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REPORT ON

2024 ANNUAL GROUNDWATER MONITORING REPORT FOR FLY ASH RESERVOIR (FAR) II CARDINAL UPLAND DISPOSAL FACILITY BRILLIANT, OHIO

by
Haley & Aldrich, Inc.
Cleveland, Ohio

for
Cardinal Operating Company
Brilliant, Ohio

File No. 210218
January 2025

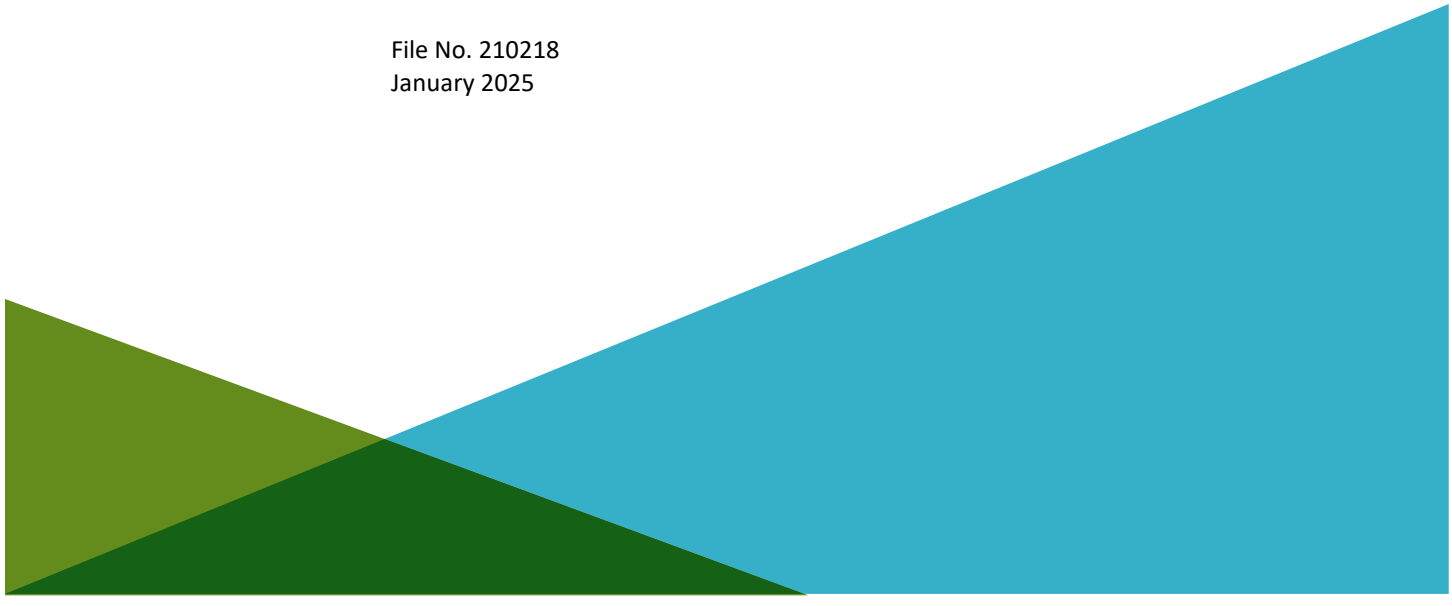

Table of Contents

List of Tables

List of Figures

1. Annual Groundwater Monitoring Report Summary

Haley & Aldrich, Inc. has prepared this 2024 Annual Groundwater Monitoring Report (Report) for the Fly Ash Reservoir (FAR) II, an existing coal combustion residual (CCR) unit at the Cardinal Upland Disposal Facility in Brilliant, Ohio. This Report was prepared to comply with the United States Environmental Protection Agency (EPA) Hazardous and Solid Waste Management System; Disposal of CCR from Electric Utilities, Title 40 Code of Federal Regulations (CFR) Part 257, Subpart D dated 17 April 2015 (Rule), specifically subsection § 257.90(e)(1) through (6).

This Report summarizes groundwater monitoring activities conducted pursuant to the CCR Rule from 1 January 2024 through 31 December 2024.

In accordance with § 257.90(e)(6), an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit is provided below:

- At the start of the current annual reporting period (1 January 2024), FAR II was operating under the assessment monitoring program. Assessment monitoring was initiated after the May 2018 groundwater sampling event, transitioning to the corrective action program in February 2019 following detection of statistically significant levels (SSLs) of some constituents above groundwater protection standards (GWPSs).
- At the end of the current annual reporting period (31 December 2024), FAR II was operating under the assessment monitoring program.
- Statistically significant increases (SSI) above background levels were identified during the October 2023 sampling event for the following Appendix III constituents:
  - Shallow Aquifer
    - chloride: S-9
    - pH: S-1005
  - Morgantown Aquifer
    - boron: FA-8, M-10, M-11, M-21, M-22, M-23, M-1004, and M-GS-3R
- SSI above background levels were identified during the April 2024 sampling event for the following Appendix III constituents:
  - Shallow Aquifer
    - boron: S-21
    - chloride: S-9
  - Morgantown Aquifer
    - boron: FA-8, M-10, M-11, M-21, M-22, M-23, M-24, and M-1004
    - pH: M-14
- SSLs of Appendix IV constituents were detected at FAR II during the October 2023 sampling event as follows:
  - Morgantown Aquifer
    - lithium: FA-8 and M-11
    - molybdenum: FA-8 and M-11

- SSLs of Appendix IV constituents were detected at FAR II during the April 2024 sampling event as follows:
  - Morgantown Aquifer
    - lithium: FA-8 and M-11
    - molybdenum: FA-8 and M-11
- These Appendix IV well-constituent pairs have already been identified in previous sampling events. No new SSLs were identified. Groundwater corrective measures monitoring continues to be completed in accordance with § 257.98(a)(1).
- Comparison of the November/ December 2024 monitoring data to background levels for Appendix III constituents and GWPSs for Appendix IV constituents is ongoing and will be included in the 2025 Annual Report.

2. 40 CFR §257.90 Applicability

To report on the activities conducted during the prior calendar year and document progress complying with the CCR Rule, the specific requirements listed in § 257.90(e)(1) through (5) are provided in the next section in bold/italic type followed by a short narrative stating how that specific requirement was met.

2.1 40 CFR § 257.90(a) AND (c)

All CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under § 257.90 through § 257.98.

Once a groundwater monitoring system and groundwater monitoring program has been established at the CCR unit as required by this subpart, the owner or operator must conduct groundwater monitoring and, if necessary, corrective action through the active life and post-closure care period of the CCR unit.

FAR II is a CCR surface Impoundment. As of July 2021, FAR II no longer receives waste streams and is undergoing closure. As such, it is subject to the groundwater monitoring and corrective action requirements set forth by the EPA in 40 CFR §§ 257.90 through 257.98. This document satisfies the requirement under § 257.90(e) which requires the CCR Unit Owner/Operator to prepare an Annual Groundwater Monitoring and Corrective Action Report.

The FAR II groundwater monitoring network consists of two aquifers: the Shallow Aquifer and the Morgantown Aquifer. Each of these aquifers are considered part of the uppermost aquifer and are monitored as part of the groundwater monitoring program.

2.2 40 CFR § 257.90(e) SUMMARY

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 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).

This Report documents the activities completed in 2024 for FAR II as required by the subject regulations. Groundwater sampling and analysis were conducted per the requirements of § 257.93, and the status of the groundwater monitoring program, set forth in § 257.95, is provided in this Report.

2.2.1 Status of the Groundwater Monitoring Program

SSIs of Appendix III constituents and SSLs of Appendix IV constituents were identified at FAR II from the Fall 2023 sampling event and the April 2024 semiannual monitoring event. FAR II remains in assessment monitoring and corrective action.

2.2.2 Key Actions Completed

- In 2024, two groundwater monitoring events were completed. The first semiannual groundwater monitoring event was completed in April and the second semiannual groundwater monitoring event was conducted in November, with a resample in December.
- Potentiometric monitoring was conducted during the semiannual sampling events, as detailed in Section 2.3.5.
- Two semiannual statistical evaluations were completed in 2024. These evaluations were conducted for the October 2023 and April 2024 semiannual sampling events. The statistical evaluation of the November 2024 semiannual sampling event is ongoing and will be presented in the 2025 Annual Report.

2.2.3 Problems Encountered

- During the November sampling event, inconsistent water level measurements were discovered in the data collected in the field. As such, a separate sampling event was conducted to determine more representative data. The sampling equipment was determined to be responsible for the inconsistencies in the data.
- During the November sampling event, monitoring well M-21 exhibited elevated turbidity levels and discoloration. Analytical results from this well showed uncharacteristically elevated levels of several constituents. A resample was taken in December, which also showed elevated levels. See Section 2.2.4 for actions to be taken.
- A groundwater sample was unable to be taken from monitoring well CA-0622A during the April sampling event due to insufficient recovery in the water table.
- A sample was unable to be taken from M-12 due to pump malfunctions during both semiannual sampling events.

2.2.4 Actions to Resolve Problems

- Future sampling events will confirm that field sampling parameters are within the expected ranges for accurate sample collection.
- During 2025, monitoring well M-21 will be reassessed to see if a representative sample can be collected.
- Samples will continue to be attempted at background monitoring wells CA-0622A and M-12 during future semiannual sampling events. No SSIs were overlooked as a result of these sampling issues.

2.2.5 Project Key Activities for Upcoming Year

Key activities to be completed in 2025 include the following:

- Prepare the 2024 annual report; place it in the record as required by § 257.105(h)(1), notify the state [§ 257.106(d)]; and post to website [§ 257.107(d)].
- Prepare the semiannual statistical report for the second semiannual event of 2024.
- Conduct semiannual groundwater monitoring and reporting as required by § 257.95.

- Conduct semiannual statistical analyses in accordance with the FAR II Statistical Analysis Plan.
- The background dataset will be updated following the Spring 2025 sampling event.

