2022 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

25222067.00 | January 31, 2023

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
2022 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	<u>October 2021</u> Boron: MW-33AR, MW-34A, MW-302 Chloride: MW-33AR Sulfate: MW-33AR, MW-34A, MW-302 <u>April 2022</u> Boron: MW-33AR, MW-34A, MW-302 Chloride: MW-33AR Field pH: MW-34A 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 2021 and April 2022 events during 2022. 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

Section Page

Tables

Figures

Appendices

I:\25222067.00\Deliverables\2022 Fed Annual Report - COL Mod 1-3\230131_2022 Annual CCR GW Report COL MOD 1-3 LF_Final.docx

1.0 INTRODUCTION

This 2022 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 2022 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, 2022, through December 31, 2022.

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**). A separate groundwater monitoring system evaluates groundwater conditions for Modules 4 through 6 of the COL Dry Ash Disposal Facility.

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.

Shallow groundwater at the site generally flows to the north and west across the existing landfill area. The October 2022 water levels and apparent flow directions reflect the influence of a temporary dewatering system installed to lower groundwater levels in the area of the Secondary Pond as part of the closure project for that CCR Unit. The water table elevations and groundwater flow directions for the April 2022 monitoring event are shown on **Figure 3**, and the water table elevations and groundwater flow directions for the October 2022 monitoring event are shown on **Figure 4**. 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.**

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. MW-1AR was added to the monitoring program in 2021 as a supplemental well because monitoring data have indicated that the groundwater flow direction in this part of the site is sometimes to the northeast. MW-1AR was abandoned in 2022 because it was within the footprint of the pending MOD 10-11 expansion area. The monitoring network certification was updated with the abandonment of MW-1AR in October 2022. Flow direction in this area of the site will continue to be monitored by additional wells in the State monitoring program, including new water level-only monitoring wells MW-312 and MW-93A, which will be part of the future Modules 10 and 11 monitoring well network. Landfill development since 2015 warrants a potential update the existing monitoring network. A conversion to a multi-unit network will be considered in 2023. 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 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;

MW-1AR was added to the monitoring program in 2021 as a downgradient well. MW-1AR was installed in November 1994 and is also included in the state monitoring program at the site. MW-1AR was added to the CCR Rule monitoring program because it is located to the northeast of Modules 1 through 3 and monitoring data have indicated that the groundwater flow direction in the northeast portion of the CCR Unit is sometimes to the northeast. MW-1AR was decommissioned as part of the groundwater monitoring program for Modules 1 through 3 of the Dry Ash Disposal Facility in 2022 due to ongoing construction in the area in preparation for future Modules 10 and 11. A groundwater monitoring system certification update was prepared in October 2022 to document the removal of MW-1AR from the monitoring system.

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 2022 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 2022 were analyzed for Appendix III 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 April 2022 monitoring event data was completed and transmitted to WPL on August 11, 2022. The validation and evaluation of the October 2022 monitoring event data was in progress at the end of 2022 and will be transmitted to WPL in 2023;

therefore, the October 2022 monitoring results and analytical report will be included in the 2023 annual report. The October 2022 groundwater elevation data is included in this report.

The sampling results for Appendix III parameters in April 2022 are summarized in **Table 5.** Field parameter results for the April 2022 sampling event are provided in **Table 6**. The analytical laboratory reports for April 2022 are provided in **Appendix C**. Historical results for each monitoring well through April 2022 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 2022. The COL Dry Ash Disposal Facility, Modules 1 through 3, remained in the detection monitoring program.

In 2022, the monitoring results for the October 2021 and April 2022 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 most recently updated in January 2020 using background data collected through October 2019. The January 2020 statistical analysis was included as an appendix in the 2021 Annual Groundwater Monitoring Report. 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; therefore, the next UPL update is planned for 2023.

For the October 2021 and April 2022 events, SSIs for boron, chloride, and sulfate were identified. Additionally, during the April 2022 event an SSI for field pH was identified.

Alternative source demonstrations (ASDs) were completed for the October 2021 and April 2022 events, demonstrating that sources other than the CCR unit were the likely cause of the observed concentrations of boron, chloride, and sulfate. A sampling error was the likely cause of the observed SSI for field pH in April 2022. 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 2022 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 2022.

Summary of Key Actions Completed:

- Statistical evaluation and determination of SSIs for the October 2021 and April 2022 monitoring events.
- ASD reports for the SSIs identified from the October 2021 and April 2022 monitoring events.
- Two semiannual groundwater sampling and analysis events (April and October 2022).
- Abandoned MW-1AR and updated the monitoring network certification.

Description of Any Problems Encountered: No problems were encountered in 2022.

Discussion of Actions to Resolve the Problems: Not applicable.

Projection of Key Activities for the Upcoming Year (2023):

- Statistical evaluation and determination of any SSIs for the October 2022 and April 2023 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 2023).

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 2021 and April 2022 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 #25222067.00

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 MOD 10-11 expansion area . The monitoring network certification was updated with the abandonment of MW-1AR in October 2022.

Possibly also add NDK Date: 9/19/2022
Checked by: NDK Date: 9/19/2022
RM Date: 1/4/2023

Table 2. CCR Rule Groundwater Samples Summary
Columbia Energy Center Dry Ash Disposal Facility, Modules 1-3
SCS Engineers Project #25222067.00

Sample Dates	Compliance Wells			Background Wells	
	MW-302	MW-34A	MW-33AR	MW-84A	MW-301
4/12-13/2022	D	D	D	D	D
10/27-28/2022	D	D	D	D	D
Total Samples	2	2	2	2	2

Abbreviations:
D = Required by Detection Monitoring Program
D-R = Detection Monitoring Retest Sample

Created by: NDK Date: 9/19/2022
Last revision by: RM Date: 12/27/2022
Checked by: MDB Date: 1/10/2023

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25222067.00

	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
	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	785.11	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
	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

Dry Ash Facility (Facility ID #03025)

	Well Number	M-3	M-4R	MW-39A	MW-39B	MW-48A	MW-48B	MW-57	MW-59	MW-216R	MW-217	MW-220RR	SG-1	SG-2	SG-3	SG-4
	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	792.06	795.25	808.60	805.36
	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	789.14	793.85	dry	dry
	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	789.5 [1]	NM	dry	dry
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36	789.5 [1]	791.33	dry	dry
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM	NM	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	788.90	dry	dry	dry
	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	NM	dry	dry	dry
	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	789.3	791.70	dry	dry
	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	788.48	791.58	dry	dry
	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	NM	793.40	dry	dry
	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	788.32	792.52	dry	dry
	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	788.31	793.85	dry	dry
	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	788.3	793.45	dry	dry
	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	788.38	>795.25	dry	dry
	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	787.76	793.25	dry	dry
	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	788.40	794.60	dry	dry
	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	748.48	795.20	dry	dry
	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	748.48	>795.25	dry	dry
	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	788.34	793.32	dry	NM
	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	788.03	793.45	below gauge	dry
	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	788.59	795.13	dry	dry
	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	788.4	794.65	dry	dry
	June 3, 2022	NM	NM	NM	NM	NM	NM	782.13	NM	NM	NM	NM	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	NM	795.21	dry	dry
	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	--	--	--	--

Ash Pond Facility (Facility ID #02325)

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25222067.00

	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
	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
	Screen Length (ft)	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
	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
	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
	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
	June 30, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM
	August 6, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM
	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
	December 11, 2020	NM	NM	NM	NM	788.19	NM	NM	NM	NM	NM	NM	NM	785.26	785.26	NM
	February 25, 2021	NM	NM	784.27	NM	788.36	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM
	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
	June 11, 2021	NM	NM	NM	NM	NM	NM	784.19	784.66	NM	NM	NM	NM	784.20	784.05	NM
	July 20, 2021	NM	NM	783.64	NM	788.39	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	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
	December 21, 2021	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	782.93	NM	NM
	February 24, 2022	NM	NM	782.34	NM	786.49	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	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
	July 27, 2022	NM	NM	783.07	NM	787.03	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	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
	November 30, 2022	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	781.62	781.14	781.15
	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
	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

CCR Rule Wells

Notes:
NM = not measured

Created by: MDB Date: 5/6/2013
Last revision by: JR Date: 12/13/2022
Checked by: RM Date: 12/23/2022

(1) The elevation for SG-1 is read off of the staff gauge (rather than measured from the top of the gauge).
(2) SG-2 could not be located during the April 2013 event.
(3) SG-3 could not be located during the October 2013 event. SG-1 could not be safely accessed during the October 2013 event.
(4) LH-2 measurements are given as leachate depth, measured by a transducer.
(5) LH-2 and LH-3 measurements were collected by WPL staff on October 9, 2017.
(6) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5 sampling event. The level was allowed to return to static and was measured on 10/10/2017.
(7) BC = Brian Clepper; NS= Nate Sievers - Columbia Site employees.
(8) 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'.

I:\25222067.00\Deliverables\2022 Fed Annual Report - COL Mod 1-3\Tables\[Table 3 - Groundwater Elevation Summary.xls]levels

Table 4. Horizontal Gradients and Flow Velocity
Columbia Energy Center - MOD 1-3 /
SCS Engineers Project #25222067.00
January - December 2022

	Flow Path A - Northwest				
Sampling Dates	**h1 (ft)**	**h2 (ft)**	**Δl (ft)**	**Δh/Δl (ft/ft)**	**V (ft/d)**
4/11-13/2022	785.00	783.27	1180	0.0015	0.037
10/25-27/2022	784.00	781.94	640	0.0032	0.082

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	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
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/Δl = hydraulic gradient

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

Created by: NDK Date: 8/2/2022
Last revision by: MDB Date: 1/10/2023
Checked by: RM Date: 1/10/2023

Table 5. Groundwater Analytical Results Summary -
Columbia Landfill, Modules 1-3 / SCS Engineers Project #25222067.00

Parameter Name	UPL Method	UPL		Background Wells		Compliance Wells		
				MW-84A	**MW-301**	**MW-33AR**	**MW-34A**	**MW-302**
				4/13/2022	4/13/2022	4/12/2022	4/12/2022	4/12/2022
Appendix III								
Boron, ug/L	P	35.6		10.5	28.7	558	237	389
Calcium, ug/L	NP	129,000		75,100	97,300	80,000	77,000	91,600
Chloride, mg/L	P	6.2		5.2	1.9 J	59.0	2.2	0.79 J
Fluoride, mg/L	DQ	DQ		<0.095	<0.095	<0.095	<0.095	<0.095
Field pH, Std. Units	P	7.78		7.34	6.60	7.60	8.34	7.21
Sulfate, mg/L	P	30.3		1.4 J, M0	12.7	155	146	22.1 M0
Total Dissolved Solids, mg/L	NP	514		334	422	506	402	398

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

Abbreviations:

mg/L = milligrams per liter
µg/L = micrograms per liter
SSI = Statistically Significant Increase
-- = Not Measured
GPS = Groundwater Protection Standard
UPL = Upper Prediction Limit
NP = Nonparametric UPL with 1-of-2 retesting
P = Parametric UPL with 1-of-2 retesting
LOD = Limit of Detection
LOQ = Limit of Quantitation
DQ = Double Quantification

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 2020 based on background well results through October 2019.
3. Interwell UPLs calculated based on results from background wells MW-84 and MW-301.

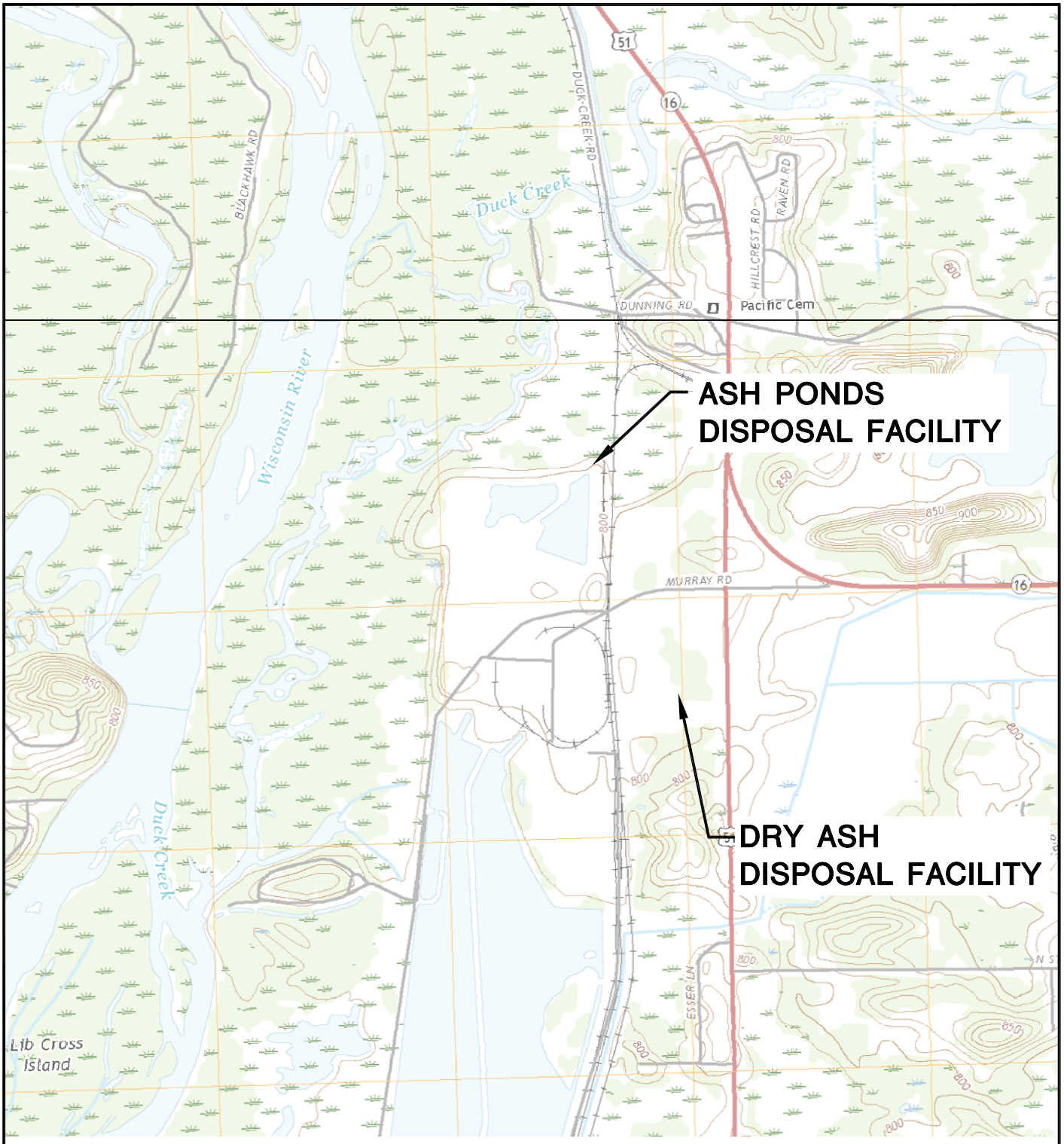
Created by:	NDK	Date:	9/19/2022
Last revision by:	AJR	Date:	12/5/2022
Checked by:	RM	Date:	12/29/2022
Scientist/Proj Mgr QA/QC:	TK	Date:	1/10/2023

Table 6. 2022 Groundwater Field Data Summary
Columbia Energy Center Dry Ash Disposal Facility - Modules 1-3 / SCS Engineers Project #25222067.00

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	4/13/2022	785.02	9.9	7.34	9.33	600.2	200.6	0.00
MW-301	4/13/2022	785.44	7.1	6.60	2.47	747.0	207.5	0.00
MW-302	4/12/2022	784.42	9.5	7.21	8.74	677.1	197.1	3.92
MW-33AR	4/12/2022	783.27	10.6	7.60	9.62	847.0	198.2	0.00
MW-34A	4/12/2022	784.30	11.4	8.34	7.82	577.0	112.6	4.39

Created by: DK Date: 9/2/2022
Last revision by: AJR Date: 12/5/2022
Checked by: BLR Date: 12/29/2022

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

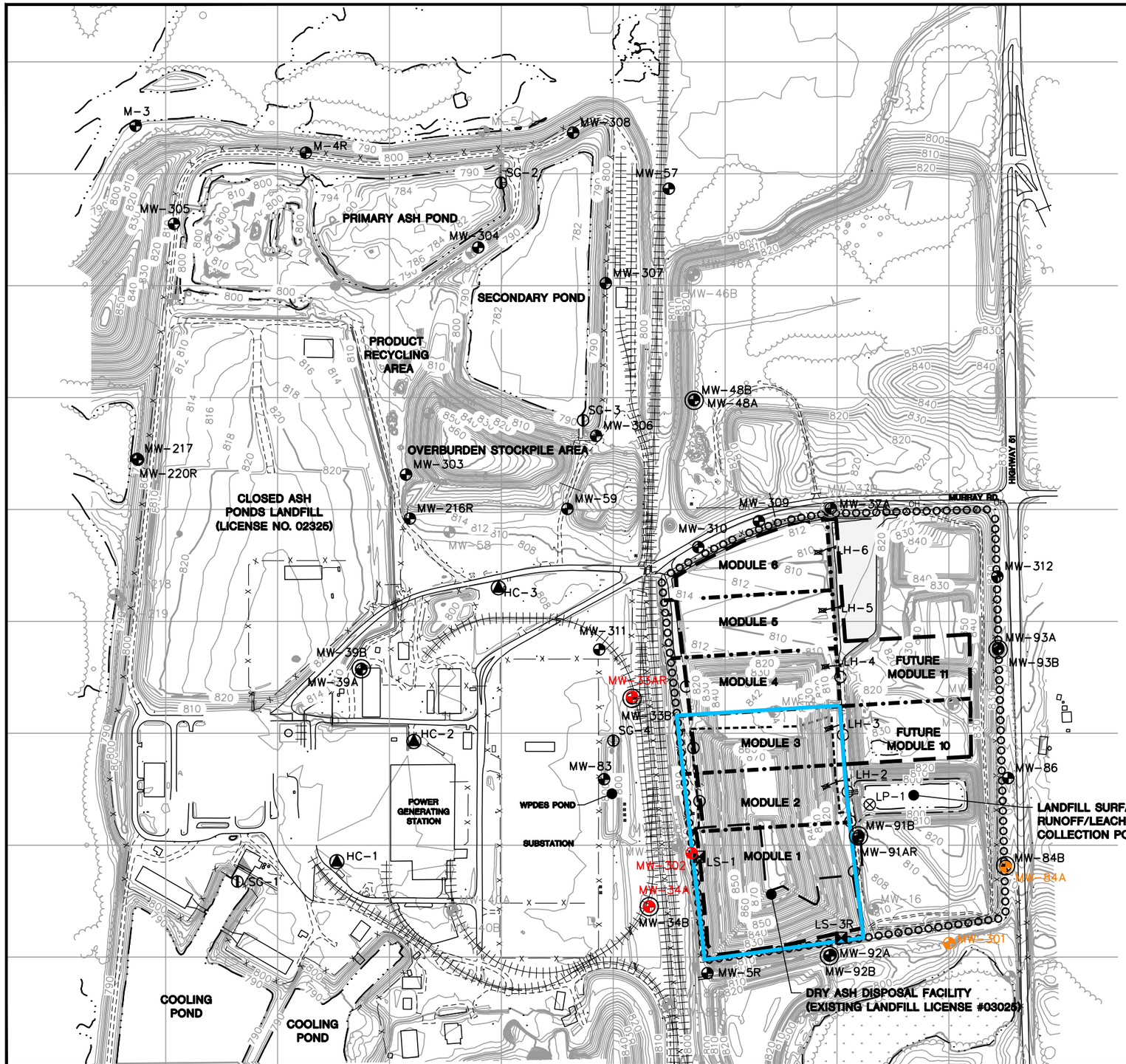
PROJECT NO.	25220067.00	DRAWN BY:	BSS
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	01/10/2020	APPROVED BY:	TK 04/10/2020

ENGINEER

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

FIGURE
1

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Site Location Map.dwg, 4/12/2020 7:05:09 PM



LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- 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 SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, MAY 2019, SEPTEMBER 2020, AUGUST 2021, AND NOVEMBER 2021.
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. 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.	25222067.00	DRAWN BY:	KP
DRAWN:	12/02/2019	CHECKED BY:	NDK/RM
REVISED:	01/16/2023	APPROVED BY:	TK 1/16/2023

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

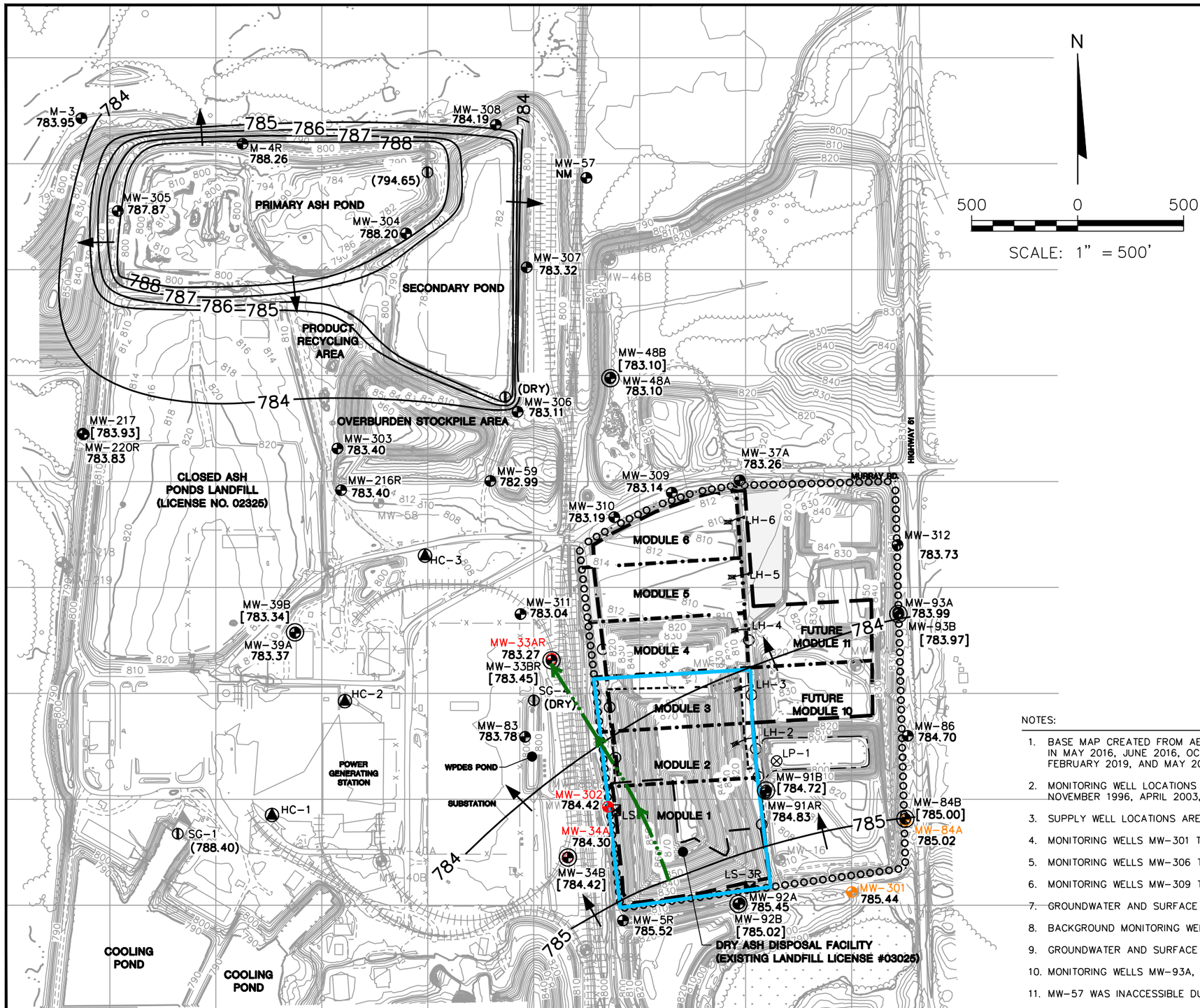
CLIENT: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULES 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE 2

I:\25222067.00\Drawings\Modules 1-3\Site Plan and Monitoring Well Locations.dwg, 1/16/2023 11:52:11 AM



NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
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 MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.
9. GROUNDWATER AND SURFACE WATER ELEVATIONS WERE MEASURED ON APRIL 11-13, 2022.
10. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
11. MW-57 WAS INACCESSIBLE DURING THE APRIL 2022 EVENT DUE TO HIGH WATER.

PROJECT NO.	25222067.00	DRAWN BY:	KP
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	12/30/2022	APPROVED BY:	TK 1/16/2023

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

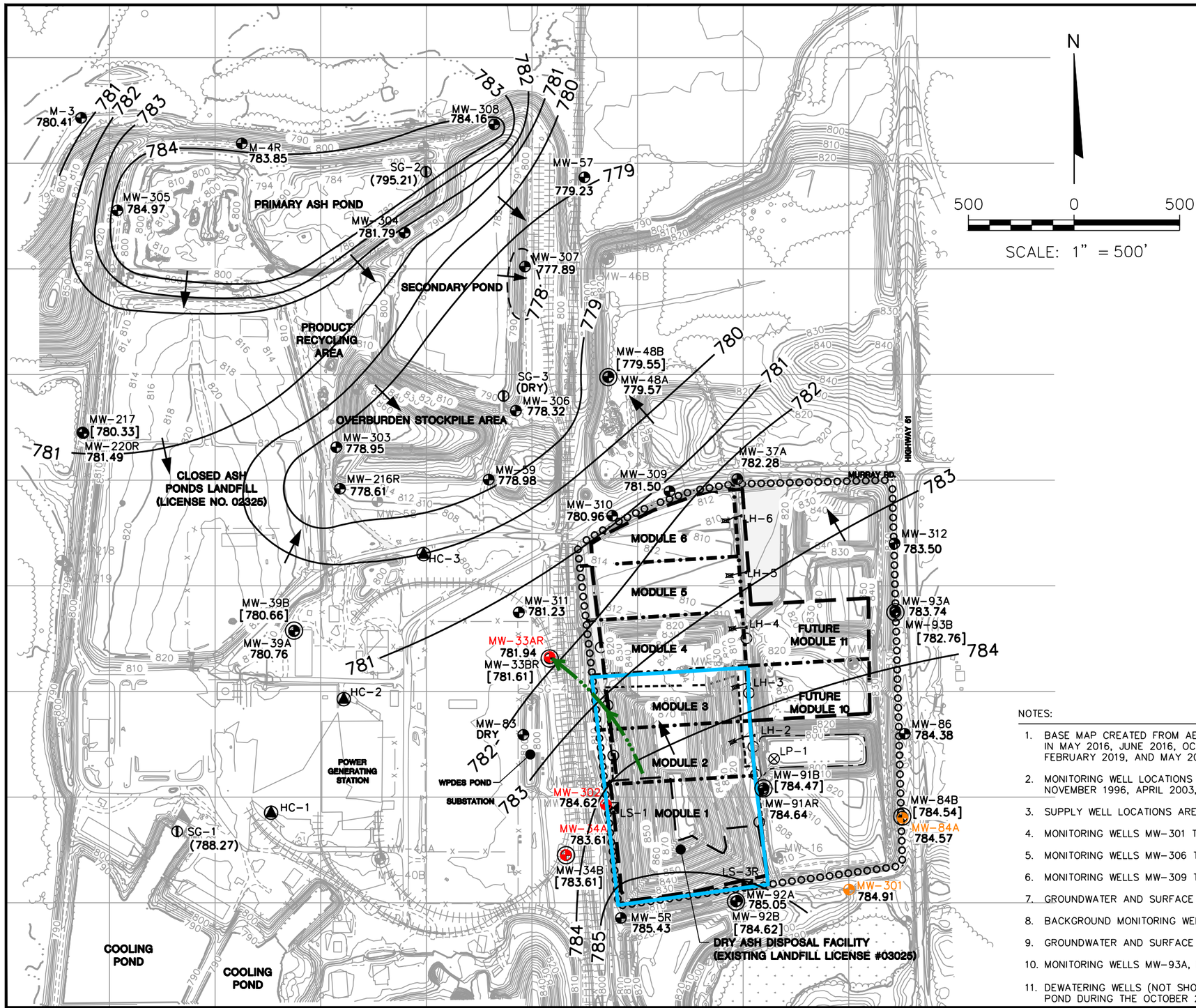
CLIENT: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULES 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

WATER TABLE MAP
APRIL 2022

FIGURE 3

I:\25222067.00\Drawings\Modules 1-3\Water Table Map-April 2022.dwg, 1/16/2023 11:58:11 AM



LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- 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
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 4)
- CCR MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- 787.62 — WATER TABLE ELEVATION
- [788.87] — POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
- (795.20) — SURFACE WATER ELEVATION (NOT CONTOURED)
- WATER TABLE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
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 MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.
9. GROUNDWATER AND SURFACE WATER ELEVATIONS WERE MEASURED ON OCTOBER 25-27, 2022.
10. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
11. DEWATERING WELLS (NOT SHOWN) AROUND THE SECONDARY POND WERE PUMPING AND DISCHARGING TO THE PRIMARY POND DURING THE OCTOBER 2022 SAMPLING EVENT.

PROJECT NO.	25222067.00	DRAWN BY:	KP
DRAWN:	12/15/2022	CHECKED BY:	MDB
REVISED:	12/30/2022	APPROVED BY:	TK 1/16/2023

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 2022

FIGURE 4

I:\25222067.00\Drawings\Modules 1-3\Water Table Map-October 2022.dwg, 1/16/2023 12:43:58 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

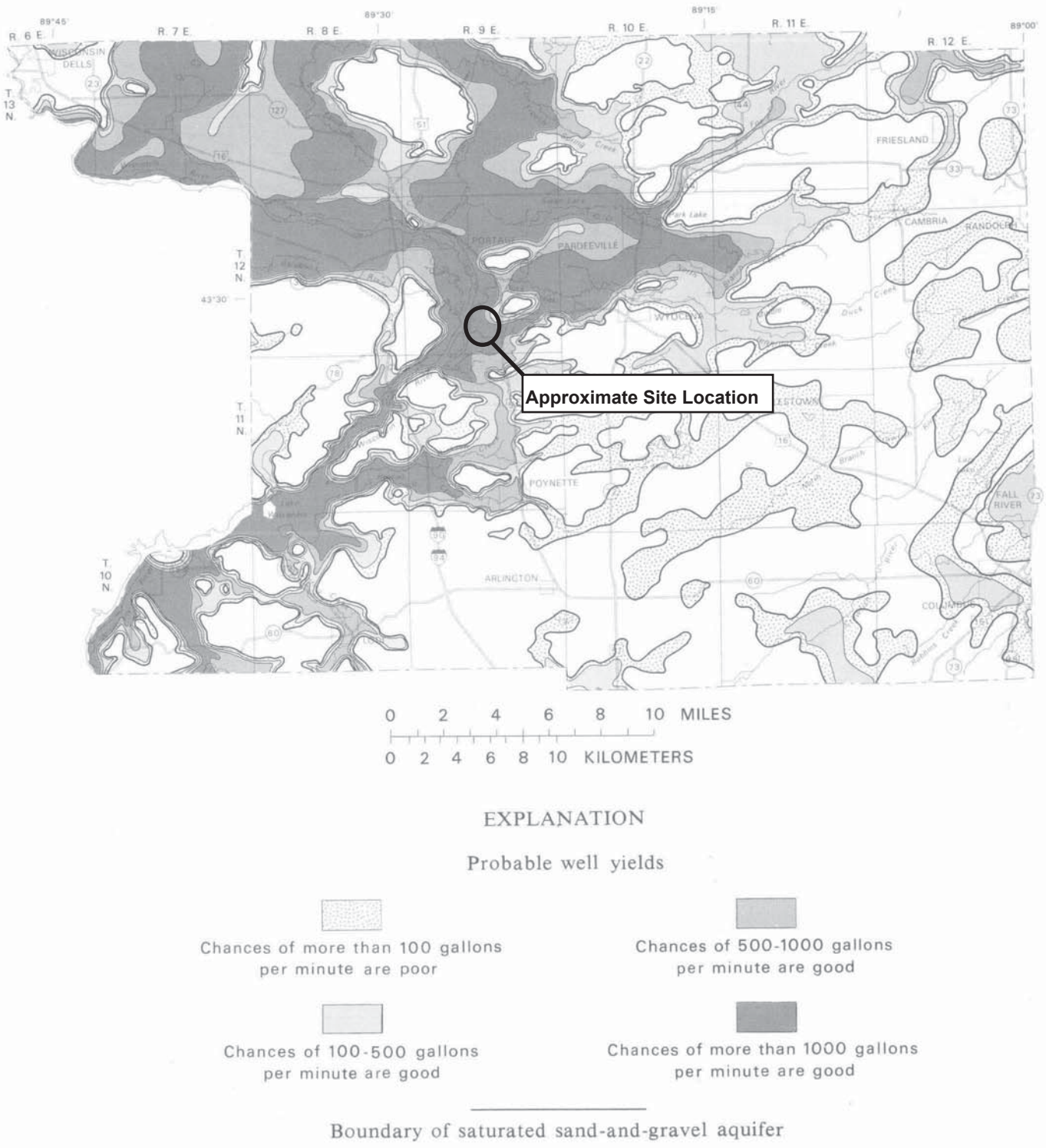
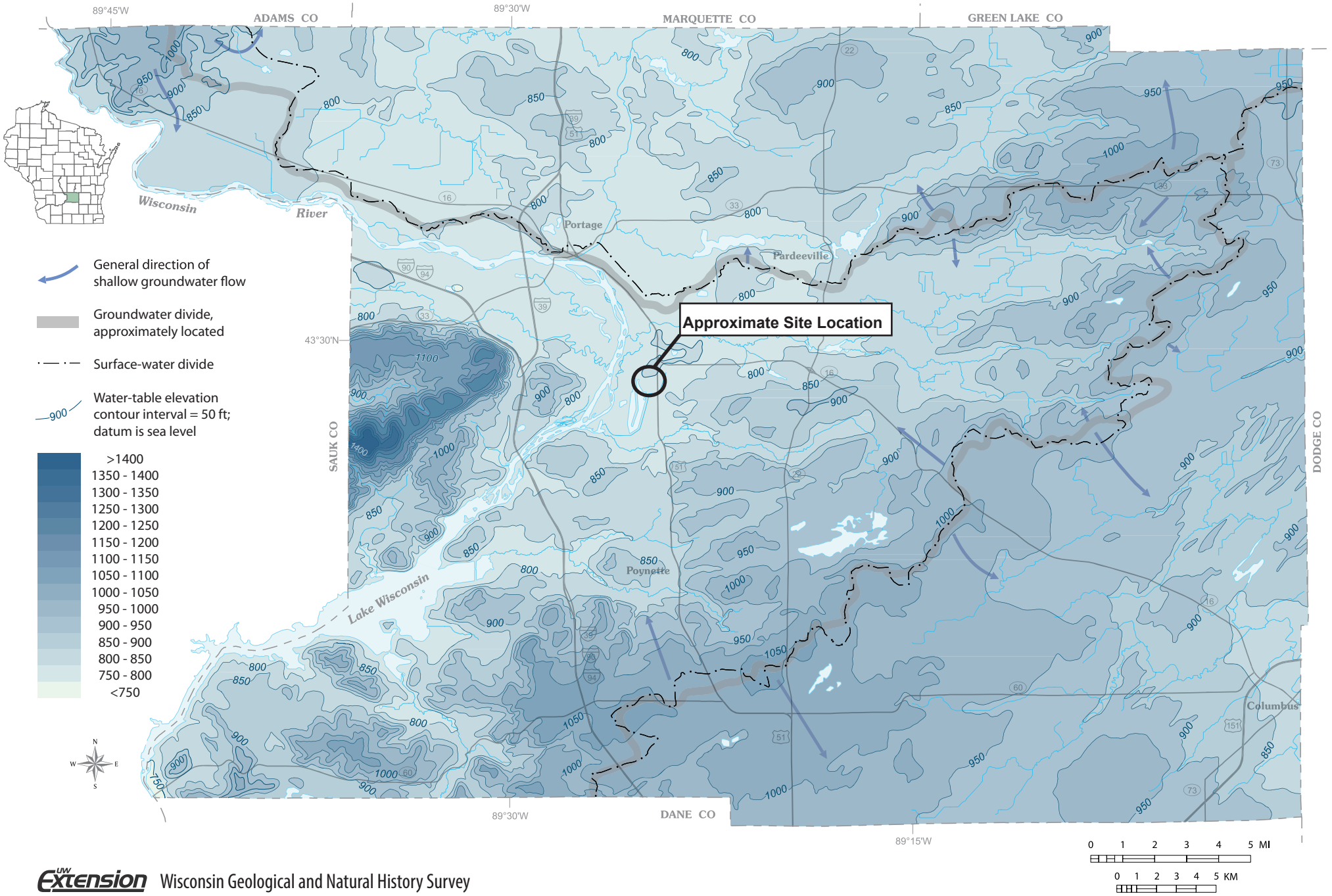


Figure 9. Probably well yields from the sand-and-gravel aquifer.

