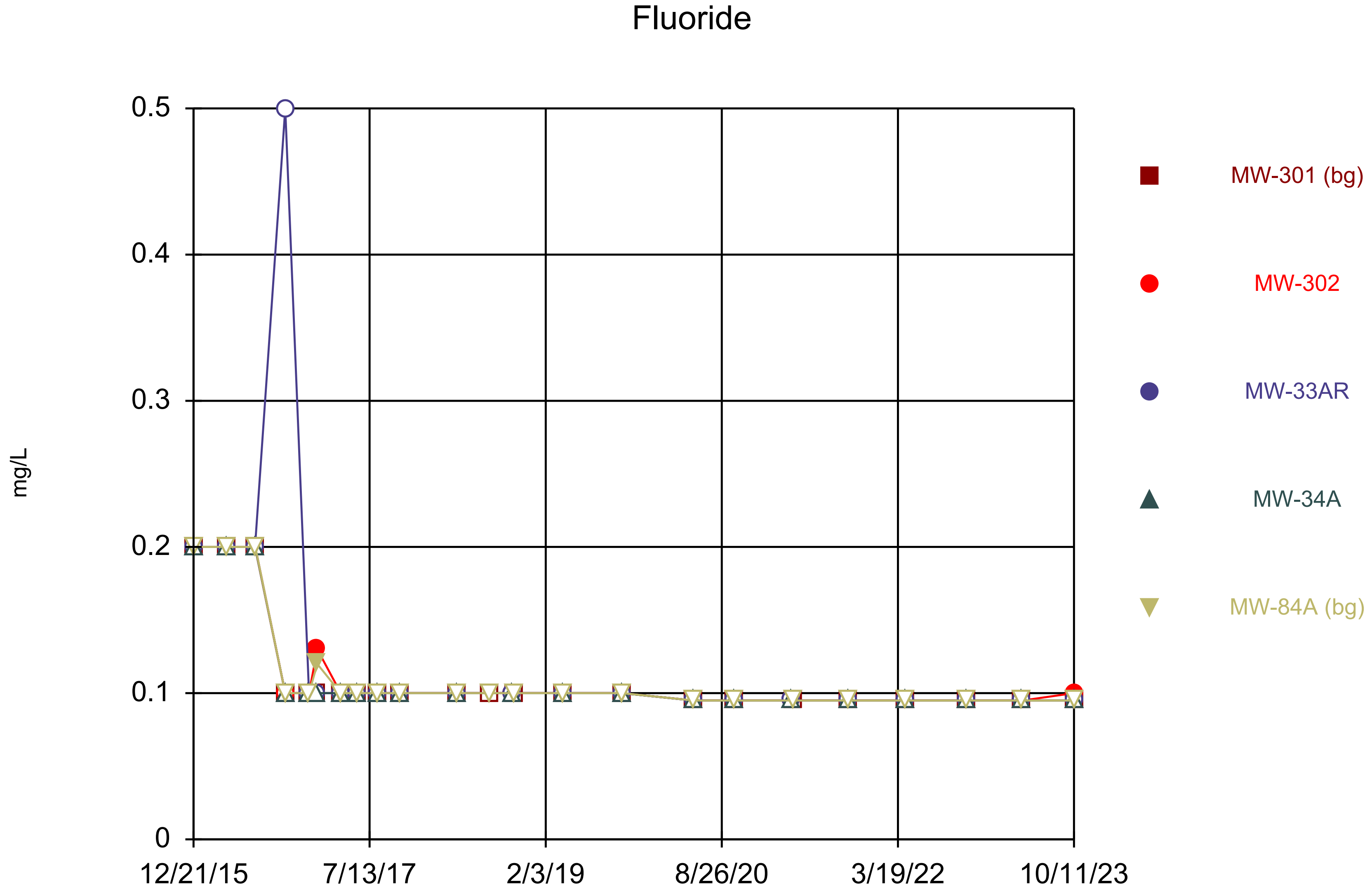
Time Series

Constituent: Field pH (Std. Units) Analysis Run 1/31/2024 3:50 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			7.87	7.91	
12/22/2015	6.85	7.63			7.6
4/5/2016	7.01	7.7	8.08	7.92	7.61
7/7/2016		7.29	7.68	7.52	
7/8/2016	6.87				7.45
7/28/2016				7.4	7.34
10/13/2016	7.28	7.72	8.23	8.19	7.91
12/29/2016	6.63	7.12	7.63	7.43	7.25
1/25/2017	7.1	8.21	8.62	7.71	6.99
4/11/2017	7.11	7.63	8.19	8.03	7.8
6/6/2017	6.7	7.16	7.78	7.57	7.28
8/7/2017			7.47	7.39	
8/8/2017	6.75	7.04			7.23
10/23/2017	7.37				
10/24/2017		8.23	7.81	7.67	7.68
4/24/2018		7.21	7.74	7.8	
4/25/2018	6.76				7.45
8/8/2018	6.91				7.38
9/21/2018		7.74	8.16	8.12	
10/22/2018		7.22	7.69	7.64	
10/24/2018	6.79				7.24
4/2/2019	6.62	7.32	7.72	7.73	
4/3/2019					7.03
10/8/2019			7.74	7.79	
10/9/2019	6.67	7.08			7.23
2/3/2020	6.89				7.51
5/28/2020			7.59	7.4	
5/29/2020	6.73	7.2			7.34
10/8/2020	6.95	7.21	7.7	7.81	7.49
2/25/2021				7.57	
4/13/2021		7.51			
4/14/2021	6.66				7.34
6/11/2021			7.71 (R)	7.61 (R)	
10/12/2021			7.59	7.68	
10/14/2021	7.01	7.07			7.42
4/12/2022		7.21	7.6	8.34	
4/13/2022	6.6				7.34
10/27/2022	6.8	7.25	7.54	7.53	7.31
4/26/2023				7.53	
4/27/2023	6.65	7.36	7.61		7.01
8/31/2023		7.33			
10/11/2023	7.06	7.4	7.88	7.78	7.51

Sanitas™ v.10.0.15 Software licensed to SCS Engineers. UG
Hollow symbols indicate censored values.



Time Series   Analysis Run 1/31/2024 3:48 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Time Series

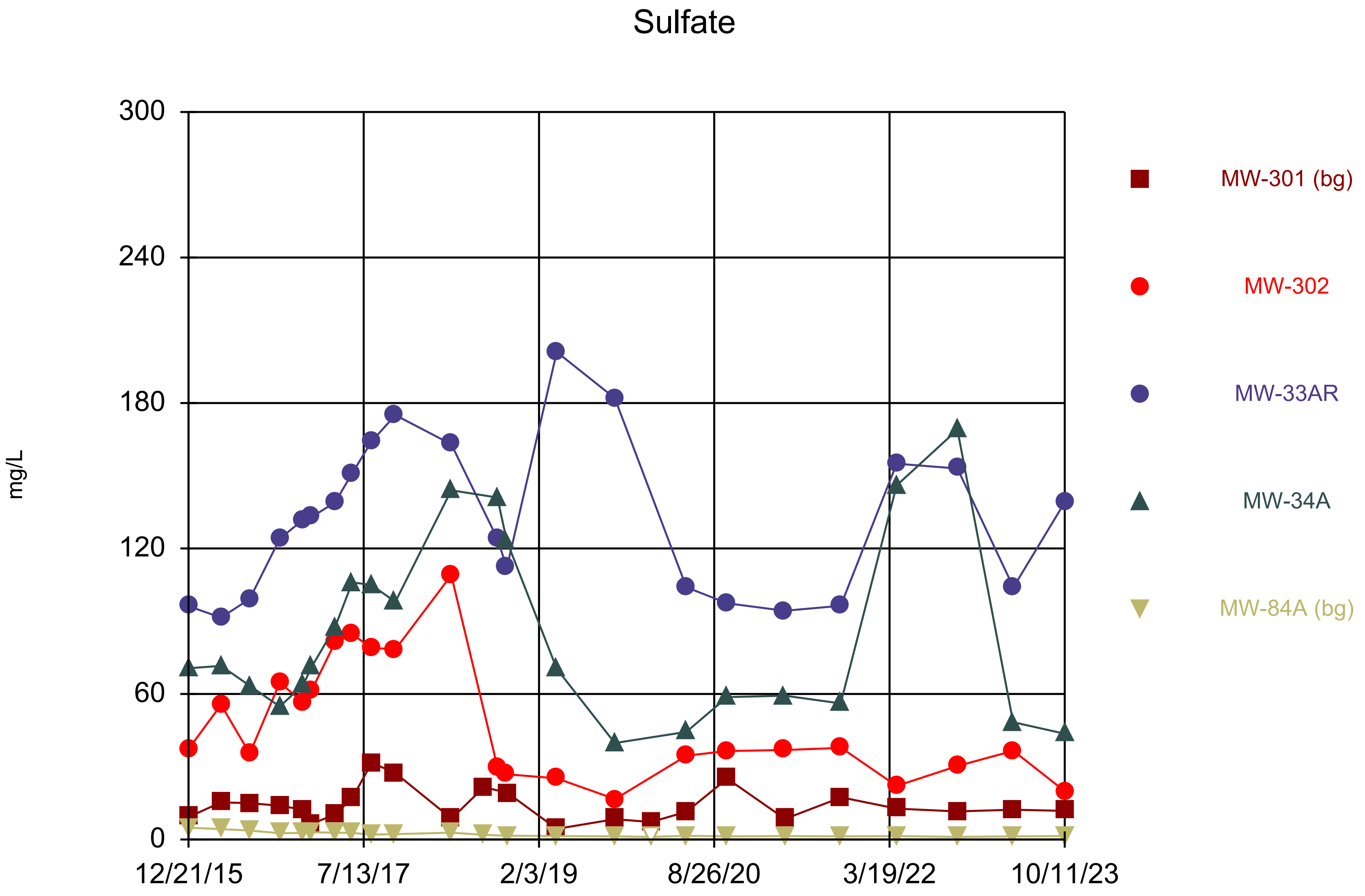
Constituent: Fluoride (mg/L)   Analysis Run 1/31/2024 3:50 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			<0.2 (U)	<0.2 (UD)	
12/22/2015	<0.2 (U)	<0.2 (U)			<0.2 (U)
4/5/2016	<0.2 (U)	<0.2 (U)	<0.2 (U)	<0.2 (U)	<0.2 (U)
7/7/2016		<0.2 (U)	<0.2 (U)	<0.2 (U)	
7/8/2016	<0.2 (U)				<0.2 (U)
10/13/2016	<0.1 (U)	<0.1 (U)	<0.5 (U)	<0.1 (U)	<0.1 (U)
12/29/2016	<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)
1/25/2017	<0.1 (U)	0.13 (J)	<0.1 (U)	<0.1 (U)	0.12 (J)
4/11/2017	<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)
6/6/2017	<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)
8/7/2017			<0.1 (U)	<0.1 (U)	
8/8/2017	<0.1 (U)	<0.1 (U)			<0.1 (U)
10/23/2017	<0.1 (U)				
10/24/2017		<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)
4/24/2018		<0.1 (U)	<0.1 (U)	<0.1 (U)	
4/25/2018	<0.1 (U)				<0.1 (U)
8/8/2018	<0.1 (U)				<0.1 (U)
10/22/2018		<0.1 (U)	<0.1 (U)	<0.1 (U)	
10/24/2018	<0.1 (U)				<0.1 (U)
4/2/2019	<0.1 (U)	<0.1 (U)	<0.1 (U)	<0.1 (U)	
4/3/2019					<0.1 (U)
10/8/2019			<0.1 (U)	<0.1 (U)	
10/9/2019	<0.1 (U)	<0.1 (U)			<0.1 (U)
5/28/2020			<0.095 (U)	<0.095 (U)	
5/29/2020	<0.095 (U)	<0.095 (U)			<0.095 (U)
10/8/2020	<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)
4/13/2021		<0.095 (U)	<0.095 (U)	<0.095 (U)	
4/14/2021	<0.095 (U)				<0.095 (U)
10/12/2021			<0.095 (U)	<0.095 (U)	
10/14/2021	<0.095 (U)	<0.095 (U)			<0.095 (U)
4/12/2022		<0.095 (U)	<0.095 (U)	<0.095 (U)	
4/13/2022	<0.095 (U)				<0.095 (U)
10/27/2022	<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)
4/26/2023				<0.095 (U)	
4/27/2023	<0.095 (U)	<0.095 (U)	<0.095 (U)		<0.095 (U)
10/11/2023	<0.095 (U)	0.1 (J)	<0.095 (U)	<0.095 (U)	<0.095 (U)

ND substitution: RL or RL/2 if <15% NDs.

Sanitas™ v.10.0.15 Software licensed to SCS Engineers. UG
Hollow symbols indicate censored values.



Time Series   Analysis Run 1/31/2024 3:48 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

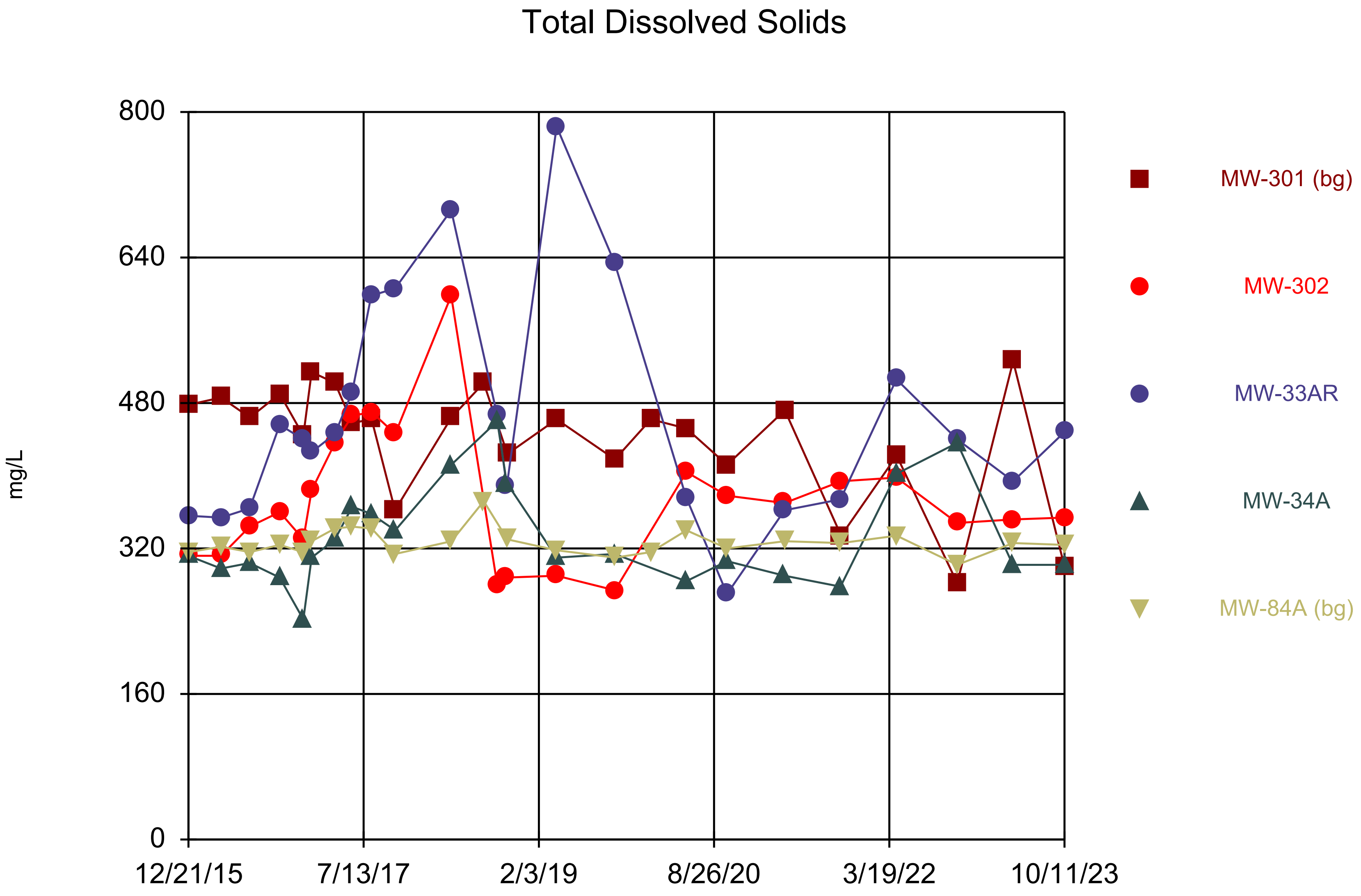
Time Series

Constituent: Sulfate (mg/L)   Analysis Run 1/31/2024 3:50 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			96.2	70.6 (D)	
12/22/2015	9.3	37.4			4.9
4/5/2016	15.3	55.6	91.5	71.6	4.3
7/7/2016		35.4	99.2	63.4	
7/8/2016	15				3.7 (J)
10/13/2016	13.9	64.7	124	54.8	2.6 (J)
12/29/2016	12.3 (J)	56.4	132	63.9	2.7 (J)
1/25/2017	6.5	61.6	133	71.2	3
4/11/2017	10.3	81.3	139	87.6	2.8 (J)
6/6/2017	17.1	84.6	151	106	2.7 (J)
8/7/2017			164	105	
8/8/2017	31.6	79			2 (J)
10/23/2017	27.5				
10/24/2017		78.4	175	98	2.2 (J)
4/24/2018		109	163	144	
4/25/2018	8.6				2.8 (J)
8/8/2018	21.6				1.9 (J)
9/21/2018		30	124	141	
10/22/2018		26.9	112	123	
10/24/2018	19.2				1.6 (J)
4/2/2019	4.4	25.2	201	70.4	
4/3/2019					1.4 (J)
10/8/2019			182	39.8	
10/9/2019	8.4	16.7			1.3 (J)
2/3/2020	7.2				<2.2 (U)
5/28/2020			104	44.4	
5/29/2020	11.5	34.6			1.5 (J)
10/8/2020	25.1	36.5	97.4	58.7	1.3 (J)
4/13/2021		36.9	94.3	59.3	
4/14/2021	8.5				1.4 (J)
10/12/2021			96.4	56.1	
10/14/2021	17.4	37.8			1.3 (J)
4/12/2022		22.1	155	146	
4/13/2022	12.7				1.4 (J)
10/27/2022	11.6	30.3	153	169	1.1 (J)
4/26/2023				48.4	
4/27/2023	12.3	36.6	104		1.3 (J)
10/11/2023	11.8	19.9	139	43.6	1.4 (J)

ND substitution: RL or RL/2 if <15% NDs.



Time Series Analysis Run 1/31/2024 3:48 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

Constituent: Total Dissolved Solids (mg/L)   Analysis Run 1/31/2024 3:50 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)
12/21/2015			356	312 (D)	
12/22/2015	478	312			316
4/5/2016	486	312	354	298	322
7/7/2016		344	364	304	
7/8/2016	464				316
10/13/2016	490	360	456	288	324
12/29/2016	444	330	440	242	316
1/25/2017	514	384	426	310	328
4/11/2017	502	436	446	330	342
6/6/2017	458	466	492	366	344
8/7/2017			598	358	
8/8/2017	462	470			342
10/23/2017	362				
10/24/2017		446	606	340	314
4/24/2018		598	692	412	
4/25/2018	464				328
8/8/2018	502				372
9/21/2018		280	466	460	
10/22/2018		288	388	392	
10/24/2018	424				330
4/2/2019	462	290	784	310	
4/3/2019					318
10/8/2019			634	314	
10/9/2019	418	274			310
2/3/2020	462				316
5/28/2020			376	284	
5/29/2020	452	404			340
10/8/2020	412	378	270	306	320
4/13/2021		370	362	290	
4/14/2021	472				328
10/12/2021			374	278	
10/14/2021	334	394			326
4/12/2022		398	506	402	
4/13/2022	422				334
10/27/2022	282	348	440	436	302
4/26/2023				302	
4/27/2023	526	352	394		326
10/11/2023	300	354	448	302	324

Attachment B

Outlier Analysis

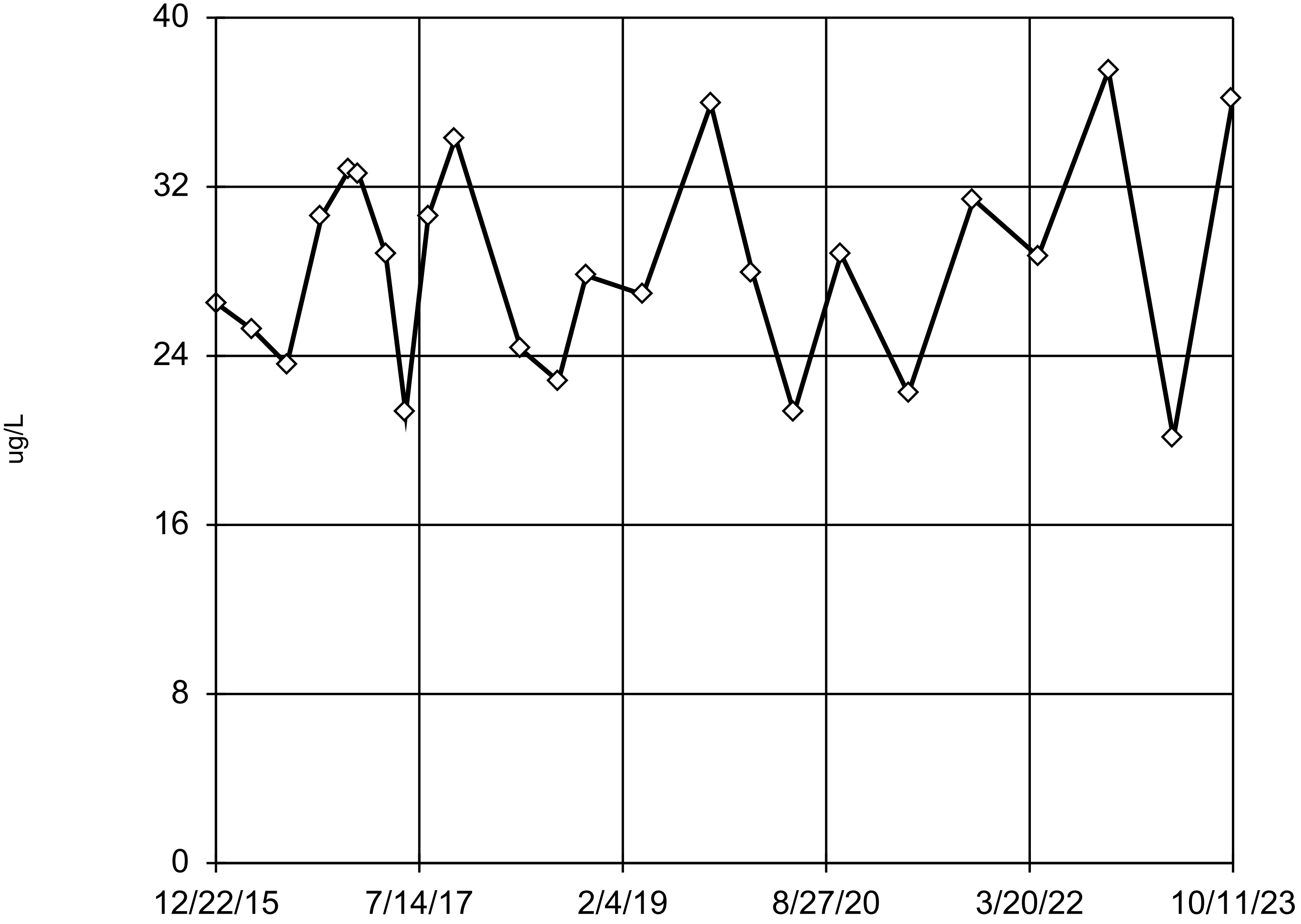
Outlier Analysis

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020 Printed 1/31/2024, 3:52 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron (ug/L)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	24	28.25	5.049	normal	ShapiroWilk
Boron (ug/L)	**MW-84A (bg)**	**Yes**	**22.9,25**	**8/8/2017,...**	**Dixon`s**	**0.05**	**24**	**13.68**	**3.693**	**normal**	**ShapiroWilk**
Calcium (ug/L)	**MW-301 (bg)**	**Yes**	**67800,523...**	**10/14/202...**	**Dixon`s**	**0.05**	**24**	**105808**	**20261**	**normal**	**ShapiroWilk**
Calcium (ug/L)	MW-84A (bg)	No	n/a	n/a	EPA 1989	0.05	24	73650	3696	normal	ShapiroWilk
Chloride (mg/L)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	24	2.658	1.223	ln(x)	ShapiroWilk
Chloride (mg/L)	MW-84A (bg)	No	n/a	n/a	EPA 1989	0.05	24	4.375	0.7385	normal	ShapiroWilk
Field pH (Std. Units)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	24	6.865	0.211	normal	ShapiroWilk
Field pH (Std. Units)	MW-84A (bg)	No	n/a	n/a	EPA 1989	0.05	25	7.39	0.2253	normal	ShapiroWilk
Fluoride (mg/L)	MW-301 (bg)	n/a	n/a	n/a	NP (nrm)	NaN	23	0.1113	0.0352	unknown	ShapiroWilk
Fluoride (mg/L)	MW-84A (bg)	n/a	n/a	n/a	NP (nrm)	NaN	23	0.1122	0.03516	unknown	ShapiroWilk
Sulfate (mg/L)	MW-301 (bg)	No	n/a	n/a	EPA 1989	0.05	24	14.13	6.818	ln(x)	ShapiroWilk
Sulfate (mg/L)	MW-84A (bg)	No	n/a	n/a	NP (nrm)	NaN	24	2.154	1.045	unknown	ShapiroWilk
Total Dissolved Solids (mg/L)	**MW-301 (bg)**	**Yes**	**334,282,300**	**10/14/202...**	**Dixon`s**	**0.05**	**24**	**441.3**	**64.07**	**normal**	**ShapiroWilk**
Total Dissolved Solids (mg/L)	**MW-84A (bg)**	**Yes**	**372**	**8/8/2018**	**Dixon`s**	**0.05**	**24**	**326.6**	**14.34**	**normal**	**ShapiroWilk**