2.3 40 CFR § 257.90(e) – INFORMATION

At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

2.3.1 40 CFR § 257.90(e)(1)

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;

As required by § 257.90(e)(1), maps showing the locations of FAR II and associated upgradient and downgradient monitoring wells are presented as Figure 1 (Shallow Aquifer) and Figure 2 (Morgantown Aquifer).

2.3.2 40 CFR § 257.90(e)(2)

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

There was no change in the monitoring well network for FAR II in 2024.

2.3.3 40 CFR § 257.90(e)(3)

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;

In accordance with § 257.95(b) and § 257.95(d)(1), two independent samples from each background and downgradient monitoring well were collected and analyzed. Summary tables including the sample names, dates of sample collection, reason for sample collection, and monitoring data obtained for the groundwater monitoring program for FAR II are presented in Table 1 (Shallow Aquifer) and Table 2 (Morgantown Aquifer). A summary of the analytical results for the Shallow and Morgantown aquifers is presented in Tables 3 and 4, respectively. In addition, in accordance with § 257.95(d)(3), Tables 5 and 6 include the GWPSs for the Shallow and Morgantown aquifers established under § 257.95(d)(2).

2.3.4 40 CFR § 257.90(e)(4)

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); and

In accordance with §257.95 of the CCR Rule, assessment monitoring at FAR II was initiated in May 2018 after SSIs over groundwater background levels were detected. In February 2019, FAR II moved into corrective action monitoring. The monitoring wells for FAR II continue to be sampled for Appendix III and Appendix IV constituents as part of the Assessment Monitoring and Corrective Action Program.

2.3.5 40 CFR § 257.90(e)(5)

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

Other information specified § 257.90 through § 257.98 is discussed in preceding sections.

As specified in § 257.93(c), groundwater flow rates and directions are provided as Figures 3 and 4 (April) and Figures 5 and 6 (December) and Tables 7 and 8 (April) and Tables 9 and 10 (December) for each aquifer.

TABLES

TABLE 1
SUMMARY OF 2024 SAMPLES COLLECTED - SHALLOW AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	Type of Well	Sample Date	Constituents Analyzed	Purpose	Sample Type
CA-0623A	Background	04/10/2024	Appendix III and IV	Assessment Monitoring Program	Primary
CA-0623A	Background	10/15/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-09	Downgradient	04/11/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-09	Downgradient	10/21/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-21	Downgradient	04/11/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-21	Downgradient	10/18/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-23	Downgradient	04/11/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-23	Downgradient	10/18/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-1005	Background	04/11/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-1005	Background	10/17/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-15	Background	04/16/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-15	Background	10/16/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-22	Background	04/12/2024	Appendix III and IV	Assessment Monitoring Program	Primary
S-22	Background	10/17/2024	Appendix III and IV	Assessment Monitoring Program	Primary

TABLE 2
SUMMARY OF 2024 SAMPLES COLLECTED - MORGANTOWN AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	Type of Well	Sample Date	Constituents Analyzed	Purpose	Sample Type
CA-0622A	Background	NA*	NA*	NA*	NA*
CA-0622A	Background	CA-0622A-10152024	Appendix III and IV	Assessment Monitoring Program	Primary
FA-8	Downgradient	FA-8-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
FA-8	Downgradient	FA-8-10212024	Appendix III and IV	Assessment Monitoring Program	Primary
M-06	Background	M-6-04172024	Appendix III and IV	Assessment Monitoring Program	Primary
M-06	Background	M-6-10242024	Appendix III and IV	Assessment Monitoring Program	Primary
M-08	Downgradient	M-8-04162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-08	Downgradient	M-8-10222024	Appendix III and IV	Assessment Monitoring Program	Primary
M-10	Downgradient	M-10-04162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-10	Downgradient	M-10-12092024	Appendix III and IV	Assessment Monitoring Program	Primary
M-11	Downgradient	M-11-04122024	Appendix III and IV	Assessment Monitoring Program	Primary
M-11	Downgradient	M-11-10242024	Appendix III and IV	Assessment Monitoring Program	Primary
M-12*	Background	NA*	NA*	NA*	NA*
M-12*	Background	NA*	NA*	NA*	NA*
M-13	Downgradient	M-13-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-13	Downgradient	M-13-10222024	Appendix III and IV	Assessment Monitoring Program	Primary
M-14	Downgradient	M-14-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-14	Downgradient	M-14-10162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-15	Downgradient	M-15-04162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-15	Downgradient	M-15-10162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-16	Downgradient	M-16-04102024	Appendix III and IV	Assessment Monitoring Program	Primary
M-16	Downgradient	M-16-10152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-21	Downgradient	M-21-04162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-21	Downgradient	M-21-10232024	Appendix III and IV	Assessment Monitoring Program	Primary
M-21	Downgradient	M-21-12172024	Appendix III and IV	Assessment Monitoring Program	Primary
M-22	Downgradient	M-22-04122024	Appendix III and IV	Assessment Monitoring Program	Primary
M-22	Downgradient	M-22-10172024	Appendix III and IV	Assessment Monitoring Program	Primary
M-23	Downgradient	M-23-04112024	Appendix III and IV	Assessment Monitoring Program	Primary
M-23	Downgradient	M-23-10182024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1003	Downgradient	M-1003-04162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1003	Downgradient	M-1003-10182024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1004	Downgradient	M-1004-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1004	Downgradient	M-1004-10172024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1302	Background	M-1302-04102024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1302	Background	M-1302-10152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1309	Downgradient	M-1309-04102024	Appendix III and IV	Assessment Monitoring Program	Primary
M-1309	Downgradient	M-1309-10222024	Appendix III and IV	Assessment Monitoring Program	Primary
M-2000	Corrective Measures	M-2000-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-2000	Corrective Measures	M-2000-10212024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-1	Downgradient	M-GS-1-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-1	Downgradient	M-GS-1-10162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-2	Downgradient	M-GS-2-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-2	Downgradient	M-GS-2-10172024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-2	Downgradient	M-GS-2A-10172024	Appendix III and IV	Assessment Monitoring Program	Duplicate
M-GS-3R	Downgradient	M-GS-3R-04112024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-3R	Downgradient	M-GS-3R-10172024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-4	Downgradient	M-GS-4-04162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-4	Downgradient	M-GS-4_DUP-04162024	Appendix III and IV	Assessment Monitoring Program	Duplicate
M-GS-4	Downgradient	M-GS-4-10162024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-5	Background	M-GS-5-04152024	Appendix III and IV	Assessment Monitoring Program	Primary
M-GS-5	Background	M-GS-5-10152024	Appendix III and IV	Assessment Monitoring Program	Primary

* Unable to be sampled during this event.

TABLE 3
SUMMARY OF 2024 FAR II SHALLOW AQUIFER ANALYTICAL RESULTS
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	CA-0623A	CA-0623A	S-09	S-09	S-21	S-21
Sample Name	CA-0623A-04102024 FAR II	CA-0623A-10152024	S-9-04112024	S-9-10212024	S-21-04112024	S-21-10182024
Sample Date	04/10/2024	10/15/2024	04/11/2024	10/21/2024	04/11/2024	10/18/2024
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary
Type of Well	Background	Background	Downgradient	Downgradient	Downgradient	Downgradient
APPENDIX III CONSTITUENTS (mg/L)						
Boron, Total	**0.506**	**0.466**	**0.408**	**0.442**	**0.735**	**0.466**
Calcium, Total	**1.11**	**1.07**	**234**	**233**	**389**	**377**
Chloride	**24.2**	**18.8**	**119**	**110**	**9.2**	**5.7**
Fluoride	**2.7**	**2.2**	**0.19**	**0.22**	**0.084**	**0.18**
Sulfate	**19**	**20**	**689**	**692**	**1050**	**997**
Total Dissolved Solids (TDS)	**603**	**616**	**1430**	**1410**	**1940**	**1950**
pH, Field (pH units)	**9.24**	-	**7.2**	**7.81**	**7.18**	**7.66**
APPENDIX IV CONSTITUENTS (mg/L)						
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	< 0.0005	< 0.0005	< 0.0005	**0.0011**	< 0.0005	< 0.0005
Barium, Total	**0.0232**	**0.0216**	**0.0212**	**0.0282**	**0.0278**	**0.023**
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	**0.0001**	< 0.0001	< 0.0001
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium, Total	< 0.001	< 0.001	< 0.001	**0.0017**	< 0.001	< 0.001
Cobalt, Total	< 0.0005	< 0.0005	**0.0013**	**0.0014**	**0.00077**	< 0.0005
Fluoride	**2.7**	**2.2**	**0.19**	**0.22**	**0.084**	**0.18**
Lead, Total	< 0.0005	< 0.0005	**0.0015**	**0.0033**	< 0.0005	< 0.0005
Lithium, Total	**0.0211**	**0.0237**	**0.0272**	**0.0281**	**0.0501**	**0.0452**
Mercury, Total	< 0.00000052	**0.00000109**	**0.00000083**	**0.0000109**	**0.00000597**	**0.00000371**
Molybdenum, Total	< 0.0005	< 0.0005	< 0.0005	**0.00072**	**0.0151**	**0.0119**
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	**0.00072**	< 0.0005	< 0.0005
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**1.19 ± 0.975**	**0.0233 ± 0.769**	**1.03 ± 1.1**	**1.15 ± 1.03**	**0.642 ± 0.857**	**0.439 ± 0.727**