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

Generalized water-table elevation in Columbia County, Wisconsin



UW Extension Wisconsin Geological and Natural History Survey

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 ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
WPL-Columbia SCS#: 25215135.00		MW-301

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Kevin Durst Badger State Drilling	11/11/2015	11/11/2015	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VY701			Feet	803.69 Feet	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	County Code	Civil Town/City/ or Village
	Columbia	11	Portage

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

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

Signature [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.

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Pocket Penetration (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: 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 ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
WPL-Columbia SCS#: 25215135.00		MW-302

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Kevin Durst Badger State Drilling	11/11/2015	11/12/2015	hollow stem auger

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
VY702			Feet	809.93 Feet	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 ☐ N Feet ☐ S ☐ E Feet ☐ W

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

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Pocket Penetration (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
S1	12	10 13 17 16	1–2	SILTY SAND, fine to medium grained, trace gravel, 10YR 5/6.						M				
S2	12	10 12 8 6	4–5	Same as above except, large gravel at bottom, trace to little gravel.						M				
S3	20	2 4 4 5	6–7	Same as above except, 10YR 4/6.	SM					M				
S4	23	3 3 4 5	9–10	Same as above except, 10YR 5/8.						M				
S5	20	3 3 3 4	11–12	Same as above except, 10YR 6/6.						M				
S6	20	3 4 4 7	14–15	POORLY GRADED SAND, 10YR 6/6.	SP					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 Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Pocket Penetration (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: 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	25	POORLY GRADED SAND, 10YR 8/3.						W				
			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

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

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

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

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

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PE223	138	MW-33AR	Feet MSL	805.4 Feet MSL	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 ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
111049180	Columbia	11	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	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			2.5	**Blind drilled to 29 feet. See log of MW-33BR for lithology.**										
			5.0											
			7.5											
			10.0											
			12.5											
			15.0		SM									
			17.5											
			20.0											
			22.5											
			25.0											
			27.5											
				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 RMC 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.

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

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 ☐

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

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

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PE224	140	MW-33BR	785.3 Feet MSL	805.3 Feet MSL	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	County	County Code	Civil Town/City/ or Village
111049180	Columbia	11	Pacific

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
AUGER	60		1–15											
1 SS	24	4 4 4 4	5–6	**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	10–11											

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

Signature Pete McC 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.

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 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	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
3 SS	24	4 5 4 5	16 17 18 19											
4 SS	24	4 3 4 4	20 21 22 23 24	Same as above, but wet.	SM									
5 SS	24	50/0	25 26 27 28 29	Hit a rock, auger through.										
6 SS	24	8 20 19 27	30 31 32 33 34	**SILTY SAND WITH GRAVEL (SM),** 70% fine to medium sand, 15% gravel, 15% fines, nonplastic, 10YR 4/3 brown, wet, dense.										
7 SS	24	10 17 19 24	35 36 37 38 39 40		SM									

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.

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: 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 56	**WEATHERED SANDSTONE,** 95% poorly graded medium sand, 5% fines, white to brown, well sorted and rounded, poorly cemented.										
				End of boring at 56 feet.										

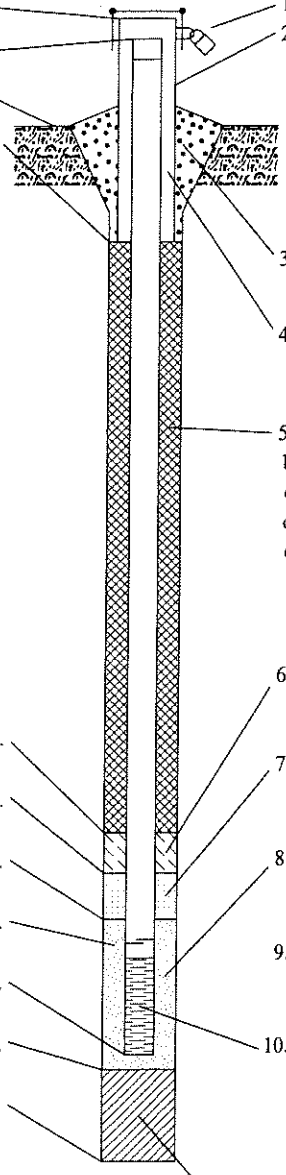
State of Wisconsin
Department of Natural Resources

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 ☐ 50 / Hollow Stem Auger ☒ 41 / Other ☐ __

15. Drilling fluid used: Water ☐ 02 / Air ☐ 01 / Drilling Mud ☐ 03 / None ☒ 99

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 ☒ 04 / Other ☐ __
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30 / Concrete ☐ 01 / Other ☐ __
4. Material between well casing and protective pipe: Bentonite ☒ 30 / Other ☐ __
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. 10.5 Lbs/gal mud weight . . . Bentonite slurry ☒ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. 3.5 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 / Tremie pumped ☒ 02 / Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☒ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 32
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 ☒ 23 / Flush threaded PVC schedule 80 ☐ 24 / Other ☐ __
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 / Continuous slot ☐ 01 / Other ☐ __
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ 14 / Other ☐ __

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

Signature: RM Cl | 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				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	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						
					40	End Boring at 37'					
						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	County	Well Name
Alliant Energy - Columbia	Columbia	MW-33AR

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
03025	11	PE223	138

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 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.	☒ a.m. 08:50 ☐ p.m.	☒ a.m. 11:50 ☐ p.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Opaque, brown	Clear ☐ 20 Turbid ☒ 25 (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: PMC
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

(+) ☒ E. (-) ☐ W. 2,155.200 FT.

(+) ☒ N. (-) ☐ S. 541.740 FT.

FROM ☒ GRIC ORIGIN ☐ BENCHMARK

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

6 COMMENTS ABOUT SAMPLING POINT:

Well depth - 30.6' Gradient from landfill - down gradient

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:

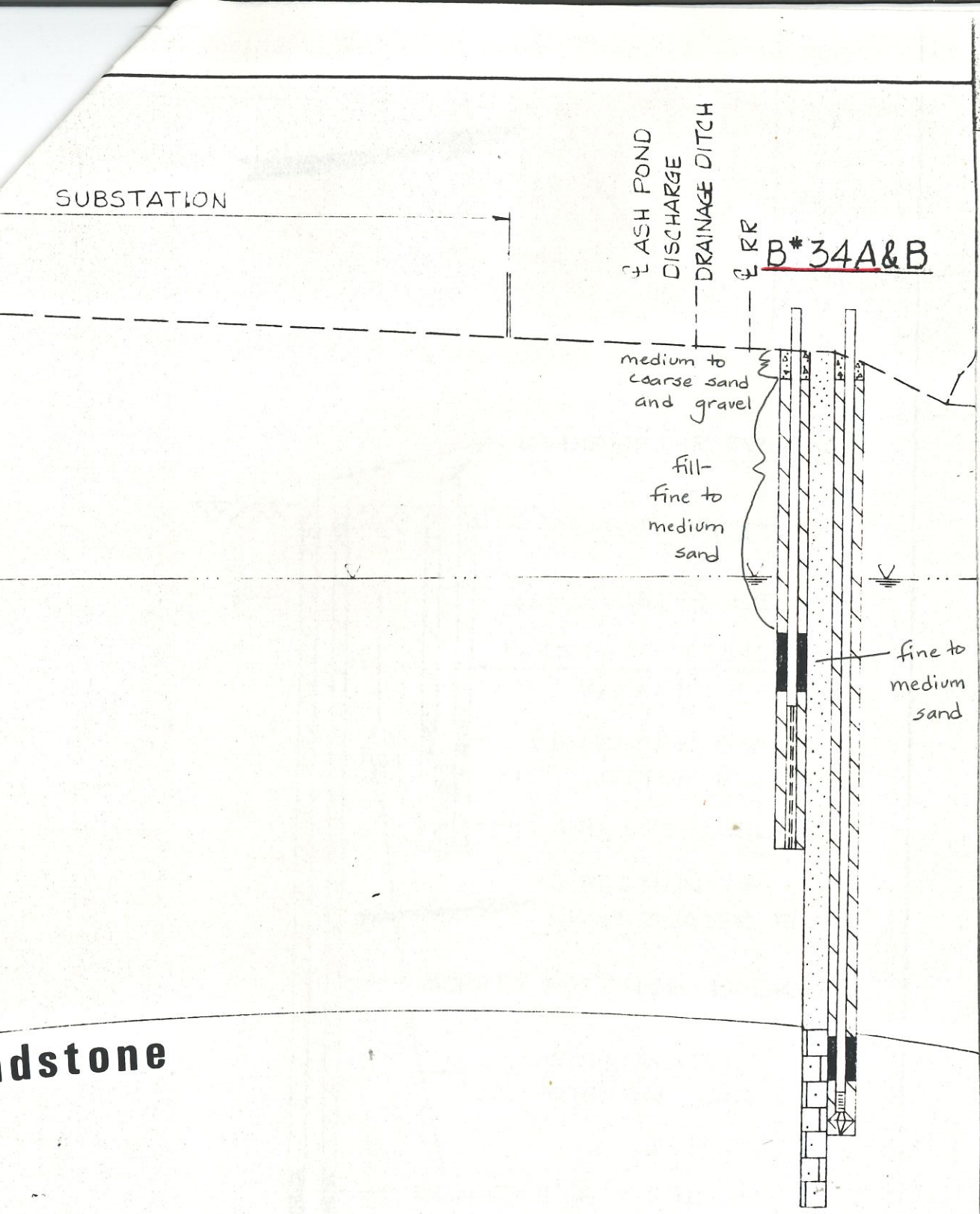
Groundwater flow - westerly

REQUIRED SAMPLING (MG/L 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	SODIUM	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	1-2-3-4-5-6-7-8-9-10-11-12

-6-



dstone

Scale:

Horizontal 1"=100'

Vertical 1"=10'

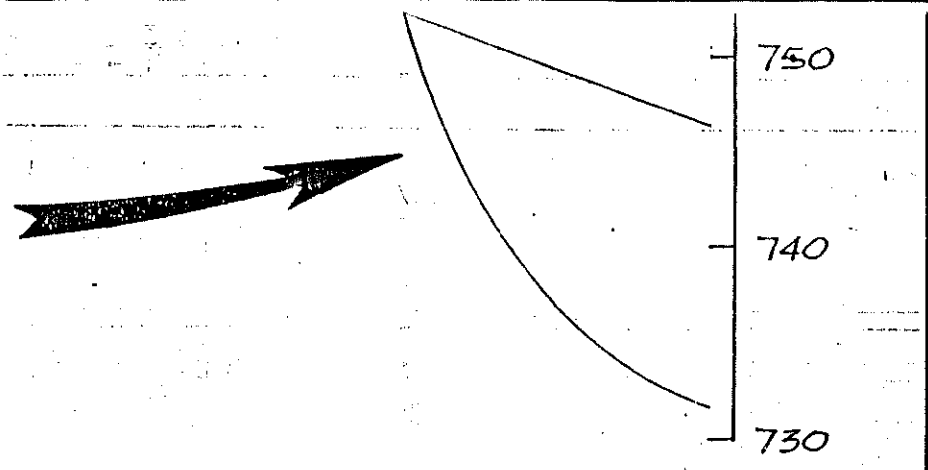
No legend available

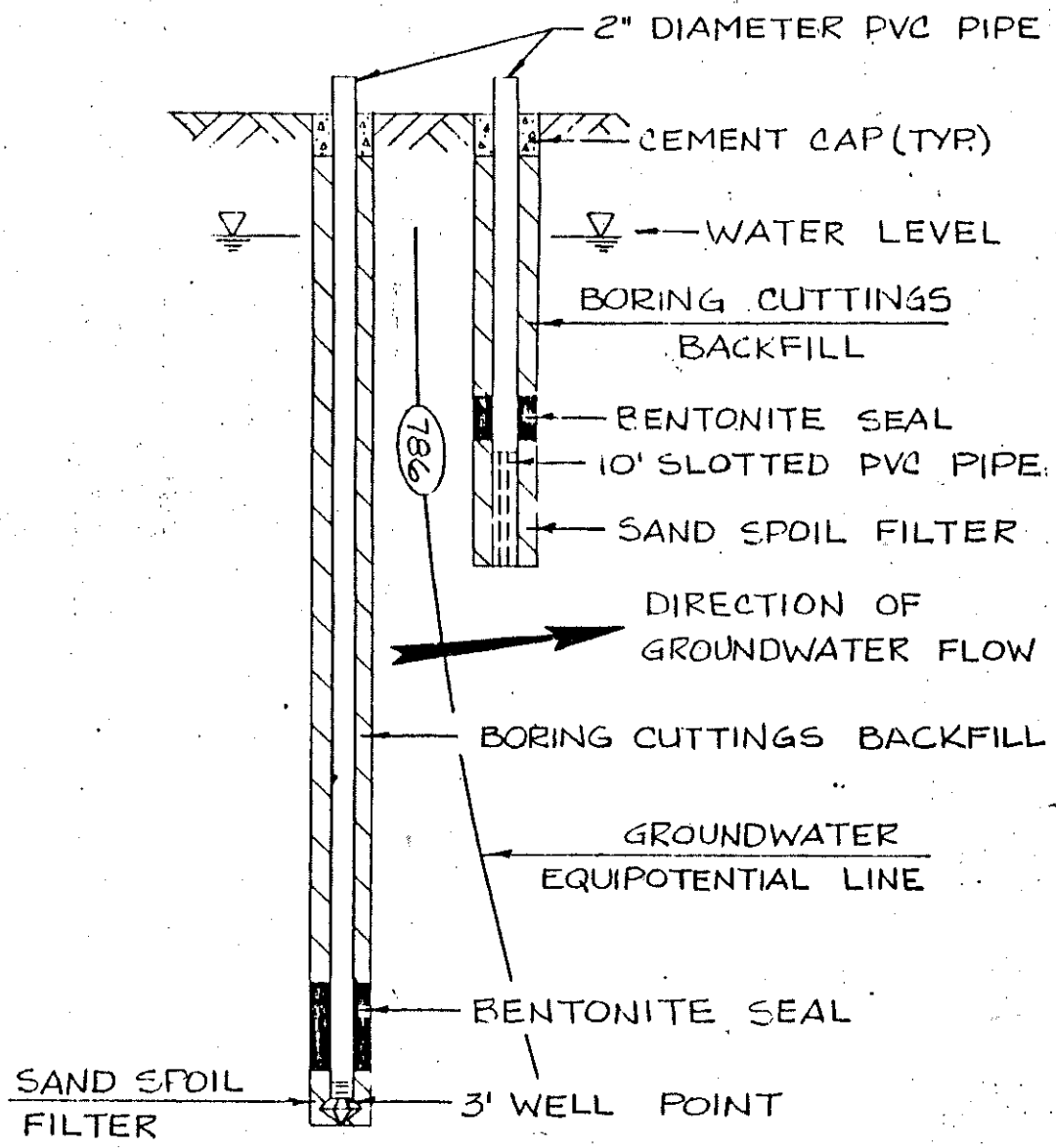
Warzyn Engineering Inc.

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

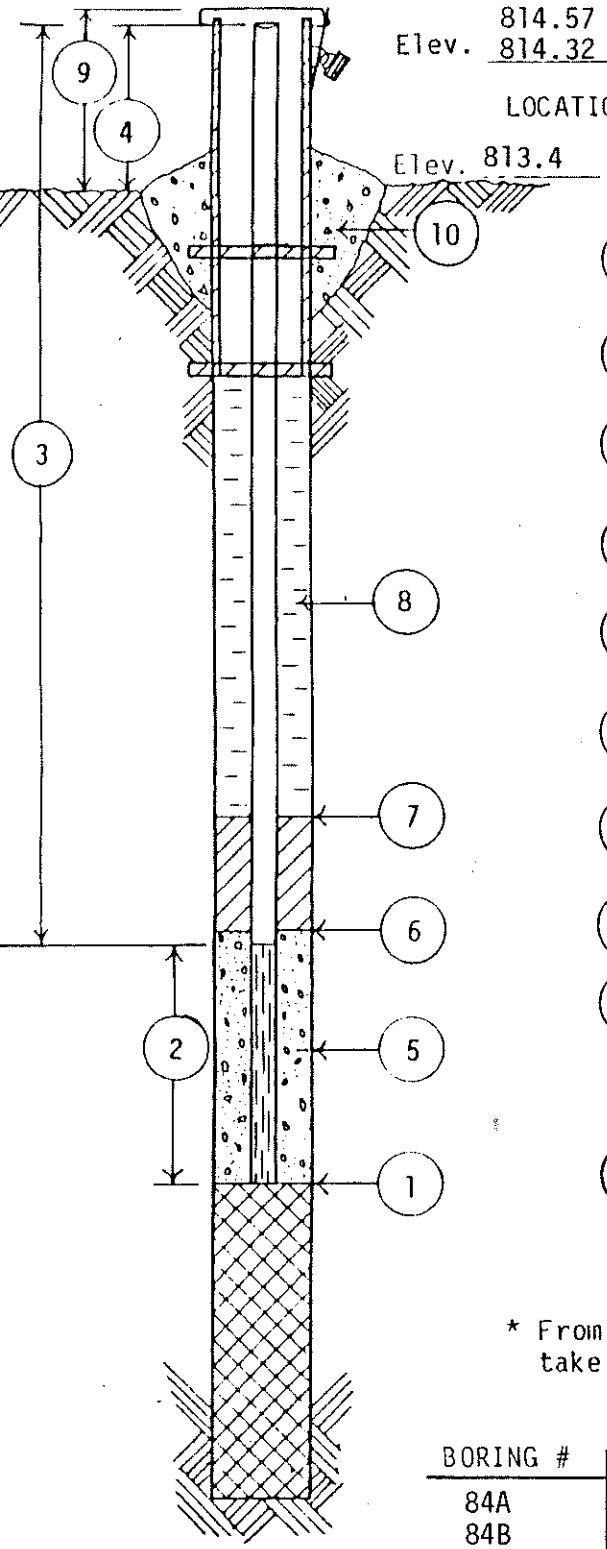
DATE 10/5/83

Elev. 814.57 Steel
814.32 PVC

CHIEF JS

LOCATION WP&L-Columbia Generating Station

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"	

WARZYN ENGINEERING INC.

FM1S-7-15]

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	County Name	Well Name
Alliant-Columbia	Columbia	MW-301

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well ID Number
	11	VY701	

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? (If yes, attach results) ☐ Yes ☒ No

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

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

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: [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	County Name	Well Name
Alliant - Columbia	Columbia	MW-302

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well ID Number
	11	VY702	

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) 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? (If yes, attach results) ☐ Yes ☒ No

	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 ☐ 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: Pardeeville, WI 53954

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: [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)
Type of Well: Well Code 11 / MW	Section Location of Waste/Source: SW 1/4 of SE 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 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 ☐ 50 / Hollow Stem Auger ☒ 41 / Other ☐ ____

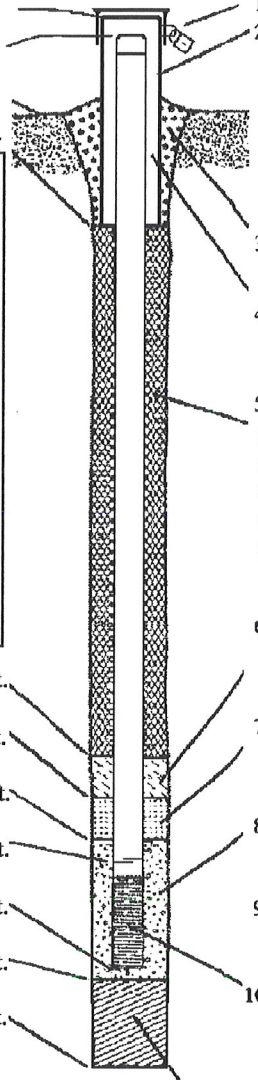
15. Drilling fluid used: Water ☐ 02 / Air ☐ 01 / Drilling Mud ☐ 03 / None ☒ 99

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 ☒ 04 / Other ☐ ____
d. Additional protection? ☒ Yes ☐ No
If yes, describe: bumper posts
3. Surface seal: Bentonite ☒ 30 / Concrete ☐ 01 / Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒ 30 / Other ☐ ____
Bentonite to grade, sand above
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 / Tremie pumped ☐ 02 / Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☑ 32
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 ☒ 23 / Flush threaded PVC schedule 80 ☐ 24 / Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 / Continuous slot ☐ 01 / Other ☐ ____
b. Manufacturer Johnson
c. Slot size: 0.01 in.
d. Slotted length: 10 ft.
11. Backfill material (below filter pack): Native / None ☐ 14 / Other ☒ ____

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

Signature: [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 ☐ 50 / Hollow Stem Auger ☒ 41 / Other ☐ ___

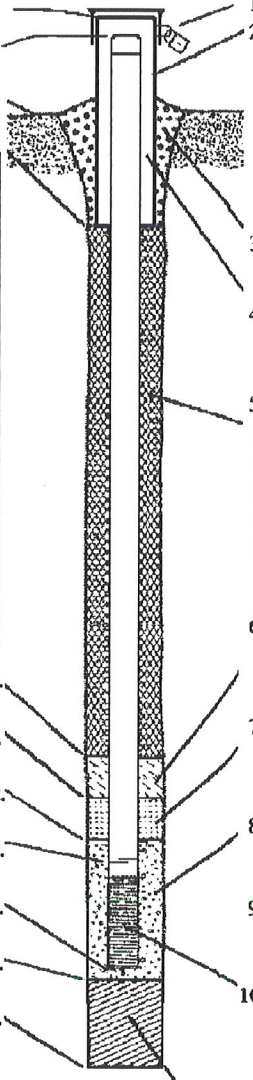
15. Drilling fluid used: Water ☐ 02 / Air ☐ 01 / Drilling Mud ☐ 03 / None ☒ 99

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 — Steel ☐ 04 / Other ☐ ___
d. Additional protection? ☐ Yes ☐ No
If yes, describe: yes, bumper posts
3. Surface seal: Bentonite ☒ 30 / Concrete ☐ 01 / Other ☐ ___
4. Material between well casing and protective pipe: Bentonite to grade, sand above — Bentonite ☒ 30 / Other ☐ ___
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 / Tremie pumped ☐ 02 / Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 32
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 ☒ 23 / Flush threaded PVC schedule 80 ☐ 24 / Other ☐ ___
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 / Continuous slot ☐ 01 / Other ☐ ___
b. Manufacturer Johnson
c. Slot size: 0.01 in.
d. Slotted length: 10 ft.
11. Backfill material (below filter pack): Native — None ☐ 14 / Other ☒ ___

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

May 13, 2022

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on April 15, 2022. 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
Sherren Clark, SCS Engineers
Tom Karwoski, SCS ENGINEERS
Nicole Kron, SCS ENGINEERS
Ryan Matzuk, SCS Engineers
Jeff Maxted, ALLIANT ENERGY
Marc Morandi, ALLIANT ENERGY

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

CERTIFICATIONS

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Florida: Cert E871149 SEKS WET
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
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 #: PA014572018-1
New Hampshire/TNI Certification #: 297617
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 #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
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
Wyoming Certification #: 8TMS-L

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
Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

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

SAMPLE SUMMARY

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40243482001	**MW-84A**	Water	04/13/22 14:20	04/15/22 07:10
40243482002	**MW-301**	Water	04/13/22 15:40	04/15/22 07:10

REPORT OF LABORATORY ANALYSIS

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

SAMPLE ANALYTE COUNT

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40243482001	**MW-84A**	EPA 6020B	KXS	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			MEA	7	PASI-G
		EPA 903.1	RPS	1	PASI-PA
		EPA 904.0	JSM	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C	SRK	1	PASI-G
		EPA 9040	YER	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40243482002	**MW-301**	EPA 6020B	KXS	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			MEA	7	PASI-G
		EPA 903.1	RPS	1	PASI-PA
		EPA 904.0	JSM	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C	SRK	1	PASI-G
		EPA 9040	YER	1	PASI-G
		EPA 300.0	HMB	3	PASI-G

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

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Sample: MW-84A **Lab ID: 40243482001** Collected: 04/13/22 14:20 Received: 04/15/22 07:10 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	04/18/22 06:24	05/01/22 02:08	7440-36-0	
Arsenic	**0.31J**	ug/L	1.0	0.28	1	04/18/22 06:24	05/01/22 02:08	7440-38-2	
Barium	**13.5**	ug/L	2.3	0.70	1	04/18/22 06:24	05/01/22 02:08	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	04/18/22 06:24	05/01/22 02:08	7440-41-7	
Boron	**10.5**	ug/L	10.0	3.0	1	04/18/22 06:24	05/01/22 02:08	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	04/18/22 06:24	05/01/22 02:08	7440-43-9	
Calcium	**75100**	ug/L	254	76.2	1	04/18/22 06:24	05/01/22 02:08	7440-70-2	
Chromium	**2.2J**	ug/L	3.4	1.0	1	04/18/22 06:24	05/01/22 02:08	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	04/18/22 06:24	05/01/22 02:08	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	04/18/22 06:24	05/01/22 02:08	7439-92-1	
Lithium	**0.36J**	ug/L	1.0	0.22	1	04/18/22 06:24	05/01/22 02:08	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	04/18/22 06:24	05/01/22 02:08	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	04/18/22 06:24	05/01/22 02:08	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	04/18/22 06:24	05/01/22 02:08	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	04/20/22 09:45	04/21/22 07:52	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.34**	Std. Units			1		04/13/22 14:20		
Field Specific Conductance	**600.2**	umhos/cm			1		04/13/22 14:20		
Oxygen, Dissolved	**9.33**	mg/L			1		04/13/22 14:20	7782-44-7	
REDOX	**200.6**	mV			1		04/13/22 14:20		
Turbidity	**0.00**	NTU			1		04/13/22 14:20		
Static Water Level	**785.02**	feet			1		04/13/22 14:20		
Temperature, Water (C)	**9.9**	deg C			1		04/13/22 14:20		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**334**	mg/L	20.0	8.7	1		04/15/22 16:44		
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		04/18/22 10:50		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**5.2**	mg/L	2.0	0.43	1		05/10/22 22:07	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/10/22 22:07	16984-48-8	
Sulfate	**1.4J**	mg/L	2.0	0.44	1		05/10/22 22:07	14808-79-8	M0

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Sample: MW-301 **Lab ID: 40243482002** Collected: 04/13/22 15:40 Received: 04/15/22 07:10 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	**0.31J**	ug/L	1.0	0.15	1	04/18/22 06:24	05/01/22 02:37	7440-36-0	
Arsenic	**0.47J**	ug/L	1.0	0.28	1	04/18/22 06:24	05/01/22 02:37	7440-38-2	
Barium	**7.8**	ug/L	2.3	0.70	1	04/18/22 06:24	05/01/22 02:37	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	04/18/22 06:24	05/01/22 02:37	7440-41-7	
Boron	**28.7**	ug/L	10.0	3.0	1	04/18/22 06:24	05/01/22 02:37	7440-42-8	
Cadmium	**0.30J**	ug/L	1.0	0.15	1	04/18/22 06:24	05/01/22 02:37	7440-43-9	
Calcium	**97300**	ug/L	254	76.2	1	04/18/22 06:24	05/01/22 02:37	7440-70-2	
Chromium	**<1.0**	ug/L	3.4	1.0	1	04/18/22 06:24	05/01/22 02:37	7440-47-3	
Cobalt	**0.32J**	ug/L	1.0	0.12	1	04/18/22 06:24	05/01/22 02:37	7440-48-4	
Lead	**3.1**	ug/L	1.0	0.24	1	04/18/22 06:24	05/01/22 02:37	7439-92-1	
Lithium	**0.56J**	ug/L	1.0	0.22	1	04/18/22 06:24	05/01/22 02:37	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	04/18/22 06:24	05/01/22 02:37	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	04/18/22 06:24	05/01/22 02:37	7782-49-2	
Thallium	**0.32J**	ug/L	1.0	0.14	1	04/18/22 06:24	05/01/22 02:37	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	04/20/22 09:45	04/21/22 07:59	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**6.60**	Std. Units			1		04/13/22 15:40		
Field Specific Conductance	**747.0**	umhos/cm			1		04/13/22 15:40		
Oxygen, Dissolved	**2.47**	mg/L			1		04/13/22 15:40	7782-44-7	
REDOX	**207.5**	mV			1		04/13/22 15:40		
Turbidity	**0.00**	NTU			1		04/13/22 15:40		
Static Water Level	**785.44**	feet			1		04/13/22 15:40		
Temperature, Water (C)	**7.1**	deg C			1		04/13/22 15:40		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**422**	mg/L	20.0	8.7	1		04/15/22 16:44		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.0**	Std. Units	0.10	0.010	1		04/18/22 10:53		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**1.9J**	mg/L	2.0	0.43	1		05/10/22 23:43	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/10/22 23:43	16984-48-8	
Sulfate	**12.7**	mg/L	2.0	0.44	1		05/10/22 23:43	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

QC Batch: 413634
QC Batch Method: EPA 7470
Analysis Method: EPA 7470
Analysis Description: 7470 Mercury
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243482001, 40243482002

METHOD BLANK: 2381580 Matrix: Water
Associated Lab Samples: 40243482001, 40243482002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	<0.066	0.20	04/21/22 07:47	

LABORATORY CONTROL SAMPLE: 2381581

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	4.9	98	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2381582 2381583

Parameter	Units	40243482001 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	5.0	5.0	100	101	85-115	1	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

QC Batch: 413354
QC Batch Method: EPA 3010A
Analysis Method: EPA 6020B
Analysis Description: 6020B MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243482001, 40243482002

METHOD BLANK: 2380530 Matrix: Water
Associated Lab Samples: 40243482001, 40243482002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	<0.15	1.0	05/01/22 00:40	
Arsenic	ug/L	<0.28	1.0	05/01/22 00:40	
Barium	ug/L	<0.70	2.3	05/01/22 00:40	
Beryllium	ug/L	<0.25	1.0	05/01/22 00:40	
Boron	ug/L	<3.0	10.0	05/01/22 00:40	
Cadmium	ug/L	<0.15	1.0	05/01/22 00:40	
Calcium	ug/L	<76.2	254	05/01/22 00:40	
Chromium	ug/L	<1.0	3.4	05/01/22 00:40	
Cobalt	ug/L	<0.12	1.0	05/01/22 00:40	
Lead	ug/L	<0.24	1.0	05/01/22 00:40	
Lithium	ug/L	<0.22	1.0	05/01/22 00:40	
Molybdenum	ug/L	<0.44	1.5	05/01/22 00:40	
Selenium	ug/L	<0.32	1.1	05/01/22 00:40	
Thallium	ug/L	<0.14	1.0	05/01/22 00:40	

LABORATORY CONTROL SAMPLE: 2380531

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	250	261	104	80-120	
Arsenic	ug/L	250	263	105	80-120	
Barium	ug/L	250	249	99	80-120	
Beryllium	ug/L	250	270	108	80-120	
Boron	ug/L	250	250	100	80-120	
Cadmium	ug/L	250	268	107	80-120	
Calcium	ug/L	10000	9930	99	80-120	
Chromium	ug/L	250	254	102	80-120	
Cobalt	ug/L	250	248	99	80-120	
Lead	ug/L	250	266	106	80-120	
Lithium	ug/L	250	250	100	80-120	
Molybdenum	ug/L	250	249	100	80-120	
Selenium	ug/L	250	278	111	80-120	
Thallium	ug/L	250	252	101	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2380532 2380533

Parameter	Units	40243482001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Antimony	ug/L	<0.15	250	250	256	257	102	103	75-125	0	20	
Arsenic	ug/L	0.31J	250	250	256	259	102	103	75-125	1	20	
Barium	ug/L	13.5	250	250	260	258	99	98	75-125	1	20	
Beryllium	ug/L	<0.25	250	250	260	260	104	104	75-125	0	20	
Boron	ug/L	10.5	250	250	255	248	98	95	75-125	3	20	
Cadmium	ug/L	<0.15	250	250	258	259	103	104	75-125	0	20	
Calcium	ug/L	75100	10000	10000	86700	85700	116	106	75-125	1	20	
Chromium	ug/L	2.2J	250	250	256	252	102	100	75-125	2	20	
Cobalt	ug/L	<0.12	250	250	244	241	98	96	75-125	1	20	
Lead	ug/L	<0.24	250	250	267	267	107	107	75-125	0	20	
Lithium	ug/L	0.36J	250	250	250	249	100	99	75-125	0	20	
Molybdenum	ug/L	<0.44	250	250	252	250	101	100	75-125	1	20	
Selenium	ug/L	<0.32	250	250	264	268	106	107	75-125	1	20	
Thallium	ug/L	<0.14	250	250	257	256	103	103	75-125	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

QC Batch: 413340
QC Batch Method: SM 2540C
Analysis Method: SM 2540C
Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243482001, 40243482002

METHOD BLANK: 2380206 Matrix: Water
Associated Lab Samples: 40243482001, 40243482002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	04/15/22 16:44	

LABORATORY CONTROL SAMPLE: 2380207

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	555	524	94	80-120	

SAMPLE DUPLICATE: 2380208

Parameter	Units	40243482001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	334	332	1	10	

SAMPLE DUPLICATE: 2380209

Parameter	Units	40243482002 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	422	412	2	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

QC Batch: 413406
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243482001, 40243482002

SAMPLE DUPLICATE: 2380677

Parameter	Units	40243487001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	10.7	10.7	0	20	H6

SAMPLE DUPLICATE: 2380701

Parameter	Units	40243447003 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	8.5	8.4	1	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

QC Batch: 414946
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: 40243482001, 40243482002

METHOD BLANK: 2389209 Matrix: Water
Associated Lab Samples: 40243482001, 40243482002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.43	2.0	05/10/22 20:23	
Fluoride	mg/L	<0.095	0.32	05/10/22 20:23	
Sulfate	mg/L	<0.44	2.0	05/10/22 20:23	

LABORATORY CONTROL SAMPLE: 2389210

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	21.1	106	90-110	
Fluoride	mg/L	2	2.1	107	90-110	
Sulfate	mg/L	20	21.4	107	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2389211 2389212

Parameter	Units	40243482001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	5.2	20	20	25.3	25.6	101	102	90-110	1	15	
Fluoride	mg/L	<0.095	2	2	2.1	2.2	106	108	90-110	2	15	
Sulfate	mg/L	1.4J	20	20	23.7	24.0	111	113	90-110	1	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.