EPA Screening (suspected outliers for Dixon's Test)

MW-301 (bg)



n = 24

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 28.25, std. dev. 5.049, critical Tn 2.644

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9664
Critical = 0.93
The distribution was found to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

EPA 1989 Outlier Screening

Constituent: Boron (ug/L) Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

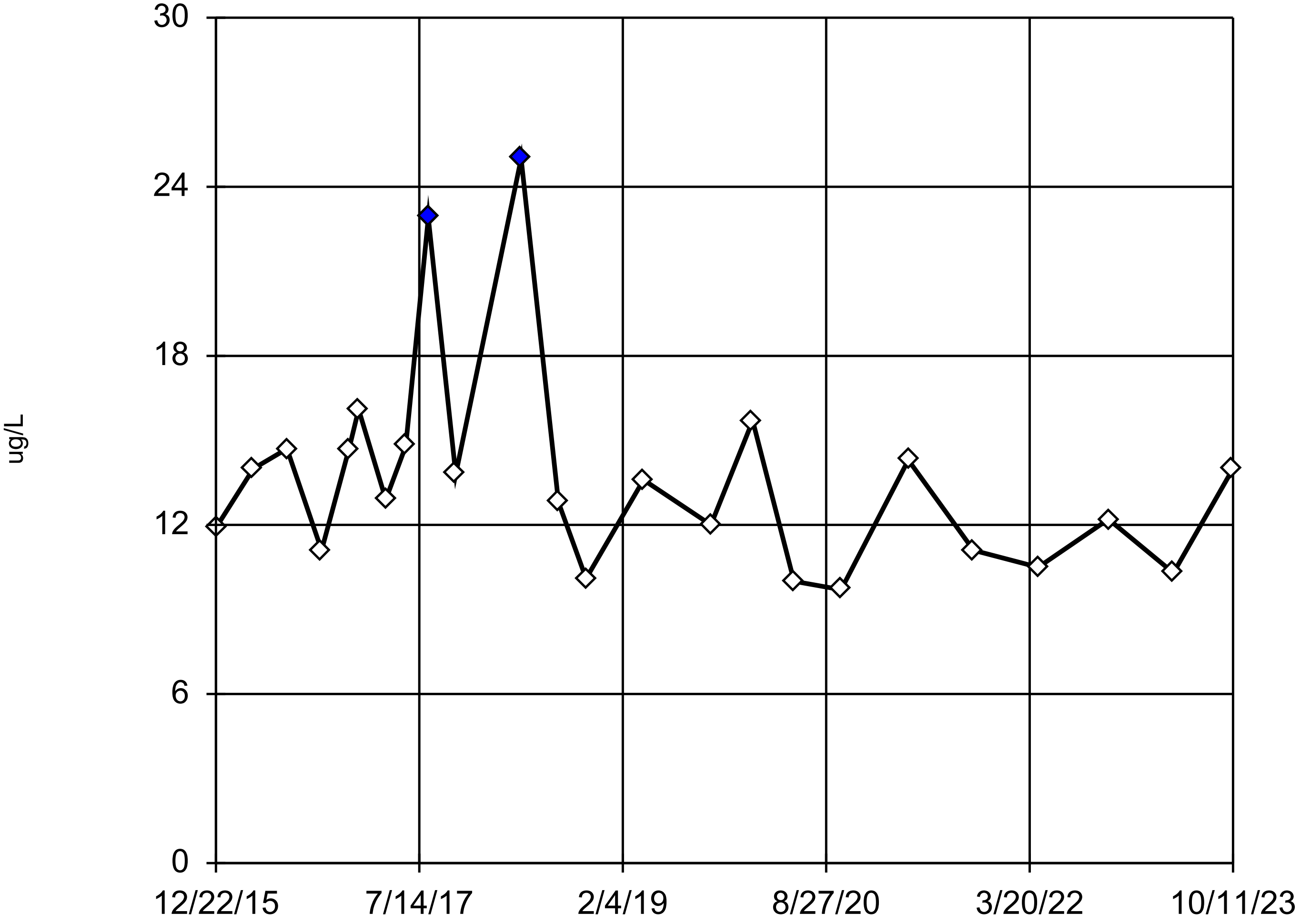
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)
12/22/2015	26.5
4/5/2016	25.2
7/8/2016	23.6
10/13/2016	30.6
12/29/2016	32.8
1/25/2017	32.6
4/11/2017	28.8
6/6/2017	21.3
8/8/2017	30.6
10/23/2017	34.3
4/25/2018	24.3
8/8/2018	22.8
10/24/2018	27.8
4/2/2019	26.9
10/9/2019	35.9
2/3/2020	27.9
5/29/2020	21.3
10/8/2020	28.8
4/14/2021	22.2
10/14/2021	31.4
4/13/2022	28.7
10/27/2022	37.5
4/27/2023	20.1
10/11/2023	36.2

Sanitas™ v.10.0.15 Software licensed to SCS Engineers. UG

Boron

MW-84A (bg)



n = 24

Statistical outliers are drawn as solid.
Testing for 2 high outliers.
Mean = 13.68.
Std. Dev. = 3.693.
22.9: c = 0.5625
tabl = 0.413.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9478
Critical = 0.926
The distribution, after removal of suspect values, was found to be normally distributed.

Dixon's Outlier Test   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

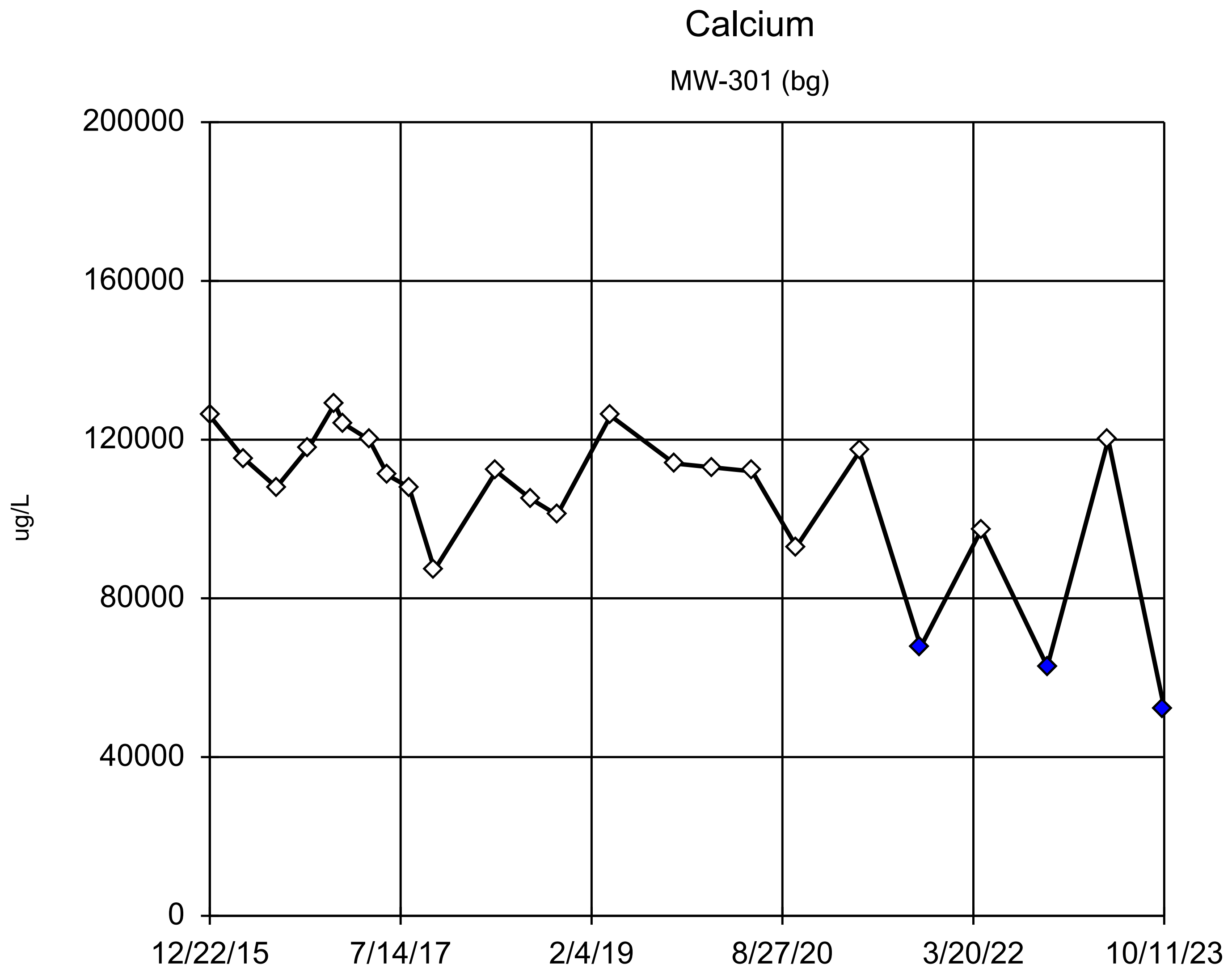
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Dixon's Outlier Test

Constituent: Boron (ug/L) Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-84A (bg)
12/22/2015	11.9
4/5/2016	14
7/8/2016	14.7
10/13/2016	11.1
12/29/2016	14.7
1/25/2017	16.1
4/11/2017	12.9
6/6/2017	14.8
8/8/2017	22.9 (O)
10/24/2017	13.8
4/25/2018	25 (O)
8/8/2018	12.8
10/24/2018	10.1 (J)
4/3/2019	13.6
10/9/2019	12
2/3/2020	15.7
5/29/2020	10
10/8/2020	9.7 (J)
4/14/2021	14.3
10/14/2021	11.1
4/13/2022	10.5
10/27/2022	12.2
4/27/2023	10.3
10/11/2023	14



n = 24

Statistical outliers are drawn as solid.
Testing for 3 low outliers.
Mean = 105808.
Std. Dev. = 20261.
67800: c = 0.433
tabl = 0.413.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9615
Critical = 0.923
The distribution, after removal of suspect values, was found to be normally distributed.

Dixon's Outlier Test Analysis Run 1/31/2024 3:51 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Dixon's Outlier Test

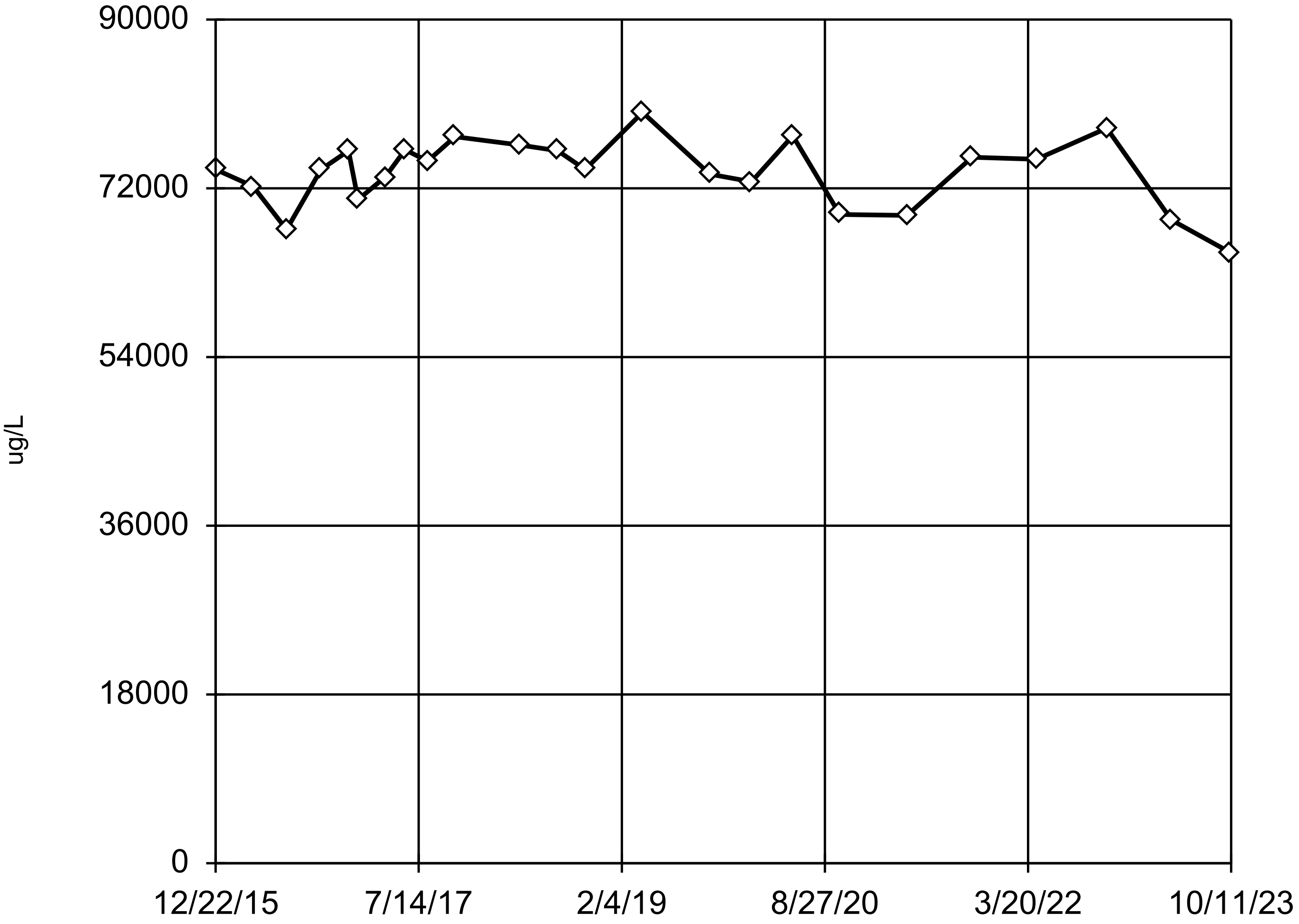
Constituent: Calcium (ug/L)   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)
12/22/2015	126000
4/5/2016	115000
7/8/2016	108000
10/13/2016	118000
12/29/2016	129000
1/25/2017	124000
4/11/2017	120000
6/6/2017	111000
8/8/2017	108000
10/23/2017	87200
4/25/2018	112000
8/8/2018	105000
10/24/2018	101000
4/2/2019	126000
10/9/2019	114000
2/3/2020	113000
5/29/2020	112000
10/8/2020	93000
4/14/2021	117000
10/14/2021	67800 (O)
4/13/2022	97300
10/27/2022	62800 (O)
4/27/2023	120000
10/11/2023	52300 (O)

EPA Screening (suspected outliers for Dixon's Test)

MW-84A (bg)



n = 24

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 73650, std. dev. 3696, critical Tn 2.644

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9639
Critical = 0.93
The distribution was found to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

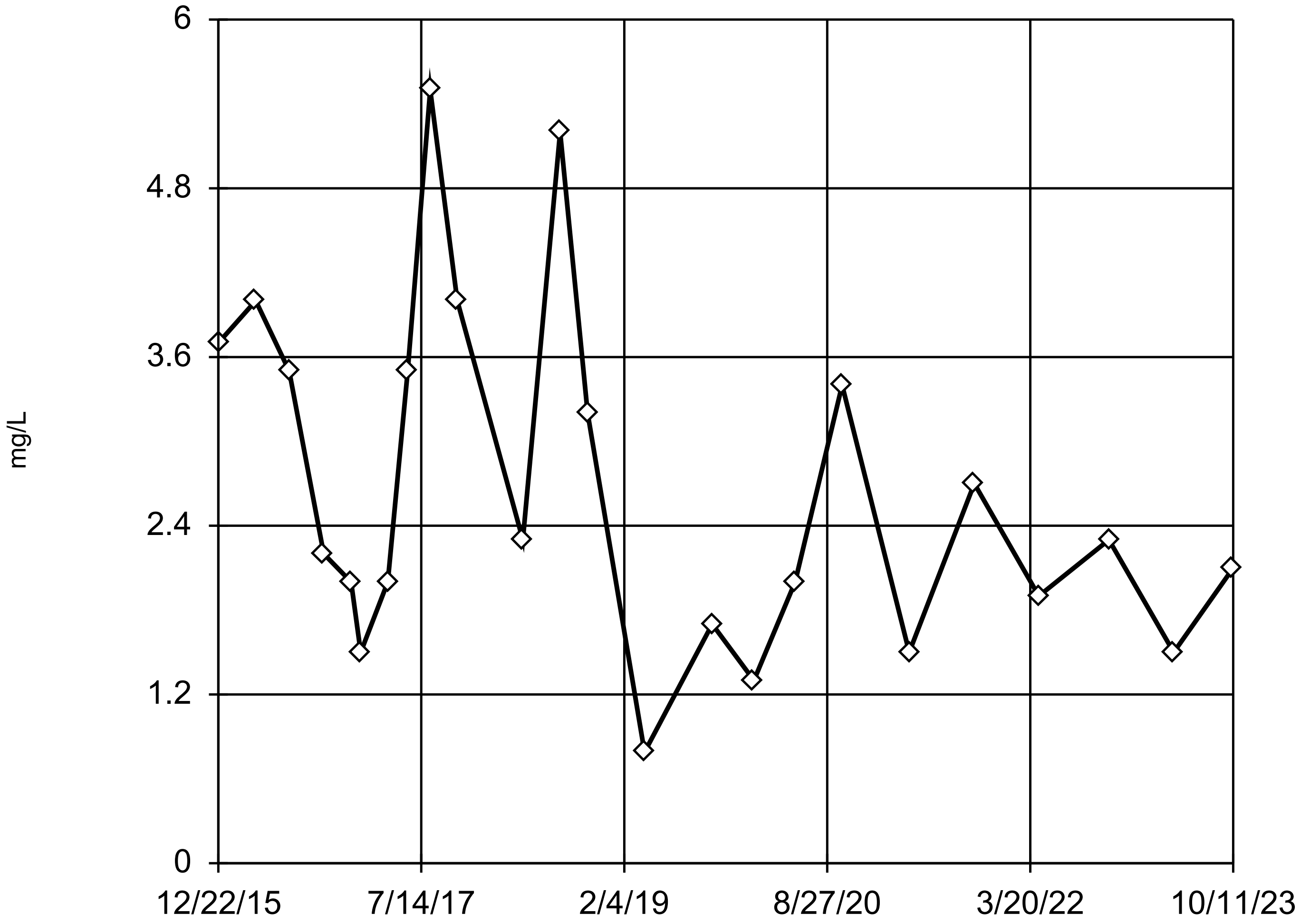
EPA 1989 Outlier Screening

Constituent: Calcium (ug/L) Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-84A (bg)
12/22/2015	74000
4/5/2016	72200
7/8/2016	67600
10/13/2016	74000
12/29/2016	76000
1/25/2017	70800
4/11/2017	73200
6/6/2017	76100
8/8/2017	74900
10/24/2017	77500
4/25/2018	76600
8/8/2018	76000
10/24/2018	74000
4/3/2019	80100
10/9/2019	73500
2/3/2020	72700
5/29/2020	77600
10/8/2020	69200
4/14/2021	69100
10/14/2021	75300
4/13/2022	75100
10/27/2022	78400
4/27/2023	68600
10/11/2023	65100

EPA Screening (suspected outliers for Dixon's Test)



n = 24

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 2.658, std. dev. 1.223, critical Tn 2.644

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9706
Critical = 0.93 (after natural log transformation)
The distribution was found to be log-normal.