< = Not detected at reporting limit
Bold = detected
- = Not Analyzed

TABLE 3
SUMMARY OF 2024 FAR II SHALLOW AQUIFER
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	S-23	S-23	S-1005	S-1005	S-15	S-15
Sample Name	S-23-04112024	S-23-10182024	S-1005-04112024	S-1005-10172024	S-15-04162024	S-15-10162024
Sample Date	04/11/2024	10/18/2024	04/11/2024	10/17/2024	04/16/2024	10/16/2024
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary
Type of Well	Downgradient	Downgradient	Background	Background	Background	Background
APPENDIX III CONSTITUENTS (mg/L)						
Boron, Total	**0.0883**	**0.0745**	**0.364**	**0.382**	**0.126**	**0.135**
Calcium, Total	**61.1**	**64.8**	**305**	**354**	**266**	**257**
Chloride	**4.6**	**4.7**	**2.1**	**2.2**	**32**	**31.6**
Fluoride	**0.082**	**0.062**	**1.6**	**0.3**	< 0.05	< 0.05
Sulfate	**11.5**	**14.7**	**2210**	**4180**	**966**	**929**
Total Dissolved Solids (TDS)	**296**	**319**	**3520**	**5990**	**1480**	**1400**
pH, Field (pH units)	**7.59**	**6.78**	**3.53**	**4.48**	**6.07**	**7.59**
APPENDIX IV CONSTITUENTS (mg/L)						
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	< 0.0005	< 0.0005	**0.0192**	**0.0782**	**0.0156**	**0.019**
Barium, Total	**0.222**	**0.223**	**0.0059**	**0.0057**	**0.0097**	**0.0096**
Beryllium, Total	< 0.0001	< 0.0001	**0.0109**	**0.0266**	**0.0002**	**0.00014**
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	**0.0016**	< 0.0001	< 0.0001
Chromium, Total	< 0.001	< 0.001	**0.011**	**0.0344**	**0.0011**	**0.0015**
Cobalt, Total	< 0.0005	< 0.0005	**0.0413**	**0.142**	**0.0088**	**0.0068**
Fluoride	**0.082**	**0.062**	**1.6**	**0.3**	< 0.05	< 0.05
Lead, Total	< 0.0005	< 0.0005	< 0.0005	**0.0021**	**0.00072**	**0.00086**
Lithium, Total	**0.0158**	**0.0158**	**0.303**	**0.626**	**0.0568**	**0.0549**
Mercury, Total	< 0.0000005	< 0.0000005	**0.000000676**	**0.00000389**	**0.00000204**	**0.0000035**
Molybdenum, Total	< 0.0005	**0.0014**	< 0.0025	< 0.01	**0.00074**	**0.0016**
Selenium, Total	< 0.0005	< 0.0005	**0.0225**	**0.0603**	< 0.0005	**0.00065**
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	**0.00099**	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**1.69 ± 1.44**	**1.33 ± 0.852**	**2.47 ± 1.18**	**0.932 ± 0.987**	**0.789 ± 0.825**	**1.62 ± 1.12**

< = Not detected at reporting limit
Bold = detected
- = Not Analyzed

TABLE 3
SUMMARY OF 2024 FAR II SHALLOW AQUIFER
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	S-22	S-22
Sample Name	S-22-04122024	S-22-10172024
Sample Date	04/12/2024	10/17/2024
Sample Type	Primary	Primary
Type of Well	Background	Background
APPENDIX III CONSTITUENTS (mg/L)		
Boron, Total	**0.0386**	**0.0376**
Calcium, Total	**456**	**419**
Chloride	**4.3**	**2.5**
Fluoride	**0.076**	< 0.05
Sulfate	**938**	**938**
Total Dissolved Solids (TDS)	**1710**	**1680**
pH, Field (pH units)	**6.87**	**7.38**
APPENDIX IV CONSTITUENTS (mg/L)		
Antimony, Total	< 0.0005	< 0.0005
Arsenic, Total	< 0.0005	**0.00067**
Barium, Total	**0.0172**	**0.0195**
Beryllium, Total	< 0.0001	< 0.0001
Cadmium, Total	< 0.0001	< 0.0001
Chromium, Total	< 0.001	**0.0011**
Cobalt, Total	**0.00072**	**0.0018**
Fluoride	**0.076**	< 0.05
Lead, Total	< 0.0005	**0.00085**
Lithium, Total	**0.0343**	**0.0351**
Mercury, Total	**0.00000083**	**0.00000115**
Molybdenum, Total	< 0.0005	**0.00058**
Selenium, Total	< 0.0005	**0.00092**
Thallium, Total	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**0.785 ± 0.806**	**0.269 ± 0.971**

< = Not detected at reporting limit
Bold = detected
- = Not Analyzed

TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AQUIFER ANALYTICAL RESULTS
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	CA-0622A	CA-0622A	FA-8	FA-8	M-06	M-06	M-08
Sample Name	NA	CA-0622A-10152024	FA-8-04152024	FA-8-10212024	M-6-04172024	M-6-10242024	M-8-04162024
Sample Date	04/15/2024	10/15/2024	04/15/2024	10/21/2024	04/17/2024	10/24/2024	04/16/2024
Sample Type	NA	Primary	Primary	Primary	Primary	Primary	Primary
Type of Well	Background	Background	Downgradient	Downgradient	Background	Background	Downgradient
APPENDIX III CONSTITUENTS (mg/L)							
Boron, Total	NA	**0.322**	**5.6**	**6.23**	**0.273**	**0.262**	**0.0325**
Calcium, Total	NA	**64.5**	**266**	**246**	**15.5**	**10.4**	**102**
Chloride	NA	**2880**	**26.9**	**39.4**	**43.4**	**48.9**	**6.4**
Fluoride	NA	**0.56**	**0.55**	**0.46**	**1.2**	**1.2**	**0.099**
Sulfate	NA	**25.6**	**812**	**820**	**28.3**	**14.2**	**97.5**
Total Dissolved Solids (TDS)	NA	**5160**	**1320**	**1420**	**770**	**720**	**404**
pH, Field (pH units)	NA	**8.77**	**7.28**	**7.92**	**8.71**	**7.38**	**7.02**
APPENDIX IV CONSTITUENTS (mg/L)							
Antimony, Total	NA	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	NA	**0.0119**	**0.013**	**0.0076**	**0.0058**	**0.0031**	**0.0011**
Barium, Total	NA	**1.04**	**0.0325**	**0.0162**	**0.618**	**0.385**	**0.105**
Beryllium, Total	NA	< 0.0001	< 0.0001	< 0.0001	**0.0021**	**0.0011**	< 0.0001
Cadmium, Total	NA	< 0.0001	< 0.0001	< 0.0001	**0.00023**	**0.00015**	< 0.0001
Chromium, Total	NA	**0.0018**	**0.0011**	< 0.001	**0.0088**	**0.0043**	< 0.001
Cobalt, Total	NA	**0.00074**	**0.0025**	< 0.0005	**0.0053**	**0.0027**	< 0.0005
Fluoride	NA	**0.56**	**0.55**	**0.46**	**1.2**	**1.2**	**0.099**
Lead, Total	NA	**0.00075**	**0.0014**	< 0.0005	**0.0351**	**0.0193**	**0.0037**
Lithium, Total	NA	**0.0737**	**0.173**	**0.187**	**0.0202**	**0.021**	< 0.01
Mercury, Total	NA	**0.00000297**	**0.0000027**	**0.000000681**	**0.000016**	**0.00000666**	< 0.0000005
Molybdenum, Total	NA	**0.0022**	**0.265**	**0.208**	< 0.0025	**0.0011**	< 0.0005
Selenium, Total	NA	**0.00063**	**0.0012**	**0.0023**	**0.0039**	**0.0022**	< 0.0005
Thallium, Total	NA	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	NA	**9.18 ± 2.25**	**0.18 ± 0.958**	**0.45 ± 0.965**	**13.1 ± 3.54**	**3.47 ± 1.35**	**2.66 ± 1.09**

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TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-08	M-10	M-10	M-11	M-11	M-12*
Sample Name	M-8-10222024	M-10-04162024	M-10-12092024	M-11-04122024	M-11-10242024	NA
Sample Date	10/22/2024	04/16/2024	12/09/2024	04/12/2024	10/24/2024	04/12/2024
Sample Type	Primary	Primary	Primary	Primary	Primary	NA
Type of Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Background
APPENDIX III CONSTITUENTS (mg/L)						
Boron, Total	**0.0332**	**0.464**	**0.47**	**5.84**	**5.58**	NA
Calcium, Total	**104**	**7.36**	**6.86**	**282**	**285**	NA
Chloride	**6.7**	**12.9**	**13.1**	**24.7**	**30.4**	NA
Fluoride	**0.1**	**0.85**	**0.8**	**0.45**	**0.46**	NA
Sulfate	**101**	**123**	**121**	**682**	**836**	NA
Total Dissolved Solids (TDS)	**419**	**703**	**719**	**1400**	**1470**	NA
pH, Field (pH units)	**7.98**	**8.33**	**7.21**	**7.32**	**8.07**	NA
APPENDIX IV CONSTITUENTS (mg/L)						
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	NA
Arsenic, Total	**0.0012**	**0.00055**	< 0.0005	**0.0186**	**0.0196**	NA
Barium, Total	**0.102**	**0.0818**	**0.0689**	**0.0285**	**0.0323**	NA
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	NA
Cadmium, Total	< 0.0001	**0.0021**	**0.00032**	< 0.0001	< 0.0001	NA
Chromium, Total	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	NA
Cobalt, Total	< 0.0005	< 0.0005	< 0.0005	**0.0017**	**0.0019**	NA
Fluoride	**0.1**	**0.85**	**0.8**	**0.45**	**0.46**	NA
Lead, Total	< 0.0005	**0.0065**	**0.002**	< 0.0005	< 0.0005	NA
Lithium, Total	< 0.01	**0.0173**	**0.0181**	**0.174**	**0.176**	NA
Mercury, Total	< 0.0000005	**0.00000534**	**0.00000281**	< 0.0000005	< 0.0000005	NA
Molybdenum, Total	< 0.0005	**0.0017**	**0.0022**	**0.277**	**0.273**	NA
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	NA
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	NA
Radium-226 & 228 (pCi/L)	**0.773 ± 1.1**	**1 ± 0.846**	**1.45 ± 1.25**	**1.52 ± 0.863**	**0.548 ± 1.11**	NA

