Intended for
Miami Fort Power Company, LLC

Date
June 30, 2025

Project No.
1940104036

CORRECTIVE MEASURES ASSESSMENT REVISION 3

POND SYSTEM
MIAMI FORT POWER PLANT
11021 BROWER ROAD
NORTH BEND, OHIO

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CORRECTIVE MEASURES ASSESSMENT REVISION 3
MIAMI FORT POWER PLANT POND SYSTEM

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DOCUMENT REVISION RECORD

Issue No.	Date	Details of Revisions
0	September 5, 2019	Original Document (prepared by O'Brien & Gere Engineers, Inc., part of Ramboll)
1	November 12, 2020	Revised to reflect the characterization of the Pond System as a single multi-unit, including an Alternate Source Demonstration for statistically significant levels of arsenic and molybdenum for the Pond System
2	November 30, 2020	• Section 2 – added additional geology/hydrogeology information including: cross-sections (Appendix B), groundwater contour maps (Appendix C), vertical and horizontal hydraulic gradients (Appendix D), and summary of monitoring (Table 1), plume delineation information (Table 2; Figures 3 and 4). • Section 4 – focused on application of evaluation criteria to potential corrective measures described in Section 3. Added Appendix E with independent evaluation of MNA. • Section 5 – focused on application of potential source control and groundwater corrective measures referenced in Sections 3 and 4. • Table 3 – focused on application of evaluation criteria to corrective measures referenced in Section 3.
3	June 30, 2025	• Miami Fort Power Station (MFS) was revised to Miami Fort Power Plant (MFPP) throughout. • Addition of the Acronyms and Abbreviations list. • Nexpera recently acquired the Fort Hill Plant previously owned by Veolia North America. References to Veolia have been replaced by Nexpera or the Fort Hill Plant in this report. • Section 2 was updated based on additional investigations conducted in 2020 and 2023. • Table 2-1 was updated to include assessment monitoring events through September 2024. • Table 2-2 was updated to include data through September 2024 • Figures were renumbered to correspond to section numbers. Figure 1-2 was added. Figure 2-1 was revised to include MW-17 and MW-19 as background wells, and to include the MFPP and the Fort Hill Plant production wells. Figures 2-2 through 2-5 were included to show potentiometric surfaces from the 2023 and 2024 semiannual sampling events. Figures 2-6 and 2-7 were updated to include data through September 2024. • Appendix B was added to include an additional Alternative Source Demonstration for the arsenic statistically significant level at MW-6. • Cross-sections (Appendix C) were updated to include additional soil borings and monitoring wells. • Groundwater Elevation Contour Maps through 2022 were added to Appendix D. • Appendix E was updated with data collected during the additional investigations conducted in 2020 and 2023. • Appendix G was added to include CMA update technical memorandum.

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APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
A3	Assessment Monitoring semiannual sampling event in April 2020
ASD	alternative source demonstration
bgs	below ground surface
CBR	closure-by-removal
CCR	coal combustion residuals
Federal CCR Rule	40 C.F.R. § 257, Subpart D: Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments
CIP	closure-in-place
CMA	Corrective Measures Assessment
CMP	corrugated metal pipe
CSM	conceptual site model
CY	cubic yards
EPRI	Electric Power Research Institute
FGD	flue gas desulfurization
Fort Hill Plant	Nexpera Fort Hill chemical manufacturing plant
ft/ft	feet per feet
gpm	gallons per minute
GWPS	groundwater protection standard
HCR	Hydrogeologic Site Characterization Report
HDPE	high density polyethylene
IDNR	Indiana Division of Natural Resources
ISS	In-Situ Solidification/Stabilization
ITRC	Interstate Technology and Regulatory Council
LCL	Lower Confidence Limit
MCY	million cubic yards
MFPP	Miami Fort Power Plant
mg/L	milligrams per liter
MNA	Monitored Natural Attenuation
MW	megawatts
NAVD88	North American Vertical Datum of 1988
NPDES	National Pollutant Discharge Elimination System
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
PRB	Permeable Reactive Barrier
PWS	public water supply
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	surface impoundment
SSI	statistically significant increases
SSL	statistically significant levels
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

1. INTRODUCTION

Ramboll Americas Engineering Solutions Inc. (Ramboll) has prepared this revision of the Corrective Measures Assessment (CMA) for the Pond System (coal combustion residuals [CCR] Multi-Unit ID 115) located at the Miami Fort Power Plant (MFPP) in North Bend, Ohio. The Pond System is a CCR Multi-Unit comprised of two hydraulically connected cells (Basins A and B).

This CMA report complies with the requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257, Subpart D: Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (Federal CCR Rule). Under the Federal CCR Rule, owners and operators of existing CCR surface impoundments (SIs) must initiate a CMA, in accordance with 40 C.F.R. § 257.96, when one or more Appendix IV constituents are detected at statistically significant levels (SSLs) above groundwater protection standards (GWPS) in the Uppermost Aquifer, and the owner or operator has not completed an alternative source demonstration (ASD) demonstrating that a source other than the CCR unit has caused the contamination.

SSLs for the following parameters have been determined after the Assessment Monitoring was initiated:

- Arsenic in MW-2, MW-6, MW-10, and MW-13
- Cobalt in 4A and MW-4
- Molybdenum in MW-6

An ASD was completed for the arsenic SSLs at MW-2, MW-10, and MW-13, and molybdenum SSL at MW-6 (**Appendix A**), as allowed by 40 C.F.R. § 257.95(g)(3)(ii). An ASD was also completed for the additional arsenic SSL at MW-6 (**Appendix B**). This CMA has been completed to comply with the 40 C.F.R. § 257.96 and 40 C.F.R. § 257.97 requirements for assessing potential corrective measures to address the cobalt SSLs.

This CMA is the next step in developing a long-term corrective action plan and has been prepared to evaluate applicable remedial measures to address cobalt SSLs in the Uppermost Aquifer. The results of the CMA will be used to select a remedy for the Uppermost Aquifer, consistent with 40 C.F.R. § 257.96 and 40 C.F.R. § 257.97 requirements.

1.1 Corrective Measures Assessment Objectives and Methodology

The objective of this CMA is to evaluate appropriate corrective measure(s) to address impacted groundwater in the Uppermost Aquifer potentially associated with the Pond System at the MFPP. The CMA evaluates the effectiveness of the corrective measures in meeting the requirements and objectives of the remedy, as described under 40 C.F.R. § 257.96(c), by addressing the following evaluation criteria:

- Performance
- Reliability
- Ease of implementation
- Potential impacts of appropriate potential remedies (safety impacts, cross-media impacts, and control of exposure to any residual contamination)
- Time required to begin and complete the remedy

- Institutional requirements that may substantially affect implementation of the remedy(s) (permitting, environmental or public health requirements)

The CMA provides a systematic, rational method for evaluating potential corrective measures. The assessment process documented herein (a) identifies the site-specific conditions that will influence the effectiveness of the potential corrective measures (**Section 2**); (b) identifies applicable corrective measures (**Section 3**); (c) assesses the corrective measures against the evaluation criteria to select potentially feasible corrective measures (**Section 4**); and (d) summarizes the remedy selection process and future actions (**Section 5**).

1.2 Evaluation Criteria

This evaluation included qualitative and/or semi-quantitative screening of the corrective measures relative to their general performance, reliability, and ease of implementation characteristics, and their potential impacts, timeframes, and institutional requirements. Evaluations were at a generalized level of detail in order to screen out corrective measures that were not expected to meet 40 C.F.R. § 257.97 design criteria, while retaining corrective measures that would meet the design criteria.

The evaluation considered the elements qualitatively, applying engineering judgement with respect to known site conditions, to provide a reasoned set of corrective measures that could be used, either individually or in combination, to achieve GWPS in the most effective and protective manner.

1.2.1 Performance

The performance of potentially applicable corrective measures was evaluated for the:

1. Potential to ensure that any environmental releases to groundwater, surface water, soil, and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors.
2. Degree to which the corrective measure isolates, removes, or contains SSLs identified in the Uppermost Aquifer.
3. Ability of the corrective measure to achieve GWPS within the Uppermost Aquifer at the compliance boundaries.

1.2.2 Reliability

The reliability of the corrective measure is a description of its ability to function as designed until the GWPS are achieved in the Uppermost Aquifer at the compliance boundaries. Evaluation of the reliability included considering:

1. Type and degree of long-term management required, including monitoring, operation, and maintenance.
2. Long-term reliability of the engineering and institutional controls associated with the corrective measure.
3. Potential need for replacement of the corrective measure.

1.2.3 Ease of Implementation

The ease or difficulty of implementing a given corrective measure was evaluated by considering:

1. Degree of difficulty associated with constructing the corrective measure.
2. Expected operational reliability of the corrective measure.
3. Need to coordinate with and obtain necessary approvals and permits.
4. Availability of necessary equipment and specialists.
5. Available capacity and location of needed treatment, storage, and disposal services.

1.2.4 Potential Impacts of the Remedy

Potential impacts associated with a given corrective measure included consideration of impacts on the distribution and/or transport of contaminants, safety impacts (the short-term risks that might be posed to the community or the environment during implementation), cross-media impacts (increased traffic, noise, fugitive dust) and control of potential exposure of humans and environmental receptors to remaining wastes.

1.2.5 Time Required to Begin, Implement, and Complete the Remedy

Evaluating the time required to begin the remedy focused on the site-specific conditions that could require additional or extended timeframes to characterize, design, and/or field test a corrective measure to verify its applicability and effectiveness. The length of time that would be required to begin and implement the remedy was considered to be the total time to (1) verify applicability and effectiveness; (2) design and obtain permits; and (3) complete construction of the corrective measure.

The time required to complete the remedy considered the total time after the corrective measure was implemented until GWPS would be achieved in the Uppermost Aquifer at the compliance boundaries.

1.2.6 Institutional, Environmental or Public Health Requirements

Institutional, environmental and public health requirements considered state, local, and site-specific permitting or other requirements that could substantially affect construction or implementation of a corrective measure.

2. SITE HISTORY AND CHARACTERIZATION

2.1 Site Description and History

The MFPP is owned and operated by Miami Fort Power Company, LLC. The MFPP is located in the southwest corner of Ohio (Hamilton County) on the north shore of the Ohio River, at the confluence with the Great Miami River, as shown in **Figure 1-1**. The facility is located within Miami Township, approximately 5 miles southwest of the village of North Bend, Ohio. The state boundary with Indiana is approximately 1,900 feet to the west of MFPP and the boundary with Kentucky lies just offshore to the south, within the Ohio River. The Pond System is bounded by the Nexpera[1] Fort Hill chemical manufacturing plant (Fort Hill Plant) property and Brower Road to the north, the Great Miami River to the west, the Ohio River to the south, and the MFPP electric switch yard to the east. The MFPP production wells are located east of Basin A and the Fort Hill Plant production wells are located northwest of Basin B (**Figure 2-1**).

The MFPP has two coal-fired units, Units 7 and 8, constructed in 1975 and 1978 with a total capacity of 1,100 megawatts (MW) and four oil-fired facilities constructed in 1971 with a total capacity of 78 MW. The Pond System (Multi-unit 115) covers a total area of approximately 51 acres and is located in the southwest corner of the MFPP property as shown in **Figure 1-2**.

The Pond System is a CCR Multi-Unit comprised of two hydraulically connected cells (Basins A and B). Basin A (formerly CCR Unit 111) is an unlined surface impoundment approximately 1,000 by 1,400 feet, or about 30 acres. It was constructed prior to 1959, and the embankments were raised in 1976 approximately 10 feet using a variety of locally available materials (AECOM, 2017; Haley & Aldrich, Inc., 2017). Basin A receives effluent from the sluice lines, which primarily transports bottom ash products as well as flue-gas desulfurization (FGD) effluent. Basin A also receives directly discharged miscellaneous yard drainage. The material is discharged into the northern portion of the basin and through a constructed internal ditch line allowing the solids to settle and the water to decant into Basin B. Solid materials collected in Basin A are generally reclaimed for beneficial reuse or landfill placement. The basin level is typically operated between elevations of 495 and 498 feet[2]. Basin A and Basin B are hydraulically connected with a 48-inch corrugated metal pipe (CMP) culvert slip-lined with a 40-inch high density polyethylene (HDPE) pipe that runs through the shared dike, allowing the basins to operate in series. The Basin A outfall is currently not in use and flow-through is controlled by the gate structure (AECOM, 2017).

Basin B (formerly CCR Unit 112) is an unlined surface impoundment approximately 750 by 1,150 feet, or about 20 acres. It is located immediately west, and downgradient, of Basin A. Basin B was constructed between 1979 and 1982 (AECOM, 2017; Haley & Aldrich, Inc., 2017). Similar to Basin A, the basin level is typically operated between elevations of 495 and 498 feet. Basin A discharges into Basin B, which is used as a polishing pond prior to discharge to the Ohio River. Water within the basins is generally discharged through the outfall structure in Basin B. Miscellaneous yard drainage is discharged directly to Basin B (AECOM, 2017).

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[1] Nexpera recently acquired the Fort Hill Plant previously owned by Veolia North America. References to Nexpera or the Fort Hill Plant in this report are synonymous with references to Veolia in previous reports.

[2] All elevations in this report are referenced to North American Vertical Datum of 1988 (NAVD88).

2.2 Geology

2.2.1 Regional Setting

The site is located adjacent to the convergence of the Great Miami River drainage basin and Ohio River, near the southern border of the Glacial Plains and the northern border of the Interior Low Plateau at the southern edge of the glacial drift deposits. The local geologic conditions within the basin area consists of an alluvial silt, clay and/or sand deposited by Ohio River floodwaters, and glacial outwash deposits consisting of fine sand, silts and clays that were mainly deposited during the Illinoian and Wisconsinan stages of the Pleistocene (AECOM, 2017).

The sedimentary bedrock immediately underlying the glacial deposits belongs to the Cincinnatian series (blue-gray limestone of the Fairview and Kope Formations). Sedimentary rock units in proximity to site consist of Richmond shales, the Maysville limestone, and the Eden shales. These rock units average approximately 800 feet in thickness (AECOM, 2017). Situated near the crest of the Cincinnati arch, these bedrock units have a regional dip of about 10 feet per mile to the west (Burgess & Niple, Limited Engineers and Architects, 1988).

2.2.2 Site Unlithified Geology

The three principal types of unlithified materials present above the bedrock in the vicinity of the Pond System consist of the following (beginning at ground surface):

- Fill, primarily consisting of bottom ash, FGD effluent, fly ash, and other non-CCR waste streams. This unit also includes man-made berms constructed of a variety of locally available materials.
- Alluvial Deposits consisting of clay, silt, and fine sand deposited by the Ohio River floodwaters, which extend to depths of approximately 20 to 60 feet below ground surface (bgs) and tend to overly the glacial outwash materials at most locations.
- Glacial Outwash (Uppermost Aquifer) consisting of sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene, with a thickness of approximately 9 to 100 feet.

2.2.3 Site Bedrock

The lower confining unit (LCU) underlying the Pond System is bedrock consisting of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope Formations (AECOM, 2017). Depth to bedrock beneath the site varies between approximately 110 to 120 feet bgs dependent on proximity to the edge of the valley wall north of the Pond System. These shale and limestone formations average around 800 feet in thickness (Burgess & Niple, Limited Engineers and Architects, 1988).

Soil boring logs and well construction logs are provided in Appendix A of the Hydrogeologic Site Characterization Report (HCR; Ramboll, 2025). Geologic cross sections are provided in Figures 2-7 through 2-11 of the HCR and included as **Appendix C**.

2.3 Hydrogeology

The hydrogeologic conceptual site model (CSM) is detailed in the sections below. The monitoring well locations are depicted on **Figure 2-1**.

2.3.1 Uppermost Aquifer

The glacial outwash deposits (*i.e.,* Uppermost Aquifer) underlying the Pond System are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently backfilled with deposits of sand, gravel and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. The thickness of the deposits ranges from approximately 60 to 100 feet and covers much of the width of the terrace between the valley wall to the Great Miami River and Ohio River confluence. The top of the Uppermost Aquifer is at an elevation of approximately 459 to 463 feet (Ramboll, 2025a). The aquifer receives most of its recharge from infiltration of precipitation on the valley floor; however, secondary recharge also comes from bank storage from the Great Miami River and Ohio River during flood stages. Recharge to the aquifer from bank storage is periodic and short-lived.

Buried valley aquifers such as the Uppermost Aquifer are Ohio's most productive water-bearing formations. Estimates of transmissivity are in excess of 50,000 gallons per day per foot (United States Geological Survey [USGS], 1997).

Regionally, yields for high-capacity wells in the Uppermost Aquifer range from 450 gallons per minute (gpm) to 3,000 gpm with one well tested as high as 6,000 gpm. (Indiana Division of Natural Resources [IDNR], 2006).

2.3.2 Groundwater Production Wells

The majority of the water withdrawn by high-capacity wells near the Site is from induced flow from the Ohio River (Ohio Department of Natural Resources [ODNR], undated). A number of pumping wells are located at and near the Site within the glacial outwash (UA). The Site operates four production wells east-southeast of Basin A for cooling water: 1B, 2B, 4A, and 5A. Use of these wells varies over time; in 2018 and 2022/2023, total site pumping was approximately 112 million gallons a year. The Site wells are located east-southeast of Basin A (**Figure 2-1**).

Three production wells (V-50, V-51 and V-52) are operated by the Fort Hill Plant to provide process (non-potable) water. These wells are currently capable of producing 350 to 500 gpm each and are located northwest of Basin B. The production well locations are depicted on **Figure 2-1**.

2.3.3 Lower Limit of Aquifer

The top of the bedrock directly underlying the glacial outwash deposits defines the lower limit of the Uppermost Aquifer. Bedrock strata in this region have low permeability, limiting their capacity to serve as productive groundwater sources for domestic use. Local groundwater wells drawing from bedrock aquifers typically access water from bedding planes and fracture zones. The shales and limestones underlying this area are relatively impermeable, resulting in water yields that are generally inadequate for domestic use. Fresh water does not typically occur at depths greater than 500 feet bgs and is generally insufficient for domestic use (AECOM, 2017).

2.3.4 Groundwater Elevations, Flow Direction, and Velocity

Groundwater elevations vary coincidentally with the elevation of the Ohio River pool elevation. Groundwater elevations in the Uppermost Aquifer typically range from approximately 453 feet (MW-9) to 471 feet (MW-18). Potentiometric surface maps based on groundwater measurements collected at the Pond System from March 2023 through September 2024 are presented in **Figures 2-2 through 2-5**.

Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and the Fort Hill Plant production wells, and south towards the Ohio River (**Appendix D**). Variation in groundwater flow direction is primarily influenced by extreme flood events or long period of sustained pool-stage conditions in the Ohio River and Miami River.

Vertical hydraulic gradients were calculated using available groundwater elevation data from September 2019 through September 2024 at nested well locations within the Uppermost Aquifer (MW-4/MW-14, MW-15/MW-16, and MW-7/MW-17) and between the shallow Alluvium and Uppermost Aquifer (MW-10S/MW-10, MW-11S/MW-11, and MW-13S/MW-13) (Table 3-2 from the HCR; included in **Appendix E**).

Horizontal hydraulic gradients were calculated using groundwater elevations measured from March 2023 to September 2024 (Table 3-4 from the HCR, included in **Appendix E**). Across Basin A, the horizontal hydraulic gradient ranged from approximately 0.0010 to 0.00006 feet per foot (ft/ft). Across Basin B, the horizontal hydraulic gradient was between 0.0013 and 0.0001 ft/ft.

Groundwater flow velocities were estimated using the hydraulic characteristics of the glacial outwash of the UA, aquifer thickness based on cross-sectional analysis, and using a transmissivity for the aquifer of 50,000 gallons per day per foot (USGS, 1997). Groundwater flow velocities were calculated for the UA to range from 0.02 to 0.37 feet per day in Basin A and 0.21 to 0.47 feet per day in Basin B (Table 3-4, from the HCR, included in **Appendix E**).

2.3.5 Hydraulic Conductivity

2.3.5.1 Field Hydraulic Conductivities

Hydraulic conductivity testing was conducted at the Pond System in August 2020 to support remedy selection and identify location(s) for additional upgradient monitoring well(s). Five wells (MW-7, MW-10S, MW-11S, MW-13S, and MW-18) were tested using physical (solid) slug methods. The results of the slug tests are summarized in a draft memorandum dated September 21, 2020 (**Appendix D**; Ramboll, 2020b). Estimated hydraulic conductivities varied based upon screened material at each well. The three wells screened within finer-grained materials yielded estimates of 9.9×10^{-7} to 9.5×10^{-6} centimeters per second (cm/s) (MW-10S, MW-11S, MW-13S). Tests at wells screened across sand in monitoring wells MW-18 and MW-7 yielded hydraulic conductivities of 1.1×10^{-2} and 9.5×10^{-4} cm/s, respectively.

2.3.5.2 Laboratory Hydraulic Conductivities

Seven samples were collected from alluvial deposits underlying the Pond System but above the Uppermost Aquifer during the 2023 investigation and analyzed for vertical hydraulic conductivity by a falling head permeability test (ASTM D5084 Method F). Laboratory results indicated a geometric mean of 3.39×10^{-8} cm/s (Sample locations on Figure 2-5 of the HCR). The geotechnical laboratory report is provided in Appendix B of the HCR. The results are summarized in Table 2-1 of the HCR. Laboratory hydraulic conductivity tests were not performed in the Uppermost Aquifer.

2.4 Groundwater Quality and Plume Delineation – 40 C.F.R. § 257.95(g)

Detection monitoring in the Uppermost Aquifer, per 40 C.F.R. § 257.90, was initiated in October 2017; statistically significant increases (SSIs) of Appendix III parameters over background concentrations were detected in October 2017. Monitoring well locations are shown on **Figure 2-1**. Alternative source evaluations were inconclusive for one or more of the SSIs. Therefore, in accordance with 40 C.F.R. § 257.94(e)(2), an Assessment Monitoring Program was established for the Pond System on April 9, 2018 (**Table 2-1**). SSLs for the following parameters have been determined after the Assessment Monitoring was initiated:

- Arsenic at wells MW-2, MW-6, MW-10 and MW-13
- Cobalt at wells MW-4 and 4A
- Molybdenum at well MW-6

An ASD was completed for the arsenic SSLs at MW-2, MW-10, and MW-13, and molybdenum SSL at MW-6 (**Appendix A**), as allowed by 40 C.F.R. § 257.95(g)(3)(ii). An ASD was also completed for the additional arsenic SSL at MW-6 (**Appendix B**). This CMA has been completed to comply with the 40 C.F.R. § 257.96 and 40 C.F.R. § 257.97 requirements for assessing potential corrective measures to address the cobalt SSLs.

SSLs for total cobalt were identified in downgradient monitoring wells MW-4 and 4A where concentrations ranged from 0.0012 mg/L to 0.0224 milligrams per liter (mg/L) between 2015 and September 2024.

In accordance with the Multi-Site Statistical Analysis Plan (Ramboll, 2022)[3], SSLs are based on a Lower Confidence Limit (LCL) calculated from all observed concentrations for each Appendix IV parameter at each monitoring well (2015 through September 2024) compared to the GWPS (0.006 mg/L for cobalt). Maximum LCL concentrations associated with the cobalt SSLs at MW-4 and 4A are 0.00955 mg/L and 0.012 mg/L, respectively (**Table 2-2**). Well locations with observed exceedances of the GWPS have been illustrated on **Figure 2-6.**

Cobalt exceedances observed at well MW-4 are vertically delineated by monitoring well MW-14, with parameter concentrations below their respective GWPSs. Cobalt observed at MW-4 is bounded to the south by the Ohio River, as there is insufficient space downgradient of MW-4 to safely install a lateral delineation monitoring well before reaching the Ohio River. The timeseries for cobalt is shown in **Figure 2-7**. Mann-Kendall analysis of cobalt concentrations observed in MW-4 indicate there is not a significant increasing trend in concentrations (**Appendix F**). During site investigation activities in 2023, monitoring well MW-4A was constructed within the Uppermost Aquifer and screened from 424.56 to 434.56 feet within the glacial outwash deposits to allow for groundwater samples to be collected in the vicinity of MFPP pumping well 4A samples. Cobalt has not been detected in MW-4A, indicating that cobalt exceedances in this area are limited to samples collected from pumping well 4A.

Elevated cobalt concentrations in groundwater at monitoring well MW-4, are not expected to be within the radius of pumping influence of any industrial wells. Currently, elevated cobalt concentrations in groundwater would only have a potential impact on surface water of the Ohio River. Mixing calculations showing the effect of cobalt loading on the Ohio River at low flow

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[3] The Multi-Site Statistical Analysis Plan undergoes periodic updates which are posted to the public website: https://www.luminant.com/ccr/ohio/?dir=Ohio%2FMiami-Fort

(*i.e.,* baseflow at the 90th percentile of daily mean low flow) show that the cobalt concentration increase near-shore in the Ohio River due to possible groundwater loading from the east portion of the Pond System (*i.e.,* Basin A) is 0.00000076 mg/L, which is 100 times lower than the typical cobalt laboratory detection limit of 0.000075 mg/L. An Ohio River Valley Water Sanitation Commission (ORSANCO) annual report for 2024 indicates the nearest water supply intakes are located at river mile 462.6 upstream of the Pond System in the Cincinnati, Ohio metro area; and, at river mile 594.6 downstream of the Pond System in the Louisville, KY metro area (ORSANCO, 2024). The Pond System is located near river mile 490, meaning the nearest downstream intake is over 100 river miles away.

2.5 Well Survey

Groundwater near the Pond System is within the radius of influence of four industrial pumping wells (1B, 2B, 4A, and 5A) operated by MFPP and located to the east-southeast of Basin A and three industrial wells (V-50, V-51 and V-52) operated by Nexpera and located to the northwest of Basin B (see **Figure 2-1**). All groundwater pumped by the production wells is non-contact water and non-potable for industrial use only. All groundwater not captured by the industrial water wells flows towards the Great Miami River to the west or the Ohio River to the south.

A search of the ODNR Division of Geological Survey[4] identified 72 wells located within 1,000-meters of the Pond System. These included 18 monitoring wells, 26 soil borings, 21 water wells for commercial operation, one well for industrial operation, and five test wells. The only wells located downgradient of the Pond System are Site monitoring wells. No public water supply (PWS) wells were identified between the Great Miami River and the Ohio River within a ten-mile radius of the MFPP.

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[4] https://waterwells.ohiodnr.gov/search/interactive-search

3. DESCRIPTION OF CORRECTIVE MEASURES

The corrective measures described below are frequently used to mitigate impacts from contaminants. The corrective measures are identified as either potential source control or groundwater corrective measures. Each measure is summarized in **Table 3-1**, Corrective Measures Assessment Matrix.

3.1 Objectives of the Corrective Measures – 40 C.F.R. § 257.96(c)

The following performance standards, per 40 C.F.R. § 257.97, must be met by the selected corrective measures:

- Be protective of human health and the environment.
- Attain the groundwater protection standards per 40 C.F.R. § 257.95(h).
- Provide source control to reduce or eliminate, to the maximum extent feasible, further releases of Appendix IV constituents.
- Remove from the environment as much of the contaminated material as feasible.
- Comply with waste management standards, per 40 C.F.R. § 257.98(d).

Site-specific considerations regarding the Pond System, provided in **Section 2**, were used to evaluate potential corrective measures. Each of the corrective measures evaluated may be capable of satisfying the performance standards listed above to varying degrees of effectiveness. The corrective measure review process yields a set of applicable corrective measures that can be used in developing a long-term corrective action plan. The corrective measures may be used independently or may be combined into specific remedial alternatives to leverage the advantages of multiple corrective measures to meet the performance standards.

The following potential corrective measures are commonly used to mitigate groundwater impacts and were considered as a part of the CMA process:

- Potential Source Control Corrective Measures
  - Closure-in-place (CIP)
  - Closure-by-removal (CBR) (Off-Site Landfill)
  - In-Situ Solidification/Stabilization (ISS)
- Potential Groundwater Remedial Corrective Measures
  - Monitored Natural Attenuation (MNA)
  - Groundwater Cutoff Wall
  - In-Situ Chemical Treatment
  - Permeable Reactive Barrier (PRB)
  - Groundwater Extraction

3.2 Potential Source Control Corrective Measures

3.2.1 Closure-in-Place

CIP would include constructing a cover system in direct contact with the graded CCR. Cover systems are designed to significantly minimize water infiltration into the CCR unit and allow surface water to drain off the cover system, thus reducing generation of potentially impacted water and reducing the extent of cobalt impact in the Uppermost Aquifer.

Construction of a cover system typically includes, but is not limited to, the following primary project components:

- Dewatering and grading the CCR to allow cover system construction.
- Relocating and/or grading the existing CCR and cover material within the impoundment to achieve acceptable grades for closure.
- Constructing a cover system that complies with the Federal CCR Rule, including establishment of a vegetative cover to minimize long-term erosion.
- Constructing a stormwater management system to convey runoff from the cover system to a system of perimeter drainage channels for ultimate routing and discharge to nearby surface water.
- Ongoing inspection and maintenance of the cover system; and stormwater and property management.

3.2.2 Closure-by-Removal

CBR would include the following components: removal of all CCR from the CCR unit; moisture conditioning the CCR as needed to facilitate excavating, loading and transporting CCR to either an on-site or off-site landfill; and backfilling the excavation. This corrective measure would address the source of groundwater impacts by removing the CCR, but the groundwater impacts would not begin to diminish until the source is completely removed.

3.2.3 In Situ Solidification/Stabilization

ISS is a potential corrective measure which consists of encapsulating waste within a cured monolith having increased compressive strength and reduced hydraulic conductivity. Hazards can be reduced by both converting waste constituents into a less soluble and mobile forms and by isolating waste from groundwater, thus facilitating groundwater remediation and reducing leaching to groundwater. ISS would include solidifying all CCR from the CCR unit and encapsulating the CCR through in-place mechanical mixing with reagents in an engineered grout mixture. The grout is typically emplaced using augers, backhoes or injection grouting. ISS also improves the geotechnical stability and material strength of the CCR materials.

ISS construction technologies include vertical rotary mixed ISS, hydraulic auger mixed ISS, hydraulic mixing tool ISS, and excavator mixed ISS. ISS construction may use a combination of these technologies depending on site-specific design requirements. ISS design typically requires data on, but not limited to, the following CCR material properties: geotechnical parameters, inorganic chemical constituents, class of ash, and ash management information (*e.g.,* coal source, co-management). Due to the variability in material properties of CCR, ISS would require an extensive mix design process for assessing ISS performance. Typical design and performance parameters include but are not limited to volume expansion (swell), leachability, permeability, and unconfined compressive strength. ISS performance may be evaluated based on both civil design and remedial performance objectives.

3.3 Potential Groundwater Corrective Measures

3.3.1 Monitored Natural Attenuation

Both federal and state regulators have long recognized that MNA can be an acceptable component of a remedial action when it can achieve remedial action objectives in a reasonable timeframe. In 1999, the United States Environmental Protection Agency (USEPA) published a final policy directive (USEPA, 1999) for use of MNA for groundwater remediation and described the process as follows:

- The reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods. The 'natural attenuation processes' that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants.

The USEPA has stated that source control is the most effective means of ensuring the timely attainment of remediation objectives (USEPA, 1999). Natural attenuation processes may be appropriate as a "finishing step" after effective source control implementation if there are no risks to receptors and/or the contaminant plume is not expanding. Thus, MNA would be used in conjunction with source control measures described in **Section 3.2**.

The 1999 USEPA MNA document was focused on organic compounds in groundwater. However, in a 2015 companion document, the USEPA addressed the use of MNA for inorganic compounds in groundwater. The USEPA noted that the use of MNA to address inorganic contaminants: (1) is not intended to constitute a treatment process for inorganic contaminants; (2) when appropriately implemented, can help to restore an aquifer to beneficial uses by immobilizing contaminants onto aquifer solids and providing the primary means for attenuation of contaminants in groundwater; and (3) is not intended to be a "do nothing" response (USEPA, 2015). Rather, documenting the applicability of MNA for groundwater remediation should be thoroughly and adequately supported with site-specific characterization data and analysis in accordance with the USEPA's tiered approach to MNA (USEPA, 1999; USEPA, 2007; USEPA, 2015):

1. Demonstrate that the area of groundwater impacts is not expanding.
2. Determine the mechanisms and rates of attenuation.
3. Determine that the capacity of the aquifer is sufficient to attenuate the mass of constituents in groundwater and that the immobilized constituents are stable and will not remobilize.
4. Design a performance monitoring program based on the mechanisms of attenuation and establish contingency remedies (tailored to site-specific conditions) should MNA not perform adequately.

Both physical and chemical attenuation processes can contribute to the reduction in mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. Physical attenuation processes applicable to CCR include dilution, dispersion, and flushing. Chemical attenuation processes applicable to CCR include precipitation and coprecipitation (*i.e.*, incorporation into sulfide minerals), sorption (*i.e.*, to iron, manganese, aluminum, or other metal oxides or oxyhydroxides, or to sulfide minerals or organic matter), and ion exchange. Timeframes to achieve GWPS are dependent on site-specific conditions, actual timeframes would require detailed technical analysis.

Cobalt has the potential to be sorbed onto iron hydroxides or organic matter in the aquifer materials, depending on the geochemical conditions, but is typically mobile (Electric Power Research Institute [EPRI], 2012). Physical and chemical mechanisms are available natural attenuation processes acting upon CCR constituents such as cobalt. The performance of MNA as a groundwater corrective measure varies based on site-specific conditions. Additional data collection and analysis may be required to support the USEPA's tiered approach to MNA (USEPA, 2015) and obtain regulatory approval.

3.3.2 Groundwater Extraction

Groundwater extraction is a widely used groundwater corrective measure. This corrective measure would include installation of one or more groundwater pumping wells or trenches to control and extract impacted groundwater. Groundwater extraction captures and contains impacted groundwater and can limit plume expansion and/or off-site migration. Construction of a groundwater extraction system typically includes, but is not limited to, the following primary components:

- Designing and constructing a groundwater extraction system consisting of one or more extraction wells or trenches and operating at a rate to allow capture of CCR impacted groundwater within the Uppermost Aquifer.
- Management of extracted groundwater, which may include modification to the existing NPDES permit, including treatment prior to discharge, if necessary.
- Ongoing inspection and maintenance of the groundwater extraction system.

Remediation of inorganics by groundwater extraction can be effective, but systems do not always perform as expected. A combination of factors, including geologic heterogeneities, difficulty in flushing low permeability zones, and rates of contaminant desorption from aquifer solids can limit effectiveness. Groundwater extraction systems require ongoing operation and maintenance to ensure optimal performance and the extracted groundwater must be managed, either by ex-situ treatment or disposal.

3.3.3 Groundwater Cutoff Wall

Since the late 1970s and early 1980s, vertical cutoff walls have been used to control and/or isolate impacted groundwater. Low-permeability cutoff walls can be used to prevent horizontal off-site migration of potentially impacted groundwater. Cutoff walls act as barriers to transport of impacted groundwater and can isolate soils that have been impacted by CCR to prevent contact with unimpacted groundwater. Cutoff walls are often used in conjunction with an interior pumping system to establish a reverse gradient within the cutoff wall. The reverse gradient imparted by the pumping system maintains an inward flow through the wall, keeping it from acting as a groundwater dam and controlling potential end-around or breakout flow of contaminated groundwater.

A commonly used cutoff wall construction technology is the slurry trench method, which consists of excavating a trench and backfilling it with a soil-bentonite mixture, often created with the soils excavated from the trench. The trench is temporarily supported with bentonite slurry that is pumped into the trench as it is excavated (D'Appolonia & Ryan, 1979). Excavation for cutoff walls is conducted with conventional hydraulic excavators, hydraulic excavators equipped with specialized booms to extend their reach (*i.e.*, long-stick excavators), or chisels and clamshells, depending upon the depth of the trench and the material to be excavated. Constructing the cutoff wall such that it intersects a low-permeability material at its base, referred to as "keying", can greatly increase its effectiveness, depending on the objectives of the barrier.

3.3.4 Permeable Reactive Barrier

Chemical treatment via a PRB is defined as an emplacement of reactive materials in the subsurface designed to intercept a contaminant plume, provide a flow path through the reactive media, and transform or otherwise render the contaminant(s) into environmentally acceptable forms to attain remediation concentration goals downgradient of the barrier (EPRI, 2006).

As groundwater passes through the PRB under natural gradients, dissolved constituents in the groundwater react with the media and are transformed or immobilized. A variety of media have been used or proposed for use in PRBs. Zero-valent iron has been shown to effectively immobilize CCR constituents, including arsenic, chromium, cobalt, molybdenum, selenium, and sulfate. Zero-valent iron has not been proven effective for boron, antimony, or lithium (EPRI, 2006).

System configurations can include continuous PRBs, in which the reactive media extends across the entire path of the contaminant plume; and funnel-and-gate systems, where low-permeability barriers are installed to control groundwater flow through a permeable gate containing the reactive media. Continuous PRBs intersect the entire contaminant plume and do not materially impact the groundwater flow system. Design may or may not include keying the PRB into a low-permeability unit at depth. Funnel-and-gate systems utilize a system of barriers to groundwater flow (funnels) to direct the contaminant plume through the reactive gate. The barriers, typically some form of cutoff wall, are keyed into a low-permeability unit at depth to prevent short circuiting of the plume. Funnel-and-gate design must consider the residence time to allow chemical reactions to occur. Directing the contaminant plume through the reactive gate can significantly increase the flow velocity, thus reducing residence time.

Design of PRB systems requires rigorous site investigation to characterize the site hydrogeology and to delineate the contaminant plume. A thorough understanding of the geochemical and redox characteristics of the plume is critical to assess the feasibility of the process and select appropriate reactive media. Laboratory studies, including batch studies and column studies using samples of site groundwater, are needed to determine the effectiveness of the selected reactive media at the site (EPRI, 2006). The main considerations in selecting reactive media are as follows (EPRI, 2006):

- Reactivity - The media should be of adequate reactivity to immobilize a contaminant within the residence time of the design.
- Hydraulic performance - The media should provide adequate flow through the barrier, meaning a greater particle size than the surrounding aquifer materials. Alternatively, gravel beds have been emplaced in front of barriers to direct flow through the barrier.

- Stability - The media should remain reactive for an amount of time that makes its use economically advantageous over other technologies.
- Environmentally compatible by-products - Any by-products of media reaction should be environmentally acceptable. For example, iron released by zero-valent iron corrosion should not occur at levels exceeding regulatory acceptance levels.
- Availability and price: The media should be easy to obtain in large quantities at a price that does not negate the economic feasibility of using a PRB.

3.3.5 In-Situ Chemical Treatment

In-situ chemical treatment technologies for inorganics are being tested and applied with increasing frequency (Evanko and Dzombak, 1997). In-situ chemical treatment includes the targeted injection of reactive media into the subsurface to mitigate groundwater impacts. Inorganic contaminants are typically remediated through immobilization by reduction or oxidation followed by precipitation or adsorption (EPRI, 2006). Chemical reactants that have been applied or are in development for application in treating inorganic contaminants include ferrous sulfate, nanoscale zero-valent iron, organo-phosphorus nutrient mixture (PrecipiPHOS™) and sodium dithionite (EPRI, 2006). Zero-valent iron has been shown to effectively immobilize cobalt.

In-situ chemical treatment design considerations include the following (EPRI, 2006):

- Source location and dimensions
- Source contaminant mass
- The ability to comingle the contaminants and reactants in the subsurface
- Competing subsurface reactions (that consume added reactants)
- Hydrologic characteristics of the source and subsurface vicinity
- Delivery options for the cleanup procedure(s)
- Capture of any contaminants mobilized by the procedures
- Long-term stability of any immobilized contaminants

4. EVALUATION OF POTENTIAL CORRECTIVE MEASURES

4.1 Evaluation Criteria – 40 C.F.R. § 257.96(c)

The corrective measures described in the previous section were evaluated relative to the criteria presented in **Section 1.2** and reiterated below:

- Performance
- Reliability
- Ease of implementation
- Potential impacts of appropriate potential remedies (safety impacts, cross-media impacts, and control of exposure to any residual contamination)
- Time required to begin and complete the remedy
- Institutional requirements that may substantially affect implementation of the remedy(s) (permitting, environmental, or public health requirements)

These factors are presented in **Table 3-1** for the corrective measures described in **Section 3** to allow a qualitative evaluation of the ability of each corrective measure to address SSLs for cobalt in the Uppermost Aquifer. The goal is to understand which potential corrective measures could be used, either independently or in combination, to attain the GWPS, as discussed in the following sections.

Discussion of potential groundwater corrective measures is provided below with content pertaining to each evaluation criteria provided above highlighted in **bold** text.

4.2 Potential Source Control Corrective Measure Evaluation

As presented in **Section 3**, the following source control corrective measures may be viable to address SSLs in the Uppermost Aquifer:

- Potential Source Control Corrective measures
  - CIP
  - CBR (On-Site or Off-Site Landfill)
  - ISS

These remedial corrective measures are discussed below relative to their ability to effectively address the cobalt SSL in the Uppermost Aquifer. To attain GWPS these source control corrective measures may be combined with groundwater corrective measures, such as MNA.

4.2.1 Closure-in-Place

CIP is an accepted corrective measure. The **performance** of CIP as a source control corrective measure can vary based on site-specific conditions and may require additional data collection or groundwater fate and transport modeling to support the design and regulatory approval. Site conditions at the Pond System are favorable for effective source control by CIP because the basins are underlain by low-permeability clays. CIP is a **reliable** source control measure that does not require active systems to operate and requires limited maintenance.

Implementation of CIP only requires commonly performed construction and earthwork activities as described in **Section 3.2** and can typically be completed in a **timeframe** of 5 to 8 years, including design, **permitting**, and construction.

Cover systems control exposure to CCR by limiting potential contact with CCR material, controlling stormwater runoff and significantly reducing infiltration of water into the CCR material. During construction of the cover system there is the potential **impact** of short-term exposure to CCR. During the approximately 1-to-2-year construction period there could be some increase in off-site traffic due to the increased need for on-site workers.

Controlling the primary source quickly results in lowering the total mass released, subsequently reducing the **time** to attain GWPS. Based on groundwater modeling of geosynthetic and soil cover systems at affiliate Dynegy Midwest Generation, LLC CCR units with similar hydrogeologic conditions (*e.g.,* Hennepin East), concentrations of CCR constituents are expected to begin to decline and the extent of groundwater **impacts** are expected to reduce within months after cover placement. **Timeframes** to achieve GWPS are dependent on site-specific conditions which require detailed technical analysis.

4.2.2 Closure-by-Removal

CBR is an accepted corrective measure. CBR is a **reliable** source control measure that does not require active systems to operate and requires limited maintenance. CBR only requires commonly performed construction and earthwork activities as described in **Section 3.2**. However, dewatering and moisture conditioning of the CCR for transport can often be problematic to **implement**; and site access is limited.

The **regulatory approval process** for constructing a new on-site landfill, if feasible, would take multiple levels of approval, including environmental **permits** and local authorization. Opposition to such projects and **regulatory approvals** would take years before construction could commence. However, most importantly, there is no available space (see **Figure 1-2**) at the MFPP on which to site or construct an on-site landfill, requiring that only off-site landfill alternatives be considered.

Assuming 60 trucks per day (8 trucks per hour), it will take over 18 years to transport the CCR to an off-site landfill. This will result in an **impact** of 289,000 roundtrips (3.6 million cubic yards [MCY] of CCR; assuming 12.5 cubic yards [CY] per truck load) between the MFPP and the landfill.

CBR of the Pond System could be completed in the **timeframe** of approximately 20 to 24 years, including design, **permitting**, and construction. Delays in controlling the primary source will increase the potential for additional mass release, subsequently increasing the **time** to attain GWPS.

During that **timeframe** the transport of the CCR could lead to the following **impacts**: increased risk to the public, increased greenhouse gas emissions and carbon footprint, and increased potential for fugitive dust exposure.

Commercially available landfill capacity is extremely limited. Decatur Hills Landfill in Greensburg, Indiana has the most available airspace within 50 miles of the MFPP, but it is insufficient to accommodate the 3.6 MCY of CCR to be removed, unless they cease accepting municipal solid waste.

Due to insufficient available commercial landfill capacity, and lack of space onsite to construct a landfill, CBR is not retained as a viable corrective measure.

4.2.3 In-Situ Solidification/Stabilization

Performance of ISS for application as a CCR source control measure is not proven, therefore the **performance** and **reliability** are unknown. The design of ISS as a source control corrective measure would require additional data collection. During ISS construction there would be the potential **impacts** of short-term exposure to CCR.

Implementation of ISS would require extensive pre-implementation testing, specialized equipment, and specialized contractors. ISS construction **timeframes** would be dependent on application volume. Treatment of all CCR materials may not be feasible dependent upon depth and obstructions. Targeted ISS may reduce the **timeframe** required; however, another source control corrective measure would be required to address remaining CCR. ISS requires **approval** by the OEPA to be **implemented**. The **timeframe to implement** ISS, including bench-scale and pilot-scale testing to support the detailed design and **regulatory approval**, would delay source control. In addition, the effects on groundwater chemistry associated with the addition of large volumes of Portland cement and other amendments to the subsurface would require detailed evaluation.

Site conditions at the Pond System would support **implementation** of ISS because the CCR material is present less than 50 feet below ground surface and underlain by low-permeability clays which are likely to provide a viable "key layer" for the stabilization of CCR material.

4.3 Potential Groundwater Corrective Measure Evaluation

Based on the corrective measure review presented in **Section 3.3**, the following remedial corrective measures are considered potentially viable to address the cobalt SSL in the Uppermost Aquifer:

- Potential Groundwater Corrective measures
  - MNA
  - Groundwater Cutoff Wall
  - In-Situ Chemical Treatment
  - PRB
  - Groundwater Extraction

These corrective measures are discussed below relative to their ability to effectively address the cobalt SSL in the Uppermost Aquifer. Additional site-specific data collection and analyses will be required to verify the feasibility of selected corrective measures and to design the corrective measure(s), consistent with 40 C.F.R. § 257.97 requirements.

4.3.1 Monitored Natural Attenuation

MNA is an in-situ remedial technology which relies on source control and natural processes occurring in aquifers to attenuated dissolved constituents and thereby reduce their concentrations in groundwater. MNA is most effective at sites where the source is controlled, the contaminant plume is stable or shrinking, contaminant concentrations are low, and potential receptors are not exposed to concentrations greater than health-based values. The **performance** of MNA as a groundwater remedy can vary based on site-specific conditions; these conditions should be evaluated in accordance with USEPA's tiered approach to MNA (USEPA, 1999; USEPA, 2007; USEPA, 2015).

The results of independent evaluations regarding the potential feasibility of MNA as a groundwater remedy are provided as **Appendix F and G**. These evaluations considered whether site-specific conditions appear favorable for **implementation** of MNA. As part of these evaluations, the likely ability of MNA, in combination with source control, to meet the criteria provided in 40 C.F.R. § 257.96(c) was completed; these results are also summarized in **Table 3-1**. As discussed in the independent evaluations in **Appendix F and G**, MNA is likely to achieve the 40 C.F.R. § 257.97 **performance** criteria based on the conclusions of the evaluation and the geochemical behavior of cobalt. Additional efforts will be completed to gather information to complete the tiered evaluation in accordance with USEPA guidance, which will support the selection of MNA, in combination with source control, as a groundwater remedy.

4.3.2 Groundwater Extraction

Groundwater extraction is a widely accepted corrective measure for groundwater with a long track record of **performance** and **reliability**. It is routinely **approved** by state and federal regulators. The **performance** of a groundwater extraction system is dependent on site-specific hydrogeologic conditions and would require additional data collection (aquifer testing) and possibly groundwater fate and transport modeling to support the design and **regulatory approval**. Groundwater extraction systems are proven **reliable** when properly designed and maintained.

Implementation of a groundwater extraction system presents design challenges due to the significant features controlling hydraulic head and groundwater flow in the Uppermost Aquifer (*i.e.,* Ohio River and Great Miami River). Relatively high horizontal hydraulic conductivities are anticipated to require a high pumping rate to successfully control groundwater in the vicinity of the Pond System. For a corrective measure using groundwater containment to effectively control off-site flow or to remove potentially contaminated groundwater, horizontal and vertical capture zone(s) must be created using pumping wells. Depending on the volumetric rate of extraction required, groundwater pumping wells may require high capacity well registration. Extracted groundwater would need to be managed, which may include modification to the existing National Pollutant Discharge Elimination System (NPDES) **permit** and treatment prior to discharge, if necessary.

There could be some **impacts** associated with constructing and operating a groundwater extraction system, including limited exposure to extracted groundwater. Additional data collection and analyses would be required to design an extraction system. Construction could be completed within 1 year. **Time of implementation** is approximately 3 to 4 years, including characterization, design, **permitting** and construction. **Timeframes** to achieve GWPS are dependent on site-specific conditions and selected source control measures, which require detailed technical analysis. Groundwater extraction requires **approval** by the OEPA to be **implemented**.

The high transmissivity of the Uppermost Aquifer (see **Section 2.2**) and the nature, extent, and detected concentrations of cobalt in groundwater may limit the effectiveness of a pump and treat system to hydraulically contain and capture the cobalt plume in close proximity to the Ohio River, and in an Uppermost Aquifer with relatively high permeability. The proximity of the plume to the

Ohio River and existing industrial production wells presents challenges for plume capture and containment, which would require removal and treatment of high volumes of groundwater.

4.3.3 Groundwater Cutoff Wall

Groundwater cutoff walls are a widely accepted corrective measure used to control and/or isolate impacted groundwater and are routinely **approved** by the state and federal regulators. Cutoff walls have a long history of **reliable performance** as hydraulic barriers provided they are properly designed and constructed. **Implementation** of a cutoff wall extending to, and keyed into, the bedrock underlying the Uppermost Aquifer would present challenges due to the required depth (estimated thickness of the permeable valley fill at the MFPP is approximately 120 feet). Additional site investigation would be required to verify the feasibility of a cutoff wall keyed into the bedrock below the Uppermost Aquifer, and to evaluate alternate configurations, including a shallower wall used in conjunction with groundwater extraction.

Cutoff walls are designed to act as hydraulic barriers; as a result, cutoff walls inherently alter the existing groundwater flow system. These changes to the existing groundwater flow system may need to be controlled to maximize the effectiveness of the remedy; for example, groundwater extraction may be required to control build-up of hydraulic head upgradient and around the groundwater cutoff walls. The effectiveness and **performance** of a cutoff wall as a hydraulic barrier also relies on the contrast between the hydraulic conductivity of the aquifer and the cutoff wall. The most effective barriers have hydraulic conductivity values that are several orders of magnitude lower than the aquifer that it is in contact with. Based on literature, and the high yield of the production wells, the hydraulic conductivity is expected to be high. The high horizontal conductivities in the Uppermost Aquifer suggest that a barrier wall would have the desired contrast in hydraulic conductivities, which improves the **reliability** as groundwater will be unlikely to migrate through the barrier.

There could be some **impacts** associated with constructing and operating a groundwater cutoff wall, including changes to the groundwater flow system that have to be considered for effective groundwater corrective action. Additional data collection and analyses would be required to design a cutoff wall. Construction could be completed within 3 to 4 years. **Time of implementation** is approximately 6 to 9 years, including characterization, design, **permitting** and construction. To attain GWPS, groundwater cutoff walls require a separate groundwater corrective measure to operate in concert with the hydraulic barriers. Groundwater cutoff walls are commonly coupled with MNA and/or groundwater extraction as groundwater corrective measures. **Timeframes** to achieve GWPS are dependent on site-specific conditions, which require detailed technical analysis. Groundwater cutoff walls require **approval** by the OEPA to be **implemented**.

4.3.4 Permeable Reactive Barrier

PRB application as a groundwater corrective measure for cobalt is not well established and more research is needed (EPRI, 2006), therefore, **performance** is unknown. PRB treatment of cobalt is expected to have variable **reliability** based on site-specific hydrogeologic and geochemical conditions. The capacity of the reactive media may be exceeded and require replacement or rejuvenation. Conservative estimates indicate iron-based reactive media are expected to require maintenance every 10 years (Interstate Technology and Regulatory Council [ITRC], 2005). **Implementation** of PRBs may have design challenges associated with both groundwater hydraulics and plume configuration given the location of the groundwater **impacts** between the Ohio River and two high-capacity pumping centers.

Funnel-and-gate PRBs inherently alters the existing groundwater flow system. As mentioned above, the high horizontal conductivities in the Uppermost Aquifer suggest that the barrier portions of a funnel-and-gate system would have the desired contrast in hydraulic conductivities which improves the **reliability** as groundwater will be unlikely to migrate through the barrier. These changes to the existing groundwater flow system may need to be controlled to reduce potential **impacts** of the remedy. Construction of PRBs could be completed within 2 to 3 years. **Time of implementation** is approximately 6 to 9 years, including characterization, design, **permitting** and construction. **Timeframes** to achieve GWPS are dependent on site-specific conditions, including reactivity and maintenance (replacement or rejuvenation requirements) which require detailed technical analysis. PRBs and potentially associated groundwater cutoff walls (funnel-and-gate system) require **approval** by OEPA to be **implemented**.

4.3.5 In-Situ Chemical Treatment

In-situ chemical treatment of cobalt is not well established, and more research is needed (EPRI, 2006); therefore, **performance and reliability** are unknown. Chemical treatment of cobalt is expected to have variable **reliability** based on site-specific geochemical conditions. The capacity of the reactive media may be exceeded and require replacement or rejuvenation. Conservative estimates indicate iron-based reactive media is expected to require maintenance every 10 years (ITRC, 2005).

Implementation of in-situ chemical treatment may have design challenges associated with groundwater hydraulics given the location of the groundwater **impacts** between the Ohio River and two high-capacity pumping centers.

Injections of reactive media could be completed within 2 to 3 years. **Time of implementation** is approximately 8 to 13 years, including characterization, design, **permitting**, and injections. Chemical treatment alters groundwater geochemical conditions, which may result in potential **impacts** associated with **implementation** of the remedy. **Timeframes** to achieve GWPS are dependent on site-specific conditions, including reactivity and maintenance (replacement or rejuvenation requirements) which require detailed technical analysis. Since in-situ chemical treatment alters groundwater geochemistry, **implementation** of the remedy may require Underground Injection Control (UIC) **approval**.

In-situ chemical treatment is not retained as a viable corrective measure to address SSLs of cobalt in the Uppermost Aquifer since its **performance** and **reliability** are unknown and the groundwater hydraulics are likely to require a level of increased control that cannot be provided by a PRB.

5. REMEDY SELECTION PROCESS

Per 40 C.F.R. § 257.97, a remedy must be selected to address the SSLs in the Uppermost Aquifer, based on the results of the CMA. The remedy should be selected as soon as possible and must meet the following standards:

- Be protective of human health and the environment
- Attain the groundwater protection standard as specified pursuant to 40 C.F.R. § 257.95(h)
- Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment
- Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems
- Comply with standards for management of wastes as specified in 40 C.F.R. § 257.98(d)

5.1 Retained Corrective Measures

This CMA was prepared to address the requirements of 40 C.F.R. § 257.96. The following potentially viable corrective measures were identified based upon site-specific conditions:

- Potential Source Control Corrective measures
  - CIP
  - ISS
- Potential Groundwater Corrective measures
  - MNA
  - Groundwater Extraction
  - Groundwater Cutoff Wall
  - PRB

Per 40 C.F.R. § 257.97, a remedy must be selected to address the SSLs in the Uppermost Aquifer, based on the results of the CMA. The remedy should be selected as soon as feasible and must meet the following standards:

- Be protective of human health and the environment
- Attain the groundwater protection standard as specified pursuant to 40 C.F.R. § 257.95(h)
- Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment
- Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems
- Comply with standards for management of wastes as specified in 40 C.F.R. § 257.98(d)

Using the currently available site-specific data discussed in this CMA, CIP is the source control corrective measure that best fits the standards mentioned above. It is a proven, reliable technology with relatively short implementation (and therefore GWPS attainment) timelines compared to ISS.

Based on the analysis completed to-date (**Appendix F and G**), MNA combined with source control appears to be a promising groundwater remedy at the Pond System when reviewed against the requirements in 40 C.F.R. § 257.96(c).

5.2 Future Actions

Supplemental site investigation activities completed through 2024 will be provided in a revised Hydrogeologic Site Characterization Report and incorporated into the groundwater model used to evaluate the proposed closure and remedy of the Pond System. Semiannual reports per 40 C.F.R. § 257.97 will be prepared to describe the progress in selecting and designing the remedy that addresses the cobalt SSL in the Uppermost Aquifer. A final report describing the selected remedy and how it meets the standards listed above will also be prepared per 40 C.F.R. § 257.97.

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TABLES

TABLE 2-1. ASSESSMENT MONITORING PROGRAM SUMMARY

CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Event	Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
A1R	September 18-20, 2018	January 2, 2019	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-10) Cobalt (MW-4) 'Molybdenum (MW-6)	January 7, 2019	April 8, 2019	September 5, 2019 (completed CMA)
A2	March 12-14, 2019	April 29, 2019	Appendix III	--	--	--	--
			Appendix IV	Arsenic (MW-2, MW-10) Cobalt (MW-4) 'Molybdenum (MW-6)	July 29, 2019	October 28, 2019	ongoing
DEL	June 12-14, 2019 (delineation event)[2]	July 1, 2019	Cobalt and Molybdenum	NA	NA	NA	NA
A2D	September 9-10, 2019	October 8, 2019	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-10) Cobalt (MW-4) 'Molybdenum (MW-6)	January 6, 2020	April 6, 2020	Feasibility study phase of CMA; Public meeting held December 16, 2019
A3	April 6-7, 2020	May 4, 2020	Appendix III	--	--	--	--
			Appendix IV	Arsenic (MW-2, MW-10, MW-13) Cobalt (4A, MW-4) 'Molybdenum (MW-6)	August 3, 2020	November 12, 2020	March 5, 2020 & September 5, 2020 (Semiannual remedy selection progress reports)
A3D	September 14-15, 2020	October 20, 2020	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-10, MW-13) Cobalt (4A, MW-4) 'Molybdenum (MW-6)	January 18, 2021	NA	November 30, 2020 (revised CMA) March 5, 2021 (Semiannual remedy selection progress report)
A4	March 24-25, 2021	April 14, 2021	Appendix III	--	--	--	--
			Appendix IV	Arsenic (MW-2, MW-10, MW-13) Cobalt (4A, MW-4) 'Molybdenum (MW-6)	July 13, 2021	NA	September 5, 2021 (Semiannual remedy selection progress report)
A4D	September 15-16, 2021	October 4, 2021	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-6, MW-10, MW-13) Cobalt (4A, MW-4) 'Molybdenum (MW-6)	January 3, 2022	NA	March 5, 2022 (Semiannual remedy selection progress report)

TABLE 2-1. ASSESSMENT MONITORING PROGRAM SUMMARY
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Event	Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
A5	March 23-24, 2022	April 7, 2022	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-6, MW-10, MW-13) Cobalt (MW-4)	July 19, 2022	NA	September 5, 2022 (Semiannual remedy selection progress report)
A5D	September 21-22, 2022	October 14, 2022	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-6, MW-10, MW-13) Cobalt (4A, MW-4)	January 31, 2023	NA	March 5, 2023 (Semiannual remedy selection progress report)
A6	March 13-15, 2023	April 19, 2023	Appendix III	--	--	--	--
			Appendix IV	Arsenic (MW-2, MW-6, MW-10, MW-13) Cobalt (4A, MW-4)	July 18, 2023	NA	September 5, 2023 (Semiannual remedy selection progress report)
A6D	September 21-25, 2023	October 17, 2023	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-6, MW-10, MW-13) Cobalt (4A, MW-4)	January 15, 2024	April 2024	March 5, 2024 (Semiannual remedy selection progress report)
A7	March 25-28, 2024	April 30, 2024	Appendix III	--	--	--	--
			Appendix IV	Arsenic (MW-2, MW-6, MW-10) Cobalt (MW-4)	July 29, 2024	NA	September 5, 2024 (Semiannual remedy selection progress report)
A7D	September 9-12, 2024	October 8, 2024	Appendix III	--	--	--	--
			Appendix IV Detected[1]	Arsenic (MW-2, MW-6, MW-10) Cobalt (MW-4)	January 6, 2025	NA	Due March 5, 2025 (Semiannual remedy selection progress report)

[O: RAB 9/11/20, C: EJT 9/16/20, U: BGH 11/18/20, U:KLT 11/24/20, C: RAB 11/24/2020, U: LDC 12/11/2024, C:RAB 2/10/2025]

Notes:
-- = SSL evaluation not apply to Appendix III parameters
ASD = Alternative Source Demonstration
CMA = Corrective Measures Assessment
NA = Not Applicable
SSL = Statistically Significant Level
1. Groundwater sample analysis was limited to Appendix IV parameters detected in previous events in accordance with 40 C.F.R. Part 257.95(d)(1).
2. June 12-14, 2019 samples were collected as part of a delineation event and analytical results were not statistically evaluated for SSLs. Individual monitoring well exceedances of the GWPS are presented in Table 2.

TABLE 2-2. GROUNDWATER CONCENTRATIONS DELINEATING THE COBALT PLUME
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Monitoring Well ID	GWPS	A1R		A2		DEL[2]		A2R		A2D		A3	
		September 18-20, 2018		March 12-14, 2019		June 12-14, 2019		8/9/2019		September 9-10, 2019		April 6-7, 2020	
		Result	LCL[1]	Result	LCL[1]	Result	LCL[1]	Result	LCL[1]	Result	LCL[1]	Result	LCL[1]
4A	0.006	NS	NS	NS	NS	NS	NA	0.00200	0.00200	NS	NS	0.00908	**0.00908**
MW-1	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA	NS	NS	<0.0005	<0.0005	<0.002	<0.002
MW-2	0.006	NS	0.00050	0.00098	0.00050	NS	NS	NS	NS	0.00063	0.00051	<0.002	0.00052
MW-3A	0.006	NS	0.00022	0.00223	0.00050	NS	NS	NS	NS	<0.0005	0.00050	<0.002	0.00050
MW-4	0.006	0.01870	**0.00762**	0.00588	**0.00727**	0.0083	NA	NS	NS	0.01710	**0.00795**	0.02240	**0.00844**
MW-5	0.006	<0.0005	0.00050	<0.0005	0.00050	0.00066	NA	NS	NS	0.00052	0.00050	<0.002	0.00050
MW-6	0.006	0.00473	0.00255	0.00258	0.00253	0.0033	NA	NS	NS	0.00296	0.00263	0.00263	0.00262
MW-7	0.006	<0.0005	NA[3]	<0.0005	NA[3]	<0.0005	NA[3]	NS	NS	<0.0005	NA[3]	<0.002	NA[3]
MW-8	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	NS	NS	<0.0005	0.00050	<0.002	0.00050
MW-9	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	NS	NS	<0.0005	0.00050	<0.002	0.00050
MW-10	0.006	NS	0.00116	<0.0005	0.00095	NS	NS	NS	NS	<0.0005	-0.00599	<0.002	0.00073
MW-11	0.006	NS	0.00211	0.00061	-0.00457	NS	NS	NS	NS	0.00062	-0.00420	<0.002	-0.00382
MW-12	0.006	0.00193	0.00183	0.00194	0.00183	0.0023	NA	NS	NS	0.00256	0.00193	0.00259	0.00193
MW-13	0.006	<0.0005	-0.01049	<0.0005	-0.01040	<0.0005	NA	NS	NS	<0.0005	-0.00836	<0.002	-0.00887
MW-14	0.006	NI	NI	NI	NI	0.00099	NA	NS	NS	0.00069	0.00069	<0.002	<0.002
MW-15	0.006	NI	NI	NI	NI	0.0065	NA	NS	NS	0.00360	0.00360	0.00386	0.00386
MW-16	0.006	NI	NI	NI	NI	0.00960	NA	NS	NS	0.00267	0.00267	0.00217	0.00217
MW-17	0.006	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW-18	0.006	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW-19	0.006	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
MW-4A	0.006	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI

TABLE 2-2. GROUNDWATER CONCENTRATIONS DELINEATING THE COBALT PLUME
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Monitoring Well ID	GWPS	A3R		A3D		A4		A4D		A5		A5R	
		June 12, 2020		September 14-15, 2020		March 24-25, 2021		September 15-16, 2021		March 23-24, 2022		June 30, 2022	
		Result	LCL [1]	Result	LCL [1]	Result	LCL [1]	Result	LCL [1]	Result	LCL [1]	Result	LCL [1]
4A	0.006	0.012	**0.012**	0.0109	**0.01090**	0.0127	**0.00929**	0.00928	**0.00921**	NS	NS	0.00168	**0.00642**
MW-1	0.006	NS	NS	<0.002	0.00200	<0.002	0.00200	<0.002	0.00200	<0.002	0.00200	NS	NS
MW-2	0.006	NS	NS	<0.002	0.00059	<0.002	0.00064	<0.002	0.00069	<0.002	0.00073	NS	NS
MW-3A	0.006	NS	NS	<0.002	0.00044	<0.002	0.00049	<0.002	0.00053	<0.002	0.00057	NS	NS
MW-4	0.006	NS	NS	0.0149	**0.00888**	0.0135	**0.00809**	0.01580	**0.00903**	0.01300	**0.00921**	NS	NS
MW-5	0.006	NS	NS	<0.002	0.00050	<0.002	0.00050	<0.002	0.00050	<0.002	0.00050	NS	NS
MW-6	0.006	NS	NS	0.00266	0.00268	0.00284	0.00269	0.00294	0.00271	0.00766	0.00283	NS	NS
MW-7	0.006	NS	NS	<0.002	NA [3]	<0.002	NA [3]	<0.002	NA [3]	<0.002	NA [3]	NS	NS
MW-8	0.006	NS	NS	<0.002	0.00050	<0.002	0.00050	<0.002	0.00050	<0.002	0.00050	NS	NS
MW-9	0.006	NS	NS	<0.002	0.00050	<0.002	0.00050	<0.002	0.00050	<0.002	0.00050	NS	NS
MW-10	0.006	NS	NS	<0.002	0.00118	<0.002	0.00125	<0.002	0.00131	<0.002	0.00136	NS	NS
MW-11	0.006	NS	NS	<0.002	-0.00298	<0.002	-0.00272	<0.002	-0.00243	<0.002	-0.00223	NS	NS
MW-12	0.006	NS	NS	0.00245	0.00200	0.00236	0.00202	0.00290	0.00225	0.00295	0.00239	NS	NS
MW-13	0.006	NS	NS	<0.002	-0.00794	<0.002	-0.00774	<0.002	-0.00733	<0.002	-0.00699	NS	NS
MW-14	0.006	NS	NS	<0.002	0.00200	<0.002	0.00200	<0.002	0.00200	<0.002	0.00200	NS	NS
MW-15	0.006	NS	NS	0.00379	0.00379	0.00371	0.00342	0.00405	0.00350	0.00284	0.00324	NS	NS
MW-16	0.006	NS	NS	0.00347	0.00347	<0.002	0	0.00376	0.00200	<0.002	0.00200	NS	NS
MW-17	0.006	NI	NI	<0.002	NA [3]	<0.002	NA [3]	<0.002	NA [3]	<0.002	NA [3]	NS	NS
MW-18	0.006	NI	NI	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-19	0.006	NI	NI	0.0145	NA [3]	0.00233	NA [3]	0.00435	NA [3]	<0.002	NA [3]	NS	NS
MW-4A	0.006	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI

TABLE 2-2. GROUNDWATER CONCENTRATIONS DELINEATING THE COBALT PLUME
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Monitoring Well ID	GWPS	A5D		A6		A6D		A6DR		A7		A7D	
		September 21-22, 2022		March 13-15, 2023		September 21-25, 2023		December 13-14, 2023		March 25-28, 2024		September 9-12, 2024	
		Result	LCL [1]	Result	LCL [1]	Result	LCL [1]	Result	LCL [1]	Result	LCL [1]	Result	LCL [1]
4A	0.006	0.00128	0.00583	0.01070	**0.00633**	0.00770	**0.00647**	0.00655	**0.00645**	0.00665	**0.00600**	NS	NS
MW-1	0.006	0.000257	0.00026	0.0000983	0.00200	0.000082	0.00200	NS	NS	<0.0000596	0.00200	0.0000845	0.00200
MW-2	0.006	0.000487	0.00050	0.000264	0.00063	0.000302	0.00063	NS	NS	0.000464	0.00063	0.000375	0.00073
MW-3A	0.006	0.0000655	0.00050	0.0000649	0.00050	0.0000611	0.00050	NS	NS	<0.0000596	0.00055	<0.0000596	0.00145
MW-4	0.006	0.00619	**0.00903**	0.01410	**0.00923**	0.01140	**0.00931**	NS	NS	0.01660	**0.00954**	0.00974	**0.00955**
MW-5	0.006	0.000349	0.00050	0.000235	0.00050	0.00041	0.00050	NS	NS	0.000337	0.00050	0.000461	0.00053
MW-6	0.006	0.00689	0.00294	0.00486	0.00301	0.00169	0.00298	NS	NS	0.000978	0.00284	0.000829	0.00272
MW-7	0.006	0.000123	NA [3]	0.000328	NA [3]	<0.0000596	NA [3]	NS	NS	<0.0000596	NA [3]	<0.0000596	NA [3]
MW-8	0.006	<0.0000596	0.00050	0.0000871	0.00050	<0.0000596	0.00050	NS	NS	0.0000916	0.00050	<0.0000596	0.00050
MW-9	0.006	0.000215	0.00050	0.000159	0.00050	0.000128	0.00050	NS	NS	0.000177	0.00050	0.000174	0.00050
MW-10	0.006	0.000329	0.00050	<0.0000596	0.00200	0.0000702	0.00200	NS	NS	0.000066	0.00200	<0.0000596	0.00200
MW-11	0.006	0.000586	-0.00231	0.000507	0.00103	0.000616	0.00085	NS	NS	0.000612	0.00085	0.000688	0.00200
MW-12	0.006	0.00300	0.00252	0.00271	0.00256	0.00301	0.00265	NS	NS	0.00274	0.00267	0.00245	0.00261
MW-13	0.006	0.000572	0.00050	0.000316	0.00050	0.000294	0.00050	NS	NS	0.000271	0.00050	0.000281	0.00050
MW-14	0.006	0.00052	0.00052	0.000493	0.00200	0.000468	0.00200	NS	NS	0.000506	0.00200	0.000509	0.00200
MW-15	0.006	0.00241	0.00298	0.00260	0.00289	0.00244	0.00280	NS	NS	0.00192	0.00082	0.00200	0.00078
MW-16	0.006	0.000554	0.00200	0.00105	0.00200	0.00102	0.00200	NS	NS	0.000479	0.00200	0.000453	0.00200
MW-17	0.006	0.00158	NA [3]	0.00161	NA [3]	0.00154	NA [3]	NS	NS	0.00176	NA [3]	0.00166	NA [3]
MW-18	0.006	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-19	0.006	0.000872	NA [3]	0.000474	NA [3]	0.000396	NA [3]	NS	NS	0.000758	NA [3]	0.000561	NA [3]
MW-4A	0.006	NI	NI	NI	NI	0.000334	NA	0.00706	NA	0.00629	NA	0.00424	NA

[O: KLT 09/01/2020, U:KLT 11/23/2020, C:RAB 11/23/2020, U:LDC 02/06/2025, C:RAB 2/10/2025]

Notes:

Bold red highlighted concentration indicates exceedance of GWPS for parameter indicated
< = Not Detected at Reporting Limit
GWPS = Groundwater Protection Standard
LCL = lower confidence limit
mg/L = milligrams per liter
NA = Not applicable; samples were not statistically evaluated.
NI = Not Installed
NS = Not Sampled

[1] Negative comparison values are the result of the Lower Confidence Band around a negative slope.