EPA 1989 Outlier Screening   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

EPA 1989 Outlier Screening

Constituent: Chloride (mg/L) Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

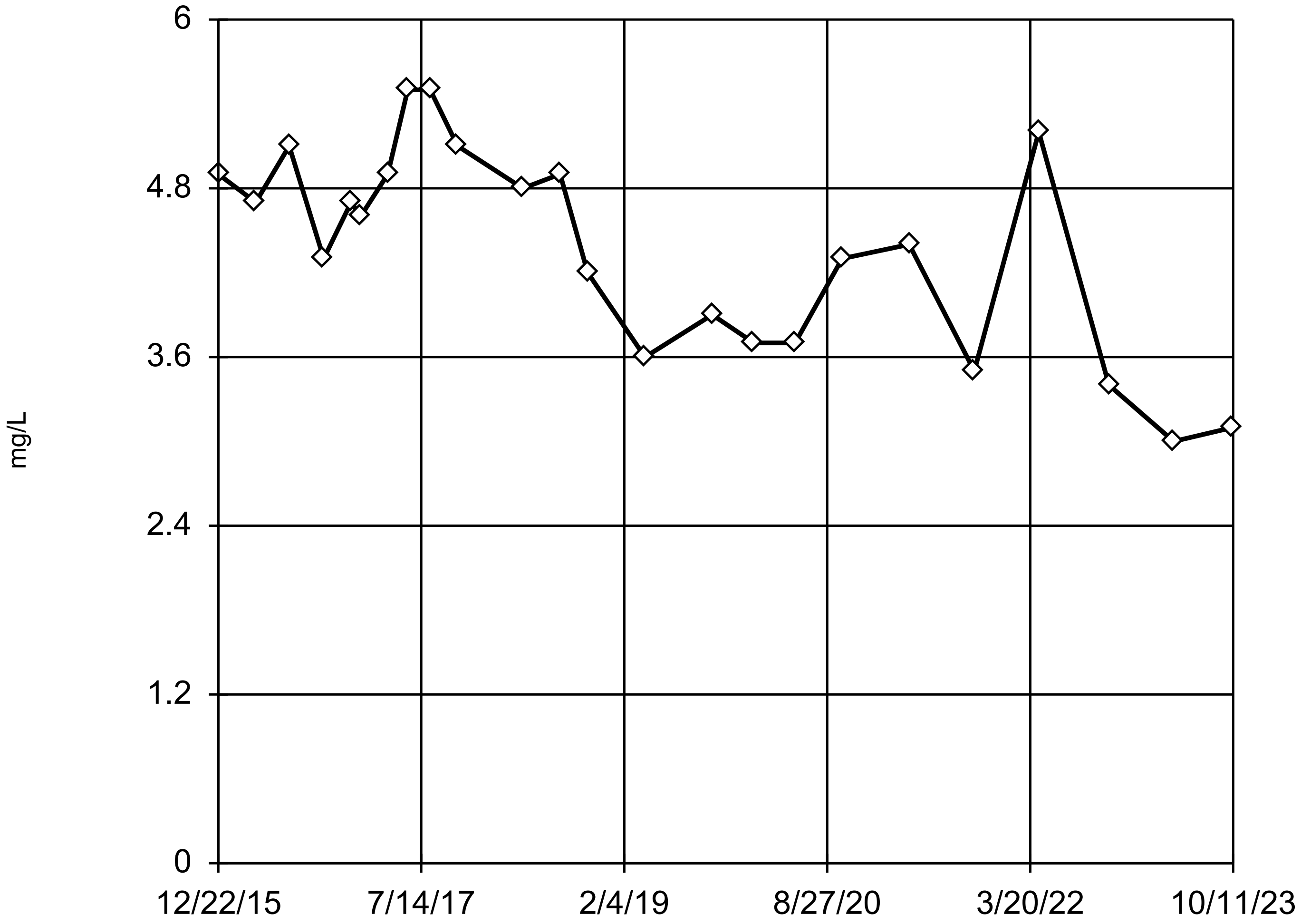
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)
12/22/2015	3.7 (J)
4/5/2016	4
7/8/2016	3.5 (J)
10/13/2016	2.2
12/29/2016	2 (J)
1/25/2017	1.5 (J)
4/11/2017	2
6/6/2017	3.5
8/8/2017	5.5
10/23/2017	4
4/25/2018	2.3
8/8/2018	5.2
10/24/2018	3.2
4/2/2019	0.79 (J)
10/9/2019	1.7 (J)
2/3/2020	1.3 (J)
5/29/2020	2 (J)
10/8/2020	3.4
4/14/2021	1.5 (J)
10/14/2021	2.7
4/13/2022	1.9 (J)
10/27/2022	2.3
4/27/2023	1.5 (J)
10/11/2023	2.1

Sanitas™ v.10.0.15 Software licensed to SCS Engineers. UG

EPA Screening (suspected outliers for Dixon's Test)

MW-84A (bg)



n = 24

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 4.375, std. dev. 0.7385, critical Tn 2.644

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9508
Critical = 0.93
The distribution was found to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

EPA 1989 Outlier Screening

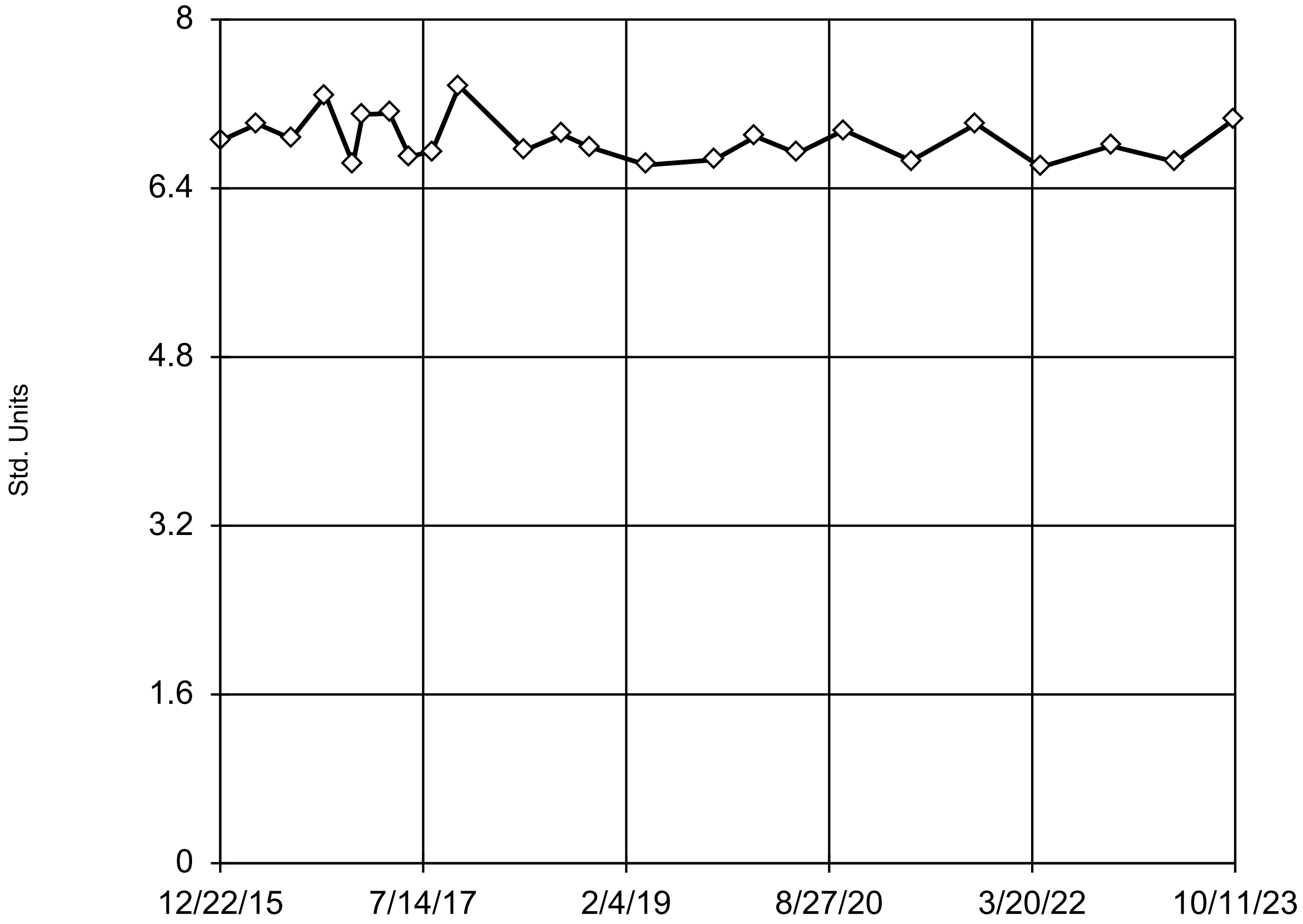
Constituent: Chloride (mg/L)   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A (bg)
12/22/2015	4.9
4/5/2016	4.7
7/8/2016	5.1
10/13/2016	4.3
12/29/2016	4.7
1/25/2017	4.6
4/11/2017	4.9
6/6/2017	5.5
8/8/2017	5.5
10/24/2017	5.1
4/25/2018	4.8
8/8/2018	4.9
10/24/2018	4.2
4/3/2019	3.6
10/9/2019	3.9
2/3/2020	3.7
5/29/2020	3.7
10/8/2020	4.3
4/14/2021	4.4
10/14/2021	3.5
4/13/2022	5.2
10/27/2022	3.4
4/27/2023	3
10/11/2023	3.1

EPA Screening (suspected outliers for Dixon's Test)

MW-301 (bg)



n = 24

Dixon's will not be run. No suspect values identified or unable to establish suspect values. Mean 6.865, std. dev. 0.211, critical Tn 2.644

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9304
Critical = 0.93
The distribution was found to be normally distributed.

EPA 1989 Outlier Screening Analysis Run 1/31/2024 3:51 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

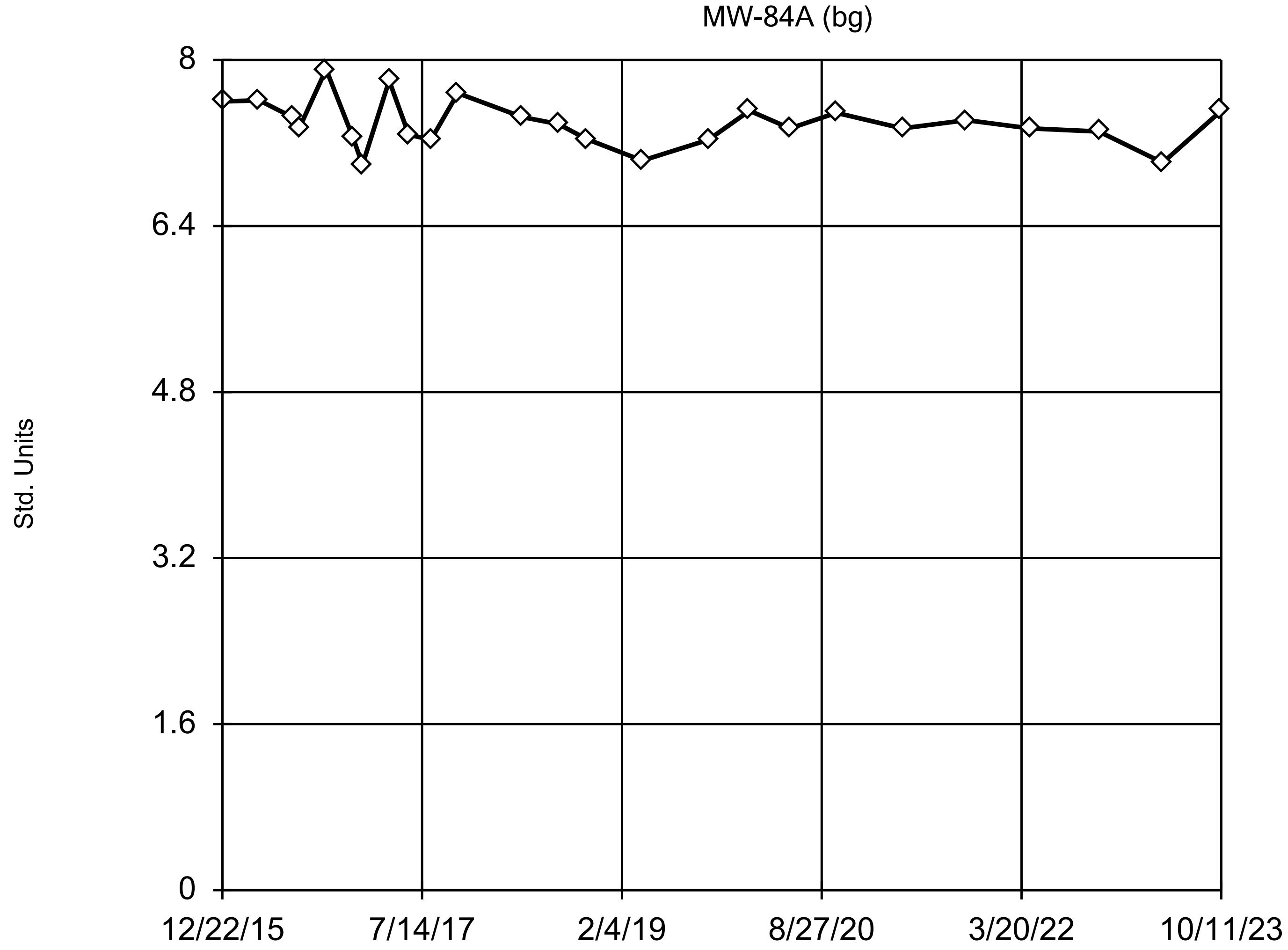
EPA 1989 Outlier Screening

Constituent: Field pH (Std. Units) Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)
12/22/2015	6.85
4/5/2016	7.01
7/8/2016	6.87
10/13/2016	7.28
12/29/2016	6.63
1/25/2017	7.1
4/11/2017	7.11
6/6/2017	6.7
8/8/2017	6.75
10/23/2017	7.37
4/25/2018	6.76
8/8/2018	6.91
10/24/2018	6.79
4/2/2019	6.62
10/9/2019	6.67
2/3/2020	6.89
5/29/2020	6.73
10/8/2020	6.95
4/14/2021	6.66
10/14/2021	7.01
4/13/2022	6.6
10/27/2022	6.8
4/27/2023	6.65
10/11/2023	7.06

EPA Screening (suspected outliers for Dixon's Test)



n = 25

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 7.39, std. dev. 0.2253, critical Tn 2.663

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9672
Critical = 0.931
The distribution was found to be normally distributed.

EPA 1989 Outlier Screening   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

EPA 1989 Outlier Screening

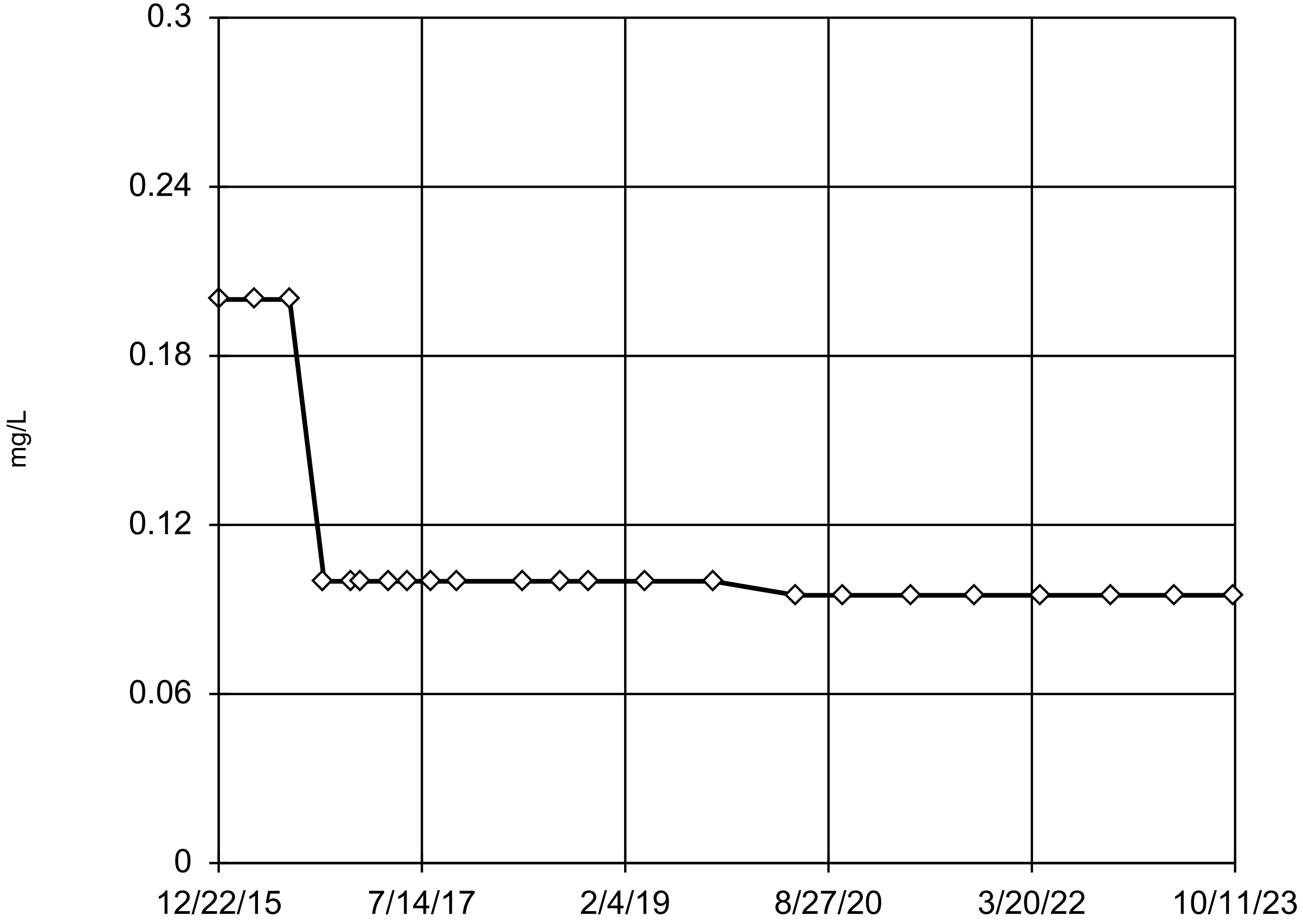
Constituent: Field pH (Std. Units)   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A (bg)
12/22/2015	7.6
4/5/2016	7.61
7/8/2016	7.45
7/28/2016	7.34
10/13/2016	7.91
12/29/2016	7.25
1/25/2017	6.99
4/11/2017	7.8
6/6/2017	7.28
8/8/2017	7.23
10/24/2017	7.68
4/25/2018	7.45
8/8/2018	7.38
10/24/2018	7.24
4/3/2019	7.03
10/9/2019	7.23
2/3/2020	7.51
5/29/2020	7.34
10/8/2020	7.49
4/14/2021	7.34
10/14/2021	7.42
4/13/2022	7.34
10/27/2022	7.31
4/27/2023	7.01
10/11/2023	7.51

Fluoride

MW-301 (bg)



n = 23

No outliers found.
Tukey's method used in
lieu of parametric test
because the Shapiro Wilk
normality test failed
at the 0.1 alpha level.

The results were invalidated, because both the
lower and upper quartiles
represent reporting limits.

Tukey's Outlier Screening   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

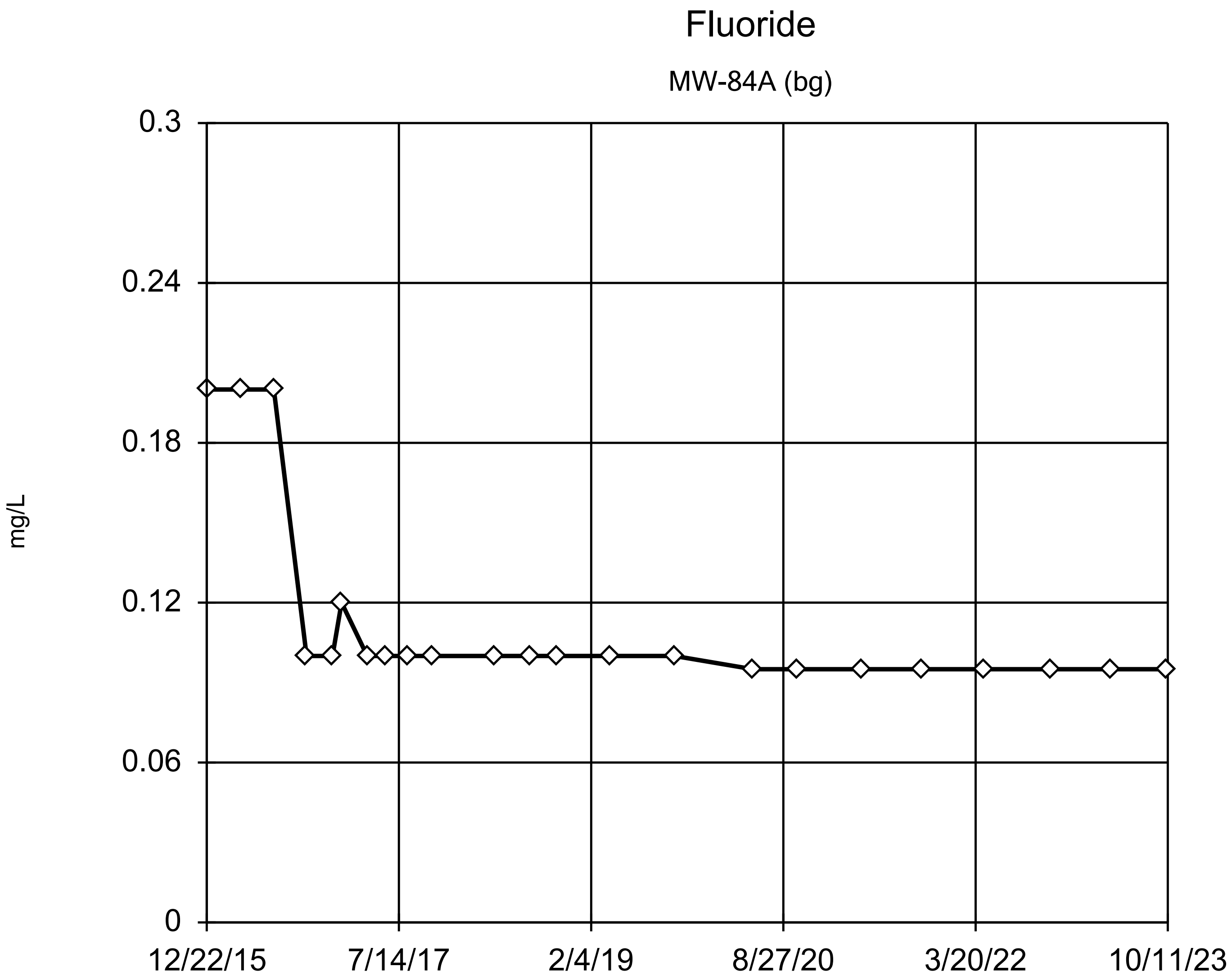
Tukey's Outlier Screening

Constituent: Fluoride (mg/L)   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)
12/22/2015	<0.2 (U)
4/5/2016	<0.2 (U)
7/8/2016	<0.2 (U)
10/13/2016	<0.1 (U)
12/29/2016	<0.1 (U)
1/25/2017	<0.1 (U)
4/11/2017	<0.1 (U)
6/6/2017	<0.1 (U)
8/8/2017	<0.1 (U)
10/23/2017	<0.1 (U)
4/25/2018	<0.1 (U)
8/8/2018	<0.1 (U)
10/24/2018	<0.1 (U)
4/2/2019	<0.1 (U)
10/9/2019	<0.1 (U)
5/29/2020	<0.095 (U)
10/8/2020	<0.095 (U)
4/14/2021	<0.095 (U)
10/14/2021	<0.095 (U)
4/13/2022	<0.095 (U)
10/27/2022	<0.095 (U)
4/27/2023	<0.095 (U)
10/11/2023	<0.095 (U)

ND substitution: RL or RL/2 if <15% NDs.



n = 23

No outliers found.
Tukey's method used in
lieu of parametric test
because the Shapiro Wilk
normality test failed
at the 0.1 alpha level.