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TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-12*	M-13	M-13	M-14	M-14	M-15
Sample Name	NA	M-13-04152024	M-13-10222024	M-14-04152024	M-14-10162024	M-15-04162024
Sample Date	10/24/2024	04/15/2024	10/22/2024	04/15/2024	10/16/2024	04/16/2024
Sample Type	NA	Primary	Primary	Primary	Primary	Primary
Type of Well	Background	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
APPENDIX III CONSTITUENTS (mg/L)						
Boron, Total	NA	**0.212**	**0.349**	**0.222**	**0.225**	**0.264**
Calcium, Total	NA	**6.58**	**11**	**0.549**	**0.633**	**1.56**
Chloride	NA	**2.8**	**1.9**	**1.6**	**1.7**	**24**
Fluoride	NA	**1.3**	**2.7**	**0.87**	**0.85**	**1.4**
Sulfate	NA	**11.6**	**44.5**	**0.37**	< 0.25	**5.9**
Total Dissolved Solids (TDS)	NA	**453**	**609**	**354**	**1470**	**534**
pH, Field (pH units)	NA	**8.9**	**6.95**	**9.67**	**6.41**	**8.17**
APPENDIX IV CONSTITUENTS (mg/L)						
Antimony, Total	NA	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	NA	**0.00053**	**0.00051**	< 0.0005	< 0.0005	**0.0013**
Barium, Total	NA	**0.104**	**0.138**	**0.0154**	**0.0147**	**0.0422**
Beryllium, Total	NA	**0.00033**	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cadmium, Total	NA	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium, Total	NA	**0.0015**	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt, Total	NA	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Fluoride	NA	**1.3**	**2.7**	**0.87**	**0.85**	**1.4**
Lead, Total	NA	**0.0011**	**0.00052**	< 0.0005	< 0.0005	< 0.0005
Lithium, Total	NA	< 0.01	**0.0142**	< 0.01	< 0.01	< 0.01
Mercury, Total	NA	**0.00000105**	**0.00000176**	< 0.0000005	< 0.0000005	< 0.00000052
Molybdenum, Total	NA	< 0.0005	**0.00069**	< 0.0005	< 0.0005	< 0.0005
Selenium, Total	NA	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Thallium, Total	NA	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	NA	**3.98 ± 2.53**	**1.4 ± 1.14**	**0.946 ± 1.25**	**0.768 ± 0.671**	**0.653 ± 0.78**

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TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-15	M-16	M-16	M-21	M-21	M-21
Sample Name	M-15-10162024	M-16-04102024	M-16-10152024	M-21-04162024	M-21-10232024	M-21-12172024
Sample Date	10/16/2024	04/10/2024	10/15/2024	04/16/2024	10/23/2024	12/17/2024
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary
Type of Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
APPENDIX III CONSTITUENTS (mg/L)						
Boron, Total	**0.263**	**0.196**	**0.189**	**3.32**	**3.29**	**3.94**
Calcium, Total	**1.56**	**2.41**	**2.42**	**297**	**28.8**	**280**
Chloride	**23.1**	**10.2**	**10.3**	**88.1**	**95.5**	**33.3**
Fluoride	**1.3**	**0.39**	**0.37**	**0.11**	**0.14**	**0.13**
Sulfate	**6.3**	**264**	**255**	**993**	**999**	**825**
Total Dissolved Solids (TDS)	**1540**	**770**	**780**	**1790**	**1800**	**1470**
pH, Field (pH units)	**7.45**	**9.17**	**7.35**	**7.13**	**8.05**	**7.42**
APPENDIX IV CONSTITUENTS (mg/L)						
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	**0.0011**	< 0.0005
Arsenic, Total	**0.0012**	< 0.0005	< 0.0005	**0.0016**	**0.0208**	**0.0047**
Barium, Total	**0.0417**	**0.0311**	**0.0314**	**0.017**	**0.0382**	**0.134**
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	**0.00072**	**0.0205**	**0.0018**
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	**0.00043**
Chromium, Total	< 0.001	< 0.001	< 0.001	< 0.001	**0.0012**	**0.0066**
Cobalt, Total	< 0.0005	< 0.0005	< 0.0005	**0.0032**	**0.0038**	**0.0036**
Fluoride	**1.3**	**0.39**	**0.37**	**0.11**	**0.14**	**0.13**
Lead, Total	< 0.0005	< 0.0005	< 0.0005	**0.0019**	**0.0045**	**0.0244**
Lithium, Total	**0.0103**	**0.0128**	**0.0132**	**0.0772**	**0.0719**	**0.103**
Mercury, Total	< 0.000001	< 0.0000005	**0.0000015**	**0.00000338**	**0.00000617**	**0.00000517**
Molybdenum, Total	< 0.0005	< 0.0005	< 0.0005	**0.0211**	**0.107**	**0.0248**
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	**0.0259**	**0.0058**
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**0.647 ± 0.979**	**0.621 ± 0.849**	**0.942 ± 0.968**	**1.62 ± 0.924**	**6.03 ± 1.86**	**-**

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TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-22	M-22	M-23	M-23	M-1003	M-1003
Sample Name	M-22-04122024	M-22-10172024	M-23-04112024	M-23-10182024	M-1003-04162024	M-1003-10182024
Sample Date	04/12/2024	10/17/2024	04/11/2024	10/18/2024	04/16/2024	10/18/2024
Sample Type	Primary	Primary	Primary	Primary	Primary	Primary
Type of Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
APPENDIX III CONSTITUENTS (mg/L)						
Boron, Total	**3.47**	**3.16**	**0.668**	**0.663**	**0.136**	**0.141**
Calcium, Total	**164**	**159**	**107**	**108**	**91.8**	**95.8**
Chloride	**40.1**	**37.7**	**13.4**	**13**	**8.6**	**9**
Fluoride	**0.52**	**0.48**	**0.45**	**0.5**	**0.15**	**0.16**
Sulfate	**373**	**353**	**1710**	**1670**	**187**	**196**
Total Dissolved Solids (TDS)	**868**	**846**	**3320**	**3330**	**570**	**592**
pH, Field (pH units)	**7.15**	**7.26**	**7.12**	**6.45**	**7.61**	**8.05**
APPENDIX IV CONSTITUENTS (mg/L)						
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	< 0.0005	< 0.0005	**0.00097**	**0.0015**	**0.00056**	**0.00067**
Barium, Total	**0.0205**	**0.0198**	**0.0074**	**0.0108**	**0.0835**	**0.0805**
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium, Total	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt, Total	< 0.0005	**0.00066**	< 0.0005	**0.00067**	< 0.0005	< 0.0005
Fluoride	**0.52**	**0.48**	**0.45**	**0.5**	**0.15**	**0.16**
Lead, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Lithium, Total	**0.0457**	**0.0434**	**0.0573**	**0.0614**	**0.0108**	**0.0138**
Mercury, Total	< 0.0000005	**0.000000531**	< 0.0000005	**0.00000112**	**0.0000008**	**0.000000667**
Molybdenum, Total	**0.05**	**0.0521**	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**1.24 ± 0.811**	**1.12 ± 1.16**	**2.08 ± 1.03**	**1.97 ± 0.986**	**2.34 ± 1.08**	**4.83 ± 1.57**

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TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-1004	M-1004	M-1302	M-1302	M-1309
Sample Name	M-1004-04152024	M-1004-10172024	M-1302-04102024	M-1302-10152024	M-1309-04102024
Sample Date	04/15/2024	10/17/2024	04/10/2024	10/15/2024	04/10/2024
Sample Type	Primary	Primary	Primary	Primary	Primary
Type of Well	Downgradient	Downgradient	Background	Background	Downgradient
APPENDIX III CONSTITUENTS (mg/L)					
Boron, Total	**2.65**	**2.75**	**0.314**	**0.313**	**0.279**
Calcium, Total	**117**	**111**	**2.88**	**2.9**	**2.72**
Chloride	**35.5**	**35.6**	**29.9**	**32.8**	**39.7**
Fluoride	**1.2**	**1.3**	**2.2**	**2.5**	**1.1**
Sulfate	**330**	**322**	**40.4**	**13.9**	**51.7**
Total Dissolved Solids (TDS)	**824**	**842**	**672**	**667**	**644**
pH, Field (pH units)	**6.97**	**7.58**	**9.11**	**7.12**	**8.5**
APPENDIX IV CONSTITUENTS (mg/L)					
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	**0.0013**	**0.0011**	< 0.0005	< 0.0005	**0.0014**
Barium, Total	**0.0285**	**0.0312**	**0.11**	**0.124**	**0.0248**
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium, Total	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Fluoride	**1.2**	**1.3**	**2.2**	**2.5**	**1.1**
Lead, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Lithium, Total	**0.023**	**0.025**	**0.0134**	**0.0186**	**0.0114**
Mercury, Total	< 0.0000005	**0.000000549**	< 0.00000052	< 0.000001	**0.000000967**
Molybdenum, Total	**0.0106**	**0.0099**	< 0.0005	< 0.0005	**0.0012**
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**0.432 ± 1.05**	**0.779 ± 0.962**	**0.12 ± 0.781**	**0.834 ± 0.893**	**0.697 ± 0.652**