[2] June 12-14, 2019 samples were collected as part of a delineation event and analytical results were not statistically evaluated for SSLs.

[3] Background well; LCL not calculated.

TABLE 3-1. CORRECTIVE MEASURES ASSESSMENT MATRIX
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

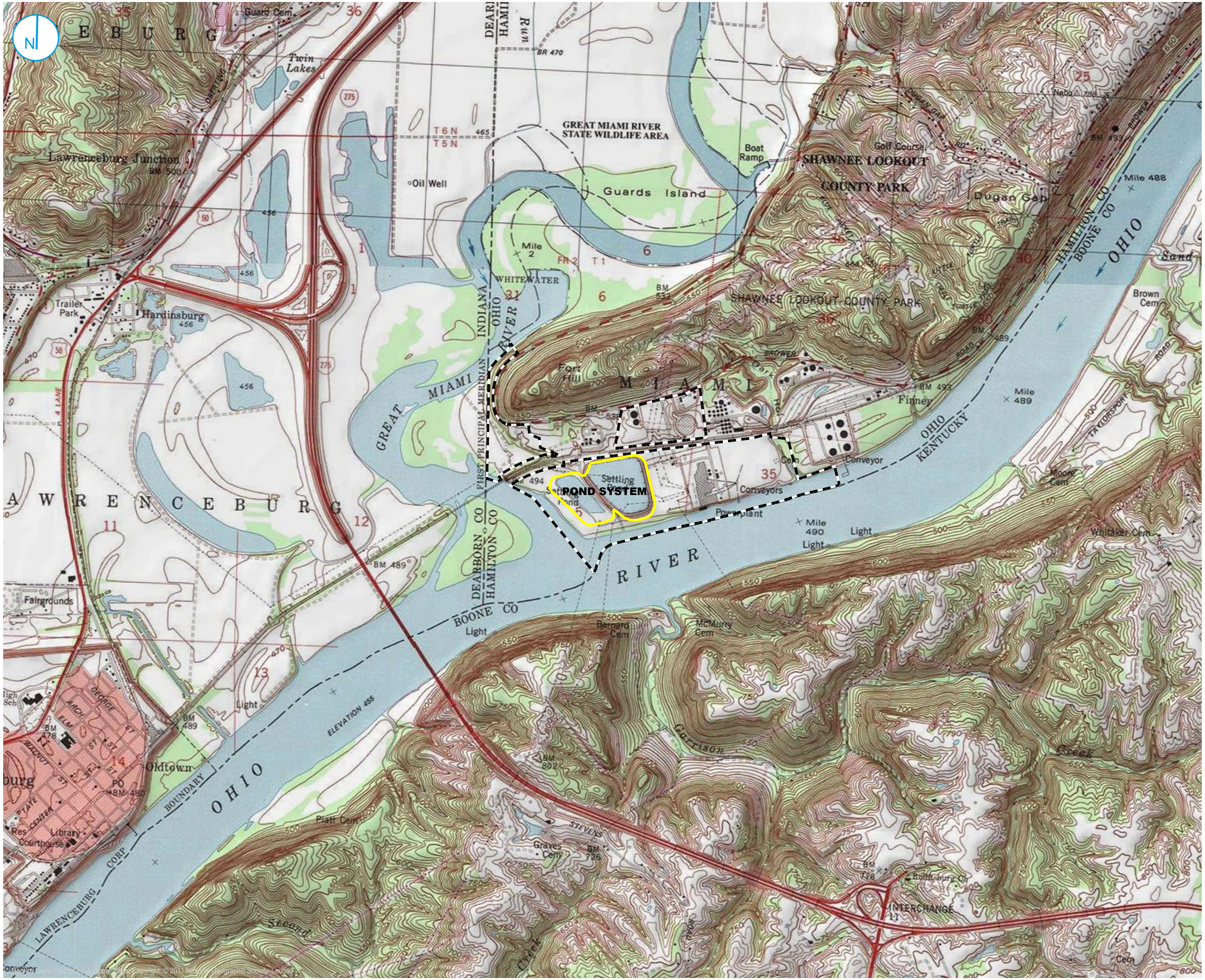
	Evaluation Factors	**Performance**	**Reliability**	**Ease of Implementation**	**Potential Impacts of Remedy** (safety impacts, cross-media impacts, control of exposure to any residual contamination)	**Time Required to Begin and Implement Remedy**[1]	**Time to Attain Groundwater Protection Standards**	**Institutional Requirements** (state/local permit requirements, environmental/public health requirements that affect implementation of remedy)
Source Control Corrective Measures	**Closure-In-Place (CIP)**	Widely accepted source control method, routinely approved; variable performance based on site-specific conditions which are favorable for Miami Fort Power Plant.	Reliable technology.	Commonly performed construction and earthwork.	Controls exposure to CCR. Some potential short term exposure during construction.	5 to 8 years.	CIP achieves source control in 5 to 8 years. Additional time to attain GWPS is dependent on selected groundwater remediation technology.	Requires regulatory approval processes.
	Closure-By-Removal (CBR)	Widely accepted, good performance with regard to source control.	Reliable technology.	Commonly performed earthwork. Dewatering can be problematic. Insufficient landfill capacity available with 50 miles.	Significant impact to the community due to CCR transport; reduction in landfill airspace; increases potential for additional mass release.	20 to 24 years.	CBR achieves source control in 20 to 24 years. Additional time to attain GWPS is dependent on selected groundwater remediation technology.	Requires regulatory approval processes.
	In-Situ Solidification /Stabilization	Not proven in CCR applications.	Unknown.	Requires extensive preimplementation testing and specialized equipment and contractors. Site specific conditions are favorable.	Some potential short term exposure during construction.	Dependent on application volume.	Dependent on selected groundwater remediation technology.	Requires regulatory approval processes.

TABLE 3-1. CORRECTIVE MEASURES ASSESSMENT MATRIX
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

	Evaluation Factors	**Performance**	**Reliability**	**Ease of Implementation**	**Potential Impacts of Remedy** (safety impacts, cross-media impacts, control of exposure to any residual contamination)	**Time Required to Begin and Implement Remedy**[1]	**Time to Attain Groundwater Protection Standards**	**Institutional Requirements** (state/local permit requirements, environmental/public health requirements that affect implementation of remedy)
Groundwater Remediation Corrective Measures	**MNA**	Performance appears likely to be good given existing information on the constituents of concern and site conditions.	Planned additional testing will evaluate if the attenuation mechanism has low reversibility and the aquifer has sufficient capacity.	Easy - completion of tiered evaluation and long-term monitoring required, neither of which require extensive specialized equipment or contractors.	None identified.	1 year, not including source control measures.	Dependent on site-specific conditions including schedule for source controls. Planned additional testing will evaluate attenuation rate.	Requires state regulatory approval processes; additional investigation is designed to address criteria of regulatory process
	Groundwater Extraction	Widely accepted, routinely approved; variable performance based on site-specific conditions. Challenges presented by high permeability aquifer, proximity to Ohio River, and other production wells.	Reliable if properly designed, constructed and maintained.	Design challenges due to groundwater hydraulics and plume configuration. Extracted groundwater may require management of high volumes of water.	Alters groundwater flow system. Potential for some limited exposure to extracted groundwater.	3 to 4 years.	Dependent on site-specific conditions including schedule for source controls.	Extracted groundwater will require management and approval from OEPA. May require high capacity well registration.
	Groundwater Cutoff Wall	Widely accepted, routinely approved, good performance if properly designed and constructed. May not be feasible for full penetration of the Uppermost Aquifer.	Reliable if properly designed and constructed (if feasible). Hydraulic conductivity of aquifer is favorable.	Widely used, established technology. May not be feasible for full penetration of the Uppermost Aquifer.	Alters groundwater flow system.	6 to 9 years.	Needs to be combined with other remediation technology(ies). Time required to attain GWPS dependent on combined technologies and schedule for source control.	Requires regulatory approval processes.
	Permeable Reactive Barrier	Permeable Reactive Barrier treatment not well established for cobalt, therefore performance is unknown.	Variable reliability based on site-specific groundwater hydraulics and geochemical conditions. Hydraulic conductivity of aquifer is favorable.	Design challenges associated with groundwater hydraulics and plume configuration.	Alters groundwater flow system.	6 to 9 years.	Dependent on site-specific conditions including detailed analysis of reactivity and maintenance.	Requires regulatory approval processes.
	In-Situ Chemical Treatment	In-Situ treatment not well established for cobalt, therefore performance is unknown.	Variable reliability based on site-specific geochemical conditions.	Design challenges associated with groundwater hydraulics.	Alters groundwater geochemistry.	8 to 13 years.	Dependent on site-specific conditions including detailed analysis of reactivity.	May require Underground Injection Control approval.

Notes:
[1] Time required to begin and implement remedy includes design, permitting and construction.
CCR = coal combustion residuals
GWPS = groundwater protection standard
MNA = monitored natural attenuation
OEPA = Ohio Environmental Protection Agency

FIGURES



▭ REGULATED UNIT (SUBJECT UNIT)

⬚ PROPERTY BOUNDARY

0 1,000 2,000 Feet

SITE LOCATION MAP

CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM

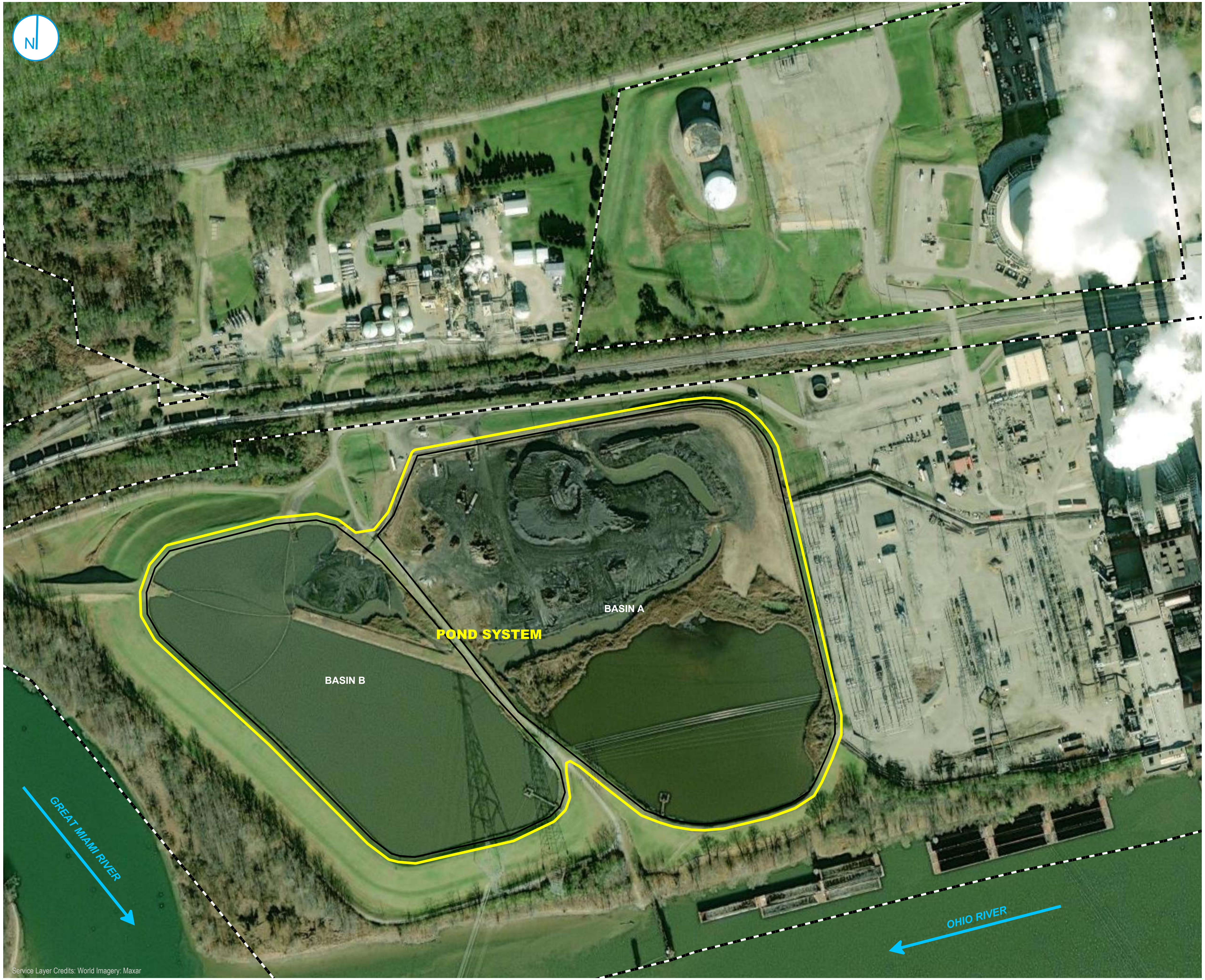
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

FIGURE 1-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Miami_Fort\MFS_115_PS_HCR.aprx\Figure 1-1. Site Location Map

PROJECT: 169000XXXX | DATED: 8/16/2024 | DESIGNER: GALARNMC



🟨 REGULATED UNIT (SUBJECT UNIT)
☐ SITE FEATURE
⬚ PROPERTY BOUNDARY

0 150 300
Feet

SITE MAP

CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM

MIAMI FORT POWER PLANT
NORTH BEND, OHIO

FIGURE 1-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Miami_Fort\MFS_115_PS_HCR.aprx\Figure 1-2. Site Map

PROJECT: 169000XXXX | DATED: 8/16/2024 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\CMA\Miami_Fort\MFS_115.aprx\Figure 2-1. Monitoring Well Location Map

Service Layer Credits: Bing Maps Aerial: © 2025 Microsoft Corporation © 2025 Maxar ©CNES (2025) Distribution Airbus DS

PROJECT: 169000XXXX | DATED: 6/23/2025 | DESIGNER: GALARNMC

- 🟦 COMPLIANCE WELL
- 🟫 BACKGROUND WELL
- ⬛ MONITORING WELL
- 🟩 PORE WATER WELL
- 🟪 MIAMI FORT PRODUCTION WELL
- 🟧 FORT HILL PLANT PRODUCTION WELL
- ▭ REGULATED UNIT (SUBJECT UNIT)
- ▭ SITE FEATURE
- ⬚ PROPERTY BOUNDARY

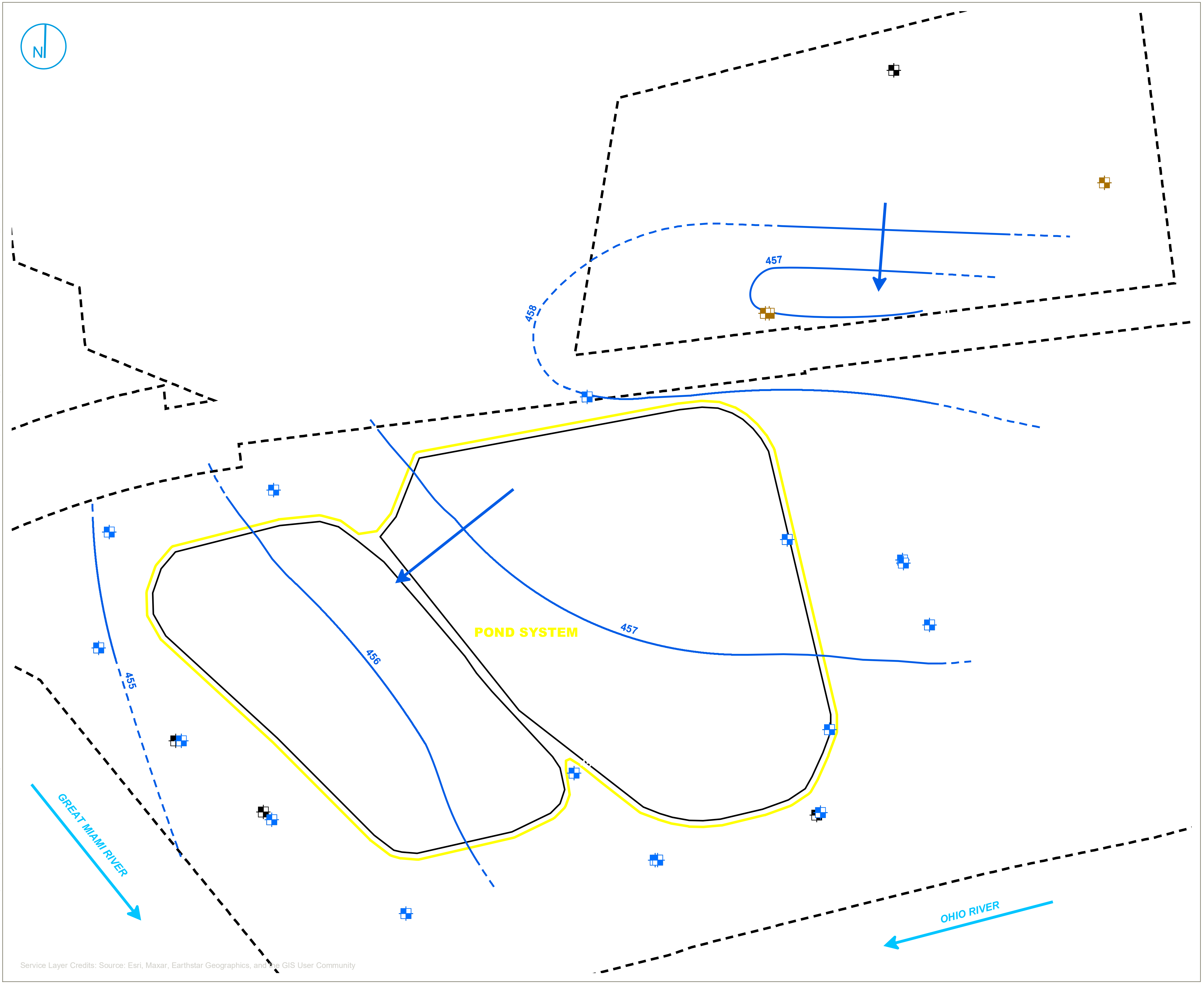
WELL LOCATION MAP

CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- PROPERTY BOUNDARY

NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 150 300 Feet

POTENTIOMETRIC SURFACE MAP
MARCH 13, 2023

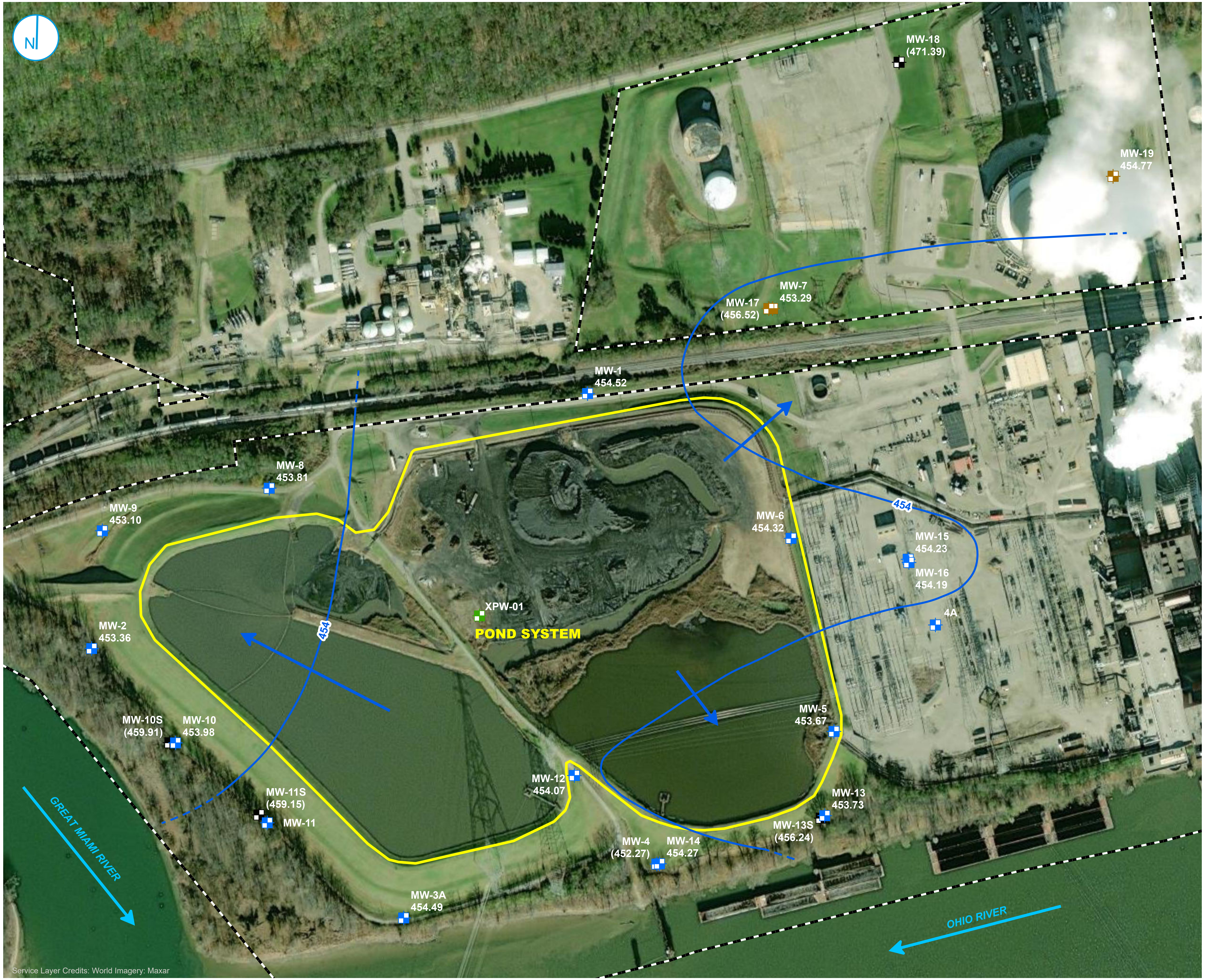
CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

FIGURE 2-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2023\Miami_Fort\PS_115\MF PS 115 Pot Surface 20230313.mxd

PROJECT: 169000XXXX | DATED: 6/1/2023 | DESIGNER: egreaves



- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- PROPERTY BOUNDARY

NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 150 300 Feet

POTENTIOMETRIC SURFACE MAP
SEPTEMBER 21, 2023

CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM

MIAMI FORT POWER PLANT
NORTH BEND, OHIO

FIGURE 2-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

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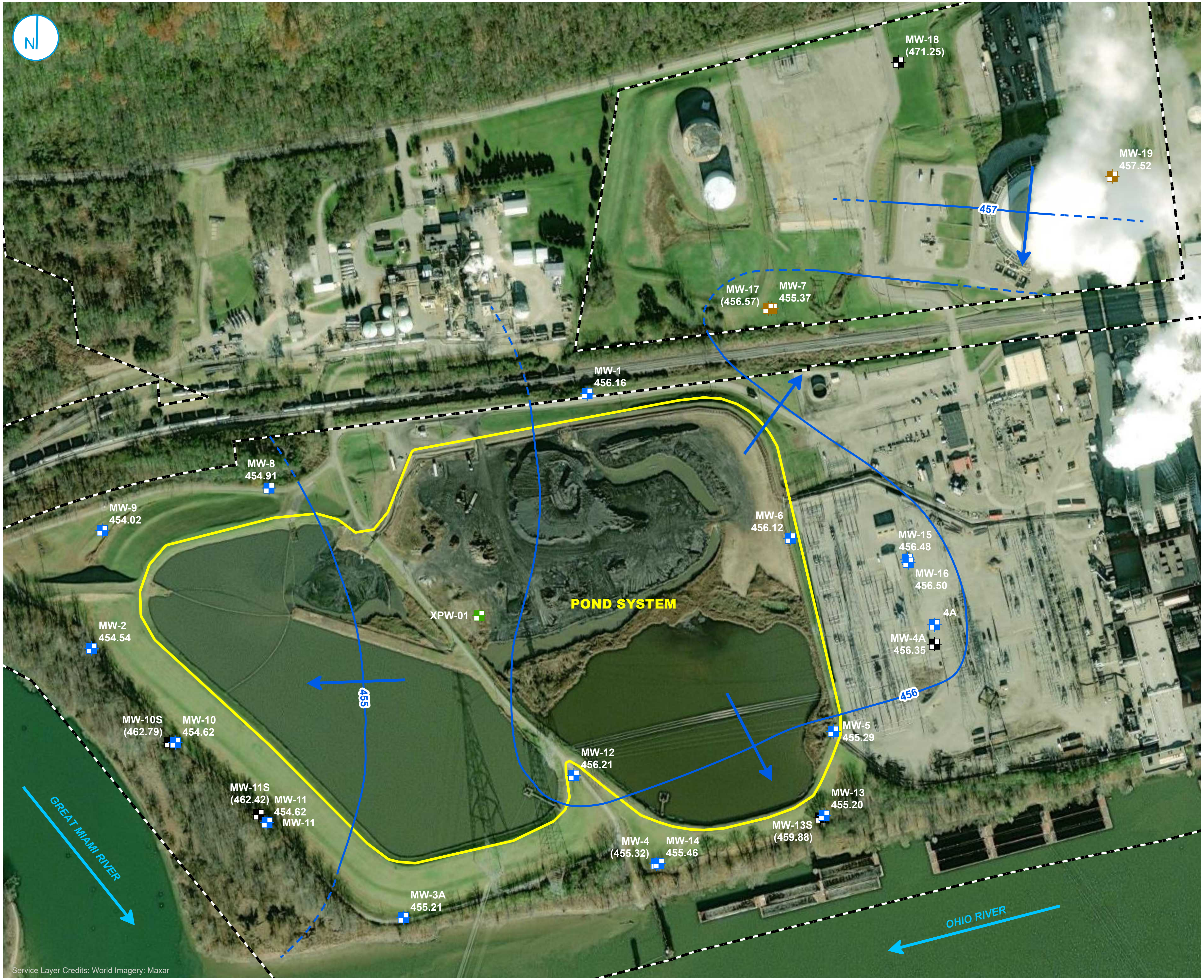

🟦 COMPLIANCE MONITORING WELL

🟫 BACKGROUND MONITORING WELL

⬛ MONITORING WELL

🟩 PORE WATER WELL

— GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)

- - INFERRED GROUNDWATER ELEVATION CONTOUR

→ GROUNDWATER FLOW DIRECTION

🟨 REGULATED UNIT (SUBJECT UNIT)

⬚ PROPERTY BOUNDARY

NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 150 300
Feet

POTENTIOMETRIC SURFACE MAP
MARCH 25-26, 2024

CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM

MIAMI FORT POWER PLANT
NORTH BEND, OHIO

FIGURE 2-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 5/15/2024 | DESIGNER: egreaves

COMPLIANCE MONITORING WELL

BACKGROUND MONITORING WELL

MONITORING WELL

GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

REGULATED UNIT (SUBJECT UNIT)

PROPERTY BOUNDARY

NOTES:

1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 150 300 Feet

POTENTIOMETRIC SURFACE MAP
SEPTEMBER 9, 2024

CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM

MIAMI FORT POWER PLANT
NORTH BEND, OHIO

FIGURE 2-5

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

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PROJECT: 169000XXXX | DATED: 10/29/2024 | DESIGNER: PWYSIATKO

● TOTAL COBALT GWPS EXCEEDANCE

● WELL WITHOUT EXCEEDANCE

▭ REGULATED UNIT (SUBJECT UNIT)

⬚ PROPERTY BOUNDARY

NOTE:
GWPS = GROUNDWATER PROTECTION STANDARD (0.006 mg/L)

0 112.5 225 Feet

TOTAL COBALT PLUME MAP

CORRECTIVE MEASURES ASSESSMENT
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

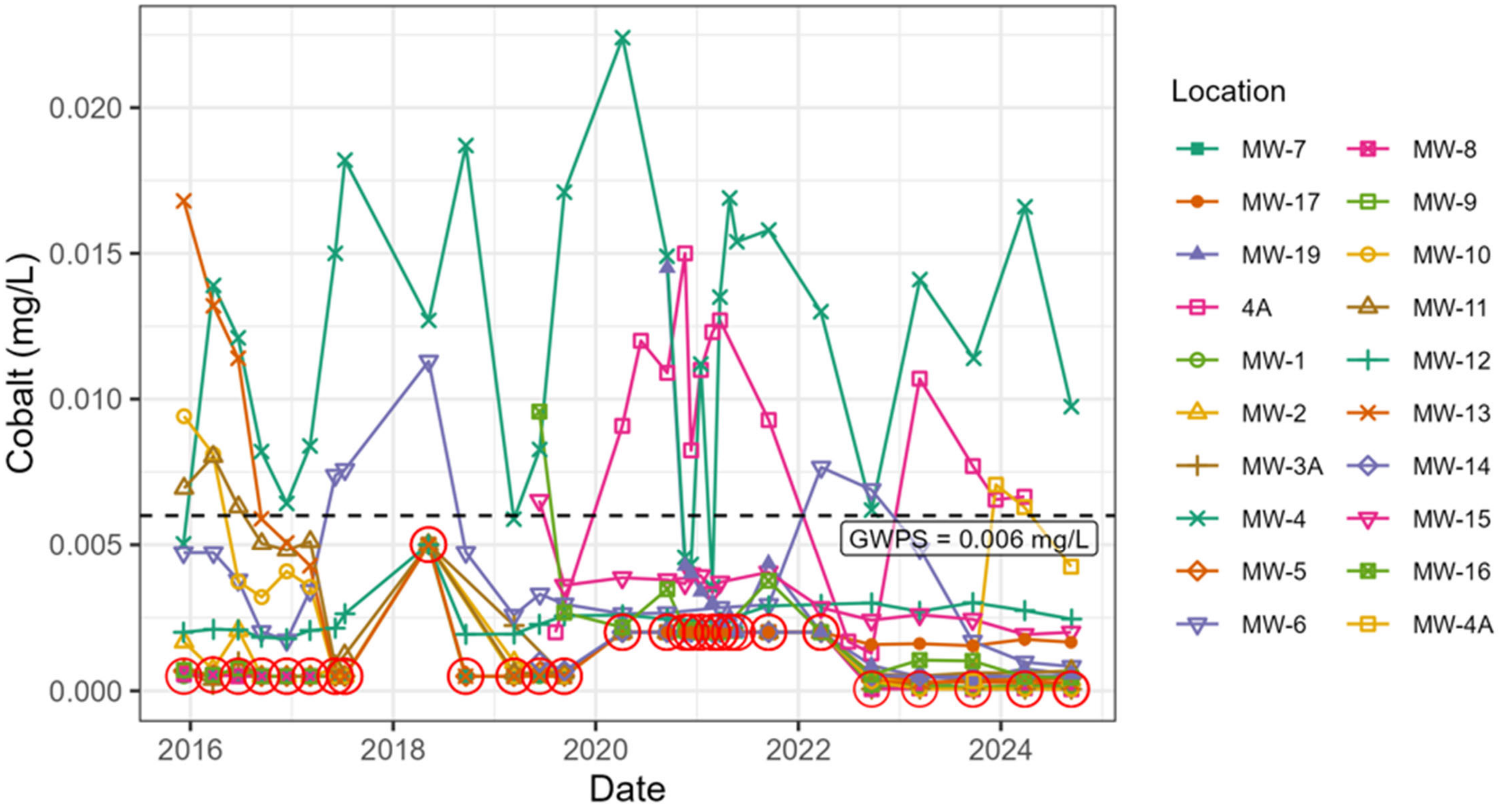
FIGURE 2-6

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\CMA\Miami_Fort\MFS_115.aprx

PROJECT: 169000XXXX | DATED: 6/23/2025 | DESIGNER: GALARNMC



NOTES:
mg/L = milligrams per liter
GWPS = groundwater protection standard

RAMBOLL

DRAFTED BY: AO | 2/7/2025

Cobalt Timeseries
Corrective Measures Assessment
Pond System
Miami Fort Power Plant
North Bend, Ohio

Figure 2-7

APPENDICES

APPENDIX A
ALTERNATE SOURCE DEMONSTRATION FOR ARSENIC SSLS AT MW-2, MW-10, AND MW-13, AND MOLYBDENUM SSL AT MW-6 (RAMBÖLL, 2020)

Intended for
Dynegy Miami Fort, LLC

Date
November 12, 2020

Project No.
1940074922

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

MIAMI FORT POND SYSTEM

CERTIFICATIONS

I, Jacob J. Walczak, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Jacob J. Walczak
Senior Hydrogeologist
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020

I, Nicole M. Pagano, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020

NICOLE M. PAGANO
E-85428

CONTENTS

FIGURES (IN TEXT)

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	Coal Combustion Residuals
CMP	corrugated metal pipe
FGD	Flue Gas Desulfurization
f/k/a	formerly known as
ft	feet
GWPS	Groundwater Protection Standards
HDPE	high density polyethylene
LOEs	lines of evidence
MCD	Miami Conservancy District
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
OEPA	Ohio Environmental Protection Agency
ORP	oxidation-reduction potential
Ramboll	Ramboll Americas Engineering Solutions, Inc., f/k/a O'Brien & Gere Engineers, Inc.
RCRA	Resource Conservation and Recovery Act
Site	Miami Fort Power Station
SSIs	Statistically Significant Increases
SSLs	Statistically Significant Levels
USGS	United States Geological Survey

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of Statistically Significant Levels (SSLs) over Groundwater Protection Standards (GWPS) of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Dynegy Miami Fort, LLC, by Ramboll Americas Engineering Solutions, Inc., formerly known as (f/k/a) O'Brien & Gere Engineers, Inc.(Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Miami Fort Pond System located near North Bend, Ohio.

The most recent Assessment Monitoring sampling event (A3) was completed on April 6 through April 7, 2020 and analytical data were received on May 4, 2020. Analytical data from all sampling events, from December 2015 through A3, were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017) to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPS. That evaluation identified the following SSLs at downgradient monitoring wells:

- Arsenic at wells MW-2, MW-10 and MW-13
- Cobalt at wells MW-4 and 4A
- Molybdenum at well MW-6

In accordance with the Statistical Analysis Plan, wells MW-13 and 4A were resampled on June 12, 2020 and analyzed only for arsenic and cobalt, respectively, to confirm the SSLs. Following evaluation of analytical data from the resample event, the SSLs listed above for MW-13 and 4A were confirmed.

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence (LOEs) demonstrate that sources other than the Miami Fort Pond System were the cause of the arsenic and molybdenum SSLs listed above. This ASD was completed by November 2, 2020, within 90 days of determination of the SSLs (August 3, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii). This ASD does not address cobalt SSLs at downgradient monitoring wells MW-4 and 4A which is addressed by the Corrective Measures Assessment for the Pond System.

2. BACKGROUND

2.1 Site Location and Description

Miami Fort Power Station (Site) is located in the southwest corner of Ohio (Hamilton County) adjacent to the state boundaries of Indiana (west) and Kentucky (south), and approximately 5 miles southwest of North Bend, Ohio on the north shore of the Ohio River at the confluence with the Great Miami River (Figure 1). The Miami Fort Pond System (Pond System) is bounded by the Veolia North America property and Brower Road to the north, the Great Miami River to west, the Ohio River to the south, and the Miami Fort electric switch yard to the east. The Miami Fort production wells are located east of Basin A and Veolia's production wells are located northwest of Basin B. Pond System CCR monitoring well locations, production well locations, and source water sampling locations are shown in Figure 1.

2.2 Description of the CCR Multi-Unit

The Pond System is a CCR Multi-Unit consisting of Basins A and B (CCR Multi-Unit ID 115). The Multi-Unit covers a total area of approximately 51 acres and is located in the southwest corner of the Site property as shown in Figure 1.

Basin A (formerly Unit 111) receives effluent from the sluice lines, which primarily transport bottom ash products as well as flue gas desulfurization (FGD) effluent and some fly ash. Basin A also receives directly discharged miscellaneous yard drainage. The material is discharged into the northern portion of the basin and through a constructed internal ditch line allowing the solids to settle and the water to decant into Basin B. Solid materials collected in Basin A are generally reclaimed for beneficial reuse or landfill placement. The Basin A normal pool level is typically between elevations of 495 and 498 ft. Basin A and Basin B are hydraulically connected with a 48-inch corrugated metal pipe (CMP) culvert sliplined with a 40-inch high density polyethylene (HDPE) pipe that runs through the shared dike, allowing the basins to operate in series. The Basin A outfall is currently not in use and flow-through is controlled by the gate structure (AECOM, 2017).

Basin B (formerly Unit 112) was constructed between 1979 and 1981 (AECOM, 2017). The Basin B normal pool level is typically below the Basin A normal pool and between elevations of 495 and 498 ft. Basin A discharges into Basin B, which is used as a polishing pond prior to discharge to the Ohio River through the permitted outfall structure in Basin B. Miscellaneous yard drainage is also currently discharged directly to Basin B (AECOM, 2017).

2.3 Geology and Hydrogeology

The native geologic materials present beneath the Pond System at the Site include alluvial deposits, glacial outwash (Uppermost Aquifer), and bedrock, as described below:

- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits are present at a depth ranging from approximately 20 to 60 ft below ground surface (bgs). A silty, sandy clay layer is the primary component of the alluvial deposits. The top of clay elevation ranges from 428 ft referenced to the North American Vertical Datum of 1988 (NAVD88) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to 495 ft beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Pond System and thickens towards the Ohio River. The clay is thickest beneath the southern half of the

Pond System, ranging in thickness from 15 ft to 48 ft. A silt layer, averaging approximately 7 ft thick, overlies the clay in several areas.

- Glacial Outwash (Uppermost Aquifer) - The Uppermost Aquifer consists of glacial outwash sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits beneath the Site is approximately 100 ft; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally overlying the outwash deposits and ranges in thickness from 4 to 30 ft; however, it is not present below the entirety of the Pond System.
- Bedrock - The bedrock consists of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope formations (AECOM, 2017). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft bgs. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

The glacial outwash deposits (Uppermost Aquifer) underlying the Pond System are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently backfilled with deposits of sand, gravel, and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. The thickness of the deposits ranges from approximately 60 to 100 ft and covers much of the width of the terrace between the valley wall to the Great Miami River and Ohio River confluence.

Groundwater elevations across the Site ranged from approximately 456 to 460 ft during A3, coincident with an approximate Ohio River pool elevation of 461 ft. The groundwater elevation contours shown on Figure 2 are based on groundwater measurements collected on April 6, 2020, the day prior to A3 analytical sampling. Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and Veolia’s production wells, and south towards the Ohio River.

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following LOEs:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

These LOEs are described and supported in greater detail below. Monitoring wells and Pond System source water sample locations are shown on Figure 1.

3.1 LOE #1: Median Arsenic and Molybdenum Concentrations in the Pond System Source Water Are Lower Than the Median Arsenic and Molybdenum Concentrations Observed in Downgradient Wells with Arsenic and Molybdenum SSLs.

Box-and-whisker plots graphically represent the range of values of a given dataset using lines to construct a box where the lower line, midline, and upper line of the box represent the values of the first quartile, median, and third quartile values, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and third quartiles of (*i.e.*, below and above the box). The interquartile range (IQR) is the distance between the first and third quartiles. Outliers (values that are at least 1.5 times the IQR away from the edges of the box) are represented by single points plotted outside of the range of the whiskers. The number in parentheses below each plot is the number of observations (i.e. samples) represented in that dataset.

Figure A below provides a box-and-whisker plot of the total arsenic concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2, and B-3 (monitoring well and source water [pond] sampling locations are shown on Figure 1). Total arsenic concentrations obtained in source water samples and presented in Figure A were pooled to provide a median concentration for comparison to arsenic concentrations in monitoring wells.

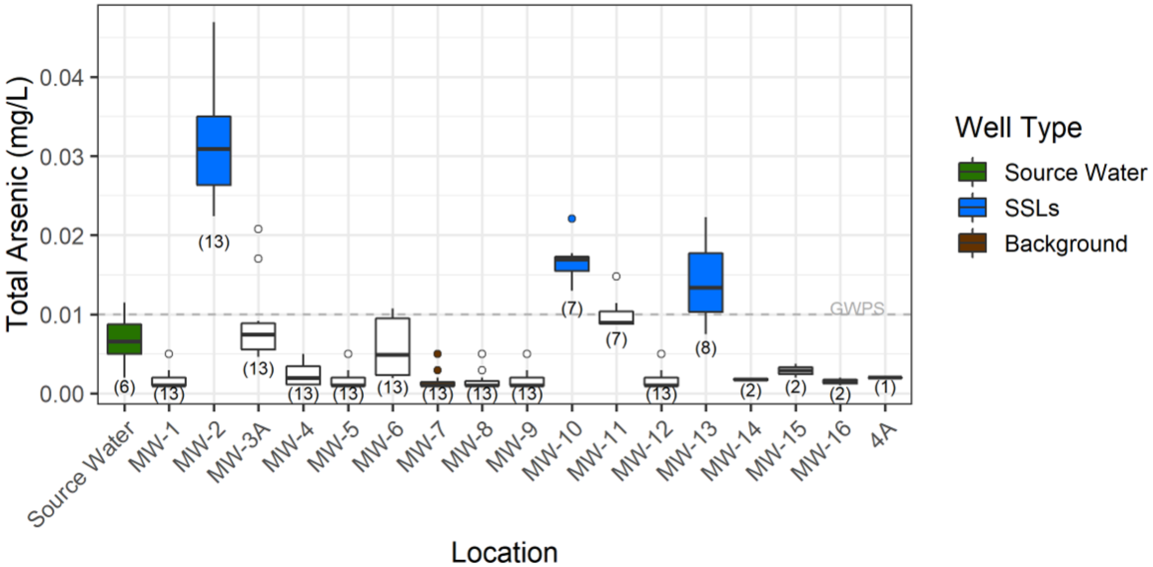


Figure A. Distribution of Arsenic Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure A) shows the arsenic concentrations in wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13) have median arsenic concentrations greater than the median arsenic concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of arsenic in downgradient groundwater at wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13), Pond System source water concentrations would be higher than the groundwater concentrations at those wells. Therefore, the Pond System is not the source of the arsenic in the downgradient groundwater.

Figure B below provides a box-and-whisker plot of the molybdenum concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2 and B-3 (monitoring well and source water sampling locations are shown on Figure 1).

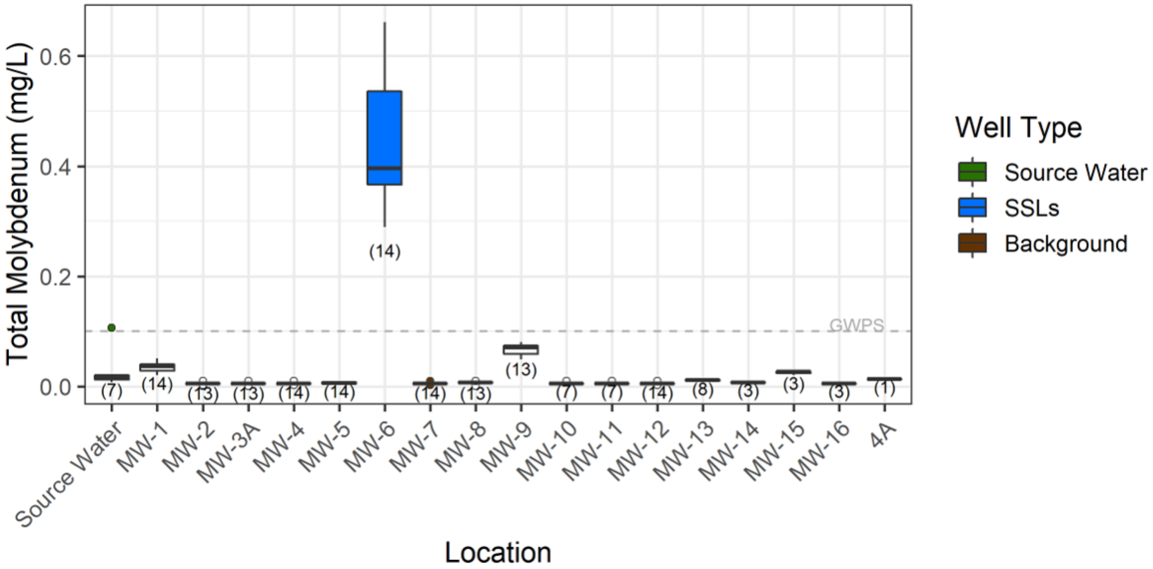


Figure B. Distribution of Molybdenum Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure B) shows the median molybdenum concentration in the well with a molybdenum SSL (*i.e.*, MW-6) is greater than the median molybdenum concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of molybdenum in downgradient groundwater at the well with a molybdenum SSL (*i.e.*, MW-6), Pond System source water concentrations would be higher than the groundwater concentrations at that well. Therefore, the Pond System is not the source of the molybdenum in the downgradient groundwater.

3.2 LOE #2: Arsenic and Molybdenum Concentrations Associated with Monitoring Wells MW-2, MW-10 and MW-13, and MW-6, respectively, are Not Correlated with Boron Concentrations, a Common Indicator for CCR Impacts to Groundwater.

Boron is a common indicator of CCR impacts to groundwater due to its leachability from CCR and mobility in groundwater. If a CCR constituent is identified as an SSL but boron is not correlated with that constituent, it is unlikely that the CCR unit is the source of the SSL.

Figure C below provides a scatter plot of arsenic versus boron concentrations (collected between 2015 and 2020) in downgradient groundwater at wells with arsenic SSLs, along with the results of a Kendall correlation test for non-parametric data. The results of the test at each well are described by the p-value and tau (Kendall's correlation coefficient) included in each plot. Typically, a p-value greater than 0.05 is considered to be a statistically insignificant relationship. The range of tau falls between -1 and 1, with a perfect correlation equal to -1 or 1. The closer tau is to 0, the less of a correlation exists in the data.

The results of the correlation analyses indicated that groundwater concentrations of arsenic observed at monitoring wells MW 2, MW-10, and MW-13 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure C below illustrates the lack of a relationship between arsenic concentrations and boron concentrations in groundwater at MW-2, MW-10, and MW-13, where the p-values are greater than 0.05 and tau is close to 0.

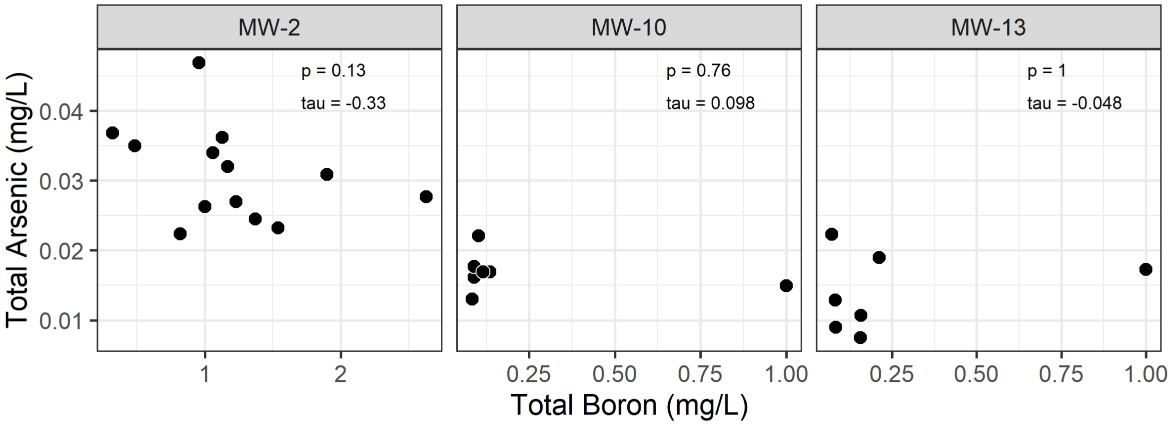


Figure C. Arsenic Concentrations Versus Boron Concentrations at Wells MW-2, MW-10, and MW-13 (2015-2020).

Figure D below provides a scatter plot of molybdenum versus boron concentrations (collected between 2015-2020) in downgradient groundwater at the only well with a molybdenum SSL, MW-6, along with the results of Kendall correlation analysis at MW-6 as described by the p-values and tau correlation coefficients included in the plot. The results of the Kendall correlation analysis indicated that groundwater molybdenum concentrations observed at monitoring well MW-6 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure D below illustrates the lack of a relationship between molybdenum concentrations and boron concentrations in groundwater at MW-6, where the p-value is greater than 0.05 and tau is close to 0.

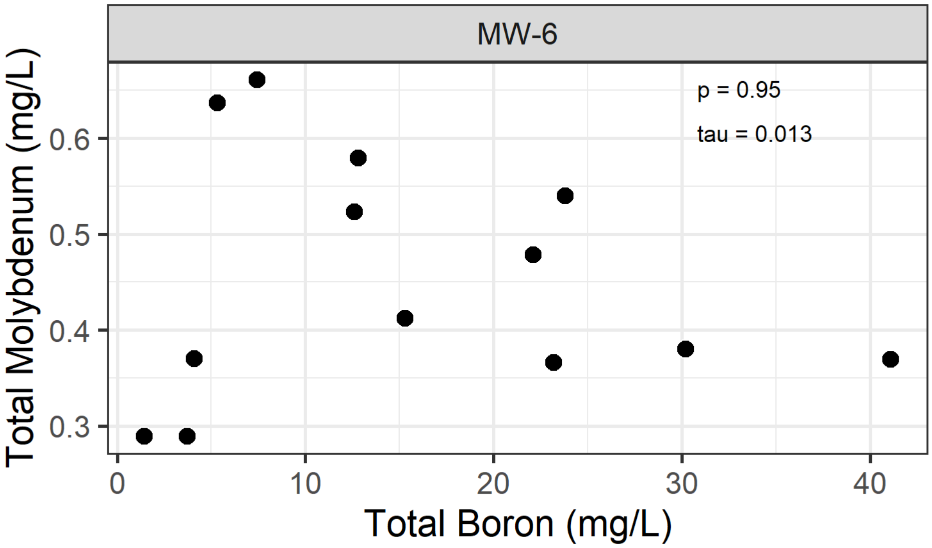


Figure D. Molybdenum Concentrations Versus Boron Concentrations at Well MW-6 (2015-2020).

Arsenic and molybdenum concentrations do not correlate with boron concentrations in downgradient monitoring wells with arsenic and molybdenum SSLs, indicating the Pond System is not the source of CCR constituents detected in the downgradient monitoring wells.

3.3 LOE #3: Naturally-Occurring Concentrations of Arsenic are Commonly Found in Soils and Groundwater in Southwestern Ohio. MW-2, MW-10, and MW-13 are Located in Southwestern Ohio, Along the Banks of the Great Miami River and Ohio River, Where They are Susceptible to Geochemical Conditions that can Mobilize Naturally-Occurring Arsenic from the Soils into Groundwater.

Naturally-occurring concentrations of arsenic are commonly found in nearby soils. Ten surficial soil samples (0 to 2 ft bgs) were collected by Ohio Environmental Protection Agency (OEPA), approximately 3,000 ft northeast of the Pond System (Figure 1), near Shawnee Lookout in Hamilton County Park, and analyzed for arsenic as part of a study to evaluate background soil concentrations of Resource Conservation and Recovery Act (RCRA) metals in the Cincinnati area (OEPA, 2015). Results of the analysis indicated surficial terrace soils (clay) adjacent to the Pond System have background arsenic concentrations ranging from 5.61 to 8.20 milligrams per kilogram (mg/kg).

Arsenic occurs naturally in southwestern Ohio glacial buried-valley deposit aquifers like the Uppermost Aquifer. Fifty-seven (57) groundwater samples were collected by the United States Geological Survey (USGS) in cooperation with the Miami Conservancy District (MCD) to increase understanding of arsenic occurrence in southwest Ohio (Thomas et al., 2005). The study included samples collected from carbonate bedrock, glacial buried-valley deposits and glacial till with interbedded sand and gravel aquifers within the Great Miami River drainage basin, and included samples from domestic wells in Preble, Miami, and Shelby counties. The USGS reported that 37 percent of the samples analyzed had elevated concentrations of arsenic (greater than or equal to 10 micrograms per liter [μg/L]) and elevated arsenic concentrations were found in all three aquifer types studied. Geochemical conditions were also evaluated and the USGS determined that elevated arsenic concentrations in the study area were associated with iron-reducing, sulfate-reducing, or methanic conditions, and all samples with elevated arsenic concentrations had iron concentrations that exceeded 1 milligrams per liter (mg/L), indicating the potential for the reduction of arsenic-bearing iron oxides present in soil.

Based on previous studies discussed above, naturally-occurring concentrations of arsenic are known to exist in both soils and groundwater in the same region (southwestern Ohio) and aquifer type (glacial buried-valley deposit aquifer) as the Pond System. The OEPA study showed arsenic-bearing soils were found in close proximity (approximately 3,000 ft northeast) to the Pond System. The USGS study showed that iron-reducing, sulfate-reducing, or methanic geochemical conditions needed to mobilize arsenic were common in southwestern Ohio aquifers. Reducing conditions indicating the potential for arsenic mobilization are likely to occur at the Pond System monitoring wells MW-2, MW-10, and MW-13, where arsenic SSLs were determined, as indicated by the following factors discussed below:

- Most riverbank boring logs indicate organic materials are present in the soils.
- MW-2, MW-10, and MW-13 are among the monitoring wells adjacent to the riverbank, where the lowest oxidation-reduction potential (ORP) at the Site were observed.

- Dissolved iron concentrations present in groundwater at monitoring well MW-2 correlate with dissolved arsenic concentrations.

Arsenic is naturally present in groundwater and soils at variable concentrations. The arsenic is co-precipitated with iron oxyhydroxides and incorporated into the mineral structure of the soils, and can also be adsorbed to organic matter or the iron oxyhydroxides in the aquifer. Both of these sources of arsenic can be mobilized in groundwater by dissolution or desorption under reducing geochemical conditions, where organic carbon commonly acts as the reducing agent (Thomas et al., 2005; McArthur et al., 2001). Arsenic-bearing soils are known to be present in the areas near the Pond System (OEPA, 2015); and, organic matter, a source of organic carbon and potential reducing agent, was observed in the most riverbank boring logs for monitoring wells located along the banks of the Great Miami River and Ohio River (see boring logs for wells MW-2, MW-3A, MW-4, MW-10, and MW-11 in Appendix A). The presence of organic material and arsenic-bearing soils indicates there is potential for naturally-occurring arsenic to become mobilized through reductive dissolution or desorption.

Reducing conditions sufficient to mobilize naturally-occurring arsenic have also been observed along the riverbanks of the Great Miami River and Ohio River as evidenced by the low ORP measurements observed in the groundwater at monitoring wells MW-2, MW-3A, MW-10, MW-11, MW-13 and MW-14 (presented in Figure E below; monitoring wells adjacent to the riverbank are illustrated with solid lines, upland wells are illustrated with dashed lines).

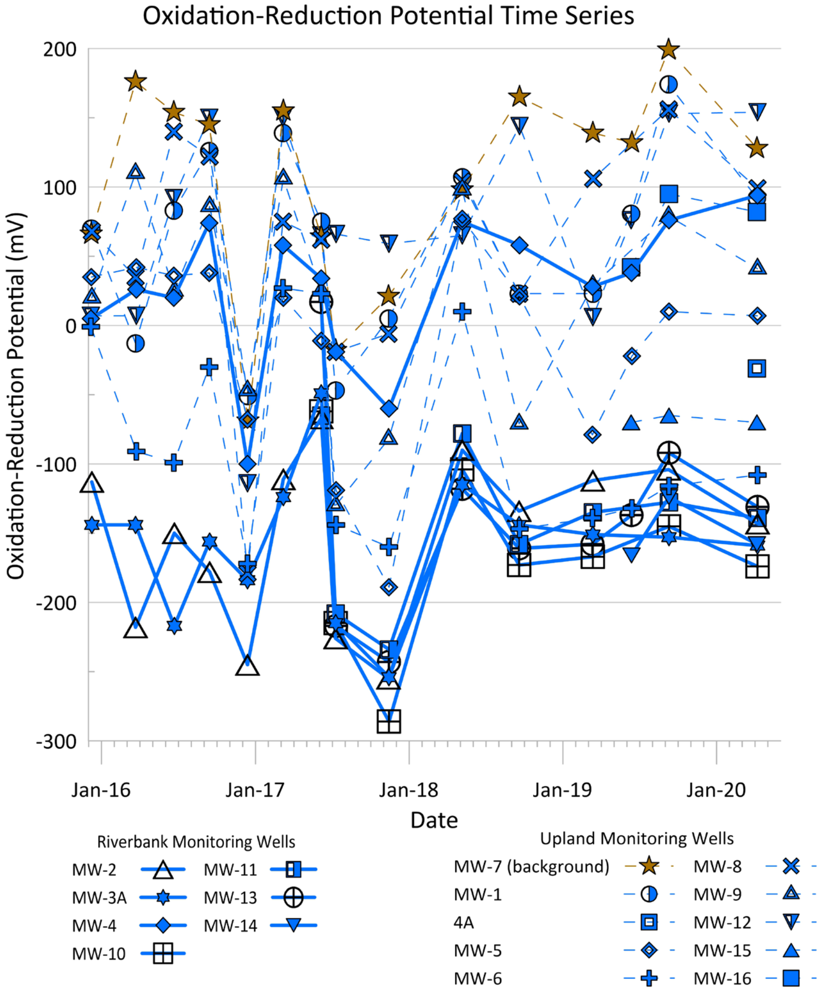


Figure E. Oxidation Reduction Potential Time-Series for Groundwater Samples (Monitoring Wells Adjacent to the Riverbank are Illustrated with Solid Lines, Upland Wells are Illustrated with Dashed Lines).

Available data indicated that concentrations of dissolved iron observed in groundwater at monitoring well MW-2 from 2008 to 2014 correlate with dissolved arsenic concentrations. Dissolved iron concentrations ranged from 11.8 to 52.1 mg/L at monitoring well MW-2 from 2008 to 2014, at least an order of magnitude greater than the 1 mg/L reported by the USGS as being indicative of iron-reducing geochemical conditions. Dissolved iron concentrations were also near or greater than 1 mg/L in A3 for MW-2, MW-10, and MW-13 at 45, 2.5 and 0.91 mg/L, respectively. Figure F below illustrates the relationship between dissolved iron concentrations and dissolved arsenic concentrations in groundwater at MW-2, where the R-squared value is 0.87, indicating a good correlation between dissolved iron and dissolved arsenic.

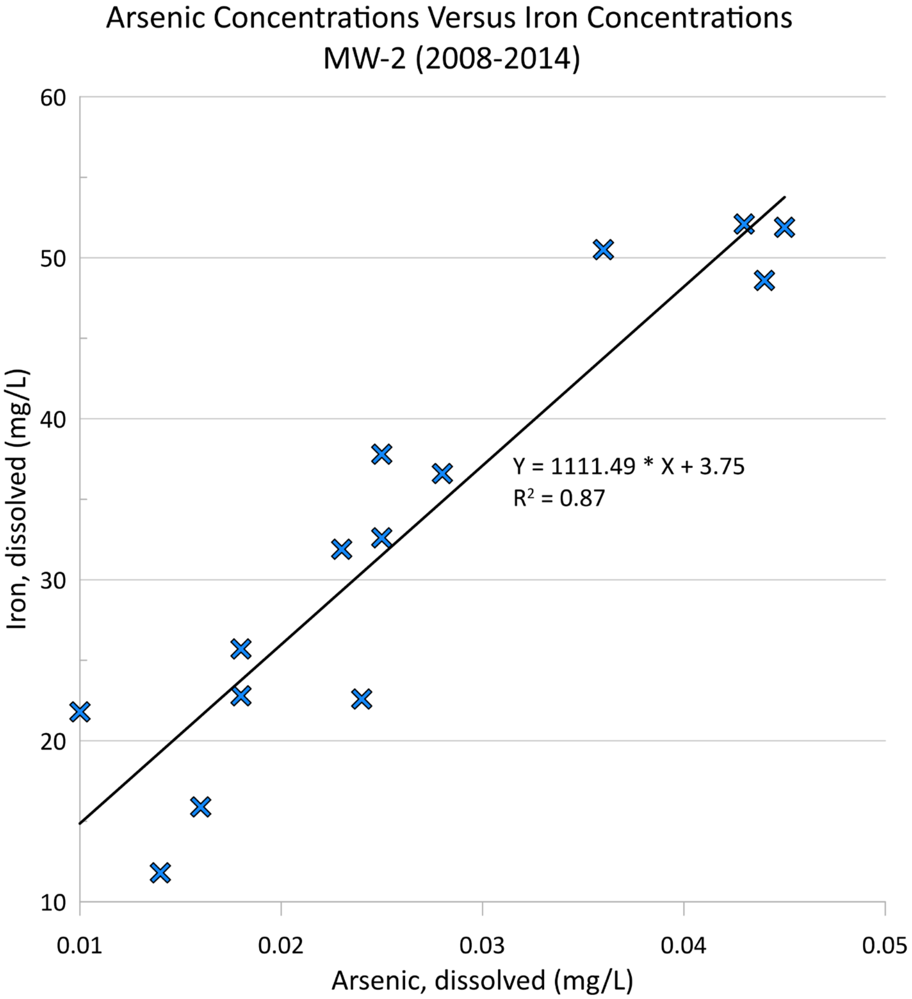


Figure F. Arsenic Concentrations Versus Iron Concentrations at Well MW-2 (2008-2014).

The presence of elevated concentrations of arsenic in background soil and groundwater in surrounding areas, as well as the presence of geochemical conditions (*i.e.*, reducing conditions) necessary to mobilize arsenic from soil to groundwater indicate that elevated concentrations of arsenic at monitoring wells MW-2, MW-10, and MW-13 are likely the result of naturally-occurring geochemical variations within the Uppermost Aquifer.