The results were invalidated, because both the
lower and upper quartiles
represent reporting limits.

Tukey's Outlier Screening   Analysis Run 1/31/2024 3:51 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Tukey's Outlier Screening

Constituent: Fluoride (mg/L)   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

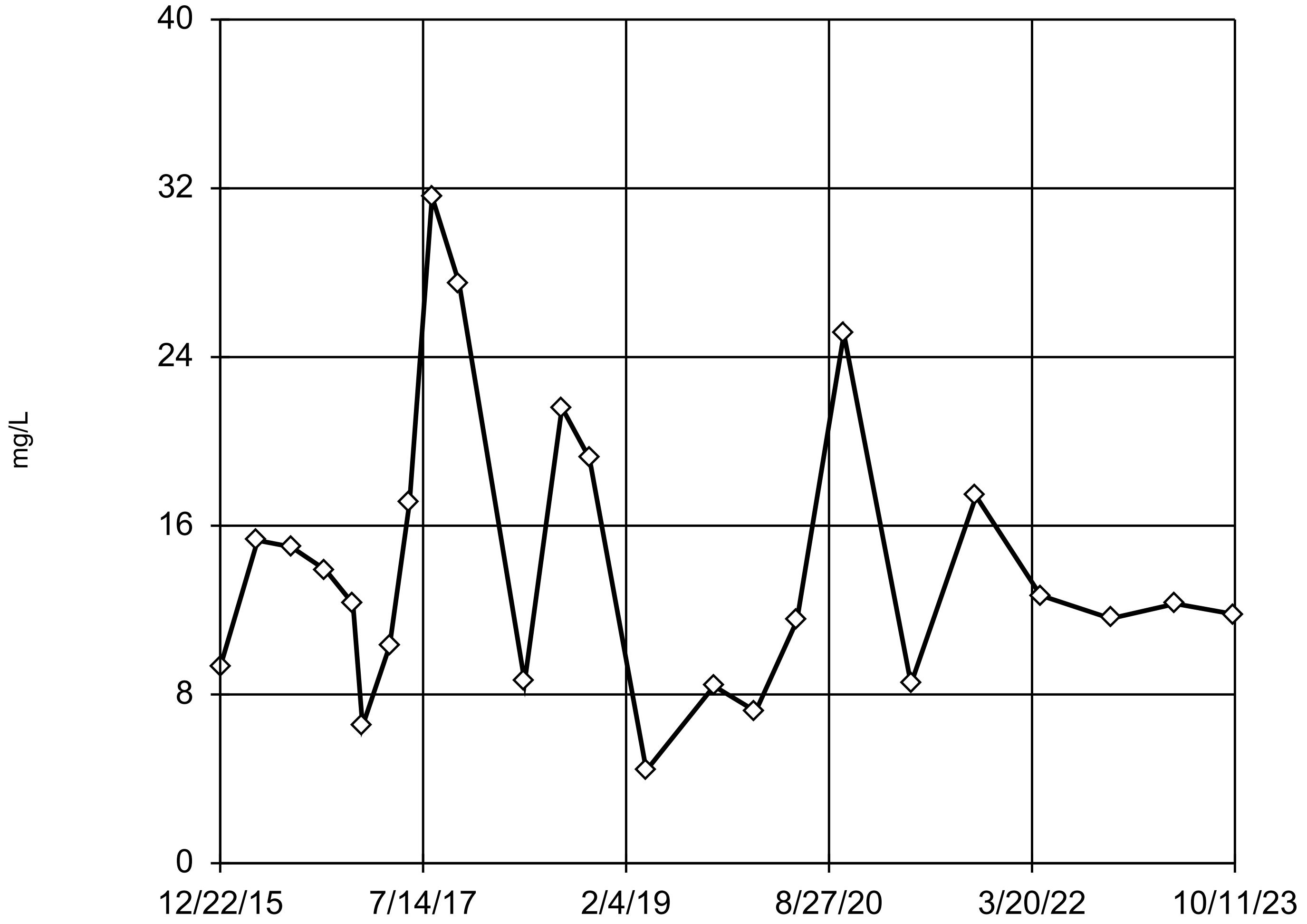
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A (bg)
12/22/2015	<0.2 (U)
4/5/2016	<0.2 (U)
7/8/2016	<0.2 (U)
10/13/2016	<0.1 (U)
12/29/2016	<0.1 (U)
1/25/2017	0.12 (J)
4/11/2017	<0.1 (U)
6/6/2017	<0.1 (U)
8/8/2017	<0.1 (U)
10/24/2017	<0.1 (U)
4/25/2018	<0.1 (U)
8/8/2018	<0.1 (U)
10/24/2018	<0.1 (U)
4/3/2019	<0.1 (U)
10/9/2019	<0.1 (U)
5/29/2020	<0.095 (U)
10/8/2020	<0.095 (U)
4/14/2021	<0.095 (U)
10/14/2021	<0.095 (U)
4/13/2022	<0.095 (U)
10/27/2022	<0.095 (U)
4/27/2023	<0.095 (U)
10/11/2023	<0.095 (U)

ND substitution: RL or RL/2 if <15% NDs.

EPA Screening (suspected outliers for Dixon's Test)

MW-301 (bg)



n = 24

Dixon's will not be run.
No suspect values identified or unable to establish suspect values.
Mean 14.13, std. dev. 6.818, critical Tn 2.644

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9884
Critical = 0.93 (after natural log transformation)
The distribution was found to be log-normal.

EPA 1989 Outlier Screening   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

EPA 1989 Outlier Screening

Constituent: Sulfate (mg/L)   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)
12/22/2015	9.3
4/5/2016	15.3
7/8/2016	15
10/13/2016	13.9
12/29/2016	12.3 (J)
1/25/2017	6.5
4/11/2017	10.3
6/6/2017	17.1
8/8/2017	31.6
10/23/2017	27.5
4/25/2018	8.6
8/8/2018	21.6
10/24/2018	19.2
4/2/2019	4.4
10/9/2019	8.4
2/3/2020	7.2
5/29/2020	11.5
10/8/2020	25.1
4/14/2021	8.5
10/14/2021	17.4
4/13/2022	12.7
10/27/2022	11.6
4/27/2023	12.3
10/11/2023	11.8

Sulfate

MW-84A (bg)

n = 24

No outliers found.
Tukey's method used in
lieu of parametric test
because the Shapiro Wilk
normality test failed
at the 0.1 alpha level.

High cutoff = 6.95, low
cutoff = -2.85, based
on IQR multiplier of 3.

Tukey's Outlier Screening   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Tukey's Outlier Screening

Constituent: Sulfate (mg/L)   Analysis Run 1/31/2024 3:52 PM   View: MOD 1-3 LF

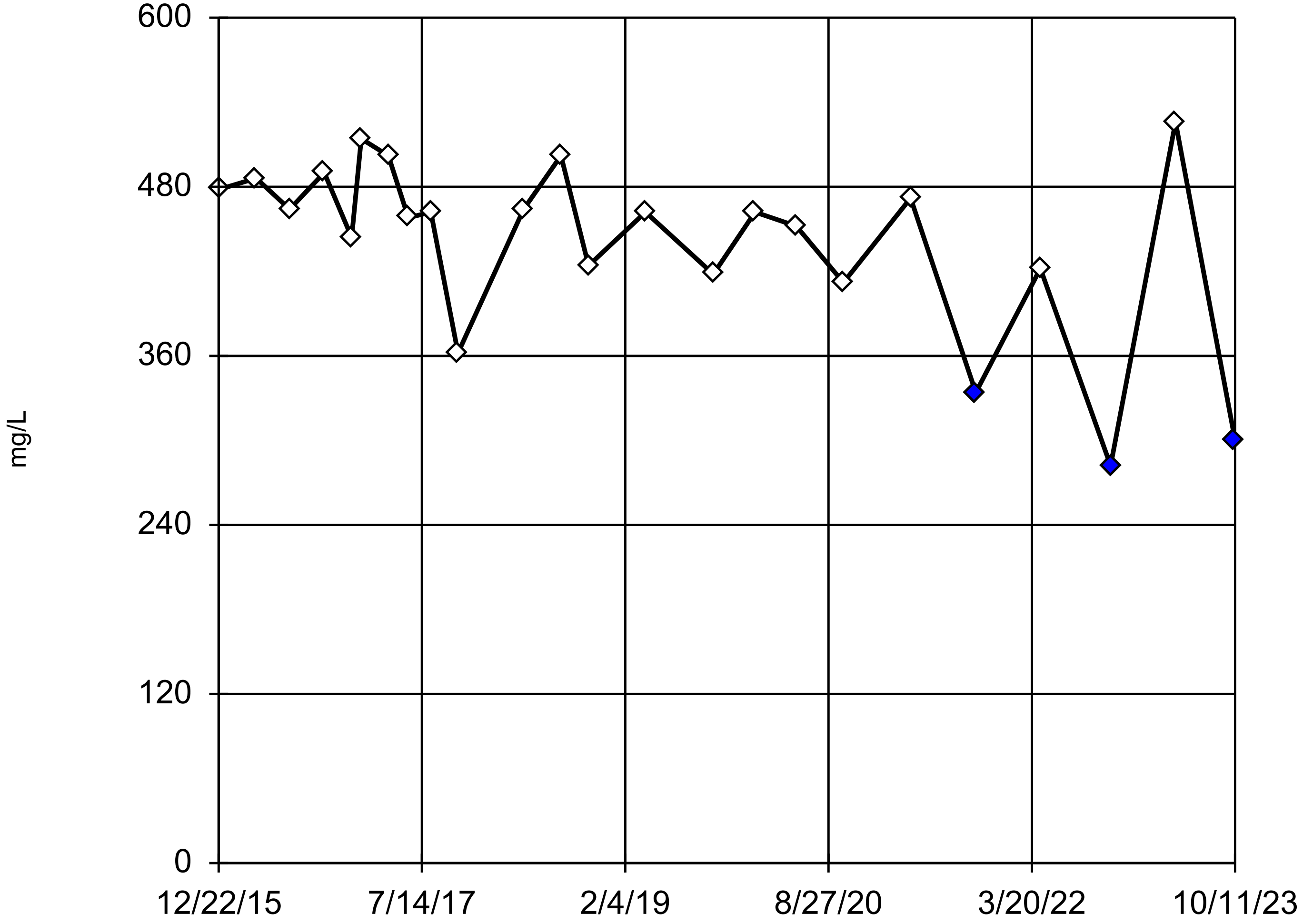
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A (bg)
12/22/2015	4.9
4/5/2016	4.3
7/8/2016	3.7 (J)
10/13/2016	2.6 (J)
12/29/2016	2.7 (J)
1/25/2017	3
4/11/2017	2.8 (J)
6/6/2017	2.7 (J)
8/8/2017	2 (J)
10/24/2017	2.2 (J)
4/25/2018	2.8 (J)
8/8/2018	1.9 (J)
10/24/2018	1.6 (J)
4/3/2019	1.4 (J)
10/9/2019	1.3 (J)
2/3/2020	<2.2 (U)
5/29/2020	1.5 (J)
10/8/2020	1.3 (J)
4/14/2021	1.4 (J)
10/14/2021	1.3 (J)
4/13/2022	1.4 (J)
10/27/2022	1.1 (J)
4/27/2023	1.3 (J)
10/11/2023	1.4 (J)

ND substitution: RL or RL/2 if <15% NDs.

Total Dissolved Solids

MW-301 (bg)



n = 24

Statistical outliers are drawn as solid.
Testing for 4 low outliers.
Mean = 441.3.
Std. Dev. = 64.07.
362: c = 0.4
tabl = 0.413.
Alpha = 0.05.
334: c = 0.4643
tabl = 0.413.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.961
Critical = 0.923
The distribution, after removal of suspect values, was found to be normally distributed.

Dixon's Outlier Test Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

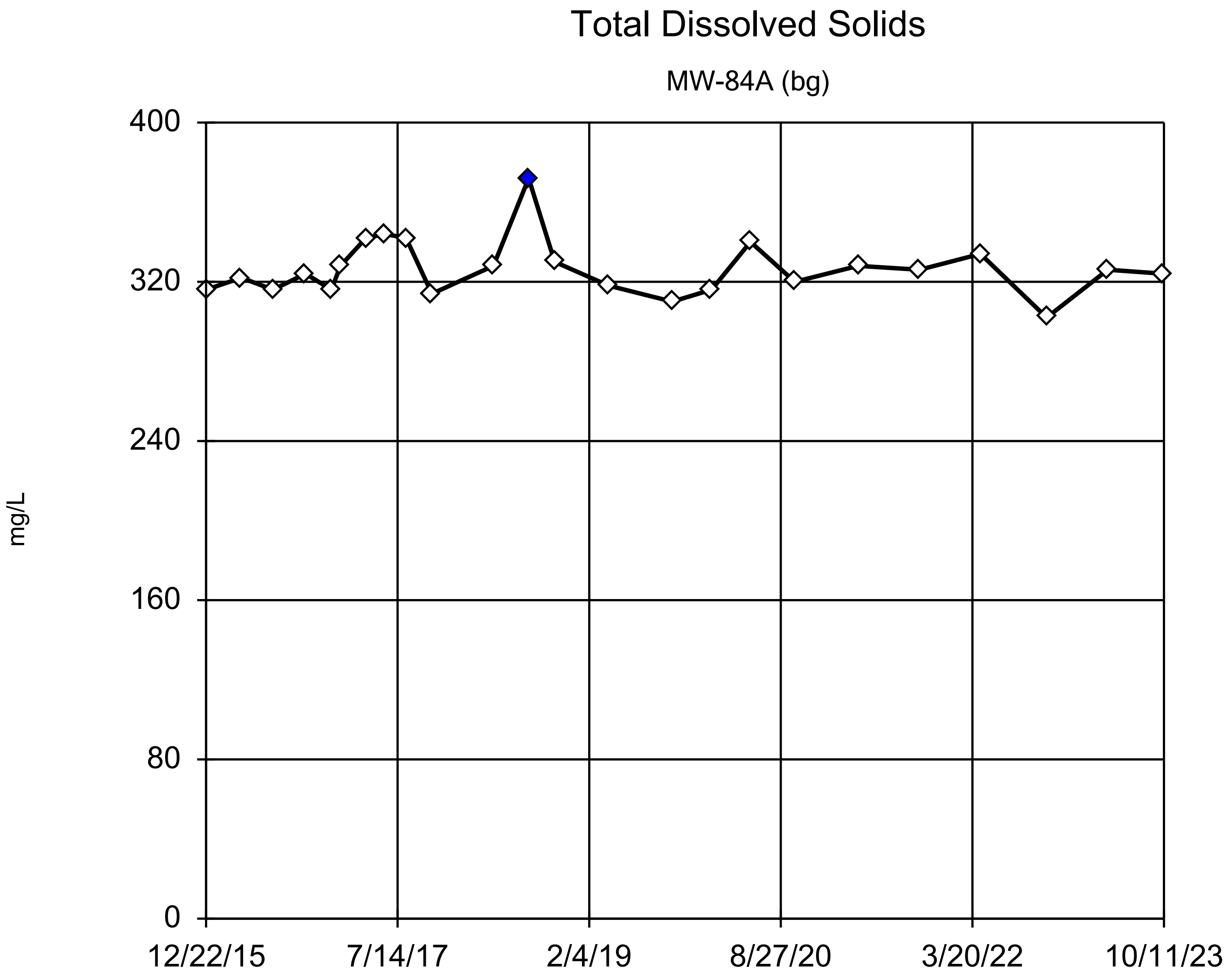
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Dixon's Outlier Test

Constituent: Total Dissolved Solids (mg/L) Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)
12/22/2015	478
4/5/2016	486
7/8/2016	464
10/13/2016	490
12/29/2016	444
1/25/2017	514
4/11/2017	502
6/6/2017	458
8/8/2017	462
10/23/2017	362
4/25/2018	464
8/8/2018	502
10/24/2018	424
4/2/2019	462
10/9/2019	418
2/3/2020	462
5/29/2020	452
10/8/2020	412
4/14/2021	472
10/14/2021	334 (O)
4/13/2022	422
10/27/2022	282 (O)
4/27/2023	526
10/11/2023	300 (O)



n = 24

Statistical outlier is
drawn as solid.
Testing for 1 high outlier.
Mean = 326.6.
Std. Dev. = 14.34.
372: c = 0.5172
tabl = 0.413.
Alpha = 0.05.

Normality test used:
Shapiro Wilk@alpha = 0.1
Calculated = 0.9632
Critical = 0.928
The distribution, after removal of suspect value, was found to be normally distributed.

Dixon's Outlier Test Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Dixon's Outlier Test

Constituent: Total Dissolved Solids (mg/L) Analysis Run 1/31/2024 3:52 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-84A (bg)
12/22/2015	316
4/5/2016	322
7/8/2016	316
10/13/2016	324
12/29/2016	316
1/25/2017	328
4/11/2017	342
6/6/2017	344
8/8/2017	342
10/24/2017	314
4/25/2018	328
8/8/2018	372 (O)
10/24/2018	330
4/3/2019	318
10/9/2019	310
2/3/2020	316
5/29/2020	340
10/8/2020	320
4/14/2021	328
10/14/2021	326
4/13/2022	334
10/27/2022	302
4/27/2023	326
10/11/2023	324

Attachment C

Welch’s t-test/Mann-Whitney Evaluation

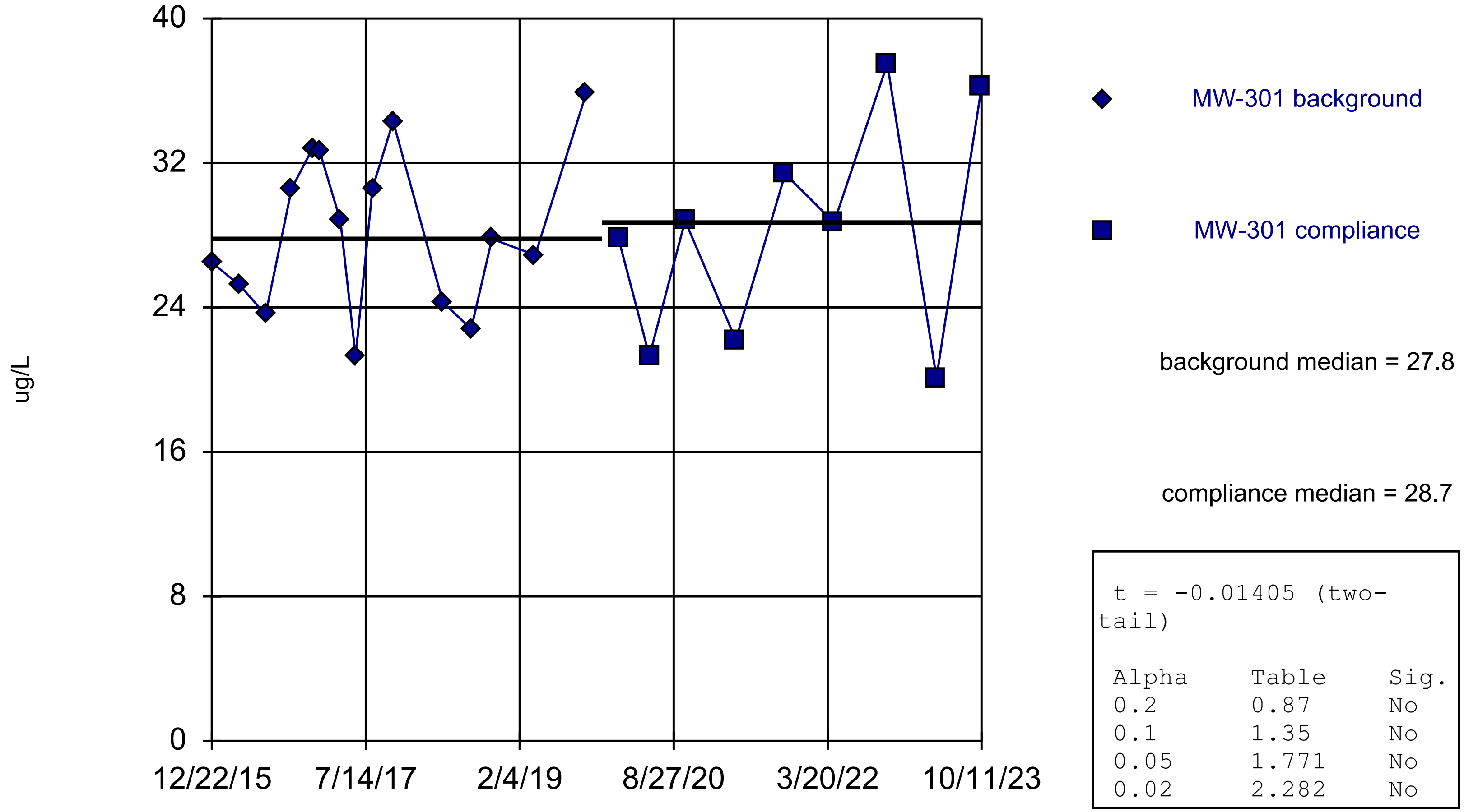
Welch's t-test/Mann-Whitney

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020   Printed 8/20/2024, 9:02 AM

Constituent	Well	Calc.	0.1	0.05	0.025	0.01	Alpha	Sig.	Bg. Wells	Method
Boron (ug/L)	MW-301 (bg)	-0....	No	No	No	No	0.01	No	(intrawell)	Welch`s
Boron (ug/L)	MW-84A (bg)	-1.85	Yes	No	No	No	0.01	No	(intrawell)	Mann-W (normality)
Calcium (ug/L)	MW-301 (bg)	-2.304	Yes	Yes	Yes	No	0.01	No	(intrawell)	Welch`s
Calcium (ug/L)	MW-84A (bg)	-1.225	Yes	No	No	No	0.01	No	(intrawell)	Welch`s
Chloride (mg/L)	MW-301 (bg)	-2.234	Yes	Yes	Yes	Yes	0.01	No	(intrawell)	Welch`s
Chloride (mg/L)	**MW-84A (bg)**	**-3.313**	**Yes**	**Yes**	**Yes**	**Yes**	**0.01**	**Yes**	**(intrawell)**	**Welch`s**
Field pH (Std. Units)	MW-301 (bg)	-0....	Yes	No	No	No	0.01	No	(intrawell)	Welch`s
Field pH (Std. Units)	MW-84A (bg)	-0....	No	No	No	No	0.01	No	(intrawell)	Welch`s
Fluoride (mg/L)	**MW-301 (bg)**	**-4.325**	**Yes**	**Yes**	**Yes**	**Yes**	**0.01**	**Yes**	**(intrawell)**	**Mann-W (NDs)**
Fluoride (mg/L)	**MW-84A (bg)**	**-4.241**	**Yes**	**Yes**	**Yes**	**Yes**	**0.01**	**Yes**	**(intrawell)**	**Mann-W (NDs)**
Sulfate (mg/L)	MW-301 (bg)	-0....	No	No	No	No	0.01	No	(intrawell)	Welch`s
Sulfate (mg/L)	**MW-84A (bg)**	**-5.019**	**Yes**	**Yes**	**Yes**	**Yes**	**0.01**	**Yes**	**(intrawell)**	**Welch`s**
Total Dissolved Solids (mg/L)	MW-301 (bg)	-1.858	Yes	Yes	Yes	No	0.01	No	(intrawell)	Welch`s
Total Dissolved Solids (mg/L)	MW-84A (bg)	-0....	No	No	No	No	0.01	No	(intrawell)	Mann-W (normality)