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TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-1309	M-2000	M-2000	M-GS-1	M-GS-1
Sample Name	M-1309-10222024	M-2000-04152024	M-2000-10212024	M-GS-1-04152024	M-GS-1-10162024
Sample Date	10/22/2024	04/15/2024	10/21/2024	04/15/2024	10/16/2024
Sample Type	Primary	Primary	Primary	Primary	Primary
Type of Well	Downgradient	Corrective Measures	Corrective Measures	Downgradient	Downgradient
APPENDIX III CONSTITUENTS (mg/L)					
Boron, Total	**0.279**	**4.96**	**5.29**	**0.276**	**0.257**
Calcium, Total	**2.76**	**232**	**247**	**6.33**	**6.93**
Chloride	**42.3**	**35.9**	**37.3**	**24.4**	**19.3**
Fluoride	**1.1**	**0.44**	**0.36**	**1**	**1.1**
Sulfate	**55.1**	**772**	**807**	**67.7**	**87.3**
Total Dissolved Solids (TDS)	**662**	**1310**	**1400**	**585**	**1600**
pH, Field (pH units)	**6.29**	**7.15**	**7.88**	**8.65**	**7.21**
APPENDIX IV CONSTITUENTS (mg/L)					
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	**0.0018**	**0.0014**	**0.0015**	< 0.0005	< 0.0005
Barium, Total	**0.0242**	**0.0235**	**0.0211**	**0.0862**	**0.0872**
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium, Total	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt, Total	< 0.0005	**0.0011**	**0.00086**	< 0.0005	< 0.0005
Fluoride	**1.1**	**0.44**	**0.36**	**1**	**1.1**
Lead, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Lithium, Total	**0.0117**	**0.168**	**0.169**	**0.0166**	**0.018**
Mercury, Total	**0.000000732**	< 0.0000005	< 0.0000005	< 0.0000005	**0.000000797**
Molybdenum, Total	**0.0012**	**0.191**	**0.192**	< 0.0005	< 0.0005
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**0.665 ± 1.09**	**1.88 ± 1.17**	**2.26 ± 1.34**	**0.942 ± 0.975**	**0.528 ± 0.627**

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TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-GS-2	M-GS-2	M-GS-2	M-GS-3R	M-GS-3R
Sample Name	M-GS-2-04152024	M-GS-2-10172024	M-GS-2A-10172024	M-GS-3R-04112024	M-GS-3R-10172024
Sample Date	04/15/2024	10/17/2024	10/17/2024	04/11/2024	10/17/2024
Sample Type	Primary	Primary	Duplicate	Primary	Primary
Type of Well	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
APPENDIX III CONSTITUENTS (mg/L)					
Boron, Total	**0.257**	**0.277**	**0.279**	**2.79**	**2.69**
Calcium, Total	**7.15**	**3.29**	**3.43**	**163**	**165**
Chloride	**11.4**	**14.4**	**14.3**	**50.9**	**48**
Fluoride	**1.5**	**2.3**	**2.3**	**0.19**	**0.17**
Sulfate	**155**	**49.5**	**45.4**	**478**	**457**
Total Dissolved Solids (TDS)	**648**	**653**	**647**	**996**	**986**
pH, Field (pH units)	**8.64**	**6.99**	-	**7.16**	**6.88**
APPENDIX IV CONSTITUENTS (mg/L)					
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	**0.0063**	**0.0032**	**0.0033**	**0.0017**	**0.0074**
Barium, Total	**0.0263**	**0.0275**	**0.0279**	**0.0137**	**0.0172**
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium, Total	< 0.001	< 0.001	< 0.001	**0.0094**	**0.0179**
Cobalt, Total	< 0.0005	< 0.0005	< 0.0005	**0.0014**	**0.0014**
Fluoride	**1.5**	**2.3**	**2.3**	**0.19**	**0.17**
Lead, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	**0.00064**
Lithium, Total	**0.0126**	**0.0137**	**0.0138**	**0.0286**	**0.03**
Mercury, Total	< 0.0000005	< 0.0000005	< 0.0000005	**0.00000171**	**0.000000638**
Molybdenum, Total	**0.0114**	**0.0033**	**0.0034**	**0.038**	**0.0388**
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**1.01 ± 1.01**	**0.288 ± 0.764**	**0.987 ± 0.783**	**0.595 ± 1.15**	**0.663 ± 0.909**

< = Not detected at reporting limit
Bold = detected
- = Not Analyzed

TABLE 4
SUMMARY OF 2024 FAR II MORGANTOWN AC
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Location Name	M-GS-4	M-GS-4	M-GS-4	M-GS-5	M-GS-5
Sample Name	M-GS-4-04162024	M-GS-4_DUP-04162024	M-GS-4-10162024	M-GS-5-04152024	M-GS-5-10152024
Sample Date	04/16/2024	04/16/2024	10/16/2024	04/15/2024	10/15/2024
Sample Type	Primary	Duplicate	Primary	Primary	Primary
Type of Well	Downgradient	Downgradient	Downgradient	Background	Background
APPENDIX III CONSTITUENTS (mg/L)					
Boron, Total	**0.183**	**0.187**	**0.182**	**0.309**	**0.286**
Calcium, Total	**2.36**	**2.36**	**2.7**	**3.92**	**4.1**
Chloride	**10.2**	**10.1**	**9.9**	**59**	**56.1**
Fluoride	**0.59**	**0.59**	**0.54**	**5.4**	**5.4**
Sulfate	**4.2**	**4.6**	**4.3**	**581**	**615**
Total Dissolved Solids (TDS)	**433**	**424**	**1210**	**1420**	**1460**
pH, Field (pH units)	**9.08**	-	**7.2**	**9.02**	**9.31**
APPENDIX IV CONSTITUENTS (mg/L)					
Antimony, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic, Total	**0.0012**	**0.0012**	**0.0011**	**0.0057**	**0.0057**
Barium, Total	**0.0249**	**0.0252**	**0.0255**	**0.0678**	**0.0489**
Beryllium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Cadmium, Total	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chromium, Total	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Fluoride	**0.59**	**0.59**	**0.54**	**5.4**	**5.4**
Lead, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Lithium, Total	< 0.01	< 0.01	< 0.01	**0.0175**	**0.0181**
Mercury, Total	**0.00000061**	**0.00000061**	**0.000000562**	< 0.0000005	**0.00000109**
Molybdenum, Total	**0.00083**	**0.00084**	< 0.0005	**0.002**	**0.002**
Selenium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Thallium, Total	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Radium-226 & 228 (pCi/L)	**0.42 ± 0.86**	**0.491 ± 0.678**	**0.745 ± 0.999**	**1.17 ± 0.927**	**1.71 ± 1.2**

< = Not detected at reporting limit
Bold = detected
- = Not Analyzed

TABLE 5
GROUNDWATER PROTECTION STANDARDS - SHALLOW AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

	Concentration Units	MCL	CCR Rules § 257.95(h)(2)	Background Upper Tolerance Limit	FAR II GWPS
APPENDIX IV CONSTITUENTS					
Antimony	mg/L	0.006	-	0.0005	0.006
Arsenic	mg/L	0.01	-	0.0854	0.0854
Barium	mg/L	2	-	0.024	2
Beryllium	mg/L	0.004	-	0.0344	0.0344
Cadmium	mg/L	0.005	-	0.0013	0.005
Chromium	mg/L	0.1	-	0.0372	0.1
Cobalt	mg/L	-	0.006	0.208	0.208
Fluoride	mg/L	4	-	2.7	4
Lead	mg/L	-	0.015	0.004	0.015
Lithium	mg/L	-	0.04	0.685	0.685
Mercury	mg/L	0.002	-	0.00000828	0.002
Molybdenum	mg/L	-	0.1	0.01	0.1
Radium 226 and 228 Combined	pCi/L	5	-	1.888	5
Selenium	mg/L	0.05	-	0.06	0.06
Thallium	mg/L	0.002	-	0.0011	0.002

TABLE 6
GROUNDWATER PROTECTION STANDARDS - MORGANTOWN AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

	Concentration Units	MCL	CCR Rules § 257.95(h)(2)	Background Upper Tolerance Limit	FAR II GWPS
APPENDIX IV CONSTITUEN					
Antimony	mg/L	0.006	-	0.0005	0.006
Arsenic	mg/L	0.01	-	0.0414	0.0414
Barium	mg/L	2	-	1.41	2
Beryllium	mg/L	0.004	-	0.0025	0.004
Cadmium	mg/L	0.005	-	0.0005	0.005
Chromium	mg/L	0.1	-	0.0197	0.1
Cobalt	mg/L	-	0.006	0.0404	0.0404
Fluoride	mg/L	4	-	6.6	6.6
Lead	mg/L	-	0.015	0.0463	0.0463
Lithium	mg/L	-	0.04	0.164	0.164
Mercury	mg/L	0.002	-	0.0000263	0.002
Molybdenum	mg/L	-	0.1	0.0601	0.1
Radium 226 and 228 Combined	pCi/L	5	-	15.76	15.76
Selenium	mg/L	0.05	-	0.0029	0.05
Thallium	mg/L	0.002	-	0.0005	0.002

TABLE 7
GROUNDWATER FLOW CALCULATIONS APRIL 2024 - SHALLOW AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Program	Groundwater Zone	Well	Hydraulic Location [1]	Depth to Water (ft)	Potentiometric Elevation (ft) [2]	Hydraulic Gradient[2] (ft/ft)	Hydraulic Conductivity[4] (cm/sec)			Effective Porosity	Groundwater Velocity (ft/day)			Diameter[5] (in)	Residence Time[6] (days)		
							Low	Representative	High		Low	Representative	High		Low	Representative	High
FAR II CCR	Shallow Aquifer	CA-0623A	Upgradient	153.62	1009.1	0.07	0.0001	0.005	0.1	0.32	0.06	3.10	62.00	6	0.01	0.16	8.06
FAR II CCR	Shallow Aquifer	S-9	Downgradient	42.95	937.61	0.51	0.0001	0.005	0.1	0.32	-	-	-	8	-	-	-
FAR II CCR	Shallow Aquifer	S-15	Upgradient	73.03	1001.3	0.12	0.0001	0.005	0.1	0.32	0.11	5.25	105.03	6	0.00	0.10	4.76
FAR II CCR	Shallow Aquifer	S-21	Downgradient	59.09	959.31	0.14	0.0001	0.005	0.1	0.32	0.12	6.09	121.89	8	0.01	0.11	5.47
FAR II CCR	Shallow Aquifer	S-22	Upgradient	19.79	988.22	0.10	0.0001	0.005	0.1	0.32	0.09	4.60	91.96	6	0.01	0.11	5.44
FAR II CCR	Shallow Aquifer	S-23	Downgradient	45.7	960.01	0.25	0.0001	0.005	0.1	0.32	-	-	-	6	-	-	-
FAR II CCR	Shallow Aquifer	S-1005	Upgradient	128.21	1002.67	0.06	0.0001	0.005	0.1	0.32	0.05	2.59	51.87	6	0.01	0.19	9.64

Notes and Abbreviations:

Measurements and calculations represent conditions on 9 April 2024.