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Sample: MW-84A **Lab ID: 40243482001** Collected: 04/13/22 14:20 Received: 04/15/22 07:10 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	**0.254 ± 0.354 (0.590) C:NA T:97%**	pCi/L	05/03/22 12:00	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.357 ± 0.315 (0.634) C:76% T:90%**	pCi/L	05/02/22 12:15	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.611 ± 0.669 (1.22)**	pCi/L	05/04/22 22:02	7440-14-4	

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Sample: MW-301 **Lab ID: 40243482002** Collected: 04/13/22 15:40 Received: 04/15/22 07:10 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	**0.000 ± 0.289 (0.649) C:NA T:99%**	pCi/L	05/03/22 12:11	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.179 ± 0.282 (0.610) C:80% T:92%**	pCi/L	05/02/22 12:15	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.179 ± 0.571 (1.26)**	pCi/L	05/04/22 22:02	7440-14-4	

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

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

QC Batch: 498723
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: 40243482001, 40243482002

METHOD BLANK: 2413743 Matrix: Water
Associated Lab Samples: 40243482001, 40243482002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	-0.232 ± 0.242 (0.655) C:NA T:96%	pCi/L	05/03/22 11:40	

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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

QC Batch: 498724
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: 40243482001, 40243482002

METHOD BLANK: 2413744 Matrix: Water
Associated Lab Samples: 40243482001, 40243482002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.105 ± 0.277 (0.621) C:77% T:92%	pCi/L	05/02/22 12:14	

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.

REPORT OF LABORATORY ANALYSIS

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

QUALIFIERS

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

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.
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.

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

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25222067.00 COLUMBIA CCR BACK
Pace Project No.: 40243482

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40243482001	**MW-84A**	EPA 3010A	413354	EPA 6020B	413520
40243482002	**MW-301**	EPA 3010A	413354	EPA 6020B	413520
40243482001	**MW-84A**	EPA 7470	413634	EPA 7470	413681
40243482002	**MW-301**	EPA 7470	413634	EPA 7470	413681
40243482001	**MW-84A**				
40243482002	**MW-301**				
40243482001	**MW-84A**	EPA 903.1	498723		
40243482002	**MW-301**	EPA 903.1	498723		
40243482001	**MW-84A**	EPA 904.0	498724		
40243482002	**MW-301**	EPA 904.0	498724		
40243482001	**MW-84A**	Total Radium Calculation	502166		
40243482002	**MW-301**	Total Radium Calculation	502166		
40243482001	**MW-84A**	SM 2540C	413340		
40243482002	**MW-301**	SM 2540C	413340		
40243482001	**MW-84A**	EPA 9040	413406		
40243482002	**MW-301**	EPA 9040	413406		
40243482001	**MW-84A**	EPA 300.0	414946		
40243482002	**MW-301**	EPA 300.0	414946		

#1

CHAIN-OF-CUSTODY Analytical Request Document

Pace Analytical®

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY- Affix Workorder/Login Label Here or List Pace Workorder Number or MTJL Log-in Number Here: 40243482

ALL SHADED AREAS are for LAB USE ONLY

Company: SCS Engineers	Billing Information: Same
Address: 2830 Dairy Dr. Madison, WI.	
Report To: Thomas Karwoski	Email To: mBlodgett@scsengineers.com
Copy To: Meghan Blodgett	Site Collection Info/Address:
Customer Project Name/Number: Columbia 25222067.00	State: WI County/City: Columbia/Portage Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET
Phone: 608-224-2830 Email:	Site/Facility ID #:
Collected By (print): Adam Dalton	Purchase Order #: Quote #:
Collected By (signature):	Turnaround Date Required:
Sample Disposal: [ ] Dispose as appropriate [ ] Return [ ] Archive: [ ] Hold:	Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)

Compliance Monitoring? [ ] Yes [ ] No

DW PWS ID #: DW Location Code:

Immediately Packed on Ice: [ ] Yes [ ] No

Field Filtered (if applicable): [ ] Yes [ ] No

Analysis: _____

Container Preservative Type **: 1 1 HCl

Lab Project Manager:

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other _____

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	Analyses: Radium 226/228	Metals	pH	TDS, Cl, F, SO4	Lab Sample # / Comments
MW-84A			4/13/22	1420				5	x	x	x	x	4115C08 001
MW-301			4/13/22	1540				5	x	x	x	x	002

Lab Profile/Line:

Lab Sample Receipt Checklist:

Custody Seals Present/Intact	Y N NA
Custody Signatures Present	Y N NA
Collector Signature Present	Y N NA
Bottles Intact	Y N NA
Correct Bottles	Y N NA
Sufficient Volume	Y N NA
Samples Received on Ice	Y N NA
VOA - Headspace Acceptable	Y N NA
USDA Regulated Soils	Y N NA
Samples in Holding Time	Y N NA
Residual Chlorine Present	Y N NA
Cl Strips:	
Sample pH Acceptable	Y N NA
pH Strips:	
Sulfide Present	Y N NA
Lead Acetate Strips: 4/15/22	

LAB USE ONLY:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: (Wet) Blue Dry None

Packing Material Used:

Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A

Lab Tracking #: 2764151

Samples received via: FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:

Temp Blank Received: (Y) N NA

Therm ID#: 113

Cooler 1 Temp Upon Receipt: 1 oC

Cooler 1 Therm Corr. Factor: .1 oC

Cooler 1 Corrected Temp: 1.1 oC

Comments:

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
SCS	4/14/22 1030		
CS logistics	4/15/22 0710	Thyke BD Pace	4/15/22 0710

MTJL LAB USE ONLY

Table #:

Acctnum:

Template:

Prelogin:

PM:

PB:

Trip Blank Received: Y N (NA)

HCL MeOH TSP Other

Non Conformance(s): YES / NO

Sample Preservation Receipt Form

Client Name: SCS Engineers Project # 40243482

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

Initial when completed: TP Date/ Time:

Lab Lot# of pH paper: 1CD3112 Lab Std #ID of preservation (if pH adjusted):

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	AG4U	AG5U	AG2S	BG3U	BP1U	BP3U	BP3B	BP3N	BP3S	VG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	JG9U	WGFU	WPFU	SP5T	ZPLC	GN							
001										2		1														2				X		2.5 / 5 / 10
002										2		1														2				X		2.5 / 5 / 10
003																																2.5 / 5 / 10
004																																2.5 / 5 / 10
005																																2.5 / 5 / 10
006																																2.5 / 5 / 10
007																																2.5 / 5 / 10
008																																2.5 / 5 / 10
009																																2.5 / 5 / 10
010																																2.5 / 5 / 10
011																																2.5 / 5 / 10
012																																2.5 / 5 / 10
013																																2.5 / 5 / 10
014																																2.5 / 5 / 10
015																																2.5 / 5 / 10
016																																2.5 / 5 / 10
017																																2.5 / 5 / 10
018																																2.5 / 5 / 10
019																																2.5 / 5 / 10
020																																2.5 / 5 / 10

VP 4/15/22

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
AG4U	120 mL amber glass unpres
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

VG9A	40 mL clear ascorbic
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	1L plastic HNO3

Page 1 of 2

Sample Condition Upon Receipt Form (SCUR)

Project #:

WO# : 40243482

40243482

Client Name: SCS Engineers

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 - 113 **Type of Ice:** (Wet) Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 1 /Corr: 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: 4/15/22 /Initials: TP

Labeled By Initials: AD

Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☐Yes ☑No ☐N/A	2. PM # TP 4/15/22
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.
- 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:	☑Yes ☐No	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
-Pace IR Containers Used:	☐Yes ☐No ☑N/A	
Containers Intact:	☑Yes ☐No	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: W		
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 login

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

May 16, 2022

Meghan Blodgett
SCS ENGINEERS
2830 Dairy Drive
Madison, WI 53718

RE: Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Dear Meghan Blodgett:

Enclosed are the analytical results for sample(s) received by the laboratory on April 15, 2022. 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
Sherren Clark, SCS Engineers
Tom Karwoski, SCS ENGINEERS
Nicole Kron, SCS ENGINEERS
Ryan Matzuk, SCS Engineers
Jeff Maxted, ALLIANT ENERGY
Marc Morandi, ALLIANT ENERGY

REPORT OF LABORATORY ANALYSIS

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

CERTIFICATIONS

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Pace Analytical Services Pennsylvania
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ANAB DOD-ELAP Rad Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification #: PA01547
Connecticut Certification #: PH-0694
Delaware Certification
EPA Region 4 DW Rad
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Florida: Cert E871149 SEKS WET
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: KY90133
KY WW Permit #: KY0098221
KY WW Permit #: KY0000221
Louisiana DHH/TNI Certification #: LA180012
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: 2017020
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 #: PA014572018-1
New Hampshire/TNI Certification #: 297617
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 #: PA200002-010
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: 02867
Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
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
Wyoming Certification #: 8TMS-L

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
Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

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

SAMPLE SUMMARY

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40243485001	**MW-33AR**	Water	04/12/22 14:20	04/15/22 07:10
40243485002	**MW-34A**	Water	04/12/22 15:30	04/15/22 07:10
40243485003	**MW-302**	Water	04/12/22 16:05	04/15/22 07:10
40243485004	**MW-93A**	Water	04/13/22 12:50	04/15/22 07:10
40243485005	**FIELD BLANK MOD1-3LF**	Water	04/13/22 12:50	04/15/22 07:10

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

SAMPLE ANALYTE COUNT

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40243485001	**MW-33AR**	EPA 6020B	KXS	2	PASI-G
			MEA	7	PASI-G
		SM 2540C	SRK	1	PASI-G
		EPA 9040	YER	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40243485002	**MW-34A**	EPA 6020B	KXS	2	PASI-G
			MEA	7	PASI-G
		SM 2540C	SRK	1	PASI-G
		EPA 9040	YER	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40243485003	**MW-302**	EPA 6020B	KXS	2	PASI-G
			MEA	7	PASI-G
		SM 2540C	SRK	1	PASI-G
		EPA 9040	YER	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40243485004	**MW-93A**	EPA 6020B	KXS	14	PASI-G
		EPA 7470	AJT	1	PASI-G
			MEA	6	PASI-G
		EPA 903.1	RPS	1	PASI-PA
		EPA 904.0	JSM	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C	SRK	1	PASI-G
		EPA 9040	YER	1	PASI-G
		EPA 300.0	HMB	3	PASI-G
40243485005	**FIELD BLANK MOD1-3LF**	EPA 6020B	KXS	14	PASI-G
		EPA 7470	AJT	1	PASI-G
		EPA 903.1	RPS	1	PASI-PA
		EPA 904.0	JSM	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C	SRK	1	PASI-G
		EPA 9040	YER	1	PASI-G
		EPA 300.0	HMB	3	PASI-G

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

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Sample: MW-33AR **Lab ID: 40243485001** Collected: 04/12/22 14:20 Received: 04/15/22 07:10 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	**558**	ug/L	10.0	3.0	1	04/18/22 06:24	05/01/22 03:14	7440-42-8	
Calcium	**80000**	ug/L	254	76.2	1	04/18/22 06:24	05/01/22 03:14	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.60**	Std. Units			1		04/12/22 14:20		
Field Specific Conductance	**847.0**	umhos/cm			1		04/12/22 14:20		
Oxygen, Dissolved	**9.62**	mg/L			1		04/12/22 14:20	7782-44-7	
REDOX	**198.2**	mV			1		04/12/22 14:20		
Turbidity	**0.00**	NTU			1		04/12/22 14:20		
Static Water Level	**783.27**	feet			1		04/12/22 14:20		
Temperature, Water (C)	**10.6**	deg C			1		04/12/22 14:20		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**506**	mg/L	20.0	8.7	1		04/15/22 16:46		
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		04/22/22 12:03		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**59.0**	mg/L	2.0	0.43	1		05/05/22 01:49	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/06/22 17:43	16984-48-8	
Sulfate	**155**	mg/L	20.0	4.4	10		05/05/22 04:18	14808-79-8	

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

ANALYTICAL RESULTS

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Sample: MW-34A **Lab ID: 40243485002** Collected: 04/12/22 15:30 Received: 04/15/22 07:10 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	04/18/22 06:24	05/01/22 03:36	7440-42-8	
Calcium	**77000**	ug/L	254	76.2	1	04/18/22 06:24	05/01/22 03:36	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**8.34**	Std. Units			1		04/12/22 15:30		
Field Specific Conductance	**577.0**	umhos/cm			1		04/12/22 15:30		
Oxygen, Dissolved	**7.82**	mg/L			1		04/12/22 15:30	7782-44-7	
REDOX	**112.6**	mV			1		04/12/22 15:30		
Turbidity	**4.39**	NTU			1		04/12/22 15:30		
Static Water Level	**784.30**	feet			1		04/12/22 15:30		
Temperature, Water (C)	**11.4**	deg C			1		04/12/22 15:30		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**402**	mg/L	20.0	8.7	1		04/15/22 16:46		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**7.8**	Std. Units	0.10	0.010	1		04/22/22 12:08		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**2.2**	mg/L	2.0	0.43	1		05/05/22 02:04	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/06/22 17:57	16984-48-8	
Sulfate	**146**	mg/L	20.0	4.4	10		05/05/22 21:19	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Sample: MW-302 **Lab ID: 40243485003** Collected: 04/12/22 16:05 Received: 04/15/22 07:10 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	**389**	ug/L	10.0	3.0	1	04/18/22 06:24	05/01/22 03:43	7440-42-8	
Calcium	**91600**	ug/L	254	76.2	1	04/18/22 06:24	05/01/22 03:43	7440-70-2	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.21**	Std. Units			1		04/12/22 16:05		
Field Specific Conductance	**677.1**	umhos/cm			1		04/12/22 16:05		
Oxygen, Dissolved	**8.74**	mg/L			1		04/12/22 16:05	7782-44-7	
REDOX	**197.1**	mV			1		04/12/22 16:05		
Turbidity	**3.92**	NTU			1		04/12/22 16:05		
Static Water Level	**784.42**	feet			1		04/12/22 16:05		
Temperature, Water (C)	**9.5**	deg C			1		04/12/22 16:05		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**398**	mg/L	20.0	8.7	1		04/15/22 16:46		
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		04/22/22 12:11		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**0.79J**	mg/L	2.0	0.43	1		05/05/22 02:19	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/06/22 18:12	16984-48-8	
Sulfate	**22.1**	mg/L	2.0	0.44	1		05/05/22 02:19	14808-79-8	M0

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Sample: MW-93A **Lab ID: 40243485004** Collected: 04/13/22 12:50 Received: 04/15/22 07:10 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	04/18/22 06:24	05/01/22 03:51	7440-36-0	
Arsenic	**<0.28**	ug/L	1.0	0.28	1	04/18/22 06:24	05/01/22 03:51	7440-38-2	
Barium	**113**	ug/L	2.3	0.70	1	04/18/22 06:24	05/01/22 03:51	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	04/18/22 06:24	05/01/22 03:51	7440-41-7	
Boron	**26.1**	ug/L	10.0	3.0	1	04/18/22 06:24	05/01/22 03:51	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	04/18/22 06:24	05/01/22 03:51	7440-43-9	
Calcium	**85500**	ug/L	254	76.2	1	04/18/22 06:24	05/01/22 03:51	7440-70-2	
Chromium	**1.2J**	ug/L	3.4	1.0	1	04/18/22 06:24	05/01/22 03:51	7440-47-3	
Cobalt	**0.41J**	ug/L	1.0	0.12	1	04/18/22 06:24	05/01/22 03:51	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	04/18/22 06:24	05/01/22 03:51	7439-92-1	
Lithium	**1.5**	ug/L	1.0	0.22	1	04/18/22 06:24	05/01/22 03:51	7439-93-2	
Molybdenum	**1.8**	ug/L	1.5	0.44	1	04/18/22 06:24	05/01/22 03:51	7439-98-7	
Selenium	**0.84J**	ug/L	1.1	0.32	1	04/18/22 06:24	05/01/22 03:51	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	04/18/22 06:24	05/01/22 03:51	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	04/20/22 09:45	04/21/22 08:20	7439-97-6	
Field Data	Analytical Method: Pace Analytical Services - Green Bay								
Field pH	**7.68**	Std. Units			1		04/13/22 12:50		
Field Specific Conductance	**691.1**	umhos/cm			1		04/13/22 12:50		
Oxygen, Dissolved	**7.73**	mg/L			1		04/13/22 12:50	7782-44-7	
REDOX	**203.0**	mV			1		04/13/22 12:50		
Turbidity	**0.00**	NTU			1		04/13/22 12:50		
Temperature, Water (C)	**9.9**	deg C			1		04/13/22 12:50		
2540C Total Dissolved Solids	Analytical Method: SM 2540C Pace Analytical Services - Green Bay								
Total Dissolved Solids	**384**	mg/L	20.0	8.7	1		04/15/22 16:46		
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		04/22/22 12:13		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**19.0**	mg/L	2.0	0.43	1		05/10/22 23:58	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/10/22 23:58	16984-48-8	
Sulfate	**7.0**	mg/L	2.0	0.44	1		05/10/22 23:58	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Sample: FIELD BLANK MOD1-3LF **Lab ID: 40243485005** Collected: 04/13/22 12:50 Received: 04/15/22 07:10 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	04/18/22 06:24	05/01/22 00:54	7440-36-0	
Arsenic	**<0.28**	ug/L	1.0	0.28	1	04/18/22 06:24	05/01/22 00:54	7440-38-2	
Barium	**<0.70**	ug/L	2.3	0.70	1	04/18/22 06:24	05/01/22 00:54	7440-39-3	
Beryllium	**<0.25**	ug/L	1.0	0.25	1	04/18/22 06:24	05/01/22 00:54	7440-41-7	
Boron	**<3.0**	ug/L	10.0	3.0	1	04/18/22 06:24	05/01/22 00:54	7440-42-8	
Cadmium	**<0.15**	ug/L	1.0	0.15	1	04/18/22 06:24	05/01/22 00:54	7440-43-9	
Calcium	**77.3J**	ug/L	254	76.2	1	04/18/22 06:24	05/01/22 00:54	7440-70-2	
Chromium	**<1.0**	ug/L	3.4	1.0	1	04/18/22 06:24	05/01/22 00:54	7440-47-3	
Cobalt	**<0.12**	ug/L	1.0	0.12	1	04/18/22 06:24	05/01/22 00:54	7440-48-4	
Lead	**<0.24**	ug/L	1.0	0.24	1	04/18/22 06:24	05/01/22 00:54	7439-92-1	
Lithium	**<0.22**	ug/L	1.0	0.22	1	04/18/22 06:24	05/01/22 00:54	7439-93-2	
Molybdenum	**<0.44**	ug/L	1.5	0.44	1	04/18/22 06:24	05/01/22 00:54	7439-98-7	
Selenium	**<0.32**	ug/L	1.1	0.32	1	04/18/22 06:24	05/01/22 00:54	7782-49-2	
Thallium	**<0.14**	ug/L	1.0	0.14	1	04/18/22 06:24	05/01/22 00:54	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	04/20/22 09:45	04/21/22 08:22	7439-97-6	
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		04/15/22 16:47		
9040 pH	Analytical Method: EPA 9040 Pace Analytical Services - Green Bay								
pH at 25 Degrees C	**6.9**	Std. Units	0.10	0.010	1		04/22/22 12:21		H6
300.0 IC Anions	Analytical Method: EPA 300.0 Pace Analytical Services - Green Bay								
Chloride	**<0.43**	mg/L	2.0	0.43	1		05/11/22 00:12	16887-00-6	
Fluoride	**<0.095**	mg/L	0.32	0.095	1		05/11/22 00:12	16984-48-8	
Sulfate	**<0.44**	mg/L	2.0	0.44	1		05/11/22 00:12	14808-79-8	

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 413634
QC Batch Method: EPA 7470
Analysis Method: EPA 7470
Analysis Description: 7470 Mercury
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243485004, 40243485005

METHOD BLANK: 2381580 Matrix: Water
Associated Lab Samples: 40243485004, 40243485005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	ug/L	<0.066	0.20	04/21/22 07:47	

LABORATORY CONTROL SAMPLE: 2381581

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	ug/L	5	4.9	98	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2381582 2381583

Parameter	Units	40243482001 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	5.0	5.0	100	101	85-115	1	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 413354
QC Batch Method: EPA 3010A
Analysis Method: EPA 6020B
Analysis Description: 6020B MET
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243485001, 40243485002, 40243485003, 40243485004, 40243485005

METHOD BLANK: 2380530 Matrix: Water
Associated Lab Samples: 40243485001, 40243485002, 40243485003, 40243485004, 40243485005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	<0.15	1.0	05/01/22 00:40	
Arsenic	ug/L	<0.28	1.0	05/01/22 00:40	
Barium	ug/L	<0.70	2.3	05/01/22 00:40	
Beryllium	ug/L	<0.25	1.0	05/01/22 00:40	
Boron	ug/L	<3.0	10.0	05/01/22 00:40	
Cadmium	ug/L	<0.15	1.0	05/01/22 00:40	
Calcium	ug/L	<76.2	254	05/01/22 00:40	
Chromium	ug/L	<1.0	3.4	05/01/22 00:40	
Cobalt	ug/L	<0.12	1.0	05/01/22 00:40	
Lead	ug/L	<0.24	1.0	05/01/22 00:40	
Lithium	ug/L	<0.22	1.0	05/01/22 00:40	
Molybdenum	ug/L	<0.44	1.5	05/01/22 00:40	
Selenium	ug/L	<0.32	1.1	05/01/22 00:40	
Thallium	ug/L	<0.14	1.0	05/01/22 00:40	

LABORATORY CONTROL SAMPLE: 2380531

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Antimony	ug/L	250	261	104	80-120	
Arsenic	ug/L	250	263	105	80-120	
Barium	ug/L	250	249	99	80-120	
Beryllium	ug/L	250	270	108	80-120	
Boron	ug/L	250	250	100	80-120	
Cadmium	ug/L	250	268	107	80-120	
Calcium	ug/L	10000	9930	99	80-120	
Chromium	ug/L	250	254	102	80-120	
Cobalt	ug/L	250	248	99	80-120	
Lead	ug/L	250	266	106	80-120	
Lithium	ug/L	250	250	100	80-120	
Molybdenum	ug/L	250	249	100	80-120	
Selenium	ug/L	250	278	111	80-120	
Thallium	ug/L	250	252	101	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2380532 2380533

Parameter	Units	40243482001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Antimony	ug/L	<0.15	250	250	256	257	102	103	75-125	0	20	
Arsenic	ug/L	0.31J	250	250	256	259	102	103	75-125	1	20	
Barium	ug/L	13.5	250	250	260	258	99	98	75-125	1	20	
Beryllium	ug/L	<0.25	250	250	260	260	104	104	75-125	0	20	
Boron	ug/L	10.5	250	250	255	248	98	95	75-125	3	20	
Cadmium	ug/L	<0.15	250	250	258	259	103	104	75-125	0	20	
Calcium	ug/L	75100	10000	10000	86700	85700	116	106	75-125	1	20	
Chromium	ug/L	2.2J	250	250	256	252	102	100	75-125	2	20	
Cobalt	ug/L	<0.12	250	250	244	241	98	96	75-125	1	20	
Lead	ug/L	<0.24	250	250	267	267	107	107	75-125	0	20	
Lithium	ug/L	0.36J	250	250	250	249	100	99	75-125	0	20	
Molybdenum	ug/L	<0.44	250	250	252	250	101	100	75-125	1	20	
Selenium	ug/L	<0.32	250	250	264	268	106	107	75-125	1	20	
Thallium	ug/L	<0.14	250	250	257	256	103	103	75-125	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 413340 | Analysis Method: SM 2540C
QC Batch Method: SM 2540C | Analysis Description: 2540C Total Dissolved Solids
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243485001, 40243485002, 40243485003, 40243485004, 40243485005

METHOD BLANK: 2380206 Matrix: Water
Associated Lab Samples: 40243485001, 40243485002, 40243485003, 40243485004, 40243485005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	<8.7	20.0	04/15/22 16:44	

LABORATORY CONTROL SAMPLE: 2380207

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Dissolved Solids	mg/L	555	524	94	80-120	

SAMPLE DUPLICATE: 2380208

Parameter	Units	40243482001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	334	332	1	10	

SAMPLE DUPLICATE: 2380209

Parameter	Units	40243482002 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	422	412	2	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 413872
QC Batch Method: EPA 9040
Analysis Method: EPA 9040
Analysis Description: 9040 pH
Laboratory: Pace Analytical Services - Green Bay
Associated Lab Samples: 40243485001, 40243485002, 40243485003, 40243485004, 40243485005

SAMPLE DUPLICATE: 2382998

Parameter	Units	40243594001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	9.2	9.1	2	20	1q,H6,PI

SAMPLE DUPLICATE: 2383176

Parameter	Units	40243485001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	7.7	7.7	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 414730
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: 40243485001, 40243485002, 40243485003

METHOD BLANK: 2387879 Matrix: Water
Associated Lab Samples: 40243485001, 40243485002, 40243485003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.43	2.0	05/04/22 11:51	
Fluoride	mg/L	<0.095	0.32	05/04/22 11:51	
Sulfate	mg/L	<0.44	2.0	05/04/22 11:51	

LABORATORY CONTROL SAMPLE: 2387880

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	20.5	102	90-110	
Fluoride	mg/L	2	2.0	100	90-110	
Sulfate	mg/L	20	20.6	103	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2387881 2387882

Parameter	Units	40243924001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	224	400	400	655	655	108	108	90-110	0	15	
Sulfate	mg/L	182	400	400	614	615	108	108	90-110	0	15	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2387883 2387884

Parameter	Units	40243485003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	0.79J	20	20	22.4	22.7	108	110	90-110	1	15	
Fluoride	mg/L	<0.095	2	2	2.1	2.1	106	107	90-110	1	15	
Sulfate	mg/L	22.1	20	20	44.3	44.6	111	112	90-110	1	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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL DATA

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 414946
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: 40243485004, 40243485005

METHOD BLANK: 2389209 Matrix: Water
Associated Lab Samples: 40243485004, 40243485005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	<0.43	2.0	05/10/22 20:23	
Fluoride	mg/L	<0.095	0.32	05/10/22 20:23	
Sulfate	mg/L	<0.44	2.0	05/10/22 20:23	

LABORATORY CONTROL SAMPLE: 2389210

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	21.1	106	90-110	
Fluoride	mg/L	2	2.1	107	90-110	
Sulfate	mg/L	20	21.4	107	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2389211 2389212

Parameter	Units	40243482001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	5.2	20	20	25.3	25.6	101	102	90-110	1	15	
Fluoride	mg/L	<0.095	2	2	2.1	2.2	106	108	90-110	2	15	
Sulfate	mg/L	1.4J	20	20	23.7	24.0	111	113	90-110	1	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.

REPORT OF LABORATORY ANALYSIS

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

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Sample: MW-93A **Lab ID: 40243485004** Collected: 04/13/22 12:50 Received: 04/15/22 07:10 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	**0.369 ± 0.343 (0.452) C:NA T:94%**	pCi/L	05/03/22 12:00	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.918 ± 0.472 (0.830) C:68% T:82%**	pCi/L	05/05/22 11:34	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**1.29 ± 0.815 (1.28)**	pCi/L	05/09/22 17:12	7440-14-4	

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

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Sample: FIELD BLANK MOD1-3LF **Lab ID: 40243485005** Collected: 04/13/22 12:50 Received: 04/15/22 07:10 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	**0.000 ± 0.330 (0.715) C:NA T:97%**	pCi/L	05/03/22 12:00	13982-63-3	
	Pace Analytical Services - Greensburg					
Radium-228	EPA 904.0	**0.205 ± 0.253 (0.534) C:87% T:90%**	pCi/L	05/02/22 12:17	15262-20-1	
	Pace Analytical Services - Greensburg					
Total Radium	Total Radium Calculation	**0.205 ± 0.583 (1.25)**	pCi/L	05/04/22 22:02	7440-14-4	

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

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 498723
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: 40243485004, 40243485005

METHOD BLANK: 2413743 Matrix: Water
Associated Lab Samples: 40243485004, 40243485005

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	-0.232 ± 0.242 (0.655) C:NA T:96%	pCi/L	05/03/22 11:40	

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.

REPORT OF LABORATORY ANALYSIS

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

QUALITY CONTROL - RADIOCHEMISTRY

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

QC Batch: 498724
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: 40243485004, 40243485005

METHOD BLANK: 2413744 Matrix: Water
Associated Lab Samples: 40243485004, 40243485005

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.105 ± 0.277 (0.621) C:77% T:92%	pCi/L	05/02/22 12:14	

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.

REPORT OF LABORATORY ANALYSIS

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

QUALIFIERS

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

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.
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.
PI	The precision between the sample and the duplicate sample exceeded laboratory control limits.

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

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25222067 COLUMBIA CCR MOD 1-3
Pace Project No.: 40243485

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40243485001	**MW-33AR**	EPA 3010A	413354	EPA 6020B	413520
40243485002	**MW-34A**	EPA 3010A	413354	EPA 6020B	413520
40243485003	**MW-302**	EPA 3010A	413354	EPA 6020B	413520
40243485004	**MW-93A**	EPA 3010A	413354	EPA 6020B	413520
40243485005	**FIELD BLANK MOD1-3LF**	EPA 3010A	413354	EPA 6020B	413520
40243485004	**MW-93A**	EPA 7470	413634	EPA 7470	413681
40243485005	**FIELD BLANK MOD1-3LF**	EPA 7470	413634	EPA 7470	413681
40243485001	**MW-33AR**				
40243485002	**MW-34A**				
40243485003	**MW-302**				
40243485004	**MW-93A**				
40243485004	**MW-93A**	EPA 903.1	498723		
40243485005	**FIELD BLANK MOD1-3LF**	EPA 903.1	498723		
40243485004	**MW-93A**	EPA 904.0	498724		
40243485005	**FIELD BLANK MOD1-3LF**	EPA 904.0	498724		
40243485004	**MW-93A**	Total Radium Calculation	503146		
40243485005	**FIELD BLANK MOD1-3LF**	Total Radium Calculation	502166		
40243485001	**MW-33AR**	SM 2540C	413340		
40243485002	**MW-34A**	SM 2540C	413340		
40243485003	**MW-302**	SM 2540C	413340		
40243485004	**MW-93A**	SM 2540C	413340		
40243485005	**FIELD BLANK MOD1-3LF**	SM 2540C	413340		
40243485001	**MW-33AR**	EPA 9040	413872		
40243485002	**MW-34A**	EPA 9040	413872		
40243485003	**MW-302**	EPA 9040	413872		
40243485004	**MW-93A**	EPA 9040	413872		
40243485005	**FIELD BLANK MOD1-3LF**	EPA 9040	413872		
40243485001	**MW-33AR**	EPA 300.0	414730		
40243485002	**MW-34A**	EPA 300.0	414730		
40243485003	**MW-302**	EPA 300.0	414730		
40243485004	**MW-93A**	EPA 300.0	414946		
40243485005	**FIELD BLANK MOD1-3LF**	EPA 300.0	414946		

CHAIN-OF-CUSTODY Analytical Request Document

Pace Analytical®

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY- Affix Workorder/Login Label Here or List Pace Workorder Number or MTJL Log-in Number Here: 40243485

ALL SHADED AREAS are for LAB USE ONLY

Company: SCS Engineers	Billing Information: Same
Address: 2830 Dairy Dr. Madison WI	
Report To: Thomas Karwoski	Email To: MBlodgett@scsengineers.com
Copy To: Meghan Blodgett	Site Collection Info/Address:
Customer Project Name/Number: Columbia 25222067.00	State: WI County/City: Columbia/Portage Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET
Phone: 608-224-2830 Email:	Site/Facility ID #: Compliance Monitoring? [ ] Yes [ ] No
Collected By (print): Adam Watson	Purchase Order #: Quote #: DW PWS ID #: DW Location Code:
Collected By (signature):	Turnaround Date Required: Immediately Packed on Ice: [ ] Yes [ ] No
Sample Disposal: [ ] Dispose as appropriate [ ] Return [ ] Archive: [ ] Hold:	Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply) Field Filtered (if applicable): [ ] Yes [ ] No Analysis:

Container Preservative Type **: 1 | U | U | 1 | 1

Lab Project Manager:

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res Cl	# of Ctns	Analyses: Boron, Calcium	pH	TDS, Cl, F, SO4	Metals, full list	Radium 226/228	Lab Profile/Line
MW-33AR	GW		4/12/22	1420				3	X	X	X			001
MW-34A	GW		4/12/22	1530				3	X	X	X			002
MW-302	GW		4/12/22	1605				3	X	X	X			003
MW-93A	GW		4/13/22	1250				5		X	X	X	X	004
~~MW-84A~~	~~GW~~		~~4/13/22~~										X	
Field Blank MOD1-3F	W		4/13/22	1250				5		X	X	X	X	005

Lab Sample Receipt Checklist:

Custody Seals Present/Intact	Y N NA
Custody Signatures Present	Y N NA
Collector Signature Present	Y N NA
Bottles Intact	Y N NA
Correct Bottles	Y N NA
Sufficient Volume	Y N NA
Samples Received on Ice	Y N NA
VOA - Headspace Acceptable	Y N NA
USDA Regulated Soils	Y N NA
Samples in Holding Time	Y N NA
Residual Chlorine Present	Y N NA
Cl Strips:	
Sample pH Acceptable	Y N NA
pH Strips:	
Sulfide Present	Y N NA
Lead Acetate Strips:	

LAB USE ONLY: Lab Sample # / Comments: 4/15/22

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: (Wet) Blue Dry None

Packing Material Used:

Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A

Lab Tracking #: 2764152

Samples received via: FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:
Temp Blank Received: (Y) N NA
Therm ID#: 113
Cooler 1 Temp Upon Receipt: 2 oC
Cooler 1 Therm Corr. Factor: .1 oC
Cooler 1 Corrected Temp: 2.1 oC
Comments:

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
SCS	4/14/22 1030		
CS logistics	4/15/22 0710	Tonya Pace	4/15/22 0710

MTJL LAB USE ONLY
Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Trip Blank Received: Y N (NA)
HCL MeOH TSP Other

Non Conformance(s): YES / NO

Sample Preservation Receipt Form

Client Name: SCS Engineers Project # 40243485

All containers needing preservation have been checked and noted below: ☑Yes ☐No ☐N/A Initial when completed: JP Date/ Time:

Lab Lot# of pH paper: 1003112 Lab Std #ID of preservation (if pH adjusted):

Pace Lab #	Glass: AG1U	BG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	Plastic: BP1U	BP3U	BP3B	BP3N	BP3S	Vials: VG9A	DG9T	VG9U	VG9H	VG9M	VG9D	Jars: JGFU	JG9U	WGFU	WPFU	General: SP5T	ZPLC	GN	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 / 10
002										2		1																		X		2.5 / 5 / 10
003										2		1																		X		2.5 / 5 / 10
004										2		1														2				X		2.5 / 5 / 10
005										2		1														2				X		2.5 / 5 / 10
006																																	2.5 / 5 / 10
007																																	2.5 / 5 / 10
008																																	2.5 / 5 / 10
009																																	2.5 / 5 / 10
010																																	2.5 / 5 / 10
011																																	2.5 / 5 / 10
012																																	2.5 / 5 / 10
013																					JP 4/15/22												2.5 / 5 / 10
014																																	2.5 / 5 / 10
015																																	2.5 / 5 / 10
016																																	2.5 / 5 / 10
017																																	2.5 / 5 / 10
018																																	2.5 / 5 / 10
019																																	2.5 / 5 / 10
020																																	2.5 / 5 / 10