Boron

MW-301 (bg)



```
 t = -0.01405 (two-
tail)

 Alpha        Table       Sig.
 0.2          0.87        No
 0.1          1.35        No
 0.05         1.771       No
 0.02         2.282       No
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9694, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

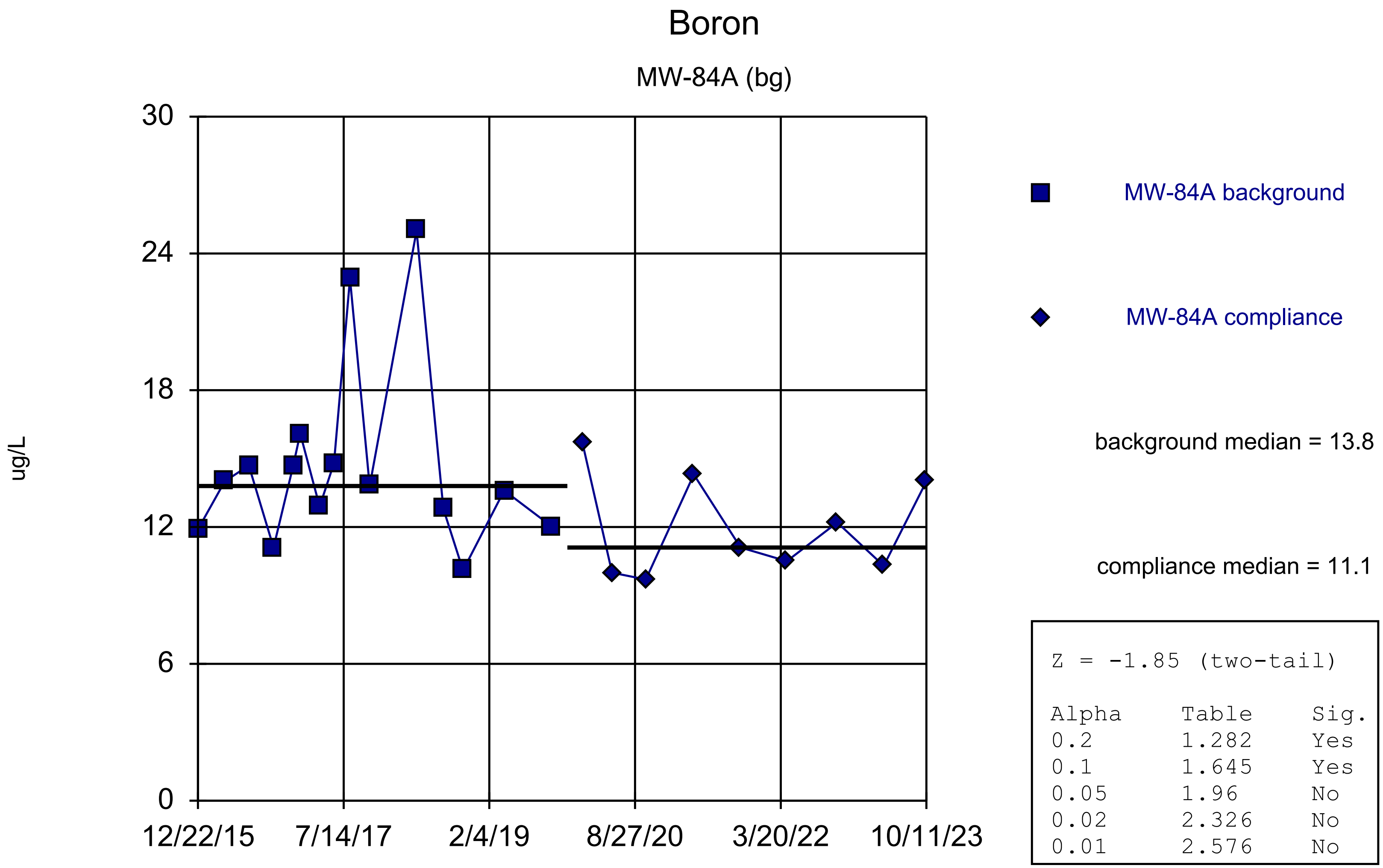
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

Constituent: Boron (ug/L)   Analysis Run 8/20/2024 9:02 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301	MW-301
12/22/2015	26.5	
4/5/2016	25.2	
7/8/2016	23.6	
10/13/2016	30.6	
12/29/2016	32.8	
1/25/2017	32.6	
4/11/2017	28.8	
6/6/2017	21.3	
8/8/2017	30.6	
10/23/2017	34.3	
4/25/2018	24.3	
8/8/2018	22.8	
10/24/2018	27.8	
4/2/2019	26.9	
10/9/2019	35.9	
2/3/2020		27.9
5/29/2020		21.3
10/8/2020		28.8
4/14/2021		22.2
10/14/2021		31.4
4/13/2022		28.7
10/27/2022		37.5
4/27/2023		20.1
10/11/2023		36.2



```
Z = -1.85 (two-tail)

Alpha     Table     Sig.
0.2       1.282     Yes
0.1       1.645     Yes
0.05      1.96      No
0.02      2.326     No
0.01      2.576     No
```

Mann-Whitney (Wilcoxon Rank Sum) used in lieu of Welch's t-test because the Shapiro Wilk normality test showed the data to be non-normal at the 0.05 alpha level.

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Mann-Whitney (Wilcoxon Rank Sum)

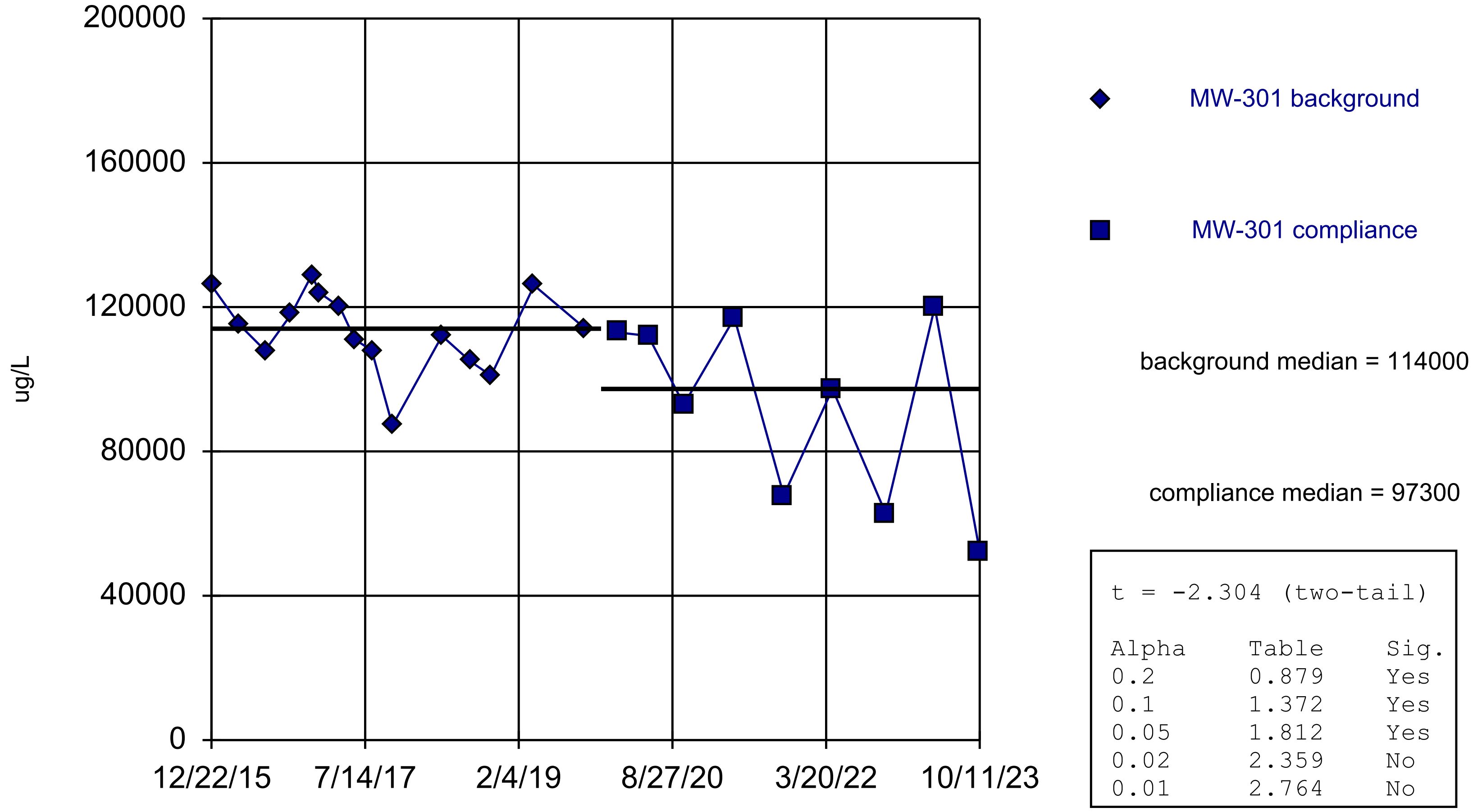
Constituent: Boron (ug/L)   Analysis Run 8/20/2024 9:02 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A	MW-84A
12/22/2015	11.9	
4/5/2016	14	
7/8/2016	14.7	
10/13/2016	11.1	
12/29/2016	14.7	
1/25/2017	16.1	
4/11/2017	12.9	
6/6/2017	14.8	
8/8/2017	22.9	
10/24/2017	13.8	
4/25/2018	25	
8/8/2018	12.8	
10/24/2018	10.1 (J)	
4/3/2019	13.6	
10/9/2019	12	
2/3/2020		15.7
5/29/2020		10
10/8/2020		9.7 (J)
4/14/2021		14.3
10/14/2021		11.1
4/13/2022		10.5
10/27/2022		12.2
4/27/2023		10.3
10/11/2023		14

Calcium

MW-301 (bg)



```
t = -2.304 (two-tail)

Alpha      Table      Sig.
0.2        0.879      Yes
0.1        1.372      Yes
0.05       1.812      Yes
0.02       2.359      No
0.01       2.764      No
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9509, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

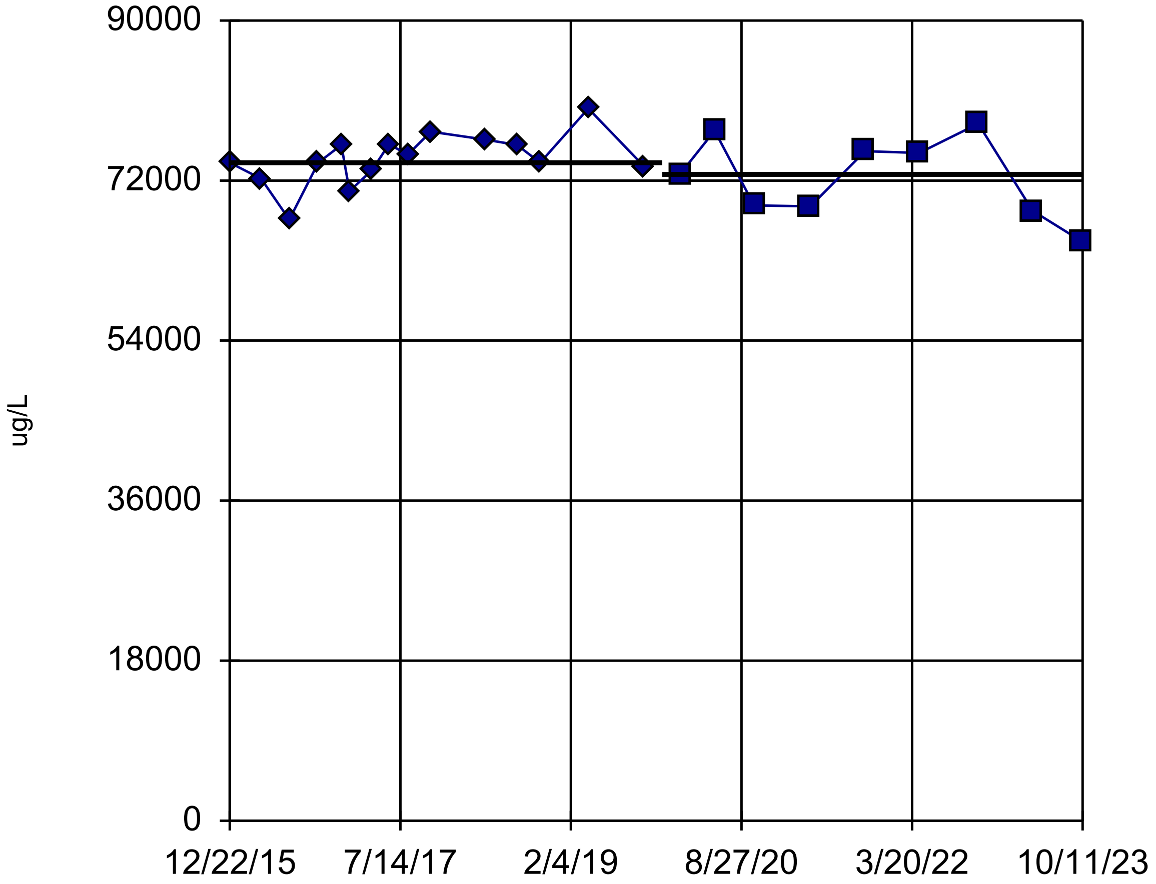
Welch's t-test

Constituent: Calcium (ug/L) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301	MW-301
12/22/2015	126000	
4/5/2016	115000	
7/8/2016	108000	
10/13/2016	118000	
12/29/2016	129000	
1/25/2017	124000	
4/11/2017	120000	
6/6/2017	111000	
8/8/2017	108000	
10/23/2017	87200	
4/25/2018	112000	
8/8/2018	105000	
10/24/2018	101000	
4/2/2019	126000	
10/9/2019	114000	
2/3/2020		113000
5/29/2020		112000
10/8/2020		93000
4/14/2021		117000
10/14/2021		67800
4/13/2022		97300
10/27/2022		62800
4/27/2023		120000
10/11/2023		52300

Calcium

MW-84A (bg)



◆ MW-84A background

■ MW-84A compliance

background median = 74000

compliance median = 72700

```
t = -1.225 (two-tail)

Alpha       Table       Sig.
0.2         0.873       Yes
0.1         1.356       No
0.05        1.782       No
0.02        2.303       No
0.01        2.681       No
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.965, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

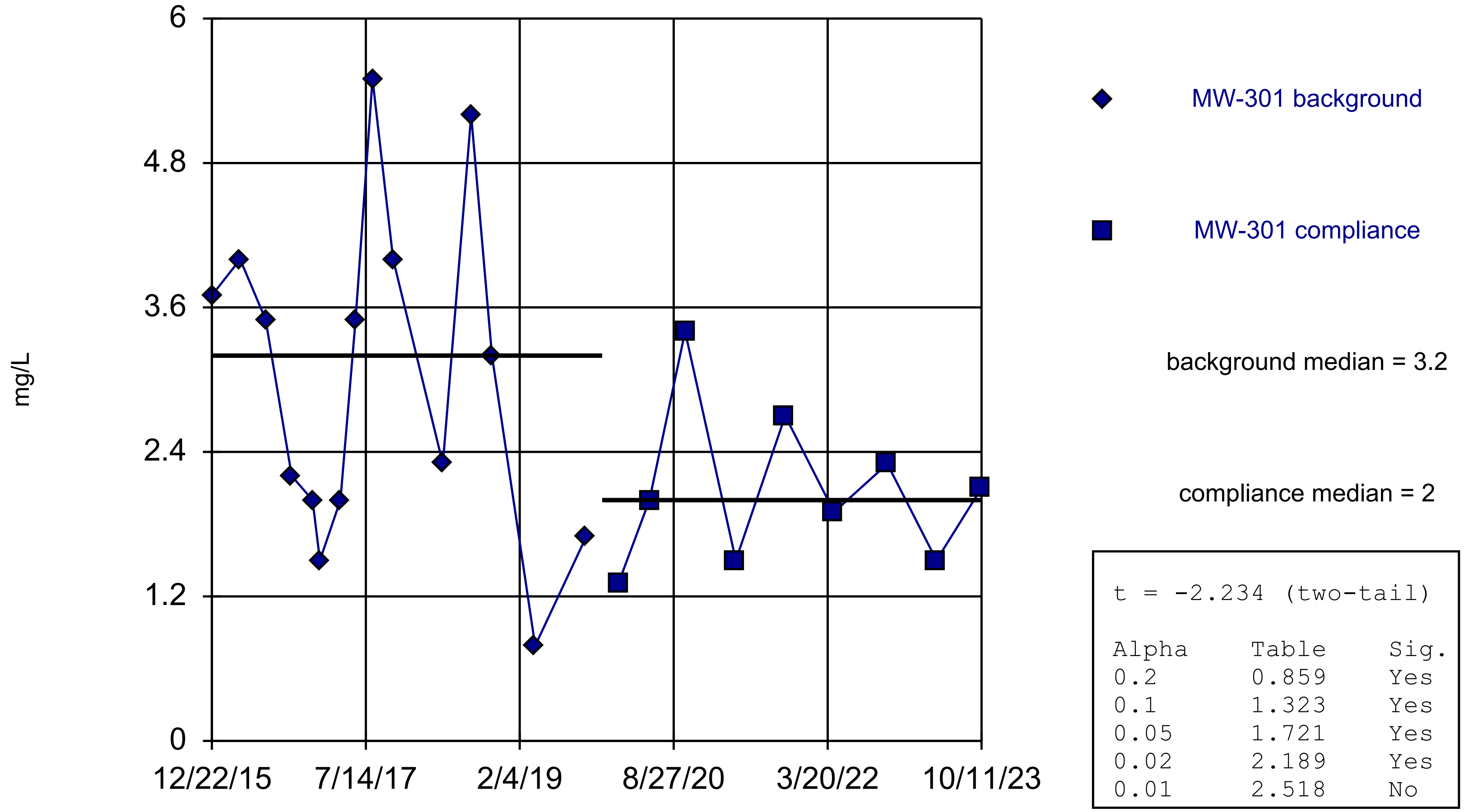
Constituent: Calcium (ug/L) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-84A	MW-84A
12/22/2015	74000	
4/5/2016	72200	
7/8/2016	67600	
10/13/2016	74000	
12/29/2016	76000	
1/25/2017	70800	
4/11/2017	73200	
6/6/2017	76100	
8/8/2017	74900	
10/24/2017	77500	
4/25/2018	76600	
8/8/2018	76000	
10/24/2018	74000	
4/3/2019	80100	
10/9/2019	73500	
2/3/2020		72700
5/29/2020		77600
10/8/2020		69200
4/14/2021		69100
10/14/2021		75300
4/13/2022		75100
10/27/2022		78400
4/27/2023		68600
10/11/2023		65100

Chloride

MW-301 (bg)



```
t = -2.234 (two-tail)

Alpha      Table      Sig.
0.2        0.859      Yes
0.1        1.323      Yes
0.05       1.721      Yes
0.02       2.189      Yes
0.01       2.518      No
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9568, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

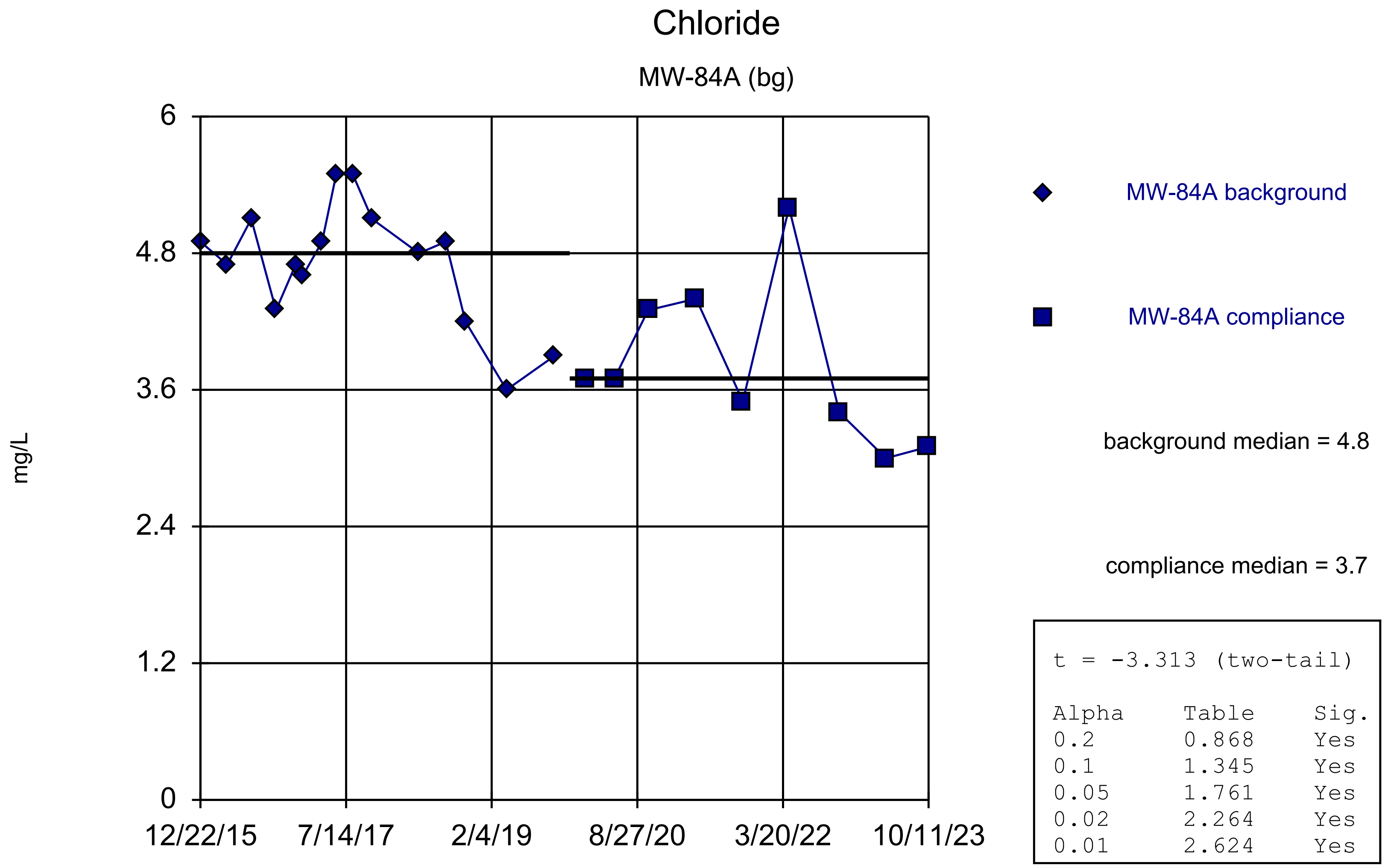
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