4. CONCLUSIONS

Based on the following three LOEs, it has been demonstrated that the arsenic SSLs at MW-2, MW-10, and MW-13, and the molybdenum SSL at MW-6 are not due to Miami Fort Pond System but are from a source other than the CCR unit being monitored:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSLs for arsenic and molybdenum observed during the A3 sampling event were not due to the Pond System. Therefore, a corrective measures assessment is not required for arsenic and molybdenum at the Miami Fort Pond System.

5. REFERENCES

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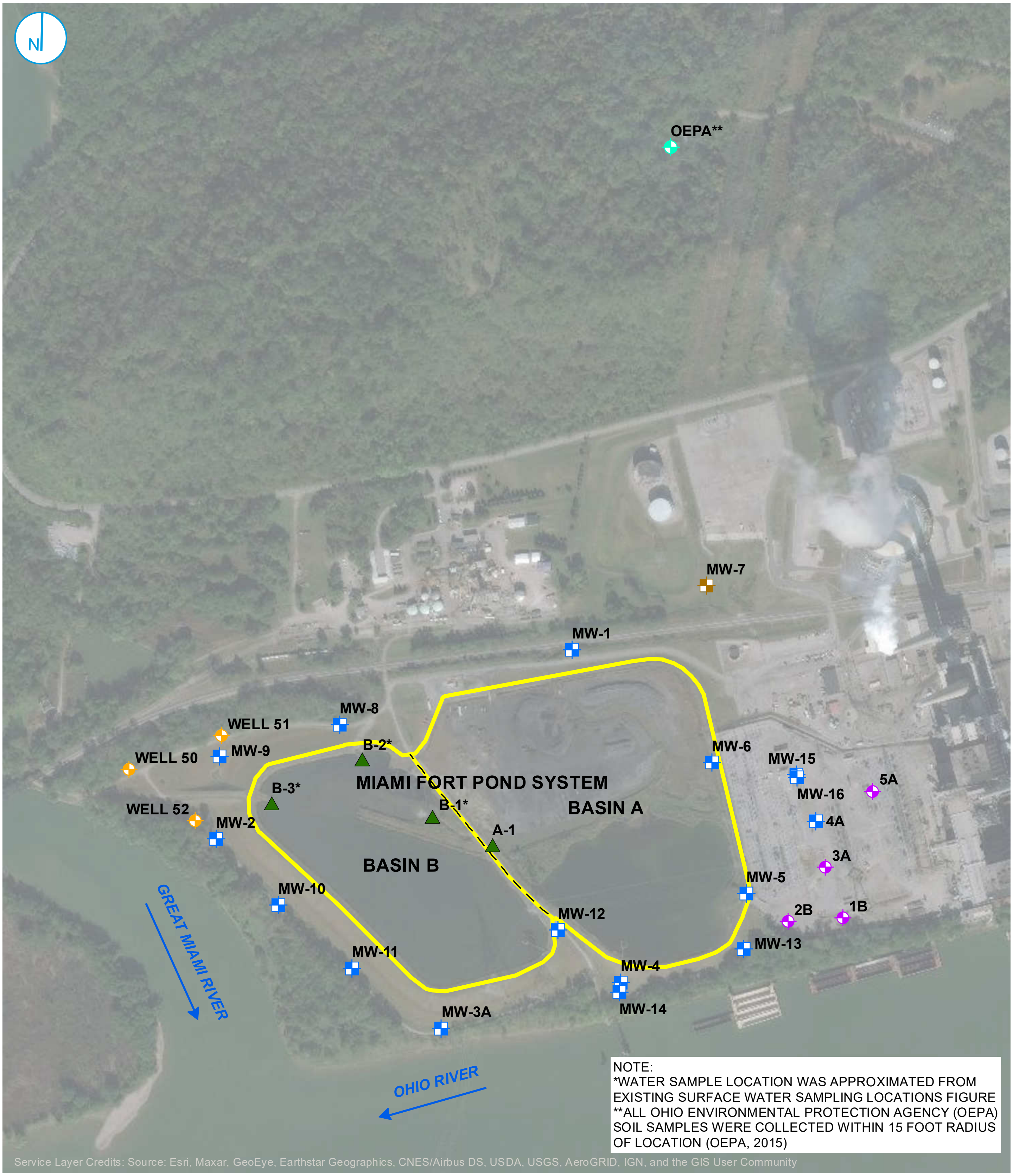
FIGURES

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\A3\Figure 1_Monitoring Well and Sampling Locations.mxd

PROJECT: 169000XXXX | DATED: 10/20/2020 | DESIGNER: galarnmc



NOTE:
*WATER SAMPLE LOCATION WAS APPROXIMATED FROM EXISTING SURFACE WATER SAMPLING LOCATIONS FIGURE
**ALL OHIO ENVIRONMENTAL PROTECTION AGENCY (OEPA) SOIL SAMPLES WERE COLLECTED WITHIN 15 FOOT RADIUS OF LOCATION (OEPA, 2015)

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

- ⊞ DOWNGRADIENT CCR MONITORING WELL LOCATION
- ⊞ BACKGROUND CCR MONITORING WELL LOCATION
- ▲ SOURCE WATER SAMPLING LOCATION
- ⊕ OEPA SOIL SAMPLE LOCATION
- ⊕ MIAMI FORT PRODUCTION WELL
- ⊕ VEOLIA PRODUCTION WELL
- ▭ CCR MONITORED MULTI-UNIT
- ▭ BERM
- ← RIVER FLOW DIRECTION

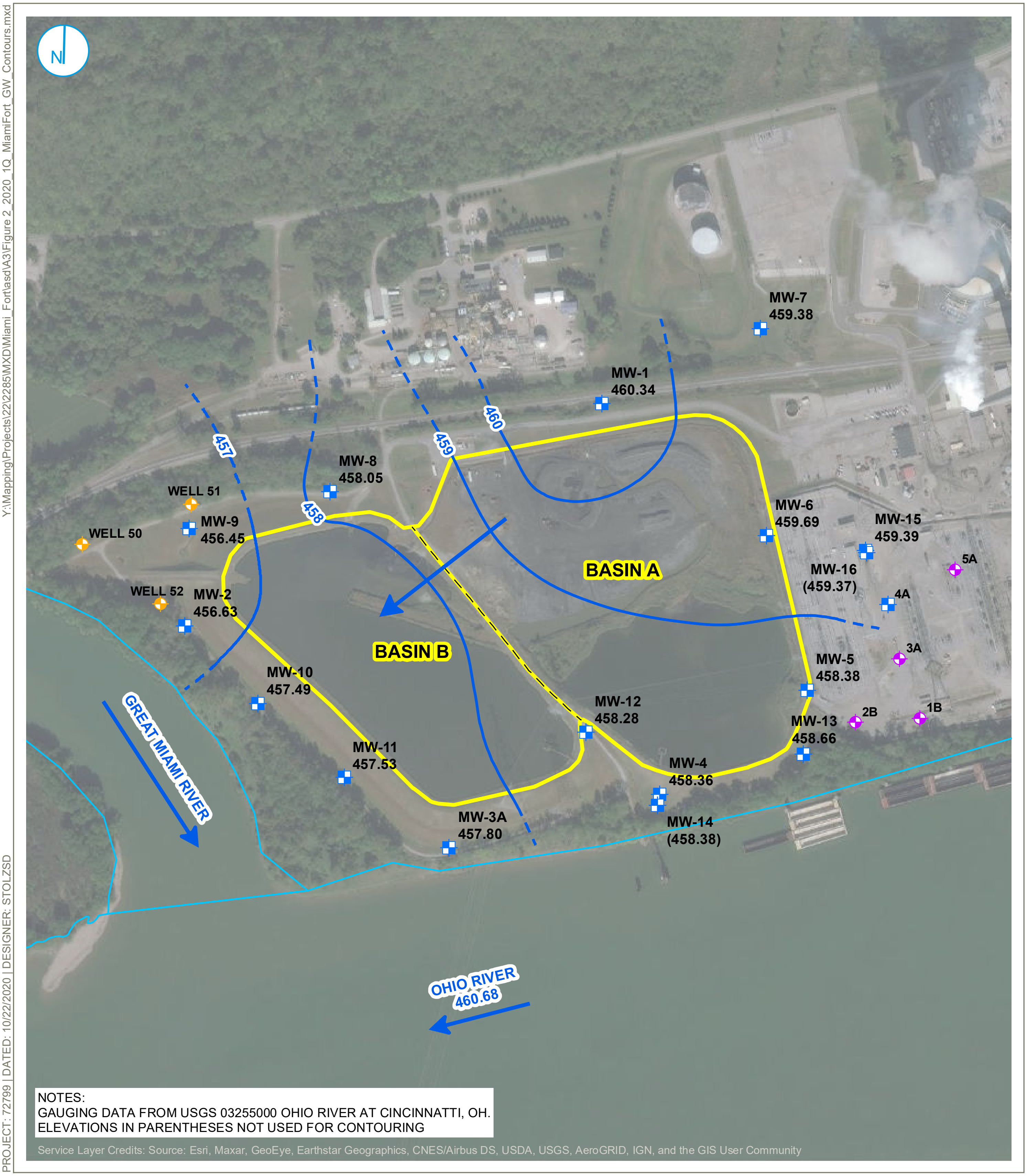
0 300 600
Feet

MONITORING WELL AND SAMPLING LOCATION MAP

FIGURE 1

MIAMI FORT POND SYSTEM (UNIT ID:115)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



NOTES:
GAUGING DATA FROM USGS 03255000 OHIO RIVER AT CINCINNATI, OH.
ELEVATIONS IN PARENTHESES NOT USED FOR CONTOURING

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

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\A3\Figure 2_2020_1Q_MiamiFort_GW_Contours.mxd

PROJECT: 72799 | DATED: 10/22/2020 | DESIGNER: STOLZSD

- ⊞ CCR MONITORING WELL LOCATION
- ⊕ MIAMI FORT PRODUCTION WELLS
- ⊕ VEOLIA PRODUCTION WELLS
- ▭ CCR MONITORED MULTI-UNIT
- ▭ BERM
- ← RIVER FLOW DIRECTION
- — SURFACE WATER FEATURE
- — GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- ➡ GROUNDWATER FLOW DIRECTION

0 250 500
Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 6, 2020

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

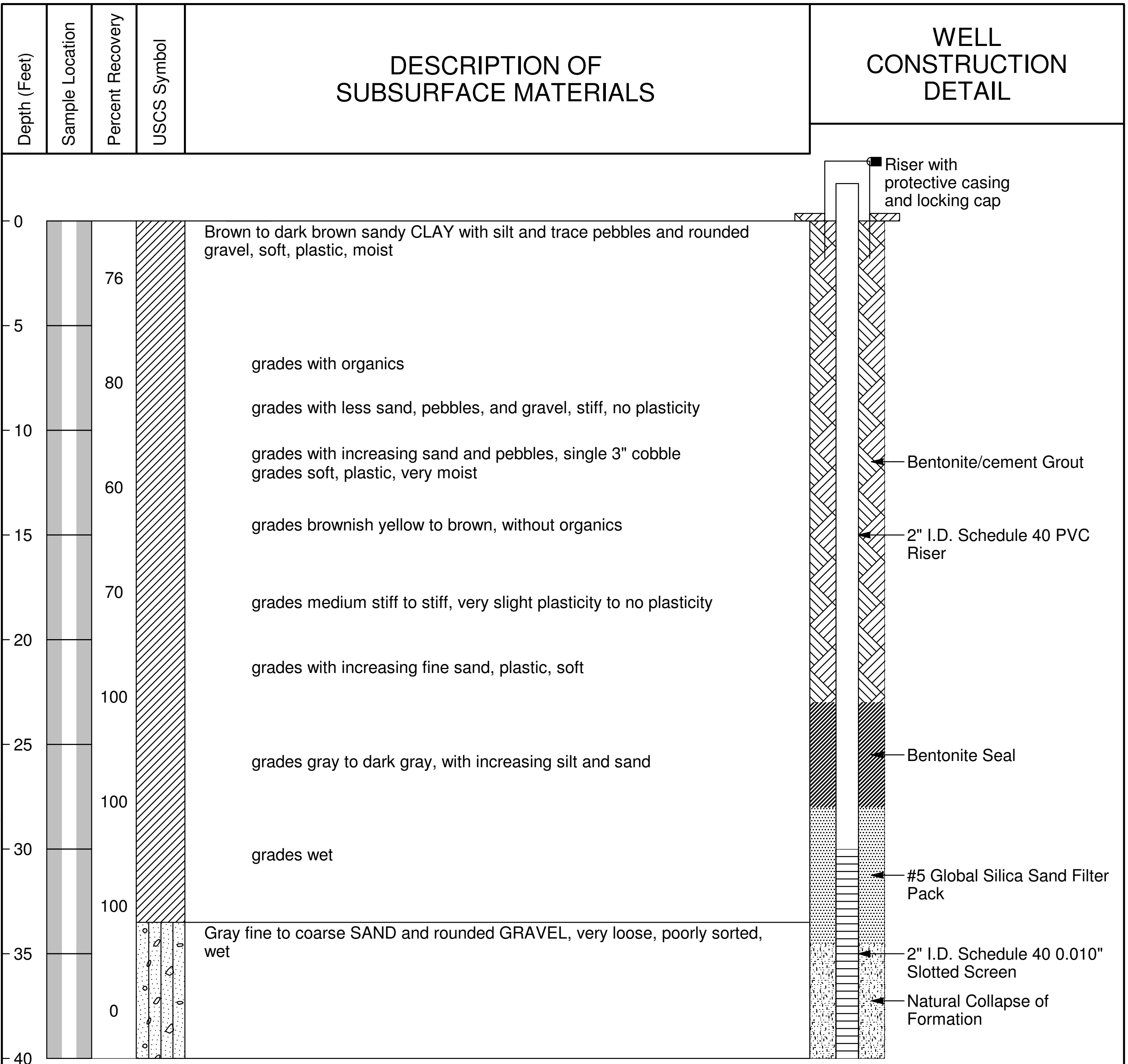
MIAMI FORT POND SYSTEM (UNIT ID: 115)
ALTERNATE SOURCE DEMONSTRATION
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL

APPENDIX A
BORING LOGS FOR MONITORING WELLS MW-2, MW-3A, MW-4, MW-10, AND MW-11

DESCRIPTION OF SUBSURFACE MATERIALS

WELL CONSTRUCTION DETAIL



Brown to dark brown sandy CLAY with silt and trace pebbles and rounded gravel, soft, plastic, moist

grades with organics

grades with less sand, pebbles, and gravel, stiff, no plasticity

grades with increasing sand and pebbles, single 3" cobble
grades soft, plastic, very moist

grades brownish yellow to brown, without organics

grades medium stiff to stiff, very slight plasticity to no plasticity

grades with increasing fine sand, plastic, soft

grades gray to dark gray, with increasing silt and sand

grades wet

Gray fine to coarse SAND and rounded GRAVEL, very loose, poorly sorted, wet

Boring terminated 40' bgs on 12/11/2007.
2" I.D. Schedule 40 PVC monitoring well installed 40' bgs with 10' 0.010" slotted screen.

LEGEND:

▥	Rotosonic
bgs	Below ground surface
NR	Not recorded

URS

JOB NO. 14947868

Duke Energy
Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL
MW-2

Project: Duke Energy
Project Location: Miami Fort Station
Project Number: 14948624

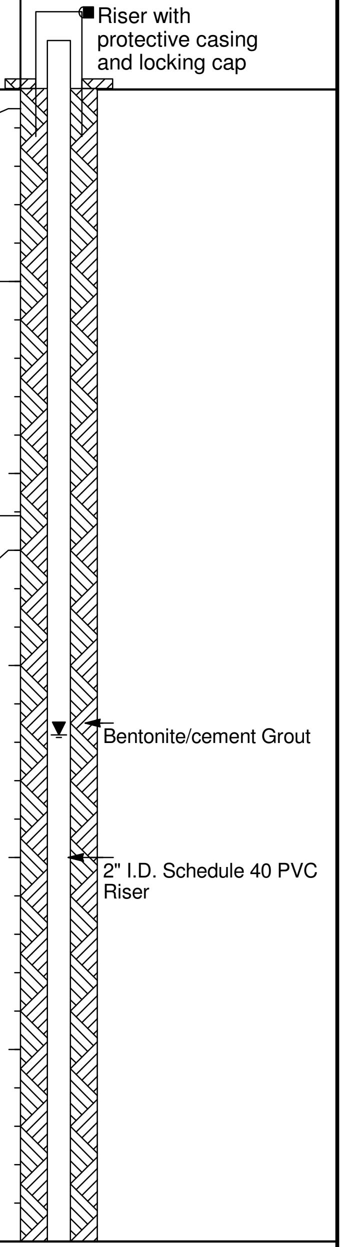
Monitoring Well MW-3A

Sheet 1 of 2

Date(s) Drilled	**2/25/2009**	Logged By	**K. Pritchard**	Checked By	**M. Wagner**
Drilling Method	**4.25 in. Hollow Stem Auger**	Drilling Contractor	**Belasco Drilling Services**	Total Depth of Borehole	**52.0 feet**
Drill Rig Type	**Truck-Mounted Auger**	Sampler Type	**Split Spoon**	Surface Elevation	**471.17 feet, msl**
Groundwater Elevation(s)	**456.42 ft, msl**	Hammer Weight and Drop	**140 lb, Dropped 30-inches**	Top of PVC Elevation	**473.23 feet, msl**
Diameter of Hole (inches)	**8.25** Diameter of Well (inches) **2**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation	**0.010-Inch**
Type of Sand Pack	**Natural Collapse**	Well Completion at Ground Surface	**Riser, With Locking Cap**		
Comments	**** Split spoon sampler advanced through interval under weight of hammer and rods only**				

Elevation, feet	Depth, feet	SAMPLES Type	Blows per 1-foot Interval	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
470	0		12	83		Yellowish red CLAY TOPSOIL, moist Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist
			19	100		
	5		6	83		grades brownish yellow with increasing clay Dark gray silty CLAY with trace fine sand and organics, plastic, very soft, moist
465			3	100		grades with increasing fine to medium sand, without organics, with iron staining
			3	83		grades with medium to coarse grained sand lenses, without staining grades high plasticity, very moist to wet
460	10		3	75		Yellowish brown clayey fine to coarse grained SAND, very loose, well sorted, wet
			2	100		Yellowish brown fine grained sandy to silty CLAY, very soft, high plasticity, very moist to wet
	15		1	100		grades wet with increasing fine sand
455			1	100		grades with fine grained sand lenses
			2	100		grades brown with increasing fine sand
450	20		2	100		
			2	100		grades with gray to reddish gray lenses, decreasing sand, without sand lenses grades gray, without gray to reddish gray lenses, medium plasticity
	25		**	100		grades high plasticity grades with increasing sand
445			3	100		grades with organics, sulphur odor, decreasing sand
	30		2	100		grades without sand, without odor grades with fine sand lenses, without organics

WELL CONSTRUCTION DETAILS



Project: Duke Energy
Project Location: Miami Fort Station
Project Number: 14948624

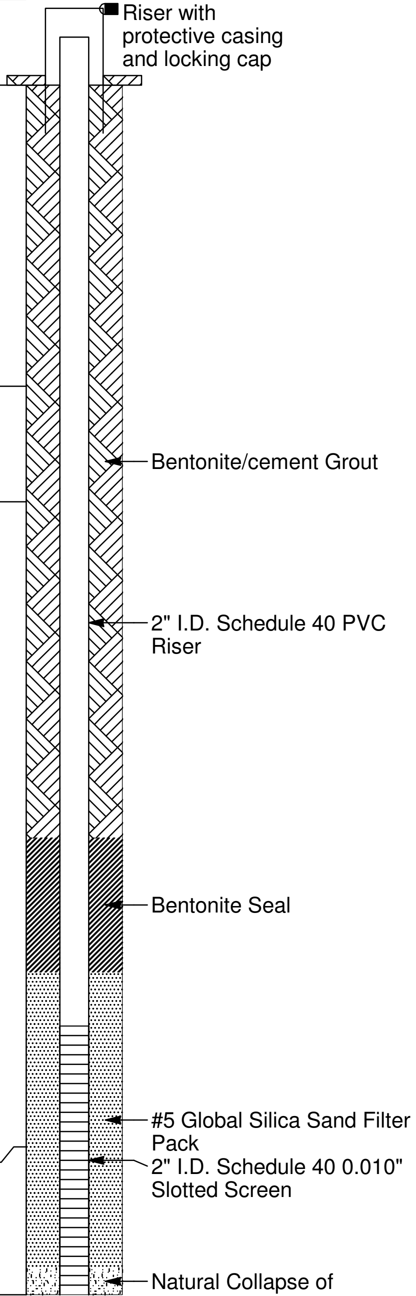
Monitoring Well MW-3A

Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES Type	Blows per 1-foot Interval	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
440	30	⊠	1	100		grades without sand, with trace organics	
		⊠	4	100		grades with sand, without organics	
	35	⊠	4	100		grades with trace fine sand and increasing silt, without sand lenses, medium plasticity grades with increasing sand, without organics	
435		⊠	3	100		grades with increasing silt, trace sand, very low plasticity, stiff	Bentonite Seal
		⊠	6	100		grades with sand, plastic, very soft grades stiff, very low plasticity, very moist	
430	40	⊠	4	100		grades with trace organcis, less sand, increasing silt	
		⊠	8	100			
	45	⊠	14	42		Gray fine to coarse grained SAND and sub-rounded to rounded GRAVEL, pebble-sized gravel with trace 1" diameter clasts, very loose, sorted, wet	
425		⊠	7	100			Natural Collapse of Formation 2" I.D. Schedule 40 0.010" Slotted Screen
		⊠	22	63		grades with increasing diameter gravel	
420	50	⊠	13	50			
						Boring terminated 52' bgs on 2/25/2009. 2" I.D. Schedule 40 PVC monitoring well installed 52' bgs with 10' 0.010" slotted screen.	
415	55						
410	60						
405	65						
	70						

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Dark gray fine to coarse SAND and GRAVEL FILL with clay, soft, moist
		100		
5				grades very hard to brittle (FILL) with glass piece
				grades dry, very loose with angular clasts (FILL)
		50		
10				
				Yellowish red silty CLAY with trace fine sand, medium stiff, very slightly moist to moist
		62		grades soft
15				
				Brownish yellow to yellowish red sandy CLAY, soft, moist (sand is very fine grained to fine grained)
		80		grades loose, with increasing sand
				grades soft
20				
		80		grades sandy clay/clayey sand (increasing sand), very moist to wet
25				grades very moist
		80		grades with less sand, with red staining and organics, medium stiff
30				grades with increasing sand
				grades with less sand
		40		
35				
				grades gray
		100		grades with increasing sand (clayey sand), very moist
				large wood piece through core sample
40				Gray medium to coarse grained SAND and rounded GRAVEL, poorly sorted, wet
		0		NO RECOVERY 40-45 feet bgs
45				

WELL CONSTRUCTION DETAIL



Boring terminated 45' bgs on 12/12/2007.
2" I.D. Schedule 40 PVC monitoring well installed 45' bgs with 10' 0.010" slotted screen.

LEGEND:

▥	Rotosonic
bgs	Below ground surface
NR	Not recorded

URS

JOB NO. 14947868

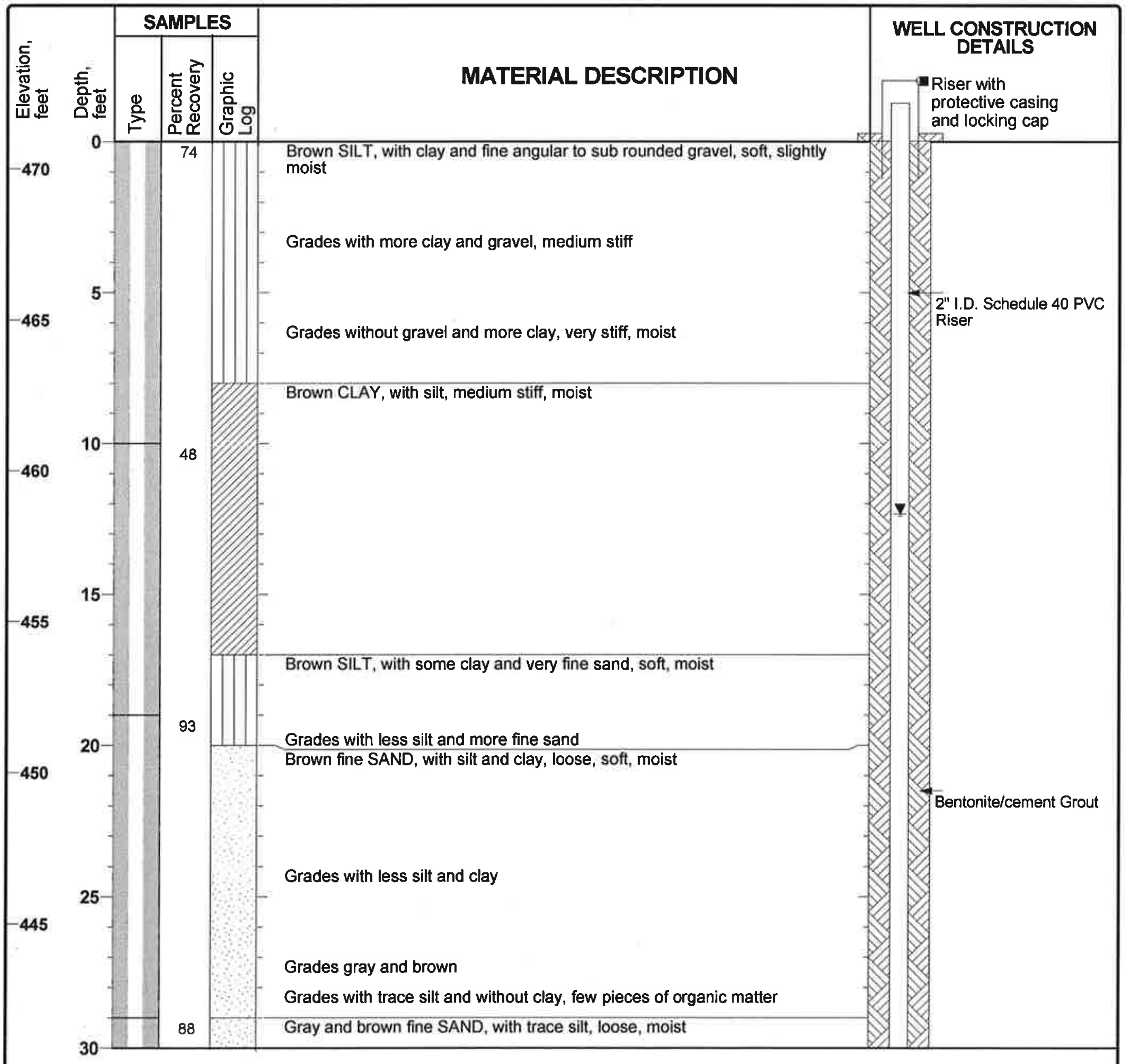
Duke Energy
Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL
MW-4

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-10
Sheet 1 of 2

Date(s) Drilled	4/10/2017	Logged By	J. Alten	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	59.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	470.90 feet, msl
Depth to Groundwater	12.34 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	473.35 feet, msl
Diameter of Hole (inches)	6.0	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Diameter of Well (inches)	2				
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					



Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist

Grades with more clay and gravel, medium stiff

Grades without gravel and more clay, very stiff, moist

Brown CLAY, with silt, medium stiff, moist

Brown SILT, with some clay and very fine sand, soft, moist

Grades with less silt and more fine sand

Brown fine SAND, with silt and clay, loose, soft, moist

Grades with less silt and clay

Grades gray and brown

Grades with trace silt and without clay, few pieces of organic matter

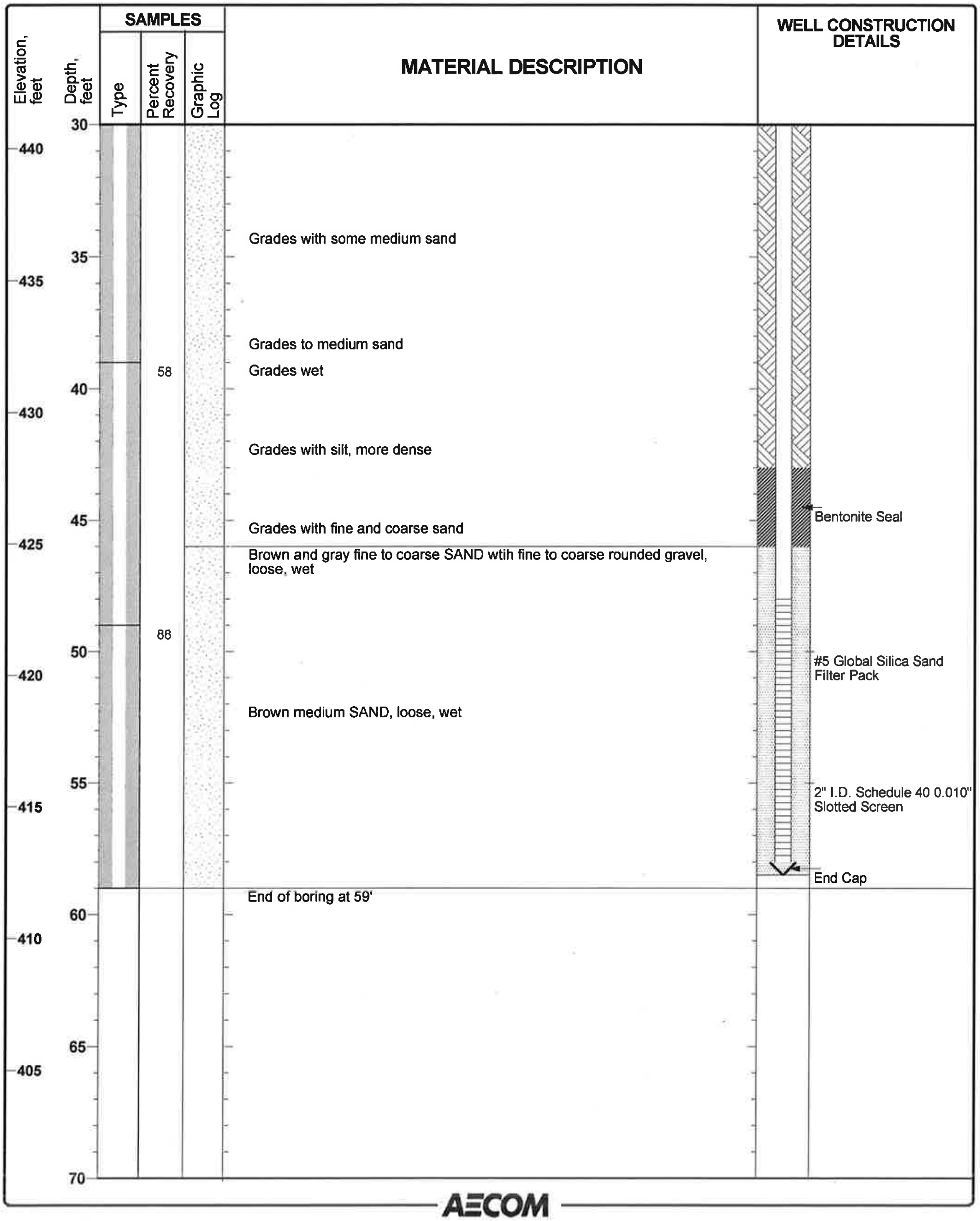
Gray and brown fine SAND, with trace silt, loose, moist

AECOM

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well MW-10

Sheet 2 of 2



Grades with some medium sand

Grades to medium sand

Grades wet

Grades with silt, more dense

Grades with fine and coarse sand

Brown and gray fine to coarse SAND wtih fine to coarse rounded gravel, loose, wet

Brown medium SAND, loose, wet

End of boring at 59'

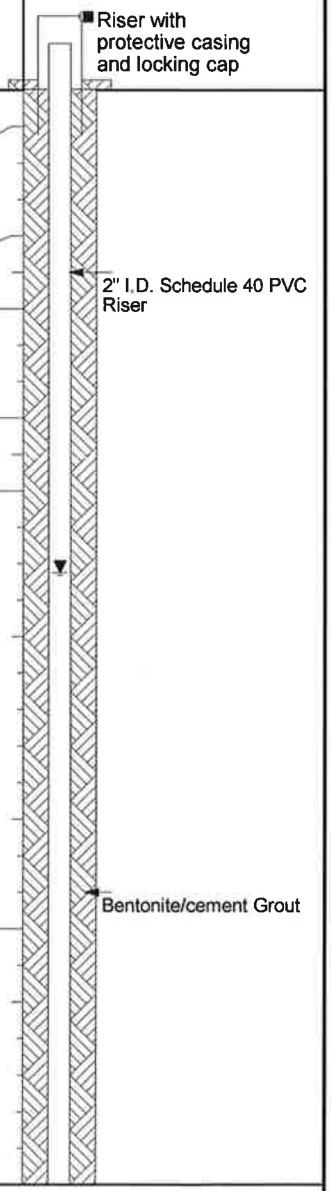
Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-11
Sheet 1 of 2

Date(s) Drilled	4/11/2017	Logged By	J. Alten	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	59.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	471.81 feet, msl
Depth to Groundwater	13.25 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	474.45 feet, msl
Diameter of Hole (inches)	6.0 Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		69		Gray coarse angluar limestone GRAVEL, with fines, medium dense, slightly moist (FILL)
					Brown and tan with reddish mottled SILT with trace fine gravel, very stiff, moist
470					
					Grades with fine sand
					Brown with red mottled fine SAND, soft, moist
	5				
					Dark gray SILT with some clay, stiff, moist, trace organci matter
465					
					Grades with more clay
					Gray and brown CLAY, with some silt, soft, moist
	10		42		
					Gray and brown SILT, with fine sand and some clay, soft, moist
460					
	15				
					Grades with less clay
455					
			56		
	20				Grades gray without clay
450					
					Gray very fine SAND with silt, soft, moist
	25				
445					
			53		
	30				Grades with dark gray and black wood fragments

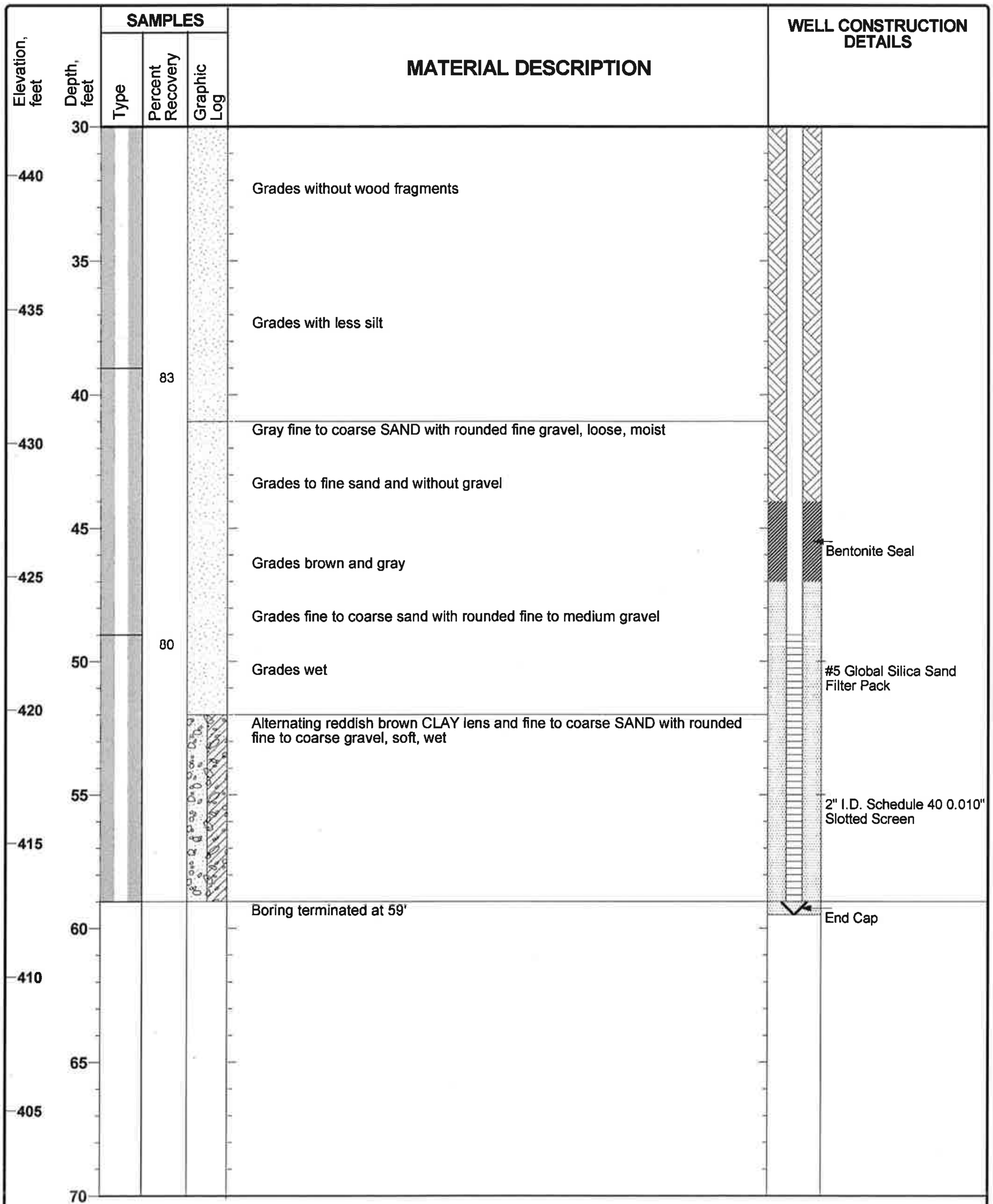
WELL CONSTRUCTION DETAILS



AECOM

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-11
Sheet 2 of 2



Grades without wood fragments

Grades with less silt

Gray fine to coarse SAND with rounded fine gravel, loose, moist

Grades to fine sand and without gravel

Grades brown and gray

Grades fine to coarse sand with rounded fine to medium gravel

Grades wet

Alternating reddish brown CLAY lens and fine to coarse SAND with rounded fine to coarse gravel, soft, wet

Boring terminated at 59'

DYNEGY CCR GENERAL MIAMI FORT STATION CCR WELLS.GPJ 5/18/17

APPENDIX B
ALTERNATIVE SOURCE DEMONSTRATION FOR ARSENIC SSL AT MW-6 (GEOSYNTEC CONSULTANTS, INC., 2024)

Geosyntec
consultants

engineers | scientists | innovators

ALTERNATIVE SOURCE DEMONSTRATION

Miami Fort Power Plant, Pond System
(Unit ID #115)
40 C.F.R. § 257.95 (g)(3)(ii)

Prepared for

Miami Fort Power Company LLC
11021 Brower Road
North Bend, Ohio 45052

Prepared by

Geosyntec Consultants, Inc.
500 W Wilson Bridge Road. Suite 250
Worthington, Ohio 43085

Project Number: GLP8066

Geosyntec
consultants

Alternative Source Demonstration

Pond System, Miami Fort Power Plant
(Unit ID #115)
40 C.F.R. § 257.95 (g)(3)(ii)

Prepared for

Miami Fort Power Company LLC
11021 Brower Road
North Bend, Ohio 45052

Prepared by

Geosyntec Consultants, Inc.
500 W Wilson Bridge Road. Suite 250
Worthington, Ohio 43085

License No.: PE.85326
Expires: 12/31/2025

John Seymour, P.E.
Senior Principal

JOHN
SEYMOUR
E-85326

Project Number: GLP8066

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ACRONYMS AND ABBREVIATIONS

%	percent
ASD	alternative source demonstration
CCR	coal combustion residuals
CMA	corrective measures assessment
ft	feet
ft bgs	feet below ground surface
GWB	Geochemist’s Workbench
GWPS	groundwater protection standard
LOE	line of evidence
MFPC	Miami Fort Power Company LLC
MFPP	Miami Fort Power Plant
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mV	millivolts
MCD	Miami Conservancy District
MNA	monitored natural attenuation
NAVD88	North American vertical datum 1988
ORP	oxidation reduction potential
SEP	sequential extraction procedure
SSL	statistically significant level
XRD	X-ray diffraction

1. INTRODUCTION

Geosyntec Consultants, Inc. (Geosyntec) has prepared this alternative source demonstration (ASD) on behalf of Miami Fort Power Company LLC (MFPC), regarding the Miami Fort Power Plant's (MFPP) Pond System coal combustion residuals (CCR) unit at 11021 Brower Rd, North Bend, OH (Site). The Pond System has an existing groundwater monitoring network which consists of 16 downgradient wells and one background well. The Site location is depicted in **Figure 1**.

Groundwater monitoring has been completed at the MFPP Pond System since 2015. The most recent assessment monitoring sampling event (A6D) was completed on September 21 through September 25, 2023. Analytical data from all sampling events completed from December 2015 through A6D were evaluated in accordance with the Statistical Analysis Plan for the Site (Ramboll 2022). Exceedances of arsenic were identified above the site-specific groundwater protection standard (GWPS) of 0.010 milligrams per liter (mg/L) at downgradient monitoring wells MW-2, MW-6, MW-10, and MW-13 on January 15, 2024.

Under Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.95(g)(3)(ii), the owner or operator of a CCR surface impoundment may submit a demonstration that a source other than the CCR unit caused the contamination, or that the exceedance of the GWPS resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. An ASD was previously prepared to address arsenic concentrations above the GWPS at MW-2, MW-10, and MW-13 (Ramboll 2020).

Geosyntec has completed a review of geochemical conditions at the Site to evaluate the influence of the uppermost aquifer solid-phase mineralogy and geochemistry on groundwater composition. Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the lines of evidence (LOEs) documented in this ASD demonstrate that a source other than the MFPP Pond System CCR unit was the cause of the GWPS exceedances for arsenic at downgradient monitoring wells MW-2, MW-6, MW-10, and MW-13. Using evidence from laboratory analyses of aquifer solids and groundwater and geochemical modeling, this assessment demonstrates that geogenic arsenic associated with aquifer solids (natural variability) was identified as the alternative source of elevated arsenic in Site groundwater.

2. BACKGROUND

2.1 Site Location and Description

The MFPP is in the southwest corner of Ohio adjacent to the state boundaries of Indiana and Kentucky. The MFPP is bounded by the Ohio River at the confluence of the Great Miami River (**Figure 1**). MFPP's Pond System is an unlined surface impoundment located in the southwest corner of the property. It is bounded by the Veolia North America property and Brower Road to the north, the Great Miami River to the west, the Ohio River to the south, Veolia's production wells to the northwest, and MFPP's electric switch yard and production wells to the east.

2.2 Description of the CCR Multi-Unit

The Pond System is a CCR Multi-Unit consisting of Basins A and B (CCR Multi-Unit ID 115). The Multi-Unit covers a total area of approximately 50 acres and is located in the southwest corner of the Site property as shown in **Figure 1**.

2.2.1 Basin A

Basin A (formerly Unit 111) is an unlined surface impoundment approximately 1,000 by 1,400 feet (ft), or about 30 acres, in size. It was initially constructed prior to 1959 and a vertical expansion was added in approximately 1976 (AECOM, 2017). Basin A receives effluent from the sluice lines, which primarily transport bottom ash products as well as flue gas desulfurization effluent and some fly ash. Basin A also receives directly discharged miscellaneous yard drainage. The material is discharged into the northern portion of the basin and through a constructed internal ditch line, allowing the solids to settle and the water to decant into Basin B. Solid materials collected in Basin A are generally reclaimed for beneficial reuse or landfill placement.

The Basin A normal pool level is typically between elevations of 495 and 498 ft (referenced to North American Vertical Datum of 1988 [NAVD88]). The Basin A outfall is currently not in use and flow-through is controlled by the gate structure (AECOM 2017).

2.2.2 Basin B

Basin B is an unlined surface impoundment approximately 750 by 1,150 ft, or about 20 acres, in size. It is located immediately west and hydraulically downgradient of Basin A. Basin B (formerly Unit 112) was constructed between 1979 and 1981 (AECOM 2017). The Basin B normal pool level is typically below the Basin A normal pool and between elevations of 495 and 498 ft NAVD88. Basin A discharges into Basin B, which is used as a polishing pond prior to discharge to the Ohio River through the outfall structure in Basin B. Miscellaneous yard drainage is also currently discharged directly to Basin B (AECOM 2017).

2.3 Geology and Hydrogeology

This section provides a summary of the Site geology and hydrogeology; additional detail is provided in the *Alternative Source Demonstration Miami Fort Pond System Report* (Ramboll 2020; **Attachment 1**) and the *Hydrogeological Characterization Report* (AECOM 2017).

The Site contains four geologic units consisting of CCR fill, recent alluvial deposits, glacial outwash, and bedrock. Below is a brief description of each geologic unit:

- The fill consists of CCR bottom ash and fly ash along with non-CCR solids. The fill unit also includes man-made berms constructed of various materials. The thickness of the fill ranges from 10 to 15 ft.
- The recent alluvial deposits consist of clay, silt, and fine sand deposited by Ohio River flood waters. The top of these deposits range from approximately 20 to 60 feet below ground surface (ft bgs). The alluvial material primarily consists of a silty, sandy clay adjacent to the site.
- The glacial outwash consists of sands and gravels. It is the uppermost aquifer at the Site and ranges from approximately 20 to 110 ft bgs, depending on the depth of the silt deposits and bedrock elevation. The bedrock consists of interbedded shales and limestones which lie approximately 110 to 120 ft bgs. The bedrock serves as a lower confining unit at the Site.

The groundwater potentiometric surface on Site is typically at approximately 455 to 460 ft NAVD88, which is coincident with the approximate pool elevation of the Ohio River. Depending on ground surface elevation, this correlates to an approximate depth to groundwater between 25-55 ft bgs in the vicinity of the Site. Groundwater flow is generally to the west/northwest towards the Great Miami River and Veolia production wells at Basin B, and east/southeast towards the Ohio River and MFPP production wells at Basin A. A potentiometric surface map generated using groundwater elevations recorded during the September 2023 sampling event is provided in **Figure 2** (originally provided in Ramboll 2024). The hydraulic gradient across the site is very low (flat) and prone to minor changes due to changes in river stage and/or nearby production well usage.

3. ALTERNATIVE SOURCE DEMONSTRATION LINES OF EVIDENCE

3.1 LOE #1: Geochemical Data Suggests Arsenic is Associated with Aquifer Solids and Mobilized to Groundwater as a Result of Oxidation-Reduction Conditions

The prior ASD report prepared by Ramboll for arsenic at the Pond System (Ramboll 2020) included discussion of prior studies by the Ohio Environmental Protection Agency (2015) and the United States Geological Survey (Thomas et al., 2005) which demonstrated that naturally occurring concentrations of arsenic are known to exist in both soils and groundwater in the same region (southwestern Ohio) and aquifer type (glacial buried-valley deposit aquifer).

Arsenic is known to become incorporated into the mineral structure of the soils through co-precipitation with iron-bearing minerals and is commonly sorbed to organic matter, clay minerals, and iron oxyhydroxides in the aquifer (Thomas et al., 2005). The previous MFPP Pond System arsenic ASD report noted that MW-2, MW-10, and MW-13 are located along the banks of the Great Miami River and Ohio River, and are susceptible to shifting geochemical conditions due to the presence of naturally occurring organic matter (a source of organic carbon and a potential reducing agent) that can drive geochemical conditions which mobilize naturally occurring arsenic from the soils to groundwater (Ramboll, 2020) (**Attachment 1**).

This ASD report expands upon the prior MFPP Pond System ASD (Ramboll, 2020) by presenting additional geochemical data and solid-phase mineralogy of aquifer solids collected at screened intervals adjacent to exceedance wells to further understand geochemical conditions in Site groundwater.

Aquifer solids were analyzed to evaluate whether subsurface material in the vicinity of the Pond System may account for reported arsenic concentrations in groundwater. Samples were submitted for analysis of total arsenic, arsenic distribution within the aquifer solids using sequential extraction procedure (SEP), and mineralogy via X-ray diffraction (XRD).

Geosyntec collected aquifer solids samples near monitoring wells MW-2, MW-4, pumping well 4A, MW-10, MW-13, and MW-19 during field events completed in February 2021 and July 2023. Samples were obtained from depths reflective of the screened interval of the nearby well at each boring location (**Figure 1**).[1] Geosyntec was unable to collect aquifer solids near MW-6 due to the proximity of overhead power lines; however, samples from soil boring B23-2 were collected near pumping well 4A to serve as an aquifer solid sample located further from the river (i.e., more representative of conditions near MW-6).

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[1] Aquifer solid samples were collected at SB-2 near monitoring well MW-4 (36-37 ft below ground surface (bgs), 42-43 ft bgs, and 43-44 ft bgs) during the February 2021 field effort (**Figure 1**). Results of these samples are excluded from subsequent results tables and discussion to emphasize relevant findings; however, SEP and XRD results for SB-2 locations are included in the **Attachments 4** and **5**, respectively.

Boring logs and monitoring well construction information for the adjacent wells are provided in **Attachment 2.** Field observations of the sample lithologies (provided in **Table 1** and **Table 2**) are also provided in the 2021 and 2023 boring logs (**Attachment 3**).

SEP is an analytical technique used to infer associations between constituents and different classes of solids (Tessier et al., 1979). SEP uses progressively stronger reagents to solubilize metals from specific phases within the solid matrix. These classes of solids are identified based on their solubility under different reagents and include the exchangeable fraction (the most labile), the carbonate-bound fraction, the fraction associated with amorphous metal oxides such as iron oxides, the iron/manganese oxide-bound fraction, the organic matter-bound fraction, the fraction assumed to be associated with sulfides, and the residual fraction (the most recalcitrant).

To evaluate data quality in an SEP analysis, first the sum of individual extraction steps from the SEP was compared to the total arsenic concentration to verify that total arsenic recovery from SEP methods is similar to total arsenic analytical results. The sum of the SEP is not expected to be exactly equal to the total metals analysis but should be generally consistent with the total metals result.

Results for total and SEP analyses of arsenic in these samples are presented in **Table 1**, and the analytical laboratory reports are provided as **Attachment 4**. The total arsenic concentrations ranged from 5.7 to 7.1 milligrams per kilograms of soil (mg/kg). The summed concentrations of arsenic from the SEP analyses ranged from 5.6 to 7.9 mg/kg. The results were generally consistent between the total metals analyses and the summed SEP steps, indicating good metals recovery and data quality. These results indicate that arsenic is naturally present in both background and downgradient (compliance well) solid-phase samples at the Site. The highest total arsenic concentrations were observed in the aquifer solids sample from upgradient well MW-19 (7.1 mg/kg).

The largest fractions of arsenic in all five samples analyzed via SEP were associated with the fraction assumed to be sulfides (30-57%), which is more recalcitrant than the other reactive fractions (**Table 1**). Additional arsenic fractions are associated with:

- the residual metals fraction (13-34%),
- the oxyhydroxide fraction (6-25%), and
- the non-crystalline metals fraction (5-23%).

The non-crystalline material and oxyhydroxide fractions represent the arsenic fraction that is leachable by organic chelating agents such as naturally occurring organic matter or reducing conditions that would be expected under depositional riverbank environments with naturally occurring organic matter. These conditions were also noted in the previous ASD in the downgradient wells along the riverbank (Ramboll, 2020). These conditions are applicable at many Pond System monitoring wells of concern; therefore, the SEP analyses indicate that arsenic associated with iron oxides and non-crystalline materials is available to be mobilized under conditions observed at the Site.

Mineralogical analyses were completed using XRD to characterize the mineralogy of the aquifer solids to evaluate specific mineral-water interactions which may affect arsenic concentrations in groundwater. Mineralogy of the samples analyzed consists primarily of quartz, various carbonate minerals (dolomite, calcite, and ankerite), various feldspar minerals (albite and microcline), clay minerals (kaolinite and chlorite) and oxide minerals (magnetite) (**Table 2**). Sulfide-bearing minerals were not identified via XRD, which suggests that the fraction assumed to be sulfide is not primarily governing arsenic mobility at the Site.

XRD results confirm the presence of mineral phases which were found to be associated with arsenic (i.e., magnetite and chlorite) based on SEP findings. Within depositional environments formed along riverbanks such as those at the Site, mixed valence Fe(II)-Fe(III) minerals tend to be more abundant than ferric (Fe(III)) iron minerals. Magnetite (Fe_3O_4), which was detected in every sample analyzed from aquifer solids near downgradient wells, is a mixed valence iron mineral. Additionally, chlorite ($(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$), which is a 2:1:1 layer ferrous (Fe(II)) iron-bearing clay mineral, was detected in aquifer solids from both background and downgradient wells. Mineralogy results are provided in **Table 2** and the laboratory analytical reports are included in **Attachment 5**.

In soils and sediments, arsenic redox chemistry (and as a result, arsenic mobilization to groundwater) is well-studied and linked to iron cycling (Gubler and ThomasArrigo, 2021; Gimenez et al., 2007). Generally, arsenic and iron are both redox sensitive elements that tend to be mobilized under more reducing groundwater conditions. Iron is mainly present in groundwater in two forms, reduced Fe(II) and oxidized Fe(III). In natural aqueous environments at pH 3-9, arsenic is primarily found as either the more oxidized species arsenate (As(V)) or the more reduced species arsenite (As(III)) (Smedley and Kinniburgh, 2002). Under more oxidizing conditions, arsenic is typically present as As(V), which shows a high sorption affinity to mixed valence and/or Fe(III)-oxyhyroxides such as magnetite or ferrihydrite (Dixit and Hering, 2003; Sun et al., 2018).

Arsenic is also often associated with clay minerals such as chlorite through the adsorption and oxidation/reduction of arsenic at the clay mineral surface (Lin and Puls, 2000). However, under reducing conditions, arsenic associated with iron mineral solid-phases is commonly soluble as As(III) due to the lack of electrical charge and associated decrease in interaction with aquifer mineralogy under circumneutral pH values (Jiang et al., 2013).

The differences in redox conditions between background and downgradient wells result in iron and arsenic speciation changes which increase arsenic mobility in downgradient wells. Monitoring wells with arsenic exceedances (MW-2, MW-6, MW-10, and MW-13) historically tend to have lower oxidation-reduction potential (ORP) values (i.e., more reducing geochemical conditions) than upgradient monitoring wells (MW-7 and MW-19) which have higher ORP values (i.e., more oxidizing geochemical conditions) as shown in **Figure 3**. The previous ASD report also described reducing geochemical conditions in downgradient Site groundwater which were expected to mobilize naturally occurring arsenic given the relationship between aqueous arsenic and iron mineralization (oxides and clays) and the sensitivity of both arsenic and iron to redox conditions (Ramboll, 2020).

If reducing conditions drive mobilization of arsenic and iron, concentrations of arsenic and iron would be inversely related to ORP. To evaluate the relationship between arsenic and iron and the observed redox conditions at the wells of concern, ORP measurements were plotted versus arsenic (**Figure 4**) and iron concentrations (**Figure 5**). Aqueous arsenic concentrations are observed to be greater in groundwater with lower ORP values, as indicated by **Figure 4**. This relationship is also true for iron (**Figure 5**), suggesting that reducing geochemical conditions increase iron and arsenic solubility in Site groundwater. Additionally, the relationship of iron with ORP (**Figure 5**) suggests iron speciation is dynamic (i.e., susceptible to reversible dissolution or precipitation reactions) in Site groundwater. Arsenic which may be associated with iron would therefore also be susceptible to mobilization along with iron under more reducing conditions.

The relationship between aqueous arsenic and iron in groundwater at the wells of concern (*i.e.,* MW-2, MW-6, MW-10, and MW-13) and background well MW-7 is illustrated on **Figure 6**. Linear trendlines were fitted to the downgradient groundwater data which shows a strong correlation (R^2 values ranging from 0.833 to 0.998) between arsenic and iron groundwater concentrations in Site groundwater (**Figure 6**). The strong correlation between aqueous arsenic and iron in groundwater and the higher concentrations of arsenic and iron with reducing conditions in Site groundwater indicates that aqueous arsenic concentrations observed at the wells of concern are strongly linked to reducing conditions driving iron and arsenic mobilization.

3.2 LOE #2: Geochemical Modeling Supports the Mobilization Mechanism.

As discussed in LOE #1, the presence of reducing geochemical conditions indicates the potential for naturally occurring arsenic to become mobilized through reductive dissolution or desorption processes. Arsenic can be present as both arsenate and arsenite and the adsorption behavior of arsenic changes with its redox speciation (Dixit and Hering, 2003).

Pourbaix diagrams were prepared for iron (**Figures 7 and 8**) and arsenic (**Figure 9)** at representative downgradient and background wells to illustrate the thermodynamic stability (range of conditions in which a species is stable) of different minerals or chemical species in an aqueous solution as a function of both pH and redox conditions.[2] **Figures 7, 8,** and **9** display Pourbaix diagrams for the representative downgradient monitoring well MW-10 and the background well MW-7.

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[2] Redox conditions are expressed in Pourbaix diagrams as redox potential (Eh) in units of volts. Eh values for groundwater samples are calculated from ORP measures collected in the field. Field ORP measurements were converted to Eh by adding +200 millivolts to correct for the Ag/AgCl electrode.

Figure 7 indicates the predicted stability of iron oxide mineral magnetite, which is supported by XRD results (**Table 2**). In addition to magnetite, amorphous iron oxyhydroxides are likely to be present in aquifer solids based on the prominent association of arsenic with amorphous metal oxides indicated by SEP results (**Table 1**). These amorphous iron oxyhydroxides constitute a significant arsenic-associated solid phase which are expected to influence arsenic mobility; however, amorphous materials are not detectable in XRD analyses and are therefore unable to be directly quantified. Iron Pourbaix diagrams were prepared for MW-10 and MW-7 with magnetite suppressed (i.e., excluded from the model; **Figure 8**) to evaluate the thermodynamic stability of the amorphous iron oxide ferrihydrite ($Fe(OH)_3$(ppd)). **Figure 8** demonstrates that a component of iron within the system exists in a state of dynamic equilibrium with respect to multiple solid or aqueous phases. This iron is susceptible to dissolution/precipitation reactions depending on groundwater redox conditions. These reactions would directly influence iron and arsenic concentrations in groundwater.

As discussed in Section 3.1, aqueous arsenic speciation influences arsenic sorption capability and therefore arsenic mobility. Differences in the arsenic speciation between MW-7 and MW-10 were observed from the arsenic Pourbaix diagrams (**Figure 9**). The Pourbaix diagram for background well MW-7, which has more oxidizing geochemical conditions than the downgradient wells, indicates As(V) (as $H_2AsO_4^-$ and $HAsO_4^{--}$) as the predominant species under these conditions. In contrast, the more mobile As(III) (as $As(OH)_3$) is predicted to be intermittently favorable at MW-10 (**Figure 9**) where the oxidation-reduction conditions are more reducing. This would suggest that conditions at MW-10 are more favorable for increased aqueous arsenic concentrations due to the greater abundance of the mobile $As(OH)_3$ species relative to background.

Additional Pourbaix diagrams are provided in **Attachments 6** and **7** for the other monitoring wells with reported arsenic exceedances. The iron (**Attachment 6**) and arsenic (**Attachment 7**) Pourbaix diagrams for the wells of concern demonstrate that much of the Site groundwater is in a dynamic state between oxidized and reduced forms of arsenic and iron, with the downgradient locations generally showing a higher predominance of the more mobile As(III) species compared to background location MW-7. More reducing conditions at downgradient wells compared to background can result in relatively greater desorption of arsenic from iron oxides and iron-bearing clays and potential dissolution of iron oxide minerals and iron-bearing clays which may contain adsorbed or co-precipitated arsenic due to changes in arsenic or iron speciation at the downgradient locations of concern.

A geochemical reaction pathway model was generated using Geochemist's Workbench (GWB) React module software package (version 17.0.1) to qualitatively assess the impact of variable Eh conditions on arsenic mobilization due to speciation changes and subsequent desorption from crystalline iron oxides (magnetite). Modeling of arsenic desorption from magnetite was completed to assess the predicted impact of this mechanism on total aqueous arsenic at representative downgradient conditions. Magnetite was observed in XRD results and predicted to be stable in downgradient and background geochemical conditions. While dissolution of additional iron phases such as amorphous iron oxyhydroxides also provide mechanisms for increasing arsenic concentrations in groundwater, amorphous phases are unable to be directly quantified as model inputs.

Groundwater composition data from monitoring well MW-10 (average of groundwater samples which contain analytical results for all major ions) was used to populate the aqueous component of the model. The magnetite component identified in XRD analysis of the aquifer solid sample associated with the screened interval of MW-10 (0.1 weight %; sample B23-12 51.5-53.5 ft bgs; **Table 2**) was included in the model as the solid-phase reactive component to assess arsenic mobility. Sorption to magnetite was incorporated into model calculations using the Dzombak and Morel (1990) two-layer surface complexation model. Crystalline iron minerals ferrite, hematite, and goethite were not detected in the XRD so they were suppressed during model simulations. While desorption from chlorite may provide an additional source of arsenic to groundwater under reducing conditions (Lins and Puls, 2000), the model does not include arsenic adsorption/desorption from chlorite as thermodynamic data representative of chlorite surface interactions with arsenic are not as well established as arsenic-oxide interactions.

Modeling results provide a qualitative conceptual demonstration of redox-change impacts to aqueous arsenic concentrations at MW-10 (average pH of 7.30) in the presence of crystalline iron oxides (i.e., magnetite), which are known to function as arsenic sorption surfaces with an effect on arsenic aqueous concentrations. **Figure 9** shows the predicted total concentration of all aqueous arsenic species over the range of Eh conditions observed in MW-10 groundwater since monitoring began. As illustrated on **Figure 9**, arsenic concentrations in the aqueous phase (independent of speciation calculations) are predicted to increase with decreasing Eh values, consistent with the higher groundwater arsenic concentrations observed at MW-10 compared to background well MW-7. The predicted concentrations of aqueous arsenic species representing the predominant arsenite ($As(OH)_3$) and arsenate ($HAsO_4^{2-}$) phases over a range of Eh conditions are illustrated in **Figure 10**, which shows that arsenite is dominant in groundwater with decreasing Eh values (i.e., higher concentrations in compliance well MW-10 compared to upgradient well MW-7). Lower Eh conditions are associated with the aqueous arsenic speciation changes and desorption of arsenic from iron oxides, as demonstrated in **Figure 11**.

These results provide further support that arsenic is more mobile at the downgradient locations (represented by MW-10 in the model) due to their historically lower ORP values than the upgradient wells (**Figure 3**). This conceptual demonstration of site-specific geochemical mechanisms reinforces the assertion that arsenic speciation influences aqueous arsenic concentrations due to its effect on the sorption and/or desorption of arsenic species to iron oxides, and iron-bearing clays, in aquifer solid material in the vicinity of the Pond System. These processes are naturally occurring and are not associated with a release from the Pond System.

3.3 LOE #3: Pond System Porewater Geochemical Signature is Distinct from the Wells of Concern and Can't be a Source.

A CCR unit release would be expected to impact the major ion chemical signature of downgradient groundwater. A Piper diagram, which represents the relative proportions of major cations and anions in water samples, was created to visualize major ion chemistry of a porewater (i.e., water within the CCR) sample, the background well (MW-7), and the exceedance wells (i.e., MW-2, MW-6, MW-10, and MW-13) (**Figure 13)**.

Geosyntec collected a porewater sample from the leachate well XPW-01 on February 25, 2021 (**Figure 1**). No changes to material handling or plant operations have occurred that would change the anticipated arsenic concentrations in the Pond System since this sample was collected.

The Piper diagram indicates that the wells of concern have a relatively similar geochemical signature to the background well MW-7. This is illustrated by the clustering of the most recent sampling results on the Piper diagram. In contrast, groundwater composition at the wells of interest is distinct from the composition of the Pond System porewater in **Figure 13**. This difference is driven by the anion composition of the samples, with the porewater containing a greater proportion of sulfate whereas both the background and downgradient groundwater have much lower sulfate and higher contributions of alkalinity. The higher alkalinity contributions are anticipated due to the relatively high abundance of carbonate minerals (i.e., calcite, dolomite, and ankerite) identified in solid-phase samples by the XRD analysis (**Table 2**). Further, the porewater sample is sulfate-dominant at 1,100 mg/L in comparison to calcium and magnesium which are present in lower concentrations at 261 mg/L and 208 mg/L, respectively (**Table 3**).

In the event of a Pond System release, groundwater from wells of interest would be expected to have similar ionic composition to Pond System porewater. The distinct geochemical signature relative to Pond System porewater and relative geochemical composition between the wells of interest and the background location suggests that arsenic exceedances of the GWPS are not attributable to impacts from the Pond System unit.

4. CONCLUSIONS

This analysis demonstrates the arsenic GWPS exceedances at MW-2, MW-6, MW-10, and MW-13 are not caused by a release from the Pond System CCR unit, but instead are attributed to a source other than the Pond System. The following summarizes the three LOEs used to support this demonstration:

1. While solid phase analyses identified total arsenic associated with both background and compliance well aquifer solids at comparable concentrations, reducing groundwater conditions at downgradient locations mobilize greater concentrations of arsenic to groundwater. Arsenic speciation in groundwater and the association of arsenic with iron-bearing minerals are both redox-dependent. Aqueous geochemical data indicate strong correlations between aqueous arsenic, iron, and redox conditions, supporting the association of arsenic and iron in aquifer solids. SEP results indicate that arsenic is associated with iron-bearing minerals such as oxides, sulfides, amorphous iron oxyhydroxides, and recalcitrant materials at both background and compliance locations. XRD identified the presence of iron-bearing minerals magnetite and chlorite at the downgradient compliance well locations which could serve as a source of arsenic and iron to groundwater.

2. A geochemical reaction pathway model was generated using GWB to qualitatively assess the impact of variable redox conditions on arsenic mobilization with regards to arsenic speciation and sorption of arsenic to magnetite. The model predicts that under reducing geochemical conditions (as expected in the wells of concern), arsenic will be desorbed from magnetite and mobilized into solution to a greater degree than would be predicted under more oxidizing background redox conditions.

3. The Pond System porewater geochemical signature is distinct from the exceedance wells groundwater quality, which suggests that these arsenic exceedances of the GWPS are not attributable to impacts from the Pond System unit.

The three LOEs demonstrates:

- Arsenic naturally exists in the aquifer solids in the vicinity of the Pond System.
- More reducing conditions downgradient of the Pond System compared to background locations appears to have resulted in changes to the speciation of arsenic and the stability of iron minerals, increasing the potential for desorption from iron minerals and dissolution of iron minerals with sorbed or coprecipitated arsenic.