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
AG4U	120 mL amber glass unpres
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

VG9A	40 mL clear ascorbic
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	1L plastic HNO3

Page 1 of 2

Sample Condition Upon Receipt Form (SCUR)

Project #:

WO# : 40243485

40243485

Client Name: SCS Engineers

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 - 113 **Type of Ice:** (Wet) Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 2 /Corr: 2.1

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: 4/15/22 /Initials: TP

Labeled By Initials: CM

Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☐Yes ☑No ☐N/A	2. pg # TP 4/15/22
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.
- 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:		8.
For Analysis: ☑Yes ☐No MS/MSD:	☐Yes ☑No ☐N/A	
Correct Containers Used:	☑Yes ☐No	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
-Pace IR Containers Used:	☐Yes ☐No ☑N/A	
Containers Intact:	☑Yes ☐No	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: W		
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 login

Appendix D

Historical Monitoring Results

Single Location

Name: WPL - Columbia

Location ID: MW-33AR
Number of Sampling Dates: 21

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	10/8/2020	4/13/2021	6/11/2021	10/12/2021	4/12/2022
Boron	ug/L	954	813	794	827	812	763	760	692	697	678	601	683	682	568	548	566	569	473	--	564	558
Calcium	ug/L	50000	48900	50500	79000	63100	57500	66800	80700	84800	98200	99800	--	66900	131000	121000	58400	57100	51600	--	53700	80000
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	27.3	26.9	--	22.6	59
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	<0.095	<0.095	--	<0.095	<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	7.7	8.78	7.71	7.59	7.6
Sulfate	mg/L	96.2	91.5	99.2	124	132	133	139	151	164	175	163	124	112	201	182	104	97.4	94.3	--	96.4	155
Total Dissolved Solids	mg/L	356	354	364	456	440	426	446	492	598	606	692	466	388	784	634	376	270	362	--	374	506
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	623.5	622	609	623.2	847
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	9.31	10.11	11.42	--	9.62
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	160.4	125.3	85.3	90	198.2
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	785.91	784.27	784.19	783.73	783.27
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	13.8	9.8	12.7	13.5	10.6
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	0	0.63	0	0	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	7.8	7.8	--	8	7.7

Single Location

Name: WPL - Columbia

Location ID: MW-34A
Number of Sampling Dates: 23

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	5/28/2020	10/8/2020	2/25/2021	4/13/2021	6/11/2021	10/12/2021	4/12/2022
Boron	ug/L	230/205	220	216	--	212	224	214	214	201	205	208	209	241	233	204	207	210	213	--	203	--	212	237
Calcium	ug/L	65300/65200	63500	60000	--	55600	62800	58900	66300	66900	67300	69600	69600	--	70100	67500	78800	58700	61300	--	61600	--	58100	77000
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	3.9	2.1	--	2.3	--	1.9	2.2
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	<0.095	<0.095	--	<0.095	--	<0.095	<0.095
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	7.4	7.81	7.57	7.93	7.61	7.68	8.34
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	44.4	58.7	--	59.3	--	56.1	146
Total Dissolved Solids	mg/L	300/324	298	304	--	288	242	310	330	366	358	340	412	460	392	310	314	284	306	--	290	--	278	402
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	459	464.2	--	472.6	472.7	478.1	577
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	10.12	9.88	--	10.47	11.77	10.1	7.82
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	198.5	143.2	--	118.8	73.4	72.6	112.6
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	785.98	785.7	--	784.77	784.66	784.42	784.3
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	11.1	12.9	--	10.3	12.2	13	11.4
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	84.51	55	--	36.34	9.72	21.13	4.39
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	7.6	7.7	--	7.8	--	7.8	7.8

Single Location

Name: WPL - Columbia

Location ID: MW-84A
Number of Sampling Dates: 22

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	2/3/2020	5/29/2020	10/8/2020	4/14/2021	10/14/2021	4/13/2022
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	15.7	10	9.7	14.3	11.1	10.5
Calcium	ug/L	74000	72200	67600	--	74000	76000	70800	73200	76100	74900	77500	76600	76000	74000	80100	73500	72700	77600	69200	69100	75300	75100
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	3.7	3.7	4.3	4.4	3.5	5.2
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	--	<0.095	<0.095	<0.095	<0.095	<0.095
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	7.51	7.34	7.49	7.34	7.42	7.34
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	<2.2	1.5	1.3	1.4	1.3	1.4
Total Dissolved Solids	mg/L	316	322	316	--	324	316	328	342	344	342	314	328	372	330	318	310	316	340	320	328	326	334
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	--	<0.15	<0.15	0.55	<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	0.38	0.34	0.49	0.91	0.41	0.31
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	14	13.9	12.6	13.4	12.9	13.5
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	--	<0.25	<0.25	0.47	<0.25	<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	--	<0.15	<0.15	0.53	<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	1.6	1.7	1.6	2.6	1.9	2.2
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	<0.12	<0.12	<0.12	0.52	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	--	<0.24	<0.24	0.55	<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	0.58	0.4	0.39	1	0.28	0.36
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	--	<0.084	<0.066	<0.066	<0.093	<0.066
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	<0.44	<0.44	<0.44	0.62	<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	<0.32	<0.32	<0.32	0.48	<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	<0.14	<0.14	<0.14	0.66	0.19	<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	0.1	0.395	0.39	0.285	0.243	0.611
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	0.1	0.368	0	-0.289	0	0.254
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	-0.153	0.0273	0.39	0.285	0.243	0.357
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	618.4	613.7	610.1	610.9	598.9	600.2
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	8.43	9.81	9.39	9.8	9.25	9.33
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	121.5	135	153.2	95.6	89.7	200.6
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	786.5	787.02	786.1	785.84	784.96	785.02
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	10.3	10.6	11.9	10.2	12.5	9.9
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	1.23	2.15	0	2.45	3.41	0
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	7.4	7.6	7.6	7.6	7.8	7.6

Single Location

Name: WPL - Columbia

Location ID: MW-301
Number of Sampling Dates: 21

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	5/29/2020	10/8/2020	4/14/2021	10/14/2021	4/13/2022
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	21.3	28.8	22.2	31.4	28.7
Calcium	ug/L	126000	115000	108000	118000	129000	124000	120000	111000	108000	87200	112000	105000	101000	126000	114000	113000	112000	93000	117000	67800	97300
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	2	3.4	1.5	2.7	1.9
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	--	<0.095	<0.095	<0.095	<0.095	<0.095
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	6.73	6.95	6.66	7.01	6.6
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	11.5	25.1	8.5	17.4	12.7
Total Dissolved Solids	mg/L	478	486	464	490	444	514	502	458	462	362	464	502	424	462	418	462	452	412	472	334	422
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	--	<0.15	0.33	<0.15	<0.15	0.31
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	0.33	0.62	<0.28	0.35	0.47
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	9.8	9.4	8.9	7.7	7.8
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	--	<0.25	<0.25	<0.25	<0.25	<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	--	<0.15	0.19	<0.15	<0.15	0.3
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	<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	<0.12	0.29	<0.12	0.34	0.32
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	--	<0.24	0.25	<0.24	<0.24	3.1
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	0.47	0.46	0.58	0.46	0.56
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	--	<0.084	<0.066	<0.066	<0.093	<0.066
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	<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	<0.32	<0.32	<0.32	<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	<0.14	0.3	<0.14	0.17	0.32
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	0.193	0.38	1.16	0.172	0.179
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	0	0.0511	0.418	0.172	0
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	0.193	0.329	0.739	-0.0327	0.179
Field Specific Conductance	umhos/cm	897	573	796	1464	859	1018	1354	698.4	691.7	561	774	799	767	883	801	868	797	760	857	597.2	747
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	2	1.22	3.9	0.25	2.47
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	118.7	183.9	102.9	57.8	207.5
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	787.77	786.53	786.5	785.28	785.44
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	8.1	11	7.4	11.1	7.1
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	0	0	2.41	3.21	0
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	7	7.2	6.9	7.3	7

Single Location

Name: WPL - Columbia

Location ID: MW-302
Number of Sampling Dates: 20

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	10/8/2020	4/13/2021	10/14/2021	4/12/2022
Boron	ug/L	80	78.8	134	132	106	149	322	671	833	691	1950	203	296	254	246	611	648	521	495	389
Calcium	ug/L	68800	65900	66900	71700	76100	75400	79600	88900	87100	94400	110000	--	56900	62400	61400	90500	80600	82400	84100	91600
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	1.1	1.4	1.3	0.79
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	<0.095	<0.095	<0.095	<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	7.21	7.51	7.07	7.21
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	36.5	36.9	37.8	22.1
Total Dissolved Solids	mg/L	312	312	344	360	330	384	436	466	470	446	598	280	288	290	274	404	378	370	394	398
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	643.1	661.3	663.7	677.1
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	9.21	9.92	8.07	8.74
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	152.7	127	149.1	197.1
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	786.74	785.77	785.09	784.42
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	11.8	9.6	11.5	9.5
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	0	2.6	2.54	3.92
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	7.6	7.4	7.7	7.4

Appendix E

Alternative Source Demonstrations

Appendix E1

October 2021 Detection Monitoring

Alternative Source Demonstration
October 2021 Detection Monitoring

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

Prepared for:

SCS ENGINEERS

25222067.00 | April 15, 2022

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

Table of Contents

Section Page

Tables

Figures

Appendices

I:\25222067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\220415_COL_1-3 LF_Oct21 ASD_Final.docx

PE CERTIFICATION

I, Sherren Clark, hereby certify that 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.

SC 4-14-2022

(signature) (date)

Sherren Clark

(printed or typed name)

License number E-29863

My license renewal date is July 31, 2022.

Pages or sheets covered by this seal:
Alternative Source Demonstration, October 2021 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. The ASD is completed 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 is evaluating the SSIs observed in the statistical evaluation of the October 2021 detection monitoring event at the Columbia Energy Center (COL) Dry Ash Disposal Facility (ADF), Modules 1-3 CCR Units. 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 concluded that several lines of evidence demonstrated that SSIs reported for boron, chloride, 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 2021 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 Units 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, 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 2021 monitoring event are summarized in the attached **Table 1**.

The October 2021 SSIs include the following parameters and wells:

- Boron: MW-33AR, MW-34A, MW-302
- Chloride: MW-33AR
- Sulfate: MW-33AR, MW-34A, MW-302

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 2021 detection monitoring event were included in the 2021 Annual Groundwater Monitoring and Corrective Action Report completed in January 2022. 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, 1978). During drilling of CCR wells MW-301 and MW-302, the unconsolidated materials were identified as consisting primarily of silty sand. Boring logs for previously installed monitoring wells MW-33AR, MW-34A, MW-84A, MW-1AR, and M-4R 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. Water levels also indicate a northeast component of flow from Modules 1-3. The existing state monitoring well MW-1AR was included as a supplemental well in the April and October 2021 monitoring events to provide additional evaluation to the northeast of the CCR Unit. A groundwater flow map for October 2021 is shown on Figure 3. 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. 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 45 feet, measured from the top of the well casing.

Existing state monitoring well MW-1AR was included as a supplemental well in the October 2021 monitoring event to provide additional evaluation to the northeast of the CCR Unit. The well depth for

MW-1AR is 44.4 feet and it was installed in November 1994. The MW-1A boring log and MW-1AR well construction form are provided in the April 2021 COL MOD 1-3 ASD, completed in October 2021, and the 2021 Annual Groundwater Monitoring and Corrective Action Report, completed in January 2022.

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. Based on the review of the field notes and results, SCS did not identify any indication that the SSI concentrations were due to a sampling error.

SCS did not identify any issues with the sampling procedures or field analysis based on review of the data and field notes. Because boron, chloride, and sulfate are laboratory parameters, there is little potential for a field analysis error to contribute to an SSI.

3.2 LABORATORY ANALYSIS REVIEW

The laboratory reports for the October 2021 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 indication that the SSIs were due to a laboratory analysis error. There were no laboratory quality control flags or issues identified in the laboratory report that affect the usability of the data for detection monitoring. The laboratory flagged some anion results for matrix spike recovery and/or matrix spike duplicate recovery outside

laboratory control limits, including the sample results from background well MW-84 for chloride, fluoride, and sulfate and the sample results from compliance well MW-34A for chloride and fluoride. The laboratory also flagged the sample result from background well MW-301 for calcium for Matrix spike recovery outside laboratory control limits, and attributed the result out of range to a parent sample concentration notably higher than the spike level. In all of these cases, the recovery outside the limits was slightly above the upper limit and the control sample results were within control limits. None of these results affected the determination of SSIs.

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.

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 2021 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 2021 monitoring event based on the methodology and analysis review. No 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 2021 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 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 also likely contributed to the chloride SSIs 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 concentrations 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 concentrations 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, shown on **Figure 2**, 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 2021 sulfate result for MW-33AR (installed to replace MW-33A) was 96.4 mg/L, for MW-34A was 56.1 mg/L, and for MW-302 was 37.8 mg/L.

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-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. 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.

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 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, northwest, and northeast. 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 MOD 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.

Existing state monitoring well MW-1AR was included as a supplemental well in the April and October 2021 monitoring events to provide additional evaluation to the northeast of the CCR Unit (**Figure 3**). Although MW-1AR appears to be downgradient from MOD 1-3 under current flow conditions, no SSIs have been observed for this well.

4.2.4 Chloride and Boron Leachate Concentrations

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 consistent since then (**Table 2** and **Appendix A**). Over the same time period, boron concentrations at MW-33AR have followed a steady gradual 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 the lysimeters 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 Units. Boron, sulfate, and chloride 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. Elevated chloride concentrations detected at well MW-33AR appear 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 2021 Annual Report due January 31, 2022.

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.

Tables

Table 1. Groundwater Analytical Results Summary - October 2021 Event
Columbia Landfill MOD 1-3 / SCS Engineers Project #25222067.00

Parameter Name	UPL	Background Wells		Compliance Wells			Supplemental Well
		MW-84A	MW-301	MW-33AR	MW-34A	MW-302	MW-1AR
		10/14/2021	10/14/2021	10/12/2021	10/12/2021	10/14/2021	10/14/2021
Appendix III							
Boron, ug/L	35.6	11.1	31.4	564	212	495	12.4
Calcium, ug/L	129,000	75,300	67,800 P6	53700	58,100	84,100	87,600
Chloride, mg/L	6.2	3.5 M0	2.7	22.6	1.9 J, M0	1.3 J	1.2 J
Fluoride, mg/L	DQ	<0.095 M0	<0.095	<0.095	<0.095 M0	<0.095	<0.095
Field pH, Std. Units	7.78	7.42	7.01	7.59	7.68	7.07	7.44
Sulfate, mg/L	30.3	1.3 J, M0	17.4	96.4	56.1	37.8	3.1
Total Dissolved Solids, mg/L	514	326	334	374	278	394	350

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
LOQ = Limit of Quantitation
LOD = Limit of Detection

Lab Notes:
J = Estimated concentration at or above the LOD and below the LOQ.
P6 = Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.
M0 = Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits

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 2020 based on background well results through October 2019.

Created by:	NDK	Date:	5/17/2021
Last revision by:	RM	Date:	11/9/2021
Checked by:	JAO	Date:	12/10/2021
Scientist/Proj Mgr QA/QC:	TK	Date:	12/20/2021

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	3.4	25.1
		4/13/2021	22.2	1.5 J	8.5
		10/14/2021	31.4	2.7	17.4
	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	1.3 J
		4/13/2021	14.3	4.40	1.4 J
		10/14/2021	11.1	3.50	17.4

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	1.1 J	36.5
		4/13/2021	521	1.4 J	36.9
		10/14/2021	495	1.3 J	37.8
	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
		10/12/2021	564	22.6	96.4

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
		10/12/2021	212	1.9 J, M0	56.1
	MW-1AR	4/14/2021	16.1	1.5 J	4.4 M0
		10/14/2021	12.4	1.2 J	3.1

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

Created by:	NDK	Date:	3/19/2020
Last revision by:	RM	Date:	2/14/2022
Scientist Check:	JAO	Date:	2/17/2022

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25222067.00

	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	LS-1	LS-3R	LH-2	LH-3	LH-4
	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					
	Screen Length (ft)																					
	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	17.42	17.10	19.90		
	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	NM	NM	NM		
	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			dry	--	
	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	NM	dry	dry	--	
	October 8, 2013													785.66	785.42	785.97	785.52	NM	NM	NM	--	
	October 15, 2013	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.66	785.42	785.97	785.52				--	
	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	NM	dry	eachate depth = 0.2 in	--	
	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	NM	dry	eachate depth = 0.3 in	--	
	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	dry	--	dry	--	
Dry Ash Facility (Facility ID #03025)	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	broken	dry	eachate depth = 14.8 in	--	
	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	broken	dry	15.9"	--	
	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	liquid depth = 3.5'	dry	0.8"	1.4"	
	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	liquid depth = 3.0'	dry	-0.3	1.4"	
	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	liquid depth = 2.7'	dry	NM	NM	
	October 9-10, 2017	NM	aband	NM	NM	NM	NM	NM	NM	NM	785.56 [6]	NM	NM	NM	NM	NM	NM	NM	NM	1.4" [5]	1.6" [5]	
	February 21, 2018	783.97	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	784.68	784.46	NM	NM	NM	NM	NM	NM	
	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	liquid depth = 2.7'	NM	NM	NM	
	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	dry	iid depth =	4.6	4	--
	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	liquid depth = 3.9'	dry	--	--	
	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	liquid depth = 3.8'	dry	-0.1"	11.7"	13.1"
	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	liquid depth = 3.8'	dry	-0.1	2.4	2.4
	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	liquid depth = 3.8'	dry	-0.1	2.7	2.4
	February 25, 2021	NM	aband	NM	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-0.1	2.7	2.6
	April 14, 2021	785.11	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	liquid depth = 3.7'		--	0.2333	0.2167
	June 11, 2021	NM	aband	NM	784.19	NM	784.66	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	--	--	--	--	
	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	liquid depth = 3.7'	--			
	October 17, 2021	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-0.01	0.26	0.23
	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	NM	NM	NM	NM	

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25222067.00

	Well Number	M-3	M-4R	MW-39A	MW-39B	MW-48A	MW-48B	MW-57	MW-59	MW-216R	MW-217	MW-220RR	SG-1	SG-2	SG-3	SG-4
	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	792.06	795.25	808.60	805.36
	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	789.14	793.85	dry	dry
	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	789.5[1]	NM	dry	dry
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36	789.5[1]	791.33	dry	dry
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM	NM	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	788.90	dry	dry	dry
	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	NM	dry	dry	dry
Ash Pond Facility (Facility ID #02325)	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	789.3	791.70	dry	dry
	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	788.48	791.58	dry	dry
	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	NM	793.40	dry	dry
	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	788.32	792.52	dry	dry
	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	788.31	793.85	dry	dry
	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	788.3	793.45	dry	dry
	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	788.38	>795.25	dry	dry
	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	787.76	793.25	dry	dry
	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	788.40	794.60	dry	dry
	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	748.48	795.20	dry	dry
	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	748.48	>795.25	dry	dry
	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	788.34	793.32	dry	NM
	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	788.03	793.45	below gauge	dry
	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	788.59	795.13	dry	dry
	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 #25222067.00

	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
	Top of Casing Elevation (feet amsl)	806.89	813.00	811.52	805.42	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74
	Screen Length (ft)	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
	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
	Measurement Date													--	--	--
	December 21-22, 2015	NM	784.78	784.11	786.13	788.96	787.58	783.77	783.50	785.31	--	--	--	--	--	--
	April 4-5, 2016	786.78	785.81	785.48	788.08	789.61	789.09	785.29	785.63	786.37	--	--	--	--	--	--
	July 7-8, 2016	786.31	786.28	784.60	787.36	789.26	787.43	785.19	785.05	785.89	--	--	--	--	--	--
	July 28, 2016	NM	NM	784.35	NM	NM	NM	NM	784.86	785.61	--	--	--	--	--	--
	October 11-13, 2016	787.64	787.76	786.18	788.18	789.78	787.88	787.36	786.45	787.22	--	--	--	--	--	--
	December 29, 2016	787.37	787.05	NM	NM	NM	NM	785.66	785.72	786.63	--	--	--	--	--	--
	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	--	--	--
	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	--	--	--
	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	--	--	--
	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	--	--	--
	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	--	--	--
	February 21, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.19	783.05	783.02
	March 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	783.10	783.10	783.00
	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
	May 24, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.79	785.09	NM	785.45	785.97	786.11
	June 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.03	786.64	786.47
	July 23, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.27	786.35	786.55
CCR Rule Wells	August 7, 2018	787.06	NM	785.20	788.25	788.56	787.63	NM	NM	786.55	NM	NM	NM	NM	NM	NM
	August 22, 2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.54	785.40	785.46
	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
	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
	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
	June 12, 2019	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	787.25	NM
	June 19, 2019	NM	NM	786.81	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	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
	December 13, 2019	--	--	--	--	--	--	--	--	--	787.03	785.68	786.43	--	--	--
	December 23, 2019	--	--	--	--	--	--	--	--	--	--	--	--	--	775.22	--
	January 17, 2020	--	--	785.58	--	--	--	--	--	--	--	--	--	--	--	--
	February 3, 2020	787.24	NM	NM	NM	NM	NM	NM	NM	786.50	785.77	785.57	786.48	NM	NM	NM
	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
	June 30, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM
	August 6, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM
	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
	December 11, 2020	--	--	--	--	788.19	--	--	--	--	--	--	--	785.26	785.26	--
	February 25, 2021	--	--	784.27	--	788.36	--	--	784.75	--	--	--	--	--	--	--
	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
	June 11, 2021	--	--	--	--	--	--	784.19	784.66	--	--	--	--	784.20	784.05	--
	July 20, 2021	--	--	783.64	--	788.39	--	--	--	--	--	--	--	--	--	--
	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
	December 21, 2021	--	--	--	--	--	--	--	--	--	--	--	--	782.93	--	--
	Bottom of Well Elevation (ft)	771.33	780.55	774.82	733.43	776.98	753.04	771.89	776.98	776.36	780.63	780.39	778.90	775.60	775.21	773.55

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25222067.00

Notes:
NM = not measured

Created by: MDB Date: 5/6/2013
Last revision by: JAO Date: 12/22/2021
Checked by: RM Date: 12/22/2021

(1) The elevation for SG-1 is read off of the staff gauge (rather than measured from the top of the gauge).
(2) SG-2 could not be located during the April 2013 event.
(3) SG-3 could not be located during the October 2013 event. SG-1 could not be safely accessed during the October 2013 event.
(4) LH-2 measurements are given as leachate depth, measured by a transducer.
(5) LH-2 and LH-3 measurements were collected by WPL staff on October 9, 2017.
(6) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5 sampling event. The level was allowed to return to static and was measured on 10/10/2017.
(7) BC = Brian Clepper; NS= Nate Sievers - Columbia Site employees.

I:\25222067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Tables\[Table 3 - Groundwater Elevation Summary.xls]levels

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25222067.00

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	--	6530	12.3	789
	2017-Apr	--	6510	20.7 J	814
	2017-Oct	--	6200	14.2 J	764
	2018-Apr	--	5920	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
LS-3R	2015-Apr	--	6480	20.6 B	807
	2015-Oct	DRY	--	--	--
	2016-Apr	DRY	--	--	--
	2016-Oct	DRY	--	--	--
	2017-Apr	DRY	--	--	--
	2017-Oct	DRY	--	--	--
	2018-Apr	DRY	--	--	--
	2018-Oct	--	6180	26.2 J	841
	2019-Apr	DRY	--	--	--
	2019-Oct	DRY	--	--	--
	2020-May	DRY	--	--	--
	2020-Oct	DRY	--	--	--
	2021-Apr	DRY	--	--	--
	2021-Oct	DRY	--	--	--

Table 4. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25222067.00

Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LP-1	2015-Apr	--	4060	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

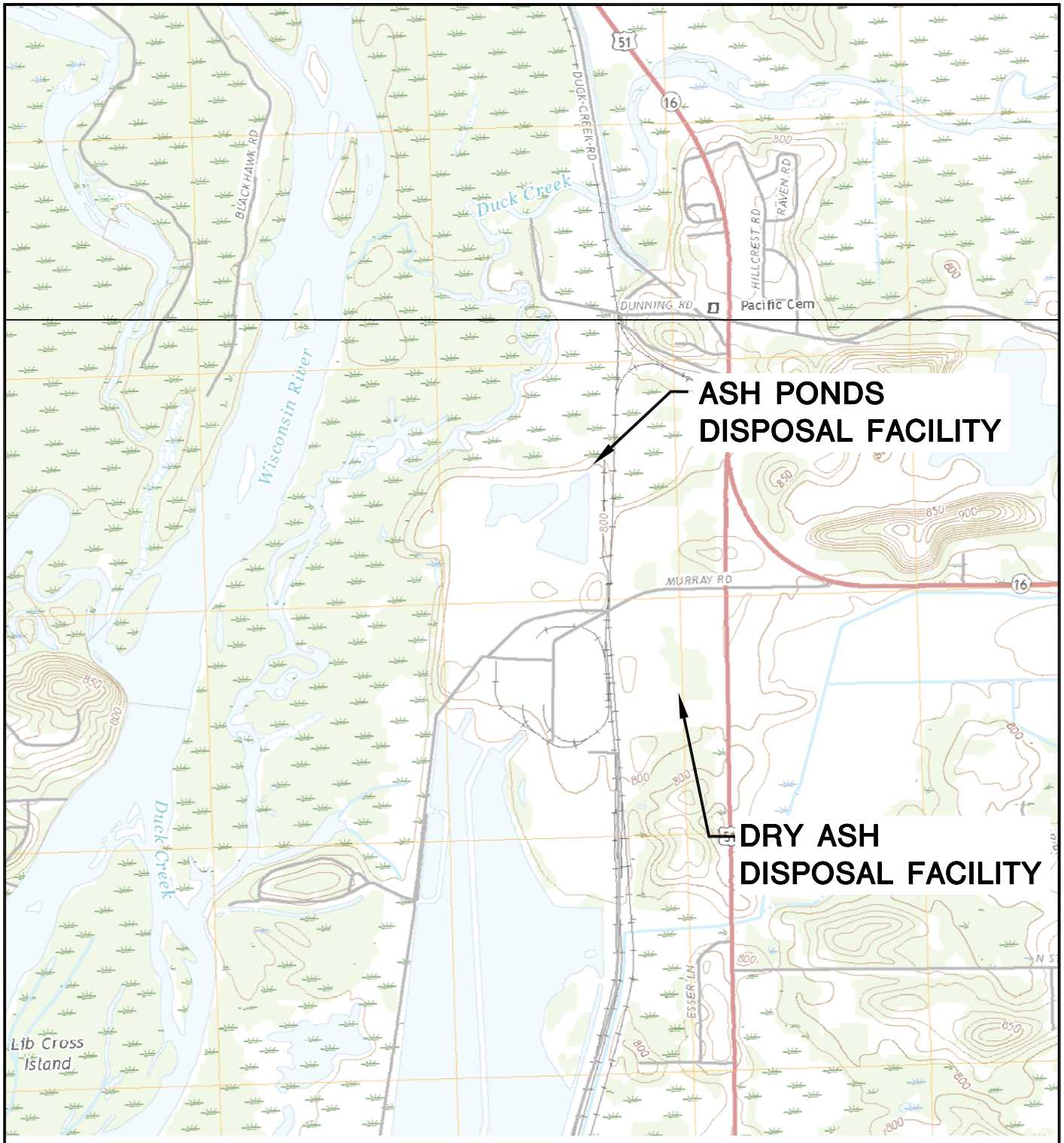
Abbreviations:
µg/L = micrograms per liter
mg/L = milligrams per liter
-- = not analyzed

Notes:
B = Analyte was detected in the associated method blank.
J = Estimated concentration at or above the LOD and below the LOQ.

Created by:	TLC	Date:	12/1/2014
Last revision by:	RM	Date:	2/14/2022
Checked by:	JAO	Date:	2/15/2021

I:\25222067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Tables\[Table 4 - Leachate_2015-Oct 2021 ASD.xlsx]Lys LP1 App III

Figures



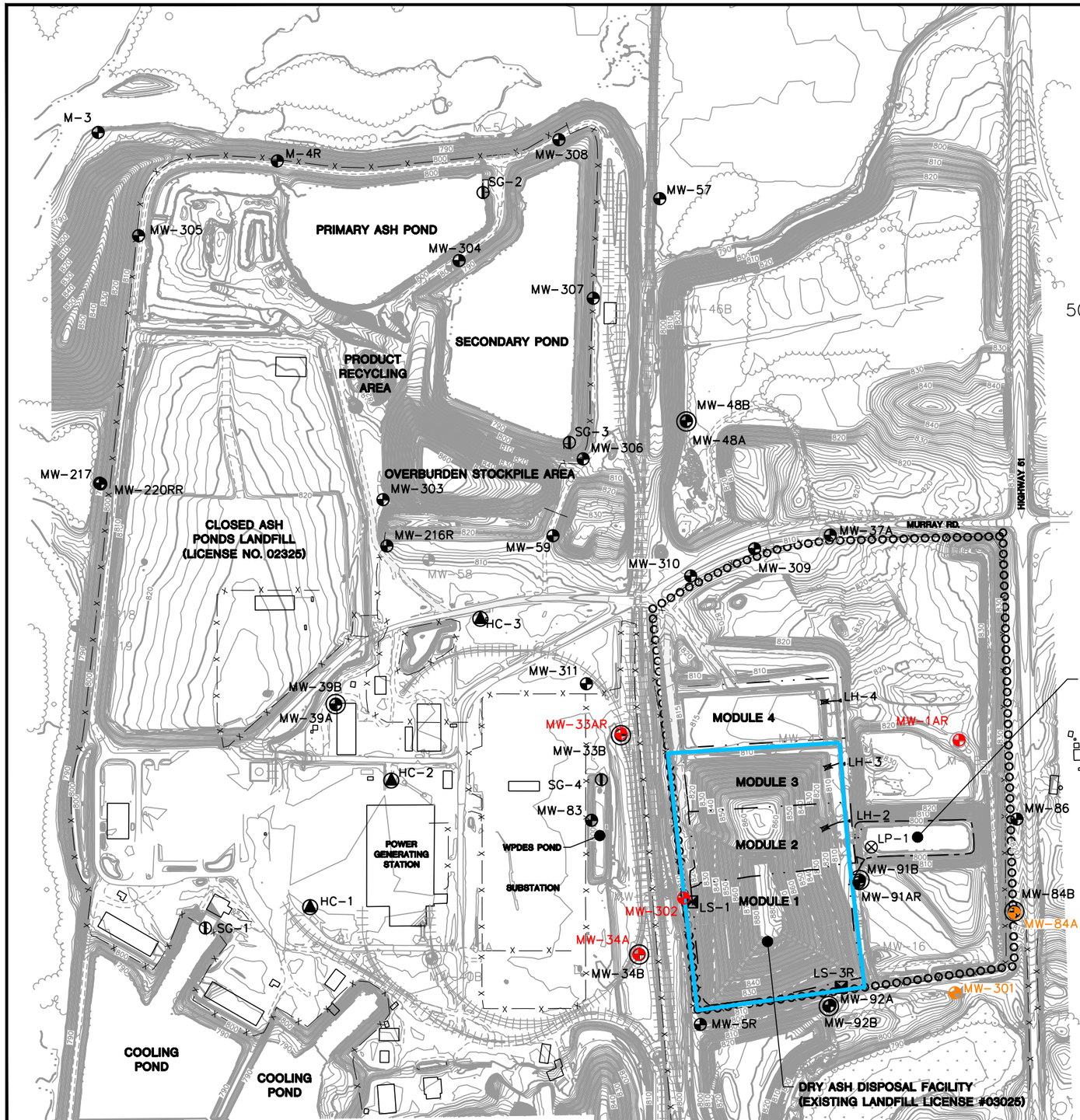
N

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 1
DRAWN:	12/02/2019	CHECKED BY:	MDB		
REVISED:	01/10/2020	APPROVED BY:	TK 04/10/2020		

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Site Location Map.dwg, 4/12/2020 7:05:09 PM



N

500 0 500

SCALE: 1" = 500'

LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- EXISTING FENCE LINE
- EXISTING TRACKS
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EDGE OF WATER
- APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
- CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
- 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 SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
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.

PROJECT NO.	25221067.00	DRAWN BY:	KP
DRAWN:	06/29/2021	CHECKED BY:	NDK
REVISED:	12/21/2021	APPROVED BY:	TK 12/22/2021

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

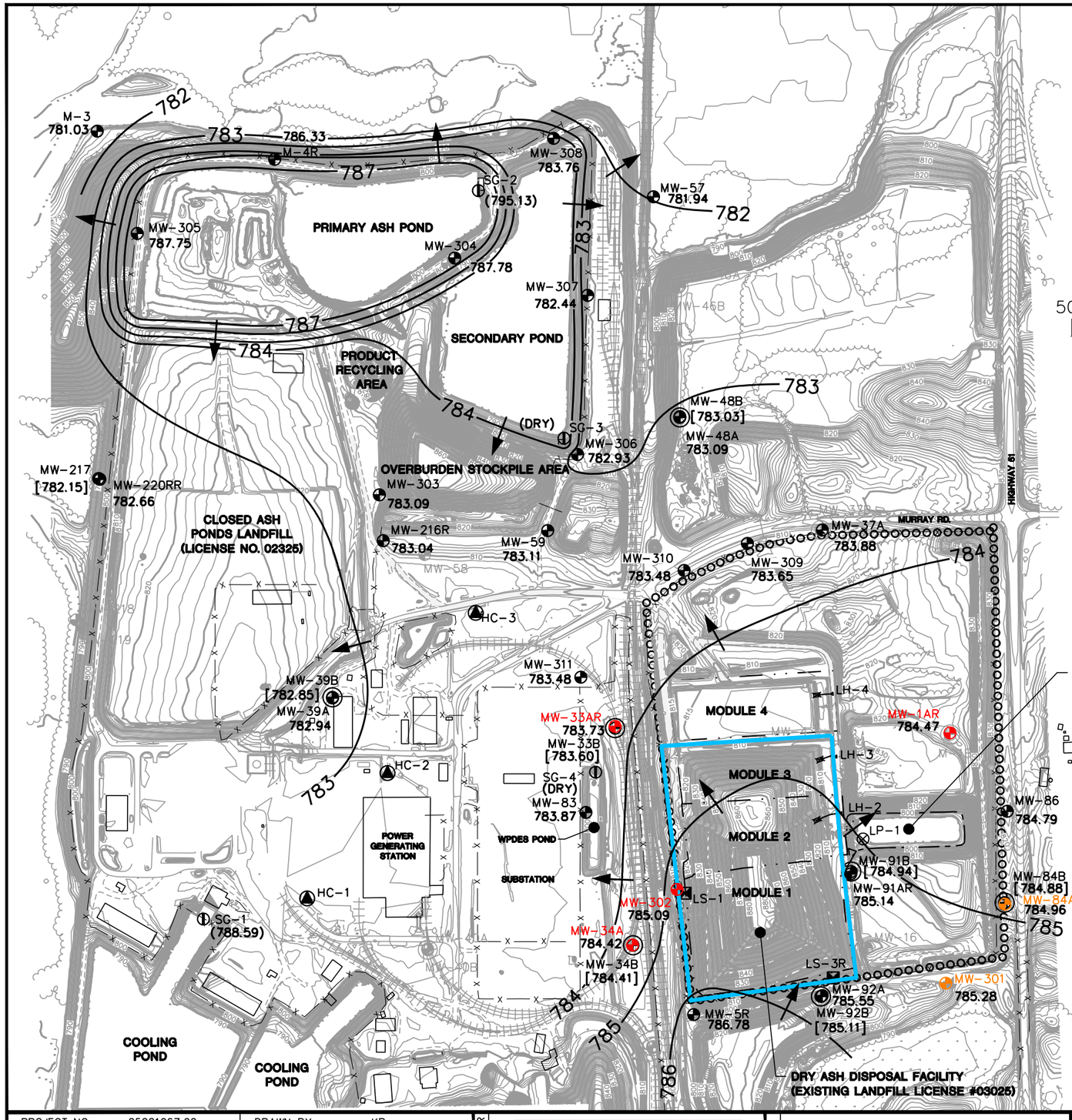
CLIENT: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULE 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE 2

I:\25221067.00\Drawings\Water Table Map April 2021 MOD1-3.dwg, 12/21/2021 4:16:47 PM



LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- EXISTING FENCE LINE
- EXISTING TRACKS
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EDGE OF WATER
- APPROVED LIMITS OF WASTE (DRY ASH LANDFILL)
- CONSTRUCTED LIMITS OF WASTE (DRY ASH LANDFILL)
- 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
- 787.62 — WATER TABLE ELEVATION
- [788.87] — POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
- (795.20) — SURFACE WATER ELEVATION (NOT CONTOURED)
- WATER TABLE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
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 OCTOBER 11-14, 2021.
8. BACKGROUND MONITORING WELLS FOR THE MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.