Constituent: Chloride (mg/L) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301	MW-301
12/22/2015	3.7 (J)	
4/5/2016	4	
7/8/2016	3.5 (J)	
10/13/2016	2.2	
12/29/2016	2 (J)	
1/25/2017	1.5 (J)	
4/11/2017	2	
6/6/2017	3.5	
8/8/2017	5.5	
10/23/2017	4	
4/25/2018	2.3	
8/8/2018	5.2	
10/24/2018	3.2	
4/2/2019	0.79 (J)	
10/9/2019	1.7 (J)	
2/3/2020		1.3 (J)
5/29/2020		2 (J)
10/8/2020		3.4
4/14/2021		1.5 (J)
10/14/2021		2.7
4/13/2022		1.9 (J)
10/27/2022		2.3
4/27/2023		1.5 (J)
10/11/2023		2.1



```
t = -3.313 (two-tail)

Alpha      Table      Sig.
0.2        0.868      Yes
0.1        1.345      Yes
0.05       1.761      Yes
0.02       2.264      Yes
0.01       2.624      Yes
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9504, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

Constituent: Chloride (mg/L)   Analysis Run 8/20/2024 9:02 AM   View: MOD 1-3 LF

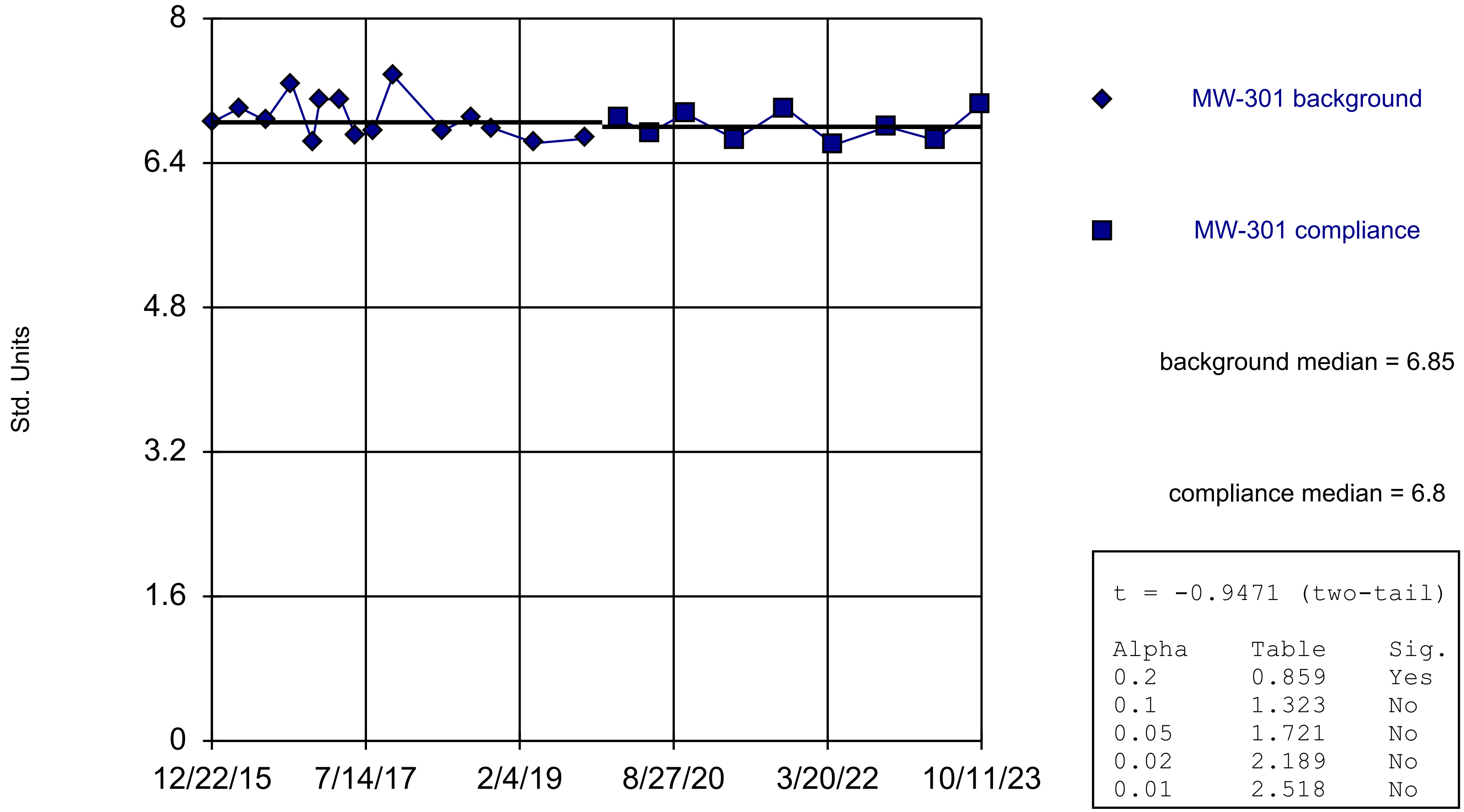
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A	MW-84A
12/22/2015	4.9	
4/5/2016	4.7	
7/8/2016	5.1	
10/13/2016	4.3	
12/29/2016	4.7	
1/25/2017	4.6	
4/11/2017	4.9	
6/6/2017	5.5	
8/8/2017	5.5	
10/24/2017	5.1	
4/25/2018	4.8	
8/8/2018	4.9	
10/24/2018	4.2	
4/3/2019	3.6	
10/9/2019	3.9	
2/3/2020		3.7
5/29/2020		3.7
10/8/2020		4.3
4/14/2021		4.4
10/14/2021		3.5
4/13/2022		5.2
10/27/2022		3.4
4/27/2023		3
10/11/2023		3.1

Sanitas™ v.10.0.20 Software licensed to SCS Engineers. UG

Field pH

MW-301 (bg)



```
t = -0.9471 (two-tail)

Alpha      Table      Sig.
0.2        0.859      Yes
0.1        1.323      No
0.05       1.721      No
0.02       2.189      No
0.01       2.518      No
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9201, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

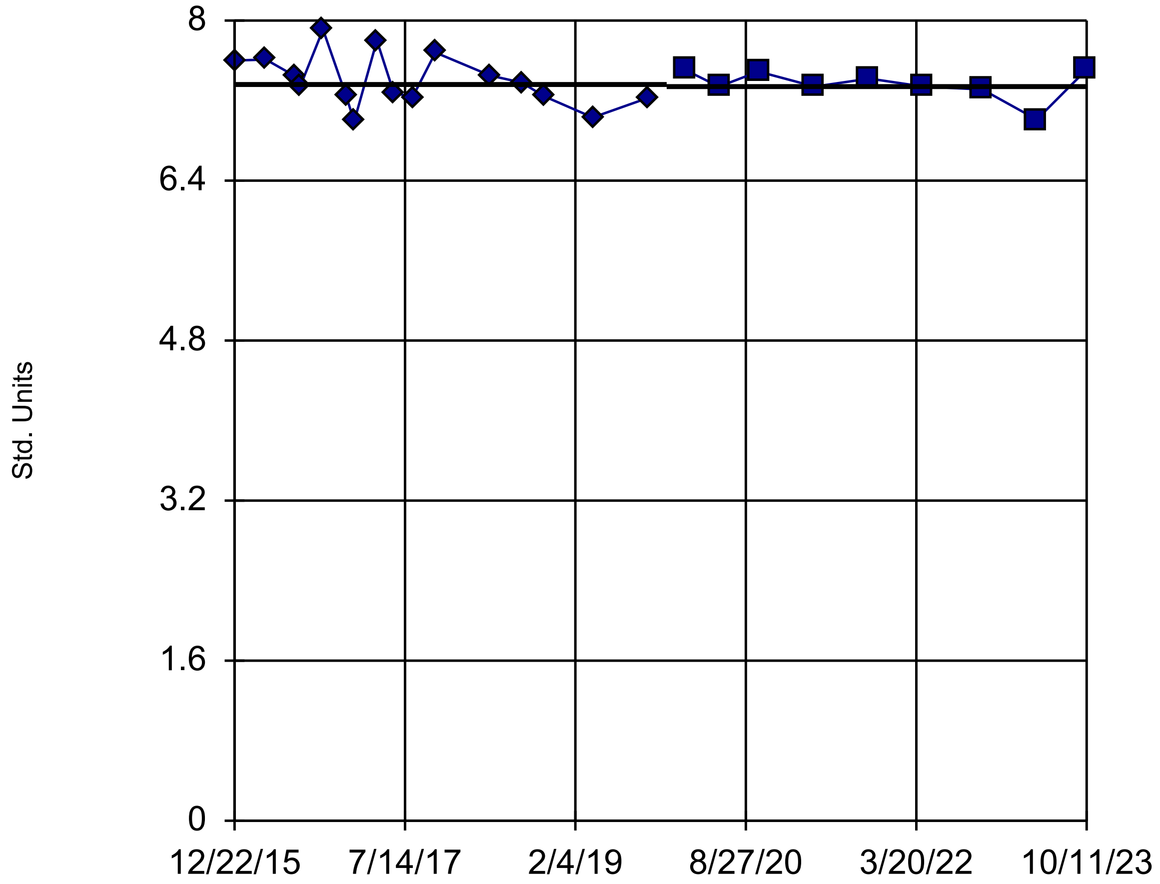
Constituent: Field pH (Std. Units) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301	MW-301
12/22/2015	6.85	
4/5/2016	7.01	
7/8/2016	6.87	
10/13/2016	7.28	
12/29/2016	6.63	
1/25/2017	7.1	
4/11/2017	7.11	
6/6/2017	6.7	
8/8/2017	6.75	
10/23/2017	7.37	
4/25/2018	6.76	
8/8/2018	6.91	
10/24/2018	6.79	
4/2/2019	6.62	
10/9/2019	6.67	
2/3/2020		6.89
5/29/2020		6.73
10/8/2020		6.95
4/14/2021		6.66
10/14/2021		7.01
4/13/2022		6.6
10/27/2022		6.8
4/27/2023		6.65
10/11/2023		7.06

Field pH

MW-84A (bg)



◆ MW-84A background

■ MW-84A compliance

background median = 7.36

compliance median = 7.34

t = -0.4942 (two-tail)

Alpha	Table	Sig.
0.2	0.858	No
0.1	1.319	No
0.05	1.714	No
0.02	2.177	No
0.01	2.5	No

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9615, critical = 0.887.

Welch's t-test   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

Constituent: Field pH (Std. Units)   Analysis Run 8/20/2024 9:02 AM   View: MOD 1-3 LF

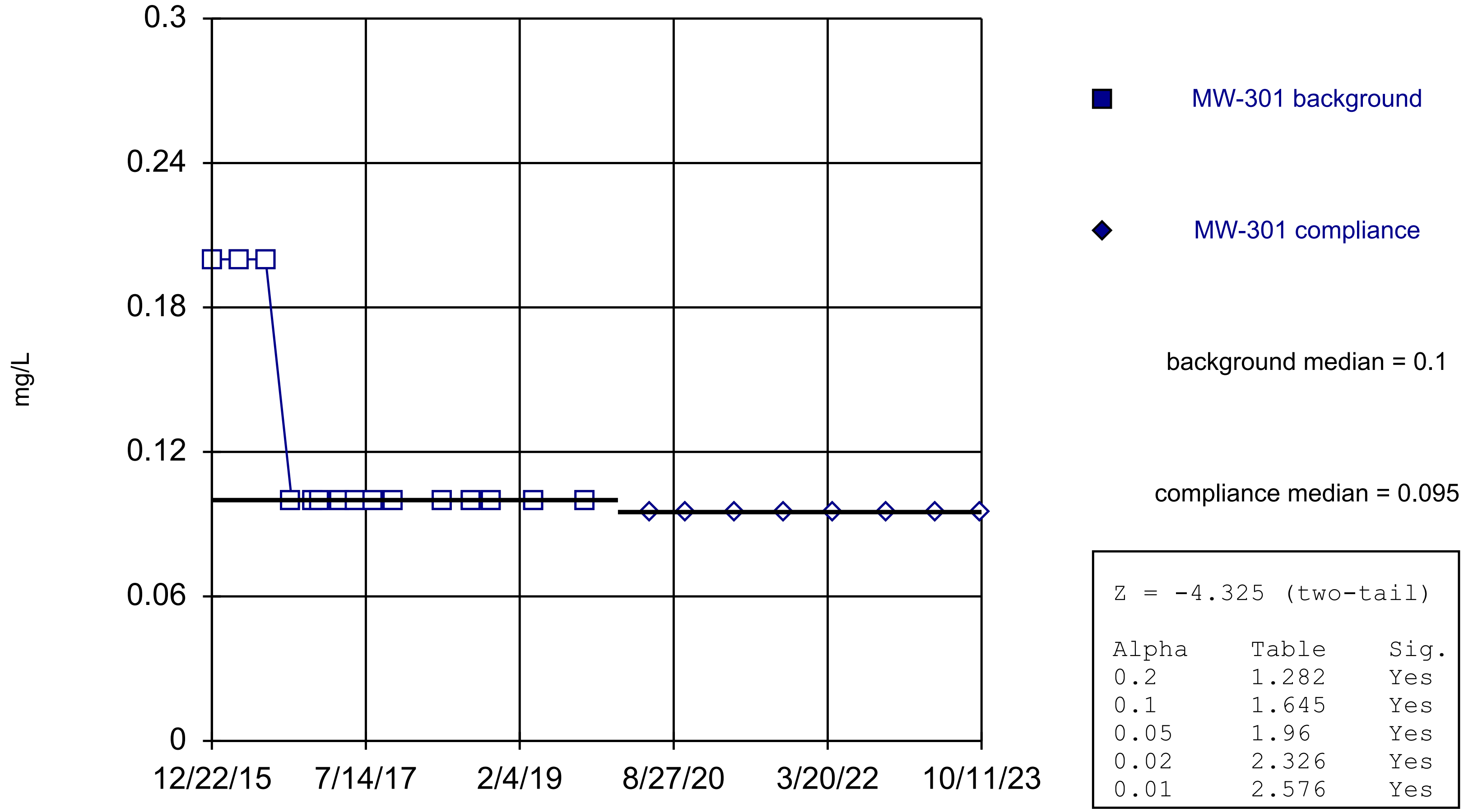
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A	MW-84A
12/22/2015	7.6	
4/5/2016	7.61	
7/8/2016	7.45	
7/28/2016	7.34	
10/13/2016	7.91	
12/29/2016	7.25	
1/25/2017	6.99	
4/11/2017	7.8	
6/6/2017	7.28	
8/8/2017	7.23	
10/24/2017	7.68	
4/25/2018	7.45	
8/8/2018	7.38	
10/24/2018	7.24	
4/3/2019	7.03	
10/9/2019	7.23	
2/3/2020		7.51
5/29/2020		7.34
10/8/2020		7.49
4/14/2021		7.34
10/14/2021		7.42
4/13/2022		7.34
10/27/2022		7.31
4/27/2023		7.01
10/11/2023		7.51

Sanitas™ v.10.0.20 Software licensed to SCS Engineers. UG
Hollow symbols indicate censored values.

Fluoride

MW-301 (bg)



```
Z = -4.325 (two-tail)

Alpha     Table     Sig.
0.2       1.282     Yes
0.1       1.645     Yes
0.05      1.96      Yes
0.02      2.326     Yes
0.01      2.576     Yes
```

Mann-Whitney (Wilcoxon Rank Sum) used in lieu of Welch's t-test because censored data exceeded 75%.

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Fluoride (mg/L) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF

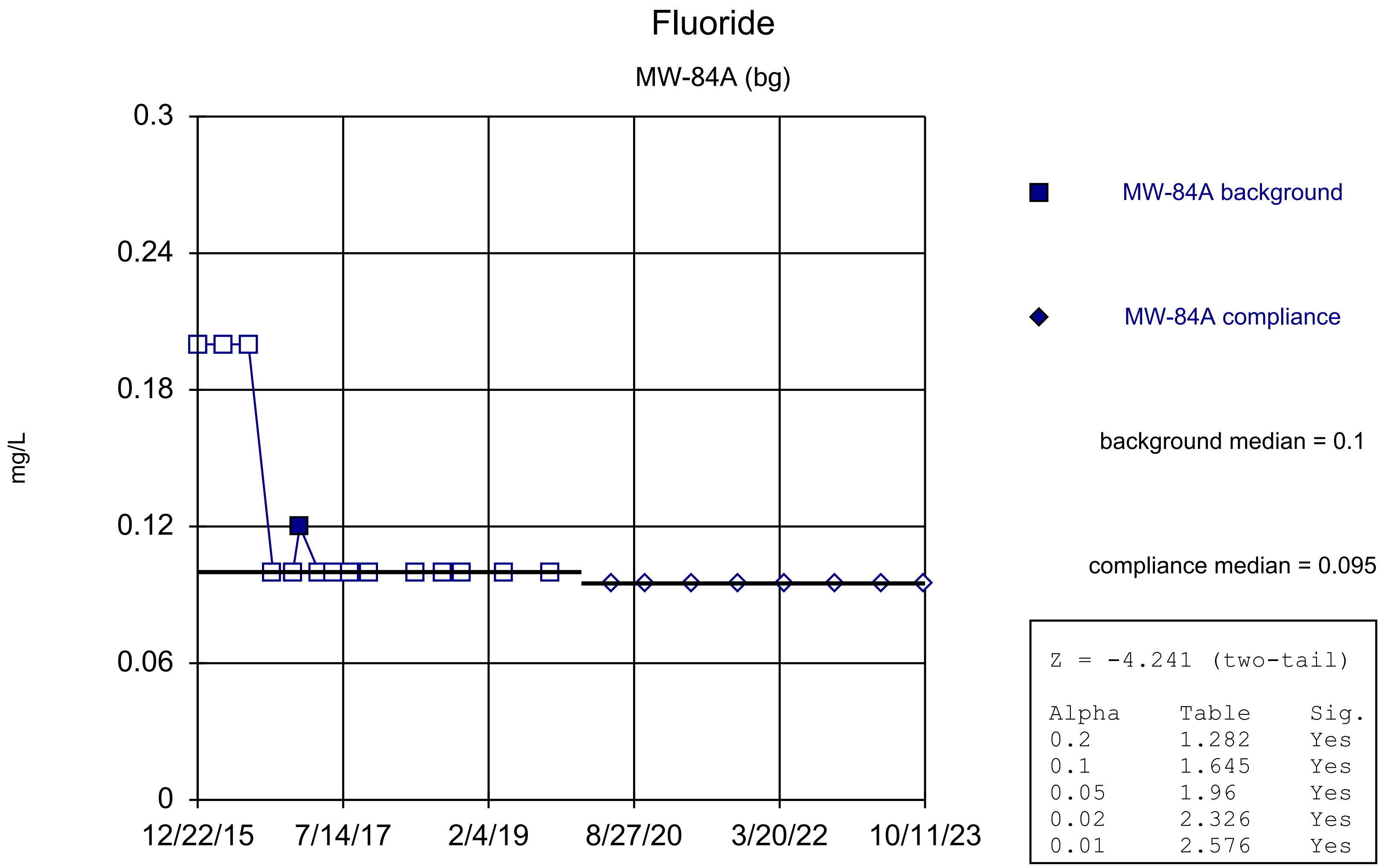
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301	MW-301
12/22/2015	<0.2 (U)	
4/5/2016	<0.2 (U)	
7/8/2016	<0.2 (U)	
10/13/2016	<0.1 (U)	
12/29/2016	<0.1 (U)	
1/25/2017	<0.1 (U)	
4/11/2017	<0.1 (U)	
6/6/2017	<0.1 (U)	
8/8/2017	<0.1 (U)	
10/23/2017	<0.1 (U)	
4/25/2018	<0.1 (U)	
8/8/2018	<0.1 (U)	
10/24/2018	<0.1 (U)	
4/2/2019	<0.1 (U)	
10/9/2019	<0.1 (U)	
5/29/2020		<0.095 (U)
10/8/2020		<0.095 (U)
4/14/2021		<0.095 (U)
10/14/2021		<0.095 (U)
4/13/2022		<0.095 (U)
10/27/2022		<0.095 (U)
4/27/2023		<0.095 (U)
10/11/2023		<0.095 (U)

ND substitution: RL or RL/2 if <15% NDs.

Sanitas™ v.10.0.20 Software licensed to SCS Engineers. UG

Hollow symbols indicate censored values.



```
Z = -4.241 (two-tail)

Alpha      Table      Sig.
0.2        1.282      Yes
0.1        1.645      Yes
0.05       1.96       Yes
0.02       2.326      Yes
0.01       2.576      Yes
```

Mann-Whitney (Wilcoxon Rank Sum) used in lieu of Welch's t-test because censored data exceeded 75%.

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 8/20/2024 9:00 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Fluoride (mg/L)   Analysis Run 8/20/2024 9:02 AM   View: MOD 1-3 LF

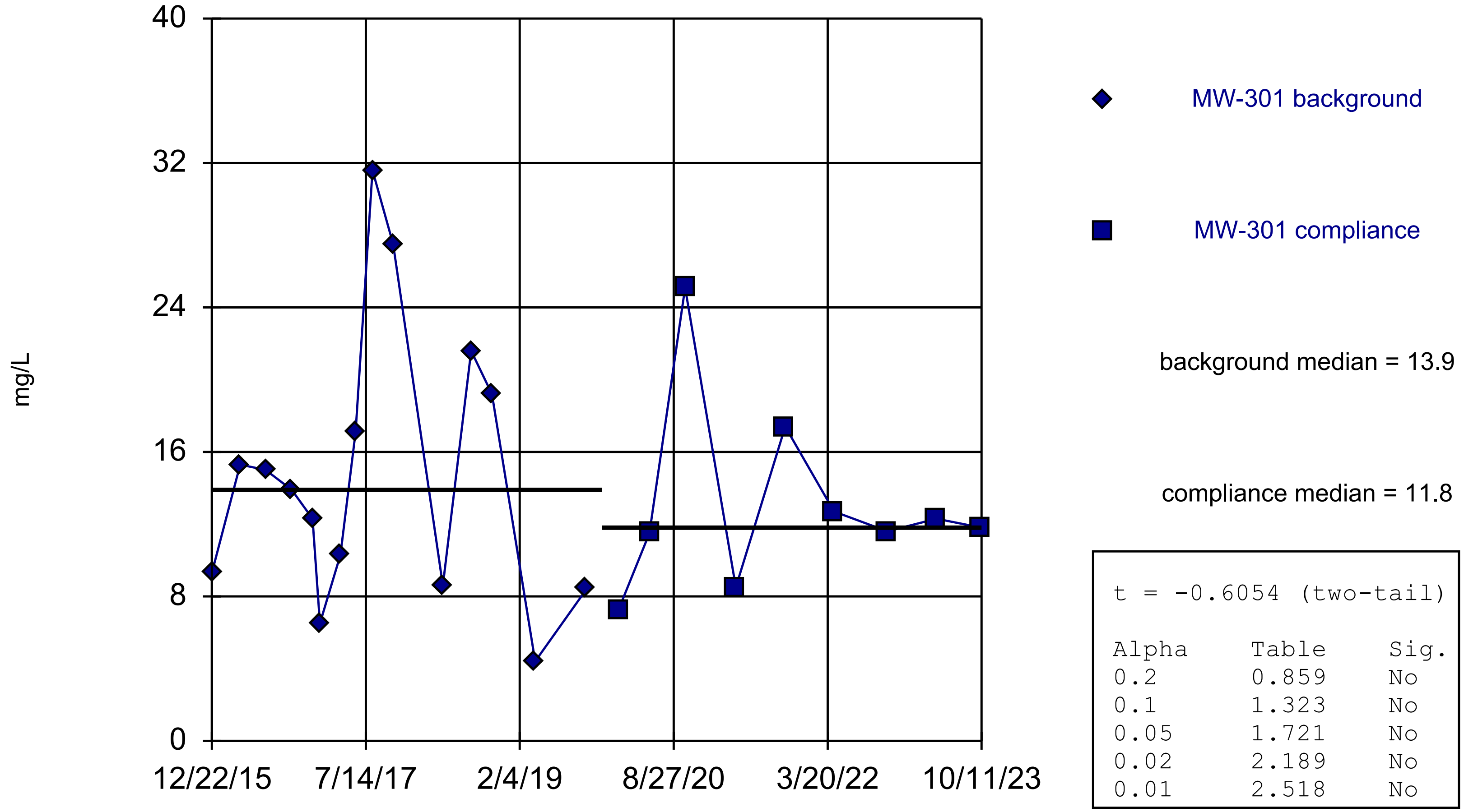
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-84A	MW-84A
12/22/2015	<0.2 (U)	
4/5/2016	<0.2 (U)	
7/8/2016	<0.2 (U)	
10/13/2016	<0.1 (U)	
12/29/2016	<0.1 (U)	
1/25/2017	0.12 (J)	
4/11/2017	<0.1 (U)	
6/6/2017	<0.1 (U)	
8/8/2017	<0.1 (U)	
10/24/2017	<0.1 (U)	
4/25/2018	<0.1 (U)	
8/8/2018	<0.1 (U)	
10/24/2018	<0.1 (U)	
4/3/2019	<0.1 (U)	
10/9/2019	<0.1 (U)	
5/29/2020		<0.095 (U)
10/8/2020		<0.095 (U)
4/14/2021		<0.095 (U)
10/14/2021		<0.095 (U)
4/13/2022		<0.095 (U)
10/27/2022		<0.095 (U)
4/27/2023		<0.095 (U)
10/11/2023		<0.095 (U)

ND substitution: RL or RL/2 if <15% NDs.