- Hydraulic calculations were excluded from contouring because of very high hydraulic gradient.

[1] *Groundwater Monitoring Network Evaluation; Cardinal Site – Fly Ash Reservoir II, Brilliant, Ohio* prepared by Geosyntec Consultants in September 2016 (Revised February 2017).

[2] Hydraulic gradient was calculated from a potentiometric surface using Arcmap software tools.

[3] Elevations datum is National Geodetic Vertical Datum of 1929 (NGVD29).

[4] Low and high conductivity values are from the 2017 Groundwater Monitoring Network Evaluation, with a representative value chosen within this range that is consistent with previous velocity calculations.

[5] Well diameter represents the diameter of the borehole (sandpack).

[6] Residence time is an estimation of how long it would take groundwater to travel a distance equivalent to the well diameter at the calculated velocity.

TABLE 8
GROUNDWATER FLOW CALCULATIONS APRIL 2024 - MORGANTOWN AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Program	Groundwater Zone	Well	Hydraulic Location [1]	Depth to Water (ft)	Potentiometric Elevation [2] (ft)	Hydraulic Gradient [3] (ft/ft)	Hydraulic Conductivity [4] (cm/sec)			Effective Porosity	Groundwater Velocity (ft/day)			Well Diameter [5] (in)	Residence Time in Well [6] (days)		
							Low	Representative	High		Low	Representative	High		Low	Representative	High
FAR II	Morgantown Sandstone	CA-0622A	Upgradient	-	-	-	1.0E-06	1.0E-04	1.0E-01	0.32	-	-	-	6	-	-	
FAR II	Morgantown Sandstone	FA-8	Downgradient	48.52	872.51	0.056	1.0E-06	1.0E-04	1.0E-01	0.32	0.0005	0.049	49.244	6	0.010	10.15	1015.36
FAR II	Morgantown Sandstone	M-6	Upgradient	66.32	944.25	0.026	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.023	22.787	6	0.022	21.94	2194.26
FAR II	Morgantown Sandstone	M-8A	Downgradient	69.03	824.17	0.113	1.0E-06	1.0E-04	1.0E-01	0.32	0.0010	0.100	99.663	6	0.005	5.02	501.69
FAR II	Morgantown Sandstone	M-10	Downgradient	102.25	880.86	0.292	1.0E-06	1.0E-04	1.0E-01	0.32	0.0026	0.259	258.570	3	0.001	0.97	96.69
FAR II	Morgantown Sandstone	M-11	Downgradient	95.05	885.16	0.168	1.0E-06	1.0E-04	1.0E-01	0.32	0.0015	0.149	148.843	3	0.002	1.68	167.96
FAR II	Morgantown Sandstone	M-12	Upgradient	218.14	958.96	0.022	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.020	19.691	6	0.025	25.39	2539.17
FAR II	Morgantown Sandstone	M-13	Downgradient	76.92	914.22	0.037	1.0E-06	1.0E-04	1.0E-01	0.32	0.0003	0.033	32.747	6	0.015	15.27	1526.85
FAR II	Morgantown Sandstone	M-14	Downgradient	86.01	902.2	0.089	1.0E-06	1.0E-04	1.0E-01	0.32	0.0008	0.079	79.126	6	0.006	6.32	631.90
FAR II	Morgantown Sandstone	M-15	Downgradient	145.42	928.86	0.008	1.0E-06	1.0E-04	1.0E-01	0.32	0.0001	0.007	6.644	6	0.075	75.25	7525.28
FAR II	Morgantown Sandstone	M-16	Downgradient	116.39	952.16	0.022	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.020	19.908	6	0.025	25.11	2511.50
FAR II	Morgantown Sandstone	M-21	Downgradient	131.51	887.1	0.134	1.0E-06	1.0E-04	1.0E-01	0.32	0.0012	0.119	118.951	6	0.004	4.20	420.34
FAR II	Morgantown Sandstone	M-22	Downgradient	103.9	904.14	0.025	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.022	22.087	6	0.023	22.64	2263.77
FAR II	Morgantown Sandstone	M-23	Downgradient	149.65	836.25	0.343	1.0E-06	1.0E-04	1.0E-01	0.32	0.0030	0.304	303.839	6	0.002	1.65	164.56
FAR II	Morgantown Sandstone	M-1003	Downgradient	88.63	847.25	0.045	1.0E-06	1.0E-04	1.0E-01	0.32	0.0004	0.040	39.609	6	0.013	12.62	1262.35
FAR II	Morgantown Sandstone	M-1004	Downgradient	97.19	911.1	0.019	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.017	16.989	4.87	0.024	23.89	2388.84
FAR II	Morgantown Sandstone	M-1302	Upgradient	88.63	942.09	0.029	1.0E-06	1.0E-04	1.0E-01	0.32	0.0003	0.025	25.293	6	0.020	19.77	1976.79
FAR II	Morgantown Sandstone	M-1309	Downgradient	239.06	933.03	0.020	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.018	17.806	6	0.028	28.08	2808.01
FAR II	Morgantown Sandstone	M-GS-1	Downgradient	52.92	938.95	0.018	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.016	16.207	6	0.031	30.85	3085.15
FAR II	Morgantown Sandstone	M-GS-2	Downgradient	87.61	903.2	0.075	1.0E-06	1.0E-04	1.0E-01	0.32	0.0007	0.066	66.118	6	0.008	7.56	756.22
FAR II	Morgantown Sandstone	M-GS-3R	Downgradient	85.31	916.13	0.027	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.024	24.067	6	0.021	20.78	2077.54
FAR II	Morgantown Sandstone	M-GS-4	Downgradient	83.31	939.49	0.018	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.016	15.536	6	0.032	32.18	3218.31
FAR II	Morgantown Sandstone	M-GS-5	Upgradient	78.8	960.74	0.026	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.023	22.645	6	0.022	22.08	2208.02

Notes and Abbreviations:

Measurements and calculations represent conditions on 9 April 2024.

- A water level could not be collected from this well.

[1] *Groundwater Monitoring Network Evaluation; Cardinal Site – Fly Ash Reservoir II, Brilliant, Ohio* prepared by Geosyntec Consultants in September 2016 (Revised February 2017).

[2] Elevations datum is National Geodetic Vertical Datum of 1929 (NGVD29).

[3] Hydraulic gradient was calculated from a potentiometric surface using Arcmap software tools.

[4] Low and high conductivity values are from the 2017 Groundwater Monitoring Network Evaluation, with a representative value chosen within this range that is consistent with previous velocity calculations.

[5] Well diameter represents the diameter of the borehole (sandpack).

[6] Residence time is an estimation of how long it would take groundwater to travel a distance equivalent to the well diameter at the calculated velocity.

TABLE 9
GROUNDWATER FLOW CALCULATIONS DECEMBER 2024 - SHALLOW AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Program	Groundwater Zone	Well	Hydraulic Location [1]	Depth to Water (ft)	Potentiometric Elevation (ft) [3]	Hydraulic Gradient [2] (ft/ft)	Hydraulic Conductivity [4] (cm/sec)			Effective Porosity	Groundwater Velocity (ft/day)			Well Diameter [5]	Residence Time [6] (days)		
							Low	Representative	High		Low	Representative	High		Low	Representative	High
FAR II CCR	Shallow Aquifer	CA-0623A	Upgradient	153.89	1008.83	0.01	0.0001	0.005	0.1	0.32	0.01	0.50	10.04	6	0.05	1.00	49.80
FAR II CCR	Shallow Aquifer	S-9	Downgradient	46.25	934.31	0.09	0.0001	0.005	0.1	0.32	-	-	-	8	-	-	-
FAR II CCR	Shallow Aquifer	S-15	Upgradient	75.24	999.09	0.12	0.0001	0.005	0.1	0.32	0.11	5.34	106.86	6	0.00	0.09	4.68
FAR II CCR	Shallow Aquifer	S-21	Downgradient	61.33	957.07	0.16	0.0001	0.005	0.1	0.32	0.14	7.02	140.48	8	0.00	0.09	4.75
FAR II CCR	Shallow Aquifer	S-22	Upgradient	35.2	972.81	0.05	0.0001	0.005	0.1	0.32	0.04	2.09	41.86	6	0.01	0.24	11.94
FAR II CCR	Shallow Aquifer	S-23	Downgradient	31.17	956.45	0.10	0.0001	0.005	0.1	0.32	-	-	-	6	-	-	-
FAR II CCR	Shallow Aquifer	S-1005 [7]	Upgradient				0.0001	0.005	0.1	0.32				6			

Notes and Abbreviations:

Measurements and calculations represent conditions on 2 December 2024.

- Hydraulic calculations were excluded from contouring because of very high hydraulic gradient.

[1] *Groundwater Monitoring Network Evaluation; Cardinal Site – Fly Ash Reservoir II, Brilliant, Ohio* prepared by Geosyntec Consultants in September 2016 (Revised February 2017).

[2] Hydraulic gradient was calculated from a potentiometric surface from the most recent representative conditions.

[3] Elevations datum is National Geodetic Vertical Datum of 1929 (NGVD29).

[4] Low and high conductivity values are from the 2017 Groundwater Monitoring Network Evaluation, with a representative value chosen within this range that is consistent with previous velocity calculations.

[5] Well diameter represents the diameter of the borehole (sandpack).

[6] Residence time is an estimation of how long it would take groundwater to travel a distance equivalent to the well diameter at the calculated velocity.