These processes are natural and are unrelated to the Pond System. This demonstration meets the expectations in 40 C.F.R. § 257.95 (g)(3)(ii) that a statistically significant increase may result from natural variation in groundwater quality.

The information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95 (g)(3)(ii) demonstrating that the GWPS exceedances for arsenic at MW-2, MW-6, MW-10, and MW-13 are not attributable to the Pond System CCR unit. Therefore, implementation of corrective measures is not required for arsenic at the Pond System CCR unit.

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TABLES

Table 1 - Arsenic SEP Results Summary
Miami Fort Power Plant

Soil Boring Location		**B23-1**		**B23-12**		**B23-12**		**B23-12**		**SB-1**	
Sample Depth (ft bgs)		**(43.5-45)**		**(31.5-33.5)**		**(38.5-39.8)**		**(51.5-53.5)**		**(64-65)**	
Location		**Downgradient**		**Downgradient**		**Downgradient**		**Downgradient**		**Upgradient**	
Adjacent Well		**MW-13/S**		**MW-10/S & MW-2**		**MW-10/S & MW-2**		**MW-10/S & MW-2**		**MW-19**	
Field Boring Log Description		**Fine/Med Coarse Sand**		**Dark Gray Clay, Staining**		**Brown/Gray Coarse Sand**		**Brown Well Graded Sand**		**Brown Well Graded Sand**	
Total Arsenic		6.9		5.7		6.0		6.8		7.1	
SEP Fraction	**SEP Reagent**	**Concentration**	**% of Total**	**Concentration**	**% of Total**	**Concentration**	**% of Total**	**Concentration**	**% of Total**	**Concentration**	**% of Total**
Exchangeable Metals Fraction	$MgSO_4$	<2.4	--	<2.6	--	<2.2	--	<2.4	--	<2.3	--
Metals Bound to Carbonates Fraction	Sodium acetate, acetic acid	<1.8	--	<1.9	--	<1.7	--	<1.8	--	<1.7	--
Non-crystalline Materials Fraction	Ammonium oxalate (pH 3)	0.35 J	6%	1.8	23%	0.77	11%	0.49 J	6%	0.34 J	5%
Metals Bound to Metal Hydroxide Fraction	Hydroxylamine HCl and acetic acid	0.62	11%	0.99	13%	0.43 J	6%	0.53 J	7%	1.7	25%
Bound to Organic Material Fraction	5% sodium hypochlorite (pH 9.5)	<9.0	--	<9.7	--	<8.4	--	2.4 J	30%	<8.6	--
Metals Bound to Acid/Sulfide Fraction	HNO_3, HCl, and H_2O	3.2	57%	2.4	30%	3.5	50%	2.7	34%	3.9	57%
Residual Metals Fraction	HF, HNO_3, HCL, and H_3BO_3	1.4	25%	2.7	34%	2.3	33%	1.8	23%	0.93	13%
SEP Total		5.6	100%	7.9	100%	7.0	100%	7.9	100%	6.9	100%

Notes:
SEP: sequential extraction procedure
ft bgs: feet below ground surface
All results shown in miligram of arsenic per kilogram of soil (mg/kg).
Total arsenic was analyzed using aqua regia digest, ICP-MS
Non-detect values are shown as less than the reporting limit.
The arsenic fraction associated with each SEP phase is shown.
% of total arsenic is calculated from the sum of the SEP fractions.

Table 2 - Summary of X-Ray Diffraction Analysis
Miami Fort Power Plant

Field Boring Location			**B23-1**	**B23-12**	**B23-12**	**B23-12**	**B23-2**	**B23-2**	**SB-1**
Sample Depth (ft bgs)			**(43.5-45)**	**(31.5-33.5)**	**(38.5-39.8)**	**(51.5-53.5)**	**(42-43.6)**	**(59-60.5)**	**(64-65)**
Location			**Downgradient**	**Downgradient**	**Downgradient**	**Downgradient**	**Downgradient**	**Downgradient**	**Upgradient**
Adjacent Well			**MW-13/S**	**MW-10/S & MW-2**	**MW-10/S & MW-2**	**MW-10/S & MW-2**	**MW-4A**	**MW-4A**	**MW-19**
Field Boring Log Description			**Fine/Med Coarse Sand**	**Dark Gray Clay, Staining**	**Brown/Gray Coarse Sand**	**Brown Well Graded Sand**	**Silty Sandy Clay, Orange Mottling**	**Med Dense/Fine Sandy Clay**	**Dark Brown Well Graded Gravely Sand**
Mineral/Compound	**Formula**	**Mineral Type**	**(wt %)**	**(wt %)**	**(wt %)**	**(wt %)**	**(wt %)**	**(wt %)**	**(wt %)**
Quartz	SiO_2	Silicate	55.4	61.0	44.9	59.2	61.0	47.5	69.0
Albite	$NaAlSi_3O_8$	Feldspar	7.7	7.5	8.4	9.5	7.8	8.4	9.9
Microcline	$KAlSi_3O_8$	Feldspar	4.0	0.4	4.6	4.2	0.4	3.7	5.5
Calcite	$CaCO_3$	Carbonate	16.4	0.5	17.4	7.8	0.4	15.0	7.0
Dolomite	$CaMg(CO_3)_2$	Carbonate	7.1	--	15.0	9.2	--	10.8	1.9
Ankerite	$CaFe(CO_3)_2$	Carbonate	2.5	--	1.2	1.1	--	5.3	0.3
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	Amphibole	0.9	0.8	0.9	1.6	0.4	1.2	--
Diopside	$CaMgSi_2O_6$	Pyroxene	0.8	2.1	0.6	1.3	1.6	2.4	--
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	Mica	3.5	14.8	4.0	3.8	15.0	4.0	3.0
Kaolinite	$Al_2Si_2O_5(OH)_4$	Clay	0.4	8.3	0.9	0.6	8.0	0.4	1.5
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	Clay	1.2	2.7	2.0	1.7	2.2	0.5	1.5
Magnetite	Fe_3O_4	Oxide	0.2	0.2	0.2	0.1	0.4	0.4	--
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10H_2O$	Clay	--	0.8	--	--	1.0	--	--
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	Mica	--	1.0	--	--	1.7	--	--
Rhodochrosite	$MnCO_3$	Carbonate	--	--	--	--	--	0.3	0.4

Clay Minerals Total	1.6	11.7	2.8	2.3	11.2	0.9	3.0

Notes:

Sample depth is shown in feet below ground surface (ft bgs).

wt %: percentage by weight

Table 3 - Major Ion Compositions
Miami Fort Power Station

Parameter	Calcium		Magnesium		Sodium		Potassium		Bicarbonate Alkalinity		Sulfate		Chloride	
Unit Sample ID	mg/L	meq/kg	mg/L	meq/kg	mg/L	meq/kg	mg/L	meq/kg	mg/L	meq/kg	mg/L	meq/kg	mg/L	meq/kg
MW-2_9/25/2023	131	6.452	55.2	4.542	18.3	0.796	0.846	0.02164	584	9.571	10.9	0.2269	33.2	0.9243
MW-6_9/21/2023	51.7	2.546	86.0	7.077	48.1	2.092	3.81	0.09745	499	8.178	6.61	0.1376	76.9	2.141
MW-7_9/22/2023	109	5.369	33.8	2.781	4.48	0.1949	1.33	0.03402	363	5.949	41.5	0.8641	3.08	0.08576
MW-10_9/22/2023	49.1	2.419	17.6	1.448	26.1	1.135	3.19	0.08159	203	3.327	22.0	0.4581	31.1	0.866
MW-13_9/22/2023	42.1	2.074	11.7	0.9628	21.0	0.9134	2.32	0.05934	123	2.016	46.7	0.9723	28.1	0.7825
XPW-01_2/25/2021	261	12.85	208	17.12	56.7	2.466	15.5	0.3964	197	3.229	1,100	22.9	324	9.015

Notes:

mg/L: milligram per liter

meq/kg: milliequivalent per kilogram

FIGURES

Legend

- 🟡 Monitoring Well
- 🟠 Pumping Well
- 🔵 Soil Borings
- 🔴 Leachate Well

Notes

-Surface water and soil boring locations are limited to Geosyntec's February 2021 and July 2023 field efforts.
- Monitoring well GPS locations were provided by Ramboll.
- Aerial imagery accessed from ArcGIS Online. Imagery taken 9/24/2013, provided courtesy of NAIP.

Site and Well Location Map

Miami Fort Power Station
North Bend, Ohio

Geosyntec consultants

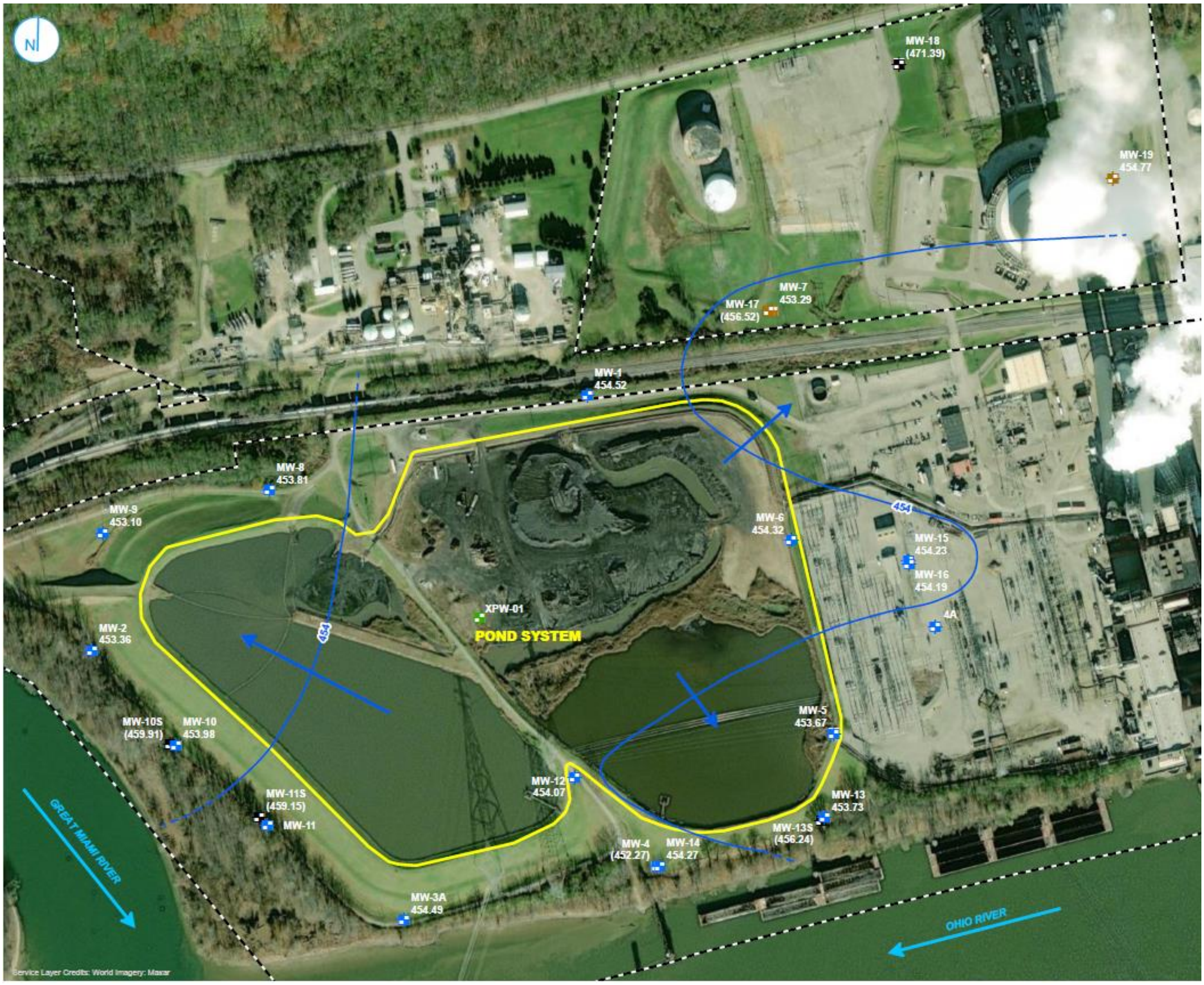
Columbus, Ohio

April 2024

Figure

1

C:\Users\minman\Documents\ArcGIS\Packages\Soil Boring Map_D4E0F7C1-56F1-4A3E-9FC1-5C1AC127B83E\v108\Soil Boring_MW.mxd; MInman; 03-Apr-2024; CHA8300-08-03



🟦 COMPLIANCE MONITORING WELL

🟫 BACKGROUND MONITORING WELL

⬛ MONITORING WELL

🟩 PORE WATER WELL

— GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)

- - - INFERRED GROUNDWATER ELEVATION CONTOUR

→ GROUNDWATER FLOW DIRECTION

🟨 REGULATED UNIT (SUBJECT UNIT)

▭ PROPERTY BOUNDARY

0 150 300 Feet

Notes

-Figure originally from “Annual Groundwater Monitoring and Corrective Action Report" (Ramboll, 2024).

-Elevations in parentheses were not used for contouring.

-Elevation contours shown in feet. North American Vertical Datum of 1988 (NAVD88).

Potentiometric Surface Map - September 2023

Miami Fort Pond System
North Bend, Ohio

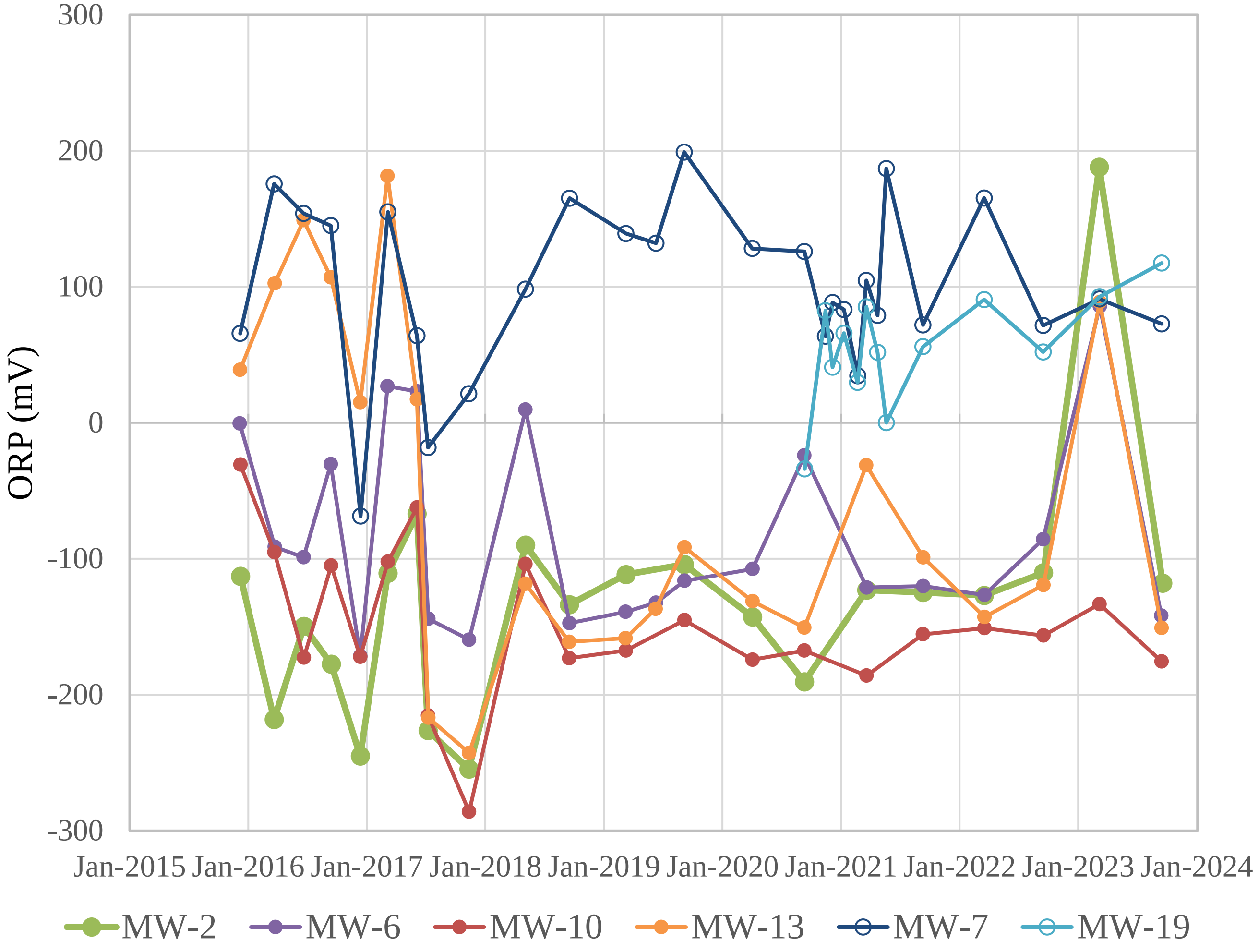
Geosyntec consultants

Figure 2

Columbus, Ohio

April 2024

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**



Notes: Data were collected under the federal coal combustion residual (CCR) rule requirements and represents oxidation reduction potential (ORP) in groundwater.

mV: millivolts

ORP Time Series Graph

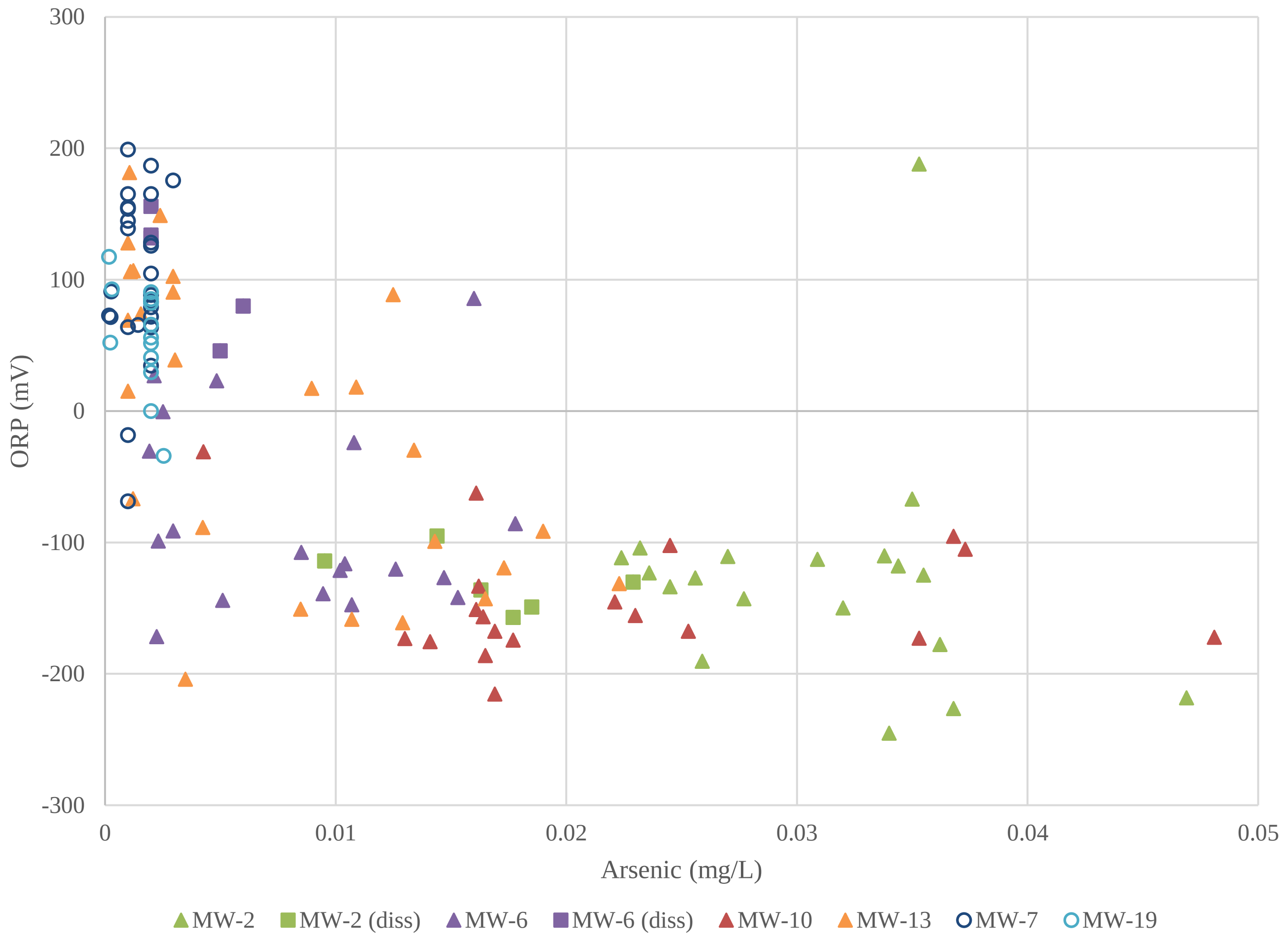
Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
3

Columbus, Ohio

April 2024



Notes: Data were collected under the federal coal combustion residual (CCR) rule requirements and represents oxidation reduction potential and arsenic in groundwater. Dissolved arsenic is shown by square symbols for occasions where only dissolved arsenic data was collected at the site rather than total arsenic data.

mg/L: milligrams per liter, mV: millivolts

Oxidation Reduction Potential Versus Arsenic Scatterplot

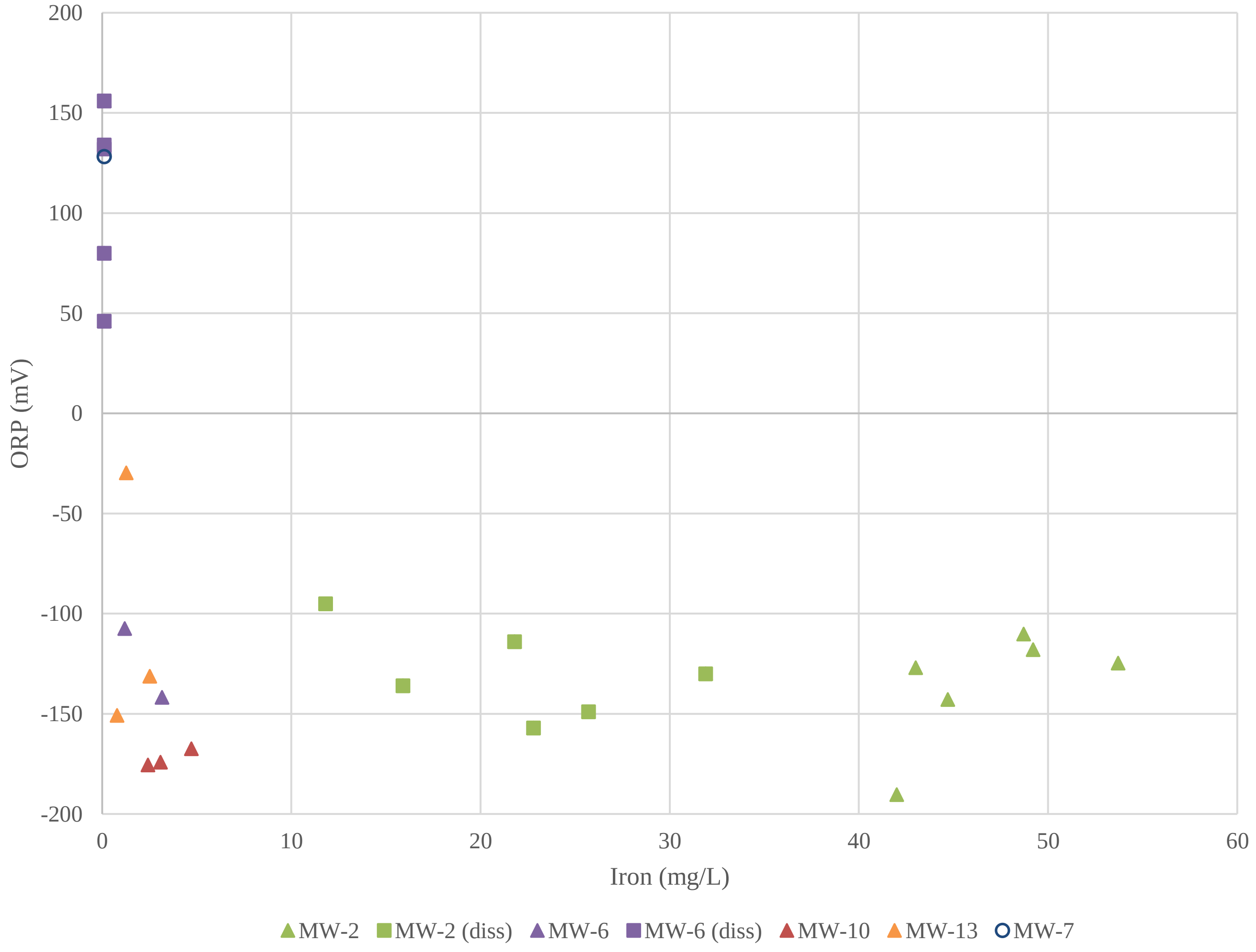
Miami Fort Pond System
North Bend. Ohio

Geosyntec consultants

Figure
4

Columbus, Ohio

April 2024



Notes: Data were collected under the federal coal combustion residual (CCR) rule requirements and represents oxidation reduction potential and iron in groundwater. Dissolved iron is shown by square symbols for occasions where only dissolved iron data was collected at the site rather than total iron data. Dissolved and total iron data was not available for upgradient well MW-19.

mg/L: milligrams per liter, mV: millivolts

Oxidation Reduction Potential Versus Iron Scatterplot

Miami Fort Pond System
North Bend, Ohio

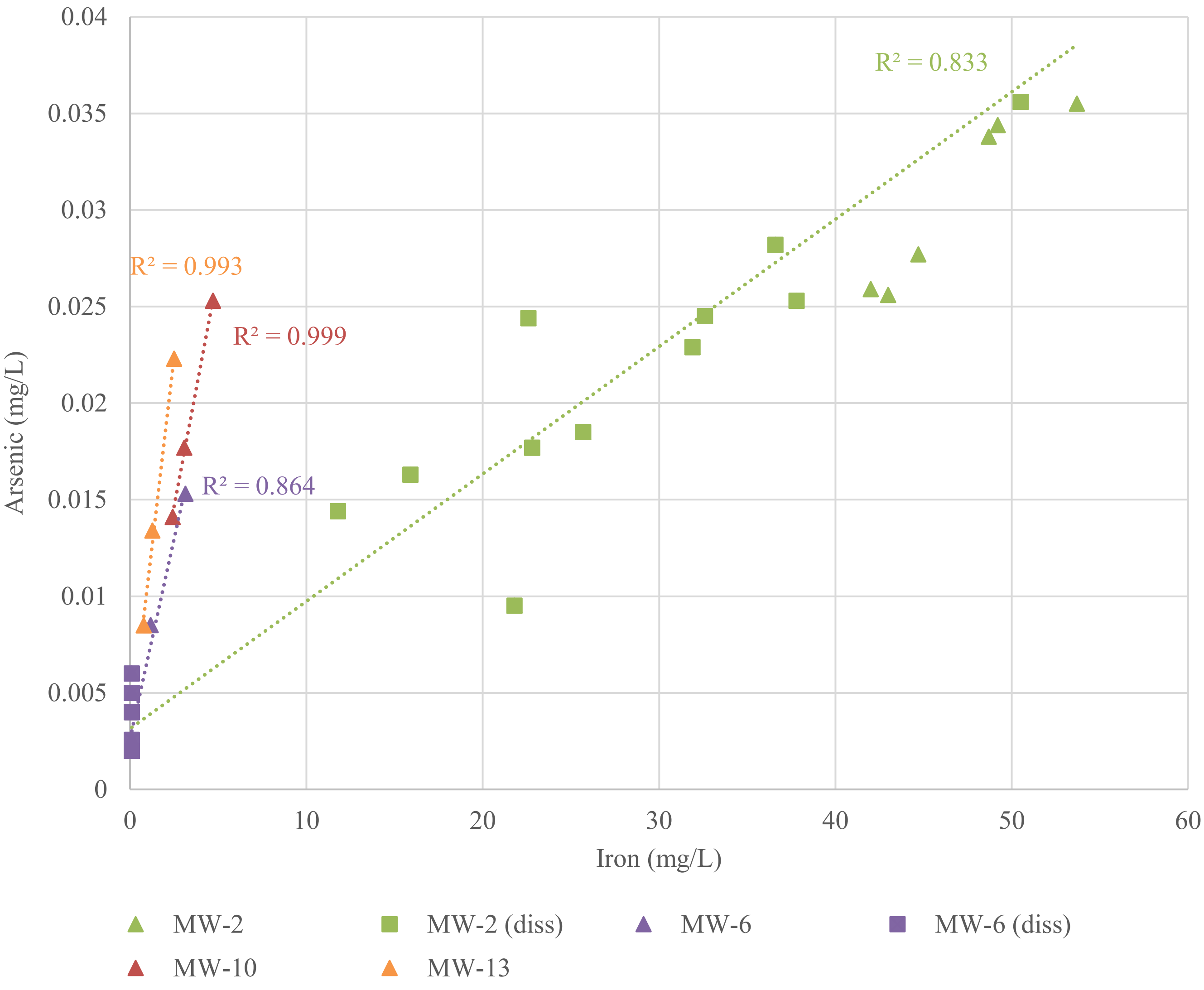
Geosyntec consultants

Figure
5

Columbus, Ohio

April 2024

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**



Notes: Data were collected under the federal coal combustion residual (CCR) rule requirements and represents aqueous arsenic and iron in groundwater. Dissolved arsenic and iron are shown by square symbols for occasions where only dissolved iron and arsenic data was collected at the site rather than total iron and arsenic data. Dissolved and total iron data was not available for upgradient well MW-19.
mg/L: milligrams per liter

Arsenic Versus Iron Scatterplot

Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Columbus, Ohio

April 2024

Figure
6

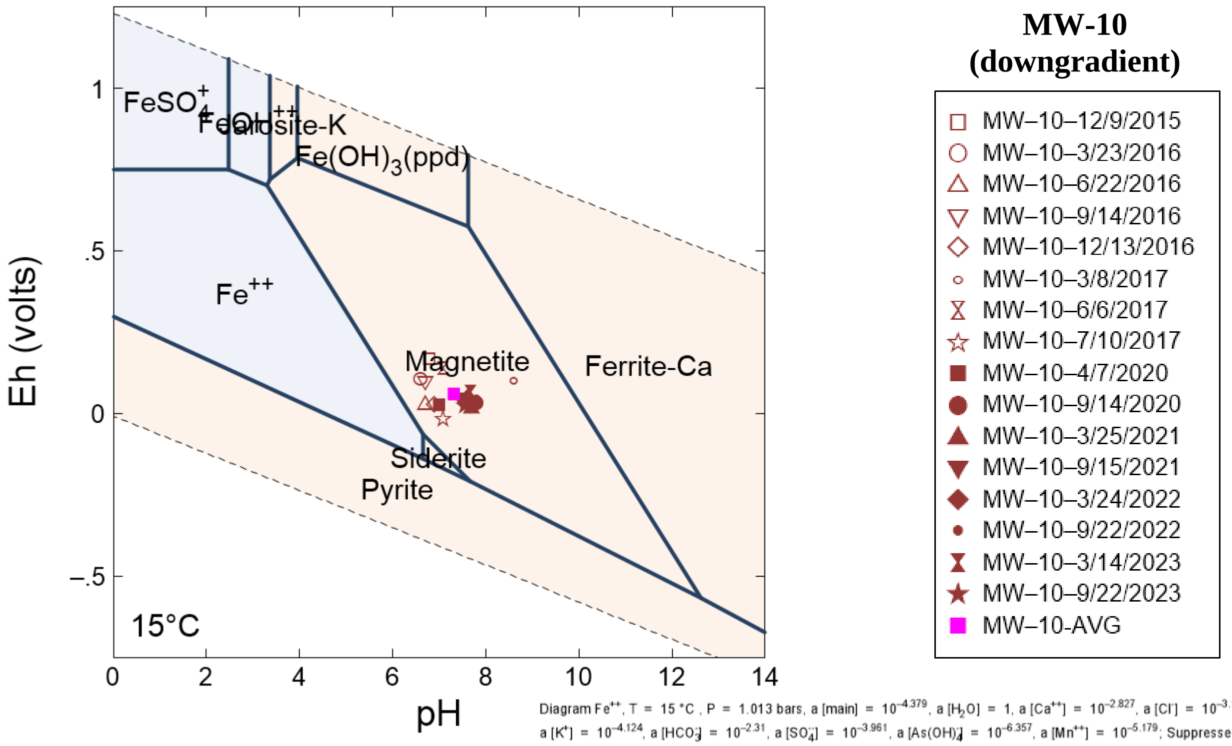

MW-10
(downgradient)

Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-4.379}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.827}$, a [Cl^-] = $10^{-3.129}$, a [Na^+] = $10^{-3.085}$, a [K^+] = $10^{-4.124}$, a [HCO_3^-] = $10^{-2.31}$, a [SO_4^{--}] = $10^{-3.961}$, a [$As(OH)_4^-$] = $10^{-6.357}$, a [Mn^{++}] = $10^{-5.179}$; Suppressed: Goethite, Hematite, Scorodite

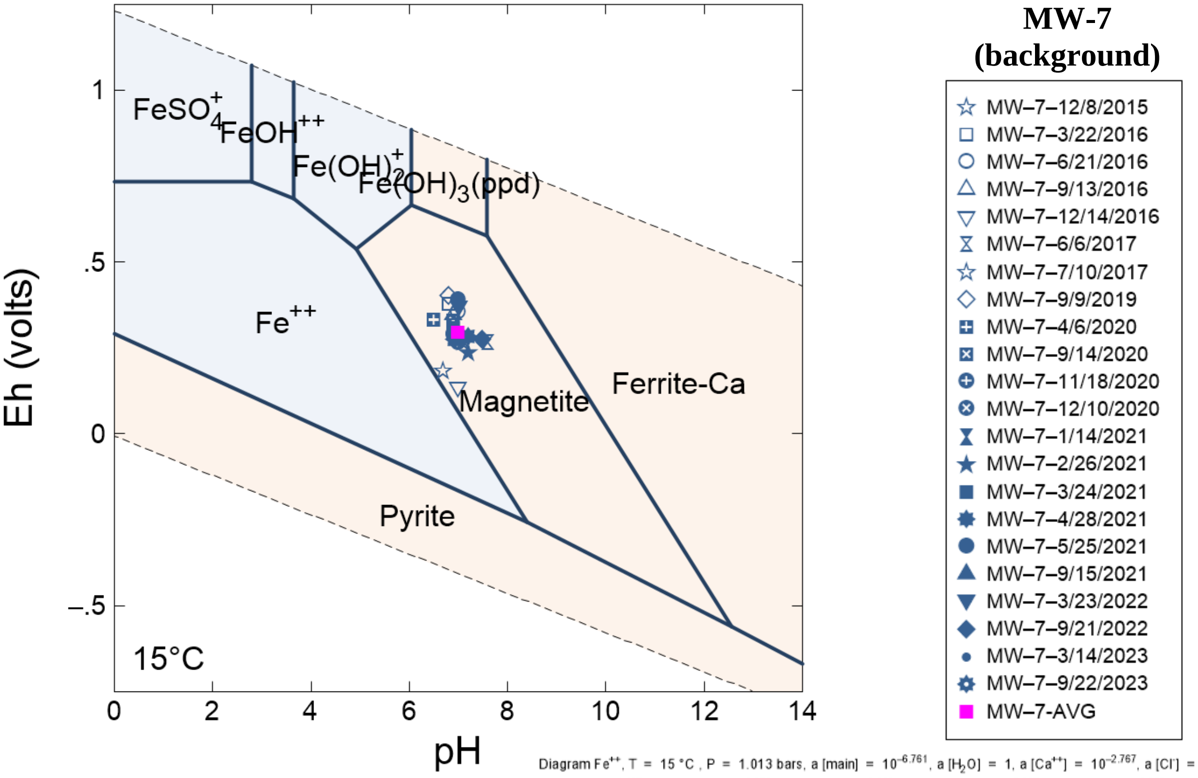

MW-7
(background)

Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-6.761}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.767}$, a [Cl^-] = $10^{-3.767}$, a [Na^+] = $10^{-3.77}$, a [K^+] = $10^{-4.407}$, a [HCO_3^-] = $10^{-2.376}$, a [SO_4^{--}] = $10^{-3.632}$, a [$As(OH)_4^-$] = $10^{-7.697}$, a [Mn^{++}] = $10^{-6.955}$; Suppressed: Goethite, Hematite, Scorodite

Notes: Groundwater samples from monitoring wells MW-10 and MW-7 which contains analytical results from all major ions are plotted in the Pourbaix diagram with the average result. Pourbaix diagrams for the remaining wells of concern can be found in **Attachment 6**.

MW-10 and MW-7: Iron Pourbaix Diagram

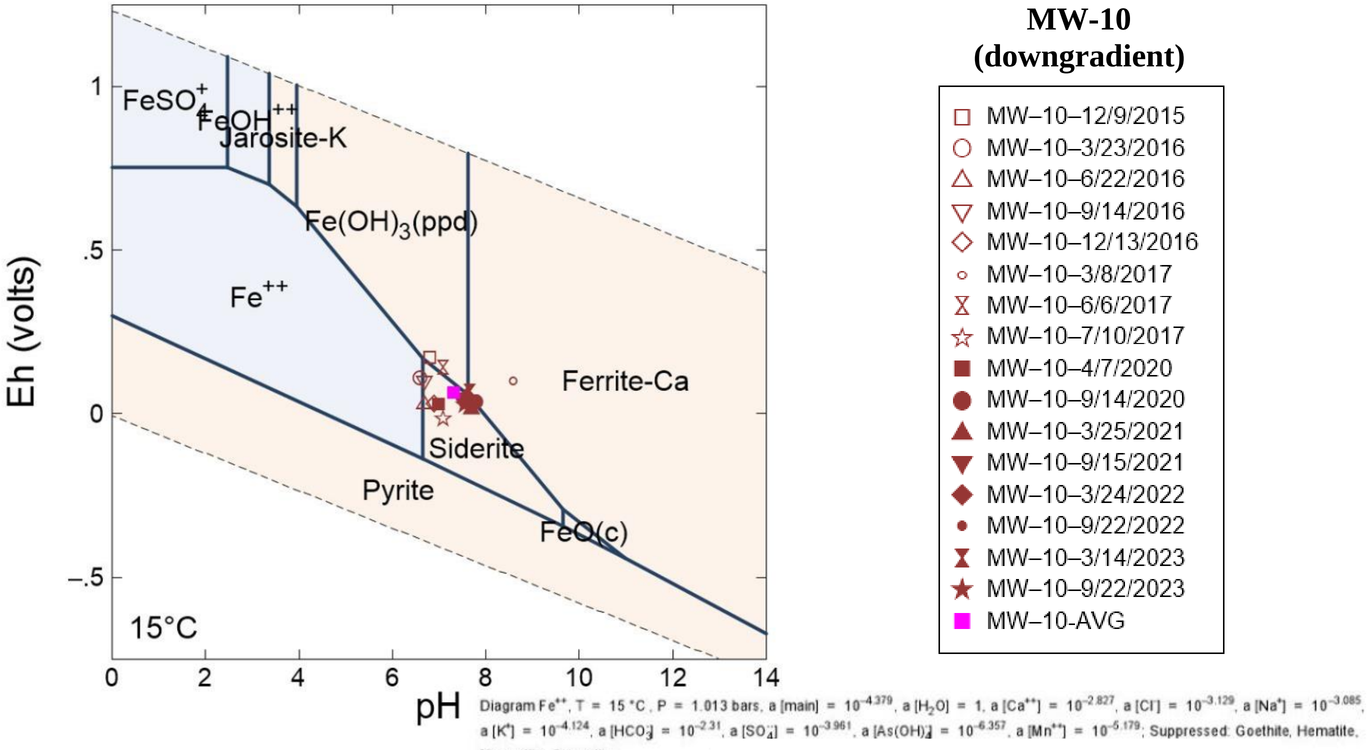
Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

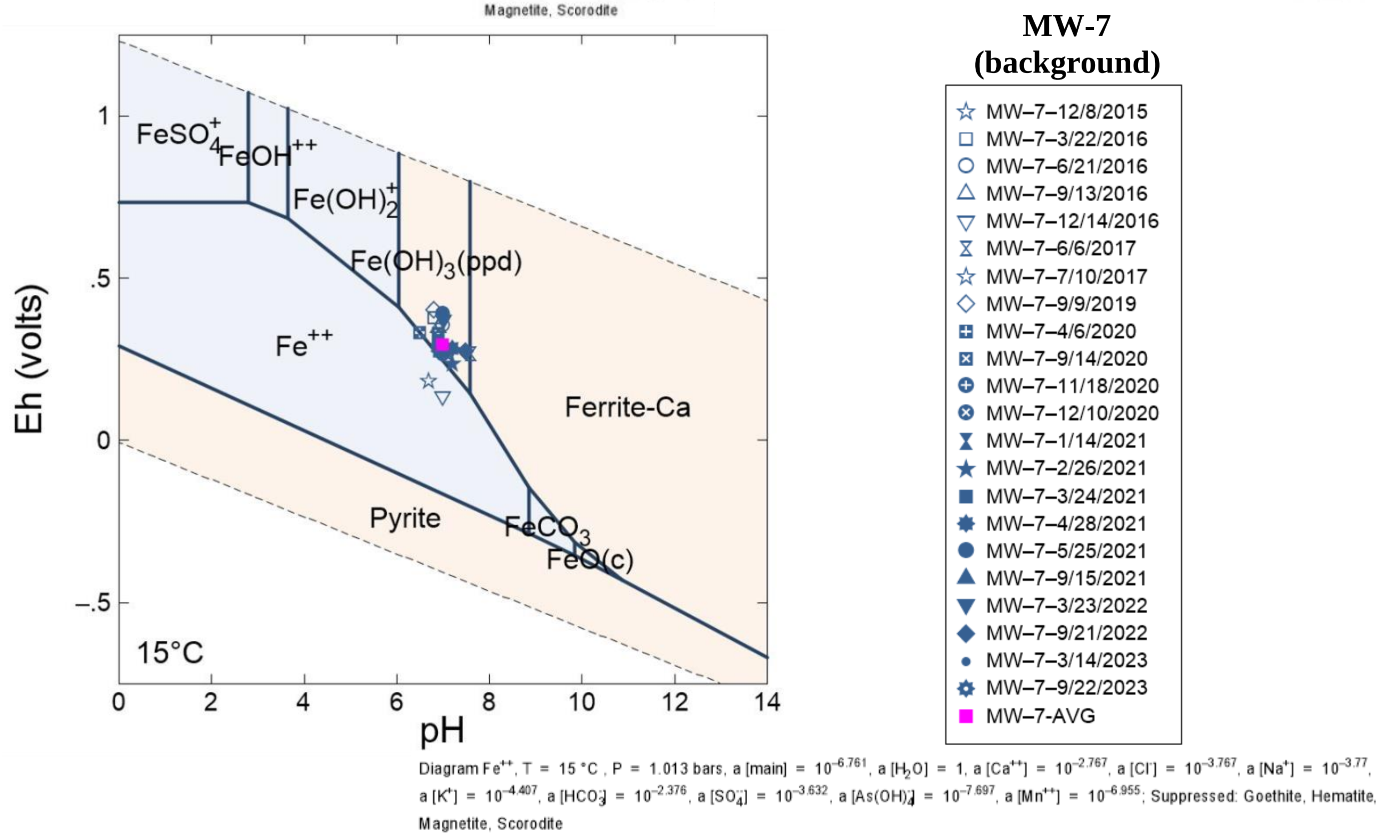
Figure
7

Columbus, Ohio | April 2024

\\stlouisms-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 ASD Update\Report\Figures



MW-10
(downgradient)



MW-7
(background)

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**

Notes: Groundwater samples from monitoring wells MW-10 and MW-7 which contains analytical results from all major ions are plotted in the Pourbaix diagram with the average result. Pourbaix diagrams for the remaining wells of concern can be found in **Attachment 6**.

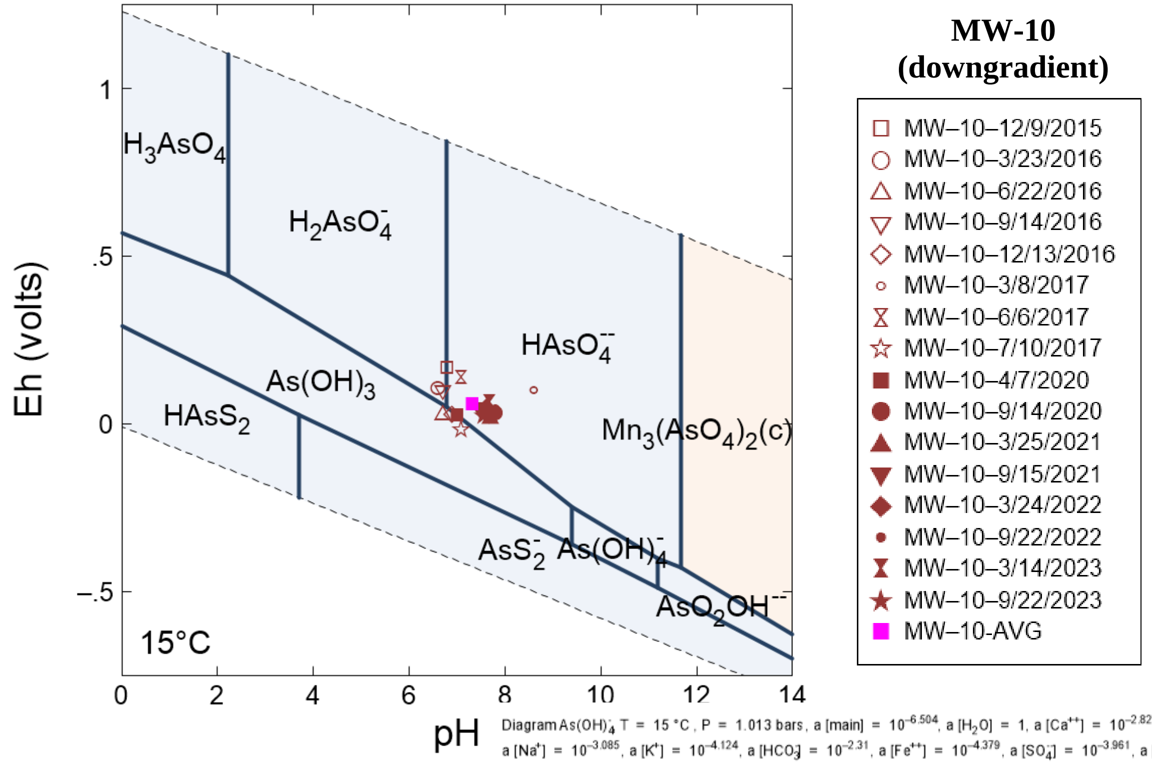
MW-10 and MW-7: Iron Pourbaix Diagram (Magnetite Suppressed)
Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
8

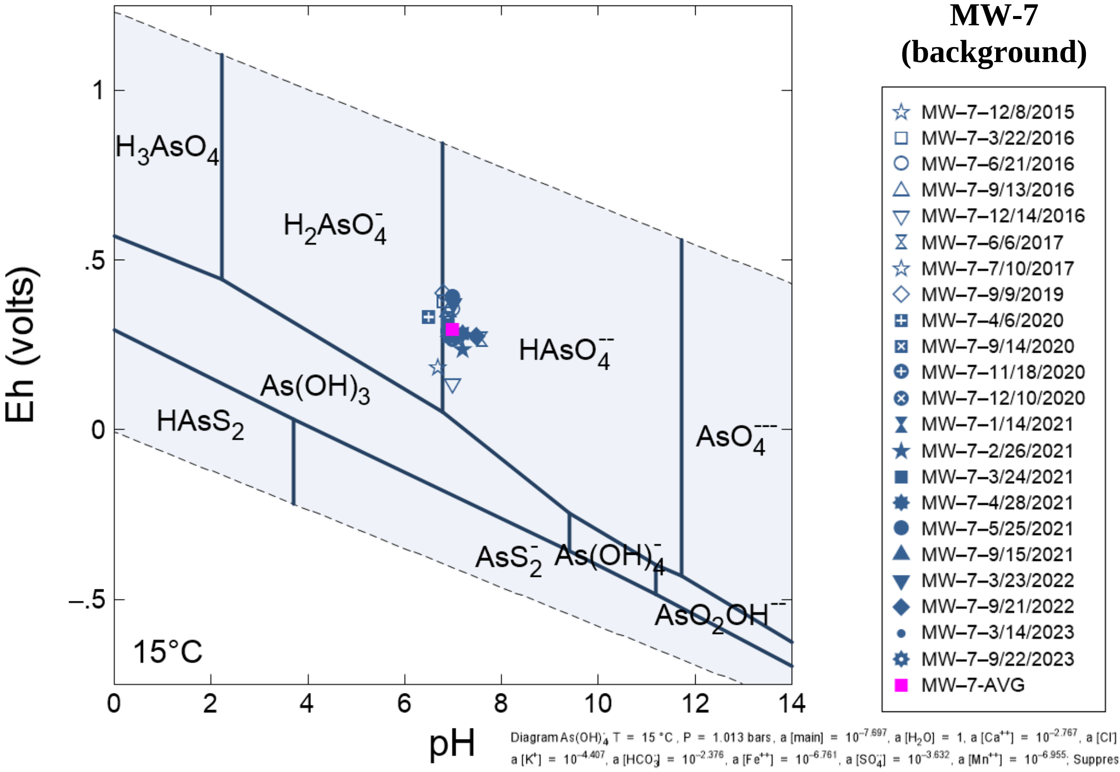
Columbus, Ohio

April 2024



MW-10
(downgradient)

Diagram $As(OH)_4^-$, T = 15 °C , P = 1.013 bars, a [main] = $10^{-6.504}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.827}$, a [Cl^-] = $10^{-3.129}$, a [Na^+] = $10^{-3.085}$, a [K^+] = $10^{-4.124}$, a [HCO_3^-] = $10^{-2.31}$, a [Fe^{++}] = $10^{-4.379}$, a [SO_4^{--}] = $10^{-3.961}$, a [Mn^{++}] = $10^{-5.186}$, Suppressed: Orpiment, Realgar, Scorodite



MW-7
(background)

Diagram $As(OH)_4^-$, T = 15 °C , P = 1.013 bars, a [main] = $10^{-7.697}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.767}$, a [Cl^-] = $10^{-3.767}$, a [Na^+] = $10^{-3.77}$, a [K^+] = $10^{-4.407}$, a [HCO_3^-] = $10^{-2.376}$, a [Fe^{++}] = $10^{-6.761}$, a [SO_4^{--}] = $10^{-3.632}$, a [Mn^{++}] = $10^{-6.955}$; Suppressed: Orpiment, Realgar, Scorodite

Notes: Groundwater samples from monitoring wells MW-10 and MW-7 which contains analytical results from all major ions are plotted in the Pourbaix diagram with the average result. Pourbaix diagrams for the remaining wells of concern can be found in **Attachment 7**.

MW-10 and MW-7: Arsenic Pourbaix Diagram

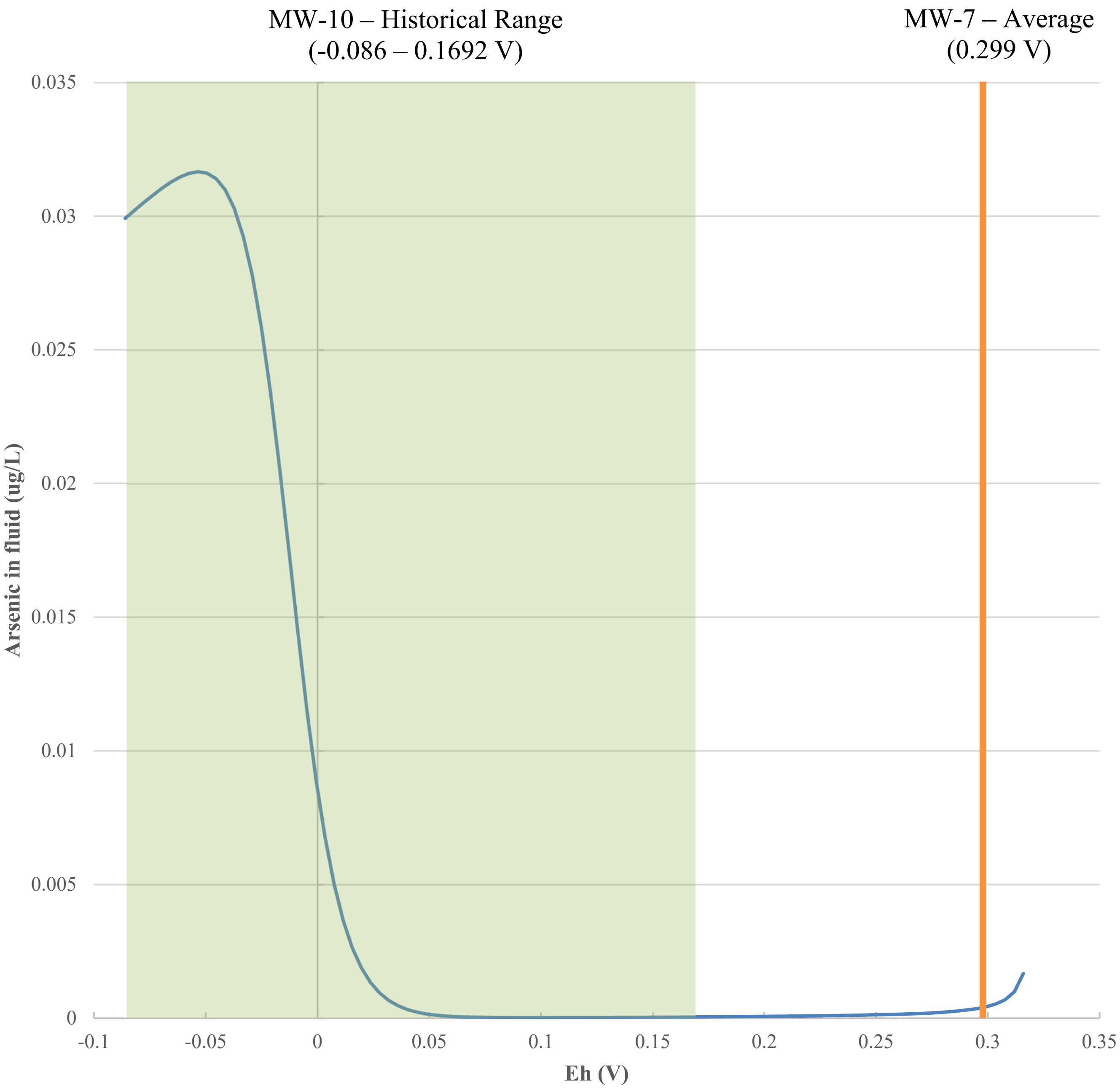
Miami Fort Pond System
North Bend, Ohio

Geosyntec
consultants

Columbus, Ohio

April 2024

Figure
9



Notes: Eh values are shown in volts (V). Predicted concentrations of aqueous arsenic in units of micrograms per liter (µg/L) as a function of Eh are shown. The historical range of measured Eh values at MW-10 is indicated by the green shading. The average Eh value of all sampling events from MW-7 is indicated by the orange line.

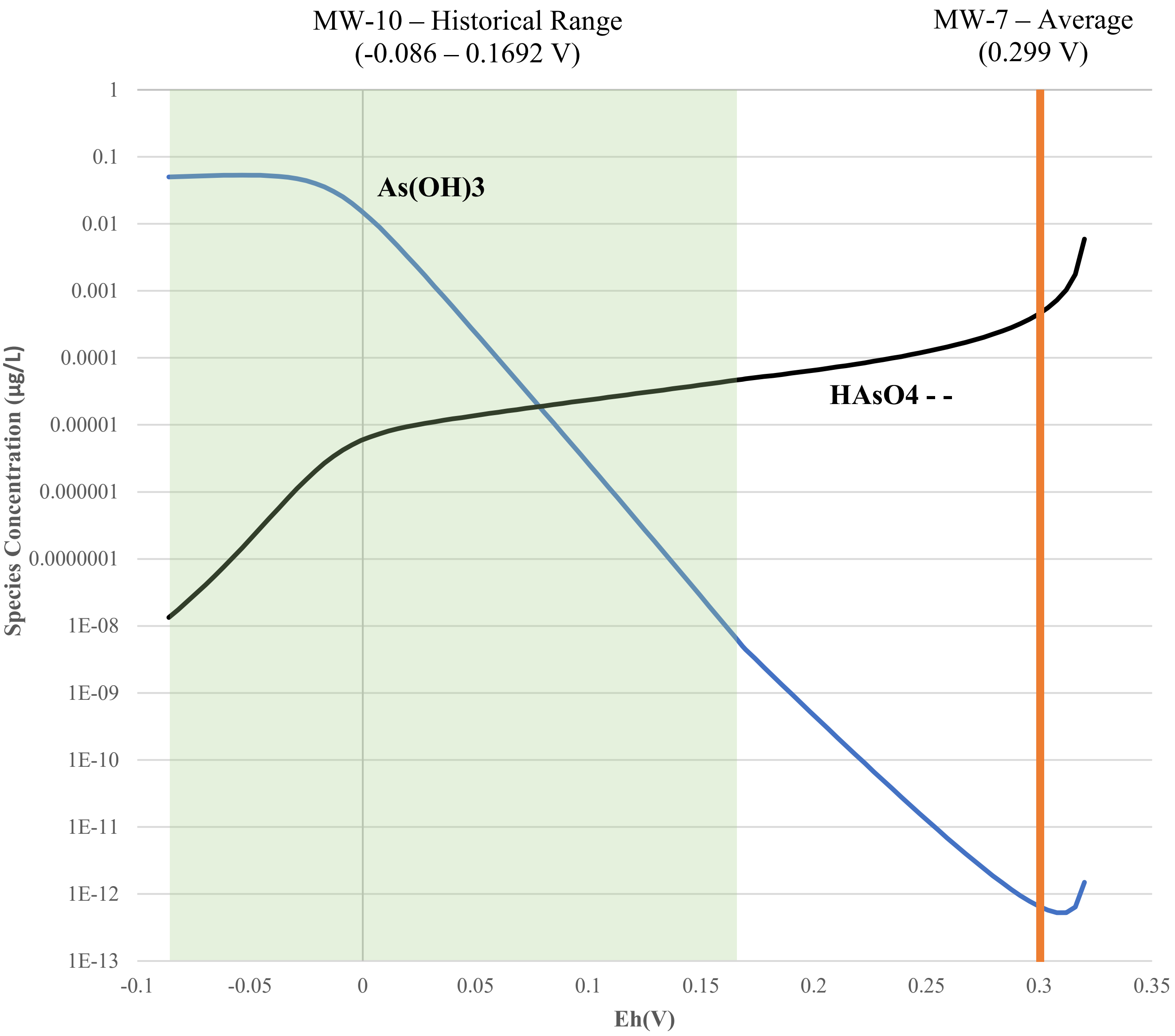
MW-10 Geochemical Model: Total Aqueous Arsenic
Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
10

Columbus, Ohio
April 2024

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**



Notes: The concentrations of aqueous arsenic species (µg/L) are plotted against Eh (V).

µg/L: micrograms per liter
V: volts

MW-10 Geochemical Model: Aqueous Arsenic Speciation

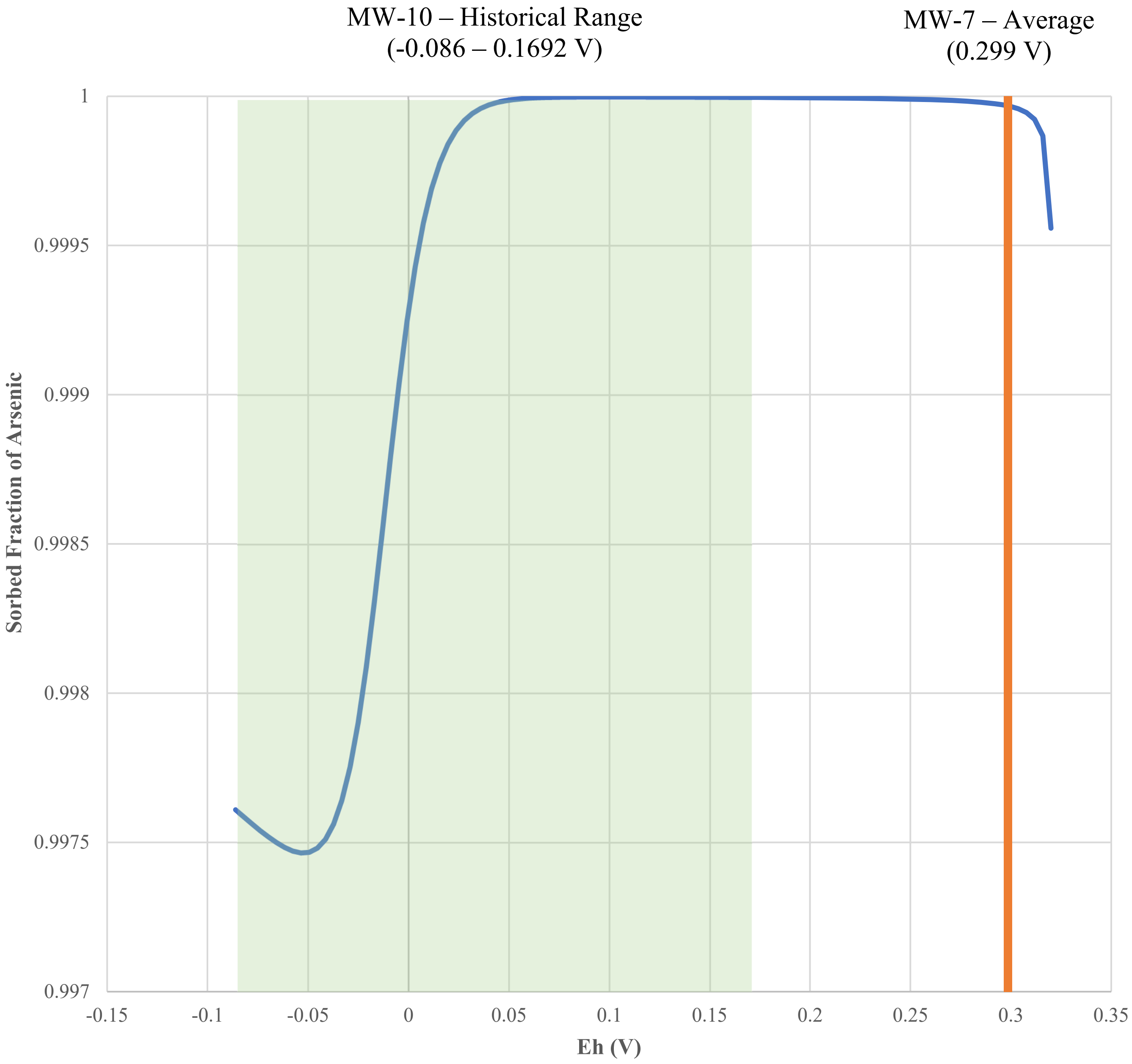
Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
11

Columbus, Ohio

April 2024



Notes: The fraction of sorbed arsenic is plotted against Eh (V).

V: volts

MW-10 Geochemical Model: Sorbed Arsenic

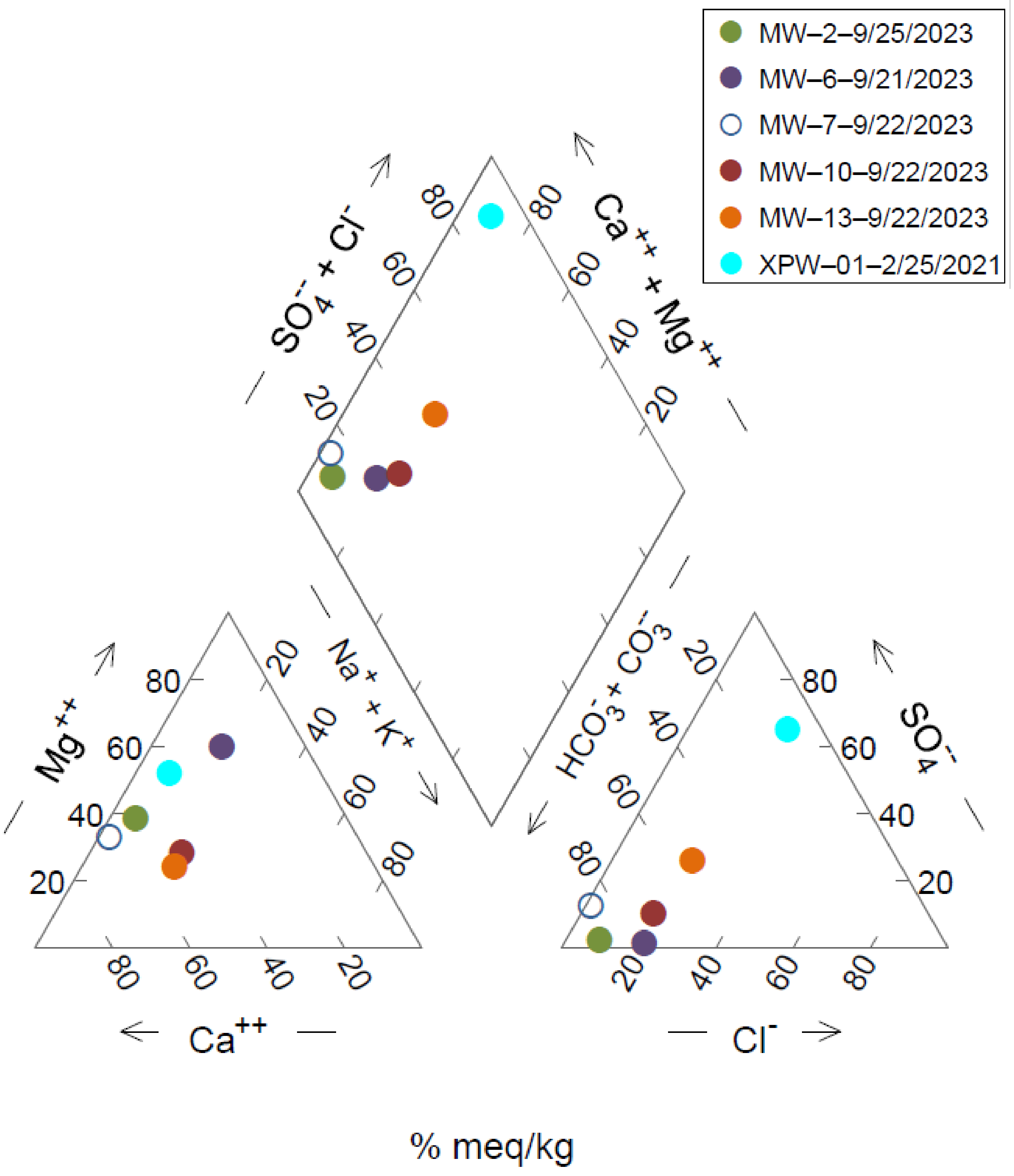
Miami Fort Pond System
North Bend, Ohio

Geosyntec
consultants

Figure
12

Columbus, Ohio

April 2024



Notes: September 2023 groundwater samples from monitoring wells MW-2, MW-6, MW-7, MW-10, and MW-13 which contain analytical results for all major ions are plotted on the Piper diagram with the most recent porewater (XPW-01) sample.