Sulfate

MW-301 (bg)



t = -0.6054 (two-tail)

Alpha	Table	Sig.
0.2	0.859	No
0.1	1.323	No
0.05	1.721	No
0.02	2.189	No
0.01	2.518	No

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9358, critical = 0.881.

Welch's t-test Analysis Run 8/20/2024 9:00 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Welch's t-test

Constituent: Sulfate (mg/L) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF

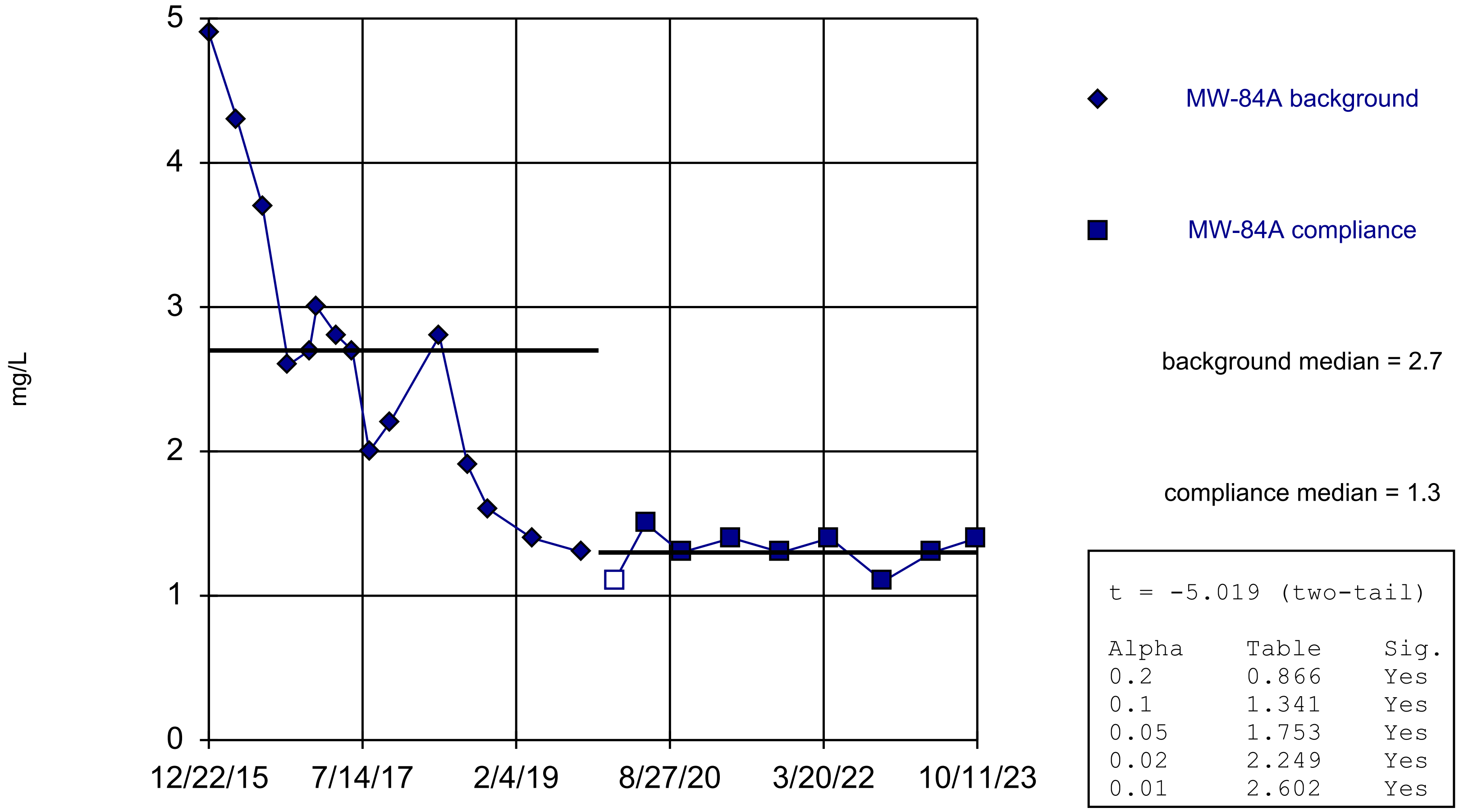
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301	MW-301
12/22/2015	9.3	
4/5/2016	15.3	
7/8/2016	15	
10/13/2016	13.9	
12/29/2016	12.3 (J)	
1/25/2017	6.5	
4/11/2017	10.3	
6/6/2017	17.1	
8/8/2017	31.6	
10/23/2017	27.5	
4/25/2018	8.6	
8/8/2018	21.6	
10/24/2018	19.2	
4/2/2019	4.4	
10/9/2019	8.4	
2/3/2020		7.2
5/29/2020		11.5
10/8/2020		25.1
4/14/2021		8.5
10/14/2021		17.4
4/13/2022		12.7
10/27/2022		11.6
4/27/2023		12.3
10/11/2023		11.8

Sanitas™ v.10.0.20 Software licensed to SCS Engineers. UG
Hollow symbols indicate censored values.

Sulfate

MW-84A (bg)



```
t = -5.019 (two-tail)

Alpha       Table      Sig.
0.2         0.866      Yes
0.1         1.341      Yes
0.05        1.753      Yes
0.02        2.249      Yes
0.01        2.602      Yes
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.9334, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:01 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

Constituent: Sulfate (mg/L) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF

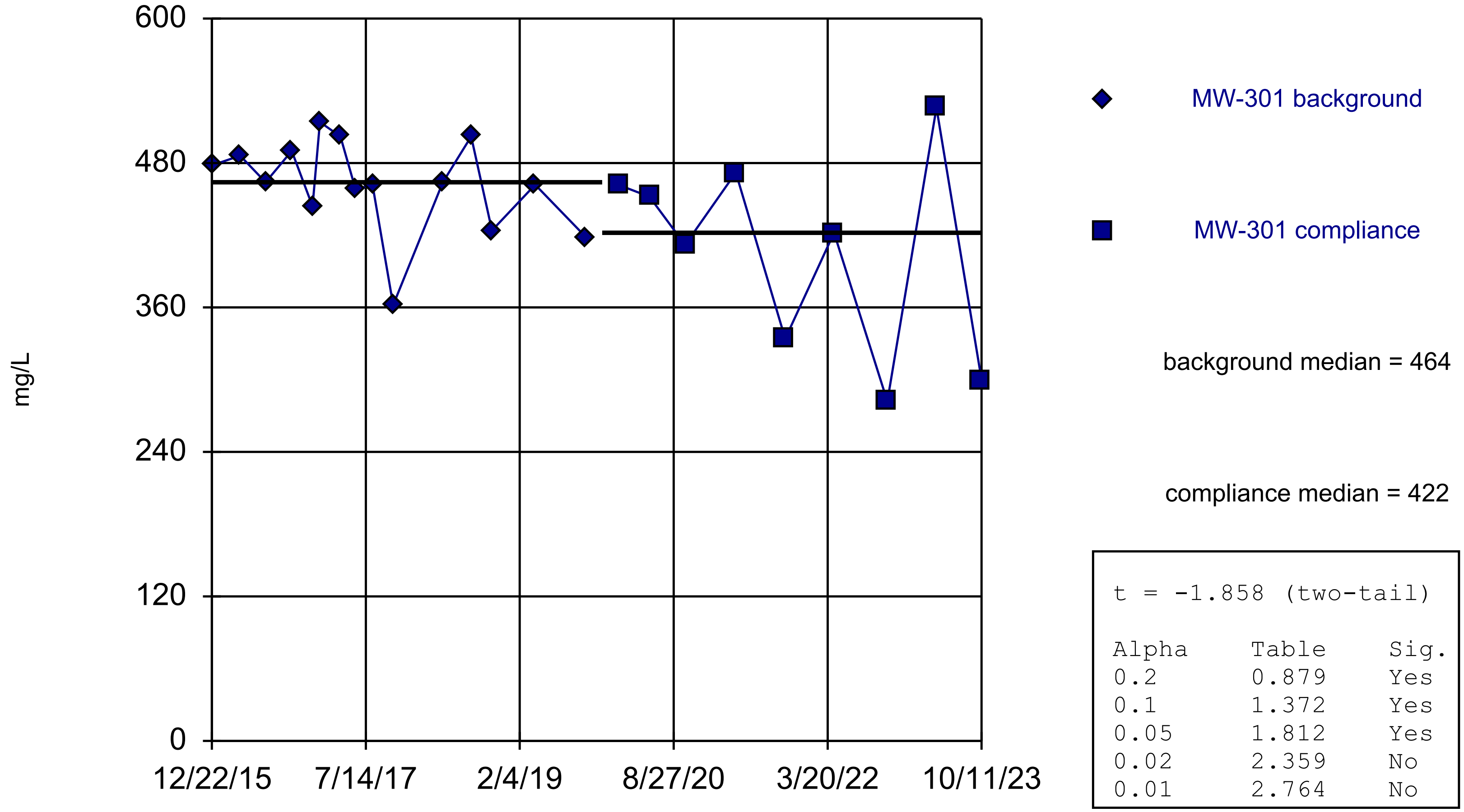
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-84A	MW-84A
12/22/2015	4.9	
4/5/2016	4.3	
7/8/2016	3.7 (J)	
10/13/2016	2.6 (J)	
12/29/2016	2.7 (J)	
1/25/2017	3	
4/11/2017	2.8 (J)	
6/6/2017	2.7 (J)	
8/8/2017	2 (J)	
10/24/2017	2.2 (J)	
4/25/2018	2.8 (J)	
8/8/2018	1.9 (J)	
10/24/2018	1.6 (J)	
4/3/2019	1.4 (J)	
10/9/2019	1.3 (J)	
2/3/2020		<2.2 (U)
5/29/2020		1.5 (J)
10/8/2020		1.3 (J)
4/14/2021		1.4 (J)
10/14/2021		1.3 (J)
4/13/2022		1.4 (J)
10/27/2022		1.1 (J)
4/27/2023		1.3 (J)
10/11/2023		1.4 (J)

ND substitution: RL or RL/2 if <15% NDs.

Total Dissolved Solids

MW-301 (bg)



```
t = -1.858 (two-tail)

Alpha     Table     Sig.
0.2       0.879     Yes
0.1       1.372     Yes
0.05      1.812     Yes
0.02      2.359     No
0.01      2.764     No
```

Normality test: Shapiro Wilk @alpha = 0.05, calculated = 0.915, critical = 0.881.

Welch's t-test   Analysis Run 8/20/2024 9:01 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Welch's t-test

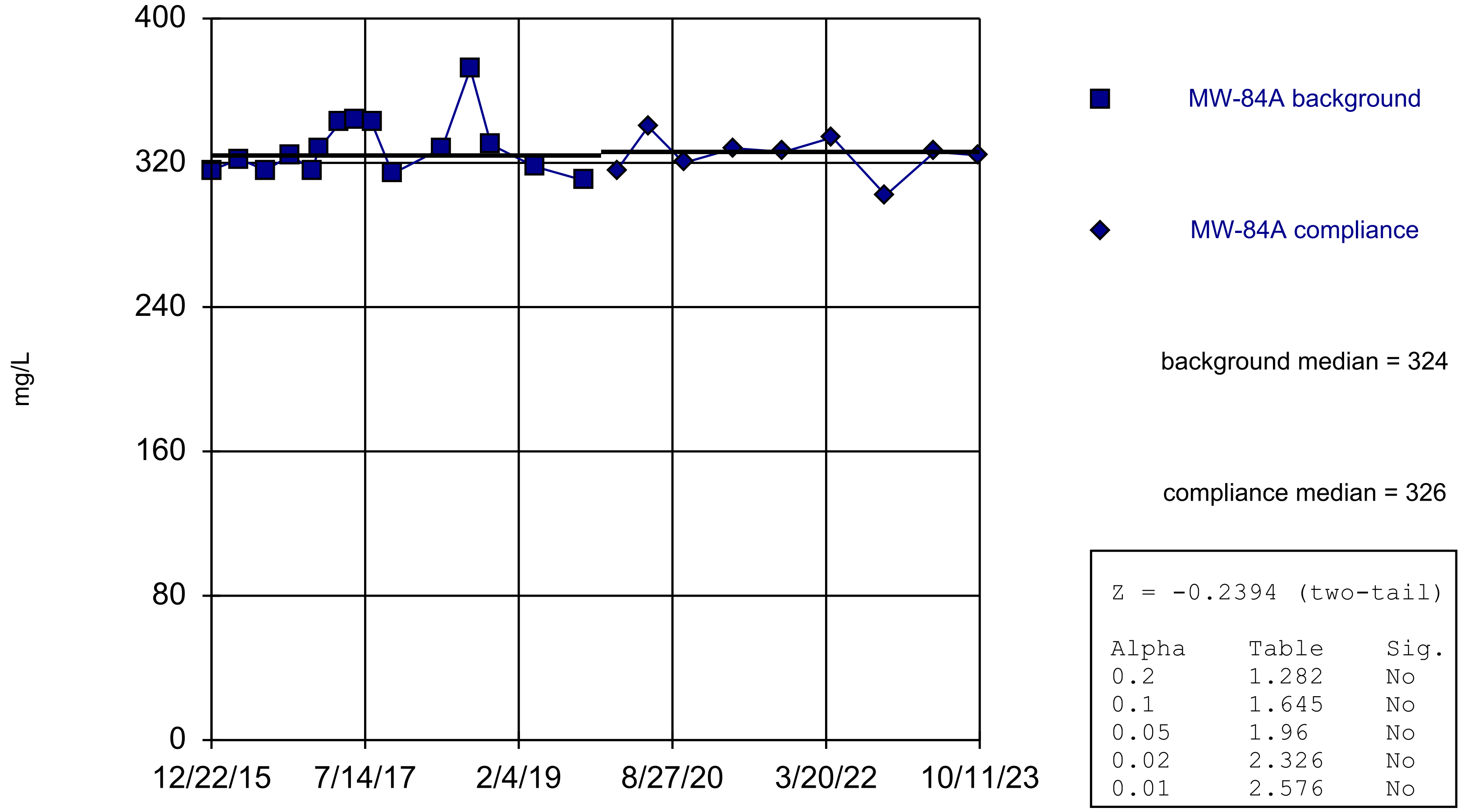
Constituent: Total Dissolved Solids (mg/L)   Analysis Run 8/20/2024 9:02 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301	MW-301
12/22/2015	478	
4/5/2016	486	
7/8/2016	464	
10/13/2016	490	
12/29/2016	444	
1/25/2017	514	
4/11/2017	502	
6/6/2017	458	
8/8/2017	462	
10/23/2017	362	
4/25/2018	464	
8/8/2018	502	
10/24/2018	424	
4/2/2019	462	
10/9/2019	418	
2/3/2020		462
5/29/2020		452
10/8/2020		412
4/14/2021		472
10/14/2021		334
4/13/2022		422
10/27/2022		282
4/27/2023		526
10/11/2023		300

Total Dissolved Solids

MW-84A (bg)



background median = 324

compliance median = 326

```
Z = -0.2394 (two-tail)