PROJECT NO.	25221067.00	DRAWN BY:	KP
DRAWN:	10/26/2021	CHECKED BY:	NDK
REVISED:	12/27/2021	APPROVED BY:	TK 12/27/2021

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
MODULE 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

WATER TABLE MAP
OCTOBER 2021

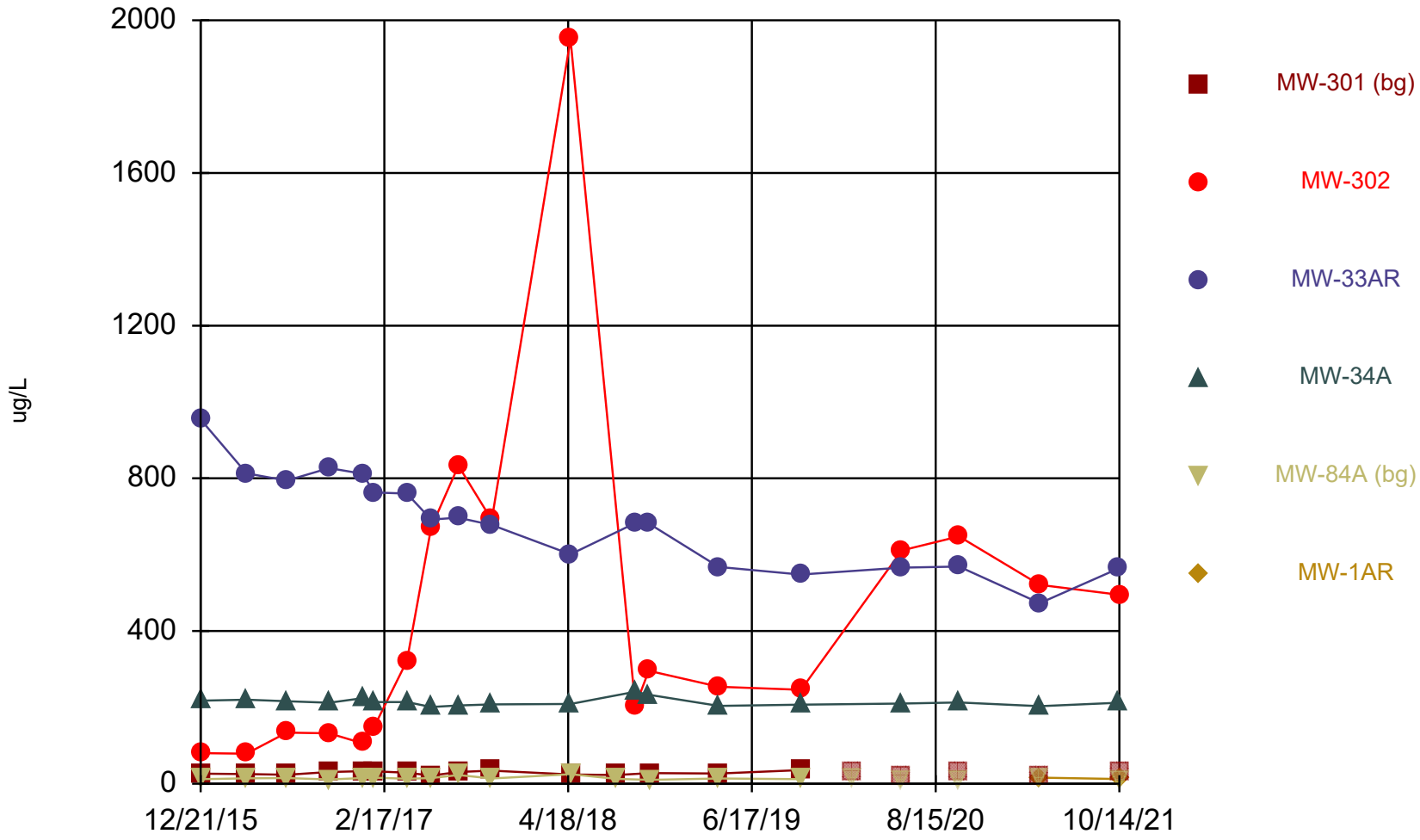
FIGURE
3

I:\25221067.00\Drawings\Water Table Map O□1 2021 MOD1-3.dwg, 1/3/2022 □51:21 AM

Appendix A

Trend Plots for CCR Wells

Boron



Time Series Analysis Run 2/14/2022 4:37 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

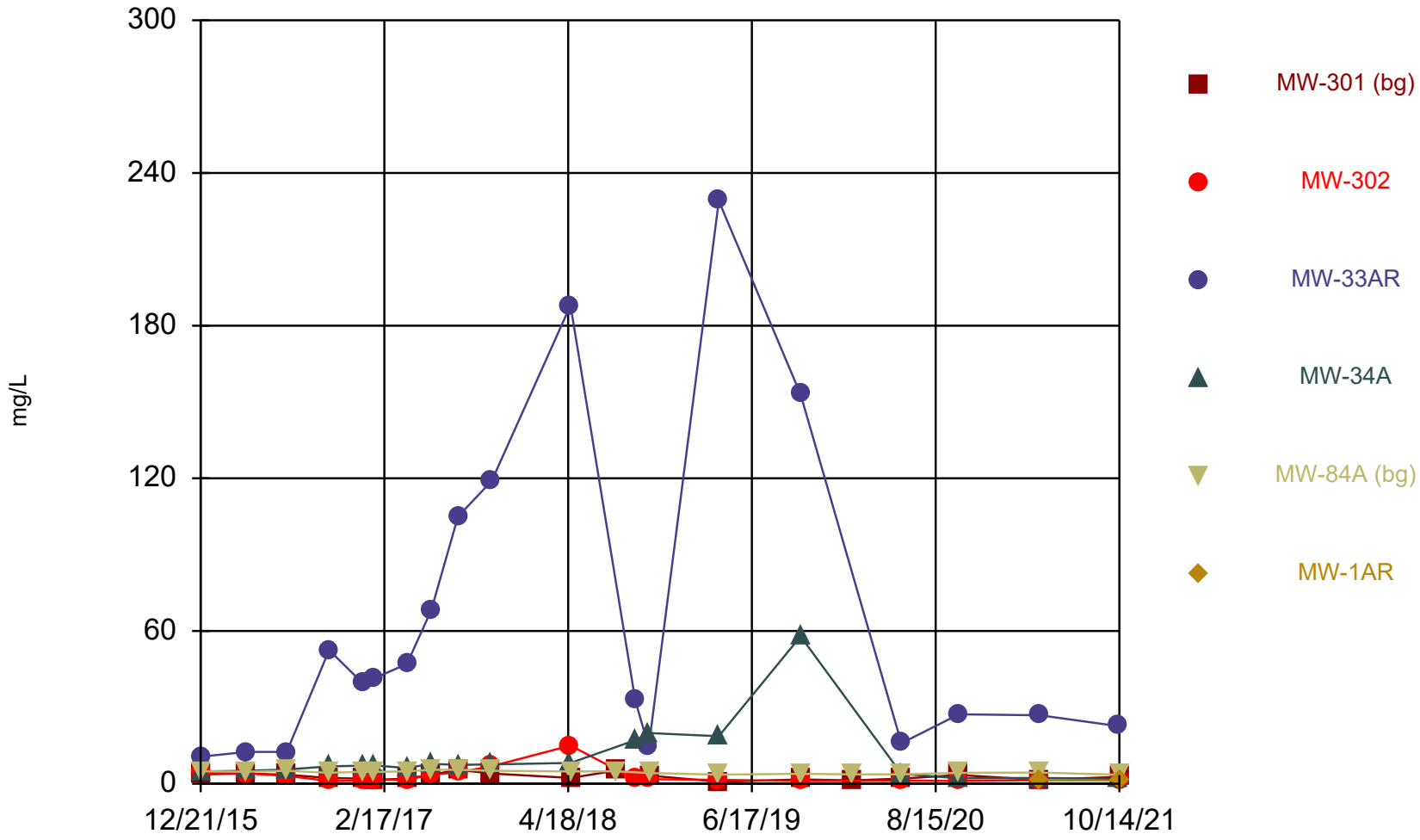
Time Series

Constituent: Boron (ug/L) Analysis Run 2/14/2022 4:38 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)	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

Chloride



Time Series Analysis Run 2/14/2022 4:37 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

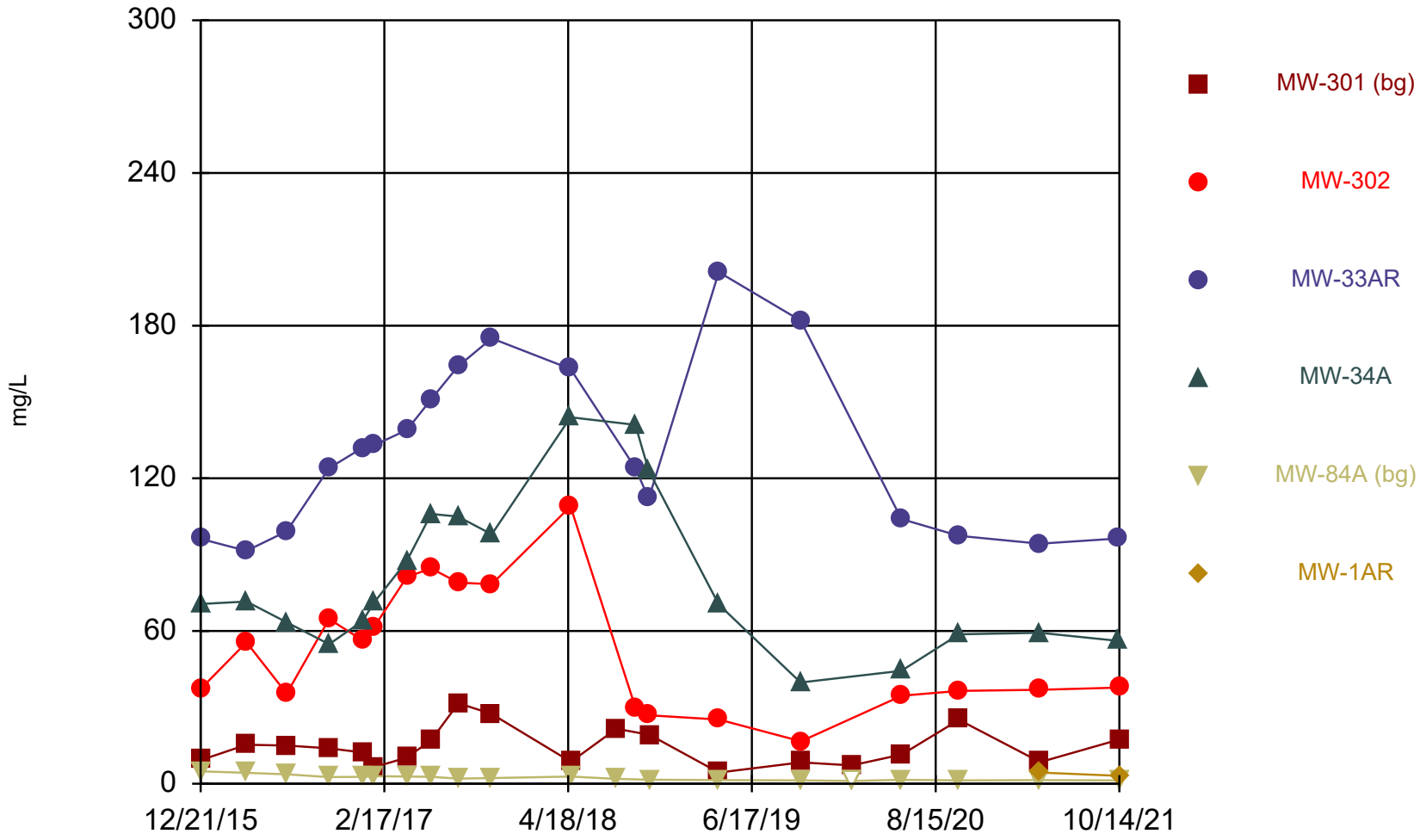
Constituent: Chloride (mg/L) Analysis Run 2/14/2022 4:38 PM View: MOD 1-3 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	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)

Hollow symbols indicate censored values.

Sulfate



Time Series Analysis Run 2/14/2022 4:37 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 2/14/2022 4:38 PM View: MOD 1-3 LF

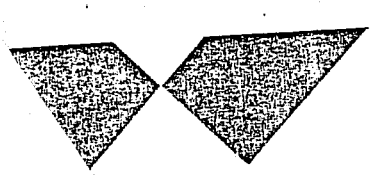
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	MW-301 (bg)	MW-302	MW-33AR	MW-34A	MW-84A (bg)	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

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 Drainage Ditch (A)	11.4	1510	520.	23.5	29	0.2	<0.1
Drainage Ditch (B)	7.8	500	21.	7.0	43	29	<0.1
	9.05	1780	750	14.0	42	5.4	<0.1

APPENDICES TO

SUPPLEMENTARY FEASIBILITY STUDY REPORT AND PRELIMINARY ENGINEERING CONCEPTS COLUMBIA SITE WISCONSIN POWER AND LIGHT COMPANY TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

WARZYN
ENGINEERING INC

APPENDIX I

WATER QUALITY DATA - DECEMBER 1978

WARZYN
ENGINEERING INC

12/76

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	5.8	1,140	15	<0.5	97	56	38	-
30B	6.65	835	160	14.6	37	20	<0.1	-
33A	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	-

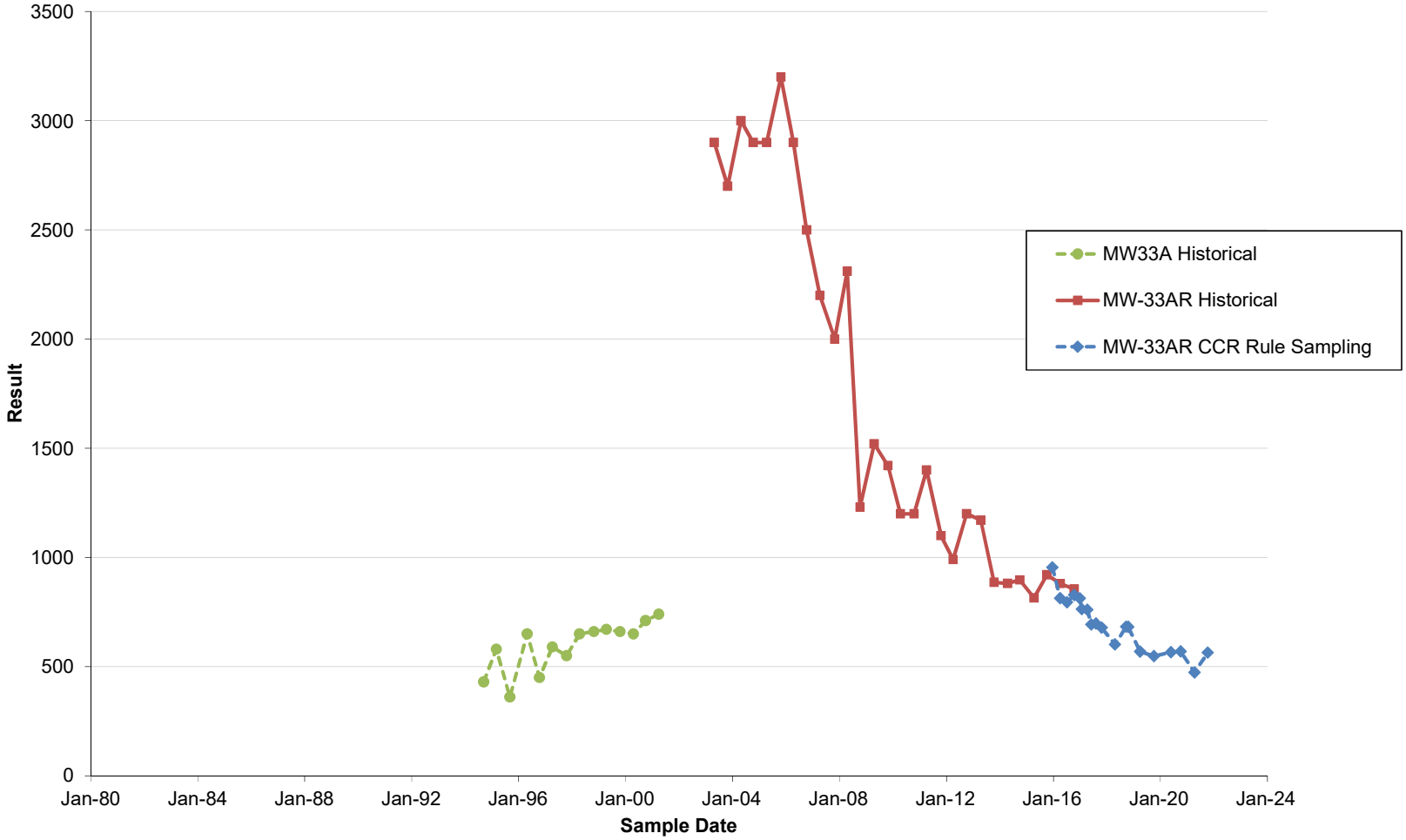
WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
42	7.15	2,050	910	15.6	23	7.5	0.1	-
44	6.15	710	6	0.5	56	27	3.5	-
45	7.2	420	32	1.0	44	26	<0.1	-
46A	7.0	560	93	<0.5	130	75	<0.1	<0.05
46B	6.5	1,290	170	20.8	46	30	<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	-

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	7.5	440	20	<0.5	27	37	<0.1	-
70B	7.3	520	25	5.2	51	34	<0.1	-
72A	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

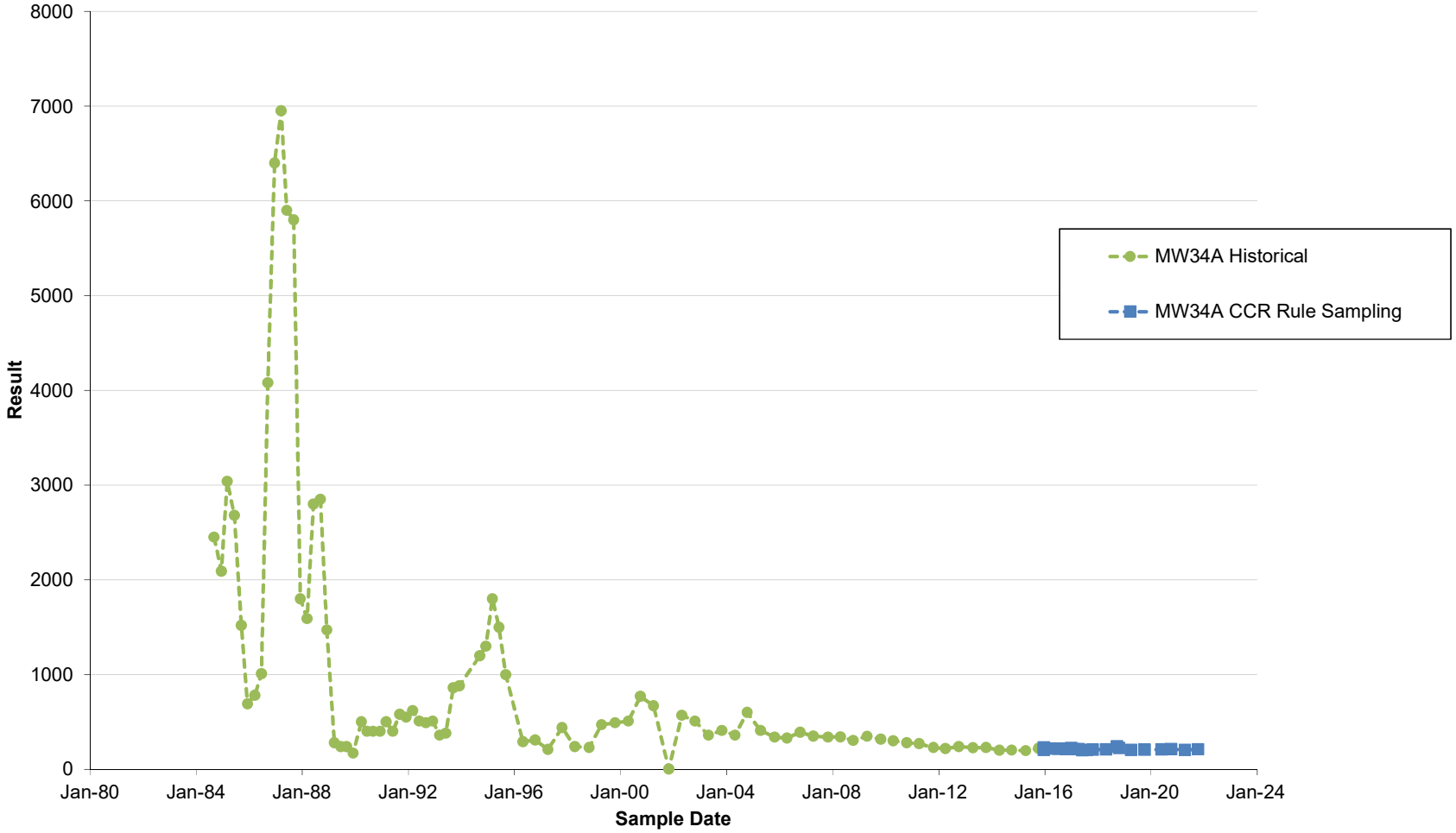
Long-Term Concentration Trend Plots

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33A and MW-33AR - Boron (µg/l as B)



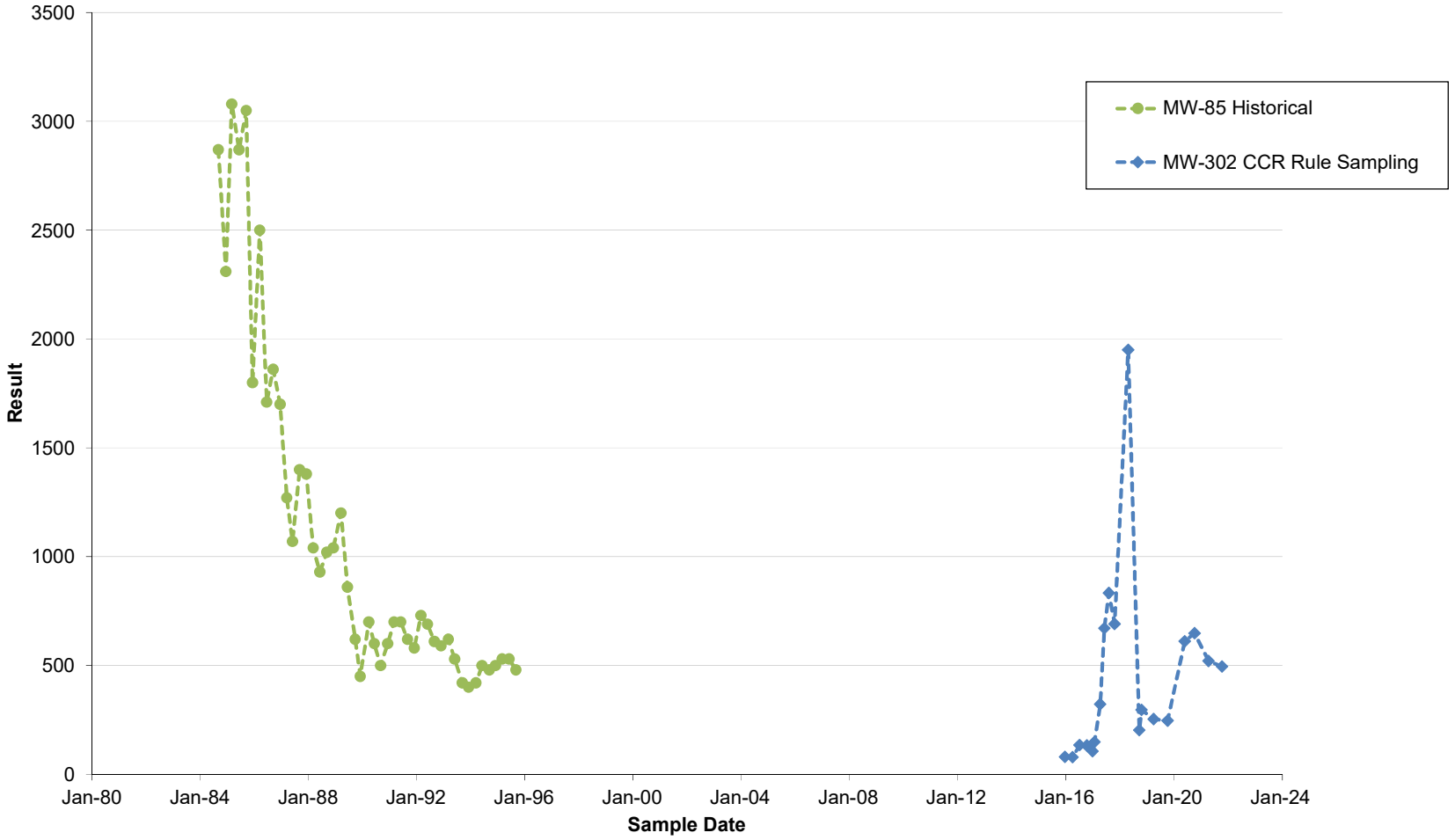
\\10.2.18.8\data\Projects\25221067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Graphs\[Bo_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Boron (µg/l as B)



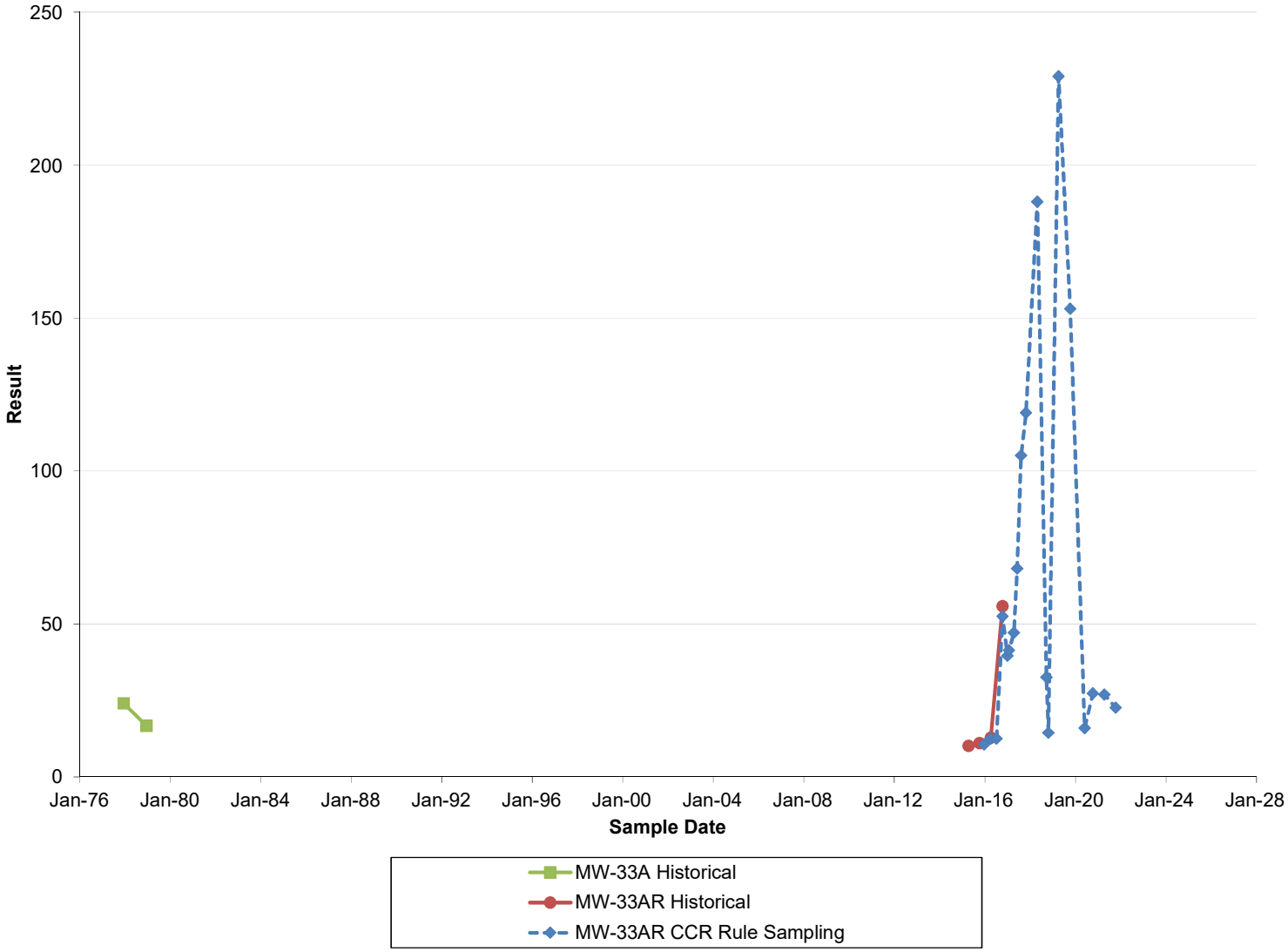
\\10.2.18.8\data\Projects\25221067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Graphs\[Bo_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-302 and MW-85 - Boron (µg/l as B)



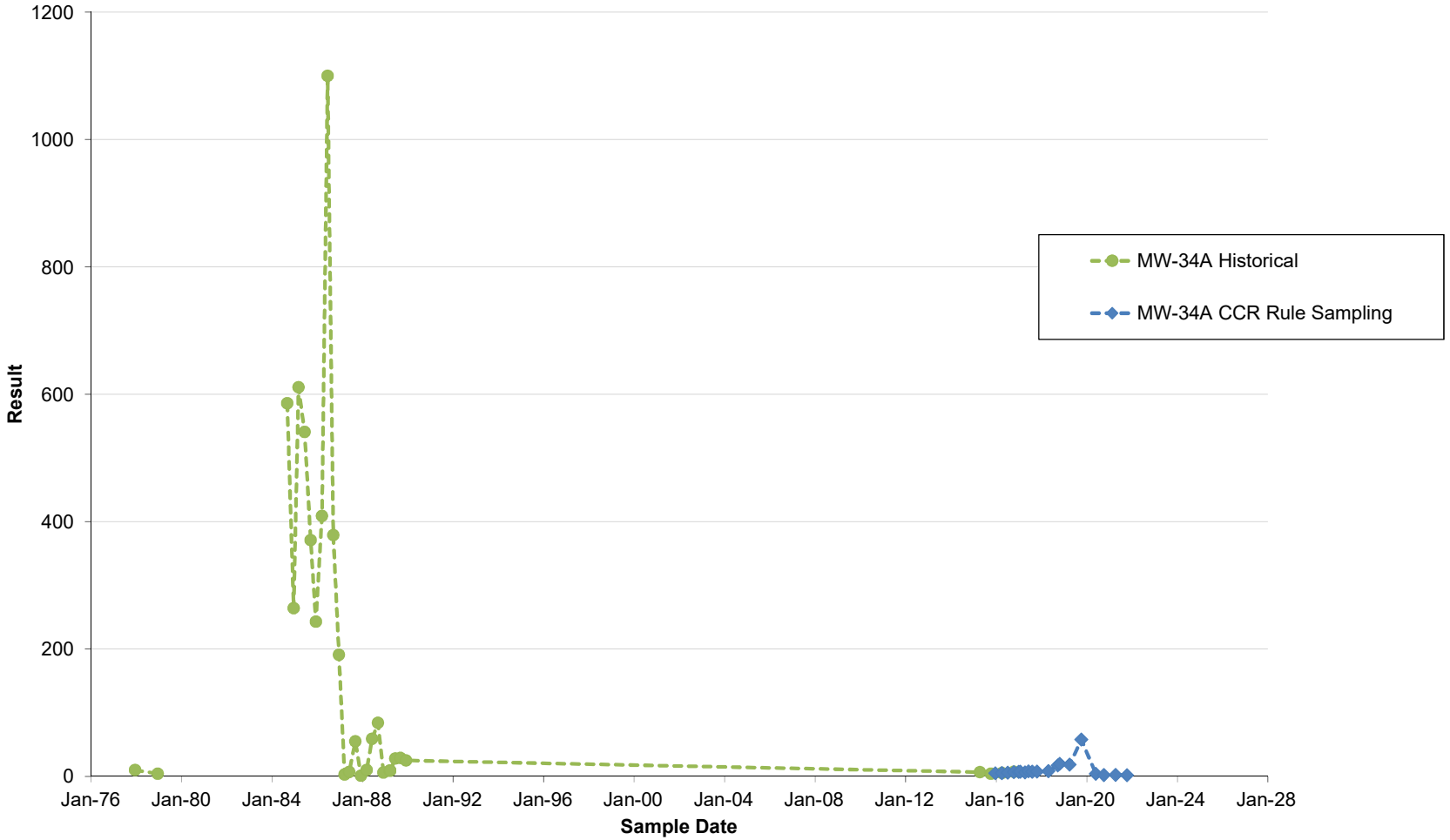
\\10.2.18.8\data\Projects\25221067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Graphs\[Bo_COL Dry.xlsx]MW-85

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Chloride (mg/l as Cl)