% meq/kg: percent milliequivalents per kilogram

Piper Diagram: Porewater Comparison

Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Columbus, Ohio

April 2024

Figure
13

ATTACHMENT 1

Ramboll's 2020 Alternative Source Demonstration

Intended for
Dynegy Miami Fort, LLC

Date
November 12, 2020

Project No.
1940074922

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

MIAMI FORT POND SYSTEM

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Jacob J. Walczak, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Jacob J. Walczak
Senior Hydrogeologist
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020

I, Nicole M. Pagano, a qualified professional engineer in good standing in the State of Ohio, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used for other than its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

Nicole M. Pagano
Qualified Professional Engineer
85428
Ohio
Ramboll Americas Engineering Solutions, Inc.,
f/k/a O'Brien & Gere Engineers, Inc.
Date: November 12, 2020

NICOLE M. PAGANO
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https://ramboll.com

CONTENTS

FIGURES (IN TEXT)

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	Coal Combustion Residuals
CMP	corrugated metal pipe
FGD	Flue Gas Desulfurization
f/k/a	formerly known as
ft	feet
GWPS	Groundwater Protection Standards
HDPE	high density polyethylene
LOEs	lines of evidence
MCD	Miami Conservancy District
μg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT/OBG	Natural Resource Technology, an OBG Company
OEPA	Ohio Environmental Protection Agency
ORP	oxidation-reduction potential
Ramboll	Ramboll Americas Engineering Solutions, Inc., f/k/a O’Brien & Gere Engineers, Inc.
RCRA	Resource Conservation and Recovery Act
Site	Miami Fort Power Station
SSIs	Statistically Significant Increases
SSLs	Statistically Significant Levels
USGS	United States Geological Survey

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a Coal Combustion Residuals (CCR) unit 90 days from the date of determination of Statistically Significant Levels (SSLs) over Groundwater Protection Standards (GWPS) of groundwater constituents listed in Appendix IV of 40 C.F.R. Part 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality (Alternate Source Demonstration [ASD]).

This ASD has been prepared on behalf of Dynegy Miami Fort, LLC, by Ramboll Americas Engineering Solutions, Inc., formerly known as (f/k/a) O'Brien & Gere Engineers, Inc.(Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Miami Fort Pond System located near North Bend, Ohio.

The most recent Assessment Monitoring sampling event (A3) was completed on April 6 through April 7, 2020 and analytical data were received on May 4, 2020. Analytical data from all sampling events, from December 2015 through A3, were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017) to determine any Statistically Significant Increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPS. That evaluation identified the following SSLs at downgradient monitoring wells:

- Arsenic at wells MW-2, MW-10 and MW-13
- Cobalt at wells MW-4 and 4A
- Molybdenum at well MW-6

In accordance with the Statistical Analysis Plan, wells MW-13 and 4A were resampled on June 12, 2020 and analyzed only for arsenic and cobalt, respectively, to confirm the SSLs. Following evaluation of analytical data from the resample event, the SSLs listed above for MW-13 and 4A were confirmed.

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the following lines of evidence (LOEs) demonstrate that sources other than the Miami Fort Pond System were the cause of the arsenic and molybdenum SSLs listed above. This ASD was completed by November 2, 2020, within 90 days of determination of the SSLs (August 3, 2020), as required by 40 C.F.R. § 257.95(g)(3)(ii). This ASD does not address cobalt SSLs at downgradient monitoring wells MW-4 and 4A which is addressed by the Corrective Measures Assessment for the Pond System.

2. BACKGROUND

2.1 Site Location and Description

Miami Fort Power Station (Site) is located in the southwest corner of Ohio (Hamilton County) adjacent to the state boundaries of Indiana (west) and Kentucky (south), and approximately 5 miles southwest of North Bend, Ohio on the north shore of the Ohio River at the confluence with the Great Miami River (Figure 1). The Miami Fort Pond System (Pond System) is bounded by the Veolia North America property and Brower Road to the north, the Great Miami River to west, the Ohio River to the south, and the Miami Fort electric switch yard to the east. The Miami Fort production wells are located east of Basin A and Veolia's production wells are located northwest of Basin B. Pond System CCR monitoring well locations, production well locations, and source water sampling locations are shown in Figure 1.

2.2 Description of the CCR Multi-Unit

The Pond System is a CCR Multi-Unit consisting of Basins A and B (CCR Multi-Unit ID 115). The Multi-Unit covers a total area of approximately 51 acres and is located in the southwest corner of the Site property as shown in Figure 1.

Basin A (formerly Unit 111) receives effluent from the sluice lines, which primarily transport bottom ash products as well as flue gas desulfurization (FGD) effluent and some fly ash. Basin A also receives directly discharged miscellaneous yard drainage. The material is discharged into the northern portion of the basin and through a constructed internal ditch line allowing the solids to settle and the water to decant into Basin B. Solid materials collected in Basin A are generally reclaimed for beneficial reuse or landfill placement. The Basin A normal pool level is typically between elevations of 495 and 498 ft. Basin A and Basin B are hydraulically connected with a 48-inch corrugated metal pipe (CMP) culvert sliplined with a 40-inch high density polyethylene (HDPE) pipe that runs through the shared dike, allowing the basins to operate in series. The Basin A outfall is currently not in use and flow-through is controlled by the gate structure (AECOM, 2017).

Basin B (formerly Unit 112) was constructed between 1979 and 1981 (AECOM, 2017). The Basin B normal pool level is typically below the Basin A normal pool and between elevations of 495 and 498 ft. Basin A discharges into Basin B, which is used as a polishing pond prior to discharge to the Ohio River through the permitted outfall structure in Basin B. Miscellaneous yard drainage is also currently discharged directly to Basin B (AECOM, 2017).

2.3 Geology and Hydrogeology

The native geologic materials present beneath the Pond System at the Site include alluvial deposits, glacial outwash (Uppermost Aquifer), and bedrock, as described below:

- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits are present at a depth ranging from approximately 20 to 60 ft below ground surface (bgs). A silty, sandy clay layer is the primary component of the alluvial deposits. The top of clay elevation ranges from 428 ft referenced to the North American Vertical Datum of 1988 (NAVD88) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to 495 ft beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Pond System and thickens towards the Ohio River. The clay is thickest beneath the southern half of the

Pond System, ranging in thickness from 15 ft to 48 ft. A silt layer, averaging approximately 7 ft thick, overlies the clay in several areas.

- Glacial Outwash (Uppermost Aquifer) - The Uppermost Aquifer consists of glacial outwash sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits beneath the Site is approximately 100 ft; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally overlying the outwash deposits and ranges in thickness from 4 to 30 ft; however, it is not present below the entirety of the Pond System.
- Bedrock - The bedrock consists of interbedded shales and limestones belonging to the Ordovician-aged Fairview and Kope formations (AECOM, 2017). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft bgs. Due to the relatively impermeable nature of the shales and limestones underlying this region, water yields in the bedrock are generally insufficient for domestic use (AECOM, 2017).

The glacial outwash deposits (Uppermost Aquifer) underlying the Pond System are part of the Ohio River Valley Fill Aquifer; a glacial buried-valley deposit aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently backfilled with deposits of sand, gravel, and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. The thickness of the deposits ranges from approximately 60 to 100 ft and covers much of the width of the terrace between the valley wall to the Great Miami River and Ohio River confluence.

Groundwater elevations across the Site ranged from approximately 456 to 460 ft during A3, coincident with an approximate Ohio River pool elevation of 461 ft. The groundwater elevation contours shown on Figure 2 are based on groundwater measurements collected on April 6, 2020, the day prior to A3 analytical sampling. Groundwater flow in the Uppermost Aquifer is generally to the west/northwest towards the Great Miami River and Veolia’s production wells, and south towards the Ohio River.

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following LOEs:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

These LOEs are described and supported in greater detail below. Monitoring wells and Pond System source water sample locations are shown on Figure 1.

3.1 LOE #1: Median Arsenic and Molybdenum Concentrations in the Pond System Source Water Are Lower Than the Median Arsenic and Molybdenum Concentrations Observed in Downgradient Wells with Arsenic and Molybdenum SSLs.

Box-and-whisker plots graphically represent the range of values of a given dataset using lines to construct a box where the lower line, midline, and upper line of the box represent the values of the first quartile, median, and third quartile values, respectively. The minimum and maximum values of the dataset (excluding outliers) are illustrated by whisker lines extending beyond the first and third quartiles of (*i.e.*, below and above the box). The interquartile range (IQR) is the distance between the first and third quartiles. Outliers (values that are at least 1.5 times the IQR away from the edges of the box) are represented by single points plotted outside of the range of the whiskers. The number in parentheses below each plot is the number of observations (i.e. samples) represented in that dataset.

Figure A below provides a box-and-whisker plot of the total arsenic concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2, and B-3 (monitoring well and source water [pond] sampling locations are shown on Figure 1). Total arsenic concentrations obtained in source water samples and presented in Figure A were pooled to provide a median concentration for comparison to arsenic concentrations in monitoring wells.

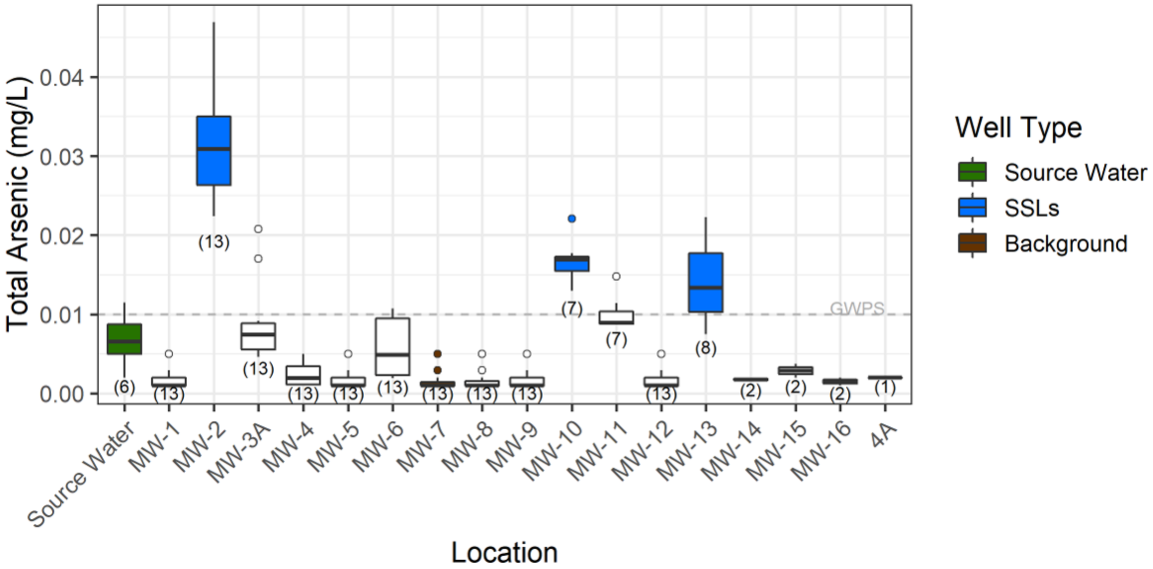

Figure A. Distribution of Arsenic Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure A) shows the arsenic concentrations in wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13) have median arsenic concentrations greater than the median arsenic concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of arsenic in downgradient groundwater at wells with arsenic SSLs (*i.e.*, MW-2, MW-10, and MW-13), Pond System source water concentrations would be higher than the groundwater concentrations at those wells. Therefore, the Pond System is not the source of the arsenic in the downgradient groundwater.

Figure B below provides a box-and-whisker plot of the molybdenum concentrations collected between 2015 and 2020 at Pond System monitoring wells and source water locations A-1, B-1, B-2 and B-3 (monitoring well and source water sampling locations are shown on Figure 1).

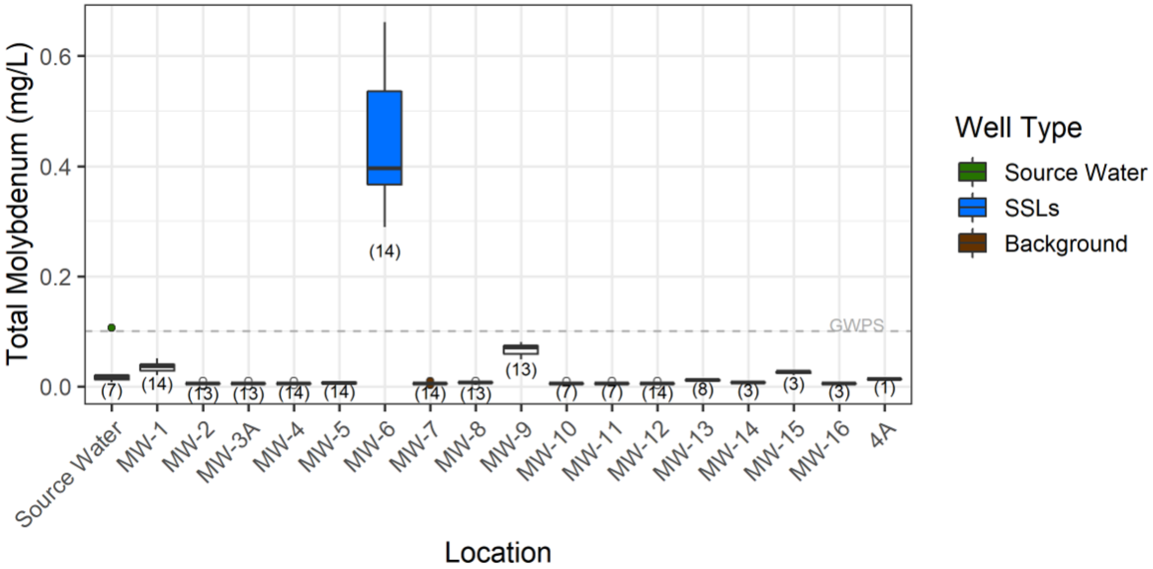

Figure B. Distribution of Molybdenum Concentrations at Pond System Monitoring Wells and Source Water Locations (note: source water locations are pooled).

The box-and-whisker plot (Figure B) shows the median molybdenum concentration in the well with a molybdenum SSL (*i.e.*, MW-6) is greater than the median molybdenum concentration observed in the source water (A-1, B-1, B-2, and B-3). If the Pond System was the source of molybdenum in downgradient groundwater at the well with a molybdenum SSL (*i.e.*, MW-6), Pond System source water concentrations would be higher than the groundwater concentrations at that well. Therefore, the Pond System is not the source of the molybdenum in the downgradient groundwater.

3.2 LOE #2: Arsenic and Molybdenum Concentrations Associated with Monitoring Wells MW-2, MW-10 and MW-13, and MW-6, respectively, are Not Correlated with Boron Concentrations, a Common Indicator for CCR Impacts to Groundwater.

Boron is a common indicator of CCR impacts to groundwater due to its leachability from CCR and mobility in groundwater. If a CCR constituent is identified as an SSL but boron is not correlated with that constituent, it is unlikely that the CCR unit is the source of the SSL.

Figure C below provides a scatter plot of arsenic versus boron concentrations (collected between 2015 and 2020) in downgradient groundwater at wells with arsenic SSLs, along with the results of a Kendall correlation test for non-parametric data. The results of the test at each well are described by the p-value and tau (Kendall's correlation coefficient) included in each plot. Typically, a p-value greater than 0.05 is considered to be a statistically insignificant relationship. The range of tau falls between -1 and 1, with a perfect correlation equal to -1 or 1. The closer tau is to 0, the less of a correlation exists in the data.

The results of the correlation analyses indicated that groundwater concentrations of arsenic observed at monitoring wells MW 2, MW-10, and MW-13 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure C below illustrates the lack of a relationship between arsenic concentrations and boron concentrations in groundwater at MW-2, MW-10, and MW-13, where the p-values are greater than 0.05 and tau is close to 0.

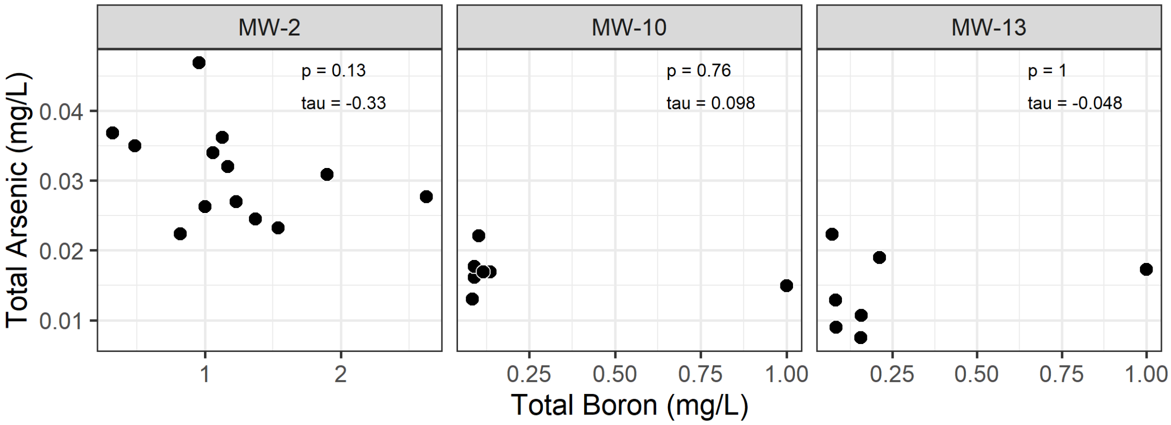

Figure C. Arsenic Concentrations Versus Boron Concentrations at Wells MW-2, MW-10, and MW-13 (2015-2020).

Figure D below provides a scatter plot of molybdenum versus boron concentrations (collected between 2015-2020) in downgradient groundwater at the only well with a molybdenum SSL, MW-6, along with the results of Kendall correlation analysis at MW-6 as described by the p-values and tau correlation coefficients included in the plot. The results of the Kendall correlation analysis indicated that groundwater molybdenum concentrations observed at monitoring well MW-6 do not correlate with concentrations of boron, a common indicator of CCR impacts to groundwater. Figure D below illustrates the lack of a relationship between molybdenum concentrations and boron concentrations in groundwater at MW-6, where the p-value is greater than 0.05 and tau is close to 0.

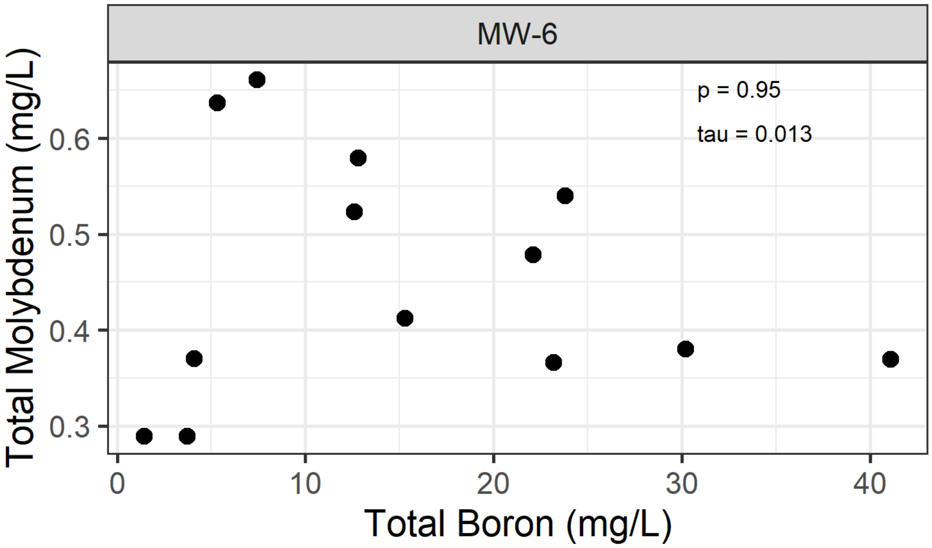

Figure D. Molybdenum Concentrations Versus Boron Concentrations at Well MW-6 (2015-2020).

Arsenic and molybdenum concentrations do not correlate with boron concentrations in downgradient monitoring wells with arsenic and molybdenum SSLs, indicating the Pond System is not the source of CCR constituents detected in the downgradient monitoring wells.

3.3 LOE #3: Naturally-Occurring Concentrations of Arsenic are Commonly Found in Soils and Groundwater in Southwestern Ohio. MW-2, MW-10, and MW-13 are Located in Southwestern Ohio, Along the Banks of the Great Miami River and Ohio River, Where They are Susceptible to Geochemical Conditions that can Mobilize Naturally-Occurring Arsenic from the Soils into Groundwater.

Naturally-occurring concentrations of arsenic are commonly found in nearby soils. Ten surficial soil samples (0 to 2 ft bgs) were collected by Ohio Environmental Protection Agency (OEPA), approximately 3,000 ft northeast of the Pond System (Figure 1), near Shawnee Lookout in Hamilton County Park, and analyzed for arsenic as part of a study to evaluate background soil concentrations of Resource Conservation and Recovery Act (RCRA) metals in the Cincinnati area (OEPA, 2015). Results of the analysis indicated surficial terrace soils (clay) adjacent to the Pond System have background arsenic concentrations ranging from 5.61 to 8.20 milligrams per kilogram (mg/kg).

Arsenic occurs naturally in southwestern Ohio glacial buried-valley deposit aquifers like the Uppermost Aquifer. Fifty-seven (57) groundwater samples were collected by the United States Geological Survey (USGS) in cooperation with the Miami Conservancy District (MCD) to increase understanding of arsenic occurrence in southwest Ohio (Thomas et al., 2005). The study included samples collected from carbonate bedrock, glacial buried-valley deposits and glacial till with interbedded sand and gravel aquifers within the Great Miami River drainage basin, and included samples from domestic wells in Preble, Miami, and Shelby counties. The USGS reported that 37 percent of the samples analyzed had elevated concentrations of arsenic (greater than or equal to 10 micrograms per liter [μg/L]) and elevated arsenic concentrations were found in all three aquifer types studied. Geochemical conditions were also evaluated and the USGS determined that elevated arsenic concentrations in the study area were associated with iron-reducing, sulfate-reducing, or methanic conditions, and all samples with elevated arsenic concentrations had iron concentrations that exceeded 1 milligrams per liter (mg/L), indicating the potential for the reduction of arsenic-bearing iron oxides present in soil.

Based on previous studies discussed above, naturally-occurring concentrations of arsenic are known to exist in both soils and groundwater in the same region (southwestern Ohio) and aquifer type (glacial buried-valley deposit aquifer) as the Pond System. The OEPA study showed arsenic-bearing soils were found in close proximity (approximately 3,000 ft northeast) to the Pond System. The USGS study showed that iron-reducing, sulfate-reducing, or methanic geochemical conditions needed to mobilize arsenic were common in southwestern Ohio aquifers. Reducing conditions indicating the potential for arsenic mobilization are likely to occur at the Pond System monitoring wells MW-2, MW-10, and MW-13, where arsenic SSLs were determined, as indicated by the following factors discussed below:

- Most riverbank boring logs indicate organic materials are present in the soils.
- MW-2, MW-10, and MW-13 are among the monitoring wells adjacent to the riverbank, where the lowest oxidation-reduction potential (ORP) at the Site were observed.

- Dissolved iron concentrations present in groundwater at monitoring well MW-2 correlate with dissolved arsenic concentrations.

Arsenic is naturally present in groundwater and soils at variable concentrations. The arsenic is co-precipitated with iron oxyhydroxides and incorporated into the mineral structure of the soils, and can also be adsorbed to organic matter or the iron oxyhydroxides in the aquifer. Both of these sources of arsenic can be mobilized in groundwater by dissolution or desorption under reducing geochemical conditions, where organic carbon commonly acts as the reducing agent (Thomas et al., 2005; McArthur et al., 2001). Arsenic-bearing soils are known to be present in the areas near the Pond System (OEPA, 2015); and, organic matter, a source of organic carbon and potential reducing agent, was observed in the most riverbank boring logs for monitoring wells located along the banks of the Great Miami River and Ohio River (see boring logs for wells MW-2, MW-3A, MW-4, MW-10, and MW-11 in Appendix A). The presence of organic material and arsenic-bearing soils indicates there is potential for naturally-occurring arsenic to become mobilized through reductive dissolution or desorption.

Reducing conditions sufficient to mobilize naturally-occurring arsenic have also been observed along the riverbanks of the Great Miami River and Ohio River as evidenced by the low ORP measurements observed in the groundwater at monitoring wells MW-2, MW-3A, MW-10, MW-11, MW-13 and MW-14 (presented in Figure E below; monitoring wells adjacent to the riverbank are illustrated with solid lines, upland wells are illustrated with dashed lines).

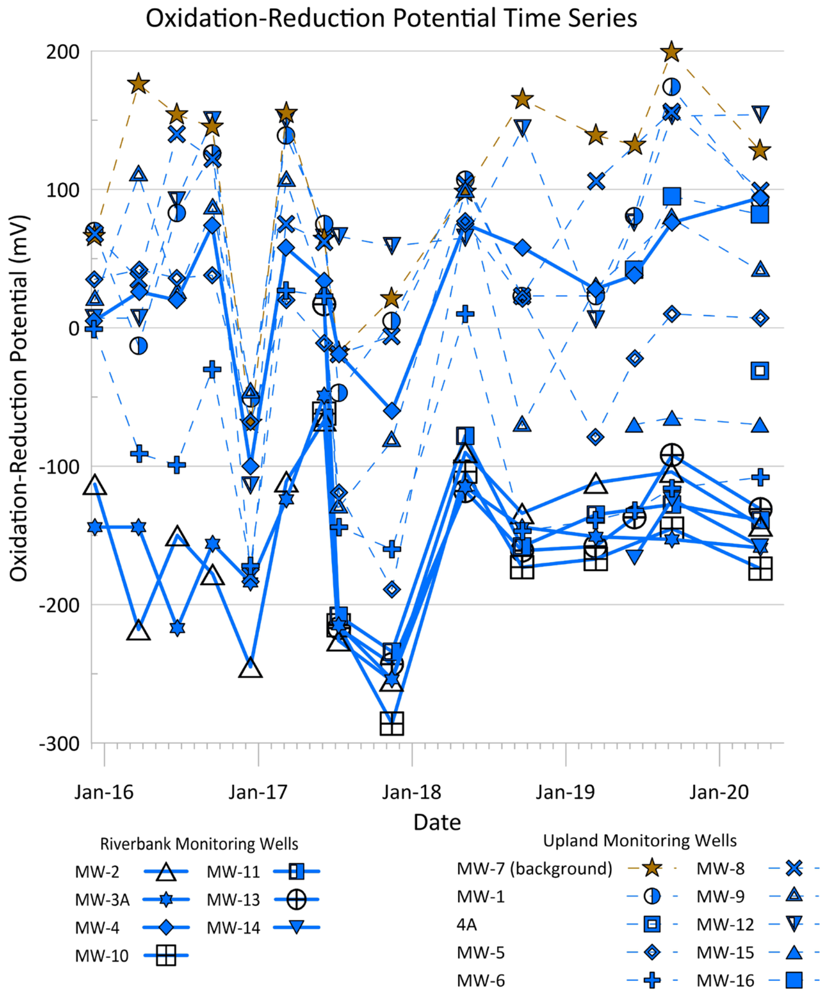

Figure E. Oxidation Reduction Potential Time-Series for Groundwater Samples (Monitoring Wells Adjacent to the Riverbank are Illustrated with Solid Lines, Upland Wells are Illustrated with Dashed Lines).

Available data indicated that concentrations of dissolved iron observed in groundwater at monitoring well MW-2 from 2008 to 2014 correlate with dissolved arsenic concentrations. Dissolved iron concentrations ranged from 11.8 to 52.1 mg/L at monitoring well MW-2 from 2008 to 2014, at least an order of magnitude greater than the 1 mg/L reported by the USGS as being indicative of iron-reducing geochemical conditions. Dissolved iron concentrations were also near or greater than 1 mg/L in A3 for MW-2, MW-10, and MW-13 at 45, 2.5 and 0.91 mg/L, respectively. Figure F below illustrates the relationship between dissolved iron concentrations and dissolved arsenic concentrations in groundwater at MW-2, where the R-squared value is 0.87, indicating a good correlation between dissolved iron and dissolved arsenic.

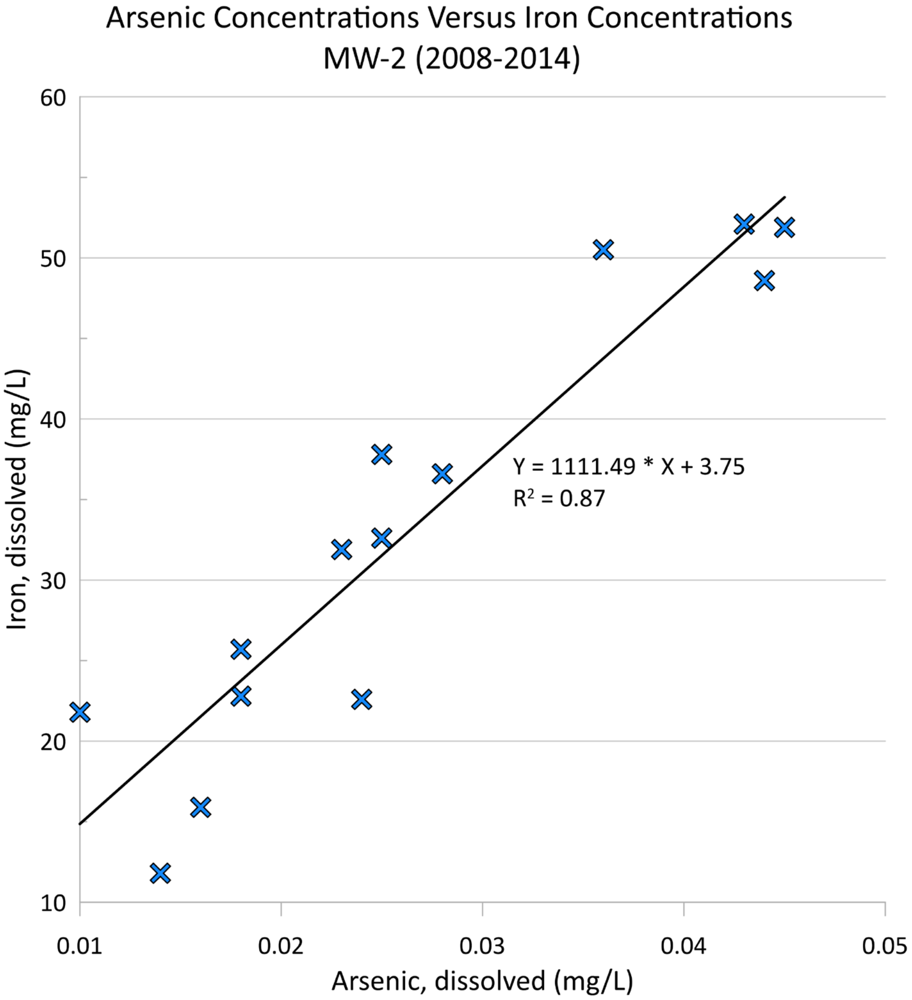

Figure F. Arsenic Concentrations Versus Iron Concentrations at Well MW-2 (2008-2014).

The presence of elevated concentrations of arsenic in background soil and groundwater in surrounding areas, as well as the presence of geochemical conditions (*i.e.*, reducing conditions) necessary to mobilize arsenic from soil to groundwater indicate that elevated concentrations of arsenic at monitoring wells MW-2, MW-10, and MW-13 are likely the result of naturally-occurring geochemical variations within the Uppermost Aquifer.

4. CONCLUSIONS

Based on the following three LOEs, it has been demonstrated that the arsenic SSLs at MW-2, MW-10, and MW-13, and the molybdenum SSL at MW-6 are not due to Miami Fort Pond System but are from a source other than the CCR unit being monitored:

1. Median arsenic and molybdenum concentrations in the Pond System source water are lower than the median arsenic and molybdenum concentrations observed in downgradient wells with arsenic and molybdenum SSLs.
2. Arsenic and molybdenum concentrations associated with monitoring wells MW-2, MW-10 and MW-13, and MW-6, respectively, are not correlated with boron concentrations, a common indicator for CCR impacts to groundwater.
3. Naturally-occurring concentrations of arsenic are commonly found in soils and groundwater in southwestern Ohio. MW-2, MW-10 and MW-13 are located in southwestern Ohio, along the banks of the Great Miami River and Ohio River, where they are susceptible to geochemical conditions that can mobilize naturally-occurring arsenic from the soils into groundwater.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSLs for arsenic and molybdenum observed during the A3 sampling event were not due to the Pond System. Therefore, a corrective measures assessment is not required for arsenic and molybdenum at the Miami Fort Pond System.

5. REFERENCES

AECOM, 2017. Hydrogeologic Characterization Report, CCR Management Units 111 (Basin A) and 112 (Basin B). Prepared for Dynegy Miami Fort, LLC by AECOM. October 11, 2017.

McArthur, J.M., Ravenscroft, R., Safiulla, S., and Thirwall, M.F., 2001, Arsenic in groundwater—Testing pollution mechanisms for sedimentary aquifers in Bangladesh: Water Resources Research, v. 37, no. 1, p. 109–117.

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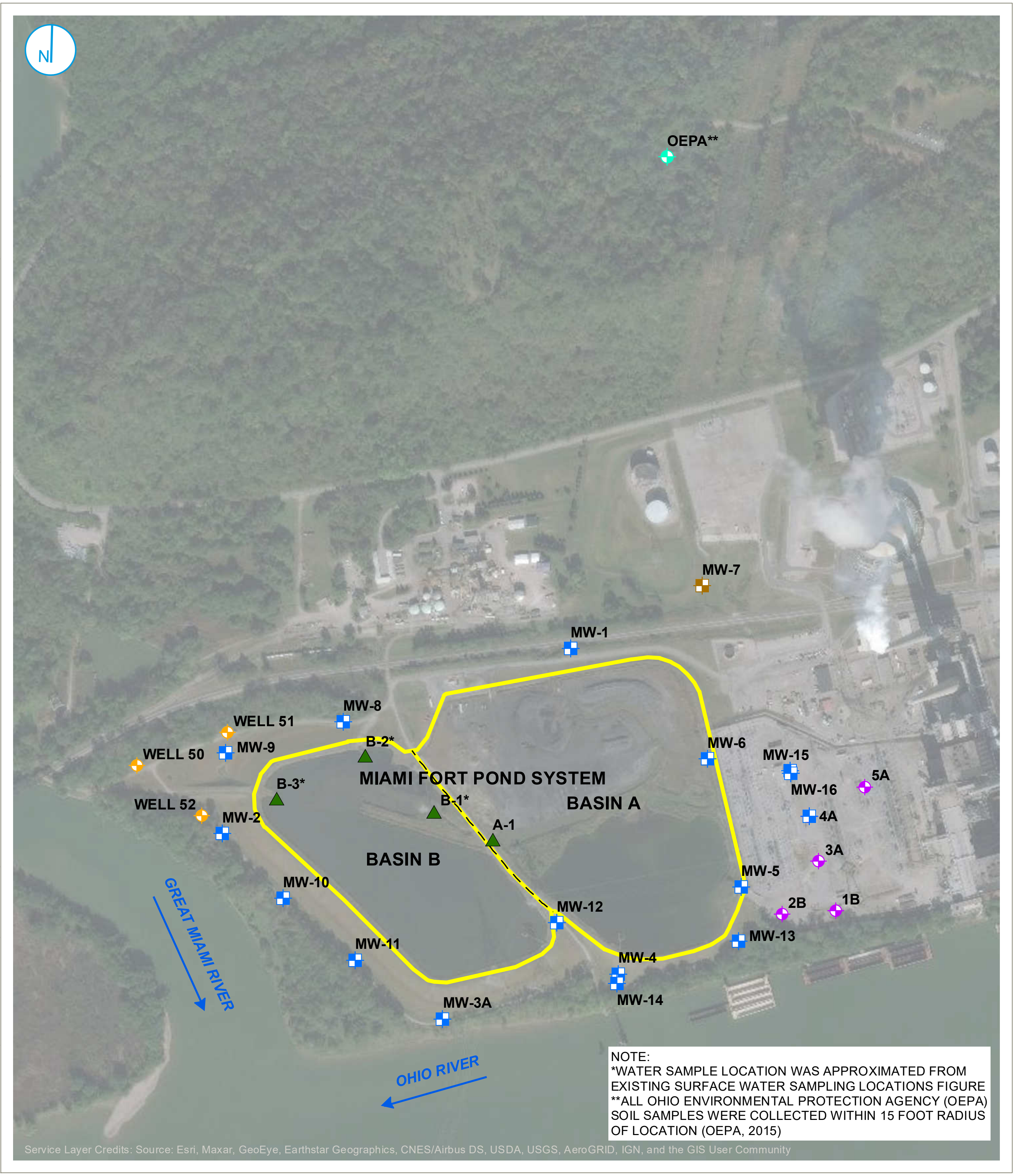
Ohio Environmental Protection Agency (OEPA), 2015, Evaluation of Background Metal Soil Concentrations in Hamilton County – Cincinnati Area, Developed in Support of the Ohio Voluntary Action Program, Summary Report, May 2015.

Thomas, M.A., Schumann, T.L., and Pletsch, B.A., 2005, Arsenic in ground water in selected parts of southwestern Ohio, 2002–03: U.S. Geological Survey Scientific Investigations Report 2005–5138, 30 p.

FIGURES

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\A3\Figure 1_Monitoring Well and Sampling Locations.mxd

PROJECT: 169000XXXX | DATED: 10/20/2020 | DESIGNER: galarnmc



NOTE:
*WATER SAMPLE LOCATION WAS APPROXIMATED FROM EXISTING SURFACE WATER SAMPLING LOCATIONS FIGURE
**ALL OHIO ENVIRONMENTAL PROTECTION AGENCY (OEPA) SOIL SAMPLES WERE COLLECTED WITHIN 15 FOOT RADIUS OF LOCATION (OEPA, 2015)

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

- ⊞ DOWNGRADIENT CCR MONITORING WELL LOCATION
- ⊞ BACKGROUND CCR MONITORING WELL LOCATION
- ▲ SOURCE WATER SAMPLING LOCATION
- ⊕ OEPA SOIL SAMPLE LOCATION
- ⊕ MIAMI FORT PRODUCTION WELL
- ⊕ VEOLIA PRODUCTION WELL
- ▭ CCR MONITORED MULTI-UNIT
- ▭ BERM
- ← RIVER FLOW DIRECTION

0 300 600 Feet

MONITORING WELL AND SAMPLING LOCATION MAP

FIGURE 1

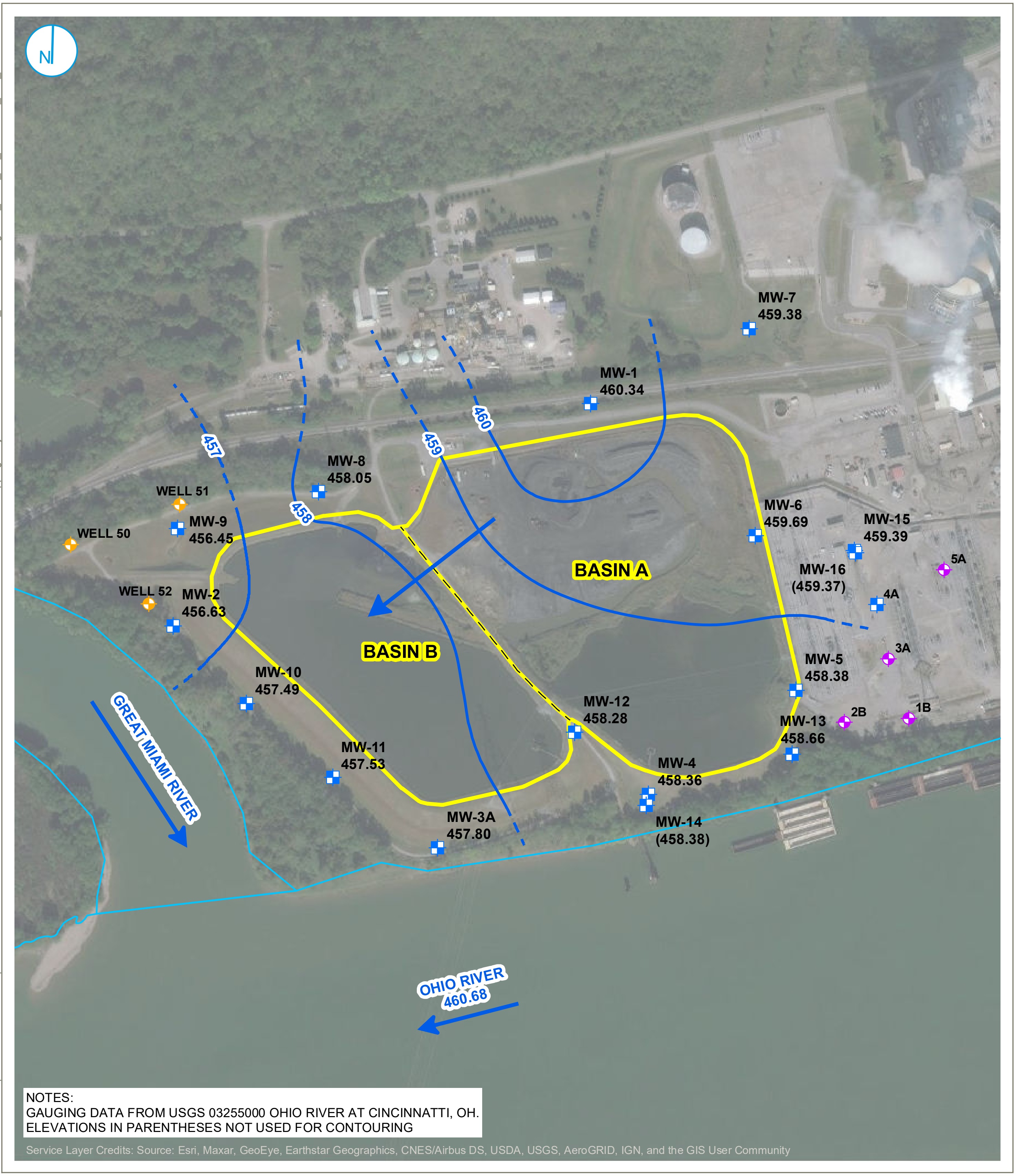
MIAMI FORT POND SYSTEM (UNIT ID:115)
ALTERNATE SOURCE DEMONSTRATION
VISTRA ENERGY
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\asd\A3\Figure 2_2020_1Q_MiamiFort_GW_Contours.mxd

PROJECT: 72799 | DATED: 10/22/2020 | DESIGNER: STOLZSD



NOTES:
GAUGING DATA FROM USGS 03255000 OHIO RIVER AT CINCINNATI, OH.
ELEVATIONS IN PARENTHESES NOT USED FOR CONTOURING

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

⊞ CCR MONITORING WELL LOCATION
⊕ MIAMI FORT PRODUCTION WELLS
⊕ VEOLIA PRODUCTION WELLS
▭ CCR MONITORED MULTI-UNIT
▭ BERM
← RIVER FLOW DIRECTION
— SURFACE WATER FEATURE
— GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- - INFERRED GROUNDWATER ELEVATION CONTOUR
➡ GROUNDWATER FLOW DIRECTION

0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP

APRIL 6, 2020

MIAMI FORT POND SYSTEM (UNIT ID: 115)
ALTERNATE SOURCE DEMONSTRATION
MIAMI FORT POWER STATION
NORTH BEND, OHIO

FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

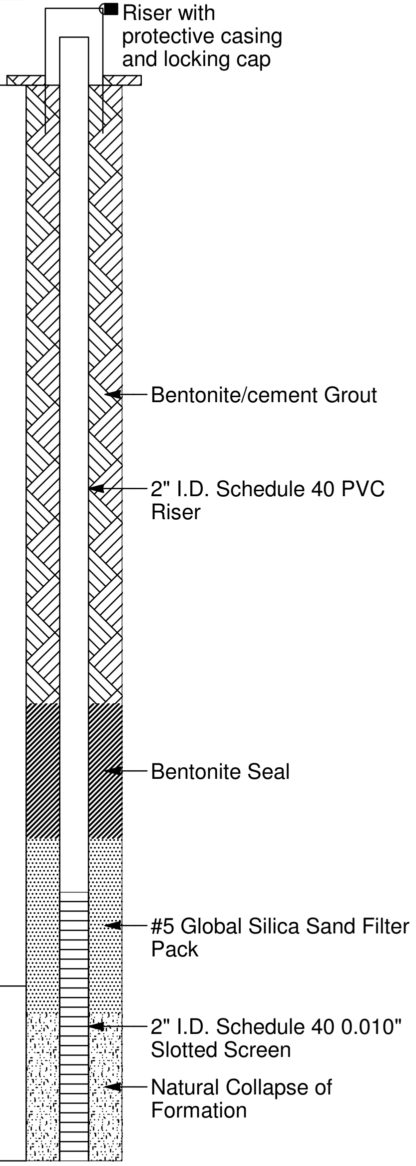
RAMBOLL

APPENDIX A
BORING LOGS FOR MONITORING WELLS MW-2, MW-3A, MW-4, MW-10, AND MW-11

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0	▨	76		Brown to dark brown sandy CLAY with silt and trace pebbles and rounded gravel, soft, plastic, moist
5	▨	80		grades with organics grades with less sand, pebbles, and gravel, stiff, no plasticity
10	▨	60		grades with increasing sand and pebbles, single 3" cobble grades soft, plastic, very moist grades brownish yellow to brown, without organics
15	▨	70		grades medium stiff to stiff, very slight plasticity to no plasticity
20	▨	100		grades with increasing fine sand, plastic, soft
25	▨	100		grades gray to dark gray, with increasing silt and sand
30	▨	100		grades wet Gray fine to coarse SAND and rounded GRAVEL, very loose, poorly sorted, wet
35	▨	0		
40				

Boring terminated 40' bgs on 12/11/2007.
2" I.D. Schedule 40 PVC monitoring well installed 40' bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



LEGEND:

▨	Rotosonic
bgs	Below ground surface
NR	Not recorded

URS

JOB NO. 14947868

Duke Energy
Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL
MW-2

Project: Duke Energy
Project Location: Miami Fort Station
Project Number: 14948624

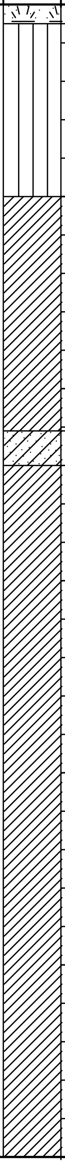
Monitoring Well MW-3A

Sheet 1 of 2

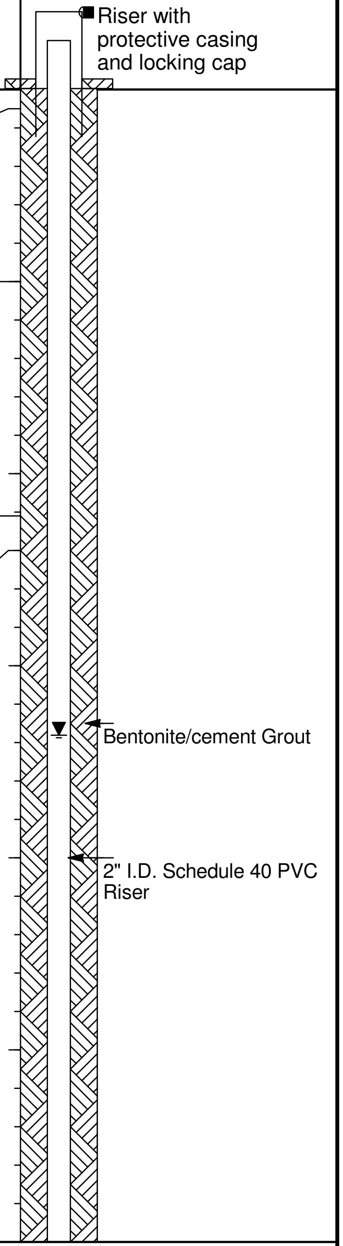
Date(s) Drilled	**2/25/2009**	Logged By	**K. Pritchard**	Checked By	**M. Wagner**
Drilling Method	**4.25 in. Hollow Stem Auger**	Drilling Contractor	**Belasco Drilling Services**	Total Depth of Borehole	**52.0 feet**
Drill Rig Type	**Truck-Mounted Auger**	Sampler Type	**Split Spoon**	Surface Elevation	**471.17 feet, msl**
Groundwater Elevation(s)	**456.42 ft, msl**	Hammer Weight and Drop	**140 lb, Dropped 30-inches**	Top of PVC Elevation	**473.23 feet, msl**
Diameter of Hole (inches) **8.25**	Diameter of Well (inches) **2**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation	**0.010-Inch**
Type of Sand Pack	**Natural Collapse**	Well Completion at Ground Surface	**Riser, With Locking Cap**		
Comments	**** Split spoon sampler advanced through interval under weight of hammer and rods only**				

Elevation, feet	Depth, feet	SAMPLES Blows per 1-foot Interval	SAMPLES Percent Recovery	MATERIAL DESCRIPTION
	0	12	83	Yellowish red CLAY TOPSOIL, moist
				Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist
470				
		19	100	
		6	83	grades brownish yellow with increasing clay
	5			Dark gray silty CLAY with trace fine sand and organics, plastic, very soft, moist
465		3	100	
				grades with increasing fine to medium sand, without organics, with iron staining
		3	83	grades with medium to coarse grained sand lenses, without staining
	10			grades high plasticity, very moist to wet
		3	75	
460				Yellowish brown clayey fine to coarse grained SAND, very loose, well sorted, wet
		2	100	Yellowish brown fine grained sandy to silty CLAY, very soft, high plasticity, very moist to wet
		1	100	
	15			
				grades wet with increasing fine sand
455		1	100	
				grades with fine grained sand lenses
		2	100	grades brown with increasing fine sand
	20			
		2	100	
450				
		2	100	grades with gray to reddish gray lenses, decreasing sand, without sand lenses
				grades gray, without gray to reddish gray lenses, medium plasticity
		**	100	grades high plasticity
	25			
				grades with increasing sand
445		3	100	
				grades with organics, sulphur odor, decreasing sand
		2	100	grades without sand, without odor
				grades with fine sand lenses, without organics
	30			

Graphic Log



WELL CONSTRUCTION DETAILS



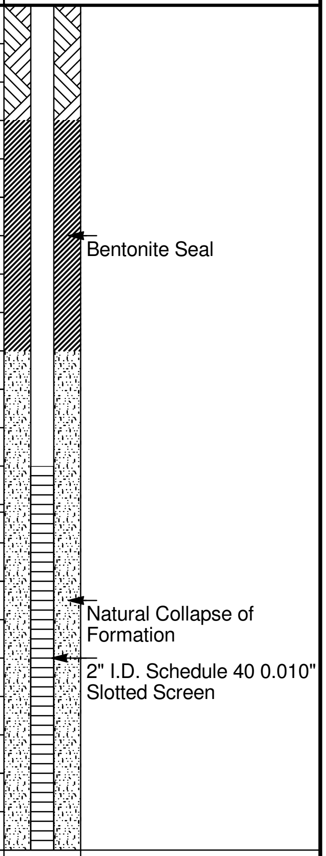
Project: Duke Energy
Project Location: Miami Fort Station
Project Number: 14948624

Monitoring Well MW-3A

Sheet 2 of 2

Elevation, feet	Depth, feet	Type	Blows per 1-foot Interval	Percent Recovery	MATERIAL DESCRIPTION
440	30	☒	1	100	grades without sand, with trace organics
		☒	4	100	grades with sand, without organics
	35	☒	4	100	grades with trace fine sand and increasing silt, without sand lenses, medium plasticity grades with increasing sand, without organics
435		☒	3	100	grades with increasing silt, trace sand, very low plasticity, stiff
		☒	6	100	grades with sand, plastic, very soft grades stiff, very low plasticity, very moist
430	40	☒	4	100	grades with trace organcis, less sand, increasing silt
		☒	8	100	Gray fine to coarse grained SAND and sub-rounded to rounded GRAVEL, pebble-sized gravel with trace 1" diameter clasts, very loose, sorted, wet
425	45	☒	14	42	
		☒	7	100	
		☒	22	63	grades with increasing diameter gravel
420	50	☒	13	50	
415	55				Boring terminated 52' bgs on 2/25/2009. 2" I.D. Schedule 40 PVC monitoring well installed 52' bgs with 10' 0.010" slotted screen.
410	60				
405	65				
	70				

WELL CONSTRUCTION DETAILS

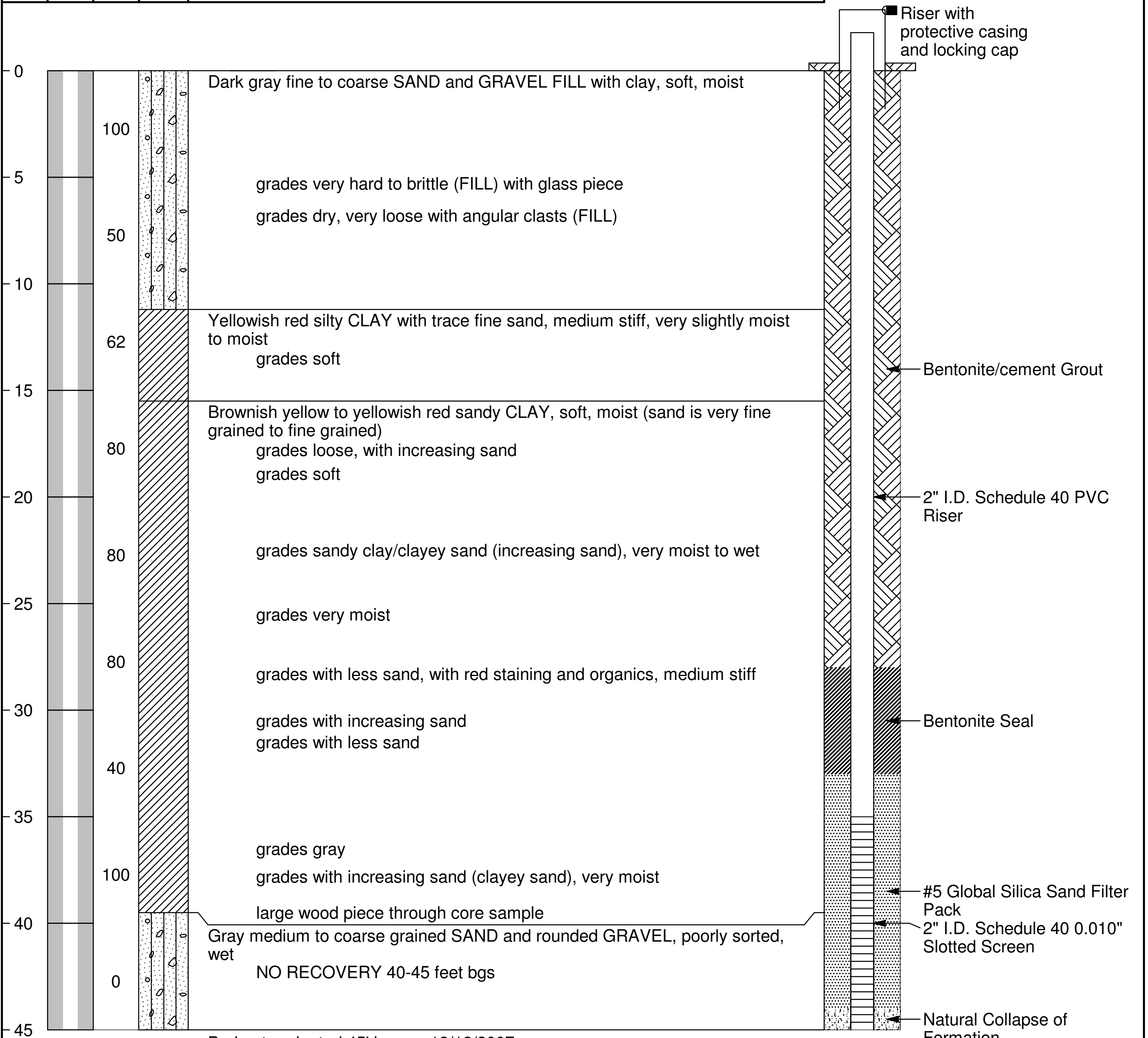


URS

Depth (Feet) | Sample Location | Percent Recovery | USCS Symbol

DESCRIPTION OF SUBSURFACE MATERIALS

WELL CONSTRUCTION DETAIL



Dark gray fine to coarse SAND and GRAVEL FILL with clay, soft, moist

grades very hard to brittle (FILL) with glass piece

grades dry, very loose with angular clasts (FILL)

Yellowish red silty CLAY with trace fine sand, medium stiff, very slightly moist to moist

grades soft

Brownish yellow to yellowish red sandy CLAY, soft, moist (sand is very fine grained to fine grained)

grades loose, with increasing sand

grades soft

grades sandy clay/clayey sand (increasing sand), very moist to wet

grades very moist

grades with less sand, with red staining and organics, medium stiff

grades with increasing sand

grades with less sand

grades gray

grades with increasing sand (clayey sand), very moist

large wood piece through core sample

Gray medium to coarse grained SAND and rounded GRAVEL, poorly sorted, wet

NO RECOVERY 40-45 feet bgs

Boring terminated 45' bgs on 12/12/2007.
2" I.D. Schedule 40 PVC monitoring well installed 45' bgs with 10' 0.010" slotted screen.