Alpha      Table      Sig.
0.2        1.282      No
0.1        1.645      No
0.05       1.96       No
0.02       2.326      No
0.01       2.576      No
```

Mann-Whitney (Wilcoxon Rank Sum) used in lieu of Welch's t-test because the Shapiro Wilk normality test showed the data to be non-normal at the 0.05 alpha level.

Mann-Whitney (Wilcoxon Rank Sum)   Analysis Run 8/20/2024 9:01 AM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Mann-Whitney (Wilcoxon Rank Sum)

Constituent: Total Dissolved Solids (mg/L) Analysis Run 8/20/2024 9:02 AM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-84A	MW-84A
12/22/2015	316	
4/5/2016	322	
7/8/2016	316	
10/13/2016	324	
12/29/2016	316	
1/25/2017	328	
4/11/2017	342	
6/6/2017	344	
8/8/2017	342	
10/24/2017	314	
4/25/2018	328	
8/8/2018	372	
10/24/2018	330	
4/3/2019	318	
10/9/2019	310	
2/3/2020		316
5/29/2020		340
10/8/2020		320
4/14/2021		328
10/14/2021		326
4/13/2022		334
10/27/2022		302
4/27/2023		326
10/11/2023		324

Attachment D

Interwell Prediction Limit Analysis

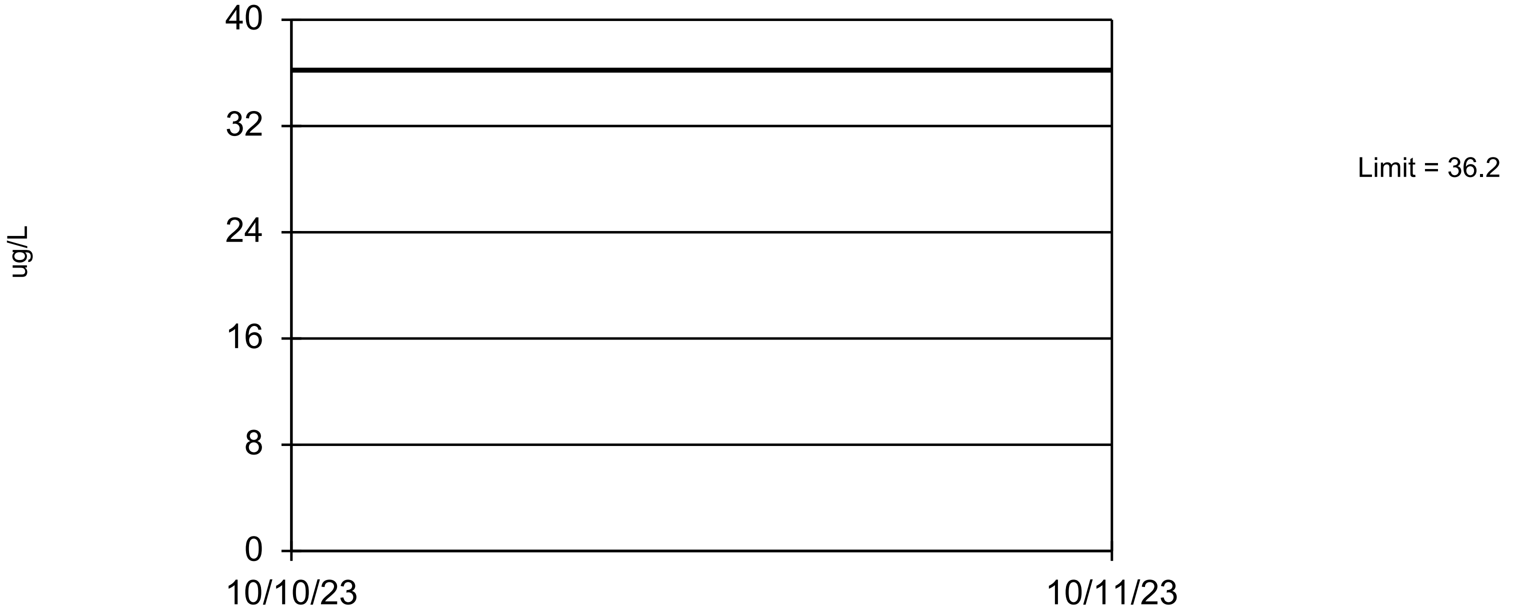
Prediction Limit

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020 Printed 8/20/2024, 1:46 PM

Constituent	Well	Upper Lim.	Date	Observ.	Sig.	Bg N	Bg Wells	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron (ug/L)	n/a	36.2	n/a	3 future	n/a	48	MW-84A,MW-301	n/a	n/a	0	n/a	n/a	0.00247	NP Inter (normality) ...
Calcium (ug/L)	n/a	126000	n/a	3 future	n/a	48	MW-301,MW-84A	n/a	n/a	0	n/a	n/a	0.00247	NP Inter (normality) ...
Chloride (mg/L)	n/a	5.76	n/a	3 future	n/a	48	MW-301,MW-84A	3.516	1.324	0	None	No	0.002922	Param Inter 1 of 2
Field pH (Std. Units)	n/a	7.71	n/a	3 future	n/a	49	MW-301,MW-84A	7.133	0.3418	0	None	No	0.002922	Param Inter 1 of 2
Sulfate (mg/L)	n/a	27.5	n/a	3 future	n/a	48	MW-84A,MW-301	n/a	n/a	2.083	n/a	n/a	0.00247	NP Inter (normality) ...
Total Dissolved Solids (mg/L)	n/a	514	n/a	3 future	n/a	48	MW-301,MW-84A	n/a	n/a	0	n/a	n/a	0.00247	NP Inter (normality) ...

Boron

Interwell Non-parametric



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 second highest of 48 background values. Annual per-constituent alpha = 0.01473. Individual comparison alpha = 0.00247 (1 of 2). Assumes 3 future values.

Prediction Limit Analysis Run 8/20/2024 1:45 PM View: MOD 1-3 LF

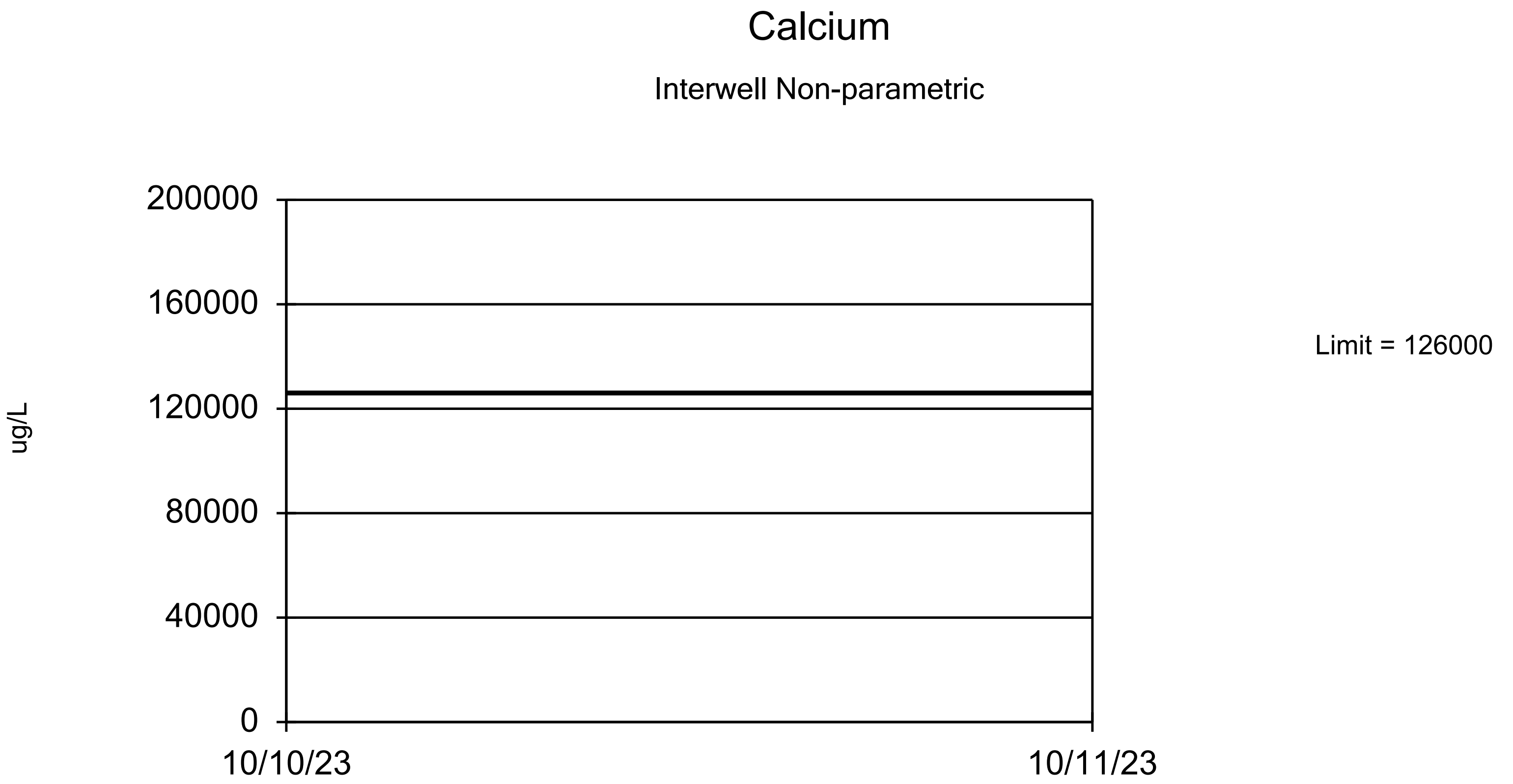
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Prediction Limit

Constituent: Boron (ug/L)   Analysis Run 8/20/2024 1:46 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-84A (bg)
12/22/2015	26.5	11.9
4/5/2016	25.2	14
7/8/2016	23.6	14.7
10/13/2016	30.6	11.1
12/29/2016	32.8	14.7
1/25/2017	32.6	16.1
4/11/2017	28.8	12.9
6/6/2017	21.3	14.8
8/8/2017	30.6	22.9
10/23/2017	34.3	
10/24/2017		13.8
4/25/2018	24.3	25
8/8/2018	22.8	12.8
10/24/2018	27.8	10.1 (J)
4/2/2019	26.9	
4/3/2019		13.6
10/9/2019	35.9	12
2/3/2020	27.9	15.7
5/29/2020	21.3	10
10/8/2020	28.8	9.7 (J)
4/14/2021	22.2	14.3
10/14/2021	31.4	11.1
4/13/2022	28.7	10.5
10/27/2022	37.5	12.2
4/27/2023	20.1	10.3
10/11/2023	36.2	14



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 second highest of 48 background values. Annual per-constituent alpha = 0.01473. Individual comparison alpha = 0.00247 (1 of 2). Assumes 3 future values.

Prediction Limit   Analysis Run 8/20/2024 1:45 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Prediction Limit

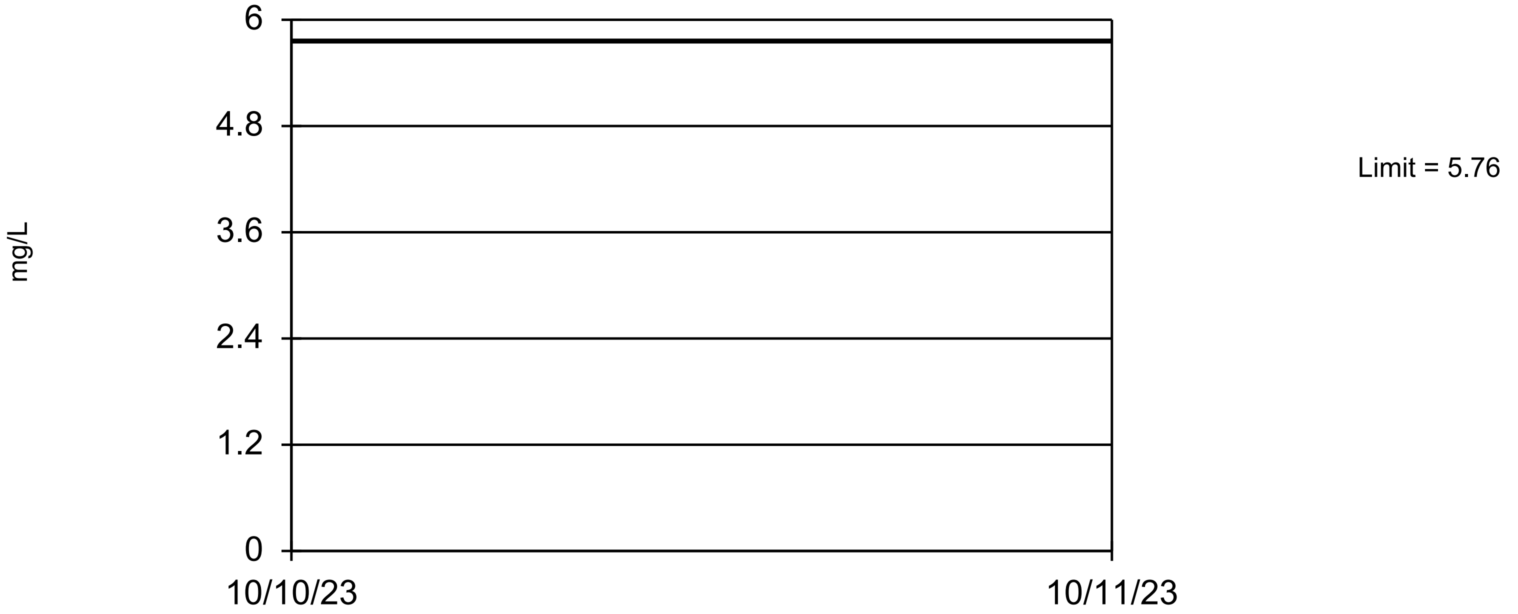
Constituent: Calcium (ug/L) Analysis Run 8/20/2024 1:46 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-84A (bg)
12/22/2015	126000	74000
4/5/2016	115000	72200
7/8/2016	108000	67600
10/13/2016	118000	74000
12/29/2016	129000	76000
1/25/2017	124000	70800
4/11/2017	120000	73200
6/6/2017	111000	76100
8/8/2017	108000	74900
10/23/2017	87200	
10/24/2017		77500
4/25/2018	112000	76600
8/8/2018	105000	76000
10/24/2018	101000	74000
4/2/2019	126000	
4/3/2019		80100
10/9/2019	114000	73500
2/3/2020	113000	72700
5/29/2020	112000	77600
10/8/2020	93000	69200
4/14/2021	117000	69100
10/14/2021	67800	75300
4/13/2022	97300	75100
10/27/2022	62800	78400
4/27/2023	120000	68600
10/11/2023	52300	65100

Chloride

Interwell Parametric



Background Data Summary: Mean=3.516, Std. Dev.=1.324, n=48. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9366, critical = 0.929. Kappa = 1.692 (c=6, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.008742. Individual comparison alpha = 0.002922. Assumes 3 future values.

Prediction Limit Analysis Run 8/20/2024 1:45 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Prediction Limit

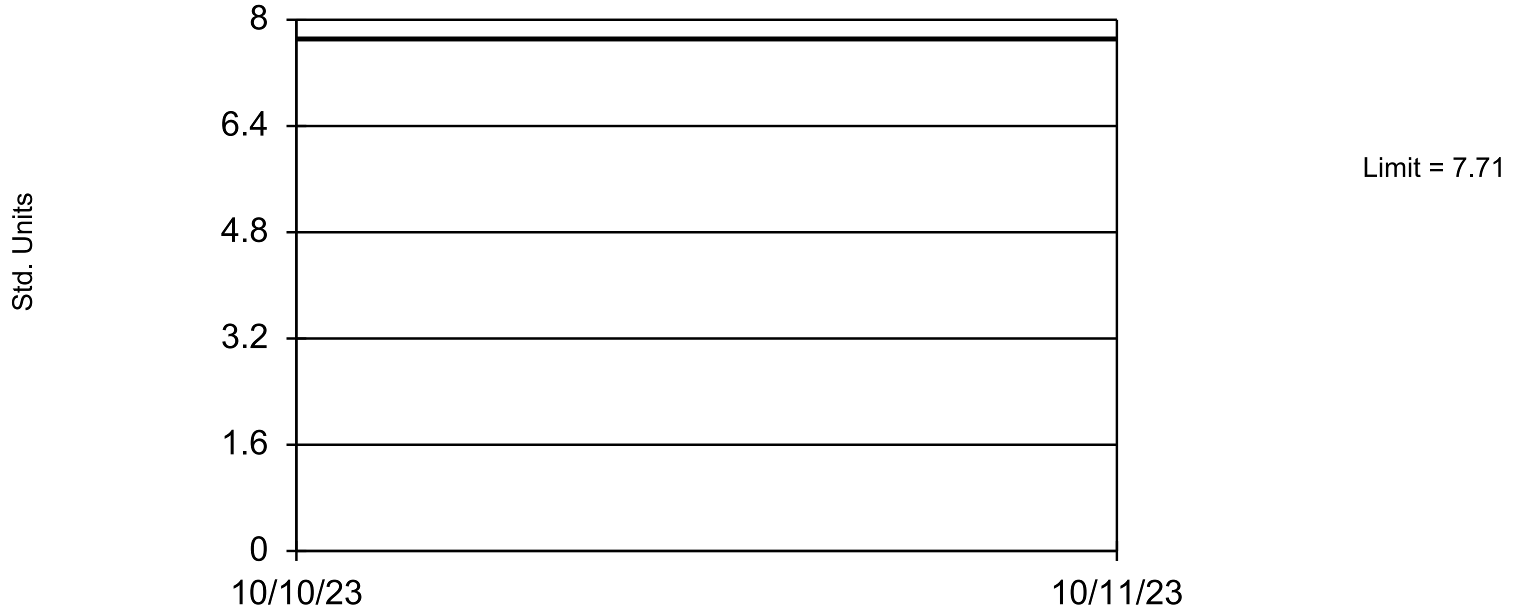
Constituent: Chloride (mg/L) Analysis Run 8/20/2024 1:46 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-84A (bg)
12/22/2015	3.7 (J)	4.9
4/5/2016	4	4.7
7/8/2016	3.5 (J)	5.1
10/13/2016	2.2	4.3
12/29/2016	2 (J)	4.7
1/25/2017	1.5 (J)	4.6
4/11/2017	2	4.9
6/6/2017	3.5	5.5
8/8/2017	5.5	5.5
10/23/2017	4	
10/24/2017		5.1
4/25/2018	2.3	4.8
8/8/2018	5.2	4.9
10/24/2018	3.2	4.2
4/2/2019	0.79 (J)	
4/3/2019		3.6
10/9/2019	1.7 (J)	3.9
2/3/2020	1.3 (J)	3.7
5/29/2020	2 (J)	3.7
10/8/2020	3.4	4.3
4/14/2021	1.5 (J)	4.4
10/14/2021	2.7	3.5
4/13/2022	1.9 (J)	5.2
10/27/2022	2.3	3.4
4/27/2023	1.5 (J)	3
10/11/2023	2.1	3.1

Field pH

Interwell Parametric



Background Data Summary: Mean=7.133, Std. Dev.=0.3418, n=49. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9533, critical = 0.929. Kappa = 1.69 (c=6, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.008742. Individual comparison alpha = 0.002922. Assumes 3 future values.

Prediction Limit Analysis Run 8/20/2024 1:45 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Prediction Limit

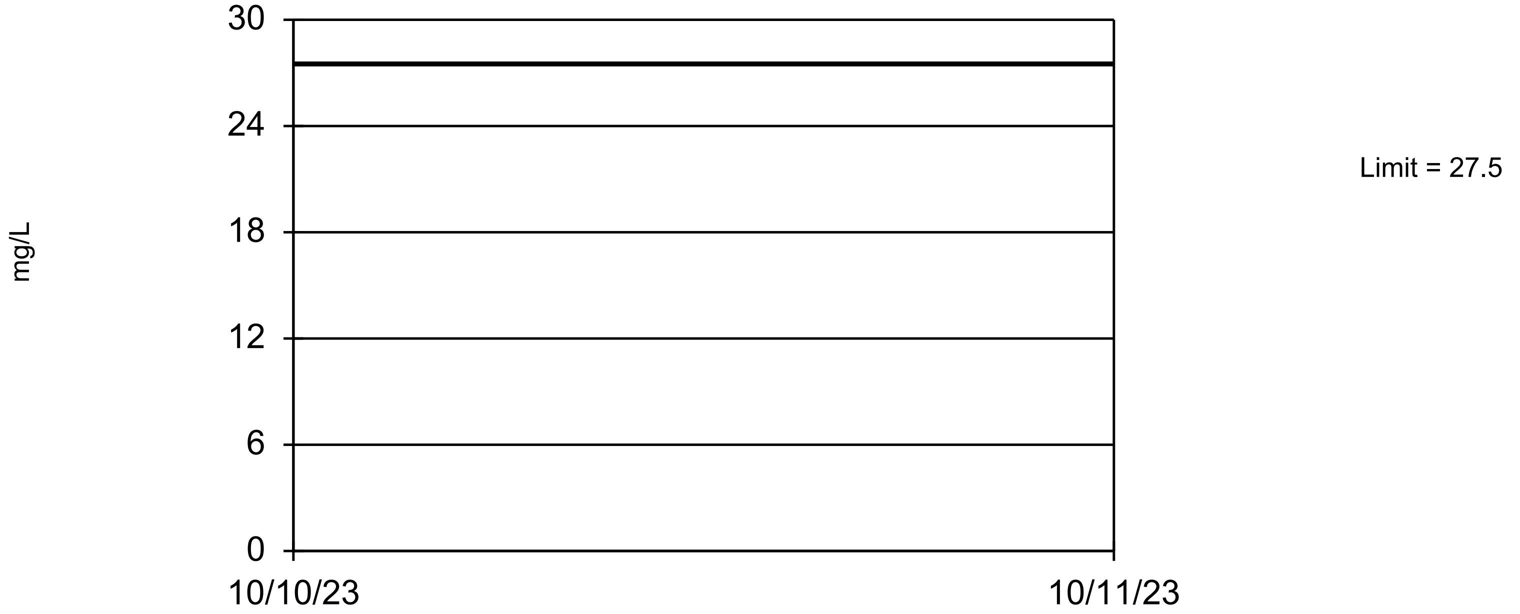
Constituent: Field pH (Std. Units)   Analysis Run 8/20/2024 1:46 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-84A (bg)
12/22/2015	6.85	7.6
4/5/2016	7.01	7.61
7/8/2016	6.87	7.45
7/28/2016		7.34
10/13/2016	7.28	7.91
12/29/2016	6.63	7.25
1/25/2017	7.1	6.99
4/11/2017	7.11	7.8
6/6/2017	6.7	7.28
8/8/2017	6.75	7.23
10/23/2017	7.37	
10/24/2017		7.68
4/25/2018	6.76	7.45
8/8/2018	6.91	7.38
10/24/2018	6.79	7.24
4/2/2019	6.62	
4/3/2019		7.03
10/9/2019	6.67	7.23
2/3/2020	6.89	7.51
5/29/2020	6.73	7.34
10/8/2020	6.95	7.49
4/14/2021	6.66	7.34
10/14/2021	7.01	7.42
4/13/2022	6.6	7.34
10/27/2022	6.8	7.31
4/27/2023	6.65	7.01
10/11/2023	7.06	7.51

Sulfate

Interwell Non-parametric



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 second highest of 48 background values. 2.083% NDs. Annual per-constituent alpha = 0.01473. Individual comparison alpha = 0.00247 (1 of 2). Assumes 3 future values.

Prediction Limit   Analysis Run 8/20/2024 1:45 PM   View: MOD 1-3 LF

Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

Prediction Limit

Constituent: Sulfate (mg/L)   Analysis Run 8/20/2024 1:46 PM   View: MOD 1-3 LF

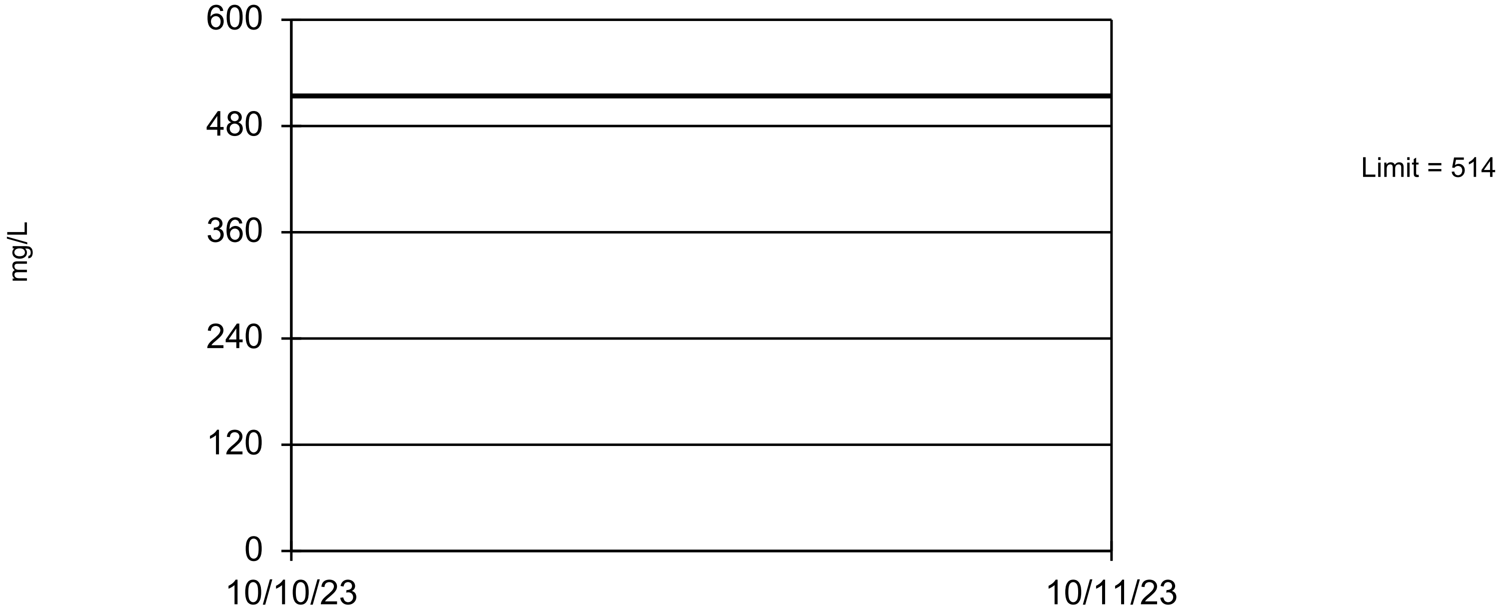
Columbia Energy Center   Client: SCS Engineers   Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-84A (bg)
12/22/2015	9.3	4.9
4/5/2016	15.3	4.3
7/8/2016	15	3.7 (J)
10/13/2016	13.9	2.6 (J)
12/29/2016	12.3 (J)	2.7 (J)
1/25/2017	6.5	3
4/11/2017	10.3	2.8 (J)
6/6/2017	17.1	2.7 (J)
8/8/2017	31.6	2 (J)
10/23/2017	27.5	
10/24/2017		2.2 (J)
4/25/2018	8.6	2.8 (J)
8/8/2018	21.6	1.9 (J)
10/24/2018	19.2	1.6 (J)
4/2/2019	4.4	
4/3/2019		1.4 (J)
10/9/2019	8.4	1.3 (J)
2/3/2020	7.2	<2.2 (U)
5/29/2020	11.5	1.5 (J)
10/8/2020	25.1	1.3 (J)
4/14/2021	8.5	1.4 (J)
10/14/2021	17.4	1.3 (J)
4/13/2022	12.7	1.4 (J)
10/27/2022	11.6	1.1 (J)
4/27/2023	12.3	1.3 (J)
10/11/2023	11.8	1.4 (J)

ND substitution: RL or RL/2 if <15% NDs.

Total Dissolved Solids

Interwell Non-parametric



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 second highest of 48 background values. Annual per-constituent alpha = 0.01473. Individual comparison alpha = 0.00247 (1 of 2). Assumes 3 future values.

Prediction Limit Analysis Run 8/20/2024 1:45 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Prediction Limit

Constituent: Total Dissolved Solids (mg/L) Analysis Run 8/20/2024 1:46 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-84A (bg)
12/22/2015	478	316
4/5/2016	486	322
7/8/2016	464	316
10/13/2016	490	324
12/29/2016	444	316
1/25/2017	514	328
4/11/2017	502	342
6/6/2017	458	344
8/8/2017	462	342
10/23/2017	362	
10/24/2017		314
4/25/2018	464	328
8/8/2018	502	372
10/24/2018	424	330
4/2/2019	462	
4/3/2019		318
10/9/2019	418	310
2/3/2020	462	316
5/29/2020	452	340
10/8/2020	412	320
4/14/2021	472	328
10/14/2021	334	326
4/13/2022	422	334
10/27/2022	282	302
4/27/2023	526	326
10/11/2023	300	324