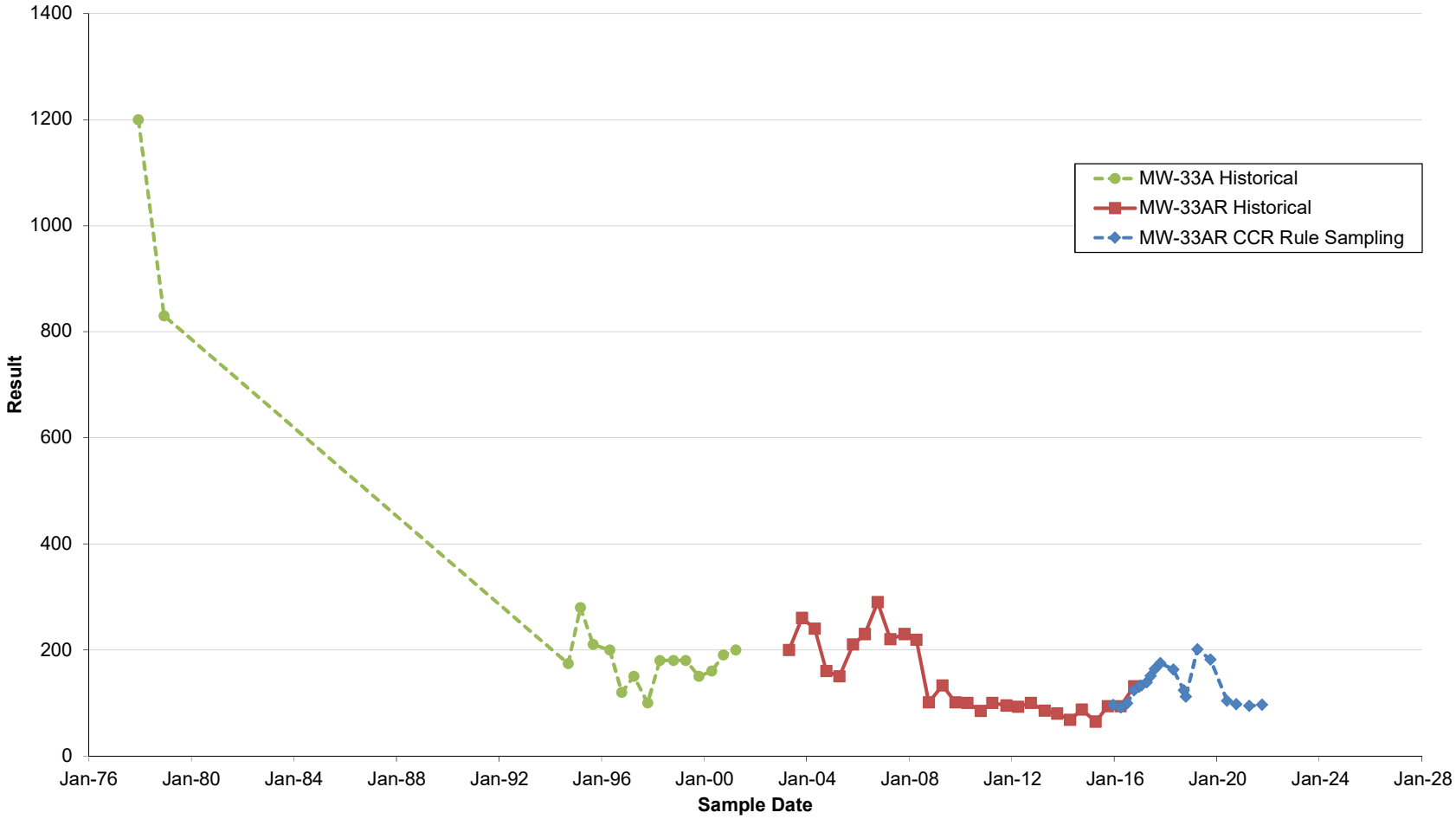
\\10.2.18.8\data\Projects\25221067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Graphs\[Cl_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Chloride (mg/l as Cl)



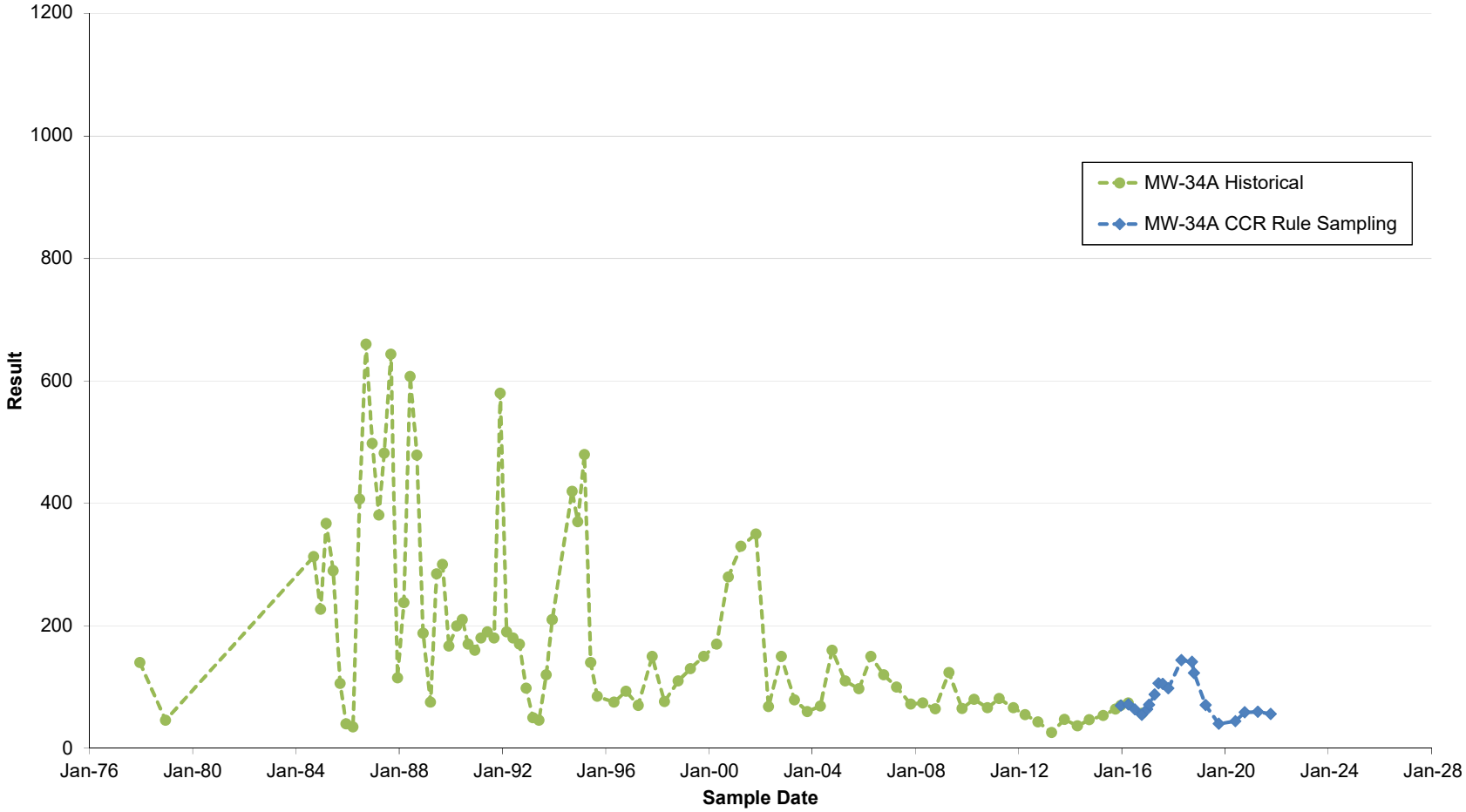
\\10.2.18.8\data\Projects\25221067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Graphs\[Cl_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Sulfate (mg/l as SO4)



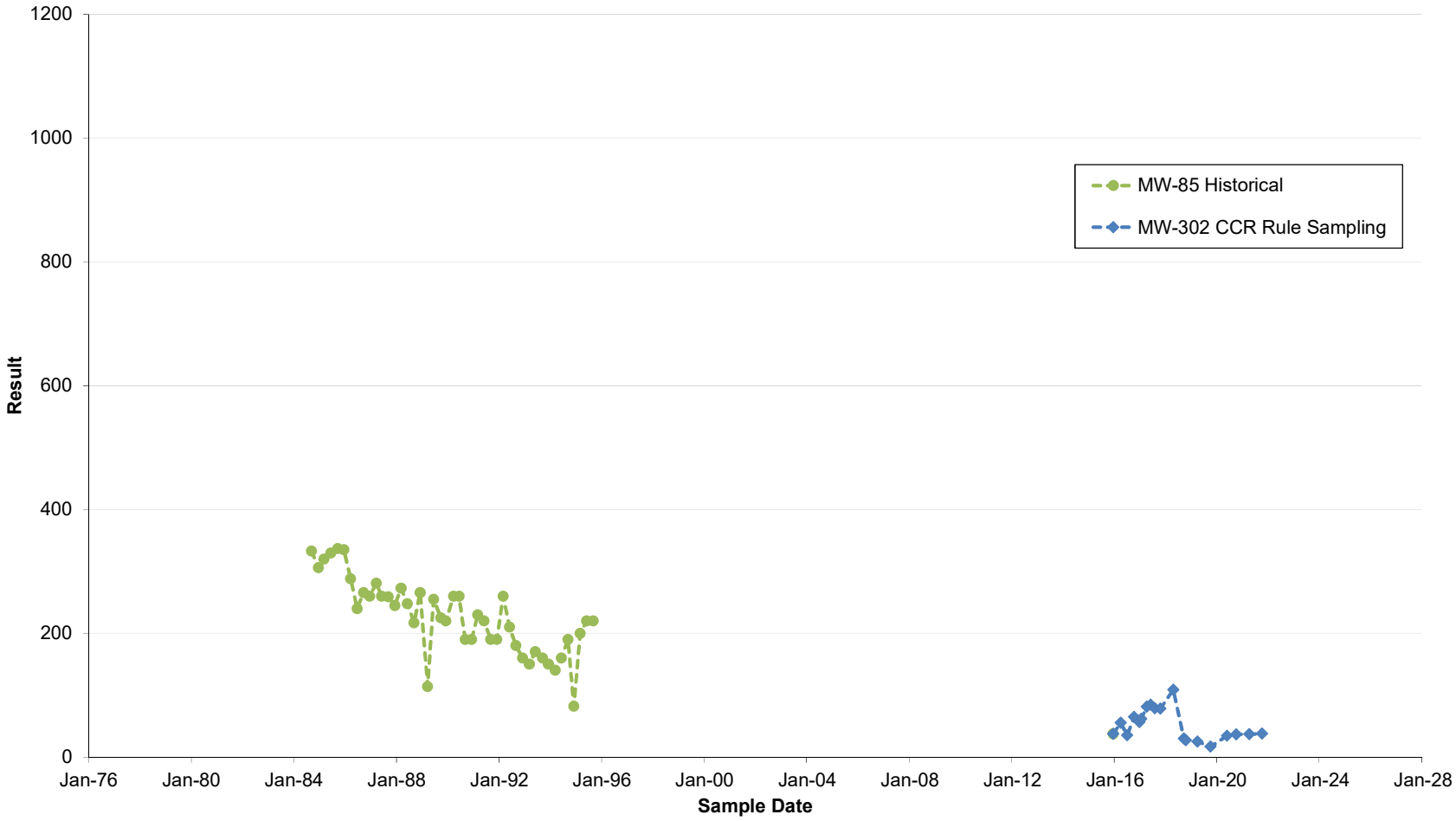
\\10.2.18.8\data\Projects\25221067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\Graphs\[SO4_COL Dry.xlsx]MW-33AR CCR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-34A - Sulfate (mg/l as SO4)



\\10.2.18.8\data\Projects\25221067.00\Deliverables\2021 Oct ASD MOD 1-3 LF\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
- OBSERVATION WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION
- BORING LOCATION AND NUMBER
- 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 CAPICITY WELLS
- —790— WATER TABLE CONTOURS (CONTOUR INTERVAL: 1 FT.)
- DIRECTION OF GROUNDWATER FLOW

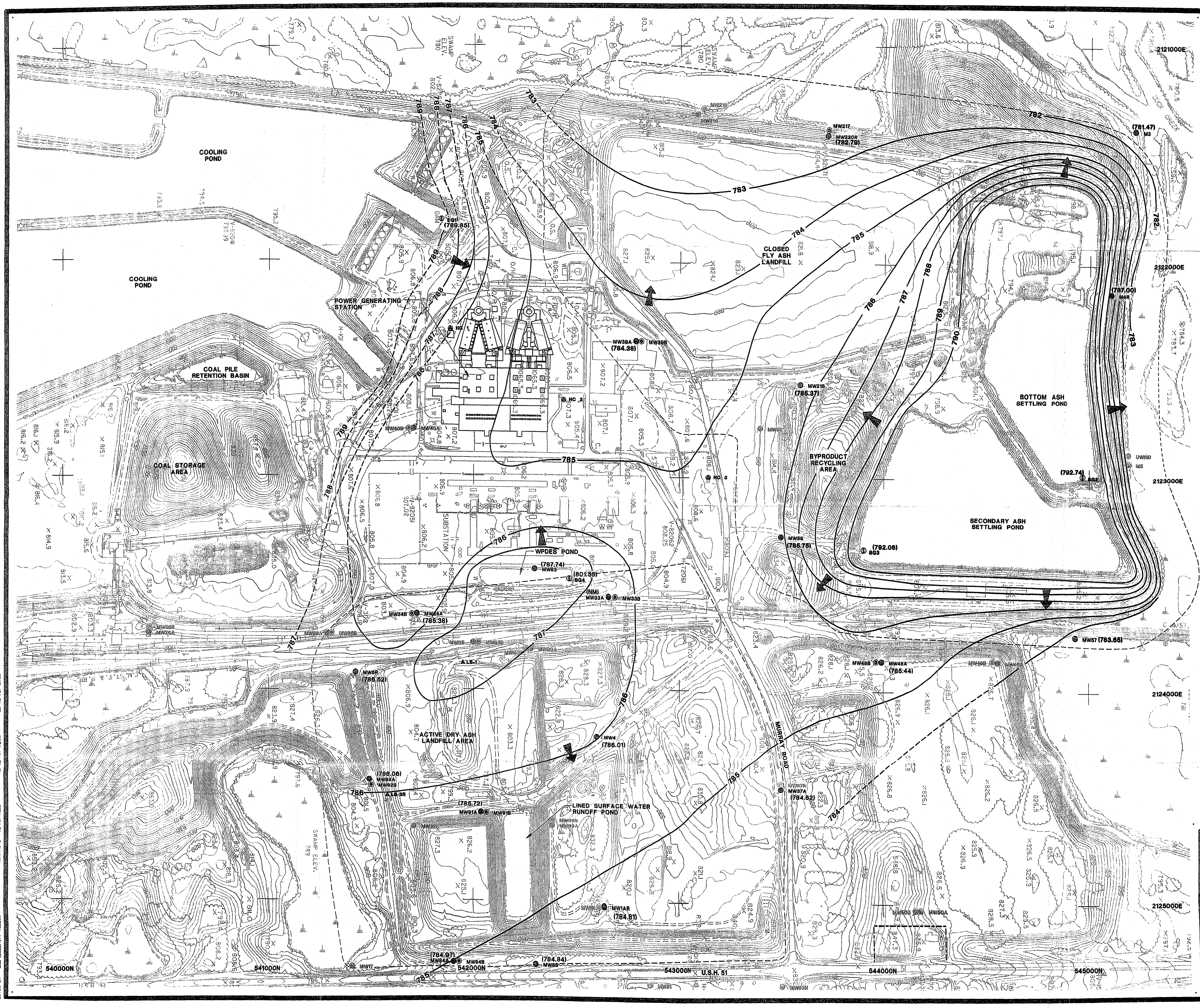
NO.	BY	DATE	REVISION	APP'D

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	



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 E2

April 2022 Detection Monitoring

Alternative Source Demonstration
April 2022 Detection Monitoring

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

Prepared for:

SCS ENGINEERS

25222067.00 | October 13, 2022

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

Table of Contents

Section Page

Tables

Figures

Appendices

I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\221013_COL_1-3 LF_Apr22 ASD_Final.docx

PE CERTIFICATION

I, Sherren Clark, hereby certify that 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.

10-13-2022

(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, April 2022 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 2022 detection monitoring event at the Columbia Energy Center (COL) Dry Ash Disposal Facility (ADF), Modules 1-3 CCR Units. 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 2022 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 Units 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, 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 April 2022 monitoring event are summarized in the attached **Table 1**.

The April 2022 SSIs include the following parameters and wells:

- Boron: MW-33AR, MW-34A, MW-302
- Chloride: MW-33AR
- Field pH: MW-34A
- Sulfate: MW-33AR, MW-34A

Concentration trends for the parameters with SSIs are shown in **Appendix A**.

Monitoring well MW-93A was included in the April 2022 sampling as a supplemental well, but is not a compliance well for the Module 1-3 CCR Unit and is not located downgradient from the Unit. As shown in **Table 1**, the chloride concentration in the sample from MW-93A was higher than background concentrations, likely because it is adjacent to U.S. Highway 51. All concentrations of Appendix IV parameters at MW-93A were well below the groundwater protection standards. Because well MW-93A is not part of the monitoring system for the Module 1-3 CCR Unit, it is not addressed further in this alternative source demonstration.

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 2022 detection monitoring event will be included in the 2022 Annual Groundwater Monitoring and Corrective Action Report to be completed in January 2023. 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, 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 state monitoring well MW-1AR was included as a supplemental well in past monitoring events and then added to the CCR Unit monitoring system to provide additional evaluation to the northeast of the CCR Unit. MW-1AR was abandoned in March 2022 in preparation of the construction of new Modules 10 and 11. State monitoring well MW-93A, piezometer MW-93B and MW-312 were installed to the east and northeast of Mod 1-3 to provide additional groundwater elevation data in that area. The groundwater flow map for April 2022 is shown on Figure 3. 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. 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.

Based on the review of field notes and comparison to previous results, it appears likely that the reported SSI for pH at MW-34A is partially due to a sampling error. Specifically, it appears likely that the field pH and dissolved oxygen readings recorded for this well during low-flow purging and sampling were switched. The two columns are next to each other on the field sheet, and can have similar values. The historical results for field pH and dissolved oxygen are summarized in Table 4 along with results of laboratory analysis of pH. Evidence to support the finding that the values were recorded in the wrong columns includes:

- Dissolved oxygen results for MW-34A have typically been higher than field pH values, but the reverse was true for the reported April 2022 values.
- The lab pH result (7.8) did not agree with the reported field pH result (8.34), but did agree with the reported dissolved oxygen value (7.82).

- The reported field pH result (8.34) was well above any previous result for field pH at MW-34A, but within the range of previous dissolved oxygen results.

- Other field parameters, including specific conductance, oxidation potential, and temperature, and turbidity were within their ranges of previous results.

Based on these results, we conclude that sampling error contributed to the SSI at MW-34A. However, even if the dissolved oxygen and field pH results were switched, the resulting field pH value of 7.82 would still slightly exceed the UPL of 7.78. Therefore, additional alternative sources for the field pH SSI are evaluated in **Section 4.0**.

Because boron, chloride, and sulfate are laboratory parameters, there is little potential for a field analysis error to contribute to an SSI.

3.2 LABORATORY ANALYSIS REVIEW

The laboratory reports for the April 2022 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, field pH, 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 indication that the SSIs for boron, chloride, and sulfate were due to a laboratory analysis error. There were no laboratory quality control flags or issues identified in the laboratory report that affect the usability of the data for detection monitoring.

The laboratory flagged some anion results for matrix spike recovery and/or matrix spike duplicate recovery outside laboratory control limits, including the sample results from background well MW-84A for sulfate, and the sample results from compliance well MW-302 for sulfate. In both of these cases, the recovery outside the limits was slightly above the upper limit and the control sample results were within control limits. None of these results affected the determination of SSIs.

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**. Except for the increase in field pH at MW-34A described above, the concentrations observed are similar to historical concentrations.

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 2022 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 2022 monitoring event based on the methodology and analysis review. The SSI for field pH at MW-34A appears to be due in part to a data recording error during sampling. 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 2022 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, field pH, and sulfate at COL Modules 1-3 landfill are shown in Table 2.

Natural variation may be present in the shallow aquifer for any of the parameters, and may have contributed to the SSI for field pH at MW-34A. Previous field pH measurements in background well MW-84A (Table 2) include pH values similar to the field pH in compliance well MW-34A from the April 2022 sampling event, if we assume that the true value for field pH was 7.82 after correcting for the apparent data recording error described in Section 3.1.

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, field pH, 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 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 also likely contributed to the chloride SSI at MW-33AR and the field pH SSI at MW-34A.

The higher chloride concentrations at MW-33AR is likely related to a non-CCR alternative source.

4.2 LINES OF EVIDENCE

The lines of evidence indicating that the SSIs for boron, chloride, field pH, 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, field pH, 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, field pH, 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, field pH, 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 2022 sulfate result for MW-33AR (installed to replace MW-33A) was 155 mg/L, for MW-34A was 146 mg/L, and for MW-302 was 22.1 mg/L.

The feasibility study also notes the regional groundwater pH range (6.0 to 8.5 standard units [std. units]) and as well as the site pH range (6.3 to 8.1 std units) observed in 1977 and 1978. The recent field pH exceedance at MW-34A (8.34 Std. Units, or 7.82 Std. Units if corrected for the apparent data recording error described in Section 3.1) is either within or similar to both the local and regional pH observations. The pH measurements provided in the Feasibility Study water quality tables (**Appendix B**) show pH measurements for the MW-33A/B and MW-34-A/B well nests ranging from 7.7 to 8.2, similar to what was observed at the MW-34A during the April 2022 groundwater monitoring event (**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-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. 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.

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 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 MOD 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 Leachate Concentrations

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 consistent since then. A slight increase was observed in the sample collected during the April 2022 event, but this observed concentration is still significantly lower than the values observed in 2019 (Table 2 and Appendix A). Over the same time period, boron concentrations at MW-33AR have followed a steady gradual 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 MOD 1-3, indicates that boron and chloride concentrations are generally both higher than background (Table 5); 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 5, 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, field pH, 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 Units. Boron, sulfate, field pH, and chloride 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. Elevated chloride concentrations detected at well MW-33AR appear likely to be related to an alternative non-CCR source, such as salt. The SSI for field pH at MW-34A also appears to be due in part to a data recording error during sampling.

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 2022 Annual Report due January 31, 2023.

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.

Tables

Table 1. Groundwater Analytical Results Summary - Columbia Landfill MOD 1-3 / SCS Engineers Project #25222067.00

				Background Wells		Compliance Wells			Supplemental Well
Parameter Name	**UPL Method**	**UPL**		**MW-84A**	**MW-301**	**MW-33AR**	**MW-34A**	**MW-302**	**MW-93A**
				4/13/2022	4/13/2022	4/12/2022	4/12/2022	4/12/2022	4/13/2022
Appendix III									
Boron, ug/L	P	35.6		10.5	28.7	558	237	389	26.1
Calcium, ug/L	NP	129,000		75,100	97,300	80,000	77,000	91,600	85,500
Chloride, mg/L	P	6.2		5.2	1.9 J	59.0	2.2	0.79 J	19.0
Fluoride, mg/L	DQ	DQ		<0.095	<0.095	<0.095	<0.095	<0.095	<0.095
Field pH, Std. Units	P	7.78		7.34	6.60	7.60	8.34	7.21	7.68
Sulfate, mg/L	P	30.3		1.4 J, M0	12.7	155	146	22.1 M0	7.0
Total Dissolved Solids, mg/L	NP	514		334	422	506	402	398	384
Appendix IV		**UPL**	**GPS**						
Antimony, ug/L	NP*	0.4	6	<0.15	0.31 J	--	--	--	<0.15
Arsenic, ug/L	P*	0.53	10	0.31 J	0.47 J	--	--	--	<0.28
Barium, ug/L	P	18.3	2000	13.5	7.8	--	--	--	113
Beryllium, ug/L	NP*	0.37	4	<0.25	<0.25	--	--	--	<0.25
Cadmium, ug/L	NP*	0.32	5	<0.15	0.30 J	--	--	--	<0.15
Chromium, ug/L	P*	3.13	100	2.2 J	<1.0	--	--	--	1.2 J
Cobalt, ug/L	NP*	0.38	6	<0.12	0.32 J	--	--	--	0.41 J
Fluoride, mg/L	DQ	DQ	4	<0.095	<0.095	--	--	--	<0.095
Lead, ug/L	NP*	0.48	15	<0.24	3.1	--	--	--	<0.24
Lithium, ug/L	P*	0.86	40	0.36 J	0.56 J	--	--	--	1.5
Mercury, ug/L	DQ	DQ	2	<0.066	<0.066	--	--	--	<0.066
Molybdenum, ug/L	NP*	0.44	100	<0.44	<0.044	--	--	--	1.8
Selenium, ug/L	NP*	0.71	50	<0.32	<0.32	--	--	--	0.84 J
Thallium, ug/L	NP*	0.48	2	<0.14	0.32 J	--	--	--	<0.14
Radium 226/228 Combined, pCI/L	P*	1.93	5	0.611	0.179	--	--	--	1.29

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
NP = Nonparametric UPL with 1-of-2 retesting
P = Parametric UPL with 1-of-2 retesting
LOQ = Limit of Quantitation
LOD = Limit of Detection
µg/L = micrograms per liter
mg/L = milligrams per liter

* = UPL is below the LOQ for background sampling. For compliance wells, only results confirmed above the LOQ are evaluated as potential SSIs above backgroun
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 2020 based on background well results through October 2019.
3. Interwell UPLs calculated based on results from background wells MW-84 and MW-301.

Created by: NDK Date: 5/17/2022
Last revision by: NDK Date: 9/22/2022
Checked by: RM Date: 9/22/2022
Scientist/Proj Mgr QA/QC: TK Date: 9/28/2022

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)	Field pH (Std. Units)	Sulfate (mg/L)
Background	MW-301	12/22/2015	26.5	3.70 J	6.85	9.30
		4/5/2016	25.2	4.00	7.01	15.3
		7/8/2016	23.6	3.50 J	6.87	15.0
		10/13/2016	30.6	2.20	7.28	13.9
		12/29/2016	32.8	2.00 J	6.63	12.3 J
		1/25/2017	32.6	1.50 J	7.10	6.50
		4/11/2017	28.8	2.00	7.11	10.3
		6/6/2017	21.3	3.50	6.70	17.1
		8/8/2017	30.6	5.50	6.75	31.6
		10/23/2017	34.3	4.00	7.37	27.5
		4/25/2018	24.3	2.30	6.76	8.60
		8/8/2018	22.8	-	6.91	-
		10/22/2018	27.8	3.20	6.79	19.2
		4/3/2019	26.9	2.90 J, B	6.62	5.30 J
		10/9/2019	35.9	1.70	6.67	8.40
		5/29/2020	21.3	2.00 J	6.73	11.5 J
		10/8/2020	28.8	3.40	6.95	25.1
		4/13/2021	22.2	1.50 J	6.66	8.5
		10/14/2021	31.4	2.70	7.01	17.4
		4/13/2022	28.7	1.90 J	6.60	12.7
	MW-84A	12/22/2015	11.9	4.90	7.60	4.90
		4/5/2016	14.0	4.70	7.61	4.30
		7/8/2016	14.7	5.10	7.45	3.70 J
		7/28/2016	-	-	7.34	-
		10/13/2016	11.1	4.30	7.91	2.60 J
		12/29/2016	14.7	4.70	7.25	2.70 J
		1/25/2017	16.1	4.60	6.99	3.00
		4/11/2017	12.9	4.90	7.80	2.80 J
		6/6/2017	14.8	5.50	7.28	2.70 J
		8/8/2017	22.9	5.50	7.23	2.00 J
		10/24/2017	13.8	5.10	7.68	2.20 J
		4/25/2018	25.0	4.80	7.45	2.80 J
		8/8/2018	12.8	--	7.38	--
		10/22/2018	10.1 J	4.20	7.24	1.60 J
		4/3/2019	13.6	3.60 B	7.03	1.40 J
		10/9/2019	12.0	3.90	7.23	1.30 J
		5/29/2020	10.0	3.70	7.34	1.50 J
		10/8/2020	9.7 J	4.30	7.49	1.30 J
		4/13/2021	14.3	4.40	7.34	1.40 J
		10/14/2021	11.1	3.50	7.42	17.4
		4/13/2022	10.5	5.20	7.34	1.40 J, M0

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)	Field pH (Std. Units)	Sulfate (mg/L)
Compliance	MW-302	12/22/2015	80.0	4.20	7.63	37.4
		4/5/2016	78.8	4.10	7.70	55.6
		7/7/2016	134	3.10 J	7.29	35.4
		10/13/2016	132	1.10 J	7.72	64.7
		12/29/2016	106	1.20 J	7.12	56.4
		1/25/2017	149	1.60 J	8.21	61.6
		4/11/2017	322	1.60 J	7.63	81.3
		6/6/2017	671	3.50	7.16	84.6
		8/8/2017	833	4.50	7.04	79.0
		10/24/2017	691	6.90	8.23	78.4
		4/24/2018	1,950	15.0	7.21	109
		9/21/2018	203	1.70 J	7.74	30.0
		10/22/2018	296	1.80 J	7.22	26.9
		4/2/2019	254	1.50 J	7.32	25.2
		10/9/2019	246	1.10 J	7.08	16.7
		5/29/2020	611	1.20 J	7.20	34.6
		10/8/2020	648	1.10 J	7.21	36.5
		4/13/2021	521	1.40 J	7.51	36.9
		10/14/2021	495	1.30 J	7.07	37.8
		4/12/2022	389	0.79 J	7.21	22.1 M0
	MW-33AR	12/21/2015	954	10.6	7.87	96.2
		4/5/2016	813	12.5	8.08	91.5
		7/7/2016	794	12.5	7.68	99.2
		10/13/2016	827	52.5	8.23	124
		12/29/2016	812	39.6	7.63	132
		1/25/2017	763	41.4	8.62	133
		4/11/2017	760	47.1	8.19	139
		6/6/2017	692	68.1	7.78	151
		8/7/2017	697	105	7.47	164
		10/24/2017	678	119	7.81	175
		4/24/2018	601	188	7.74	163
		9/21/2018	683	32.6	8.16	124
		10/22/2018	682	14.4	7.69	112
		4/2/2019	568	229	7.72	201
		10/8/2019	548	153	7.74	182
		5/28/2020	566	15.9	7.59	104
		10/8/2020	569	27.3	7.70	97.4
		4/13/2021	473	26.9	8.78	94.3
		6/11/2021	--	--	7.71	--
		10/12/2021	564	22.6	7.59	96.4
		4/12/2022	558	59.0	7.60	155

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)	Field pH (Std. Units)	Sulfate (mg/L)
Compliance	MW-34A	12/21/2015	230	4.90	7.91	69.9
		4/5/2016	220	5.10	7.92	71.6
		7/7/2016	216	5.60	7.52	63.4
		7/28/2016	-	-	7.40	-
		10/13/2016	212	6.80	8.19	54.8
		12/29/2016	224	7.10	7.43	63.9
		1/25/2017	214	7.20	7.71	71.2
		4/11/2017	214	6.20	8.03	87.6
		6/6/2017	201	7.80	7.57	106
		8/7/2017	205	7.40	7.39	105
		10/24/2017	208	7.60	7.67	98.0
		4/24/2018	209	8.20	7.80	144
		9/21/2018	241	17.1	8.12	141
		10/22/2018	233	19.9	7.64	123
		4/4/2019	204	18.7	7.73	70.4
		10/8/2019	207	57.9	7.79	39.8
		5/28/2020	210	3.90	7.40	44.4
		10/8/2020	213	2.10	7.81	58.7
		4/13/2021	203	2.30	7.93	59.3
		6/11/2022	--	--	7.71	--
		10/12/2021	212	1.90 J, M0	7.68	56.1
		4/12/2022	237	2.20	8.34	146
	MW-1AR[(2)]	4/14/2021	16.1	1.50 J	7.26	4.40 M0
		10/14/2021	12.4	1.20 J	7.44	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:	NDK	Date:	9/28/2022
Scientist Check:	TK	Date:	9/28/2022

Table 3. Groundwater Elevation - State Monitoring Program and CCR Well Network
Columbia Dry Ash and Ash Pond Disposal Facilities / SCS Engineers Project #25222067.00

	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	LS-1	LS-3R	LH-2	LH-3	LH-4
	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	17.42	17.10	19.90		
	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	NM	NM	NM		
	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			dry	--	
	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	NM	dry	dry	--	
	October 8, 2013													785.66	785.42	785.97	785.52	NI	NI	NI	NM	NM	NM	--	
	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	NM	dry	ote depth =	--	
	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	NM	dry	ote depth =	--	
	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	dry	--	dry	--	
	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	broken	dry	ote depth =	--	
Dry Ash Facility (Facility ID #03025)	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	broken	dry	15.9"	--	
	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	liquid depth = 3.5'	dry	0.8"	1.4"	
	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	liquid depth = 3.0'	dry	-0.3	1.4"	
	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	liquid depth = 2.7'	dry	NM	NM	
	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	NM	NM	1.4" [5]	1.6" [5]	
	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	NM	NM	NM	NM	
	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	liquid depth = 2.7'	NM	NM	NM	
	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	dry	liquid depth = 2.4'	4.6	4	--
	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	liquid depth = 3.9'	dry	--	--	
	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	liquid depth = 3.8'	dry	-0.1"	11.7"	13.1"
	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	liquid depth = 3.8'	dry	-0.1	2.4	2.4
	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	liquid depth = 3.8'	dry	-0.1	2.7	2.4
	February 25, 2021	NM	aband	NM	NM	NM	784.75	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NM	NM	-0.1	2.7	2.6
	April 14, 2021	785.11	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	liquid depth = 3.7'		--	0.233333333	0.2167
	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	adand	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	liquid depth = 3.7'	--			
	October 17, 2021	NM	adand	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NI	NI	NI	NM	NM	-0.01	0.26	0.23
	April 1, 2022	aband	aband	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-"0.1"	3.1"	2.9"
	April 11-13, 2022	aband	adand	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	liquid depth = 3.8'	dry	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	NM	NM	NM	NM	

	Well Number	M-3	M-4R	MW-39A	MW-39B	MW-48A	MW-48B	MW-57	MW-59	MW-216R	MW-217	MW-220RR	SG-1	SG-2	SG-3	SG-4
	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	792.06	795.25	808.60	805.36
	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	789.14	793.85	dry	dry
	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	789.5 [1]	NM	dry	dry
	October 8, 2013	781.22	786.67	NM	NM	783.69	783.58	NM	NM	783.39	782.27	782.36	789.5 [1]	791.33	dry	dry
	October 15, 2013	NM	NM	782.94	782.81	NM	NM	782.47	783.49	NM	NM	NM	NM	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	788.90	dry	dry	dry
	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	NM	dry	dry	dry
	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	789.3	791.70	dry	dry
Ash Pond Facility (Facility ID #02325)	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	788.48	791.58	dry	dry
	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	NM	793.40	dry	dry
	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	788.32	792.52	dry	dry
	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	788.31	793.85	dry	dry
	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	788.3	793.45	dry	dry
	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	788.38	>795.25	dry	dry
	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	787.76	793.25	dry	dry
	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	788.40	794.60	dry	dry
	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	748.48	795.20	dry	dry
	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	748.48	>795.25	dry	dry
	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	788.34	793.32	dry	NM
	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	788.03	793.45	below gauge	dry
	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	788.59	795.13	dry	dry
	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	788.4	794.65	dry	dry
	June 3, 2022	NM	NM	NM	NM	NM	NM	782.13	NM	NM	NM	NM	NM	NM	NM	NM
	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 #25222067.00

	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
	Top of Casing Elevation (feet amsl)	806.89	813.00	811.52	805.42	806.32	806.10	808.29	805.95	814.28	807.63	806.89	806.9	813.27	813.62	809.74
	Screen Length (ft)	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
	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
	Measurement Date													--	--	--
CCR Rule Wells	December 21-22, 2015	NM	784.78	784.11	786.13	788.96	787.58	783.77	783.50	785.31	--	--	--	--	--	--
	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
	June 30, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	786.18	NM	NM
	August 6, 2020	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	785.93	NM	NM
	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
	December 11, 2020	--	--	--	--	788.19	--	--	--	--	--	--	--	785.26	785.26	--
	February 25, 2021	--	--	784.27	--	788.36	--	--	784.75	--	--	--	--	--	--	--
	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
	June 11, 2021	--	--	--	--	--	--	784.19	784.66	--	--	--	--	784.20	784.05	--
	July 20, 2021	--	--	783.64	--	788.39	--	--	--	--	--	--	--	--	--	--
	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
	December 21, 2021	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	782.93	NM	NM
	February 24, 2022	NM	NM	782.34	NM	786.49	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	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
	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

Notes:
NM = not measured

Created by: MDB Date: 5/6/2013
Last revision by: NDK Date: 9/22/2022
Checked by: RM Date: 9/22/2022

(1) The elevation for SG-1 is read off of the staff gauge (rather than measured from the top of the gauge).
(2) SG-2 could not be located during the April 2013 event.
(3) SG-3 could not be located during the October 2013 event. SG-1 could not be safely accessed during the October 2013 event.
(4) LH-2 measurements are given as leachate depth, measured by a transducer.
(5) LH-2 and LH-3 measurements were collected by WPL staff on October 9, 2017.
(6) The depth to water at MW-84A was not measured prior to purging for sampling during the October 3-5 sampling event. The level was allowed to return to static and was measured on 10/10/2017.
(7) BC = Brian Clepper; NS= Nate Sievers - Columbia Site employees.