LEGEND:

▥	Rotosonic
bgs	Below ground surface
NR	Not recorded

Duke Energy - 14947868 - North Bend, OH

DUKE ENERGY MIAMI FORT STATION MIAMI FORT STATION.GPJ 2/5/08

URS

JOB NO. 14947868

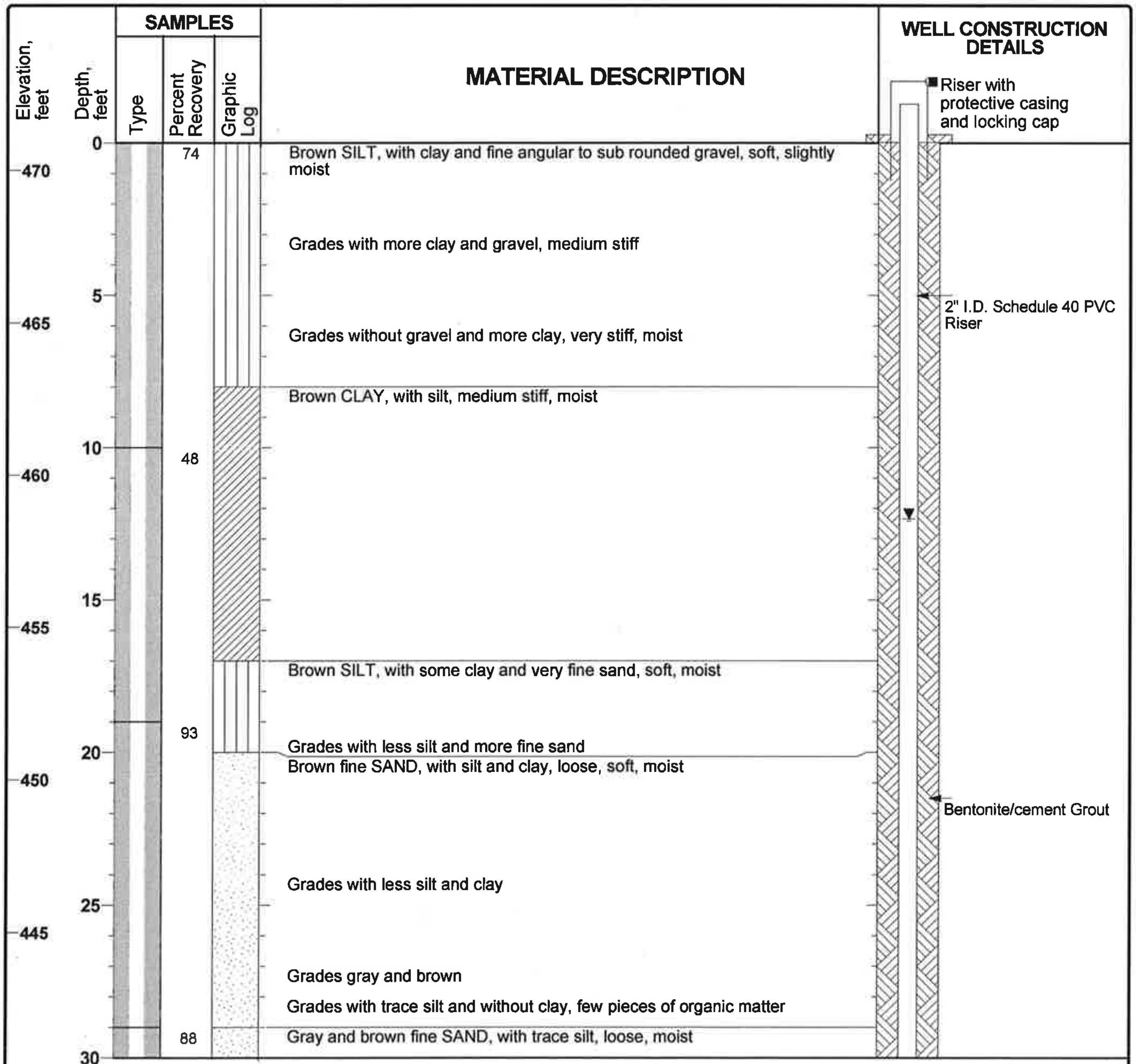
Duke Energy
Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL
MW-4

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-10
Sheet 1 of 2

Date(s) Drilled	**4/10/2017**	Logged By	**J. Alten**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**59.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**470.90 feet, msl**
Depth to Groundwater	**12.34 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**473.35 feet, msl**
Diameter of Hole (inches)	**6.0**	Diameter of Well (inches) **2**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation **0.010-Inch**
Type of Sand Pack	**#5 Silica Sand**	Well Completion at Ground Surface	**Riser, With locking cap and protective casing.**		
Comments					



Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist

Grades with more clay and gravel, medium stiff

Grades without gravel and more clay, very stiff, moist

Brown CLAY, with silt, medium stiff, moist

Brown SILT, with some clay and very fine sand, soft, moist

Grades with less silt and more fine sand

Brown fine SAND, with silt and clay, loose, soft, moist

Grades with less silt and clay

Grades gray and brown

Grades with trace silt and without clay, few pieces of organic matter

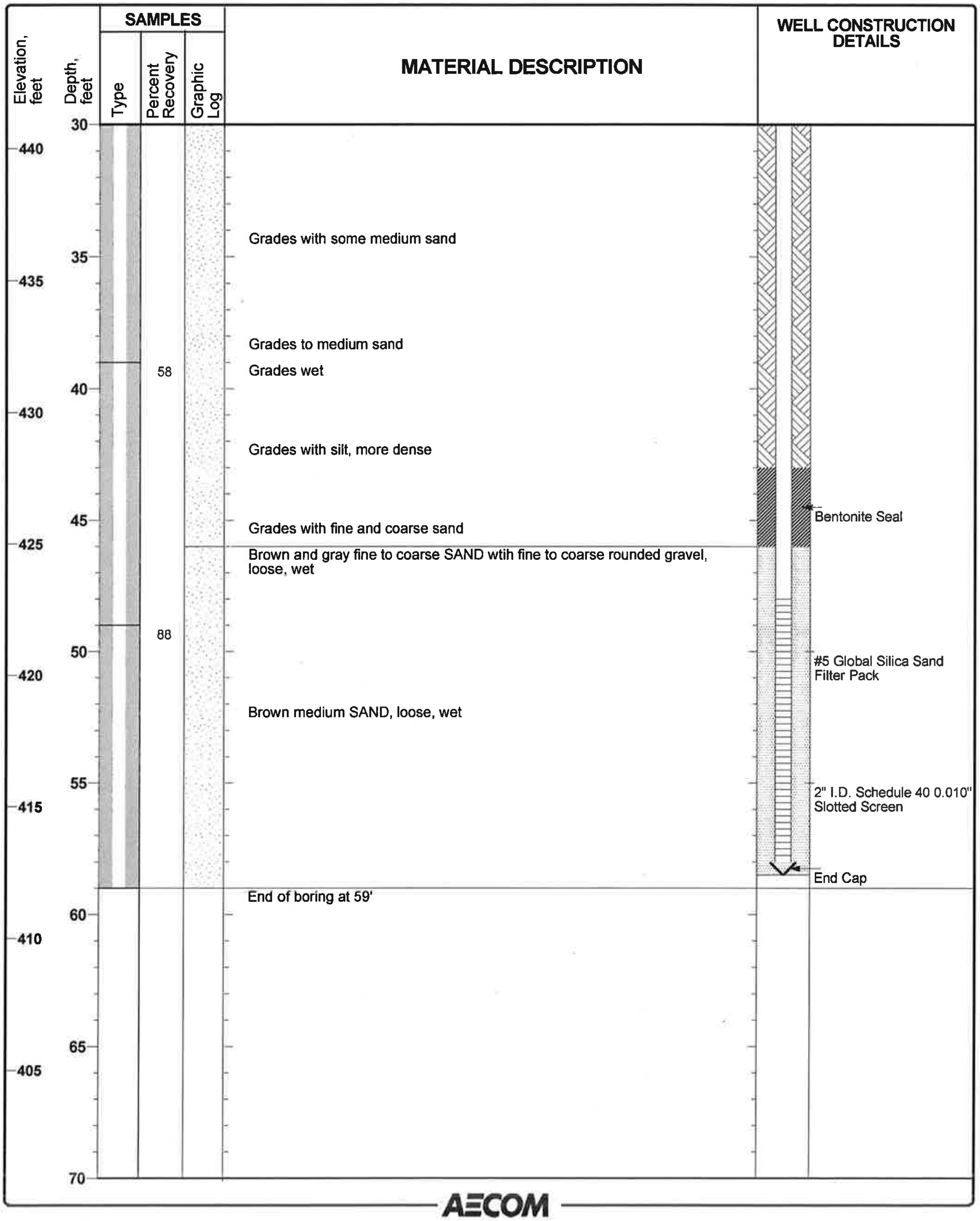
Gray and brown fine SAND, with trace silt, loose, moist

AECOM

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-10

Sheet 2 of 2



MATERIAL DESCRIPTION

Grades with some medium sand

Grades to medium sand

Grades wet

Grades with silt, more dense

Grades with fine and coarse sand

Brown and gray fine to coarse SAND wtih fine to coarse rounded gravel, loose, wet

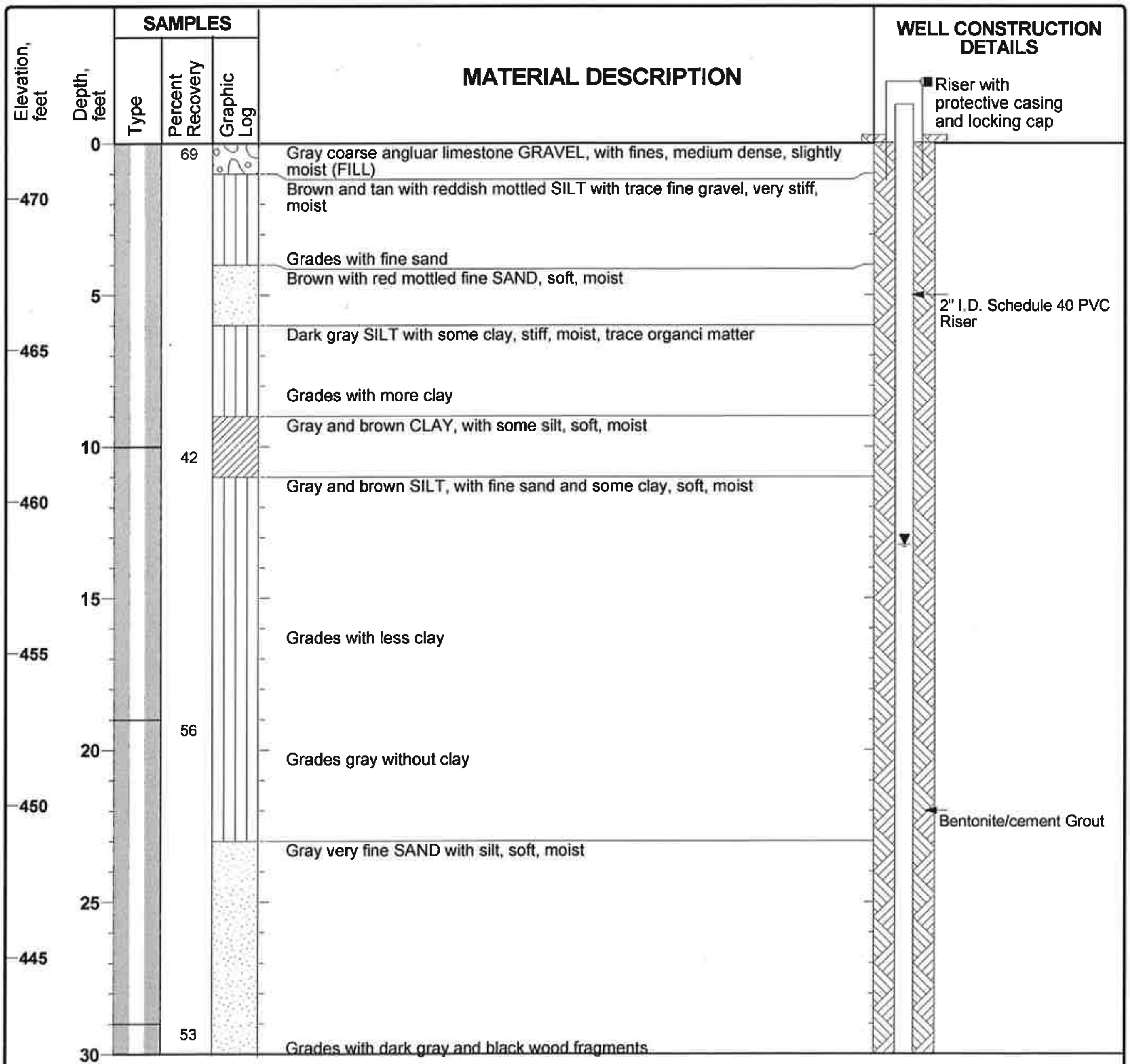
Brown medium SAND, loose, wet

End of boring at 59'

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-11
Sheet 1 of 2

Date(s) Drilled	4/11/2017	Logged By	J. Alten	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	59.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	471.81 feet, msl
Depth to Groundwater	13.25 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	474.45 feet, msl
Diameter of Hole (inches)	6.0 Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					



MATERIAL DESCRIPTION

Gray coarse angluar limestone GRAVEL, with fines, medium dense, slightly moist (FILL)

Brown and tan with reddish mottled SILT with trace fine gravel, very stiff, moist

Grades with fine sand

Brown with red mottled fine SAND, soft, moist

Dark gray SILT with some clay, stiff, moist, trace organci matter

Grades with more clay

Gray and brown CLAY, with some silt, soft, moist

Gray and brown SILT, with fine sand and some clay, soft, moist

Grades with less clay

Grades gray without clay

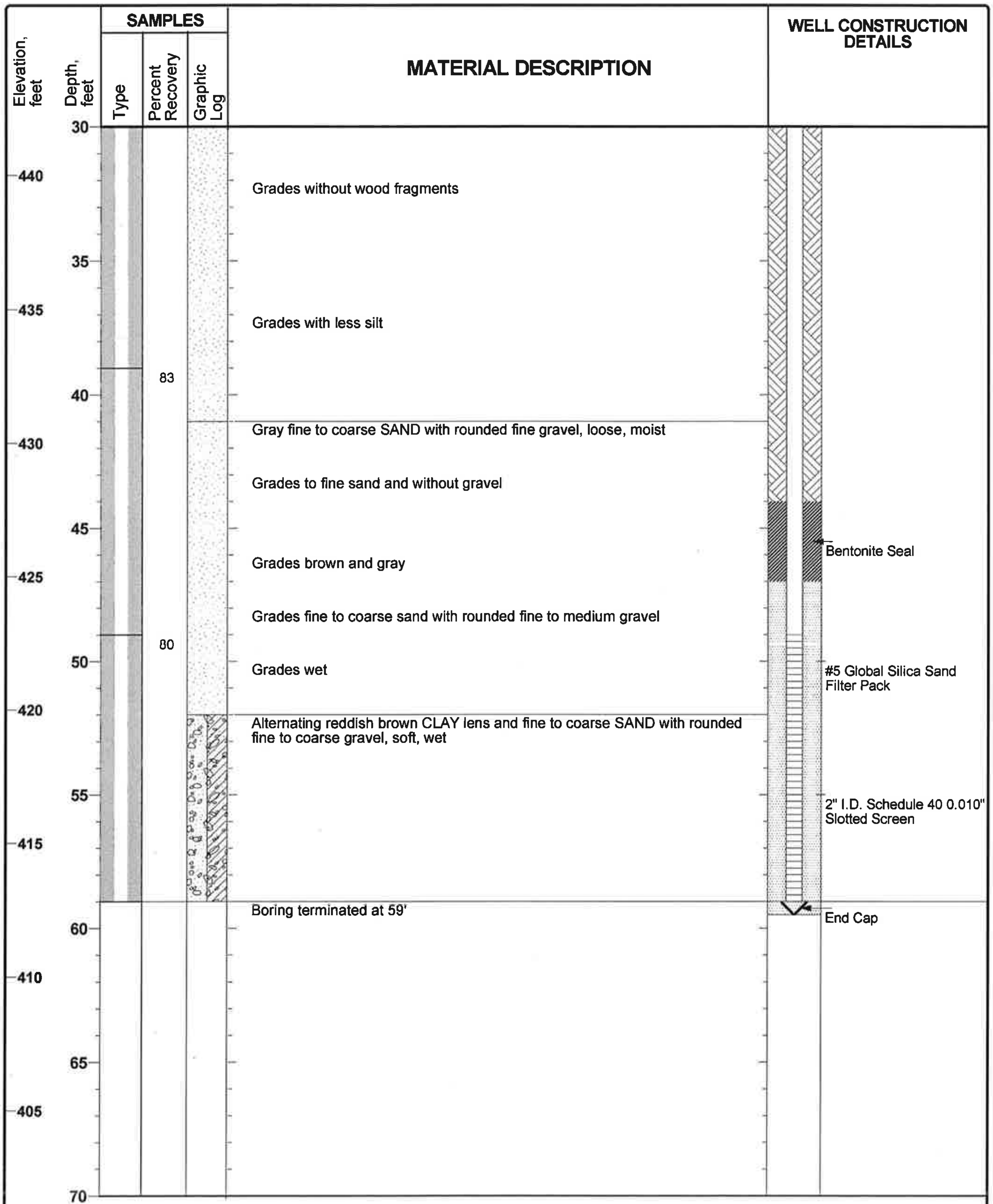
Gray very fine SAND with silt, soft, moist

Grades with dark gray and black wood fragments

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-11

Sheet 2 of 2



Grades without wood fragments

Grades with less silt

Gray fine to coarse SAND with rounded fine gravel, loose, moist

Grades to fine sand and without gravel

Grades brown and gray

Grades fine to coarse sand with rounded fine to medium gravel

Grades wet

Alternating reddish brown CLAY lens and fine to coarse SAND with rounded fine to coarse gravel, soft, wet

Boring terminated at 59'

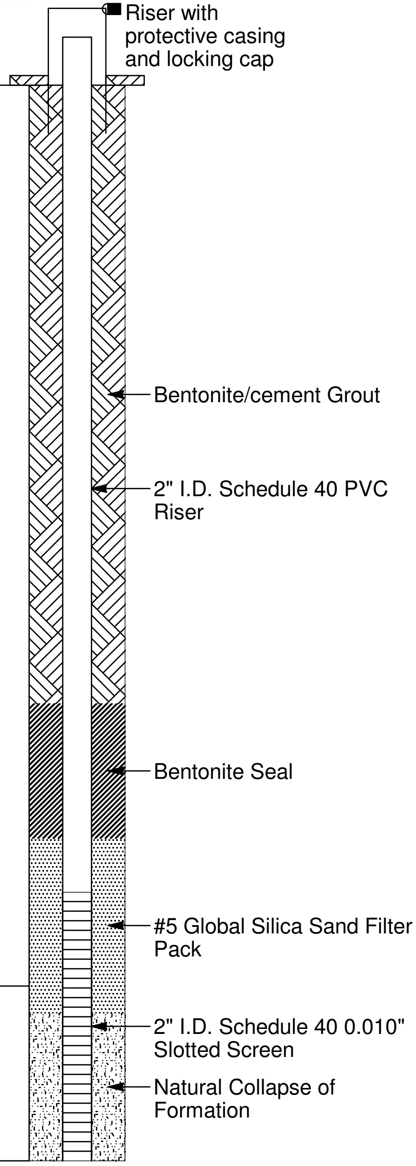
ATTACHMENT 2

Adjacent Monitoring Well Boring Logs and Well Construction Forms

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0		76		Brown to dark brown sandy CLAY with silt and trace pebbles and rounded gravel, soft, plastic, moist
5		80		grades with organics grades with less sand, pebbles, and gravel, stiff, no plasticity
10		60		grades with increasing sand and pebbles, single 3" cobble grades soft, plastic, very moist grades brownish yellow to brown, without organics
15		70		grades medium stiff to stiff, very slight plasticity to no plasticity
20		100		grades with increasing fine sand, plastic, soft
25		100		grades gray to dark gray, with increasing silt and sand
30		100		grades wet Gray fine to coarse SAND and rounded GRAVEL, very loose, poorly sorted, wet
35		0		
40				

Boring terminated 40' bgs on 12/11/2007.
2" I.D. Schedule 40 PVC monitoring well installed 40' bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



LEGEND:

▥	Rotosonic
bgs	Below ground surface
NR	Not recorded

URS

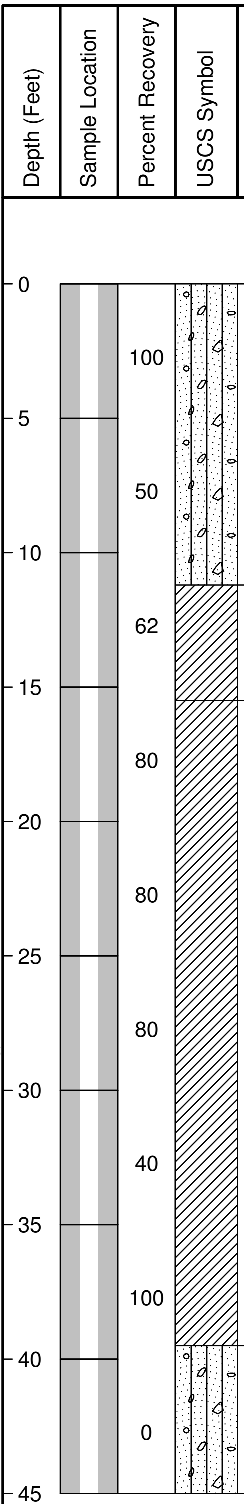
JOB NO. 14947868

Duke Energy
Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL
MW-2

Duke Energy - 14947868 - North Bend, OH

DUKE ENERGY MIAMI FORT STATION MIAMI FORT STATION.GPJ 2/5/08



DESCRIPTION OF SUBSURFACE MATERIALS

Dark gray fine to coarse SAND and GRAVEL FILL with clay, soft, moist

grades very hard to brittle (FILL) with glass piece

grades dry, very loose with angular clasts (FILL)

Yellowish red silty CLAY with trace fine sand, medium stiff, very slightly moist to moist

grades soft

Brownish yellow to yellowish red sandy CLAY, soft, moist (sand is very fine grained to fine grained)

grades loose, with increasing sand

grades soft

grades sandy clay/clayey sand (increasing sand), very moist to wet

grades very moist

grades with less sand, with red staining and organics, medium stiff

grades with increasing sand

grades with less sand

grades gray

grades with increasing sand (clayey sand), very moist

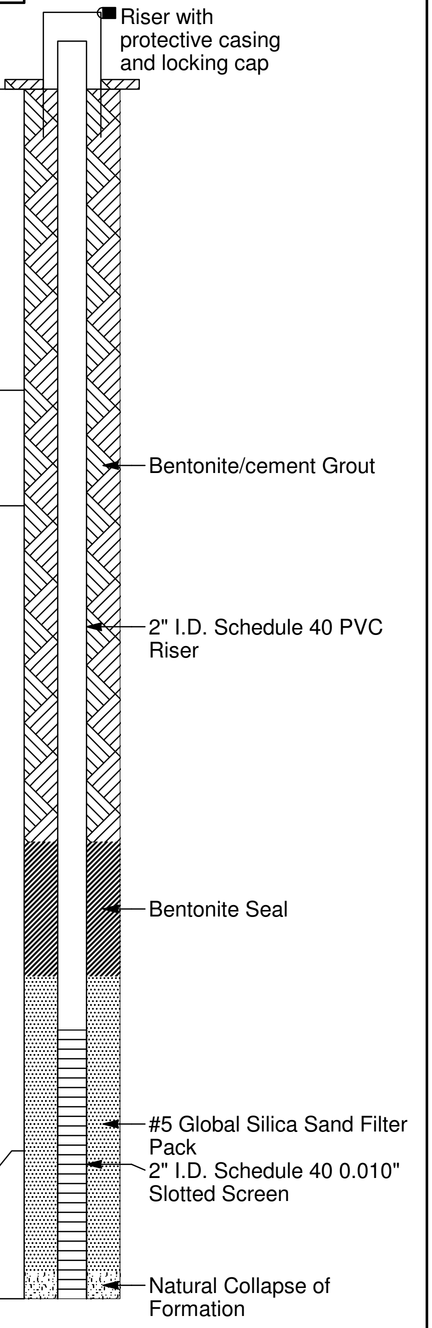
large wood piece through core sample

Gray medium to coarse grained SAND and rounded GRAVEL, poorly sorted, wet

NO RECOVERY 40-45 feet bgs

Boring terminated 45' bgs on 12/12/2007.
2" I.D. Schedule 40 PVC monitoring well installed 45' bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



LEGEND:

▥	Rotosonic
bgs	Below ground surface
NR	Not recorded

URS

JOB NO. 14947868

Duke Energy
Miami Fort Station
11021 Brower Road
North Bend, OH

MONITORING WELL
MW-4

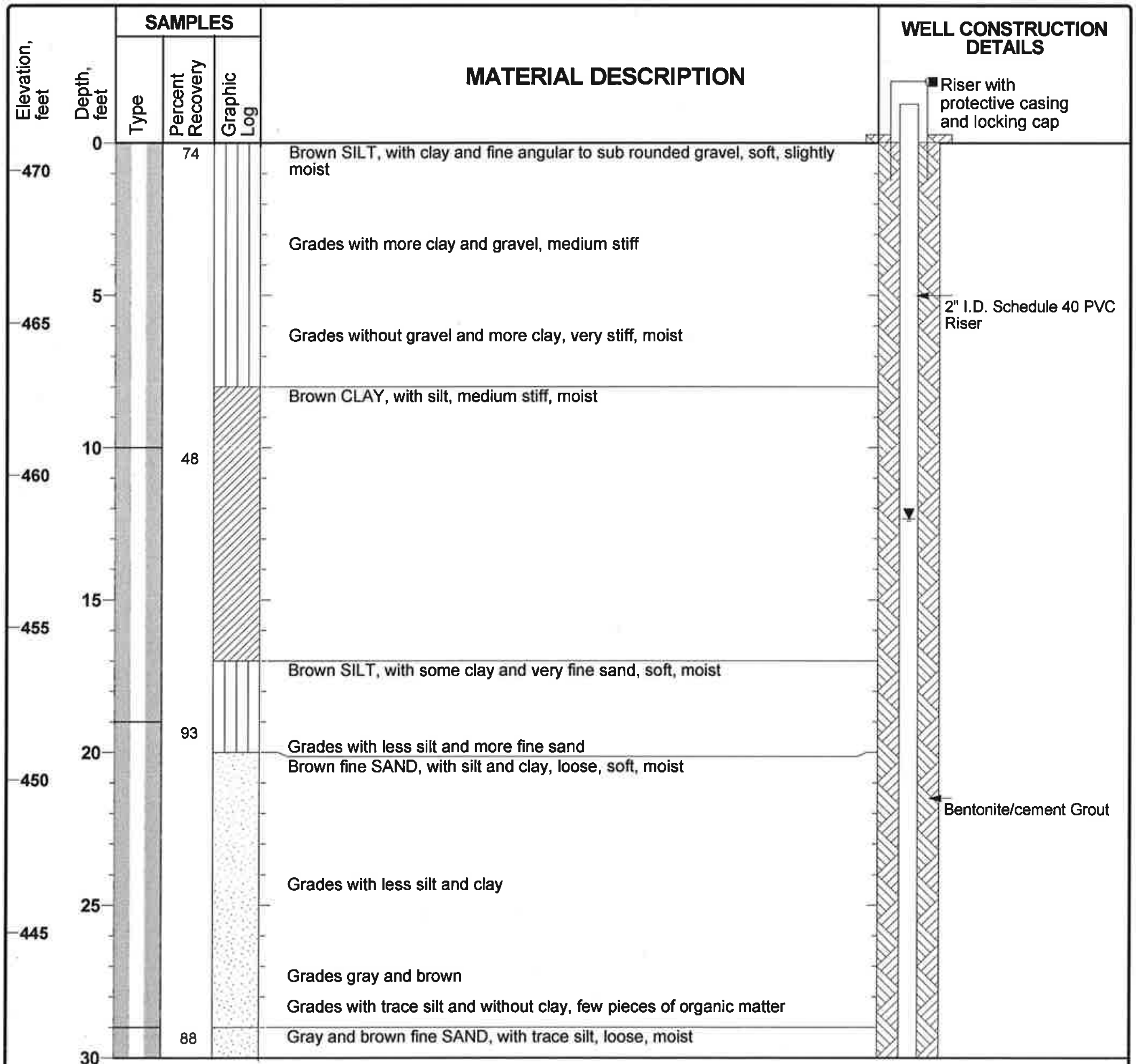
Page 1 of 1

Duke Energy - 14947868 - North Bend, OH

DUKE ENERGY MIAMI FORT STATION MIAMI FORT STATION.GPJ 2/5/08

Project: Dynegy **Project Location: Miami Fort Station** **Project Number: 60442412**	**Monitoring Well** **MW-10** Sheet 1 of 2

Date(s) Drilled	**4/10/2017**	Logged By	**J. Alten**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz Drilling**	Total Depth of Borehole	**59.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**470.90 feet, msl**
Depth to Groundwater	**12.34 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**473.35 feet, msl**
Diameter of Hole (inches) **6.0**	Diameter of Well (inches) **2**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation	**0.010-Inch**
Type of Sand Pack	**#5 Silica Sand**	Well Completion at Ground Surface	**Riser, With locking cap and protective casing.**		
Comments					



Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist

Grades with more clay and gravel, medium stiff

Grades without gravel and more clay, very stiff, moist

Brown CLAY, with silt, medium stiff, moist

Brown SILT, with some clay and very fine sand, soft, moist

Grades with less silt and more fine sand

Brown fine SAND, with silt and clay, loose, soft, moist

Grades with less silt and clay

Grades gray and brown

Grades with trace silt and without clay, few pieces of organic matter

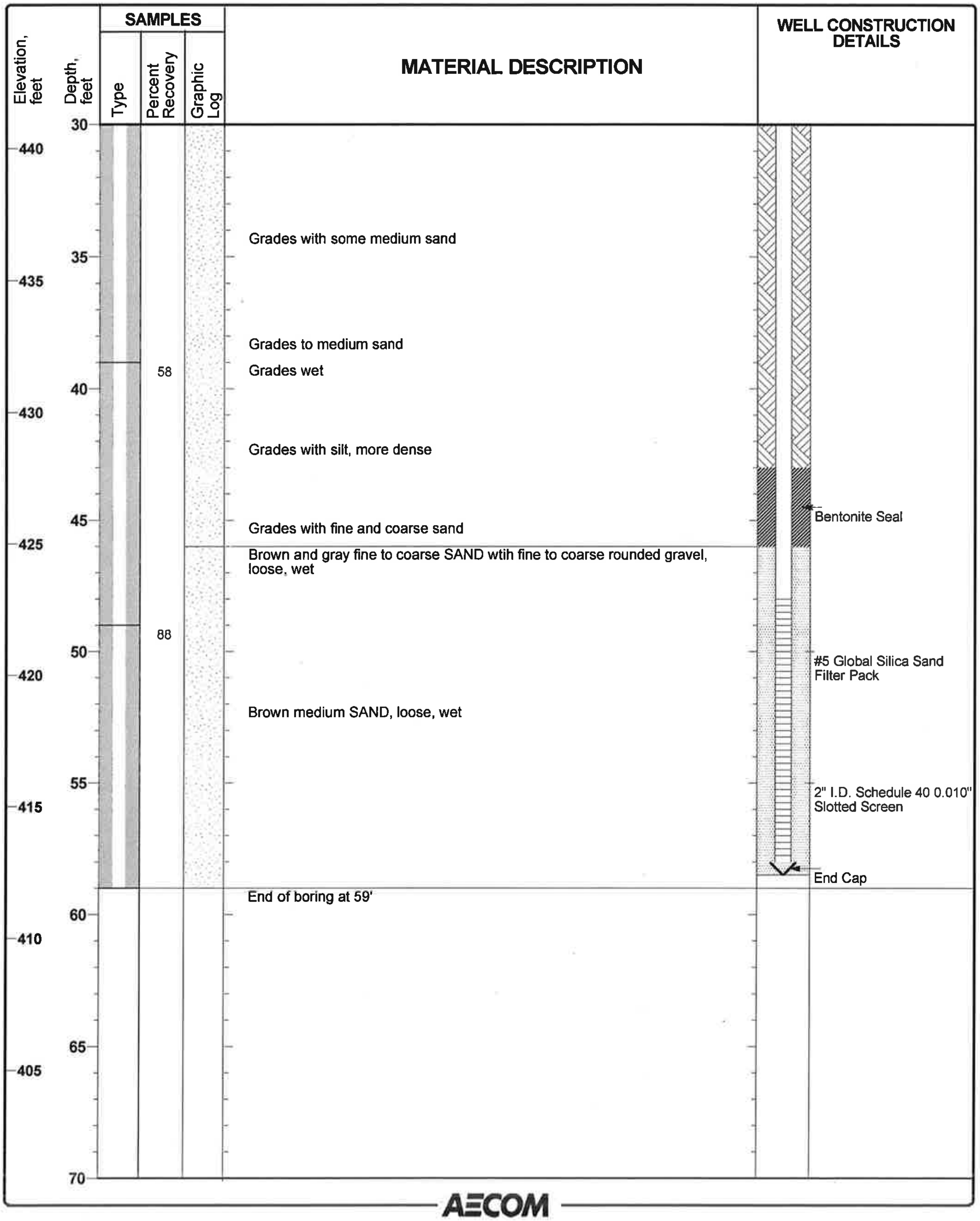
Gray and brown fine SAND, with trace silt, loose, moist

AECOM

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-10

Sheet 2 of 2



Grades with some medium sand

Grades to medium sand

Grades wet

Grades with silt, more dense

Grades with fine and coarse sand

Brown and gray fine to coarse SAND wtih fine to coarse rounded gravel, loose, wet

Brown medium SAND, loose, wet

End of boring at 59'

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

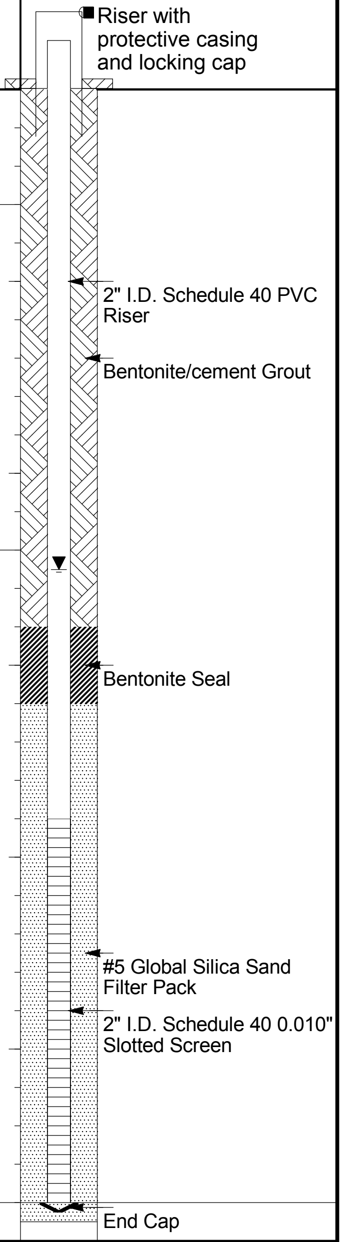
Monitoring Well MW-10S

Sheet 1 of 1

Date(s) Drilled	**10/21/2015**	Logged By	**B. Smolenski**	Checked By	**M. Wagner**
Drilling Method	**Rotosonic**	Drilling Contractor	**Frontz**	Total Depth of Borehole	**29.0 feet**
Drill Rig Type	**Rotosonic**	Sampler Type	**Sonic Sleeve**	Surface Elevation	**471.31 feet, msl**
Depth to Groundwater	**12.51 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**473.51 feet, msl**
Diameter of Hole (inches) **6.0**	Diameter of Well (inches) **2**	Type of Well Casing	**Schedule 40 PVC**	Screen Perforation	**0.010-Inch**
Type of Sand Pack	**#5 Silica Sand**	Well Completion at Ground Surface	**Riser, With locking cap and protective casing.**		
Comments					

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		100		Brown SILT, with clay, stiff, slightly moist, with oxidation staining
470					
			68		Dark gray silty CLAY, stiff, slightly moist
	5				
465					
	10				
460					Medium to dark brown SILTY with clay, very soft to soft, moist to wet
	15				
455					
			100		
	20				
450					grades gray with black mottling
					grades sandy, very fine to fine grained
	25				
445					
					End of boring at 29' bgs
	30				

WELL CONSTRUCTION DETAILS



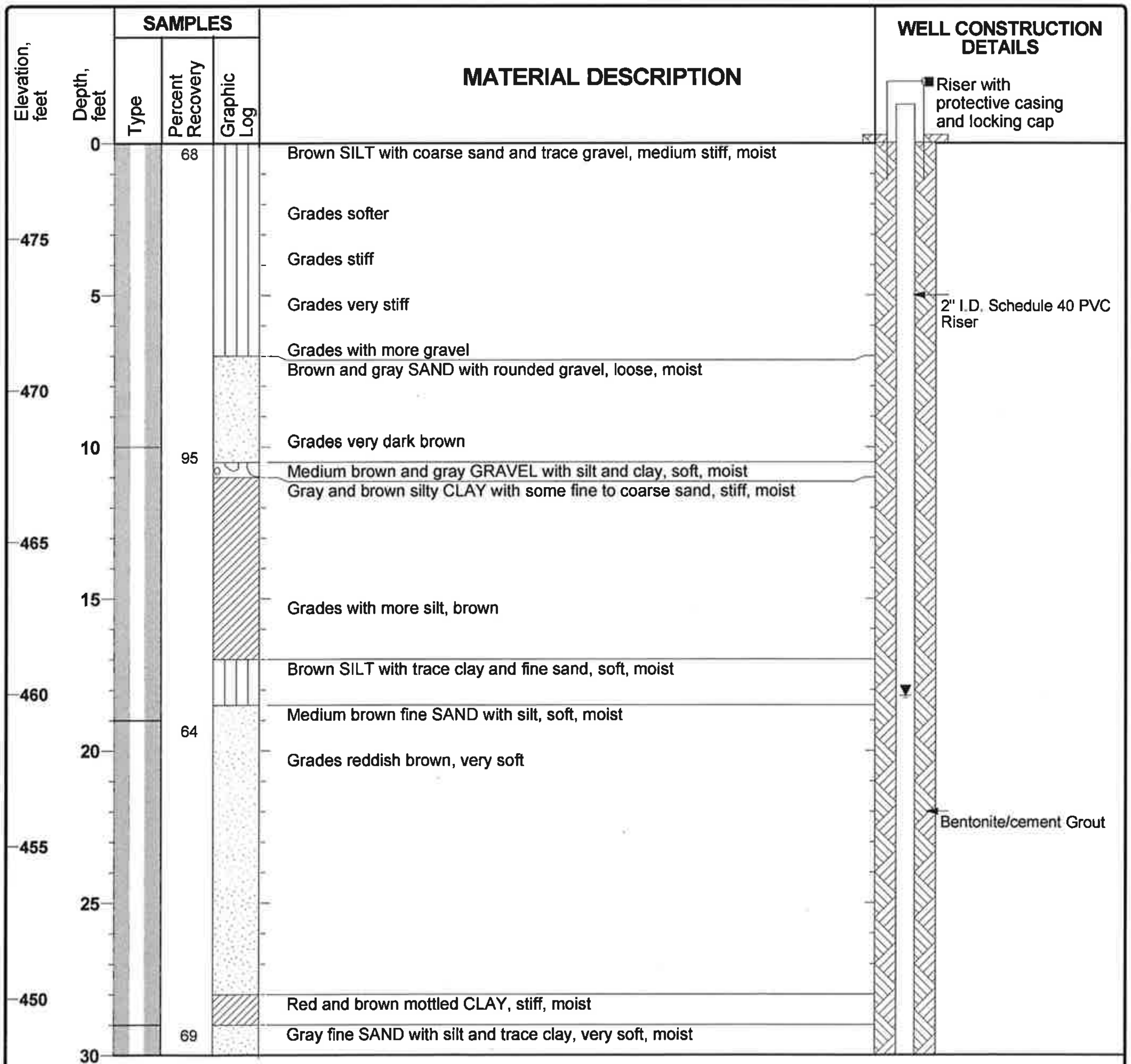
Basin A

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well MW-13

Sheet 1 of 2

Date(s) Drilled	4/11/2017	Logged By	J. Alten	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz Drilling	Total Depth of Borehole	59.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	478.13 feet, msl
Depth to Groundwater	18.2 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	480.70 feet, msl
Diameter of Hole (inches)	6.0 Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					



MATERIAL DESCRIPTION

Brown SILT with coarse sand and trace gravel, medium stiff, moist

Grades softer

Grades stiff

Grades very stiff

Grades with more gravel

Brown and gray SAND with rounded gravel, loose, moist

Grades very dark brown

Medium brown and gray GRAVEL with silt and clay, soft, moist

Gray and brown silty CLAY with some fine to coarse sand, stiff, moist

Grades with more silt, brown

Brown SILT with trace clay and fine sand, soft, moist

Medium brown fine SAND with silt, soft, moist

Grades reddish brown, very soft

Red and brown mottled CLAY, stiff, moist

Gray fine SAND with silt and trace clay, very soft, moist

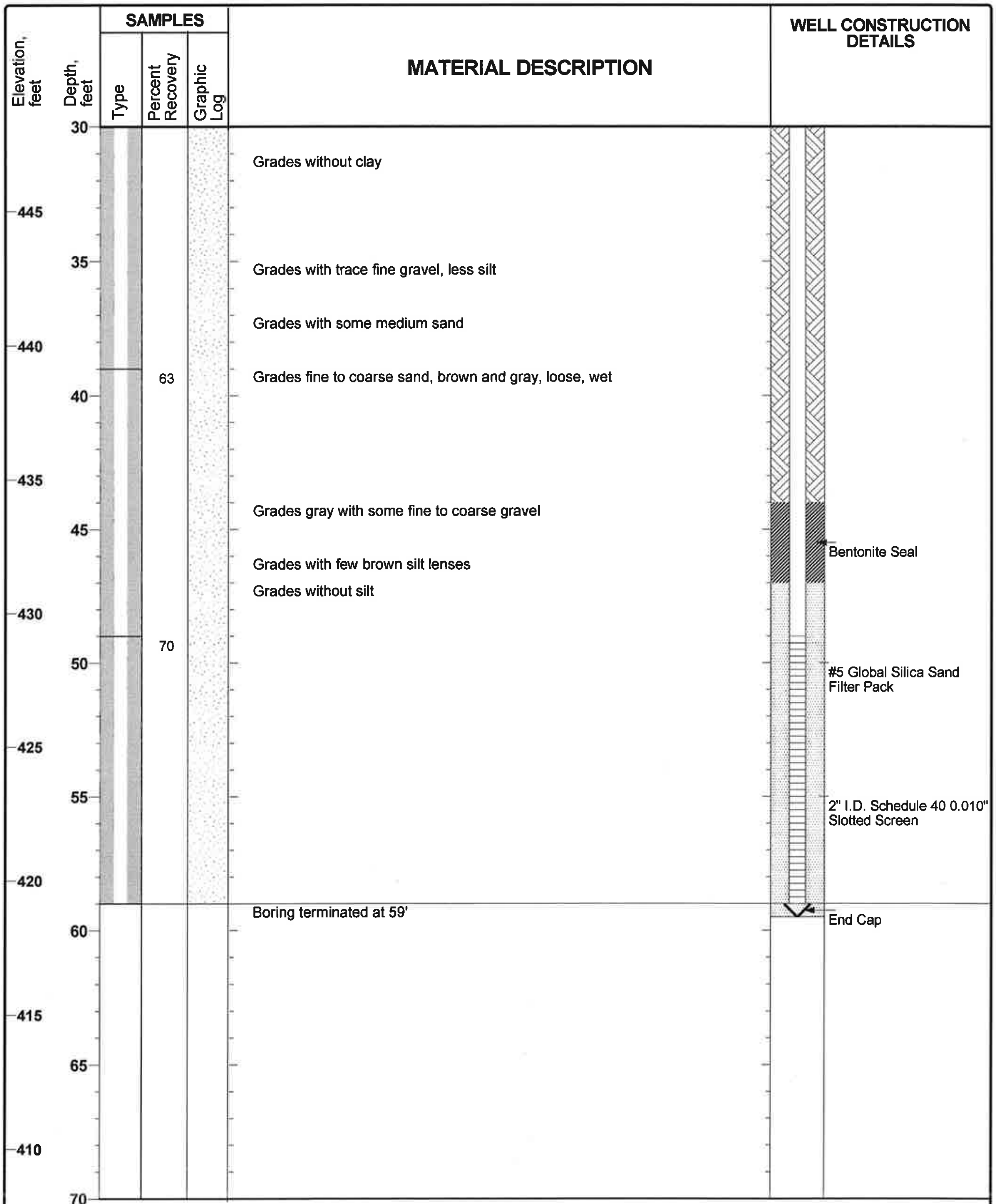
AECOM

Basin A

Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well MW-13

Sheet 2 of 2



Grades without clay

Grades with trace fine gravel, less silt

Grades with some medium sand

Grades fine to coarse sand, brown and gray, loose, wet

Grades gray with some fine to coarse gravel

Grades with few brown silt lenses

Grades without silt

Boring terminated at 59'

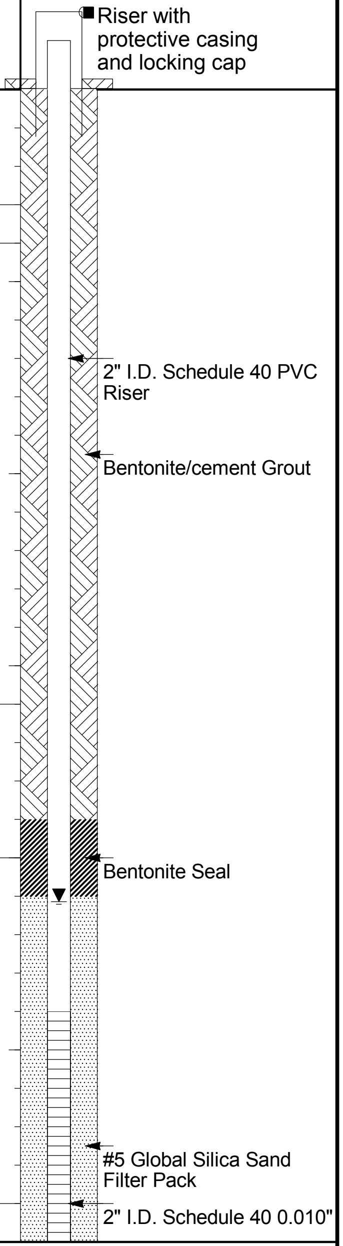
Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well
MW-13S
Sheet 1 of 2

Date(s) Drilled	10/21/2015	Logged By	B. Smolenski	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz	Total Depth of Borehole	34.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	477.55 feet, msl
Depth to Groundwater	21.14 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	479.88 feet, msl
Diameter of Hole (inches)	6.0 Diameter of Well (inches) 2	Type of Well Casing	Schedule 40 PVC	Screen Perforation	0.010-Inch
Type of Sand Pack	#5 Silica Sand	Well Completion at Ground Surface	Riser, With locking cap and protective casing.		
Comments					

Elevation, feet	Depth, feet	SAMPLES Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION
	0		100		Reddish brown silty CLAY, trace fine angular coal fragments, very stiff, dry, with black mottling
475					
					Black coarse SAND, with fine to medium angular gravel, loose, wet
			60		Gray silty CLAY, stiff, slightly moist, with trace black mottling
	5				
470					
					grades reddish brown
	10				
465					
	15				
					Reddish brown very fine to fine sandy SILT, with clay, soft, moist
460					
			45		
	20				Reddish brown clayey, silty, fine SAND, very soft, wet
455					
					grades with black mottling and oxidation staining
	25				
					grades fine to medium grained, with less fines
450					
			100		Reddish brown CLAY, with silt, medium stiff to stiff, slightly moist, with fine to
	30				

WELL CONSTRUCTION DETAILS



URS

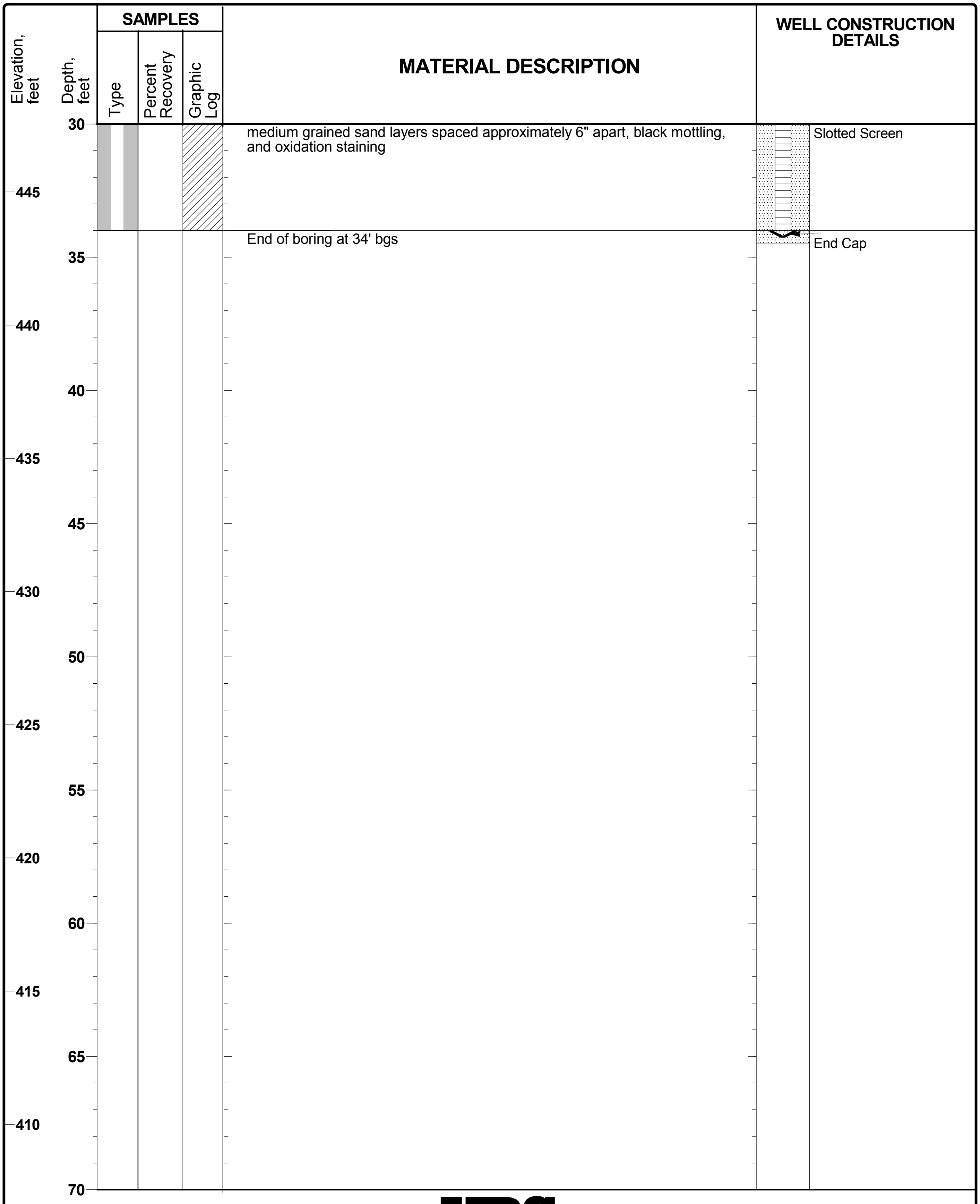
Project: Dynegy

Project Location: Miami Fort Station

Project Number: 60442412

Monitoring Well
MW-13S

Sheet 2 of 2



medium grained sand layers spaced approximately 6" apart, black mottling, and oxidation staining

End of boring at 34' bgs

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name Miami Fort Power Station	License/Permit/Monitoring Number	Boring Number MW-19

Boring Drilled By: Name of crew chief (first, last) and Firm Rick Tustin Cascade Drilling	Date Drilling Started 8/11/2020	Date Drilling Completed 8/12/2020	Drilling Method Mini Sonic

Common Well Name MW-19	Final Static Water Level Feet (NAVD88)	Surface Elevation 498.58 Feet (NAVD88)	Borehole Diameter 6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 414,966.41 N, 1,314,727.57 E N/[✓ S]
1/4 of 1/4 of Section , T N, R

Lat 39° 6' 59.17"
Long 84° 48' 16.18"

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

Facility ID	County Hamilton	State OH	Civil Town/City/ or Village North Bend

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120			0 - 1' **FILL, POORLY-GRADED GRAVEL WITH SAND:** (GP)s, grayish brown (10YR 5/2), coarse gravel, little fine to coarse sand, moist.	(FILL) (GP)s									
			1 2 3 4 5 6	1 - 6.4' **SILT:** ML, brown (10YR 5/3), trace fine sand, moist.	ML				1 1 1.5					
			7 8 9	6.4 - 27.8' **POORLY-GRADED SAND:** SP, light brown (10YR 6/4), fine to medium sand, trace subrounded fine to coarse gravel, trace silt, dry.	SP				1 3 3.5					
2 CS	120 120		10 11 12	10' grades little subrounded fine to coarse gravel.										

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

Signature	Firm Ramboll 234 W Florida Street, 5th Floor, Milwaukee, WI 53204	Tel: (414)837-3607 Fax: (414)837-3608

Boring Number MW-19

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				6.4 - 27.8' **POORLY-GRADED SAND:** SP, light brown (10YR 6/4), fine to medium sand, trace subrounded fine to coarse gravel, trace silt, dry. *(continued)*										
			13											
			14											
			15											
			16	16' little silt.										
			17	17' trace silt.										
			18											
			19											
3 CS	120 120		20	20' grades brown (10YR 5/3).	SP									
			21											
			22											
			23											
			24											
			25											
			26											
			27											
			28	27.8 - 34' **SILTY SAND:** SM, brown (10YR 5/3), very fine to fine sand, little silt, dry.										
			29											
4 CS	120 120		30		SM									
			31											
			32											

RAMBOLL

SOIL BORING LOG INFORMATION SUPPLEMENT

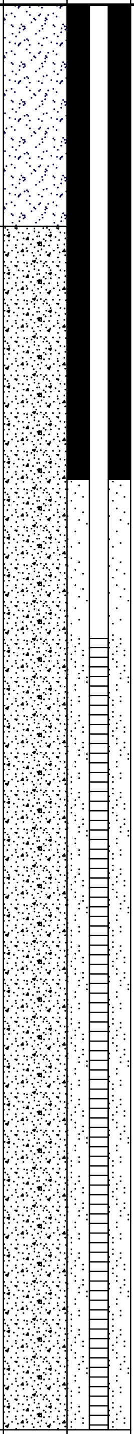
Boring Number MW-19

Page 3 of 4

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33 34	27.8 - 34' **SILTY SAND:** SM, brown (10YR 5/3), very fine to fine sand, little silt, dry. *(continued)*	SM									
			35	34 - 35' **POORLY-GRADED SAND:** SP, brown (10YR 5/3), fine to medium sand, trace fine gravel, dry.	SP									
5 CS	120 120		36 37 38 39 40 41 42 43 44 45	35 - 44.9' **SILT:** ML, brown (10YR 5/3), trace very fine to fine sand, wet.	ML									
6 CS	120 120		46 47 48 49 50 51 52	44.9 - 54.8' **POORLY-GRADED SAND:** SP, brown (10YR 5/3), fine to medium sand, trace fine to coarse gravel, wet.	SP									

Boring Number MW-19

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			53 54	44.9 - 54.8' **POORLY-GRADED SAND:** SP, brown (10YR 5/3), fine to medium sand, trace fine to coarse gravel, wet. *(continued)*	SP									
			55 56 57 58 59	54.8 - 70' **WELL-GRADED SAND:** SW, brown (10YR 5/3), fine to coarse sand, trace fine to coarse gravel, wet.										
7 CS	120 120		60 61 62 63 64 65 66 67 68 69	60' grades little subrounded fine to coarse gravel.	SW									
			70	70' End of boring.										



ATTACHMENT 3

Boring Logs (2021 and 2023 Field Efforts)

Client: Miami Fort
Project:
Address: 11021 Brower Rd.

FIELD LOGGING FORM

Log of Boring/Well: XPW -01
Page: 1 of 5

Bore Clear Date: 2/22/2021
Bore Clear Co:
Bore Clear Method:
Drilling Start Date:
Drilling End Date:
Drilling Company: Cascade
Drilling Method: Sonic

Boring Depth (ft):
Boring Diameter (in):
Sampling Method(s):
Logged By:
Boring Location (X):
Boring Location (Y):
Boring Elevation (Z):
Dynamic DTW (ft): @

Well Depth (ft):
Well Diameter (in):
Screen Slot (in):
Riser Material:
Screen Material:
Seal Material(s):
Filter Pack:
Static DTW (ft): @

				COLLECT				DESCRIBE												MEASURE		
									FINES		SAND			GRAVEL								
Depth (ft)	Graphic Log	Boring Backfill	Well Construction	Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	Depth (ft)
						1ft }		SM		S	M				S		L	M	(surface) light brown, silty sand			
1										S	M						L	D	dark grey silty sand			1
2								Same as above											5in lense of gravelly sand			2
						5		GM														
3										M	S						S	S	gray silty sand (mostly silt)			3
4																						4
5						5		GM		M	S			S			S	S	dark gray pebbly silt			5
6								CL	M	S						M	M	S	silty clay, gray			6
7																						7
8								Same as above														8
						2		SM		S	M			S				M	gray brown silty sand with some pebbles			
9																						9
10								same as above														10
						5		GP				M		S			L	S	black, dark grey medium grained sand			
11								SM			M			S			L	S	grey fine grained sand			11
12																						12
13																						13
14																						14
								same as above														

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other
Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present
Plasticity (Fines): N - None L - Low M - Medium H - High
Grading (Coarse): W - Well-graded P - Poorly-graded
Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard
Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense
Moisture: D - Dry M - Moist W - Wet S - Saturated

Client:

Project:

Address:

FIELD LOGGING FORM

Log of Boring/Well: XYW - 01

Page: 2 of 5

				COLLECT				DESCRIBE												MEASURE		
									FINES		SAND			GRAVEL								
Depth (ft)	Graphic Log	Boring Backfill	Well Construction	Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	Depth (ft)
								SP			M			S	F		L	S	dark gray silty sand with pebbles and cobbles			
16																						16
17																						17
						A		SAA														
18																						18
						5		ML	S	M	F						S	S	light gray clay-silty layer			
19																						19
								GM		S	M			F			L	S	dark gray silty sand			
								SP	S	M							M	S	brown gray silty clay			
20																						20
21																						21
22																						22
23																						23
24																						24
25																						25
26																						26
27																						27
28																						28
29																			EOB at 20ft			29
30																						30
31																						31
32																						32
33																						33
34																						34

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other

Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present

Plasticity (Fines): N - None L - Low M - Medium H - High

Grading (Coarse): W - Well-graded P - Poorly-graded

Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard

Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

Moisture: D - Dry M - Moist W - Wet S - Saturated

Client: Miami Fort
Project:
Address:

FIELD LOGGING FORM

Log of Boring/Well: MW-04/SB-2
Page: 1 of 5

Bore Clear Date: 2/23/2021
Bore Clear Co:
Bore Clear Method:
Drilling Start Date:
Drilling End Date:
Drilling Company: Cascade
Drilling Method: Sonic rig

Boring Depth (ft):
Boring Diameter (in):
Sampling Method(s):
Logged By:
Boring Location (X):
Boring Location (Y):
Boring Elevation (Z):
Dynamic DTW (ft): @

Well Depth (ft):
Well Diameter (in):
Screen Slot (in):
Riser Material:
Screen Material:
Seal Material(s):
Filter Pack:
Static DTW (ft): @

				COLLECT				DESCRIBE												MEASURE		
									FINES		SAND			GRAVEL								
Depth (ft)	Graphic Log	Boring Backfill	Well Construction	Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	Depth (ft)
								CL	S	M				F			M	M	orange brown silty clay w/ orange and black streaks			
1																						1
										same as above												
2								SW		S	S	M		S			L	S	dark gray silty sand with pebbles			2
3						5 ft																3
4																						4
												same as above										
5								CL	S	S	S						F	M	orange brown silty clay with black speckles			5
6						5 ft						same as above										6
								CL	M	S	S			F			VF	D	orange brown clay			
7								SW		S	M			S			MD	D	light brown silty sand with red and black specks			7
8								CL	M	S	F			S			M	M	light brown silty clay			8
9																						9
10																						10
										same as above												
11								CL	M	S							M	M	orange-brown clay with black streaks			11
								CL	M	S							M	M	Same as above, no black streaks/layer			
12						5 ft																12
13																						13
14																						14

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other
Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present
Plasticity (Fines): N - None L - Low M - Medium H - High
Grading (Coarse): W - Well-graded P - Poorly-graded
Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard
Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense
Moisture: D - Dry M - Moist W - Wet S - Saturated

FIELD LOGGING FORM

Client:

Project:

Address:

Log of Boring/Well: MW-4/SB-2

Page: 2 of 5

Depth (ft)	Graphic Log	Boring Backfill	Well Construction	COLLECT				DESCRIBE	FINES		SAND			GRAVEL						MEASURE		Depth (ft)
				Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	
								CL	M	S							M	M	orange brown clay			
16																						16
17																						17
						5 ft																
18																						18
19																						19
20												Same as above										20
								SC	S	S	M						L	M	orange brown clayey sand			
21																						21
22																						22
						5 ft																
23																						23
24																						24
												same as above										
25								OL	M	S							S	S	orange brown silty clay			25
26																						26
						5 ft																
27																						27
28												same as above										28
								CL	M	S	S						S	M	orange brown silty clay with some sands and black streaks			
29																						29
30												Same as above							(continue 2/24/2021)			30
								SC	S		M	S					L	M	light brown ~~silty~~ clayey sands			
31								CL	M			S					M	M	sandy light brown clay with black and orange staining			31
						5 ft																
32																						32
33												same as above										33
34								SC	S		M	F					S	M	light brown clayey sand with black staining/streaks			34
												same as above										

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other

Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present

Plasticity (Fines): N - None L - Low M - Medium H - High

Grading (Coarse): W - Well-graded P - Poorly-graded

Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard

Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

Moisture: D - Dry M - Moist W - Wet S - Saturated

Client:
Project:
Address:

FIELD LOGGING FORM

Log of Boring/Well: MW-4/SB-2
Page: 3 of 5

				COLLECT				DESCRIBE												MEASURE		
									FINES		SAND			GRAVEL								
Depth (ft)	Graphic Log	Boring Backfill	Well Construction	Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	Depth (ft)
36								SC	S		M	F					L	M	gray-brown clayey sand with red and black staining			36
37											same as above											37
38								CL	M	S	S						M	M	greenish-gray sandy clay with orange and black staining (grades from light brown)			38
								CL	M	S	F						M	M				
39																						39
40								GC	S		same as above						L		greenish-gray sandy clay (primarily gray) with orange & black staining			40
												M	S	S	F			M				
41								SM		S	S	M					L	M				41
42								GC				M	S	S	F		L	S	light brown sands with pebbles and gravel			42
43								SP		same as above												43
												S	M				L	S	light brown silty sands w/ some black specks			
44																						44
45												same as above							gravelly sands			45
46				EOB @ 45 ft																		46
47																						47
48																						48
49																						49
50																						50
51																						51
52																						52
53																						53
54																						54

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other
Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present
Plasticity (Fines): N - None L - Low M - Medium H - High
Grading (Coarse): W - Well-graded P - Poorly-graded
Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard
Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense
Moisture: D - Dry M - Moist W - Wet S - Saturated

Client: Miami Fort
Project:
Address:

FIELD LOGGING FORM

Log of Boring/Well: MW-19/SB-1
Page: 1 of 5

Bore Clear Date: 2/24/2021
Bore Clear Co:
Bore Clear Method:
Drilling Start Date:
Drilling End Date:
Drilling Company:
Drilling Method: Sonic

Boring Depth (ft):
Boring Diameter (in):
Sampling Method(s):
Logged By:
Boring Location (X):
Boring Location (Y):
Boring Elevation (Z):
Dynamic DTW (ft): @

Well Depth (ft):
Well Diameter (in):
Screen Slot (in):
Riser Material:
Screen Material:
Seal Material(s):
Filter Pack:
Static DTW (ft): @

				COLLECT				DESCRIBE												MEASURE		
									FINES		SAND			GRAVEL								
Depth (ft)	Graphic Log	Boring Backfill	Well Construction	Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	Depth (ft)
								CH	M					S	S	H	M	D	brown gravelly clay			
1																						1
2						5 ft																2
								SM-CL		M	S						L	D	orange brown sandy silt			
3																						3
4																						4
										same as above												5
								CL	M	S	S					M	M	M	brown silty-sandy clay mix			
6																						6
7						4.5 ft																7
8										same as above												8
9								GW-SW				M	S	S	S	W	VL	D	brown sand and gravel			9
10										same as above												10
											S	M		S		W	L	D	light brown gravely sands			
										M							M	D	silt (brown)			
11								GW					S	S	M	W	L	D	pebbles and cobbles mixed with coarse grained sand			11
12						8.5 ft																12
13						(10-20 interval)																13
14																						14
												Same as above										

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other
Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present
Plasticity (Fines): N - None L - Low M - Medium H - High
Grading (Coarse): W - Well-graded P - Poorly-graded
Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard
Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense
Moisture: D - Dry M - Moist W - Wet S - Saturated

FIELD LOGGING FORM

Client:
Project:
Address:

Log of Boring/Well: MW-19/SB-1
Page: 2 of 5

				COLLECT				DESCRIBE	FINES		SAND			GRAVEL						MEASURE		
Depth (ft)	Graphic Log	Boring Backfill	Well Construction	Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	Depth (ft)
								GW					S	S	M	W	L	D	white/gray pebbles and cobbles mixed with coarse brown sand well graded			
16																						16
17								GW-SW				S	S	M		W	L	D	brownish white sands and gravel well-graded			17
18																						18
19																						19
20											Same as above											20
								GW		F		S	M	S	S	W	VL	D	light brown to tan sand ~~with~~ (coarse grained mostly)			
21								SW-GW				S	M	S		W	VL	D	light to dark brown, coarse grained sand with pebbles			21
22																						22
23																						23
24				5ft (20-30ft interval)																		24
25																						25
26																						26
27																						27
28																						28
29																						29
30								GW			~~Some~~	S	M ~~[illegible]~~	S	S	W	VL	D	white to light sand w/ pebbles/cobbles			30
31								SW				M	S	S		W	VL	D	dark brown sand with pebbles			31
32																						32
33				10ft (30-40ft interval)																		33
34																						34
												same as above										

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other

Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present

Plasticity (Fines): N - None L - Low M - Medium H - High

Grading (Coarse): W - Well-graded P - Poorly-graded

Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard

Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense

Moisture: D - Dry M - Moist W - Wet S - Saturated

Client:
Project:
Address:

FIELD LOGGING FORM

Log of Boring/Well:
Page: 3 of 5

Depth (ft)	Graphic Log	Boring Backfill	Well Construction	COLLECT				DESCRIBE												MEASURE		Depth (ft)
				Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	FINES Clay	FINES Silt	SAND Fine	SAND Medium	SAND Coarse	GRAVEL Fine	GRAVEL Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	
36								SM-SC	S	S	M						L	D	orange brown clayey-silty sand			36
37																						37
38																						38
39																						39
40											same as above											40
								SM-SC	S	S	M						L	D	orange brown clayey sand			
41																						41
42																						42
43																						43
44												same as above										44
						ft 10 (40-50 ft) material		CL	M	S	S						M	W	mostly silty light brown clay			
45												SAA										45
								SC	S		M						S	S	clayey light brown sand			
46																						46
47																						47
48											same as above											48
49								SC	S		M						S	W	light brown, clayey sand			49
50								SP			S	M					L	S	light brown sand			50
51								SP			S	M		F			L	D	light brown poorly graded sand with scattered pebbles			51
52																						52
53																						53
54																						54
										same as above												

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other
Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present
Plasticity (Fines): N - None L - Low M - Medium H - High
Grading (Coarse): W - Well-graded P - Poorly-graded
Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard
Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense
Moisture: D - Dry M - Moist W - Wet S - Saturated

Client:
Project:
Address:

FIELD LOGGING FORM

Log of Boring/Well: MW-19/SB-1
Page: 4 of 5

				COLLECT				DESCRIBE												MEASURE		
									FINES		SAND			GRAVEL								
Depth (ft)	Graphic Log	Boring Backfill	Well Construction	Sampling Method	Blows/0.5 foot	Recovery (ft)	Time	USCS symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Plasticity/Grading	Consistency/Density	Moisture	Color (qualitative or Munsell); Notes	PID (ppm)	Sample ID	Depth (ft)
								SP			S	M		~~S~~ F			L	D	light brown sand			
56																						56
57						10ft																57
58						(50-60ft interval)																58
											Same as above											
59								SP			S	M		S					light brown sand with some pebbles (gravely sand)			59
											SAA											
60								SW				S	M	S			L	S	brown gravely sand			60
61								SW				S	M	S			L	M	dark brown gravely sand			61
62																						62
63																						63
64																						64
65						10 ft																65
66						(60-70ft interval)																66
67																						67
68																						68
69												Same as above										69
70								SW				S	M	S	F		L	M	dark brown gravely sands			70
71																						71
72																						72
73																						73
74																						74
												SAA							EOB @ 75ft			

Sampling method: GR - Grab EN - Encor SS - SPT MC - Mod CA SH - Shelby Tube CO - Core Barrel DP - Direct Push OT - Other
Enter T-Trace, F-Few, L-Little, S-Some, M-Mostly for each (silt/clay) or main (sand/gravel) grain size present, and "x" for other sand/gravel grain sizes present
Plasticity (Fines): N - None L - Low M - Medium H - High
Grading (Coarse): W - Well-graded P - Poorly-graded
Consistency (Fines): VS - Very soft S - Soft M - Medium F - Stiff VF - Very stiff H - Hard
Density (Coarse): VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense
Moisture: D - Dry M - Moist W - Wet S - Saturated

Geosyntec consultants

SOIL BORING LOG
REVISED 11/07

Page 1 of 4

PROJECT NAME: Vistra Miami Fort GLP8066

BORING NUMBER/WELL NAME: B23-12

DRILLER INFO

FIRM: SM&E

DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE

GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle

OFFICE: Cincinnati

DATE/TIME STARTED: 13:42 7/12/23

DATE/TIME FINISHED: 18:15 7/12/23

BOREHOLE DEPTH: 53.5 ft

BOREHOLE DIA.: 8 inches

DRILLING METHOD: CME split spoon

BORING LOCATION: N E

Lat: Long:

Sample		Blow Counts	Depth in Feet	Soil/Rock Description (Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
Number / Type	Recovery / Attempted					
0 - 1.5'	12"	19 19 13	1	Brown to dark brown sandy clay w/ silt, large gravel rounded, well graded, fill material		
			2 3 4	Auger		
4 - 5.5'	05"	4 3 2	5	Brown to dark brown silty clay, med plasticity, less silt, coal fines, w/ organics, moist		
			6 7 8 9	Auger		
9 - 10.5'	05"	1 1 1	10	Brown to dark brown clay, black organics, soft, ~~low~~ med. plasticity, moist		
			11 12 13 14	Auger		
14 - 15.5'	16.5"	2 1 1	15	SAA, med plasticity, decayed wood ~ 15.5', organics		

Geosyntec consultants

SOIL BORING LOG
REVISED 11/07

Page 2 of 4

PROJECT NAME:
Vistra Miami Fort
GLP8066

BORING NUMBER/WELL NAME: B23-12

DRILLER INFO
FIRM: SM&E
DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE
GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle
OFFICE: Cincinnati

DATE/TIME STARTED: 13:42 7/12/23
DATE/TIME FINISHED: 18:15 7/12/23
BOREHOLE DEPTH: 53.5 ft
DRILLING METHOD: CME Split spoon
BOREHOLE DIA.: 8 inches

BORING LOCATION: N E
Lat: Long:

Sample: Number / Type	Sample: Recovery / Attempted	Blow Counts	Depth in Feet	Soil/Rock Description (Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
			15 16 17 18	Auger		
19 – 20.5	7.5"	WH " " " "	19 20	H2O @ 19' Brown to dk brown clay, low plasticity, small gravel, soft, moist to wet		
			21	Auger		
21.5 – 23'	5"	WR WR 1	22	SAA, black mottling, large gravel		collected 1 bag of sample
23 – 24.5'	20"	WH 1 1	23 24	Medium brown silty clay, grades sandy, very fine grained, uniform pockets of sand, moist to wet		
			25 26 27 28	Auger		
29 – 30.5	14.5"	WH 1 1	29 30	Brown to dk brown clay, grades gray to dk gray w/ inc silt& sand		collected 1 bag of samples 30- 30.5'

Geosyntec consultants

SOIL BORING LOG

REVISED 11/07

Page 3 of 4

PROJECT NAME: Vistra Miami Fort GLP8066

BORING NUMBER/WELL NAME: B23-12

DRILLER INFO
FIRM: SM&E
DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE
GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle
OFFICE: Cincinnati

DATE/TIME STARTED: 13:42 7/12/23
DATE/TIME FINISHED: 18:15 7/12/23
BOREHOLE DEPTH: 53.5 ft
BOREHOLE DIA.: 8 inches
DRILLING METHOD: CME split spoon

BORING LOCATION: N E
Lat: Long:

Sample		Blow Counts	Depth in Feet	Soil/Rock Description	PID READING	Comments
Number / Type	Recovery / Attempted			(Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)		
			30			
30.5 - 32'	18"	WH " " " "	31 32	30.5-31.4' brown clay, iron oxide staining, moist to wet, low plasticity ~~wet~~ soft. 31.4-32' dk gray clay low plasticity, moist to wet		collected 1 bag 30.5-31.4' collected 1 bag 31.4-32'
32 - 33.5'	13"	1 2 3	33	~~[illegible]~~ dk gray clay, 1/4" silty sand seam, low plasticity, decayed wood/organics		collected 1 bag 32-33.5'
33.5 - 35'	10"	3 3 4	34 35	Brown/gray fine to coarse sand, very loose, poorly sorted, wet *JH thinks likely is not a representative sample*		collected 3 bags 33.5-35'
				Auger		
35.5 - 37'	13.5"	3 3 4	36 37	SAA, rounded gravel, well graded *JH thinks this is a representative sand sample*		collected 1 bag 35.5-37'
			38	Auger		
38.5 - 40'	16"	2 13 14	39 40	Brown and gray fine to coarse sand w/ coarse rounded gravel, loose, wet well graded		
			41 42 43	Auger		
43.5 - 45'	17"	3 11 13	44 45	Brown and gray fine well graded sand, large rounded med gravel, wet		collected 1 bag ~~43.5~~ 44-45' 43.5-44' was likely residual fallen in material