[7] Well unable to be measured during this sampling event.

TABLE 10
GROUNDWATER FLOW CALCULATIONS DECEMBER 2024 - MORGANTOWN AQUIFER
FAR II
CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

Program	Groundwater Zone	Well	Hydraulic Location [1]	Depth to Water (ft)	Potentiometric Elevation [2] (ft)	Hydraulic Gradient [3] (ft/ft)	Hydraulic Conductivity [4] (cm/sec)			Effective Porosity	Groundwater Velocity (ft/day)			Well Diameter [5] (in)	Residence Time in Well [6] (days)		
							Low	Representative	High		Low	Representative	High		Low	Representative	High
FAR II	Morgantown Sandstone	CA-0622A	Upgradient	230.21	932.07	0.018	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.016	15.648	6	0.032	31.95	3195.27
FAR II	Morgantown Sandstone	FA-8	Downgradient	52.3	868.73	0.049	1.0E-06	1.0E-04	1.0E-01	0.32	0.0004	0.043	43.433	6	0.012	11.51	1151.19
FAR II	Morgantown Sandstone	M-6	Upgradient	70.38	940.19	0.029	1.0E-06	1.0E-04	1.0E-01	0.32	0.0003	0.026	25.790	6	0.019	19.39	1938.72
FAR II	Morgantown Sandstone	M-8	Downgradient	72.61	820.59	0.049	1.0E-06	1.0E-04	1.0E-01	0.32	0.0004	0.043	43.415	6	0.012	11.52	1151.68
FAR II	Morgantown Sandstone	M-10	Downgradient	104.68	878.43	0.212	1.0E-06	1.0E-04	1.0E-01	0.32	0.0019	0.188	187.877	3	0.001	1.33	133.07
FAR II	Morgantown Sandstone	M-11	Downgradient	96.47	883.74	0.025	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.023	22.537	3	0.011	11.09	1109.27
FAR II	Morgantown Sandstone	M-12	Upgradient	221.18	955.92	0.025	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.023	22.528	6	0.022	22.19	2219.49
FAR II	Morgantown Sandstone	M-13	Downgradient	81.62	909.52	0.048	1.0E-06	1.0E-04	1.0E-01	0.32	0.0004	0.043	42.585	6	0.012	11.74	1174.13
FAR II	Morgantown Sandstone	M-14	Downgradient	88.37	899.84	0.034	1.0E-06	1.0E-04	1.0E-01	0.32	0.0003	0.030	30.371	6	0.016	16.46	1646.30
FAR II	Morgantown Sandstone	M-15	Downgradient	147.36	926.92	0.037	1.0E-06	1.0E-04	1.0E-01	0.32	0.0003	0.032	32.480	6	0.015	15.39	1539.39
FAR II	Morgantown Sandstone	M-16	Downgradient	118.54	950.01	0.035	1.0E-06	1.0E-04	1.0E-01	0.32	0.0003	0.031	31.444	6	0.016	15.90	1590.14
FAR II	Morgantown Sandstone	M-21	Downgradient	135.54	883.07	0.006	1.0E-06	1.0E-04	1.0E-01	0.32	0.0001	0.005	5.494	6	0.091	91.01	9100.98
FAR II	Morgantown Sandstone	M-22	Downgradient	107.1	900.94	0.015	1.0E-06	1.0E-04	1.0E-01	0.32	0.0001	0.013	13.222	6	0.038	37.82	3781.65
FAR II	Morgantown Sandstone	M-23	Downgradient	150.5	835.4	0.455	1.0E-06	1.0E-04	1.0E-01	0.32	0.0040	0.403	402.908	6	0.001	1.24	124.10
FAR II	Morgantown Sandstone	M-1003	Downgradient	90.04	845.84	0.046	1.0E-06	1.0E-04	1.0E-01	0.32	0.0004	0.040	40.462	6	0.012	12.36	1235.72
FAR II	Morgantown Sandstone	M-1004	Downgradient	101.28	907.01	0.022	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.019	19.405	4.87	0.021	20.91	2091.37
FAR II	Morgantown Sandstone	M-1302	Upgradient	90.3	940.42	0.002	1.0E-06	1.0E-04	1.0E-01	0.32	0.0000	0.002	2.114	6	0.237	236.53	23652.91
FAR II	Morgantown Sandstone	M-1309	Downgradient	241.02	931.07	0.004	1.0E-06	1.0E-04	1.0E-01	0.32	0.0000	0.003	3.280	6	0.152	152.45	15245.28
FAR II	Morgantown Sandstone	M-GS-1	Downgradient	56.18	935.69	0.053	1.0E-06	1.0E-04	1.0E-01	0.32	0.0005	0.047	46.640	6	0.011	10.72	1072.05
FAR II	Morgantown Sandstone	M-GS-2	Downgradient	93.32	897.49	0.055	1.0E-06	1.0E-04	1.0E-01	0.32	0.0005	0.049	48.818	6	0.010	10.24	1024.21
FAR II	Morgantown Sandstone	M-GS-3R	Downgradient	90.65	910.79	0.017	1.0E-06	1.0E-04	1.0E-01	0.32	0.0001	0.015	14.981	6	0.033	33.37	3337.49
FAR II	Morgantown Sandstone	M-GS-4	Downgradient	85	937.8	0.023	1.0E-06	1.0E-04	1.0E-01	0.32	0.0002	0.020	20.262	6	0.025	24.68	2467.64
FAR II	Morgantown Sandstone	M-GS-5	Upgradient	82.01	957.53	0.004	1.0E-06	1.0E-04	1.0E-01	0.32	0.0000	0.004	3.737	6	0.134	133.79	13379.42

Notes and Abbreviations:

Measurements and calculations represent conditions on 2 December 2024.

- A water level could not be collected from this well.

[1] *Groundwater Monitoring Network Evaluation; Cardinal Site – Fly Ash Reservoir II, Brilliant, Ohio* prepared by Geosyntec Consultants in September 2016 (Revised February 2017).

[2] Elevations datum is National Geodetic Vertical Datum of 1929 (NGVD29).

[3] Hydraulic gradient was calculated from a potentiometric surface from the most recent representative conditions.

[4] Low and high conductivity values are from the 2017 Groundwater Monitoring Network Evaluation, with a representative value chosen within this range that is consistent with previous velocity calculations.

[5] Well diameter represents the diameter of the borehole (sandpack).

[6] Residence time is an estimation of how long it would take groundwater to travel a distance equivalent to the well diameter at the calculated velocity.

FIGURES

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Legend

- MONITORING WELL
- FLY ASH RESERVOIR (FAR II)
- RESIDUAL SOLID WASTE LANDFILL (FAR I)

NOTES:

1.ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE

2. DEFFINITIONS
FT=FOOT
NGVD29=NATIONAL GEODETIC VERTICAL DATUM 1929

3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT MSL)

4. AERIAL IMAGERY SOURCE NEARMAP 14 MAY 2023

N

0 600 1,200
SCALE IN FEET

HALEY ALDRICH

CARDINAL UPLAND
DISPOSAL FACILITY
BRILLIANT, OHIO

CCR UNIT AND MONITORING WELLS FAR II SHALLOW AQUIFER

JANUARY 2025

FIGURE 1

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Legend

- FLY ASH RESERVOIR (FAR II)
- RESIDUAL SOLID WASTE LANDFILL (FAR I)
- FARII-MORGONTWON

NOTES:

1.ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE

2. DEFFINITIONS
FT=FOOT
NGVD29=NATIONAL GEODETIC VERTICAL DATUM 1929

3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT MSL)