Table 4. Field pH, Lab pH, and Dissolved Oxygen at MW-34A
Columbia Dry ADF, Modules 1-3

Date	Field pH (Standard Units)	Dissolved Oxygen (mg/L)	Lab pH (Standard Units)
12/21/2015	7.91	10	7.7
4/5/2016	7.92	9.38	7.7
7/7/2016	7.52	3.96	7.4
7/28/2016	7.40	5.11	--
10/13/2016	8.19	10.33	7.6
12/29/2016	7.43	9.9	7.4
1/25/2017	7.71	9.83	7.3
4/11/2017	8.03	9.96	7.9
6/6/2017	7.57	10.27	7.7
8/7/2017	7.39	8.02	7.8
10/24/2017	7.67	9.9	7.7
4/24/2018	7.80	2.45	7.7
9/21/2018	8.12	10.54	7.7
10/22/2018	7.64	10.62	7.8
4/2/2019	7.73	10.22	7.7
10/8/2019	7.79	11.71	7.7
5/28/2020	7.40	10.12	7.6
10/8/2020	7.81	9.88	7.7
2/25/2021	7.57	--	--
4/13/2021	7.93	10.47	--
6/11/2021	7.61	11.77	--
10/12/2021	7.68	10.1	7.8
4/12/2022	8.34	7.82	7.8

Note: Lab pH analysis initiated outside of the 15 minute EPA required holding time.

Created by:	SCC	Date:	9/27/2022
Last revision by:	SCC	Date:	9/27/2022
Checked by:	NDK	Date:	9/28/2022

Table 5. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25222067.00

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
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	--	--	--

Table 5. Analytical Results - Lysimeters and Leachate Pond
Columbia Dry Ash Disposal Facility
SCS Engineers Project #25222067.00

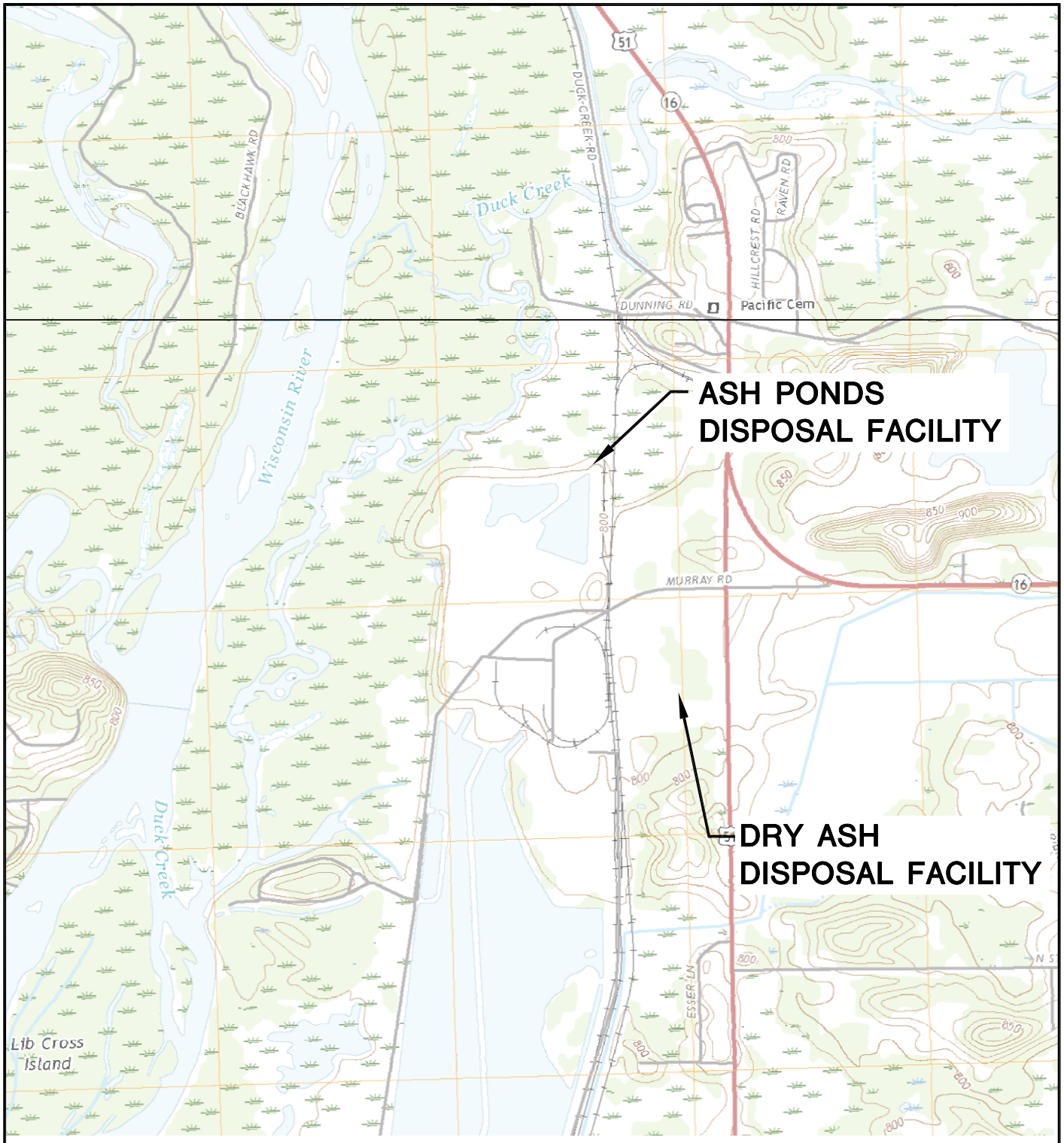
Monitoring Point	Monitoring Period	Monitoring Point Dry/ Broken	Boron, Total (µg/L)	Chloride, Total (mg/L)	Sulfate, Total (mg/L)
LP-1	2015-Apr	--	4,060	27.8	734
	2015-Oct	--	4,300	37.1	820
	2016-Apr	--	1,830	26.8	416
	2016-Oct	--	4,610	71.5	835
	2017-Apr	--	2,690	66.3	587
	2017-Oct	--	4,970	91.7	739
	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

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 LOD and below the LOQ.

Created by:	MDB	Date:	12/1/2014
Last revision by:	RM	Date:	8/18/2022
Checked by:	DK	Date:	8/18/2022

Figures



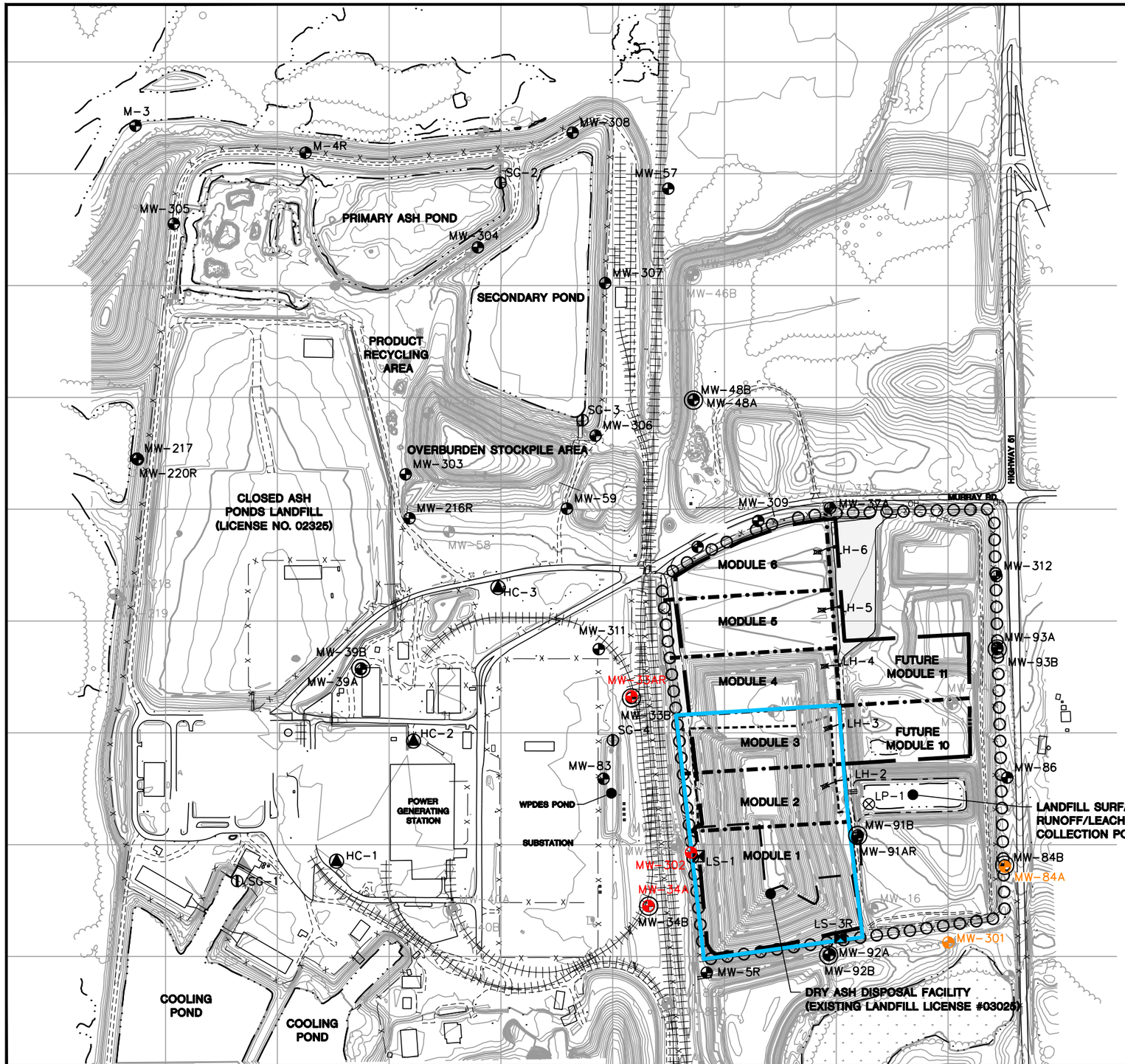
N

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 1
DRAWN:	12/02/2019	CHECKED BY:	MDB		
REVISED:	01/10/2020	APPROVED BY:	TK 04/10/2020		

I:\25220067.00\Drawings\ASD Mod 1-3 LF\Site Location Map.dwg, 4/12/2020 7:05:09 PM



LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- 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 MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, MAY 2019, SEPTEMBER 2020, AUGUST 2021, AND NOVEMBER 2021.
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.

500 0 500

SCALE: 1" = 500'

PROJECT NO.	25222067.00	DRAWN BY:	KP
DRAWN:	12/02/2019	CHECKED BY:	NDK/RM
REVISED:	09/19/2022	APPROVED BY:	TK 9/28/2022

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

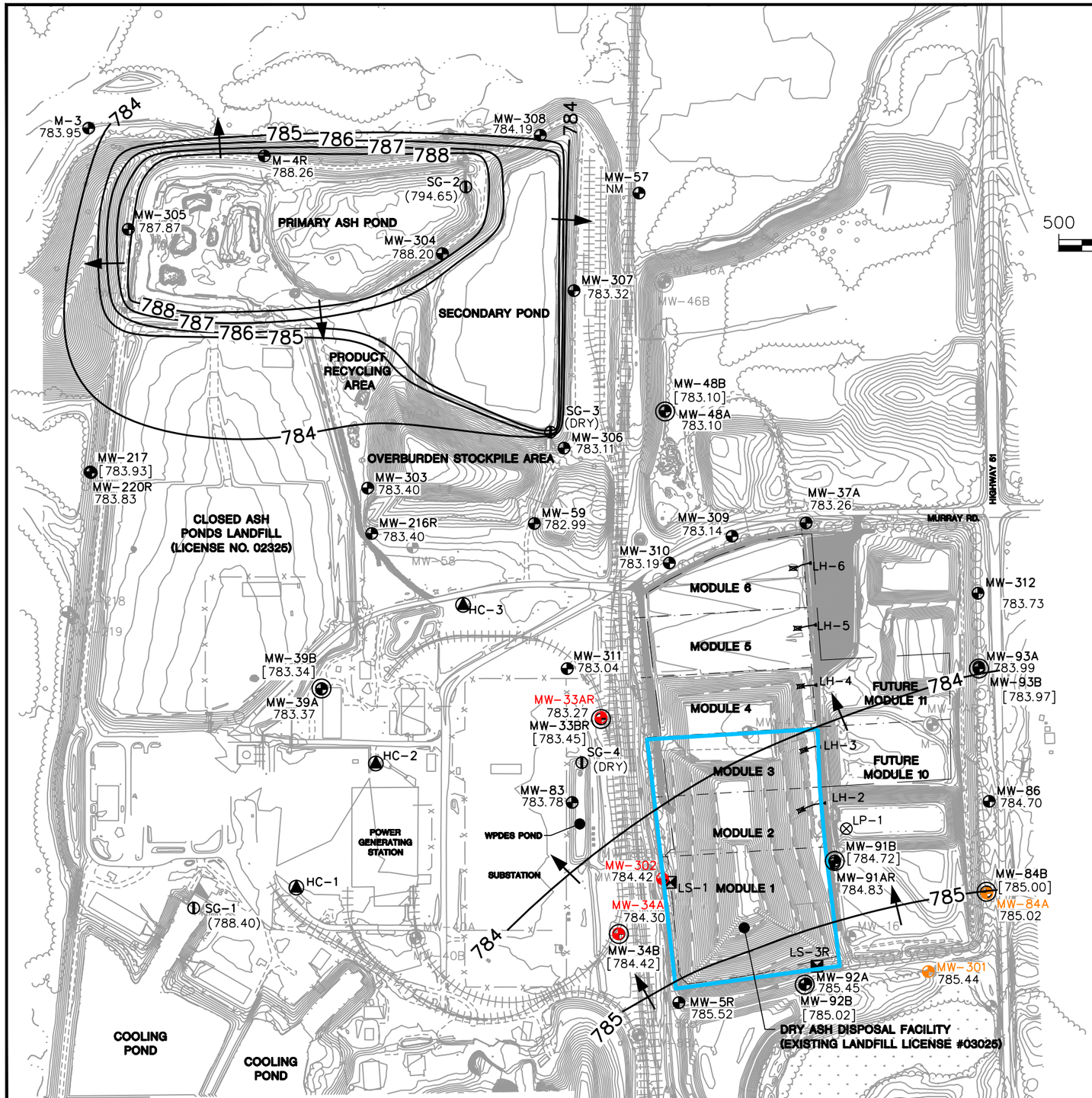
CLIENT: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

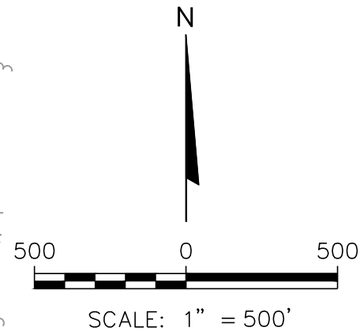
SITE: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
MODULES 1-3 DRY ASH DISPOSAL FACILITY
PARDEEVILLE, WI

SITE PLAN AND MONITORING WELL LOCATIONS

FIGURE 2

I:\25222067.00\Drawings\2□Site Plan and M□nit□ring Well L□ati□ns M□d 1-3.dwg, □/23/2022 11:51:42 AM





LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- 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
- **787.62** WATER TABLE ELEVATION
- **[788.87]** POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
- **(795.20)** SURFACE WATER ELEVATION (NOT CONTOURED)
- WATER TABLE CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEY BY SCS ENGINEERS IN MAY 2016, JUNE 2016, OCTOBER 2016, NOVEMBER 2016, APRIL 2017, NOVEMBER 2017, JULY 2018, AUGUST 2018, FEBRUARY 2019, AND MAY 2019.
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 MODULE 1-3 DRY ASH FACILITY ARE: MW-301 AND MW-84A.
9. GROUNDWATER AND SURFACE WATER ELEVATIONS WERE MEASURED ON APRIL 11-13, 2022.
10. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
11. MW-57 WAS INACCESSIBLE DURING THE APRIL 2022 EVENT DUE TO HIGH WATER.

PROJECT NO.	25222067.00	DRAWN BY:	KP
DRAWN:	12/02/2019	CHECKED BY:	MDB
REVISED:	06/20/2022	APPROVED BY:	TK 9/28/2022

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
APRIL 2022

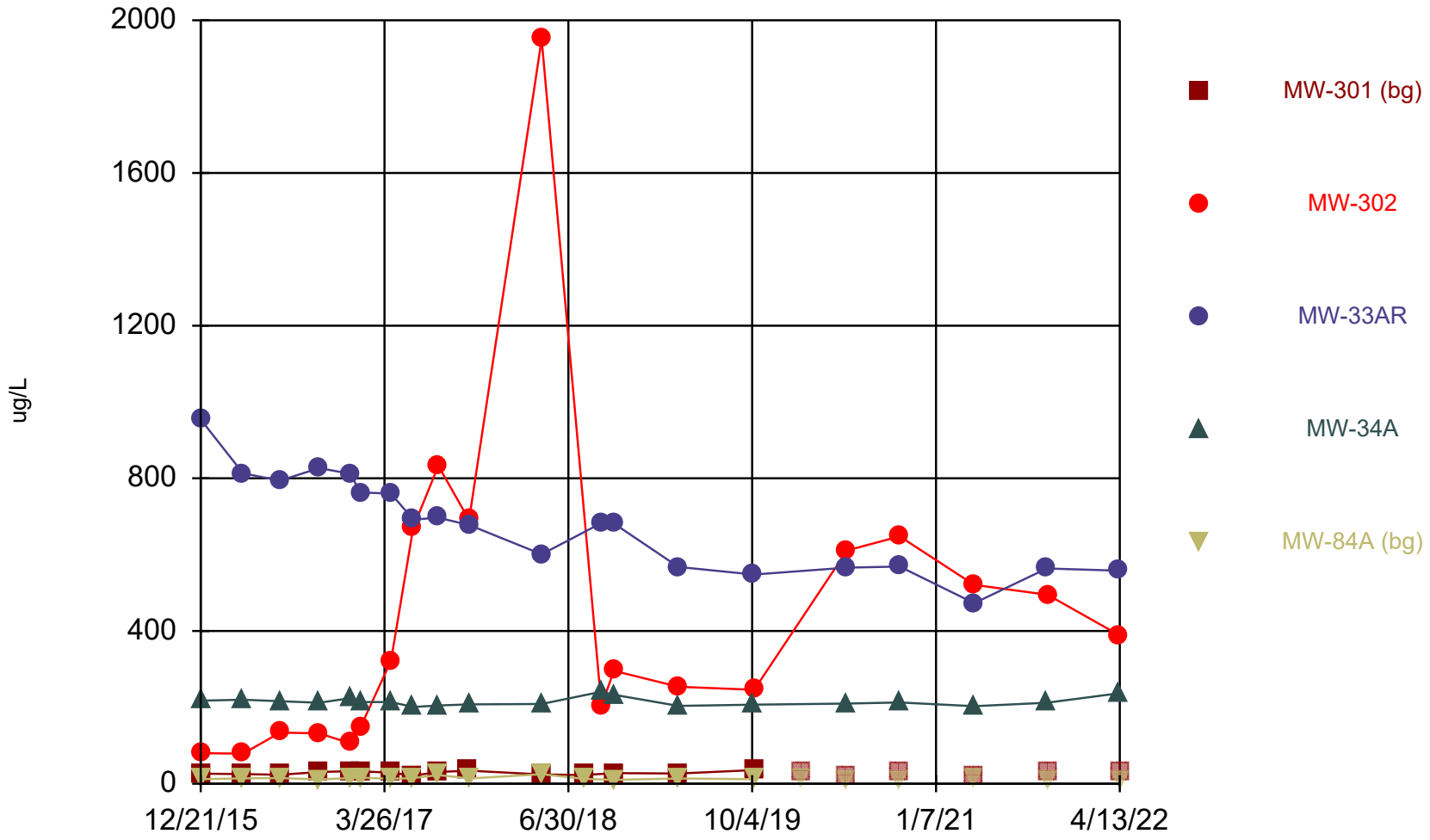
FIGURE
3

I:\25222067.00\Drawings\3□Water Table Map.dwg, □23/2022 11:54:04 AM

Appendix A

Trend Plots for CCR Wells

Boron



Time Series Analysis Run 9/28/2022 10:32 AM View: MOD 4 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

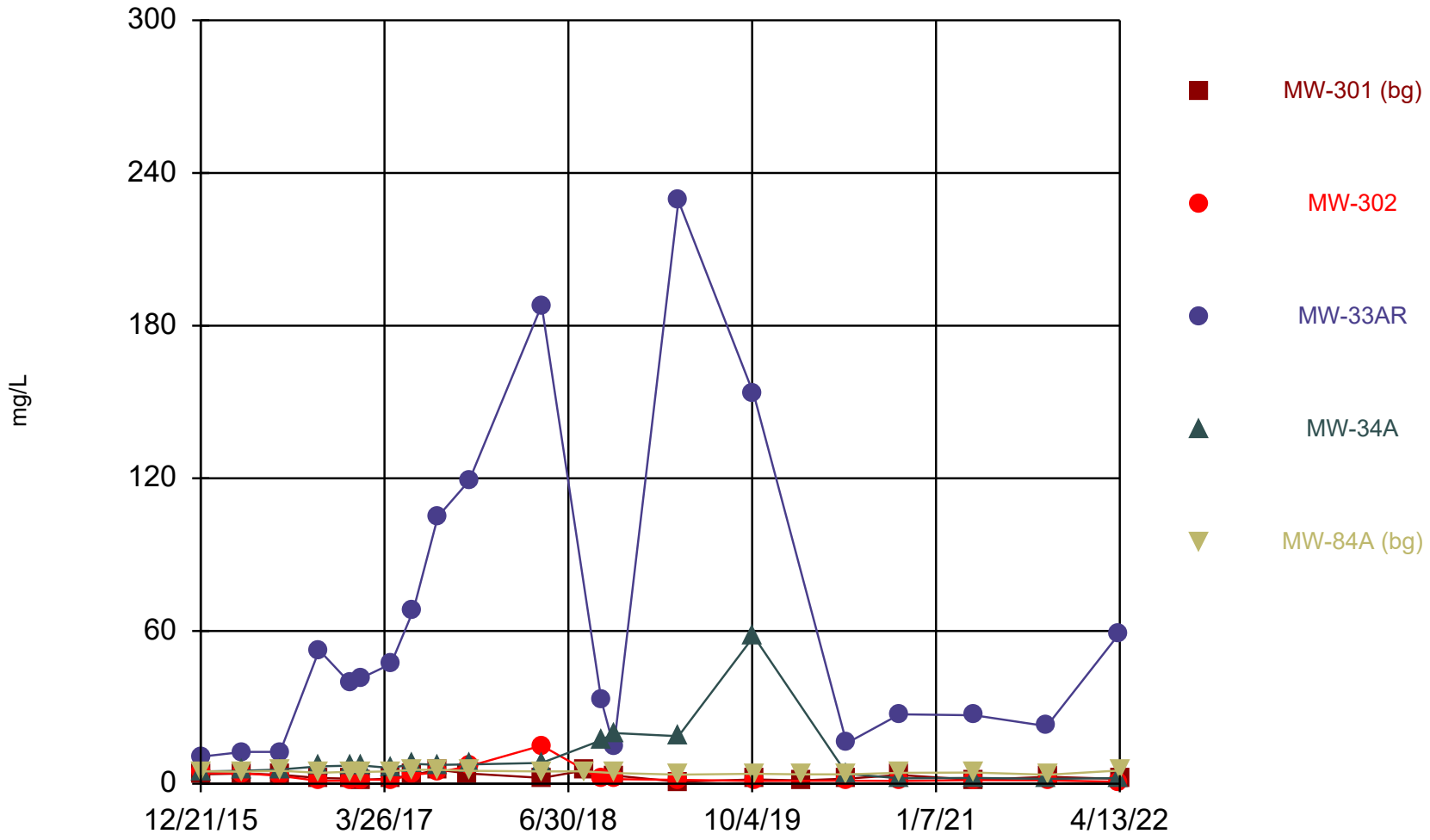
Time Series

Constituent: Boron (ug/L) Analysis Run 9/28/2022 10:34 AM View: MOD 4 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

Chloride



Time Series Analysis Run 9/28/2022 10:32 AM View: MOD 4 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

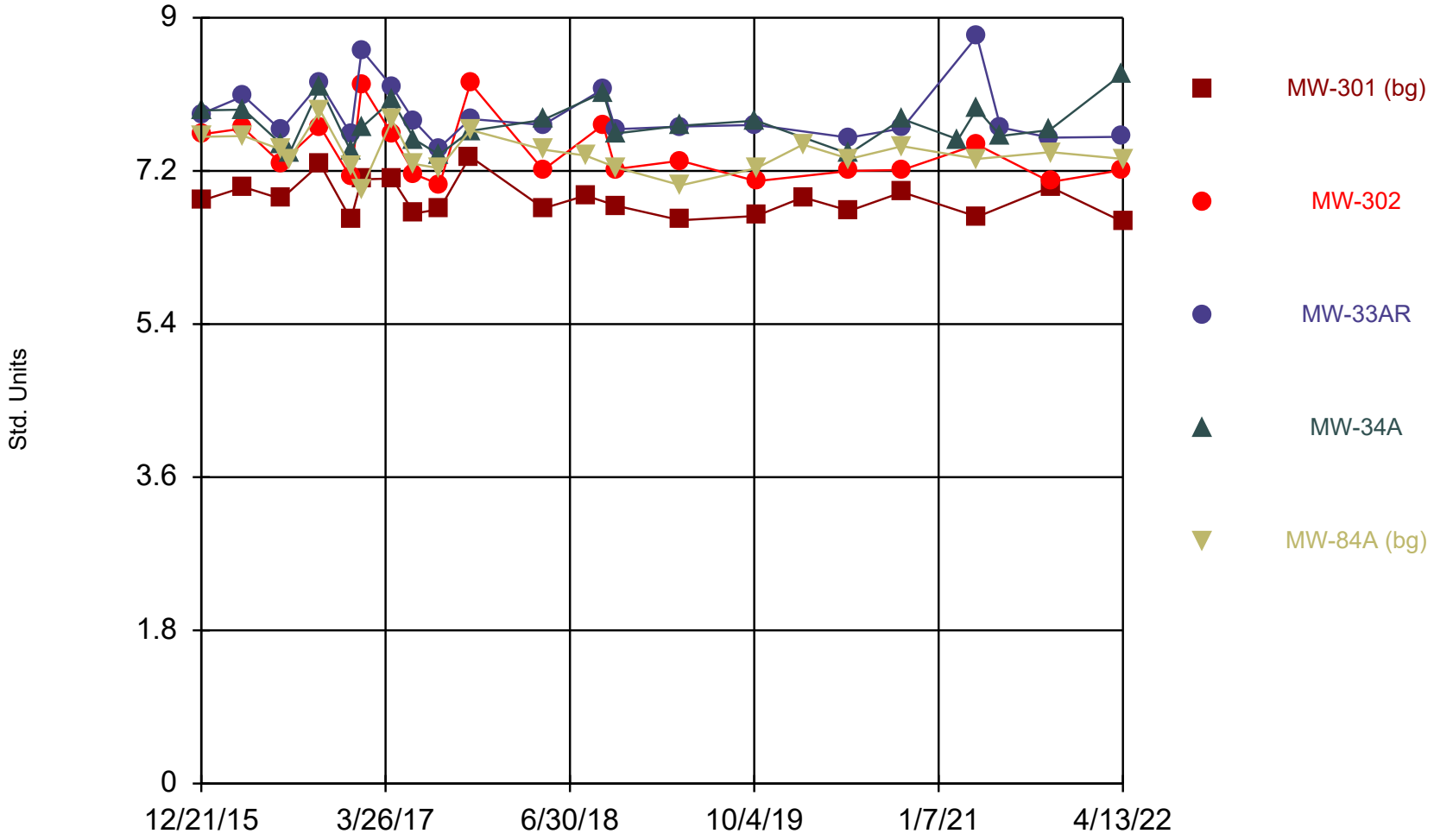
Time Series

Constituent: Chloride (mg/L) Analysis Run 9/28/2022 10:34 AM View: MOD 4 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

Field pH



Time Series Analysis Run 9/28/2022 10:32 AM View: MOD 4 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

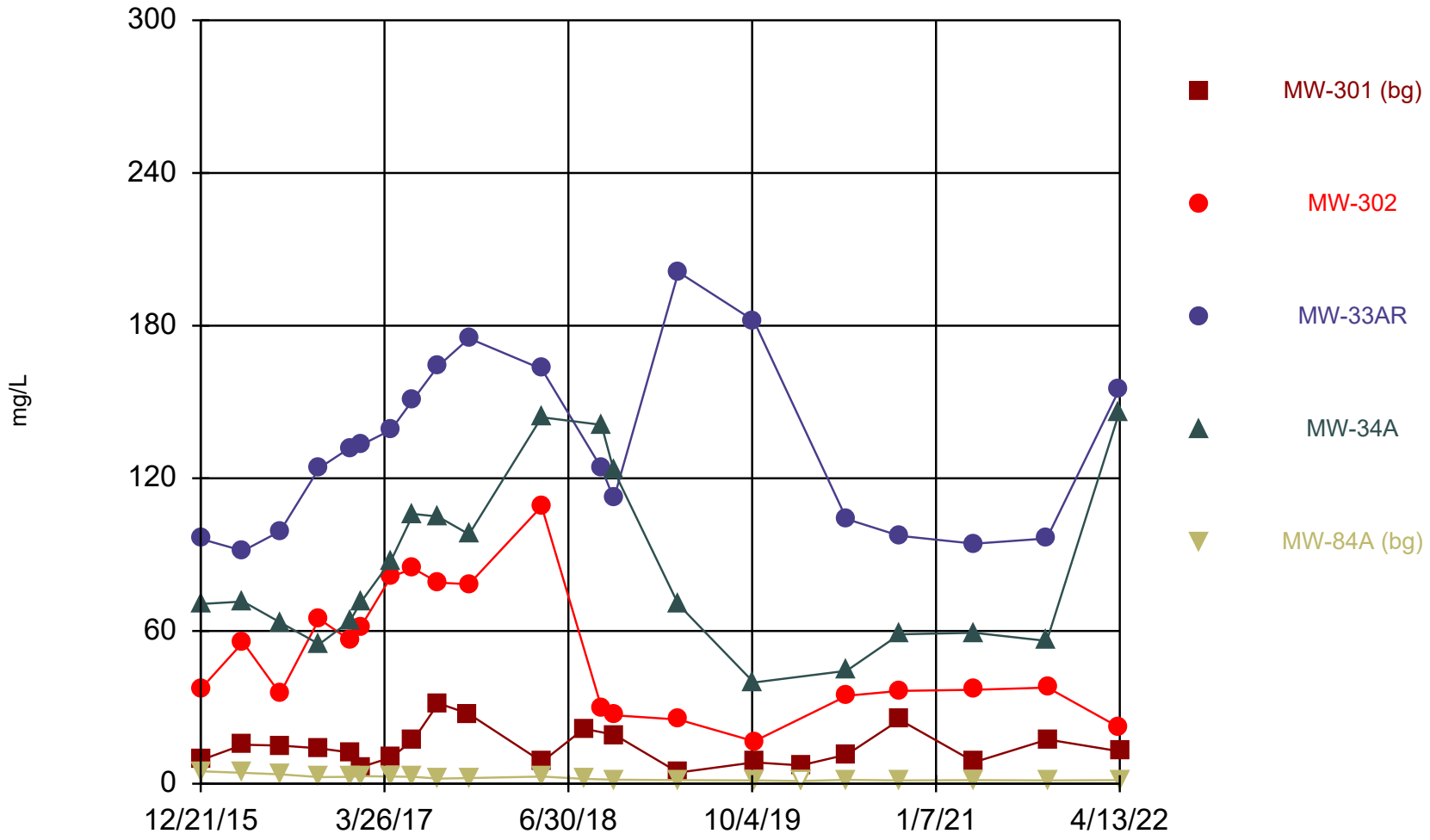
Constituent: Field pH (Std. Units) Analysis Run 9/28/2022 10:34 AM View: MOD 4 LF

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	8.78	7.93	
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

Hollow symbols indicate censored values.