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SOIL BORING LOG

REVISED 11/07

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PROJECT NAME: Vistra Miami Fort GLP8066

BORING NUMBER/WELL NAME: B23-12

DRILLER INFO

FIRM: SM&E

DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE

GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle

OFFICE: Cincinnati

DATE/TIME STARTED: 13:42 7/12/23

DATE/TIME FINISHED: 18:15 7/12/23

BOREHOLE DEPTH: 53.5 ft

BOREHOLE DIA.: 8 inches

DRILLING METHOD: CME split spoon

BORING LOCATION: N E

Lat: Long:

Sample				Soil/Rock Description		
Number / Type	Recovery / Attempted	Blow Counts	Depth in Feet	(Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
			45			
			46			
			47			
			48	Auger		
			49			
			50			
50.5 - 52'	10.5"	8 8 9	51	Brown med sand, well graded, loose, wet		collected 1 bag 51.5-52'
52-53.5'	11"	3 9 8	52 53	Brown med sand, well graded, loose, wet		collected 1 bag 52-53.5'
			54			

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28.5 H_2O 7/11, seepage 23.5'
23.3' H_2O 7/12 Page 1 of 3

SOIL BORING LOG

REVISED 11/07

PROJECT NAME: Vistra Miami Fort GLP8066

BORING NUMBER/WELL NAME: B23-1

DRILLER INFO

FIRM: SM&E

DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE

GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle

OFFICE: Cincinnati

DATE/TIME STARTED: 14:12 7/11/23

DATE/TIME FINISHED: 17:00 7/11/23

BOREHOLE DEPTH: 45 ft

BOREHOLE DIA.: 8 outside 3 1/4 inside inches

DRILLING METHOD: Split spoon CME

BORING LOCATION: N E

Lat: Long:

Sample		Blow Counts	Depth in Feet	Soil/Rock Description (Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
Number / Type	Recovery / Attempted					
0-1.5'	13"	5 4 5	1	Brown silty clay w/ coal fines, trace gravel, med stiff, dry		
			2 3	Auger		
3.5-5'	13.5"	4 5 5	4	3.5-4' Brown silty clay SAA, 4-4.5' black coarse loose dry sand 4.5-4.6' clay SAA		
			5 6 7 8	Auger		
8.5-10'	14"	3 8 11	9	8.5-9' Brown silty clay w/ orange mottling, coal fines, end of fill, SAA 9-10' brown & gray sand w/ rounded gravel, loose, dry		
			10 11 12 13	Auger		
13.5-15'	<1"	3 5 4	14 15	Moist brown & gray sand w/ rounded gravel, loose, little recovery		

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SOIL BORING LOG

REVISED 11/07

PROJECT NAME: Vistra Miami Fort GLP8066

BORING NUMBER/WELL NAME: B23-1

DRILLER INFO

FIRM: SM&E

DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE

GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle

OFFICE: Cincinnati

DATE/TIME STARTED: 14:12 7/11/23

DATE/TIME FINISHED: 17:00 7/11/23

BOREHOLE DEPTH: 45 ft

BOREHOLE DIA.: 8 inches

DRILLING METHOD: CME

BORING LOCATION: N E

Lat: Long:

Sample Number / Type	Sample Recovery / Attempted	Blow Counts	Depth in Feet	Soil/Rock Description (Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
			15 16 17 18	Auger		
18.5 – 20'	2"	2 3 2	19	Silty clay, low recovery (likely missing sand layer) brown w/black mottling soft, moist, low plasticity		
			20 21 22 23	Auger	seepage	23.3' H_2O gauged 7/12 AM
23.5 – 25'	17"	WH 1 2	24	23.5-23.8' brown wet silty clay, soft, more sand than clay 23.8-25' brown clay, very soft, moist, low plasticity, hint of red		
			25 26 27 28	Auger		
28.5 – 30'	12"	2 1 1	29 30	wet to moist brown clay, soft, low plasticity, coal fines, silty clay	H_2O	Collected 1 bag ~30.5'

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SOIL BORING LOG
REVISED 11/07

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PROJECT NAME: Vistra Miami Fort GLP8066	**BORING NUMBER/WELL NAME:** B23-1
DRILLER INFO **FIRM:** SM&E **DRILLER NAME(S)** Brandon Kenyon	**GEOSYNTEC REPRESENTATIVE** **GEOLOGIST/ENGINEER:** Brianna O'Neil-Hankle **OFFICE:** Cincinnati
DATE/TIME STARTED: 14:12 7/11/23 **DATE/TIME FINISHED:** 17:00 7/11/23	
BOREHOLE DEPTH: 45 ft **BOREHOLE DIA.:** 8 inches	**DRILLING METHOD:** CME Split Spoon
BORING LOCATION: N E Lat: Long:	

Sample				Soil/Rock Description		
Number / Type	Recovery / Attempted	Blow Counts	Depth in Feet	(Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
			30	Auger		
30.5 - 32'	18"	3 2 2	31	30.5-31.5' wet to moist silty brown clay, low plasticity 31.5-32' brown moist clay w/ oxidation		collected 1 bag 30.5-31.5' oxidation collected 1 bag 31.5-32' SAA
32 - 33.5'	18.5"	1 2 3	32 33	32-33' SAA 33-33.2' gray sandy layer 33.2-33.5' wet to moist silty brown clay, low plasticity		collected 1 bag 32-33' sandy interval w/clay collected 1 bag 33-33.2' sandy g/b collected 1 bag 33.2-33.5' oxidation
33.5 - 35'	17.5"	1 2 2	34	lean clay w 1/4" fine sand/silty seam, similar oxidation w/ orange mottling 33.5-34.5' 34.5-35' sandy silty clay, more sand		collected 1 bag 33.5-34.5' moist silty clay layer w/oxidation collected 1 bag 34.5-35' moist silty clay, sandy interval less clay
			35 36 37 38 39 40	Auger		
40.5 - 42'	20"	1 2 2	41	40.5-41.9' gray silty fine sand w/ trace clay, very soft, moist 41.9-42' decayed wood organic layer in predominately clay, brown, moist, silty		collected 1 bag 40.5-41.9' gray sand lense collected 1 bag 41.9-42' brown clay w/organic layer, silty clay
42 - 43.5'	17.5"	1 1/12"	42 43	Brown gravely sand fine to med grain size - coarse		collected 1 bag 42-43.5' brown gravely sand fine to med grain size to coarse sand
43.5 - 45'	16"	1 2 3	44 45	Fine to medium to coarse sand, SAA		collected 1 bag SAA, fine to med to coarse sand

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SOIL BORING LOG

REVISED 11/07

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PROJECT NAME: Vistra Miami Fort GLP8066

BORING NUMBER/WELL NAME: B23-2

DRILLER INFO

FIRM: SM&E

DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE

GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle

OFFICE: Cincinnati

DATE/TIME STARTED: 7/20/23 11:42

DATE/TIME FINISHED: 7/24 2:30

BOREHOLE DEPTH: 40.5 ft

BOREHOLE DIA.: 4.25 inches

DRILLING METHOD: HSA, ID ST & split-spoon

BORING LOCATION: N E

Lat: Long:

Sample		Blow Counts	Depth in Feet	Soil/Rock Description	PID READING	Comments
Number / Type	Recovery / Attempted			(Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)		
			1			
2 - 3.5	17"	7 3 5	2 3	2-2.7' bottom ash, gravel fill 2.7-3.5' brown/dk gray clay low plasticity, coal fines dry		
3.5 - 5'	14"	4 4 4	4 5	3.5-4' gravel & dk brown/dk gray clay w/ ash, low plasticity, ~~wet~~ dry 4-5' SAA, no gravel, silty clay, ~~well graded~~ uniform fine-med sand		
5 - 6.5	15.5	5 4 10	6	5-5.5' SAA, w/ gravel 5.5-6.25' limestone/gravel 6.25-6.5' slag (crushed up)		
6.5 - 8'	14"	2 4 4	7 8	6.5-8' slag mixed w/ sand, and gravel, dry, well graded fine-med.		
8 - 9.5'	10"	3 2 2	9	SAA		
9.5 - 11'	8.5"	3 2 3	10 11	9.5-9.8' SAA 9.8-11' brown clay, dry, orange mottling, hard, low plasticity		
11- 12.5'	13.5"	2 2 3	12	11-11.5' SAA, med plasticity, dry 11.5-12.5' dk brown clay w/ black mottling, med plasticity, dry silty clay		
12.5 - 14'	11"	6 5 5	13 14	12.5-14' SAA, black & orange mottling, [illegible] silt		
14 -15.5	17.5"	2 2 2 2	15	silty clay, less silt than before, dry, soft, med plasticity, orange mottling, decayed wood, med gravel		

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SOIL BORING LOG

REVISED 11/07

PROJECT NAME:
Vistra Miami Fort
GLP8066

BORING NUMBER/WELL NAME: B23-2

DRILLER INFO
FIRM: SM&E

GEOSYNTEC REPRESENTATIVE
GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle

DATE/TIME STARTED: 7/20/23 11:42
DATE/TIME FINISHED: 7/24/23 2:30

DRILLER NAME(S) Brandon Kenyon

OFFICE: Cincinnati

BOREHOLE DEPTH: 70.5 ft

BOREHOLE DIA.: 4.25 inches

DRILLING METHOD: ST & split spoon HSA, ID

BORING LOCATION: N E

Lat: Long:

Sample Number / Type	Sample Recovery / Attempted	Blow Counts	Depth in Feet	Soil/Rock Description (Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
			15			
15.5 – 17'	0"	4 5 5	16	Limestone blocked shoe, poor recovery		
			17	Auger		
18.0 – 19.5'	13"	2 4 6	18 19	Brown silty clay, med soft, low plasticity, ash residual, black mottling, dry		
19.5 – 21'	19"	4 4 8	20	SAA		
21 – 23'	19"	ST	21 22	Shelby tube		
23 – 24.5	19.5"	1 3 3	23 24	brown silty clay, no mottling, moist, soft, low plasticity		
24.5 – 26'	19"	2 3 4	25	brown silty clay, more silty than before, low plasticity, moist, soft		
26 – 27.5'	11"	3 3 3	26 27	SAA, low-med plasticity, slag residual		
27.5 – 29'	15"	4 3 2	28	brown silty sandy clay, low-med plasticity		
			29 30	Auger		

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SOIL BORING LOG

REVISED 11/07

PROJECT NAME:
Vistra Miami Fort
GLP8066

DRILLER INFO
FIRM: SM&E

DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE
GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle

OFFICE: Cincinnati

BORING NUMBER/WELL NAME: B23-2

DATE/TIME STARTED: 7/20/23 11:42

DATE/TIME FINISHED: 7/24/23 2:30

BOREHOLE DEPTH: 70.5 ft

BOREHOLE DIA.: 4.25 inches

DRILLING METHOD: ST & split spoon HSA, ID m

BORING LOCATION: N E
Lat: Long:

Sample Number / Type	Sample Recovery / Attempted	Blow Counts	Depth in Feet	Soil/Rock Description (Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
		ST	30 31	Shelby tube		
32 - 33.5'	17.5"	WH 2 3	32 33	moist, brown, silty clay, low plasticity		
33.5 - 35'	18"	WH 3 4	34	33.5-34.5' SAA 34.5-35' brown sand, moist, w/ some clay, small grain size		seepage @35'
35 - 36.5'	18"	1 2 3	35 36	35-35.5' brown moist sandy clay 35.5-36.5' moist brown sandy, silty layer, small grain size		
36.5 - 38'	15.5"	WH WH 2	37	SAA		
38 - 39.5'	15"	WH WH 1	38 39	SAA, orange mottling		
39.5 - 41'	18"	WH WH WH	40 41	SAA, moist silty sandy clay, more sand than clay, no orange mottling		Groundwater 39.5'
41 - 42.5'	18"	WH 2 3	42	41-42' SAA, black mottling 42-42.5' SAA, no black mottling, orange mottling		42-42.5' collected 1 bag of sample
42.5 - 44'	18"	WH 2 9	43 44	42.5-43.6' SAA, orange mottling 43.6-44' gravel/sand, well graded, med-large gravel		42.5-43.6' collected 1 bag of sample
			45	Auger		

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SOIL BORING LOG

REVISED 11/07

PROJECT NAME:
Vistra Miami Fort
GLP8066

BORING NUMBER/WELL NAME: B23-2

DRILLER INFO
FIRM: SM&E
DRILLER NAME(S) Brandon Kenyon

GEOSYNTEC REPRESENTATIVE
GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle
OFFICE: Cincinnati

DATE/TIME STARTED:
DATE/TIME FINISHED:
BOREHOLE DEPTH: 70.5 ft
BOREHOLE DIA.: 4.25 inches
DRILLING METHOD: ST & split spoon HSA, ID

BORING LOCATION: N E
Lat: Long:

Sample				Soil/Rock Description		
Number / Type	Recovery / Attempted	Blow Counts	Depth in Feet	(Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
45-46.5'	14"	2 2 4	45 46	45-45.8' wet silty, sandy, clay, no orange mottling 44.8--45.5' clay/gravel/sand, med-large gravel		45-46.5' collected 1 bag of sample (Jar from SM&E)
			47 48	Auger		
49-50.5'	0"	WH 4 1	49 50	poor recovery, < 1" gravel/sand		
			51 52 53	Auger		52.3' WL GW reading before drilling H2O was added to hole
54-55.5'	12"	8 9 12	54 55	med gravel w/ silty clay		
			56 57 58	Auger		
59-60.5'	15.5"	9 20 10	59 60	med dense - fine clay w/ sand, wet		59-60.5' 1 bag sample collected

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SOIL BORING LOG

REVISED 11/07

PROJECT NAME: Vistra Miami Fort
GLP8066

BORING NUMBER/WELL NAME: B23-2

DRILLER INFO
FIRM: SM&E
DRILLER NAME(S) Brandon Kenyan

GEOSYNTEC REPRESENTATIVE
GEOLOGIST/ENGINEER: Brianna O'Neil-Hankle
OFFICE: Cincinnati

DATE/TIME STARTED: 7/20/23 11:42
DATE/TIME FINISHED: 7/24/23 2:30 PM
BOREHOLE DEPTH: 70.5 ft
BOREHOLE DIA.: 4.25 inches
DRILLING METHOD: ST & Split Spoon
HSA, ID

BORING LOCATION: N E
Lat: Long:

Sample: Number / Type	Sample: Recovery / Attempted	Blow Counts	Depth in Feet	Soil/Rock Description (Density, Color, USCS Classification, moisture, plasticity, cohesiveness, structure, other)	PID READING	Comments
59-60.5			60			
			61			
			62	Auger		
			63			
			64	[illegible]		
			65			
			66			
			67			
			68			
			69	[illegible]		Fell in to 67' setting screen there.
69-70.5'	8.5'	12 14 14	70	69-70.5' silty sand, small-medium gravel, well graded, wet w/ med dense clay		69-70.5' collected 1 bag of sample
			71			Initial targeted screened interval 59-69' but because of fallen in sand, moved to ~57-67'
			72			
			73			
			74			
			75			

ATTACHMENT 4

Sequential Extraction Procedure Laboratory Analytical Report (2021 and 2023 Field Efforts)

eurofins | Environment Testing America

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ANALYTICAL REPORT

Eurofins TestAmerica, Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
Tel: (865)291-3000

Laboratory Job ID: 140-22107-1
Client Project/Site: SEP Analysis - Miami Fort

For:
Geosyntec Consultants, Inc.
941 Chatham Lane
Suite 103
Columbus, Ohio 43221

Attn: Allison Kreinberg

Ryan Henry

Authorized for release by:
3/30/2021 4:22:28 PM

Ryan Henry, Project Manager I
(865)291-3000
williamr.henry@eurofinset.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Definitions/Glossary

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Case Narrative

Job ID: 140-22107-1

Laboratory: Eurofins TestAmerica, Knoxville

Narrative

Job Narrative
140-22107-1

Receipt
The samples were received on 2/27/2021 at 11:15am and arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.1º C.

Metals
7 Step Sequential Extraction Procedure

These soil samples were prepared and analyzed using Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0008, "7 Step Sequential Extraction Procedure". SW-846 Method 6010B as incorporated in Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0007 was used to perform the final instrument analyses.

An aliquot of each sample was sequentially extracted using the steps listed below:

- Step 1 - Exchangeable Fraction: A 5 gram aliquot of sample was extracted with 25 mL of 1M magnesium sulfate (MgSO4), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 2 - Carbonate Fraction: The sample residue from step 1 was extracted with 25 mL of 1M sodium acetate/acetic acid (NaOAc/HOAc) at pH 5, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 3 - Non-crystalline Materials Fraction: The sample residue from step 2 was extracted with 25 mL of 0.2M ammonium oxalate (pH 3), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 4 - Metal Hydroxide Fraction: The sample residue from step 3 was extracted with 25 mL of 1M hydroxylamine hydrochloride solution in 25% v/v acetic acid, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 5 - Organic-bound Fraction: The sample residue from step 4 was extracted three times with 25 mL of 5% sodium hypochlorite (NaClO) at pH 9.5, centrifuged and filtered. The resulting leachates were combined and 5 mL were digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 6 - Acid/Sulfide Fraction: The sample residue from step 5 was extracted with 25 mL of a 3:1:2 v/v solution of HCl-HNO3-H2O, centrifuged and filtered. 5 mL of the resulting leachate was diluted to 50 mL with reagent water and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 7 - Residual Fraction: A 1.0 g aliquot of the sample residue from step 6 was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Results are reported in mg/kg on a dry weight basis.

In addition, a 1.0 g aliquot of the original sample was digested using HF, HNO3, HCl and H3BO3. The digestate was analyzed by ICP using method 6010B. Total metal results are reported in mg/kg on a dry weight basis.

Results were calculated using the following equation:

Result, µg/g or mg/Kg, dry weight = (C × V × V1 × D) / (W × S × V2)

Where:
C = Concentration from instrument readout, µg/mL
V = Final volume of digestate, mL
D = Instrument dilution factor
V1 = Total volume of leachate, mL
V2 = Volume of leachate digested, mL
W = Wet weight of sample, g
S = Percent solids/100

A method blank, laboratory control sample and laboratory control sample duplicate were prepared and analyzed with each SEP step in

Job ID: 140-22107-1 (Continued)

Laboratory: Eurofins TestAmerica, Knoxville (Continued)

order to provide information about both the presence of elements of interest in the extraction solutions, and the recovery of elements of interest from the extraction solutions. Results outside of laboratory QC limits do not reflect out of control performance, but rather the effect of the extraction solution upon the analyte.

A laboratory sample duplicate was prepared and analyzed with each batch of samples in order to provide information regarding the reproducibility of the procedure.

SEP Report Notes:

The final report lists the results for each step, the result for the total digestion of the sample, and a sum of the results of steps 1 through 7 by element.

Magnesium was not reported for step 1 because the extraction solution for this step (magnesium sulfate) contains high levels of magnesium. Sodium was not reported for steps 2 and 5 since the extraction solutions for these steps contain high levels of sodium. The sum of steps 1 through 7 is much higher than the total result for sodium and magnesium due to the magnesium and sodium introduced by the extraction solutions.

The digestates for steps 1, 2 and 5 were analyzed at a dilution due to instrument problems caused by the high solids content of the digestates. The reporting limits were adjusted accordingly.

Method 6010B SEP: The following sample was diluted due to the presence of titanium which interferes with Cobalt: SB-2 - 20210224 (140-22107-2). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Sample Summary

Client: Geosyntec Consultants, Inc.
Project/Site: SEP Analysis - Miami Fort

Job ID: 140-22107-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-22107-1	SB-1 - 20210224	Solid	02/24/21 13:35	02/27/21 11:15	
140-22107-2	SB-2 - 20210224	Solid	02/24/21 08:45	02/27/21 11:15	

Client Sample ID: SB-1 - 20210224

Lab Sample ID: 140-22107-1

Date Collected: 02/24/21 13:35

Matrix: Solid

Date Received: 02/27/21 11:15

Percent Solids: 87.5

Method: 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		11	0.21	mg/Kg	☼	03/11/21 08:00	03/23/21 12:57	4
Molybdenum	ND		9.1	0.37	mg/Kg	☼	03/11/21 08:00	03/23/21 12:57	4

Method: 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**1.1**	**J**	8.6	0.22	mg/Kg	☼	03/16/21 08:00	03/23/21 14:34	3
Molybdenum	ND		6.9	0.28	mg/Kg	☼	03/16/21 08:00	03/23/21 14:34	3

Method: 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**1.3**	**J**	2.9	0.051	mg/Kg	☼	03/17/21 08:00	03/23/21 16:03	1
Molybdenum	ND		2.3	0.094	mg/Kg	☼	03/17/21 08:00	03/23/21 16:03	1

Method: 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**2.5**	**J**	2.9	0.061	mg/Kg	☼	03/18/21 08:00	03/24/21 12:14	1
Molybdenum	**0.32**	**J**	2.3	0.094	mg/Kg	☼	03/18/21 08:00	03/24/21 12:14	1

Method: 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		43	0.69	mg/Kg	☼	03/22/21 08:00	03/24/21 13:41	5
Molybdenum	ND		34	1.4	mg/Kg	☼	03/22/21 08:00	03/24/21 13:41	5

Method: 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**2.0**	**J**	2.9	0.053	mg/Kg	☼	03/22/21 08:00	03/24/21 15:21	1
Molybdenum	**0.47**	**J**	2.3	0.11	mg/Kg	☼	03/22/21 08:00	03/24/21 15:21	1

Method: 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**0.54**	**J**	2.9	0.030	mg/Kg	☼	03/23/21 08:00	03/26/21 11:30	1
Molybdenum	ND		2.3	0.094	mg/Kg	☼	03/23/21 08:00	03/26/21 11:30	1

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**7.3**		2.5	0.023	mg/Kg			03/30/21 14:25	1
Molybdenum	**0.79**	**J**	2.0	0.082	mg/Kg			03/30/21 14:25	1

Method: 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**6.0**		2.9	0.030	mg/Kg	☼	03/10/21 08:00	03/28/21 11:06	1
Molybdenum	**0.86**	**J**	2.3	0.094	mg/Kg	☼	03/10/21 08:00	03/28/21 11:06	1

Client Sample ID: SB-2 - 20210224

Date Collected: 02/24/21 08:45
Date Received: 02/27/21 11:15

Lab Sample ID: 140-22107-2
Matrix: Solid
Percent Solids: 85.4

Method: 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**0.79**	**J**	12	0.21	mg/Kg	☼	03/11/21 08:00	03/23/21 13:02	4
Molybdenum	ND		9.4	0.38	mg/Kg	☼	03/11/21 08:00	03/23/21 13:02	4

Method: 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**0.59**	**J**	8.8	0.22	mg/Kg	☼	03/16/21 08:00	03/23/21 14:39	3
Molybdenum	ND		7.0	0.29	mg/Kg	☼	03/16/21 08:00	03/23/21 14:39	3

Method: 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**1.4**	**J**	2.9	0.053	mg/Kg	☼	03/17/21 08:00	03/23/21 16:08	1
Molybdenum	**0.14**	**J**	2.3	0.096	mg/Kg	☼	03/17/21 08:00	03/23/21 16:08	1

Method: 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**4.1**		2.9	0.062	mg/Kg	☼	03/18/21 08:00	03/24/21 12:19	1
Molybdenum	**0.55**	**J**	2.3	0.096	mg/Kg	☼	03/18/21 08:00	03/24/21 12:19	1

Method: 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		44	0.70	mg/Kg	☼	03/22/21 08:00	03/24/21 13:56	5
Molybdenum	ND		35	1.5	mg/Kg	☼	03/22/21 08:00	03/24/21 13:56	5

Method: 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**2.7**	**J**	2.9	0.054	mg/Kg	☼	03/22/21 08:00	03/24/21 15:26	1
Molybdenum	**0.34**	**J**	2.3	0.12	mg/Kg	☼	03/22/21 08:00	03/24/21 15:26	1

Method: 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**0.92**	**J**	5.9	0.061	mg/Kg	☼	03/23/21 08:00	03/26/21 14:23	2
Molybdenum	ND		2.3	0.096	mg/Kg	☼	03/23/21 08:00	03/26/21 11:35	1

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**11**		2.5	0.023	mg/Kg			03/30/21 14:25	1
Molybdenum	**1.0**	**J**	2.0	0.082	mg/Kg			03/30/21 14:25	1

Method: 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**8.7**		2.9	0.030	mg/Kg	☼	03/10/21 08:00	03/28/21 11:11	1
Molybdenum	**1.1**	**J**	2.3	0.096	mg/Kg	☼	03/10/21 08:00	03/28/21 11:11	1

Default Detection Limits

Method: 6010B SEP - SEP Metals (ICP) - Step 1

Prep: 3010A

SEP: Exchangeable

Analyte	RL	MDL	Units
Cobalt	2.5	0.045	mg/Kg
Molybdenum	2.0	0.082	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 2

Prep: 3010A

SEP: Carbonate

Analyte	RL	MDL	Units
Cobalt	2.5	0.063	mg/Kg
Molybdenum	2.0	0.082	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 3

Prep: 3010A

SEP: Non-Crystalline

Analyte	RL	MDL	Units
Cobalt	2.5	0.045	mg/Kg
Molybdenum	2.0	0.082	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 4

Prep: 3010A

SEP: Metal Hydroxide

Analyte	RL	MDL	Units
Cobalt	2.5	0.053	mg/Kg
Molybdenum	2.0	0.082	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 5

Prep: 3010A

SEP: Organic-Bound

Analyte	RL	MDL	Units
Cobalt	7.5	0.12	mg/Kg
Molybdenum	6.0	0.25	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 6

SEP: Acid/Sulfide

Analyte	RL	MDL	Units
Cobalt	2.5	0.046	mg/Kg
Molybdenum	2.0	0.099	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 7

Prep: Residual

Analyte	RL	MDL	Units
Cobalt	2.5	0.026	mg/Kg
Molybdenum	2.0	0.082	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	RL	MDL	Units
Cobalt	2.5	0.023	mg/Kg
Molybdenum	2.0	0.082	mg/Kg

Method: 6010B - SEP Metals (ICP) - Total

Default Detection Limits

Client: Geosyntec Consultants, Inc.
Project/Site: SEP Analysis - Miami Fort

Job ID: 140-22107-1

Method: 6010B - SEP Metals (ICP) - Total

Prep: Total

Analyte	RL	MDL	Units
Cobalt	2.5	0.026	mg/Kg
Molybdenum	2.0	0.082	mg/Kg

QC Sample Results

Method: 6010B - SEP Metals (ICP) - Total

Lab Sample ID: MB 140-47551/13-A
Matrix: Solid
Analysis Batch: 48227

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 47551

	MB	MB							
Analyte	**Result**	**Qualifier**	**RL**	**MDL**	**Unit**	**D**	**Prepared**	**Analyzed**	**Dil Fac**
Cobalt	ND		2.5	0.026	mg/Kg		03/10/21 08:00	03/28/21 10:46	1
Molybdenum	ND		2.0	0.082	mg/Kg		03/10/21 08:00	03/28/21 10:46	1

Lab Sample ID: LCS 140-47551/14-A
Matrix: Solid
Analysis Batch: 48227

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 47551

			Spike	LCS	LCS				%Rec.		
Analyte			**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**		
Cobalt			5.00	5.17		mg/Kg		103	80 - 125		
Molybdenum			25.0	25.4		mg/Kg		102	80 - 125		

Lab Sample ID: LCSD 140-47551/15-A
Matrix: Solid
Analysis Batch: 48227

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 47551

			Spike	LCSD	LCSD				%Rec.		RPD
Analyte			**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**	**RPD**	**Limit**
Cobalt			5.00	5.14		mg/Kg		103	80 - 125	1	30
Molybdenum			25.0	25.3		mg/Kg		101	80 - 125	0	30

Method: 6010B SEP - SEP Metals (ICP)

Lab Sample ID: MB 140-47631/13-B ^4
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Method Blank
Prep Type: Step 1
Prep Batch: 47642

	MB	MB							
Analyte	**Result**	**Qualifier**	**RL**	**MDL**	**Unit**	**D**	**Prepared**	**Analyzed**	**Dil Fac**
Cobalt	ND		10	0.18	mg/Kg		03/11/21 08:00	03/23/21 12:42	4
Molybdenum	ND		8.0	0.33	mg/Kg		03/11/21 08:00	03/23/21 12:42	4

Lab Sample ID: LCS 140-47631/14-B ^5
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Lab Control Sample
Prep Type: Step 1
Prep Batch: 47642

			Spike	LCS	LCS				%Rec.		
Analyte			**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**		
Cobalt			5.00	4.95	J	mg/Kg		99	80 - 120		
Molybdenum			25.0	24.3		mg/Kg		97	80 - 120		

Lab Sample ID: LCSD 140-47631/15-B ^5
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 1
Prep Batch: 47642

			Spike	LCSD	LCSD				%Rec.		RPD
Analyte			**Added**	**Result**	**Qualifier**	**Unit**	**D**	**%Rec**	**Limits**	**RPD**	**Limit**
Cobalt			5.00	5.08	J	mg/Kg		102	80 - 120	3	30
Molybdenum			25.0	24.7		mg/Kg		99	80 - 120	1	30

QC Sample Results

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-47643/13-B ^3
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Method Blank
Prep Type: Step 2
Prep Batch: 47679

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		7.5	0.19	mg/Kg		03/16/21 08:00	03/23/21 14:10	3
Molybdenum	ND		6.0	0.25	mg/Kg		03/16/21 08:00	03/23/21 14:10	3

Lab Sample ID: LCS 140-47643/14-B ^5
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Lab Control Sample
Prep Type: Step 2
Prep Batch: 47679

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	5.00	4.28	J	mg/Kg		86	80 - 120
Molybdenum	25.0	18.7		mg/Kg		75	70 - 120

Lab Sample ID: LCSD 140-47643/15-B ^5
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 2
Prep Batch: 47679

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	5.00	4.30	J	mg/Kg		86	80 - 120	0	30
Molybdenum	25.0	18.8		mg/Kg		75	70 - 120	0	30

Lab Sample ID: MB 140-47680/13-B
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Method Blank
Prep Type: Step 3
Prep Batch: 47796

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		2.5	0.045	mg/Kg		03/17/21 08:00	03/23/21 15:49	1
Molybdenum	ND		2.0	0.082	mg/Kg		03/17/21 08:00	03/23/21 15:49	1

Lab Sample ID: LCS 140-47680/14-B
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Lab Control Sample
Prep Type: Step 3
Prep Batch: 47796

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	5.00	4.90		mg/Kg		98	80 - 120
Molybdenum	25.0	23.9		mg/Kg		95	80 - 120

Lab Sample ID: LCSD 140-47680/15-B
Matrix: Solid
Analysis Batch: 48064

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 3
Prep Batch: 47796

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	5.00	4.78		mg/Kg		96	80 - 120	3	30
Molybdenum	25.0	23.4		mg/Kg		94	80 - 120	2	30

Lab Sample ID: MB 140-47797/13-B
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Method Blank
Prep Type: Step 4
Prep Batch: 47850

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		2.5	0.053	mg/Kg		03/18/21 08:00	03/24/21 12:00	1
Molybdenum	ND		2.0	0.082	mg/Kg		03/18/21 08:00	03/24/21 12:00	1

QC Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: SEP Analysis - Miami Fort
Job ID: 140-22107-1

Method: 6010B SEP - SEP Metals (ICP)

Lab Sample ID: LCS 140-47797/14-B
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Lab Control Sample
Prep Type: Step 4
Prep Batch: 47850

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	5.00	5.16		mg/Kg		103	80 - 120
Molybdenum	25.0	25.3		mg/Kg		101	80 - 120

Lab Sample ID: LCSD 140-47797/15-B
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 4
Prep Batch: 47850

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	5.00	5.16		mg/Kg		103	80 - 120	0	30
Molybdenum	25.0	25.3		mg/Kg		101	80 - 120	0	30

Lab Sample ID: MB 140-47851/13-B ^5
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Method Blank
Prep Type: Step 5
Prep Batch: 47922

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		38	0.60	mg/Kg		03/22/21 08:00	03/24/21 13:27	5
Molybdenum	ND		30	1.3	mg/Kg		03/22/21 08:00	03/24/21 13:27	5

Lab Sample ID: LCS 140-47851/14-B ^5
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Lab Control Sample
Prep Type: Step 5
Prep Batch: 47922

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	15.0	2.02	J	mg/Kg		13	1 - 60
Molybdenum	75.0	51.7		mg/Kg		69	60 - 100

Lab Sample ID: LCSD 140-47851/15-B ^5
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 5
Prep Batch: 47922

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	15.0	2.13	J	mg/Kg		14	1 - 60	5	30
Molybdenum	75.0	51.8		mg/Kg		69	60 - 100	0	30

Lab Sample ID: MB 140-47923/13-A
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Method Blank
Prep Type: Step 6
Prep Batch: 47923

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		2.5	0.046	mg/Kg		03/22/21 08:00	03/24/21 15:06	1
Molybdenum	ND		2.0	0.099	mg/Kg		03/22/21 08:00	03/24/21 15:06	1

Lab Sample ID: LCS 140-47923/14-A
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Lab Control Sample
Prep Type: Step 6
Prep Batch: 47923

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	5.00	4.98		mg/Kg		100	80 - 120
Molybdenum	25.0	23.9		mg/Kg		96	80 - 120

Method: 6010B SEP - SEP Metals (ICP)

Lab Sample ID: LCSD 140-47923/15-A
Matrix: Solid
Analysis Batch: 48108

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 6
Prep Batch: 47923

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt			5.00	5.09		mg/Kg		102	80 - 120	2	30
Molybdenum			25.0	24.2		mg/Kg		97	80 - 120	1	30

Lab Sample ID: MB 140-47981/13-A
Matrix: Solid
Analysis Batch: 48208

Client Sample ID: Method Blank
Prep Type: Step 7
Prep Batch: 47981

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		2.5	0.026	mg/Kg		03/23/21 08:00	03/26/21 11:11	1
Molybdenum	ND		2.0	0.082	mg/Kg		03/23/21 08:00	03/26/21 11:11	1

Lab Sample ID: LCS 140-47981/14-A
Matrix: Solid
Analysis Batch: 48208

Client Sample ID: Lab Control Sample
Prep Type: Step 7
Prep Batch: 47981

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cobalt			5.00	5.20		mg/Kg		104	80 - 125		
Molybdenum			25.0	25.7		mg/Kg		103	80 - 125		

Lab Sample ID: LCSD 140-47981/15-A
Matrix: Solid
Analysis Batch: 48208

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 7
Prep Batch: 47981

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt			5.00	5.15		mg/Kg		103	80 - 125	1	30
Molybdenum			25.0	25.4		mg/Kg		102	80 - 125	1	30

Metals

Prep Batch: 47551

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Total/NA	Solid	Total	
140-22107-2	SB-2 - 20210224	Total/NA	Solid	Total	
MB 140-47551/13-A	Method Blank	Total/NA	Solid	Total	
LCS 140-47551/14-A	Lab Control Sample	Total/NA	Solid	Total	
LCSD 140-47551/15-A	Lab Control Sample Dup	Total/NA	Solid	Total	

SEP Batch: 47631

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 1	Solid	Exchangeable	
140-22107-2	SB-2 - 20210224	Step 1	Solid	Exchangeable	
MB 140-47631/13-B ^4	Method Blank	Step 1	Solid	Exchangeable	
LCS 140-47631/14-B ^5	Lab Control Sample	Step 1	Solid	Exchangeable	
LCSD 140-47631/15-B ^5	Lab Control Sample Dup	Step 1	Solid	Exchangeable	

Prep Batch: 47642

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 1	Solid	3010A	47631
140-22107-2	SB-2 - 20210224	Step 1	Solid	3010A	47631
MB 140-47631/13-B ^4	Method Blank	Step 1	Solid	3010A	47631
LCS 140-47631/14-B ^5	Lab Control Sample	Step 1	Solid	3010A	47631
LCSD 140-47631/15-B ^5	Lab Control Sample Dup	Step 1	Solid	3010A	47631

SEP Batch: 47643

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 2	Solid	Carbonate	
140-22107-2	SB-2 - 20210224	Step 2	Solid	Carbonate	
MB 140-47643/13-B ^3	Method Blank	Step 2	Solid	Carbonate	
LCS 140-47643/14-B ^5	Lab Control Sample	Step 2	Solid	Carbonate	
LCSD 140-47643/15-B ^5	Lab Control Sample Dup	Step 2	Solid	Carbonate	

Prep Batch: 47679

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 2	Solid	3010A	47643
140-22107-2	SB-2 - 20210224	Step 2	Solid	3010A	47643
MB 140-47643/13-B ^3	Method Blank	Step 2	Solid	3010A	47643
LCS 140-47643/14-B ^5	Lab Control Sample	Step 2	Solid	3010A	47643
LCSD 140-47643/15-B ^5	Lab Control Sample Dup	Step 2	Solid	3010A	47643

SEP Batch: 47680

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 3	Solid	Non-Crystalline	
140-22107-2	SB-2 - 20210224	Step 3	Solid	Non-Crystalline	
MB 140-47680/13-B	Method Blank	Step 3	Solid	Non-Crystalline	
LCS 140-47680/14-B	Lab Control Sample	Step 3	Solid	Non-Crystalline	
LCSD 140-47680/15-B	Lab Control Sample Dup	Step 3	Solid	Non-Crystalline	

Prep Batch: 47796

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 3	Solid	3010A	47680
140-22107-2	SB-2 - 20210224	Step 3	Solid	3010A	47680
MB 140-47680/13-B	Method Blank	Step 3	Solid	3010A	47680

Metals (Continued)

Prep Batch: 47796 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 140-47680/14-B	Lab Control Sample	Step 3	Solid	3010A	47680
LCSD 140-47680/15-B	Lab Control Sample Dup	Step 3	Solid	3010A	47680

SEP Batch: 47797

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 4	Solid	Metal Hydroxide	
140-22107-2	SB-2 - 20210224	Step 4	Solid	Metal Hydroxide	
MB 140-47797/13-B	Method Blank	Step 4	Solid	Metal Hydroxide	
LCS 140-47797/14-B	Lab Control Sample	Step 4	Solid	Metal Hydroxide	
LCSD 140-47797/15-B	Lab Control Sample Dup	Step 4	Solid	Metal Hydroxide	

Prep Batch: 47850

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 4	Solid	3010A	47797
140-22107-2	SB-2 - 20210224	Step 4	Solid	3010A	47797
MB 140-47797/13-B	Method Blank	Step 4	Solid	3010A	47797
LCS 140-47797/14-B	Lab Control Sample	Step 4	Solid	3010A	47797
LCSD 140-47797/15-B	Lab Control Sample Dup	Step 4	Solid	3010A	47797

SEP Batch: 47851

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 5	Solid	Organic-Bound	
140-22107-2	SB-2 - 20210224	Step 5	Solid	Organic-Bound	
MB 140-47851/13-B ^5	Method Blank	Step 5	Solid	Organic-Bound	
LCS 140-47851/14-B ^5	Lab Control Sample	Step 5	Solid	Organic-Bound	
LCSD 140-47851/15-B ^5	Lab Control Sample Dup	Step 5	Solid	Organic-Bound	

Prep Batch: 47922

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 5	Solid	3010A	47851
140-22107-2	SB-2 - 20210224	Step 5	Solid	3010A	47851
MB 140-47851/13-B ^5	Method Blank	Step 5	Solid	3010A	47851
LCS 140-47851/14-B ^5	Lab Control Sample	Step 5	Solid	3010A	47851
LCSD 140-47851/15-B ^5	Lab Control Sample Dup	Step 5	Solid	3010A	47851

SEP Batch: 47923

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 6	Solid	Acid/Sulfide	
140-22107-2	SB-2 - 20210224	Step 6	Solid	Acid/Sulfide	
MB 140-47923/13-A	Method Blank	Step 6	Solid	Acid/Sulfide	
LCS 140-47923/14-A	Lab Control Sample	Step 6	Solid	Acid/Sulfide	
LCSD 140-47923/15-A	Lab Control Sample Dup	Step 6	Solid	Acid/Sulfide	

Prep Batch: 47981

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 7	Solid	Residual	
140-22107-2	SB-2 - 20210224	Step 7	Solid	Residual	
MB 140-47981/13-A	Method Blank	Step 7	Solid	Residual	
LCS 140-47981/14-A	Lab Control Sample	Step 7	Solid	Residual	
LCSD 140-47981/15-A	Lab Control Sample Dup	Step 7	Solid	Residual	

Metals

Analysis Batch: 48064

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 1	Solid	6010B SEP	47642
140-22107-1	SB-1 - 20210224	Step 2	Solid	6010B SEP	47679
140-22107-1	SB-1 - 20210224	Step 3	Solid	6010B SEP	47796
140-22107-2	SB-2 - 20210224	Step 1	Solid	6010B SEP	47642
140-22107-2	SB-2 - 20210224	Step 2	Solid	6010B SEP	47679
140-22107-2	SB-2 - 20210224	Step 3	Solid	6010B SEP	47796
MB 140-47631/13-B ^4	Method Blank	Step 1	Solid	6010B SEP	47642
MB 140-47643/13-B ^3	Method Blank	Step 2	Solid	6010B SEP	47679
MB 140-47680/13-B	Method Blank	Step 3	Solid	6010B SEP	47796
LCS 140-47631/14-B ^5	Lab Control Sample	Step 1	Solid	6010B SEP	47642
LCS 140-47643/14-B ^5	Lab Control Sample	Step 2	Solid	6010B SEP	47679
LCS 140-47680/14-B	Lab Control Sample	Step 3	Solid	6010B SEP	47796
LCSD 140-47631/15-B ^5	Lab Control Sample Dup	Step 1	Solid	6010B SEP	47642
LCSD 140-47643/15-B ^5	Lab Control Sample Dup	Step 2	Solid	6010B SEP	47679
LCSD 140-47680/15-B	Lab Control Sample Dup	Step 3	Solid	6010B SEP	47796

Analysis Batch: 48108

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 4	Solid	6010B SEP	47850
140-22107-1	SB-1 - 20210224	Step 5	Solid	6010B SEP	47922
140-22107-1	SB-1 - 20210224	Step 6	Solid	6010B SEP	47923
140-22107-2	SB-2 - 20210224	Step 4	Solid	6010B SEP	47850
140-22107-2	SB-2 - 20210224	Step 5	Solid	6010B SEP	47922
140-22107-2	SB-2 - 20210224	Step 6	Solid	6010B SEP	47923
MB 140-47797/13-B	Method Blank	Step 4	Solid	6010B SEP	47850
MB 140-47851/13-B ^5	Method Blank	Step 5	Solid	6010B SEP	47922
MB 140-47923/13-A	Method Blank	Step 6	Solid	6010B SEP	47923
LCS 140-47797/14-B	Lab Control Sample	Step 4	Solid	6010B SEP	47850
LCS 140-47851/14-B ^5	Lab Control Sample	Step 5	Solid	6010B SEP	47922
LCS 140-47923/14-A	Lab Control Sample	Step 6	Solid	6010B SEP	47923
LCSD 140-47797/15-B	Lab Control Sample Dup	Step 4	Solid	6010B SEP	47850
LCSD 140-47851/15-B ^5	Lab Control Sample Dup	Step 5	Solid	6010B SEP	47922
LCSD 140-47923/15-A	Lab Control Sample Dup	Step 6	Solid	6010B SEP	47923

Analysis Batch: 48208

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Step 7	Solid	6010B SEP	47981
140-22107-2	SB-2 - 20210224	Step 7	Solid	6010B SEP	47981
140-22107-2	SB-2 - 20210224	Step 7	Solid	6010B SEP	47981
MB 140-47981/13-A	Method Blank	Step 7	Solid	6010B SEP	47981
LCS 140-47981/14-A	Lab Control Sample	Step 7	Solid	6010B SEP	47981
LCSD 140-47981/15-A	Lab Control Sample Dup	Step 7	Solid	6010B SEP	47981

Analysis Batch: 48227

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Total/NA	Solid	6010B	47551
140-22107-2	SB-2 - 20210224	Total/NA	Solid	6010B	47551
MB 140-47551/13-A	Method Blank	Total/NA	Solid	6010B	47551
LCS 140-47551/14-A	Lab Control Sample	Total/NA	Solid	6010B	47551
LCSD 140-47551/15-A	Lab Control Sample Dup	Total/NA	Solid	6010B	47551

QC Association Summary

Client: Geosyntec Consultants, Inc.
Project/Site: SEP Analysis - Miami Fort

Job ID: 140-22107-1

Metals

Analysis Batch: 48306

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Sum of Steps 1-7	Solid	6010B SEP	
140-22107-2	SB-2 - 20210224	Sum of Steps 1-7	Solid	6010B SEP	

General Chemistry

Analysis Batch: 47479

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-22107-1	SB-1 - 20210224	Total/NA	Solid	Moisture	
140-22107-2	SB-2 - 20210224	Total/NA	Solid	Moisture	

Lab Chronicle

Client: Geosyntec Consultants, Inc.
Project/Site: SEP Analysis - Miami Fort

Job ID: 140-22107-1

Client Sample ID: SB-1 - 20210224

Date Collected: 02/24/21 13:35
Date Received: 02/27/21 11:15

Lab Sample ID: 140-22107-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			48306	03/30/21 14:25	DKW	TAL KNX
	Instrument ID: NOEQUIP									
Total/NA	Analysis	Moisture		1			47479	03/05/21 07:52	BKD	TAL KNX
	Instrument ID: W3									

Client Sample ID: SB-1 - 20210224

Date Collected: 02/24/21 13:35
Date Received: 02/27/21 11:15

Lab Sample ID: 140-22107-1
Matrix: Solid
Percent Solids: 87.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	47551	03/10/21 08:00	KNC	TAL KNX
Total/NA	Analysis	6010B		1			48227	03/28/21 11:06	KNC	TAL KNX
	Instrument ID: DUO									
Step 1	SEP	Exchangeable			5.000 g	25 mL	47631	03/10/21 10:45	KNC	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	47642	03/11/21 08:00	KNC	TAL KNX
Step 1	Analysis	6010B SEP		4			48064	03/23/21 12:57	KNC	TAL KNX
	Instrument ID: DUO									
Step 2	SEP	Carbonate			5.000 g	25 mL	47643	03/11/21 08:00	KNC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	47679	03/16/21 08:00	KNC	TAL KNX
Step 2	Analysis	6010B SEP		3			48064	03/23/21 14:34	KNC	TAL KNX
	Instrument ID: DUO									
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	47680	03/16/21 08:00	KNC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	47796	03/17/21 08:00	KNC	TAL KNX
Step 3	Analysis	6010B SEP		1			48064	03/23/21 16:03	KNC	TAL KNX
	Instrument ID: DUO									
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	47797	03/17/21 08:00	KNC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	47850	03/18/21 08:00	KNC	TAL KNX
Step 4	Analysis	6010B SEP		1			48108	03/24/21 12:14	KNC	TAL KNX
	Instrument ID: DUO									
Step 5	SEP	Organic-Bound			5.000 g	75 mL	47851	03/18/21 08:00	KNC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	47922	03/22/21 08:00	KNC	TAL KNX
Step 5	Analysis	6010B SEP		5			48108	03/24/21 13:41	KNC	TAL KNX
	Instrument ID: DUO									
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	47923	03/22/21 08:00	KNC	TAL KNX
Step 6	Analysis	6010B SEP		1			48108	03/24/21 15:21	KNC	TAL KNX
	Instrument ID: DUO									
Step 7	Prep	Residual			1.000 g	50 mL	47981	03/23/21 08:00	KNC	TAL KNX
Step 7	Analysis	6010B SEP		1			48208	03/26/21 11:30	KNC	TAL KNX
	Instrument ID: DUO									

Lab Chronicle

Client: Geosyntec Consultants, Inc.
Project/Site: SEP Analysis - Miami Fort

Job ID: 140-22107-1

Client Sample ID: SB-2 - 20210224

Date Collected: 02/24/21 08:45
Date Received: 02/27/21 11:15

Lab Sample ID: 140-22107-2

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			48306	03/30/21 14:25	DKW	TAL KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			47479	03/05/21 07:52	BKD	TAL KNX
	Instrument ID:	W3								

Client Sample ID: SB-2 - 20210224

Date Collected: 02/24/21 08:45
Date Received: 02/27/21 11:15

Lab Sample ID: 140-22107-2

Matrix: Solid
Percent Solids: 85.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	47551	03/10/21 08:00	KNC	TAL KNX
Total/NA	Analysis	6010B		1			48227	03/28/21 11:11	KNC	TAL KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	47631	03/10/21 10:45	KNC	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	47642	03/11/21 08:00	KNC	TAL KNX
Step 1	Analysis	6010B SEP		4			48064	03/23/21 13:02	KNC	TAL KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	47643	03/11/21 08:00	KNC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	47679	03/16/21 08:00	KNC	TAL KNX
Step 2	Analysis	6010B SEP		3			48064	03/23/21 14:39	KNC	TAL KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	47680	03/16/21 08:00	KNC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	47796	03/17/21 08:00	KNC	TAL KNX
Step 3	Analysis	6010B SEP		1			48064	03/23/21 16:08	KNC	TAL KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	47797	03/17/21 08:00	KNC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	47850	03/18/21 08:00	KNC	TAL KNX
Step 4	Analysis	6010B SEP		1			48108	03/24/21 12:19	KNC	TAL KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	47851	03/18/21 08:00	KNC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	47922	03/22/21 08:00	KNC	TAL KNX
Step 5	Analysis	6010B SEP		5			48108	03/24/21 13:56	KNC	TAL KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	47923	03/22/21 08:00	KNC	TAL KNX
Step 6	Analysis	6010B SEP		1			48108	03/24/21 15:26	KNC	TAL KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	47981	03/23/21 08:00	KNC	TAL KNX
Step 7	Analysis	6010B SEP		1			48208	03/26/21 11:35	KNC	TAL KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	47981	03/23/21 08:00	KNC	TAL KNX
Step 7	Analysis	6010B SEP		2			48208	03/26/21 14:23	KNC	TAL KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47551/13-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	47551	03/10/21 08:00	KNC	TAL KNX
Total/NA	Analysis	6010B		1			48227	03/28/21 10:46	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47631/13-B ^4
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	47631	03/10/21 10:45	KNC	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	47642	03/11/21 08:00	KNC	TAL KNX
Step 1	Analysis	6010B SEP		4			48064	03/23/21 12:42	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47643/13-B ^3
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	47643	03/11/21 08:00	KNC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	47679	03/16/21 08:00	KNC	TAL KNX
Step 2	Analysis	6010B SEP		3			48064	03/23/21 14:10	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47680/13-B
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	47680	03/16/21 08:00	KNC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	47796	03/17/21 08:00	KNC	TAL KNX
Step 3	Analysis	6010B SEP		1			48064	03/23/21 15:49	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47797/13-B
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	47797	03/17/21 08:00	KNC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	47850	03/18/21 08:00	KNC	TAL KNX
Step 4	Analysis	6010B SEP		1			48108	03/24/21 12:00	KNC	TAL KNX
	Instrument ID: DUO									

Lab Chronicle

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47851/13-B ^5

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	47851	03/18/21 08:00	KNC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	47922	03/22/21 08:00	KNC	TAL KNX
Step 5	Analysis	6010B SEP		5			48108	03/24/21 13:27	KNC	TAL KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47923/13-A

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	47923	03/22/21 08:00	KNC	TAL KNX
Step 6	Analysis	6010B SEP		1			48108	03/24/21 15:06	KNC	TAL KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-47981/13-A

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	47981	03/23/21 08:00	KNC	TAL KNX
Step 7	Analysis	6010B SEP		1			48208	03/26/21 11:11	KNC	TAL KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-47551/14-A

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	47551	03/10/21 08:00	KNC	TAL KNX
Total/NA	Analysis	6010B		1			48227	03/28/21 10:51	KNC	TAL KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-47631/14-B ^5

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	47631	03/10/21 10:45	KNC	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	47642	03/11/21 08:00	KNC	TAL KNX
Step 1	Analysis	6010B SEP		5			48064	03/23/21 12:47	KNC	TAL KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-47643/14-B ^5
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	47643	03/11/21 08:00	KNC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	47679	03/16/21 08:00	KNC	TAL KNX
Step 2	Analysis	6010B SEP		5			48064	03/23/21 14:15	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-47680/14-B
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	47680	03/16/21 08:00	KNC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	47796	03/17/21 08:00	KNC	TAL KNX
Step 3	Analysis	6010B SEP		1			48064	03/23/21 15:54	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-47797/14-B
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	47797	03/17/21 08:00	KNC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	47850	03/18/21 08:00	KNC	TAL KNX
Step 4	Analysis	6010B SEP		1			48108	03/24/21 12:05	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-47851/14-B ^5
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	47851	03/18/21 08:00	KNC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	47922	03/22/21 08:00	KNC	TAL KNX
Step 5	Analysis	6010B SEP		5			48108	03/24/21 13:32	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-47923/14-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	47923	03/22/21 08:00	KNC	TAL KNX
Step 6	Analysis	6010B SEP		1			48108	03/24/21 15:11	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Lab Sample ID: LCS 140-47981/14-A

Date Collected: N/A **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	47981	03/23/21 08:00	KNC	TAL KNX
Step 7	Analysis	6010B SEP		1			48208	03/26/21 11:16	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup Lab Sample ID: LCSD 140-47551/15-A

Date Collected: N/A **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	47551	03/10/21 08:00	KNC	TAL KNX
Total/NA	Analysis	6010B		1			48227	03/28/21 10:56	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup Lab Sample ID: LCSD 140-47631/15-B ^5

Date Collected: N/A **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	47631	03/10/21 10:45	KNC	TAL KNX
Step 1	Prep	3010A			5 mL	50 mL	47642	03/11/21 08:00	KNC	TAL KNX
Step 1	Analysis	6010B SEP		5			48064	03/23/21 17:31	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup Lab Sample ID: LCSD 140-47643/15-B ^5

Date Collected: N/A **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	47643	03/11/21 08:00	KNC	TAL KNX
Step 2	Prep	3010A			5 mL	50 mL	47679	03/16/21 08:00	KNC	TAL KNX
Step 2	Analysis	6010B SEP		5			48064	03/23/21 14:29	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup Lab Sample ID: LCSD 140-47680/15-B

Date Collected: N/A **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	47680	03/16/21 08:00	KNC	TAL KNX
Step 3	Prep	3010A			5 mL	50 mL	47796	03/17/21 08:00	KNC	TAL KNX
Step 3	Analysis	6010B SEP		1			48064	03/23/21 15:59	KNC	TAL KNX
	Instrument ID: DUO									

Lab Chronicle

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-47797/15-B

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	47797	03/17/21 08:00	KNC	TAL KNX
Step 4	Prep	3010A			5 mL	50 mL	47850	03/18/21 08:00	KNC	TAL KNX
Step 4	Analysis	6010B SEP		1			48108	03/24/21 12:09	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-47851/15-B ^5

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	47851	03/18/21 08:00	KNC	TAL KNX
Step 5	Prep	3010A			5 mL	50 mL	47922	03/22/21 08:00	KNC	TAL KNX
Step 5	Analysis	6010B SEP		5			48108	03/24/21 13:37	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-47923/15-A

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	47923	03/22/21 08:00	KNC	TAL KNX
Step 6	Analysis	6010B SEP		1			48108	03/24/21 15:16	KNC	TAL KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-47981/15-A

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	47981	03/23/21 08:00	KNC	TAL KNX
Step 7	Analysis	6010B SEP		1			48208	03/26/21 11:20	KNC	TAL KNX
	Instrument ID: DUO									

Laboratory References:

TAL KNX = Eurofins TestAmerica, Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

Accreditation/Certification Summary

Client: Geosyntec Consultants, Inc. Job ID: 140-22107-1
Project/Site: SEP Analysis - Miami Fort

Laboratory: Eurofins TestAmerica, Knoxville

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
	AFCEE	N/A	
ANAB	Dept. of Defense ELAP	L2311	02-13-22
ANAB	Dept. of Energy	L2311.01	02-13-22
ANAB	ISO/IEC 17025	L2311	02-13-22
ANAB	ISO/IEC 17025	L2311	02-14-22
Arkansas DEQ	State	88-0688	06-17-21
California	State	2423	06-30-22
Colorado	State	TN00009	02-28-21 *
Connecticut	State	PH-0223	09-30-21
Florida	NELAP	E87177	07-01-21
Georgia (DW)	State	906	12-11-22
Hawaii	State	NA	12-11-21
Kansas	NELAP	E-10349	10-31-21
Kentucky (DW)	State	90101	12-31-21
Louisiana	NELAP	83979	06-30-21
Louisiana (DW)	State	LA019	12-31-21
Maryland	State	277	03-31-22
Michigan	State	9933	12-11-22
Nevada	State	TN00009	07-31-21
New Hampshire	NELAP	299919	01-17-22
New Jersey	NELAP	TN001	07-01-21
New York	NELAP	10781	04-01-21
North Carolina (DW)	State	21705	07-31-21
North Carolina (WW/SW)	State	64	12-31-21
Ohio VAP	State	CL0059	06-02-23
Oklahoma	State	9415	08-31-21
Oregon	NELAP	TNI0189	01-01-22
Pennsylvania	NELAP	68-00576	12-31-21
Tennessee	State	02014	12-11-22
Texas	NELAP	T104704380-18-12	08-31-21
US Fish & Wildlife	US Federal Programs	058448	07-31-21
USDA	US Federal Programs	P330-19-00236	08-20-22
Utah	NELAP	TN00009	07-31-21
Virginia	NELAP	460176	09-14-21
Washington	State	C593	01-19-22
West Virginia (DW)	State	9955C	01-02-22
West Virginia DEP	State	345	05-01-21
Wisconsin	State	998044300	08-31-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Geosyntec Consultants, Inc.
Project/Site: SEP Analysis - Miami Fort

Job ID: 140-22107-1

Method	Method Description	Protocol	Laboratory
6010B	SEP Metals (ICP) - Total	SW846	TAL KNX
6010B SEP	SEP Metals (ICP)	SW846	TAL KNX
Moisture	Percent Moisture	EPA	TAL KNX
3010A	Preparation, Total Metals	SW846	TAL KNX
Acid/Sulfide	Sequential Extraction Procedure, Acid/Sulfide Fraction	TAL-KNOX	TAL KNX
Carbonate	Sequential Extraction Procedure, Carbonate Fraction	TAL-KNOX	TAL KNX
Exchangeable	Sequential Extraction Procedure, Exchangeable Fraction	TAL-KNOX	TAL KNX
Metal Hydroxide	Sequential Extraction Procedure, Metal Hydroxide Fraction	TAL-KNOX	TAL KNX
Non-Crystalline	Sequential Extraction Procedure, Non-crystalline Materials	TAL-KNOX	TAL KNX
Organic-Bound	Sequential Extraction Procedure, Organic Bound Fraction	TAL-KNOX	TAL KNX
Residual	Sequential Extraction Procedure, Residual Fraction	TAL-KNOX	TAL KNX
Total	Preparation, Total Material	TAL-KNOX	TAL KNX

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-KNOX = TestAmerica Laboratories, Knoxville, Facility Standard Operating Procedure.

Laboratory References:

TAL KNX = Eurofins TestAmerica, Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

Eurofins TestAmerica, Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
Phone: 865-291-3000 Fax: 865-584-4315

Chain of Custody Record

eurofins | Environment Testing America

Client Information

Client Contact: Allison Kreinberg
Company: Geosyntec Consultants, Inc.
Address: 941 Chatham Lane Suite 103
City: Columbus
State, Zip: OH, 43221
Phone: 614-468-0421(Tel)
Email: akreinberg@geosyntec.com
Project Name: Miami Fort
Site: Miami Fort Gen. station

Sampler: Brian Ares
Phone: 513-235-3497
PWSID:
Due Date Requested:
TAT Requested (days): standard
Compliance Project: ☐ Yes ☐ No
PO #: Purchase Order not required
WO #:
Project #: 14006199
SSOW#:

Lab PM: Henry, Ryan
E-Mail: williamr.henry@eurofinset.com
Carrier Tracking No(s):
State of Origin:

COC No: 140-8978-2733.1
Page: Page 1 of 1
Job #:

Analysis Requested

140-22107 Chain of Custody

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010B_SEP - SEP Metals	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N		
SB-1-20210224	2/24/21	1335	C	S	N	N	✓		
SB-2-20210224	2/24/21	845	C	S	N	N	✓		

BA

Preservation Codes:
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - other (specify)
Other:

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ________ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)
Special Instructions/QC Requirements:

Empty Kit Relinquished by: Date: Time: Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Brian Ares	2/25/21 1730	GST		2/27/21 1115	ETA

Custody Seals Intact: ☐ Yes ☐ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

Ver: 11/01/2020

Loc: 140

Log In Number: 22107

EUROFINS/TESTAMERICA KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

Review Items	Yes	No	NA	**If No, what was the problem?**
1. Are the shipping containers intact?	✓			☐ **Containers, Broken**
2. Were ambient air containers received intact?			✓	☐ Checked in lab
3. The coolers/containers custody seal if present, is it intact?	✓			☐ Yes ☐ NA
4. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C, VOST: 10°C) Thermometer ID : SC68 Correction factor: +0.0	✓			☐ **Cooler Out of Temp, Client Contacted, Proceed/Cancel** ☐ **Cooler Out of Temp, Same Day Receipt**
5. Were all of the sample containers received intact?	✓			☐ **Containers, Broken**
6. Were samples received in appropriate containers?	✓			☐ **Containers, Improper; Client Contacted; Proceed/Cancel**
7. Do sample container labels match COC? (IDs, Dates, Times)	✓			☐ **COC & Samples Do Not Match** ☐ **COC Incorrect/Incomplete** ☐ **COC Not Received**
8. Were all of the samples listed on the COC received?	✓			☐ **Sample Received, Not on COC** ☐ **Sample on COC, Not Received**
9. Is the date/time of sample collection noted?	✓			☐ **COC; No Date/Time; Client Contacted**
10. Was the sampler identified on the COC?	✓			☐ **Sampler Not Listed on COC**
11. Is the client and project name/# identified?	✓			☐ **COC Incorrect/Incomplete**
12. Are tests/parameters listed for each sample?	✓			☐ **COC No tests on COC**
13. Is the matrix of the samples noted?	✓			☐ **COC Incorrect/Incomplete**
14. Was COC relinquished? (Signed/Dated/Timed)	✓			☐ **COC Incorrect/Incomplete**
15. Were samples received within holding time?	✓			☐ **Holding Time - Receipt**
16. Were samples received with correct chemical preservative (excluding Encore)?			✓	☐ **pH Adjusted, pH Included (See box 16A)** ☐ **Incorrect Preservative**
17. Were VOA samples received without headspace?			✓	☐ **Headspace (VOA only)**
18. Did you check for residual chlorine, if necessary? (e.g. 1613B, 1668) Chlorine test strip lot number:_____			✓	☐ **Residual Chlorine**
19. For 1613B water samples is pH<9?			✓	☐ If no, notify lab to adjust
20. For rad samples was sample activity info. Provided?			✓	☐ Project missing info

Comments/Actions Taken

RT: 4.1°c CT: 4.1°c, 1 cooler
Custody seal intact
FrK# 7841 2919 8554
Fedex First OVN
KW 2/27/21

Labeling Verified by: _____ **Date:** _____

pH test strip lot number: _____

	Box 16A: pH Preservation	Box 18A: Residual Chlorine
Preservative:		
Lot Number:		
Exp Date:		
Analyst:		
Date:		
Time:		

Project #: 14006199 PM Instructions: _____

Sample Receiving Associate: KW Date: 2/27/21

QA026R32.doc, 062719

Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Allison Kreinberg
Geosyntec Consultants Inc
941 Chatham Lane
Suite 103
Columbus, Ohio 43221

Generated 8/28/2023 3:37:02 PM

JOB DESCRIPTION

Vistra / Miami Fort - SEP

JOB NUMBER

140-32884-1

Eurofins Knoxville
5815 Middlebrook Pike
Knoxville TN 37921

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins TestAmerica Project Manager.

Authorization

Ryan Henry

Generated
8/28/2023 3:37:02 PM

Authorized for release by
Ryan Henry, Project Manager I
WilliamR.Henry@et.eurofinsus.com
(865)291-3006

Table of Contents

Definitions/Glossary

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Qualifiers

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
F3	Duplicate RPD exceeds the control limit
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL, and the absolute difference between results is < the upper reporting limits for both.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Case Narrative

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Job ID: 140-32884-1

Laboratory: Eurofins Knoxville

Narrative

Job Narrative
140-32884-1

Receipt
The samples were received on 7/28/2023 at 1:45pm and arrived in good condition. The temperature of the cooler at receipt was 32.3º C.

Receipt Exceptions
The Field Sampler was not listed on the Chain of Custody.

Metals
7 Step Sequential Extraction Procedure

These soil samples were prepared and analyzed using Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0008, “7 Step Sequential Extraction Procedure”. SW-846 Method 6010B as incorporated in Eurofins TestAmerica Knoxville standard operating procedure KNOX-MT-0007 was used to perform the final instrument analyses.

An aliquot of each sample was sequentially extracted using the steps listed below:

- Step 1 - Exchangeable Fraction: A 5 gram aliquot of sample was extracted with 25 mL of 1M magnesium sulfate ($MgSO_4$), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 2 - Carbonate Fraction: The sample residue from step 1 was extracted with 25 mL of 1M sodium acetate/acetic acid (NaOAc/HOAc) at pH 5, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 3 - Non-crystalline Materials Fraction: The sample residue from step 2 was extracted with 25 mL of 0.2M ammonium oxalate (pH 3), centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 4 - Metal Hydroxide Fraction: The sample residue from step 3 was extracted with 25 mL of 1M hydroxylamine hydrochloride solution in 25% v/v acetic acid, centrifuged and filtered. 5 mL of the resulting leachate was digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 5 - Organic-bound Fraction: The sample residue from step 4 was extracted three times with 25 mL of 5% sodium hypochlorite (NaClO) at pH 9.5, centrifuged and filtered. The resulting leachates were combined and 5 mL were digested using method 3010A and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 6 - Acid/Sulfide Fraction: The sample residue from step 5 was extracted with 25 mL of a 3:1:2 v/v solution of $HCl-HNO_3-H_2O$, centrifuged and filtered. 5 mL of the resulting leachate was diluted to 50 mL with reagent water and analyzed by method 6010B. Results are reported in mg/kg on a dry weight basis.
- Step 7 - Residual Fraction: A 1.0 g aliquot of the sample residue from step 6 was digested using HF, HNO_3, HCl and H_3BO_3. The digestate was analyzed by ICP using method 6010B. Results are reported in mg/kg on a dry weight basis.