4. AERIAL IMAGERY SOURCE NEARMAP 14 MAY 2023

N

0 600 1,200
SCALE IN FEET

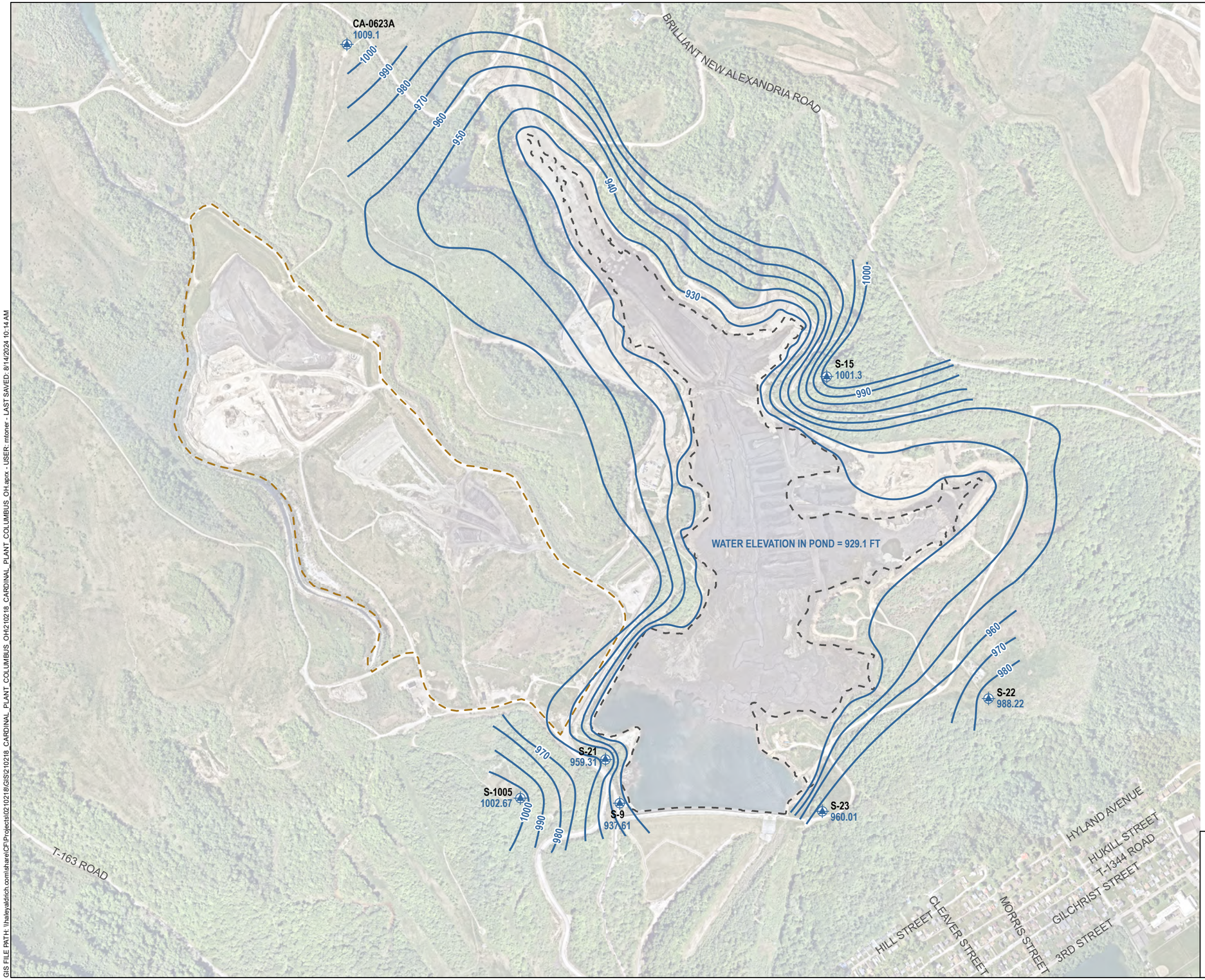
HALEY ALDRICH

CARDINAL UPLAND
DISPOSAL FACILITY
BRILLIANT, OHIO

CCR UNIT AND MONITORING WELLS FAR II MORGANTOWN AQUIFER

JANUARY 2025

FIGURE 2



LEGEND

- MONITORING WELL WITH **GROUNDWATER ELEVATION** IN FEET
- GROUNDWATER ELEVATION CONTOUR, 10-FT INTERVAL (NGVD29)
- FLY ASH RESERVOIR (FAR II)
- RESIDUAL SOLID WASTE LANDFILL (FAR I)

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. DEFINITIONS:
   FT = FOOT
   NGVD29 = NATIONAL GEODETIC VERITCAL DATUM 1929
3. GROUNDWATER ELEVATIONS MEASURED 9 APRIL 2024.
4. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
5. AERIAL IMAGERY SOURCE: NEARMAP, 14 MAY 2023

N

0 800 1,600
SCALE IN FEET

HALEY ALDRICH

CARDINAL UPLAND DISPOSAL FACILITY
BRILLIANT, OHIO

POTENTIOMETRIC SURFACE FAR II SHALLOW AQUIFER APRIL 2024

AUGUST 2024

FIGURE 3

LEGEND

- MONITORING WELL WITH **GROUNDWATER ELEVATION** IN FEET
- MONITORING WELL EXCLUDED FROM CONTOURING WITH GROUNDWATER ELEVATION IN FEET
- GROUNDWATER ELEVATION CONTOUR, 10-FT INTERVAL (NGVD29)
- HISTORIC BOTTOM ASH POND (BAP)
- FLY ASH RESERVOIR (FAR II)
- RESIDUAL SOLID WASTE LANDFILL (FAR I)
- RETROFITTED BOTTOM ASH POND (RBAP)

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. DEFINITIONS:
   FT = FOOT
   NGVD29 = NATIONAL GEODETIC VERITCAL DATUM 1929
3. GROUNDWATER ELEVATIONS MEASURED 9 APRIL 2024.
4. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
5. AERIAL IMAGERY SOURCE: NEARMAP, 14 MAY 2023
6. CA-0662A UNABLE TO BE MEASURED DURING THIS SAMPLING EVENT.

N

0 800 1,600
SCALE IN FEET

HALEY ALDRICH

CARDINAL PLANT
BRILLIANT, OHIO

POTENTIOMETRIC SURFACE FLY ASH RESERVOIR (FAR II) MORGANTOWN AQUIFER 2 APRIL 2024

JANUARY 2025

FIGURE 4

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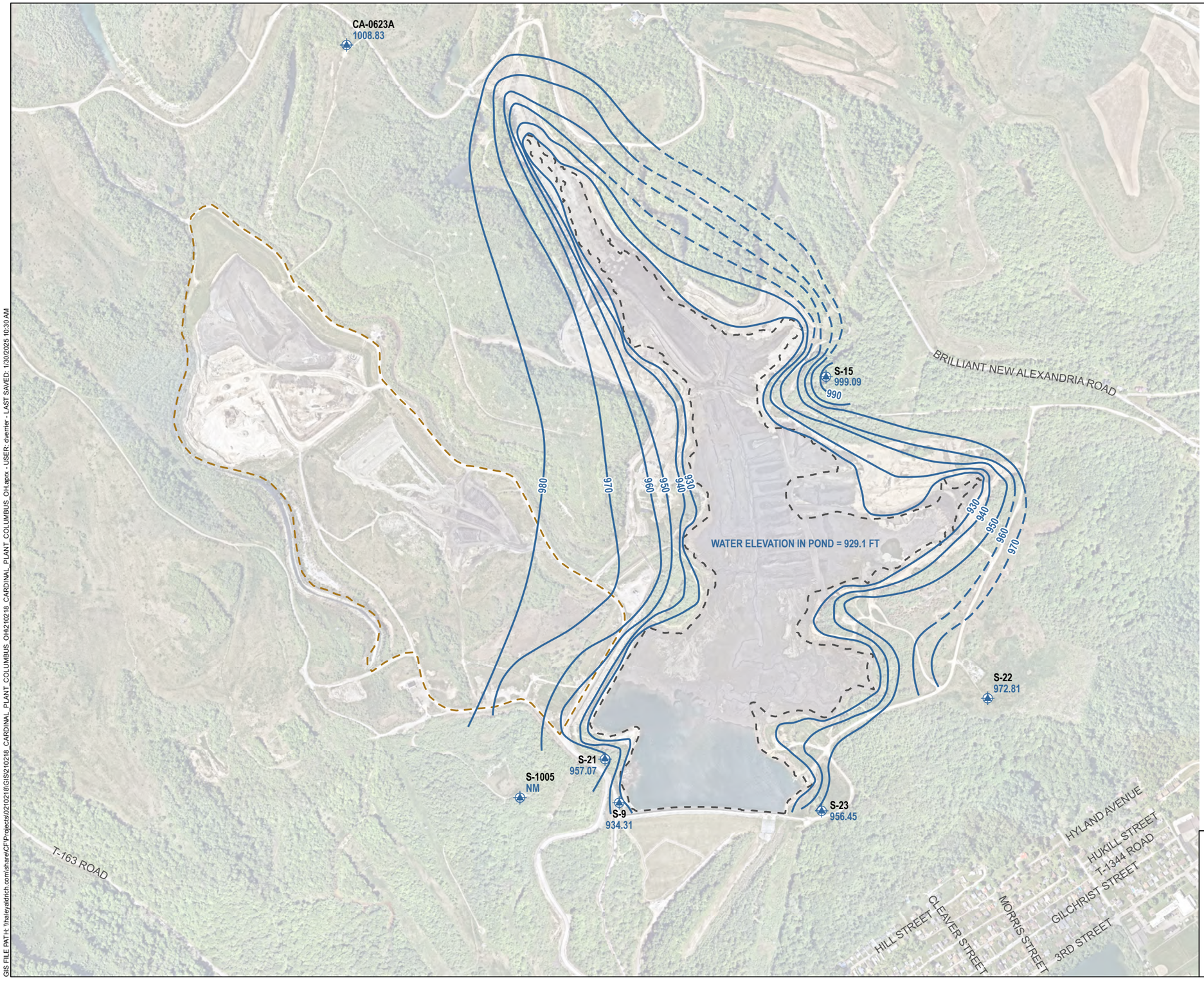

LEGEND

- MONITORING WELL WITH **GROUNDWATER ELEVATION** IN FEET
- GROUNDWATER ELEVATION CONTOUR, 10-FT INTERVAL (NGVD29)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- FLY ASH RESERVOIR (FAR II)
- RESIDUAL SOLID WASTE LANDFILL (FAR I)

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. DEFINITIONS:
   FT = FOOT
   NGVD29 = NATIONAL GEODETIC VERITCAL DATUM 1929
   NM = NOT MEASURED, WELL UNABLE TO BE MEASURED DURING THIS SAMPLING EVENT
3. GROUNDWATER ELEVATIONS MEASURED 2 DECEMBER 2024.
4. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
5. AERIAL IMAGERY SOURCE: NEARMAP, 14 MAY 2023

N

0 790 1,580
SCALE IN FEET

HALEY ALDRICH

CARDINAL PLANT
BRILLIANT, OHIO

POTENTIOMETRIC SURFACE FAR II SHALLOW AQUIFER DECEMBER 2024

JANUARY 2025

FIGURE 5

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LEGEND

- MONITORING WELL WITH **GROUNDWATER ELEVATION** IN FEET
- GROUNDWATER ELEVATION CONTOUR, 10-FT INTERVAL (NGVD29)
- FLY ASH RESERVOIR (FAR II)
- RESIDUAL SOLID WASTE LANDFILL (FAR I)

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. DEFINITIONS:
   FT = FOOT
   NGVD29 = NATIONAL GEODETIC VERITCAL DATUM 1929
3. GROUNDWATER ELEVATIONS MEASURED 2 DECEMBER 2024.
4. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT MSL).
5. AERIAL IMAGERY SOURCE: NEARMAP, 14 MAY 2023

N

0 790 1,580
SCALE IN FEET

HALEY ALDRICH

CARDINAL PLANT
BRILLIANT, OHIO

POTENTIOMETRIC SURFACE FAR II MORGANTOWN AQUIFER DECEMBER 2024

JANUARY 2025

FIGURE 6