Sulfate



Time Series Analysis Run 9/28/2022 10:32 AM View: MOD 4 LF

Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

Time Series

Constituent: Sulfate (mg/L) Analysis Run 9/28/2022 10:34 AM View: MOD 4 LF

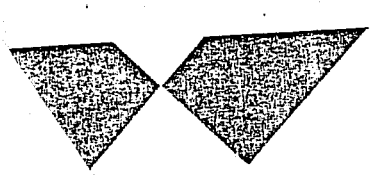
Columbia Energy Center Client: SCS Engineers Data: December - Chem- export-Dec2020

	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)

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 Drainage Ditch (A)	11.4	1510	520.	23.5	29	0.2	<0.1
Drainage Ditch (B)	7.8	500	21.	7.0	43	29	<0.1
	9.05	1780	750	14.0	42	5.4	<0.1

APPENDICES TO

SUPPLEMENTARY FEASIBILITY STUDY REPORT AND PRELIMINARY ENGINEERING CONCEPTS COLUMBIA SITE WISCONSIN POWER AND LIGHT COMPANY TOWN OF PACIFIC, COLUMBIA COUNTY, WISCONSIN

WARZYN
ENGINEERING INC

APPENDIX I

WATER QUALITY DATA - DECEMBER 1978

WARZYN
ENGINEERING INC

12/76

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	5.8	1,140	15	<0.5	97	56	38	-
30B	6.65	835	160	14.6	37	20	<0.1	-
33A	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	-

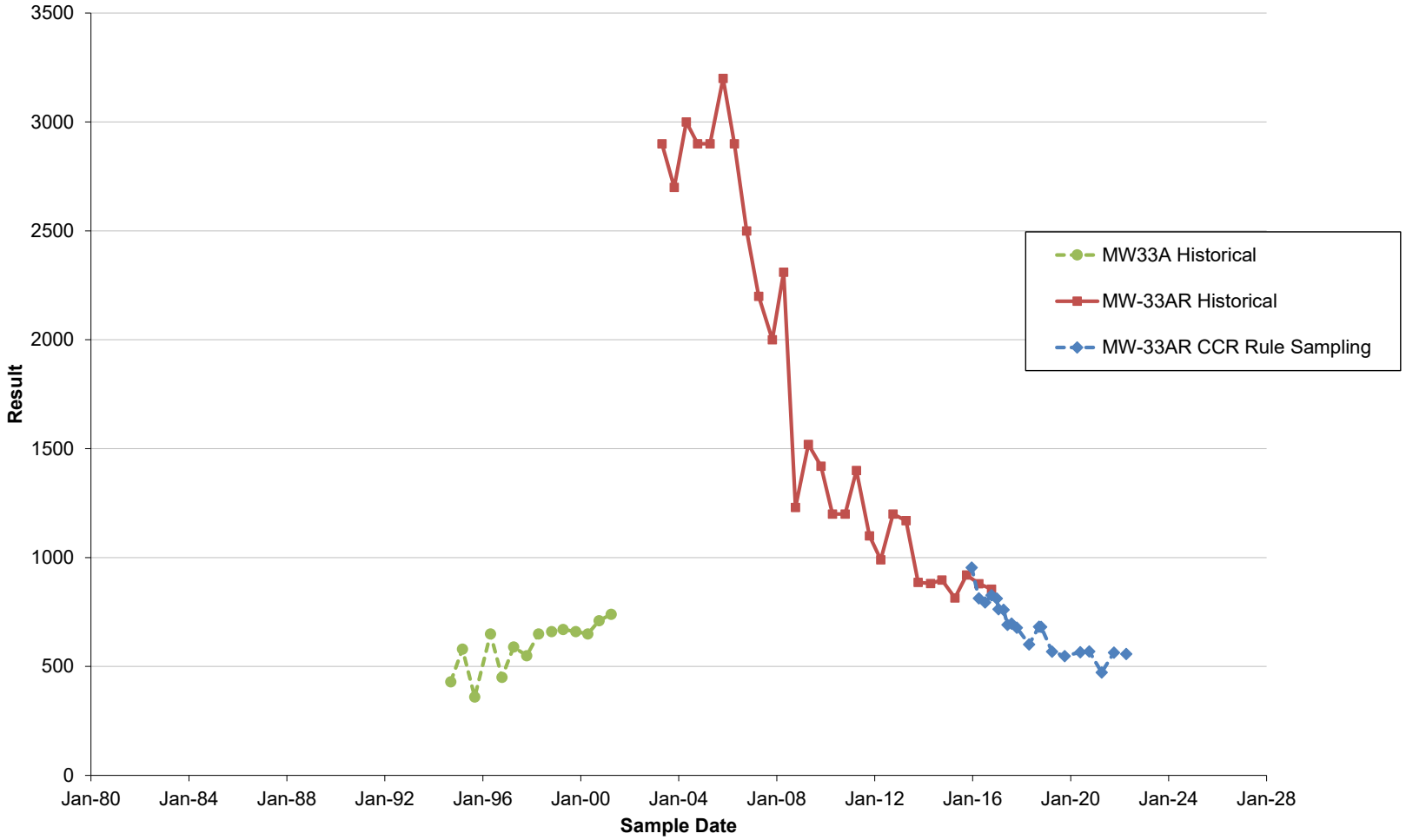
WELL NO.	pH	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	SULFATE (mg/l)	CHLORIDE (mg/l)	CALCIUM (mg/l)	MAGNESIUM (mg/l)	IRON (mg/l)	BORON (mg/l)
42	7.15	2,050	910	15.6	23	7.5	0.1	-
44	6.15	710	6	0.5	56	27	3.5	-
45	7.2	420	32	1.0	44	26	<0.1	-
46A	7.0	560	93	<0.5	130	75	<0.1	<0.05
46B	6.5	1,290	170	20.8	46	30	<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	-

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	7.5	440	20	<0.5	27	37	<0.1	-
70B	7.3	520	25	5.2	51	34	<0.1	-
72A	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

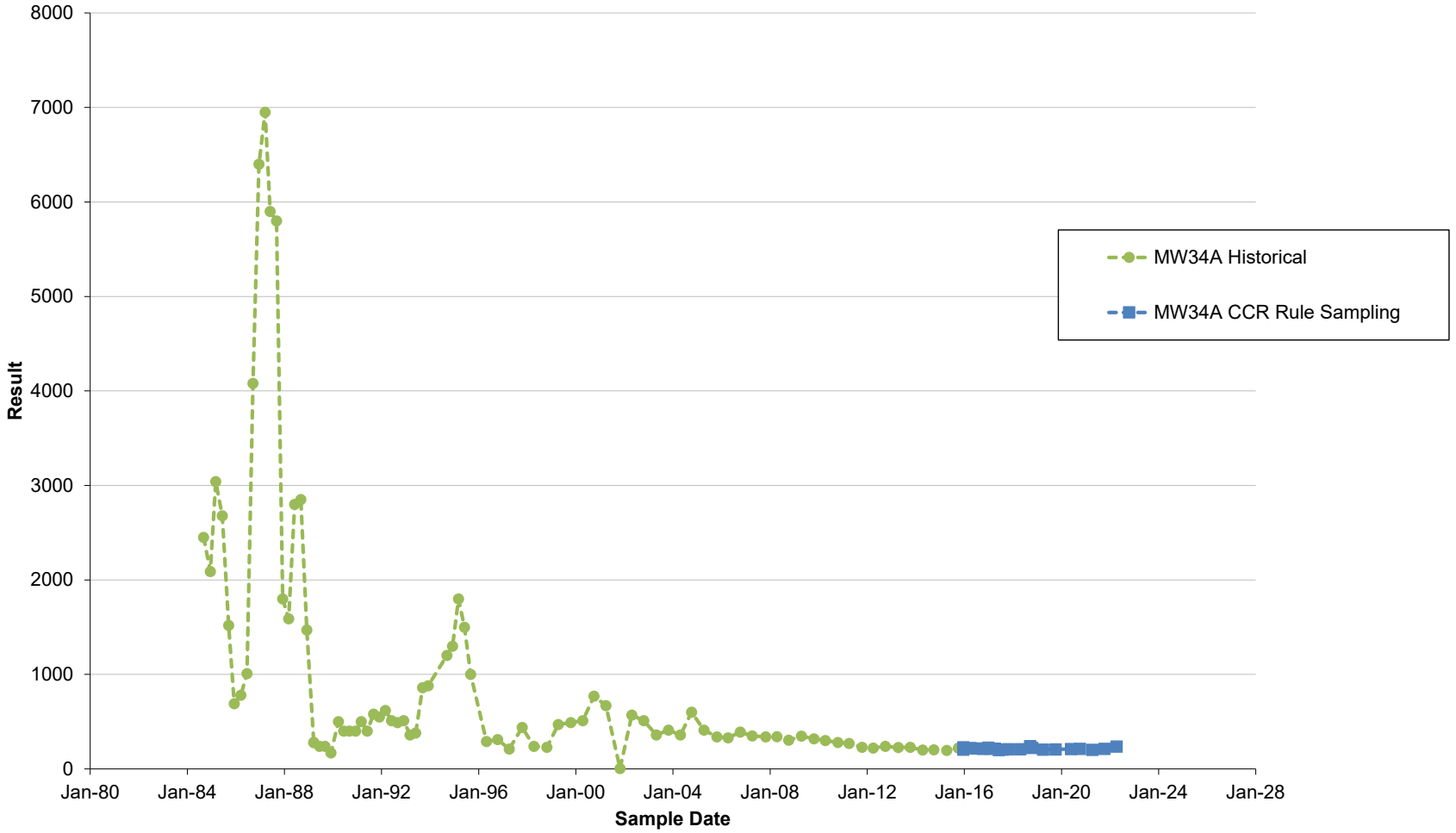
Long-Term Concentration Trend Plots

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33A and MW-33AR - Boron (µg/l as B)



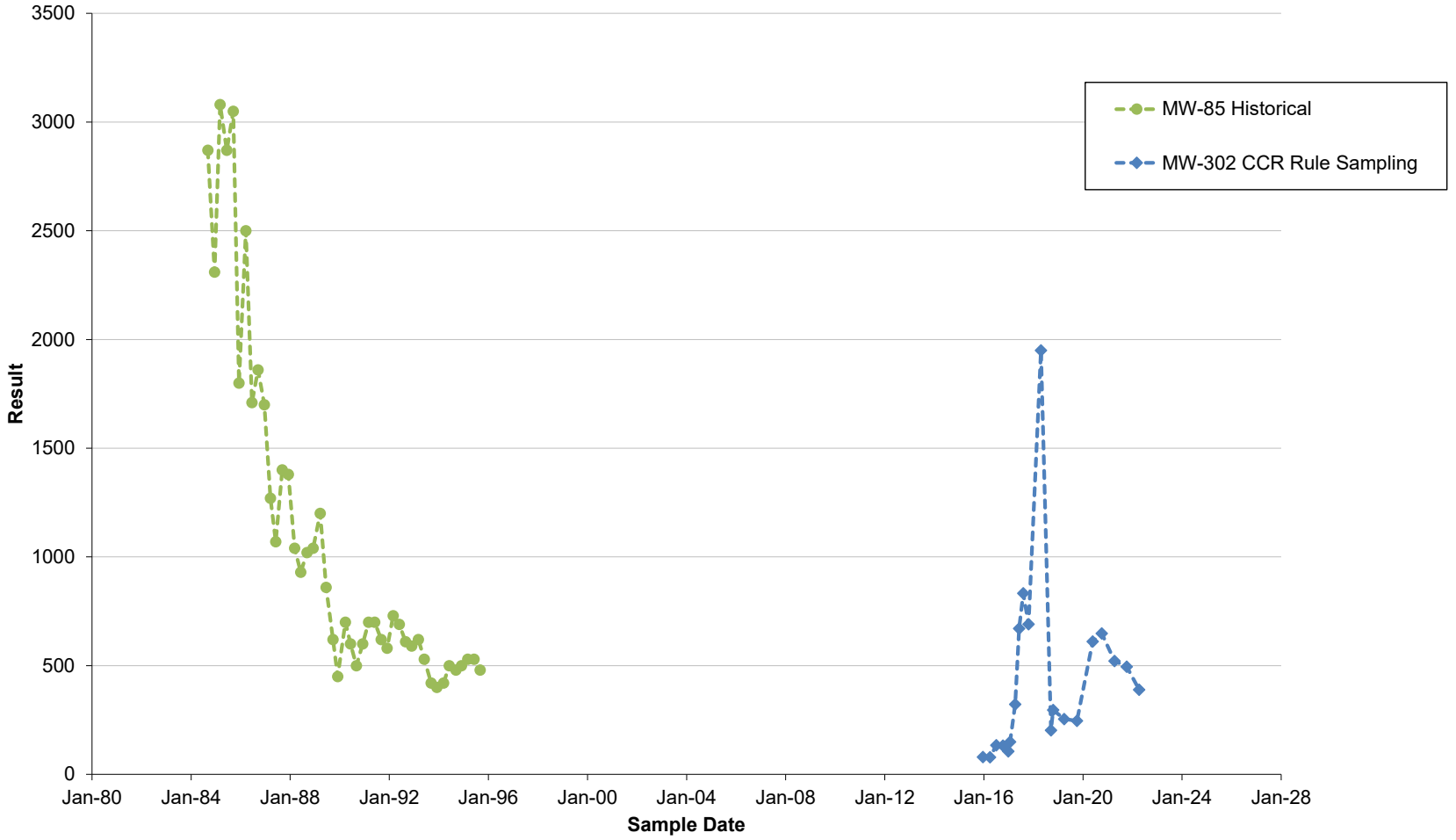
I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\Graphs\[Bo_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Boron (µg/l as B)



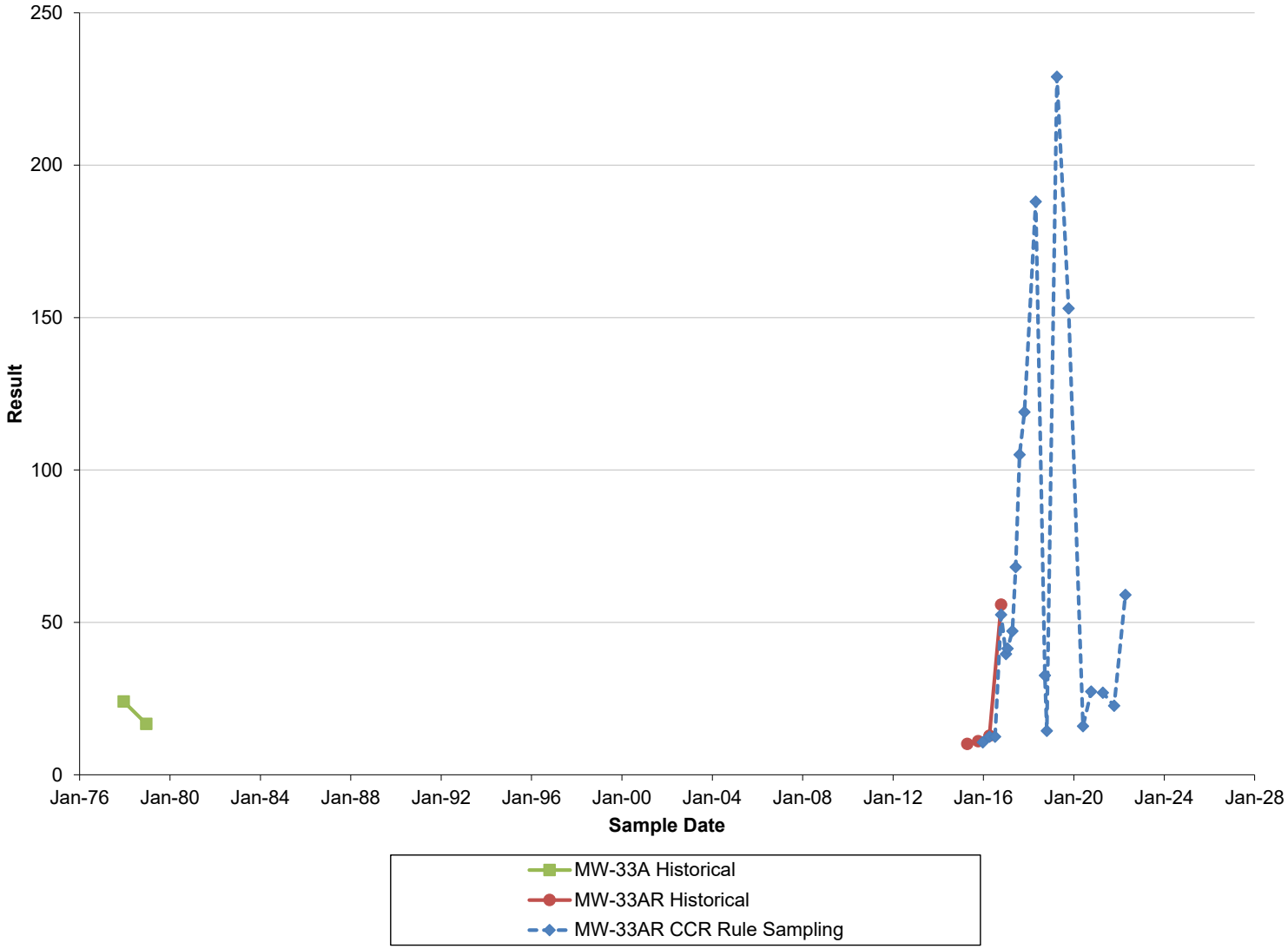
I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\Graphs\[Bo_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-302 and MW-85 - Boron (µg/l as B)



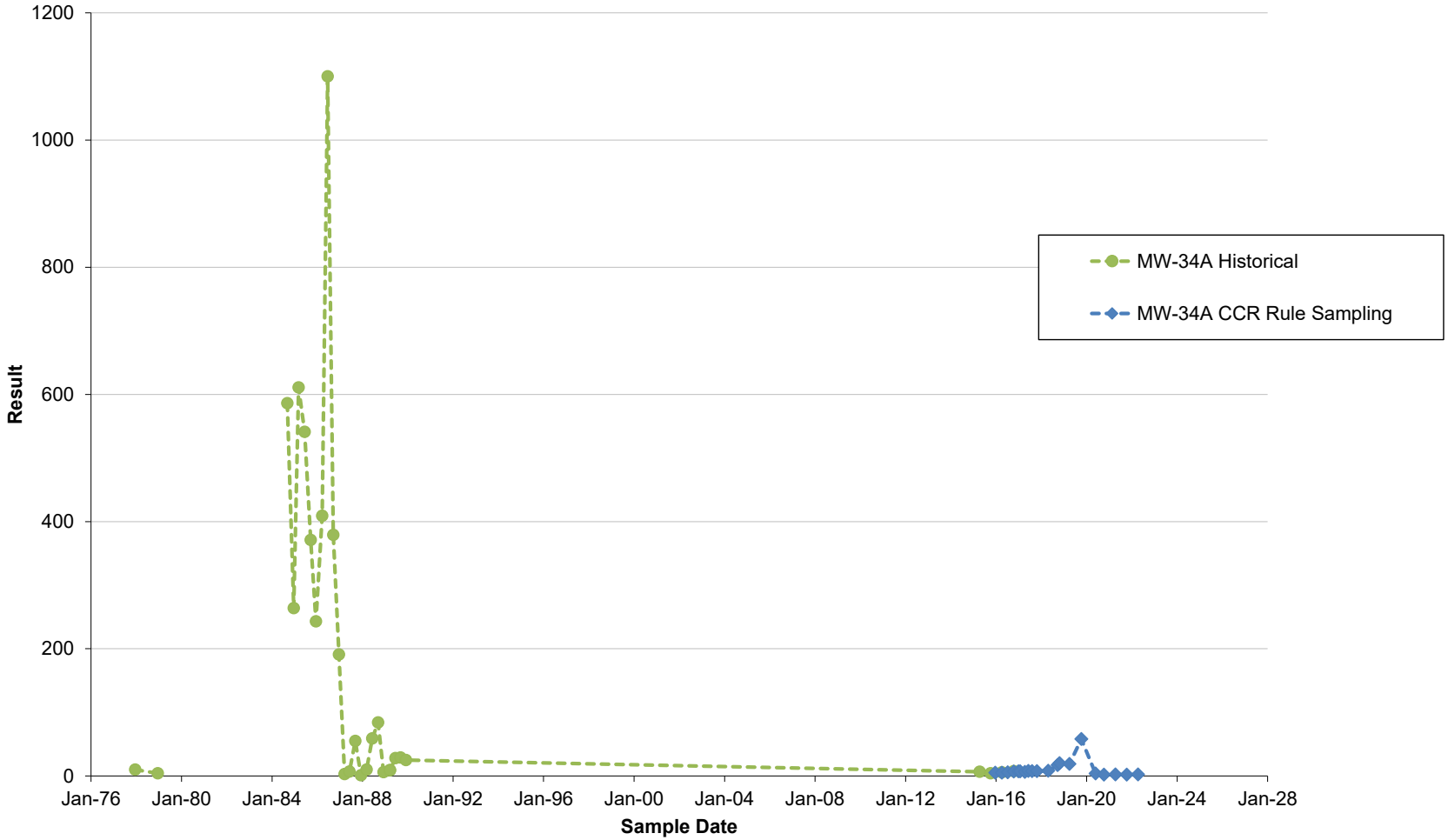
I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\Graphs\[Bo_COL Dry.xlsx]MW-85

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Chloride (mg/l as Cl)



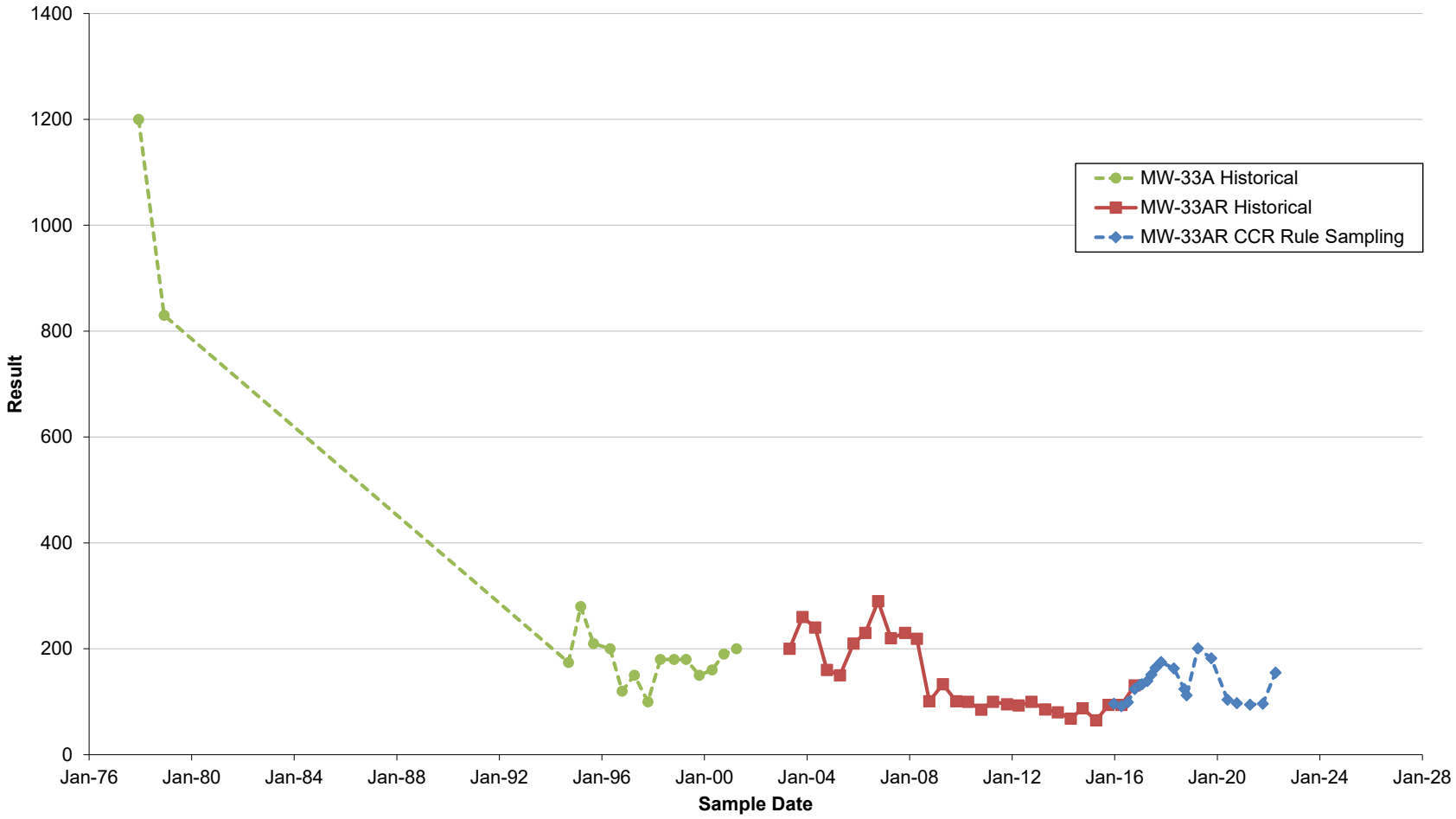
I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\Graphs\[Cl_COL Dry.xlsx]MW-33AR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW34A - Chloride (mg/l as Cl)



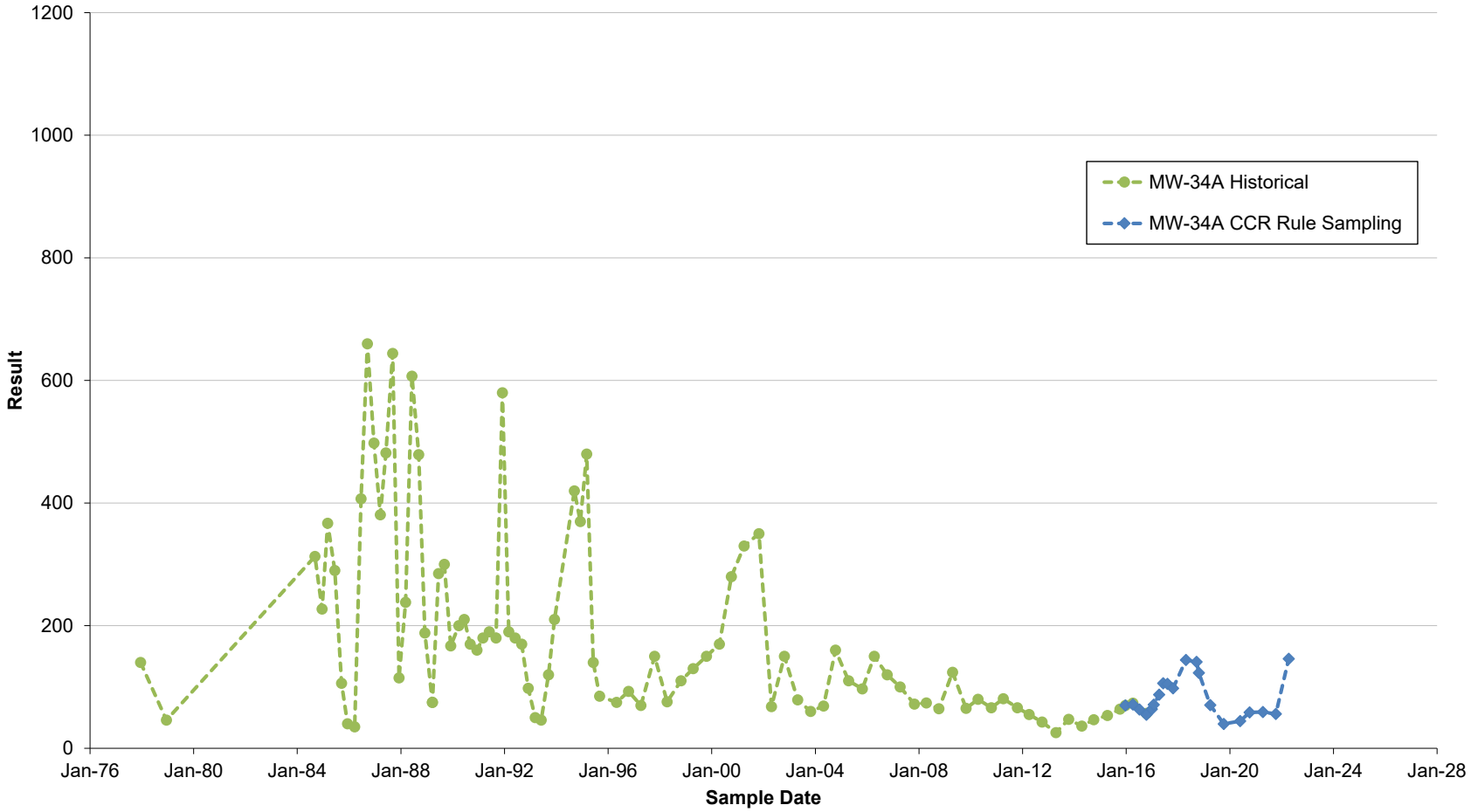
I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\Graphs\[Cl_COL Dry.xlsx]MW-34A

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-33 and MW-33AR - Sulfate (mg/l as SO4)



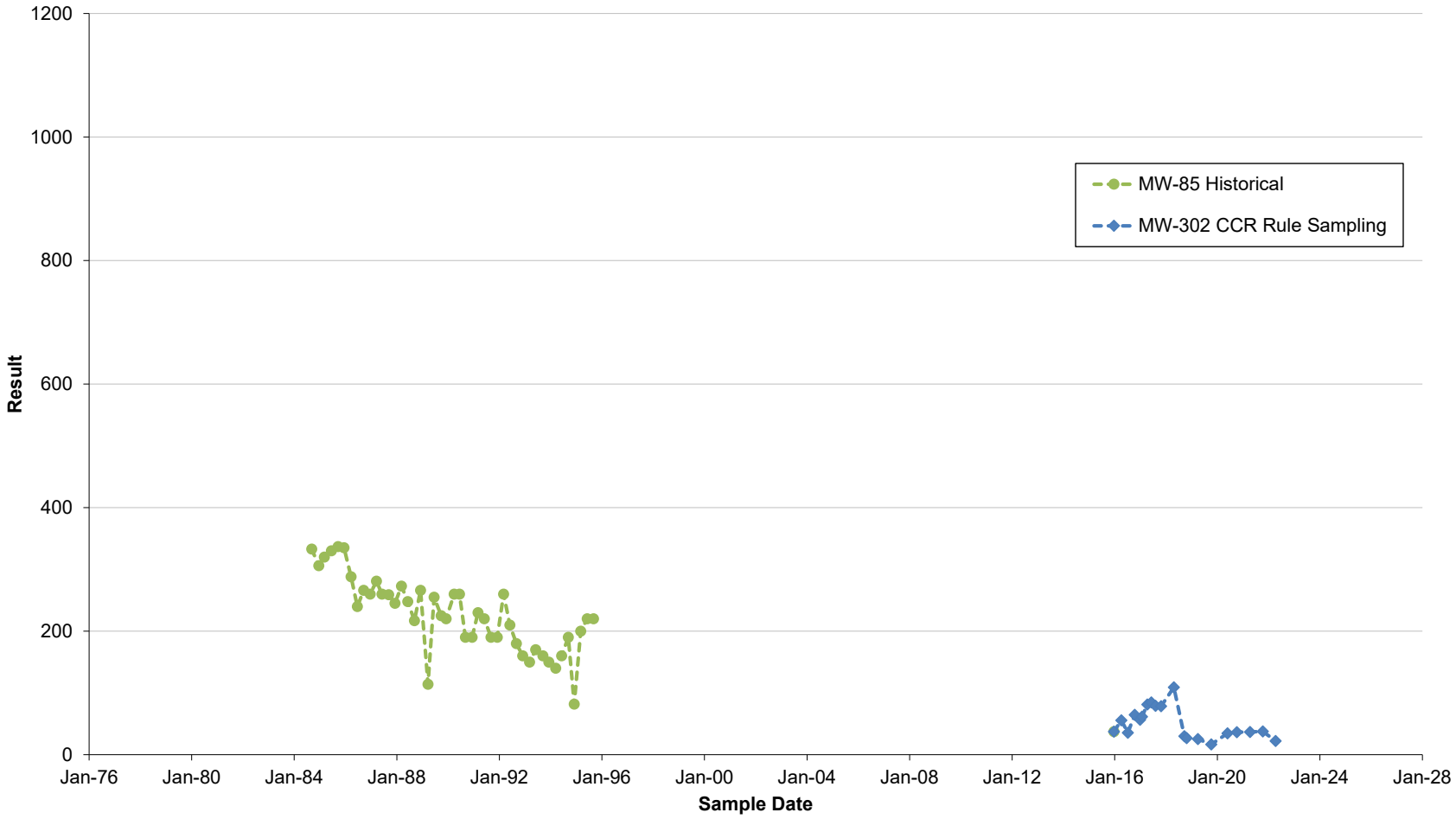
I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\Graphs\[SO4_COL Dry.xlsx]MW-33AR CCR

Wisconsin Power & Light Company
Columbia Dry Ash Disposal Facility
MW-34A - Sulfate (mg/l as SO4)



I:\25222067.00\Deliverables\2022 Apr ASD MOD 1-3 LF\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
- OBSERVATION WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION
- BORING LOCATION AND NUMBER
- 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 CAPICITY WELLS
- —790— WATER TABLE CONTOURS (CONTOUR INTERVAL: 1 FT.)
- DIRECTION OF GROUNDWATER FLOW

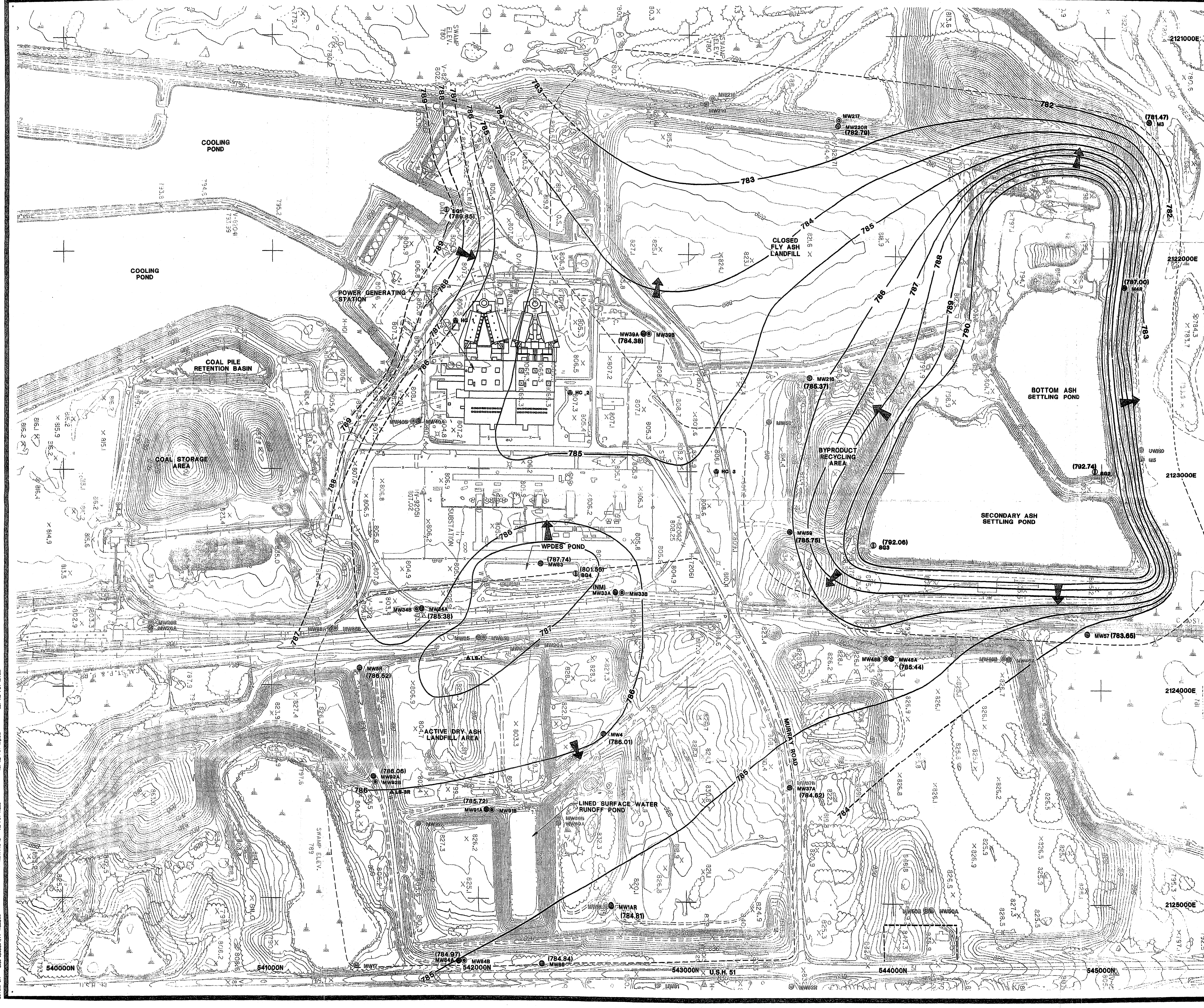
NO.	BY	DATE	REVISION	APP'D

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	



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