In addition, a 1.0 g aliquot of the original sample was digested using HF, HNO_3, HCl and H_3BO_3. The digestate was analyzed by ICP using method 6010B. Total metal results are reported in mg/kg on a dry weight basis.

Results were calculated using the following equation:

$$\text{Result, µg/g or mg/Kg, dry weight} = (C \times V \times V1 \times D) / (W \times S \times V2)$$

Where:
C = Concentration from instrument readout, µg/mL
V = Final volume of digestate, mL
D = Instrument dilution factor
V1 = Total volume of leachate, mL
V2 = Volume of leachate digested, mL
W = Wet weight of sample, g
S = Percent solids/100

Job ID: 140-32884-1 (Continued)

Laboratory: Eurofins Knoxville (Continued)

A method blank, laboratory control sample and laboratory control sample duplicate were prepared and analyzed with each SEP step in order to provide information about both the presence of elements of interest in the extraction solutions, and the recovery of elements of interest from the extraction solutions. Results outside of laboratory QC limits do not reflect out of control performance, but rather the effect of the extraction solution upon the analyte.

A laboratory sample duplicate was prepared and analyzed with each batch of samples in order to provide information regarding the reproducibility of the procedure.

SEP Report Notes:

The final report lists the results for each step, the result for the total digestion of the sample, and a sum of the results of steps 1 through 7 by element.

Magnesium was not reported for step 1 because the extraction solution for this step (magnesium sulfate) contains high levels of magnesium.

Sodium was not reported for steps 2 and 5 since the extraction solution for these steps contain high levels of sodium.

The sum of steps 1 through 7 is much higher than the total result for sodium and magnesium due to the magnesium and sodium introduced by the extraction solutions.

The digestates for steps 1, 2 and 5 were analyzed at a dilution due to instrument problems caused by the high solids content of the digestates. The reporting limits were adjusted accordingly.

Method 6010B: The sample duplicate (DUP) precision for preparation batch 140-75970 and analytical batch 140-76934 was outside control limits. Sample non-homogeneity is suspected.

Method 6010B: The serial dilution performed for the following samples associated with batch 140-76934 was outside control limits: B23-12 31.5-33.5 20230712 (140-32884-2), (140-32884-A-2-A SD) and (140-32884-A-2-A SD ^5)

Methods 6010B, 6010B SEP: The following samples were diluted due to the presence of Silicon which interferes with Arsenic: B23-1 43.5-45 20230711 (140-32884-1), B23-12 31.5-33.5 20230712 (140-32884-2), B23-12 38.5-39.8 20230712 (140-32884-3) and B23-12 51.5-53.5 20230712 (140-32884-4). Elevated reporting limits (RLs) are provided.

Methods 6010B, 6010B SEP: The following samples were diluted due to the presence of Silicon which interferes with Cobalt: B23-12 31.5-33.5 20230712 (140-32884-2), B23-2 42-43.6 20230724 (140-32884-5) and B23-2 59-60.5 20230724 (140-32884-6). Elevated reporting limits (RLs) are provided.

Methods 6010B, 6010B SEP: The following samples were diluted due to the presence of Titanium which interferes with Cobalt: B23-12 31.5-33.5 20230712 (140-32884-2) and B23-2 42-43.6 20230724 (140-32884-5). Elevated reporting limits (RLs) are provided.

Method 6010B SEP: The sample duplicate (DUP) precision for preparation batch 140-76044, 140-76084, 140-76085 and 140-76118 and analytical batch 140-76517 was outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample / laboratory control sample duplicate (LCS/LCSD) precision was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
% Moisture: The samples were analyzed for percent moisture using SOP number KNOX-WC-0012 (based on Modified MCAWW 160.3 and SM2540B and on the percent moisture determinations described in methods 3540C and 3550B).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
140-32884-1	B23-1 43.5-45 20230711	Solid	07/11/23 14:45	07/28/23 13:45
140-32884-2	B23-12 31.5-33.5 20230712	Solid	07/12/23 14:15	07/28/23 13:45
140-32884-3	B23-12 38.5-39.8 20230712	Solid	07/12/23 14:30	07/28/23 13:45
140-32884-4	B23-12 51.5-53.5 20230712	Solid	07/12/23 14:45	07/28/23 13:45
140-32884-5	B23-2 42-43.6 20230724	Solid	07/24/23 09:30	07/28/23 13:45
140-32884-6	B23-2 59-60.5 20230724	Solid	07/24/23 11:00	07/28/23 13:45

Client Sample Results

Client: Geosyntec Consultants Inc	Job ID: 140-32884-1
Project/Site: Vistra / Miami Fort - SEP

## Client Sample ID: B23-1 43.5-45 20230711	Lab Sample ID: 140-32884-1

Date Collected: 07/11/23 14:45	**Matrix: Solid**
Date Received: 07/28/23 13:45	**Percent Solids: 83.7**

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.4	0.62	mg/Kg	☼	08/02/23 08:00	08/15/23 11:07	4
Iron	ND		24	14	mg/Kg	☼	08/02/23 08:00	08/15/23 11:07	4
Manganese	**0.87**	**J**	3.6	0.15	mg/Kg	☼	08/02/23 08:00	08/15/23 11:07	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		1.8	0.47	mg/Kg	☼	08/03/23 08:00	08/15/23 12:11	3
Iron	**45**		18	10	mg/Kg	☼	08/03/23 08:00	08/15/23 12:11	3
Manganese	**180**		2.7	1.0	mg/Kg	☼	08/03/23 08:00	08/15/23 12:11	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.35**	**J**	0.60	0.16	mg/Kg	☼	08/04/23 08:00	08/15/23 13:16	1
Iron	**180**		6.0	3.5	mg/Kg	☼	08/04/23 08:00	08/15/23 13:16	1
Manganese	**120**	**B**	0.90	0.032	mg/Kg	☼	08/04/23 08:00	08/15/23 13:16	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.62**		0.60	0.26	mg/Kg	☼	08/07/23 08:00	08/15/23 14:21	1
Iron	**2600**		6.0	3.5	mg/Kg	☼	08/07/23 08:00	08/15/23 14:21	1
Manganese	**140**		0.90	0.16	mg/Kg	☼	08/07/23 08:00	08/15/23 14:21	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		9.0	2.3	mg/Kg	☼	08/09/23 08:00	08/21/23 14:24	5
Iron	ND		90	53	mg/Kg	☼	08/09/23 08:00	08/21/23 14:24	5
Manganese	**9.7**	**J**	13	2.2	mg/Kg	☼	08/09/23 08:00	08/21/23 14:24	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**3.2**		0.60	0.18	mg/Kg	☼	08/08/23 11:30	08/21/23 15:29	1
Iron	**6000**		6.0	3.5	mg/Kg	☼	08/08/23 11:30	08/21/23 15:29	1
Manganese	**58**		0.90	0.30	mg/Kg	☼	08/08/23 11:30	08/21/23 15:29	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.4**		1.2	0.72	mg/Kg	☼	08/09/23 08:00	08/24/23 14:27	2
Iron	**3400**		6.0	4.9	mg/Kg	☼	08/09/23 08:00	08/24/23 12:31	1
Manganese	**57**		0.90	0.37	mg/Kg	☼	08/09/23 08:00	08/24/23 12:31	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**5.6**		0.50	0.13	mg/Kg			08/25/23 14:43	1
Iron	**12000**		5.0	4.1	mg/Kg			08/25/23 14:43	1
Manganese	**570**		0.75	0.052	mg/Kg			08/25/23 14:43	1

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**6.9**		1.2	0.72	mg/Kg	☼	08/09/23 08:00	08/24/23 15:16	2
Iron	**11000**		6.0	4.9	mg/Kg	☼	08/09/23 08:00	08/24/23 13:23	1
Manganese	**510**		0.90	0.37	mg/Kg	☼	08/09/23 08:00	08/24/23 13:23	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP
Job ID: 140-32884-1

Client Sample ID: B23-12 31.5-33.5 20230712

Date Collected: 07/12/23 14:15
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-2
Matrix: Solid
Percent Solids: 77.0

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.6	0.68	mg/Kg	☼	08/02/23 08:00	08/15/23 11:12	4
Iron	ND		26	15	mg/Kg	☼	08/02/23 08:00	08/15/23 11:12	4
Manganese	**62**		3.9	0.16	mg/Kg	☼	08/02/23 08:00	08/15/23 11:12	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		1.9	0.51	mg/Kg	☼	08/03/23 08:00	08/15/23 12:16	3
Iron	**290**		19	11	mg/Kg	☼	08/03/23 08:00	08/15/23 12:16	3
Manganese	**47**		2.9	1.1	mg/Kg	☼	08/03/23 08:00	08/15/23 12:16	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.8**		0.65	0.17	mg/Kg	☼	08/04/23 08:00	08/15/23 13:21	1
Iron	**4800**		6.5	3.8	mg/Kg	☼	08/04/23 08:00	08/15/23 13:21	1
Manganese	**170**	**B**	0.97	0.035	mg/Kg	☼	08/04/23 08:00	08/15/23 13:21	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.99**		0.65	0.29	mg/Kg	☼	08/07/23 08:00	08/15/23 14:26	1
Iron	**6400**		6.5	3.8	mg/Kg	☼	08/07/23 08:00	08/15/23 14:26	1
Manganese	**98**		0.97	0.17	mg/Kg	☼	08/07/23 08:00	08/15/23 14:26	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		9.7	2.5	mg/Kg	☼	08/09/23 08:00	08/21/23 14:29	5
Iron	ND		97	57	mg/Kg	☼	08/09/23 08:00	08/21/23 14:29	5
Manganese	**8.7**	**J**	15	2.4	mg/Kg	☼	08/09/23 08:00	08/21/23 14:29	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**2.4**		0.65	0.19	mg/Kg	☼	08/08/23 11:30	08/21/23 15:34	1
Iron	**6900**		6.5	3.8	mg/Kg	☼	08/08/23 11:30	08/21/23 15:34	1
Manganese	**38**		0.97	0.32	mg/Kg	☼	08/08/23 11:30	08/21/23 15:34	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**2.7**		1.3	0.78	mg/Kg	☼	08/09/23 08:00	08/24/23 14:32	2
Iron	**5000**		6.5	5.3	mg/Kg	☼	08/09/23 08:00	08/24/23 12:37	1
Manganese	**35**		0.97	0.40	mg/Kg	☼	08/09/23 08:00	08/24/23 12:37	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.9**		0.50	0.13	mg/Kg			08/25/23 14:43	1
Iron	**23000**		5.0	4.1	mg/Kg			08/25/23 14:43	1
Manganese	**460**		0.75	0.052	mg/Kg			08/25/23 14:43	1

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**5.7**		0.65	0.39	mg/Kg	☼	08/09/23 08:00	08/24/23 13:28	1
Iron	**19000**		6.5	5.3	mg/Kg	☼	08/09/23 08:00	08/24/23 13:28	1
Manganese	**510**		0.97	0.40	mg/Kg	☼	08/09/23 08:00	08/24/23 13:28	1

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: B23-12 38.5-39.8 20230712

Date Collected: 07/12/23 14:30
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-3
Matrix: Solid
Percent Solids: 89.1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.2	0.58	mg/Kg	☼	08/02/23 08:00	08/15/23 11:21	4
Iron	ND		22	13	mg/Kg	☼	08/02/23 08:00	08/15/23 11:21	4
Manganese	**4.3**		3.4	0.14	mg/Kg	☼	08/02/23 08:00	08/15/23 11:21	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		1.7	0.44	mg/Kg	☼	08/03/23 08:00	08/15/23 12:26	3
Iron	**150**		17	9.8	mg/Kg	☼	08/03/23 08:00	08/15/23 12:26	3
Manganese	**130**		2.5	0.94	mg/Kg	☼	08/03/23 08:00	08/15/23 12:26	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.77**		0.56	0.15	mg/Kg	☼	08/04/23 08:00	08/15/23 13:31	1
Iron	**1400**		5.6	3.3	mg/Kg	☼	08/04/23 08:00	08/15/23 13:31	1
Manganese	**79**	**B**	0.84	0.030	mg/Kg	☼	08/04/23 08:00	08/15/23 13:31	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.43**	**J**	0.56	0.25	mg/Kg	☼	08/07/23 08:00	08/15/23 14:50	1
Iron	**2600**		5.6	3.3	mg/Kg	☼	08/07/23 08:00	08/15/23 14:50	1
Manganese	**160**		0.84	0.15	mg/Kg	☼	08/07/23 08:00	08/15/23 14:50	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		8.4	2.1	mg/Kg	☼	08/09/23 08:00	08/21/23 14:39	5
Iron	ND		84	49	mg/Kg	☼	08/09/23 08:00	08/21/23 14:39	5
Manganese	**11**	**J**	13	2.1	mg/Kg	☼	08/09/23 08:00	08/21/23 14:39	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**3.5**		0.56	0.17	mg/Kg	☼	08/08/23 11:30	08/21/23 15:44	1
Iron	**7200**		5.6	3.3	mg/Kg	☼	08/08/23 11:30	08/21/23 15:44	1
Manganese	**70**		0.84	0.28	mg/Kg	☼	08/08/23 11:30	08/21/23 15:44	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**2.3**		1.1	0.67	mg/Kg	☼	08/09/23 08:00	08/24/23 14:41	2
Iron	**6300**		5.6	4.6	mg/Kg	☼	08/09/23 08:00	08/24/23 12:57	1
Manganese	**100**		0.84	0.35	mg/Kg	☼	08/09/23 08:00	08/24/23 12:57	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.0**		0.50	0.13	mg/Kg			08/25/23 14:43	1
Iron	**18000**		5.0	4.1	mg/Kg			08/25/23 14:43	1
Manganese	**560**		0.75	0.052	mg/Kg			08/25/23 14:43	1

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**6.0**		1.1	0.67	mg/Kg	☼	08/09/23 08:00	08/24/23 15:31	2
Iron	**12000**		5.6	4.6	mg/Kg	☼	08/09/23 08:00	08/24/23 13:53	1
Manganese	**440**		0.84	0.35	mg/Kg	☼	08/09/23 08:00	08/24/23 13:53	1

1 2 3 4 5 6 7 8 9 10 11 12 13

Client Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP
Job ID: 140-32884-1

Client Sample ID: B23-12 51.5-53.5 20230712

Date Collected: 07/12/23 14:45
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-4
Matrix: Solid
Percent Solids: 84.6

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.4	0.61	mg/Kg	☼	08/02/23 08:00	08/15/23 11:26	4
Iron	ND		24	14	mg/Kg	☼	08/02/23 08:00	08/15/23 11:26	4
Manganese	**4.7**		3.5	0.15	mg/Kg	☼	08/02/23 08:00	08/15/23 11:26	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		1.8	0.46	mg/Kg	☼	08/03/23 08:00	08/15/23 12:31	3
Iron	**150**		18	10	mg/Kg	☼	08/03/23 08:00	08/15/23 12:31	3
Manganese	**98**		2.7	0.99	mg/Kg	☼	08/03/23 08:00	08/15/23 12:31	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.49**	**J**	0.59	0.15	mg/Kg	☼	08/04/23 08:00	08/15/23 13:51	1
Iron	**890**		5.9	3.4	mg/Kg	☼	08/04/23 08:00	08/15/23 13:51	1
Manganese	**54**	**B**	0.89	0.032	mg/Kg	☼	08/04/23 08:00	08/15/23 13:51	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.53**	**J**	0.59	0.26	mg/Kg	☼	08/07/23 08:00	08/15/23 14:55	1
Iron	**1900**		5.9	3.4	mg/Kg	☼	08/07/23 08:00	08/15/23 14:55	1
Manganese	**67**		0.89	0.15	mg/Kg	☼	08/07/23 08:00	08/15/23 14:55	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**2.4**	**J**	8.9	2.2	mg/Kg	☼	08/09/23 08:00	08/21/23 14:44	5
Iron	ND		89	52	mg/Kg	☼	08/09/23 08:00	08/21/23 14:44	5
Manganese	**4.1**	**J**	13	2.2	mg/Kg	☼	08/09/23 08:00	08/21/23 14:44	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**2.7**		0.59	0.18	mg/Kg	☼	08/08/23 11:30	08/21/23 15:49	1
Iron	**6400**		5.9	3.4	mg/Kg	☼	08/08/23 11:30	08/21/23 15:49	1
Manganese	**46**		0.89	0.30	mg/Kg	☼	08/08/23 11:30	08/21/23 15:49	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.8**		1.2	0.71	mg/Kg	☼	08/09/23 08:00	08/24/23 14:46	2
Iron	**7700**		5.9	4.8	mg/Kg	☼	08/09/23 08:00	08/24/23 13:02	1
Manganese	**67**		0.89	0.37	mg/Kg	☼	08/09/23 08:00	08/24/23 13:02	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.9**		0.50	0.13	mg/Kg			08/25/23 14:43	1
Iron	**17000**		5.0	4.1	mg/Kg			08/25/23 14:43	1
Manganese	**340**		0.75	0.052	mg/Kg			08/25/23 14:43	1

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**6.8**		1.2	0.71	mg/Kg	☼	08/09/23 08:00	08/24/23 15:36	2
Iron	**12000**		5.9	4.8	mg/Kg	☼	08/09/23 08:00	08/24/23 13:59	1
Manganese	**280**		0.89	0.37	mg/Kg	☼	08/09/23 08:00	08/24/23 13:59	1

Client Sample Results

Client Sample ID: B23-2 42-43.6 20230724

Lab Sample ID: 140-32884-5
Date Collected: 07/24/23 09:30
Matrix: Solid
Date Received: 07/28/23 13:45
Percent Solids: 79.2

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		13	0.23	mg/Kg	☼	08/02/23 08:00	08/15/23 11:31	4
Iron	ND		25	15	mg/Kg	☼	08/02/23 08:00	08/15/23 11:31	4
Manganese	**3.6**	**J**	3.8	0.16	mg/Kg	☼	08/02/23 08:00	08/15/23 11:31	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		9.5	0.24	mg/Kg	☼	08/03/23 08:00	08/15/23 12:51	3
Iron	ND		19	11	mg/Kg	☼	08/03/23 08:00	08/15/23 12:51	3
Manganese	**2.5**	**J**	2.8	1.1	mg/Kg	☼	08/03/23 08:00	08/15/23 12:51	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**3.9**		3.2	0.057	mg/Kg	☼	08/04/23 08:00	08/15/23 13:56	1
Iron	**900**		6.3	3.7	mg/Kg	☼	08/04/23 08:00	08/15/23 13:56	1
Manganese	**120**	**B**	0.95	0.034	mg/Kg	☼	08/04/23 08:00	08/15/23 13:56	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**2.9**	**J**	3.2	0.067	mg/Kg	☼	08/07/23 08:00	08/15/23 15:00	1
Iron	**11000**		6.3	3.7	mg/Kg	☼	08/07/23 08:00	08/15/23 15:00	1
Manganese	**110**		0.95	0.16	mg/Kg	☼	08/07/23 08:00	08/15/23 15:00	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		47	0.76	mg/Kg	☼	08/09/23 08:00	08/21/23 14:49	5
Iron	ND		95	56	mg/Kg	☼	08/09/23 08:00	08/21/23 14:49	5
Manganese	**2.4**	**J**	14	2.3	mg/Kg	☼	08/09/23 08:00	08/21/23 14:49	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**3.1**	**J**	3.2	0.058	mg/Kg	☼	08/08/23 11:30	08/21/23 16:08	1
Iron	**12000**		6.3	3.7	mg/Kg	☼	08/08/23 11:30	08/21/23 16:08	1
Manganese	**71**		0.95	0.32	mg/Kg	☼	08/08/23 11:30	08/21/23 16:08	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**0.46**	**J**	6.3	0.066	mg/Kg	☼	08/09/23 08:00	08/24/23 14:51	2
Iron	**4600**		6.3	5.2	mg/Kg	☼	08/09/23 08:00	08/24/23 13:08	1
Manganese	**34**		0.95	0.39	mg/Kg	☼	08/09/23 08:00	08/24/23 13:08	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**10**		2.5	0.023	mg/Kg			08/25/23 14:43	1
Iron	**28000**		5.0	4.1	mg/Kg			08/25/23 14:43	1
Manganese	**340**		0.75	0.052	mg/Kg			08/25/23 14:43	1

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**9.6**		6.3	0.066	mg/Kg	☼	08/09/23 08:00	08/24/23 15:41	2
Iron	**24000**		6.3	5.2	mg/Kg	☼	08/09/23 08:00	08/24/23 14:05	1
Manganese	**300**		0.95	0.39	mg/Kg	☼	08/09/23 08:00	08/24/23 14:05	1

Client Sample ID: B23-2 59-60.5 20230724

Date Collected: 07/24/23 11:00
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-6

Matrix: Solid
Percent Solids: 85.2

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		12	0.21	mg/Kg	☼	08/02/23 08:00	08/15/23 11:51	4
Iron	ND		23	14	mg/Kg	☼	08/02/23 08:00	08/15/23 11:51	4
Manganese	**0.15**	**J**	3.5	0.15	mg/Kg	☼	08/02/23 08:00	08/15/23 11:51	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		8.8	0.22	mg/Kg	☼	08/03/23 08:00	08/15/23 12:57	3
Iron	**47**		18	10	mg/Kg	☼	08/03/23 08:00	08/15/23 12:57	3
Manganese	**81**		2.6	0.99	mg/Kg	☼	08/03/23 08:00	08/15/23 12:57	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**1.8**	**J**	2.9	0.053	mg/Kg	☼	08/04/23 08:00	08/15/23 14:01	1
Iron	**130**		5.9	3.4	mg/Kg	☼	08/04/23 08:00	08/15/23 14:01	1
Manganese	**200**	**B**	0.88	0.032	mg/Kg	☼	08/04/23 08:00	08/15/23 14:01	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**1.3**	**J**	2.9	0.062	mg/Kg	☼	08/07/23 08:00	08/15/23 15:05	1
Iron	**1600**		5.9	3.4	mg/Kg	☼	08/07/23 08:00	08/15/23 15:05	1
Manganese	**200**		0.88	0.15	mg/Kg	☼	08/07/23 08:00	08/15/23 15:05	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		44	0.70	mg/Kg	☼	08/09/23 08:00	08/21/23 15:09	5
Iron	ND		88	52	mg/Kg	☼	08/09/23 08:00	08/21/23 15:09	5
Manganese	**29**		13	2.2	mg/Kg	☼	08/09/23 08:00	08/21/23 15:09	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**2.8**	**J**	2.9	0.054	mg/Kg	☼	08/08/23 11:30	08/21/23 16:13	1
Iron	**6300**		5.9	3.4	mg/Kg	☼	08/08/23 11:30	08/21/23 16:13	1
Manganese	**76**		0.88	0.29	mg/Kg	☼	08/08/23 11:30	08/21/23 16:13	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**0.56**	**J**	5.9	0.061	mg/Kg	☼	08/09/23 08:00	08/24/23 14:56	2
Iron	**3700**		5.9	4.8	mg/Kg	☼	08/09/23 08:00	08/24/23 13:13	1
Manganese	**75**		0.88	0.36	mg/Kg	☼	08/09/23 08:00	08/24/23 13:13	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**6.5**		2.5	0.023	mg/Kg			08/25/23 14:43	1
Iron	**12000**		5.0	4.1	mg/Kg			08/25/23 14:43	1
Manganese	**660**		0.75	0.052	mg/Kg			08/25/23 14:43	1

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**7.0**		5.9	0.061	mg/Kg	☼	08/09/23 08:00	08/24/23 15:46	2
Iron	**11000**		5.9	4.8	mg/Kg	☼	08/09/23 08:00	08/24/23 14:10	1
Manganese	**530**		0.88	0.36	mg/Kg	☼	08/09/23 08:00	08/24/23 14:10	1

Default Detection Limits

Method: 6010B SEP - SEP Metals (ICP) - Step 1

Prep: 3010A

SEP: Exchangeable

Analyte	RL	MDL	Units
Arsenic	0.50	0.13	mg/Kg
Cobalt	2.5	0.045	mg/Kg
Iron	5.0	2.9	mg/Kg
Manganese	0.75	0.031	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 2

Prep: 3010A

SEP: Carbonate

Analyte	RL	MDL	Units
Arsenic	0.50	0.13	mg/Kg
Cobalt	2.5	0.063	mg/Kg
Iron	5.0	2.9	mg/Kg
Manganese	0.75	0.28	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 3

Prep: 3010A

SEP: Non-Crystalline

Analyte	RL	MDL	Units
Arsenic	0.50	0.13	mg/Kg
Cobalt	2.5	0.045	mg/Kg
Iron	5.0	2.9	mg/Kg
Manganese	0.75	0.027	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 4

Prep: 3010A

SEP: Metal Hydroxide

Analyte	RL	MDL	Units
Arsenic	0.50	0.22	mg/Kg
Cobalt	2.5	0.053	mg/Kg
Iron	5.0	2.9	mg/Kg
Manganese	0.75	0.13	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 5

Prep: 3010A

SEP: Organic-Bound

Analyte	RL	MDL	Units
Arsenic	1.5	0.38	mg/Kg
Cobalt	7.5	0.12	mg/Kg
Iron	15	8.8	mg/Kg
Manganese	2.3	0.37	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 6

SEP: Acid/Sulfide

Analyte	RL	MDL	Units
Arsenic	0.50	0.15	mg/Kg
Cobalt	2.5	0.046	mg/Kg
Iron	5.0	2.9	mg/Kg
Manganese	0.75	0.25	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 7

Default Detection Limits

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Method: 6010B SEP - SEP Metals (ICP) - Step 7

Prep: Residual

Analyte	RL	MDL	Units
Arsenic	0.50	0.30	mg/Kg
Cobalt	2.5	0.026	mg/Kg
Iron	5.0	4.1	mg/Kg
Manganese	0.75	0.31	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	RL	MDL	Units
Arsenic	0.50	0.13	mg/Kg
Cobalt	2.5	0.023	mg/Kg
Iron	5.0	4.1	mg/Kg
Manganese	0.75	0.052	mg/Kg

Method: 6010B - SEP Metals (ICP) - Total

Prep: Total

Analyte	RL	MDL	Units
Arsenic	0.50	0.30	mg/Kg
Cobalt	2.5	0.026	mg/Kg
Iron	5.0	4.1	mg/Kg
Manganese	0.75	0.31	mg/Kg

QC Sample Results

Client: Geosyntec Consultants Inc | Job ID: 140-32884-1
Project/Site: Vistra / Miami Fort - SEP

Method: 6010B - SEP Metals (ICP) - Total

Lab Sample ID: MB 140-75970/8-A | **Client Sample ID: Method Blank**
Matrix: Solid | **Prep Type: Total/NA**
Analysis Batch: 76934 | **Prep Batch: 75970**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.50	0.30	mg/Kg		08/09/23 08:00	08/24/23 12:17	1
Cobalt	ND		2.5	0.026	mg/Kg		08/09/23 08:00	08/24/23 12:17	1
Iron	ND		5.0	4.1	mg/Kg		08/09/23 08:00	08/24/23 12:17	1
Manganese	ND		0.75	0.31	mg/Kg		08/09/23 08:00	08/24/23 12:17	1

Lab Sample ID: LCS 140-75970/9-A | **Client Sample ID: Lab Control Sample**
Matrix: Solid | **Prep Type: Total/NA**
Analysis Batch: 76934 | **Prep Batch: 75970**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Arsenic			5.00	4.93		mg/Kg		99	80 - 120		
Cobalt			5.00	5.02		mg/Kg		100	80 - 125		
Iron			50.0	51.5		mg/Kg		103	80 - 120		
Manganese			5.00	5.06		mg/Kg		101	80 - 120		

Lab Sample ID: LCSD 140-75970/10-A | **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid | **Prep Type: Total/NA**
Analysis Batch: 76934 | **Prep Batch: 75970**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic			5.00	4.89		mg/Kg		98	80 - 120	1	30
Cobalt			5.00	5.00		mg/Kg		100	80 - 125	0	30
Iron			50.0	52.0		mg/Kg		104	80 - 120	1	30
Manganese			5.00	5.01		mg/Kg		100	80 - 120	1	30

Lab Sample ID: 140-32884-2 DU | **Client Sample ID: B23-12 31.5-33.5 20230712**
Matrix: Solid | **Prep Type: Total/NA**
Analysis Batch: 76934 | **Prep Batch: 75970**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Arsenic	5.7			5.85		mg/Kg	☼			3	30
Iron	19000			18600		mg/Kg	☼			5	30
Manganese	510			299	F3	mg/Kg	☼			52	30

Lab Sample ID: 140-32884-2 DU | **Client Sample ID: B23-12 31.5-33.5 20230712**
Matrix: Solid | **Prep Type: Total/NA**
Analysis Batch: 76934 | **Prep Batch: 75970**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Cobalt	10			10.1		mg/Kg	☼			2	30

Method: 6010B SEP - SEP Metals (ICP)

Lab Sample ID: MB 140-75971/8-B ^4 | **Client Sample ID: Method Blank**
Matrix: Solid | **Prep Type: Step 1**
Analysis Batch: 76517 | **Prep Batch: 76022**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.0	0.52	mg/Kg		08/02/23 08:00	08/15/23 10:52	4
Cobalt	ND		10	0.18	mg/Kg		08/02/23 08:00	08/15/23 10:52	4

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-75971/8-B ^4
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Method Blank
Prep Type: Step 1
Prep Batch: 76022

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	ND		20	12	mg/Kg		08/02/23 08:00	08/15/23 10:52	4
Manganese	ND		3.0	0.12	mg/Kg		08/02/23 08:00	08/15/23 10:52	4

Lab Sample ID: LCS 140-75971/9-B ^5
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample
Prep Type: Step 1
Prep Batch: 76022

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	5.00	4.76		mg/Kg		95	80 - 120
Cobalt	5.00	4.93	J	mg/Kg		99	80 - 120
Iron	50.0	50.2		mg/Kg		100	80 - 120
Manganese	5.00	4.99		mg/Kg		100	80 - 120

Lab Sample ID: LCSD 140-75971/10-B ^5
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 1
Prep Batch: 76022

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic	5.00	4.69		mg/Kg		94	80 - 120	2	30
Cobalt	5.00	4.88	J	mg/Kg		98	80 - 120	1	30
Iron	50.0	49.8		mg/Kg		100	80 - 120	1	30
Manganese	5.00	4.92		mg/Kg		98	80 - 120	1	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 1
Prep Batch: 76022

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	ND		ND		mg/Kg	☼	NC	30
Cobalt	0.41	J	0.384	J	mg/Kg	☼	5	30
Iron	ND		33.2		mg/Kg	☼	NC	30
Manganese	62		66.8		mg/Kg	☼	7	30

Lab Sample ID: MB 140-76044/8-B ^3
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Method Blank
Prep Type: Step 2
Prep Batch: 76085

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		1.5	0.39	mg/Kg		08/03/23 08:00	08/15/23 11:56	3
Cobalt	ND		7.5	0.19	mg/Kg		08/03/23 08:00	08/15/23 11:56	3
Iron	ND		15	8.7	mg/Kg		08/03/23 08:00	08/15/23 11:56	3
Manganese	ND		2.3	0.84	mg/Kg		08/03/23 08:00	08/15/23 11:56	3

Lab Sample ID: LCS 140-76044/9-B ^5
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample
Prep Type: Step 2
Prep Batch: 76085

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	5.00	3.97		mg/Kg		79	60 - 120
Cobalt	5.00	4.71	J	mg/Kg		94	80 - 120

QC Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCS 140-76044/9-B ^5
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample
Prep Type: Step 2
Prep Batch: 76085

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Iron	50.0	ND		mg/Kg		3	
Manganese	5.00	4.73		mg/Kg		95	80 - 120

Lab Sample ID: LCSD 140-76044/10-B ^5
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 2
Prep Batch: 76085

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic	5.00	4.22		mg/Kg		84	60 - 120	6	30
Cobalt	5.00	4.80	J	mg/Kg		96	80 - 120	2	30
Iron	50.0	ND		mg/Kg		4		19	
Manganese	5.00	4.83		mg/Kg		97	80 - 120	2	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 2
Prep Batch: 76085

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	ND		ND		mg/Kg	☼	NC	30
Cobalt	0.40	J	0.843	J F5	mg/Kg	☼	72	30
Iron	290		619		mg/Kg	☼	73	
Manganese	47		71.6	F3	mg/Kg	☼	42	30

Lab Sample ID: MB 140-76084/8-B
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Method Blank
Prep Type: Step 3
Prep Batch: 76118

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.50	0.13	mg/Kg		08/04/23 08:00	08/15/23 13:02	1
Cobalt	ND		2.5	0.045	mg/Kg		08/04/23 08:00	08/15/23 13:02	1
Iron	ND		5.0	2.9	mg/Kg		08/04/23 08:00	08/15/23 13:02	1
Manganese	0.0960	J	0.75	0.027	mg/Kg		08/04/23 08:00	08/15/23 13:02	1

Lab Sample ID: LCS 140-76084/9-B
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample
Prep Type: Step 3
Prep Batch: 76118

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	5.00	4.83		mg/Kg		97	80 - 120
Cobalt	5.00	4.87		mg/Kg		97	80 - 120
Iron	50.0	50.5		mg/Kg		101	80 - 120
Manganese	5.00	4.79		mg/Kg		96	80 - 120

Lab Sample ID: LCSD 140-76084/10-B
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 3
Prep Batch: 76118

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic	5.00	4.85		mg/Kg		97	80 - 120	1	30
Cobalt	5.00	4.92		mg/Kg		98	80 - 120	1	30

1 2 3 4 5 6 7 8 9 10 11 12 13

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCSD 140-76084/10-B
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 3
Prep Batch: 76118

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Iron			50.0	50.2		mg/Kg		100	80 - 120	1	30
Manganese			5.00	4.82		mg/Kg		96	80 - 120	1	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 3
Prep Batch: 76118

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Arsenic	1.8			1.62		mg/Kg	☼			13	30
Cobalt	2.0	J		1.91	J	mg/Kg	☼			3	30
Iron	4800			4990		mg/Kg	☼			4	30
Manganese	170	B		249	F3	mg/Kg	☼			39	30

Lab Sample ID: MB 140-76125/8-B
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Method Blank
Prep Type: Step 4
Prep Batch: 76167

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.50	0.22	mg/Kg		08/07/23 08:00	08/15/23 14:06	1
Cobalt	ND		2.5	0.053	mg/Kg		08/07/23 08:00	08/15/23 14:06	1
Iron	ND		5.0	2.9	mg/Kg		08/07/23 08:00	08/15/23 14:06	1
Manganese	ND		0.75	0.13	mg/Kg		08/07/23 08:00	08/15/23 14:06	1

Lab Sample ID: LCS 140-76125/9-B
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample
Prep Type: Step 4
Prep Batch: 76167

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Arsenic			5.00	4.93		mg/Kg		99	80 - 130		
Cobalt			5.00	4.92		mg/Kg		98	80 - 120		
Iron			50.0	49.0		mg/Kg		98	80 - 120		
Manganese			5.00	4.84		mg/Kg		97	80 - 120		

Lab Sample ID: LCSD 140-76125/10-B
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 4
Prep Batch: 76167

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic			5.00	4.91		mg/Kg		98	80 - 130	0	30
Cobalt			5.00	4.88		mg/Kg		98	80 - 120	1	30
Iron			50.0	48.1		mg/Kg		96	80 - 120	2	30
Manganese			5.00	4.79		mg/Kg		96	80 - 120	1	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 4
Prep Batch: 76167

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Arsenic	0.99			1.00		mg/Kg	☼			1	30
Cobalt	4.6			4.64		mg/Kg	☼			2	30

QC Sample Results

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76517

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 4
Prep Batch: 76167

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Iron	6400			6380		mg/Kg	☼			0.5	30
Manganese	98			116		mg/Kg	☼			17	30

Lab Sample ID: MB 140-76168/8-B ^5
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: Method Blank
Prep Type: Step 5
Prep Batch: 76267

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		7.5	1.9	mg/Kg		08/09/23 08:00	08/21/23 14:08	5
Cobalt	ND		38	0.60	mg/Kg		08/09/23 08:00	08/21/23 14:08	5
Iron	ND		75	44	mg/Kg		08/09/23 08:00	08/21/23 14:08	5
Manganese	ND		11	1.9	mg/Kg		08/09/23 08:00	08/21/23 14:08	5

Lab Sample ID: LCS 140-76168/9-B ^5
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: Lab Control Sample
Prep Type: Step 5
Prep Batch: 76267

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Arsenic			15.0	11.3		mg/Kg		75	60 - 100		
Cobalt			15.0	3.03	J	mg/Kg		20	1 - 60		
Iron			150	ND		mg/Kg		3			
Manganese			15.0	3.62	J	mg/Kg		24	1 - 60		

Lab Sample ID: LCSD 140-76168/10-B ^5
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 5
Prep Batch: 76267

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic			15.0	10.6		mg/Kg		71	60 - 100	7	30
Cobalt			15.0	2.95	J	mg/Kg		20	1 - 60	3	30
Iron			150	ND		mg/Kg		2		45	
Manganese			15.0	3.27	J	mg/Kg		22	1 - 60	10	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 5
Prep Batch: 76267

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Arsenic	ND			ND		mg/Kg	☼			NC	30
Cobalt	ND			ND		mg/Kg	☼			NC	30
Iron	ND			ND		mg/Kg	☼			NC	
Manganese	8.7	J		10.8	J	mg/Kg	☼			22	30

Lab Sample ID: MB 140-76252/8-A
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: Method Blank
Prep Type: Step 6
Prep Batch: 76252

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.50	0.15	mg/Kg		08/08/23 11:30	08/21/23 15:14	1
Cobalt	ND		2.5	0.046	mg/Kg		08/08/23 11:30	08/21/23 15:14	1

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-76252/8-A
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: Method Blank
Prep Type: Step 6
Prep Batch: 76252

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Iron	ND		5.0	2.9	mg/Kg		08/08/23 11:30	08/21/23 15:14	1
Manganese	ND		0.75	0.25	mg/Kg		08/08/23 11:30	08/21/23 15:14	1

Lab Sample ID: LCS 140-76252/9-A
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: Lab Control Sample
Prep Type: Step 6
Prep Batch: 76252

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	5.00	5.33		mg/Kg		107	80 - 120
Cobalt	5.00	5.00		mg/Kg		100	80 - 120
Iron	50.0	50.5		mg/Kg		101	80 - 120
Manganese	5.00	5.13		mg/Kg		103	80 - 120

Lab Sample ID: LCSD 140-76252/10-A
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 6
Prep Batch: 76252

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic	5.00	5.32		mg/Kg		106	80 - 120	0	30
Cobalt	5.00	5.03		mg/Kg		101	80 - 120	1	30
Iron	50.0	50.7		mg/Kg		101	80 - 120	0	30
Manganese	5.00	5.17		mg/Kg		103	80 - 120	1	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76738

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 6
Prep Batch: 76252

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	2.4		1.82		mg/Kg	☼	27	30
Cobalt	2.1	J	2.26	J	mg/Kg	☼	7	30
Iron	6900		6890		mg/Kg	☼	0.08	30
Manganese	38		40.0		mg/Kg	☼	4	30

Lab Sample ID: MB 140-76270/8-A
Matrix: Solid
Analysis Batch: 76934

Client Sample ID: Method Blank
Prep Type: Step 7
Prep Batch: 76270

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.50	0.30	mg/Kg		08/09/23 08:00	08/24/23 12:02	1
Cobalt	ND		2.5	0.026	mg/Kg		08/09/23 08:00	08/24/23 12:02	1
Iron	ND		5.0	4.1	mg/Kg		08/09/23 08:00	08/24/23 12:02	1
Manganese	ND		0.75	0.31	mg/Kg		08/09/23 08:00	08/24/23 12:02	1

Lab Sample ID: LCS 140-76270/9-A
Matrix: Solid
Analysis Batch: 76934

Client Sample ID: Lab Control Sample
Prep Type: Step 7
Prep Batch: 76270

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	5.00	4.99		mg/Kg		100	80 - 120
Cobalt	5.00	5.08		mg/Kg		102	80 - 125

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCS 140-76270/9-A
Matrix: Solid
Analysis Batch: 76934

Client Sample ID: Lab Control Sample
Prep Type: Step 7
Prep Batch: 76270

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Iron	50.0	52.4		mg/Kg		105	80 - 120
Manganese	5.00	5.12		mg/Kg		102	80 - 120

Lab Sample ID: LCSD 140-76270/10-A
Matrix: Solid
Analysis Batch: 76934

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 7
Prep Batch: 76270

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic	5.00	4.92		mg/Kg		98	80 - 120	2	30
Cobalt	5.00	5.03		mg/Kg		101	80 - 125	1	30
Iron	50.0	51.8		mg/Kg		104	80 - 120	1	30
Manganese	5.00	5.06		mg/Kg		101	80 - 120	1	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76934

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 7
Prep Batch: 76270

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Iron	5000		4690		mg/Kg	☼	6	30
Manganese	35		33.3		mg/Kg	☼	5	30

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Analysis Batch: 76934

Client Sample ID: B23-12 31.5-33.5 20230712
Prep Type: Step 7
Prep Batch: 76270

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	2.7		2.27		mg/Kg	☼	17	30
Cobalt	0.74	J	0.614	J	mg/Kg	☼	19	30

QC Association Summary

Metals

Prep Batch: 75970

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Total/NA	Solid	Total	
140-32884-2	B23-12 31.5-33.5 20230712	Total/NA	Solid	Total	
140-32884-3	B23-12 38.5-39.8 20230712	Total/NA	Solid	Total	
140-32884-4	B23-12 51.5-53.5 20230712	Total/NA	Solid	Total	
140-32884-5	B23-2 42-43.6 20230724	Total/NA	Solid	Total	
140-32884-6	B23-2 59-60.5 20230724	Total/NA	Solid	Total	
MB 140-75970/8-A	Method Blank	Total/NA	Solid	Total	
LCS 140-75970/9-A	Lab Control Sample	Total/NA	Solid	Total	
LCSD 140-75970/10-A	Lab Control Sample Dup	Total/NA	Solid	Total	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Total/NA	Solid	Total	

SEP Batch: 75971

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 1	Solid	Exchangeable	
140-32884-2	B23-12 31.5-33.5 20230712	Step 1	Solid	Exchangeable	
140-32884-3	B23-12 38.5-39.8 20230712	Step 1	Solid	Exchangeable	
140-32884-4	B23-12 51.5-53.5 20230712	Step 1	Solid	Exchangeable	
140-32884-5	B23-2 42-43.6 20230724	Step 1	Solid	Exchangeable	
140-32884-6	B23-2 59-60.5 20230724	Step 1	Solid	Exchangeable	
MB 140-75971/8-B ^4	Method Blank	Step 1	Solid	Exchangeable	
LCS 140-75971/9-B ^5	Lab Control Sample	Step 1	Solid	Exchangeable	
LCSD 140-75971/10-B ^5	Lab Control Sample Dup	Step 1	Solid	Exchangeable	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 1	Solid	Exchangeable	

Prep Batch: 76022

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 1	Solid	3010A	75971
140-32884-2	B23-12 31.5-33.5 20230712	Step 1	Solid	3010A	75971
140-32884-3	B23-12 38.5-39.8 20230712	Step 1	Solid	3010A	75971
140-32884-4	B23-12 51.5-53.5 20230712	Step 1	Solid	3010A	75971
140-32884-5	B23-2 42-43.6 20230724	Step 1	Solid	3010A	75971
140-32884-6	B23-2 59-60.5 20230724	Step 1	Solid	3010A	75971
MB 140-75971/8-B ^4	Method Blank	Step 1	Solid	3010A	75971
LCS 140-75971/9-B ^5	Lab Control Sample	Step 1	Solid	3010A	75971
LCSD 140-75971/10-B ^5	Lab Control Sample Dup	Step 1	Solid	3010A	75971
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 1	Solid	3010A	75971

SEP Batch: 76044

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 2	Solid	Carbonate	
140-32884-2	B23-12 31.5-33.5 20230712	Step 2	Solid	Carbonate	
140-32884-3	B23-12 38.5-39.8 20230712	Step 2	Solid	Carbonate	
140-32884-4	B23-12 51.5-53.5 20230712	Step 2	Solid	Carbonate	
140-32884-5	B23-2 42-43.6 20230724	Step 2	Solid	Carbonate	
140-32884-6	B23-2 59-60.5 20230724	Step 2	Solid	Carbonate	
MB 140-76044/8-B ^3	Method Blank	Step 2	Solid	Carbonate	
LCS 140-76044/9-B ^5	Lab Control Sample	Step 2	Solid	Carbonate	
LCSD 140-76044/10-B ^5	Lab Control Sample Dup	Step 2	Solid	Carbonate	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 2	Solid	Carbonate	

Metals

SEP Batch: 76084

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 3	Solid	Non-Crystalline	
140-32884-2	B23-12 31.5-33.5 20230712	Step 3	Solid	Non-Crystalline	
140-32884-3	B23-12 38.5-39.8 20230712	Step 3	Solid	Non-Crystalline	
140-32884-4	B23-12 51.5-53.5 20230712	Step 3	Solid	Non-Crystalline	
140-32884-5	B23-2 42-43.6 20230724	Step 3	Solid	Non-Crystalline	
140-32884-6	B23-2 59-60.5 20230724	Step 3	Solid	Non-Crystalline	
MB 140-76084/8-B	Method Blank	Step 3	Solid	Non-Crystalline	
LCS 140-76084/9-B	Lab Control Sample	Step 3	Solid	Non-Crystalline	
LCSD 140-76084/10-B	Lab Control Sample Dup	Step 3	Solid	Non-Crystalline	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 3	Solid	Non-Crystalline	

Prep Batch: 76085

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 2	Solid	3010A	76044
140-32884-2	B23-12 31.5-33.5 20230712	Step 2	Solid	3010A	76044
140-32884-3	B23-12 38.5-39.8 20230712	Step 2	Solid	3010A	76044
140-32884-4	B23-12 51.5-53.5 20230712	Step 2	Solid	3010A	76044
140-32884-5	B23-2 42-43.6 20230724	Step 2	Solid	3010A	76044
140-32884-6	B23-2 59-60.5 20230724	Step 2	Solid	3010A	76044
MB 140-76044/8-B ^3	Method Blank	Step 2	Solid	3010A	76044
LCS 140-76044/9-B ^5	Lab Control Sample	Step 2	Solid	3010A	76044
LCSD 140-76044/10-B ^5	Lab Control Sample Dup	Step 2	Solid	3010A	76044
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 2	Solid	3010A	76044

Prep Batch: 76118

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 3	Solid	3010A	76084
140-32884-2	B23-12 31.5-33.5 20230712	Step 3	Solid	3010A	76084
140-32884-3	B23-12 38.5-39.8 20230712	Step 3	Solid	3010A	76084
140-32884-4	B23-12 51.5-53.5 20230712	Step 3	Solid	3010A	76084
140-32884-5	B23-2 42-43.6 20230724	Step 3	Solid	3010A	76084
140-32884-6	B23-2 59-60.5 20230724	Step 3	Solid	3010A	76084
MB 140-76084/8-B	Method Blank	Step 3	Solid	3010A	76084
LCS 140-76084/9-B	Lab Control Sample	Step 3	Solid	3010A	76084
LCSD 140-76084/10-B	Lab Control Sample Dup	Step 3	Solid	3010A	76084
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 3	Solid	3010A	76084

SEP Batch: 76125

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 4	Solid	Metal Hydroxide	
140-32884-2	B23-12 31.5-33.5 20230712	Step 4	Solid	Metal Hydroxide	
140-32884-3	B23-12 38.5-39.8 20230712	Step 4	Solid	Metal Hydroxide	
140-32884-4	B23-12 51.5-53.5 20230712	Step 4	Solid	Metal Hydroxide	
140-32884-5	B23-2 42-43.6 20230724	Step 4	Solid	Metal Hydroxide	
140-32884-6	B23-2 59-60.5 20230724	Step 4	Solid	Metal Hydroxide	
MB 140-76125/8-B	Method Blank	Step 4	Solid	Metal Hydroxide	
LCS 140-76125/9-B	Lab Control Sample	Step 4	Solid	Metal Hydroxide	
LCSD 140-76125/10-B	Lab Control Sample Dup	Step 4	Solid	Metal Hydroxide	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 4	Solid	Metal Hydroxide	

Metals

Prep Batch: 76167

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 4	Solid	3010A	76125
140-32884-2	B23-12 31.5-33.5 20230712	Step 4	Solid	3010A	76125
140-32884-3	B23-12 38.5-39.8 20230712	Step 4	Solid	3010A	76125
140-32884-4	B23-12 51.5-53.5 20230712	Step 4	Solid	3010A	76125
140-32884-5	B23-2 42-43.6 20230724	Step 4	Solid	3010A	76125
140-32884-6	B23-2 59-60.5 20230724	Step 4	Solid	3010A	76125
MB 140-76125/8-B	Method Blank	Step 4	Solid	3010A	76125
LCS 140-76125/9-B	Lab Control Sample	Step 4	Solid	3010A	76125
LCSD 140-76125/10-B	Lab Control Sample Dup	Step 4	Solid	3010A	76125
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 4	Solid	3010A	76125

SEP Batch: 76168

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 5	Solid	Organic-Bound	
140-32884-2	B23-12 31.5-33.5 20230712	Step 5	Solid	Organic-Bound	
140-32884-3	B23-12 38.5-39.8 20230712	Step 5	Solid	Organic-Bound	
140-32884-4	B23-12 51.5-53.5 20230712	Step 5	Solid	Organic-Bound	
140-32884-5	B23-2 42-43.6 20230724	Step 5	Solid	Organic-Bound	
140-32884-6	B23-2 59-60.5 20230724	Step 5	Solid	Organic-Bound	
MB 140-76168/8-B ^5	Method Blank	Step 5	Solid	Organic-Bound	
LCS 140-76168/9-B ^5	Lab Control Sample	Step 5	Solid	Organic-Bound	
LCSD 140-76168/10-B ^5	Lab Control Sample Dup	Step 5	Solid	Organic-Bound	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 5	Solid	Organic-Bound	

SEP Batch: 76252

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 6	Solid	Acid/Sulfide	
140-32884-2	B23-12 31.5-33.5 20230712	Step 6	Solid	Acid/Sulfide	
140-32884-3	B23-12 38.5-39.8 20230712	Step 6	Solid	Acid/Sulfide	
140-32884-4	B23-12 51.5-53.5 20230712	Step 6	Solid	Acid/Sulfide	
140-32884-5	B23-2 42-43.6 20230724	Step 6	Solid	Acid/Sulfide	
140-32884-6	B23-2 59-60.5 20230724	Step 6	Solid	Acid/Sulfide	
MB 140-76252/8-A	Method Blank	Step 6	Solid	Acid/Sulfide	
LCS 140-76252/9-A	Lab Control Sample	Step 6	Solid	Acid/Sulfide	
LCSD 140-76252/10-A	Lab Control Sample Dup	Step 6	Solid	Acid/Sulfide	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 6	Solid	Acid/Sulfide	

Prep Batch: 76267

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 5	Solid	3010A	76168
140-32884-2	B23-12 31.5-33.5 20230712	Step 5	Solid	3010A	76168
140-32884-3	B23-12 38.5-39.8 20230712	Step 5	Solid	3010A	76168
140-32884-4	B23-12 51.5-53.5 20230712	Step 5	Solid	3010A	76168
140-32884-5	B23-2 42-43.6 20230724	Step 5	Solid	3010A	76168
140-32884-6	B23-2 59-60.5 20230724	Step 5	Solid	3010A	76168
MB 140-76168/8-B ^5	Method Blank	Step 5	Solid	3010A	76168
LCS 140-76168/9-B ^5	Lab Control Sample	Step 5	Solid	3010A	76168
LCSD 140-76168/10-B ^5	Lab Control Sample Dup	Step 5	Solid	3010A	76168
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 5	Solid	3010A	76168

Metals

Prep Batch: 76270

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 7	Solid	Residual	
140-32884-2	B23-12 31.5-33.5 20230712	Step 7	Solid	Residual	
140-32884-3	B23-12 38.5-39.8 20230712	Step 7	Solid	Residual	
140-32884-4	B23-12 51.5-53.5 20230712	Step 7	Solid	Residual	
140-32884-5	B23-2 42-43.6 20230724	Step 7	Solid	Residual	
140-32884-6	B23-2 59-60.5 20230724	Step 7	Solid	Residual	
MB 140-76270/8-A	Method Blank	Step 7	Solid	Residual	
LCS 140-76270/9-A	Lab Control Sample	Step 7	Solid	Residual	
LCSD 140-76270/10-A	Lab Control Sample Dup	Step 7	Solid	Residual	
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 7	Solid	Residual	

Analysis Batch: 76517

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 1	Solid	6010B SEP	76022
140-32884-1	B23-1 43.5-45 20230711	Step 2	Solid	6010B SEP	76085
140-32884-1	B23-1 43.5-45 20230711	Step 3	Solid	6010B SEP	76118
140-32884-1	B23-1 43.5-45 20230711	Step 4	Solid	6010B SEP	76167
140-32884-2	B23-12 31.5-33.5 20230712	Step 1	Solid	6010B SEP	76022
140-32884-2	B23-12 31.5-33.5 20230712	Step 2	Solid	6010B SEP	76085
140-32884-2	B23-12 31.5-33.5 20230712	Step 3	Solid	6010B SEP	76118
140-32884-2	B23-12 31.5-33.5 20230712	Step 4	Solid	6010B SEP	76167
140-32884-3	B23-12 38.5-39.8 20230712	Step 1	Solid	6010B SEP	76022
140-32884-3	B23-12 38.5-39.8 20230712	Step 2	Solid	6010B SEP	76085
140-32884-3	B23-12 38.5-39.8 20230712	Step 3	Solid	6010B SEP	76118
140-32884-3	B23-12 38.5-39.8 20230712	Step 4	Solid	6010B SEP	76167
140-32884-4	B23-12 51.5-53.5 20230712	Step 1	Solid	6010B SEP	76022
140-32884-4	B23-12 51.5-53.5 20230712	Step 2	Solid	6010B SEP	76085
140-32884-4	B23-12 51.5-53.5 20230712	Step 3	Solid	6010B SEP	76118
140-32884-4	B23-12 51.5-53.5 20230712	Step 4	Solid	6010B SEP	76167
140-32884-5	B23-2 42-43.6 20230724	Step 1	Solid	6010B SEP	76022
140-32884-5	B23-2 42-43.6 20230724	Step 2	Solid	6010B SEP	76085
140-32884-5	B23-2 42-43.6 20230724	Step 3	Solid	6010B SEP	76118
140-32884-5	B23-2 42-43.6 20230724	Step 4	Solid	6010B SEP	76167
140-32884-6	B23-2 59-60.5 20230724	Step 1	Solid	6010B SEP	76022
140-32884-6	B23-2 59-60.5 20230724	Step 2	Solid	6010B SEP	76085
140-32884-6	B23-2 59-60.5 20230724	Step 3	Solid	6010B SEP	76118
140-32884-6	B23-2 59-60.5 20230724	Step 4	Solid	6010B SEP	76167
MB 140-75971/8-B ^4	Method Blank	Step 1	Solid	6010B SEP	76022
MB 140-76044/8-B ^3	Method Blank	Step 2	Solid	6010B SEP	76085
MB 140-76084/8-B	Method Blank	Step 3	Solid	6010B SEP	76118
MB 140-76125/8-B	Method Blank	Step 4	Solid	6010B SEP	76167
LCS 140-75971/9-B ^5	Lab Control Sample	Step 1	Solid	6010B SEP	76022
LCS 140-76044/9-B ^5	Lab Control Sample	Step 2	Solid	6010B SEP	76085
LCS 140-76084/9-B	Lab Control Sample	Step 3	Solid	6010B SEP	76118
LCS 140-76125/9-B	Lab Control Sample	Step 4	Solid	6010B SEP	76167
LCSD 140-75971/10-B ^5	Lab Control Sample Dup	Step 1	Solid	6010B SEP	76022
LCSD 140-76044/10-B ^5	Lab Control Sample Dup	Step 2	Solid	6010B SEP	76085
LCSD 140-76084/10-B	Lab Control Sample Dup	Step 3	Solid	6010B SEP	76118
LCSD 140-76125/10-B	Lab Control Sample Dup	Step 4	Solid	6010B SEP	76167
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 1	Solid	6010B SEP	76022
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 2	Solid	6010B SEP	76085

Metals (Continued)

Analysis Batch: 76517 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 3	Solid	6010B SEP	76118
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 4	Solid	6010B SEP	76167

Analysis Batch: 76738

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 5	Solid	6010B SEP	76267
140-32884-1	B23-1 43.5-45 20230711	Step 6	Solid	6010B SEP	76252
140-32884-2	B23-12 31.5-33.5 20230712	Step 5	Solid	6010B SEP	76267
140-32884-2	B23-12 31.5-33.5 20230712	Step 6	Solid	6010B SEP	76252
140-32884-3	B23-12 38.5-39.8 20230712	Step 5	Solid	6010B SEP	76267
140-32884-3	B23-12 38.5-39.8 20230712	Step 6	Solid	6010B SEP	76252
140-32884-4	B23-12 51.5-53.5 20230712	Step 5	Solid	6010B SEP	76267
140-32884-4	B23-12 51.5-53.5 20230712	Step 6	Solid	6010B SEP	76252
140-32884-5	B23-2 42-43.6 20230724	Step 5	Solid	6010B SEP	76267
140-32884-5	B23-2 42-43.6 20230724	Step 6	Solid	6010B SEP	76252
140-32884-6	B23-2 59-60.5 20230724	Step 5	Solid	6010B SEP	76267
140-32884-6	B23-2 59-60.5 20230724	Step 6	Solid	6010B SEP	76252
MB 140-76168/8-B ^5	Method Blank	Step 5	Solid	6010B SEP	76267
MB 140-76252/8-A	Method Blank	Step 6	Solid	6010B SEP	76252
LCS 140-76168/9-B ^5	Lab Control Sample	Step 5	Solid	6010B SEP	76267
LCS 140-76252/9-A	Lab Control Sample	Step 6	Solid	6010B SEP	76252
LCSD 140-76168/10-B ^5	Lab Control Sample Dup	Step 5	Solid	6010B SEP	76267
LCSD 140-76252/10-A	Lab Control Sample Dup	Step 6	Solid	6010B SEP	76252
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 5	Solid	6010B SEP	76267
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 6	Solid	6010B SEP	76252

Analysis Batch: 76934

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Step 7	Solid	6010B SEP	76270
140-32884-1	B23-1 43.5-45 20230711	Step 7	Solid	6010B SEP	76270
140-32884-1	B23-1 43.5-45 20230711	Total/NA	Solid	6010B	75970
140-32884-1	B23-1 43.5-45 20230711	Total/NA	Solid	6010B	75970
140-32884-2	B23-12 31.5-33.5 20230712	Step 7	Solid	6010B SEP	76270
140-32884-2	B23-12 31.5-33.5 20230712	Step 7	Solid	6010B SEP	76270
140-32884-2	B23-12 31.5-33.5 20230712	Total/NA	Solid	6010B	75970
140-32884-3	B23-12 38.5-39.8 20230712	Step 7	Solid	6010B SEP	76270
140-32884-3	B23-12 38.5-39.8 20230712	Step 7	Solid	6010B SEP	76270
140-32884-3	B23-12 38.5-39.8 20230712	Total/NA	Solid	6010B	75970
140-32884-3	B23-12 38.5-39.8 20230712	Total/NA	Solid	6010B	75970
140-32884-4	B23-12 51.5-53.5 20230712	Step 7	Solid	6010B SEP	76270
140-32884-4	B23-12 51.5-53.5 20230712	Step 7	Solid	6010B SEP	76270
140-32884-4	B23-12 51.5-53.5 20230712	Total/NA	Solid	6010B	75970
140-32884-4	B23-12 51.5-53.5 20230712	Total/NA	Solid	6010B	75970
140-32884-5	B23-2 42-43.6 20230724	Step 7	Solid	6010B SEP	76270
140-32884-5	B23-2 42-43.6 20230724	Step 7	Solid	6010B SEP	76270
140-32884-5	B23-2 42-43.6 20230724	Total/NA	Solid	6010B	75970
140-32884-5	B23-2 42-43.6 20230724	Total/NA	Solid	6010B	75970
140-32884-6	B23-2 59-60.5 20230724	Step 7	Solid	6010B SEP	76270
140-32884-6	B23-2 59-60.5 20230724	Step 7	Solid	6010B SEP	76270
140-32884-6	B23-2 59-60.5 20230724	Total/NA	Solid	6010B	75970
140-32884-6	B23-2 59-60.5 20230724	Total/NA	Solid	6010B	75970

Metals (Continued)

Analysis Batch: 76934 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 140-75970/8-A	Method Blank	Total/NA	Solid	6010B	75970
MB 140-76270/8-A	Method Blank	Step 7	Solid	6010B SEP	76270
LCS 140-75970/9-A	Lab Control Sample	Total/NA	Solid	6010B	75970
LCS 140-76270/9-A	Lab Control Sample	Step 7	Solid	6010B SEP	76270
LCSD 140-75970/10-A	Lab Control Sample Dup	Total/NA	Solid	6010B	75970
LCSD 140-76270/10-A	Lab Control Sample Dup	Step 7	Solid	6010B SEP	76270
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 7	Solid	6010B SEP	76270
140-32884-2 DU	B23-12 31.5-33.5 20230712	Step 7	Solid	6010B SEP	76270
140-32884-2 DU	B23-12 31.5-33.5 20230712	Total/NA	Solid	6010B	75970
140-32884-2 DU	B23-12 31.5-33.5 20230712	Total/NA	Solid	6010B	75970

Analysis Batch: 76993

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Sum of Steps 1-7	Solid	6010B SEP	
140-32884-2	B23-12 31.5-33.5 20230712	Sum of Steps 1-7	Solid	6010B SEP	
140-32884-3	B23-12 38.5-39.8 20230712	Sum of Steps 1-7	Solid	6010B SEP	
140-32884-4	B23-12 51.5-53.5 20230712	Sum of Steps 1-7	Solid	6010B SEP	
140-32884-5	B23-2 42-43.6 20230724	Sum of Steps 1-7	Solid	6010B SEP	
140-32884-6	B23-2 59-60.5 20230724	Sum of Steps 1-7	Solid	6010B SEP	

General Chemistry

Analysis Batch: 76093

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-32884-1	B23-1 43.5-45 20230711	Total/NA	Solid	Moisture	
140-32884-2	B23-12 31.5-33.5 20230712	Total/NA	Solid	Moisture	
140-32884-3	B23-12 38.5-39.8 20230712	Total/NA	Solid	Moisture	
140-32884-4	B23-12 51.5-53.5 20230712	Total/NA	Solid	Moisture	
140-32884-5	B23-2 42-43.6 20230724	Total/NA	Solid	Moisture	
140-32884-6	B23-2 59-60.5 20230724	Total/NA	Solid	Moisture	
140-32884-1 DU	B23-1 43.5-45 20230711	Total/NA	Solid	Moisture	

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: B23-1 43.5-45 20230711
Date Collected: 07/11/23 14:45
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			76993	08/25/23 14:43	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			76093	08/02/23 16:04	TMB	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: B23-1 43.5-45 20230711
Date Collected: 07/11/23 14:45
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-1
Matrix: Solid
Percent Solids: 83.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 13:23	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			76934	08/24/23 15:16	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 11:07	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 12:11	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:16	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:21	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:24	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:29	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 12:31	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			76934	08/24/23 14:27	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: B23-12 31.5-33.5 20230712

Lab Sample ID: 140-32884-2

Date Collected: 07/12/23 14:15

Matrix: Solid

Date Received: 07/28/23 13:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			76993	08/25/23 14:43	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			76093	08/02/23 16:04	TMB	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: B23-12 31.5-33.5 20230712

Lab Sample ID: 140-32884-2

Date Collected: 07/12/23 14:15

Matrix: Solid

Date Received: 07/28/23 13:45

Percent Solids: 77.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 13:28	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 11:12	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 12:16	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:21	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:26	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:29	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:34	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 12:37	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			76934	08/24/23 14:32	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: B23-12 38.5-39.8 20230712

Lab Sample ID: 140-32884-3

Date Collected: 07/12/23 14:30
Date Received: 07/28/23 13:45

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			76993	08/25/23 14:43	KNC	EET KNX
	Instrument ID: NOEQUIP									
Total/NA	Analysis	Moisture		1			76093	08/02/23 16:04	TMB	EET KNX
	Instrument ID: NOEQUIP									

Client Sample ID: B23-12 38.5-39.8 20230712

Lab Sample ID: 140-32884-3

Date Collected: 07/12/23 14:30
Date Received: 07/28/23 13:45

Matrix: Solid
Percent Solids: 89.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 13:53	KNC	EET KNX
	Instrument ID: DUO									
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			76934	08/24/23 15:31	KNC	EET KNX
	Instrument ID: DUO									
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 11:21	KNC	EET KNX
	Instrument ID: DUO									
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 12:26	KNC	EET KNX
	Instrument ID: DUO									
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:31	KNC	EET KNX
	Instrument ID: DUO									
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:50	KNC	EET KNX
	Instrument ID: DUO									
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:39	KNC	EET KNX
	Instrument ID: DUO									
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:44	KNC	EET KNX
	Instrument ID: DUO									
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 12:57	KNC	EET KNX
	Instrument ID: DUO									
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			76934	08/24/23 14:41	KNC	EET KNX
	Instrument ID: DUO									

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: B23-12 51.5-53.5 20230712

Lab Sample ID: 140-32884-4

Date Collected: 07/12/23 14:45
Matrix: Solid
Date Received: 07/28/23 13:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			76993	08/25/23 14:43	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			76093	08/02/23 16:04	TMB	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: B23-12 51.5-53.5 20230712

Lab Sample ID: 140-32884-4

Date Collected: 07/12/23 14:45
Matrix: Solid
Date Received: 07/28/23 13:45
Percent Solids: 84.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 13:59	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			76934	08/24/23 15:36	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 11:26	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 12:31	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:51	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:55	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:44	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:49	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 13:02	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			76934	08/24/23 14:46	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: B23-2 42-43.6 20230724

Lab Sample ID: 140-32884-5

Date Collected: 07/24/23 09:30
Date Received: 07/28/23 13:45

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			76993	08/25/23 14:43	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			76093	08/02/23 16:04	TMB	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: B23-2 42-43.6 20230724

Lab Sample ID: 140-32884-5

Date Collected: 07/24/23 09:30
Date Received: 07/28/23 13:45

Matrix: Solid
Percent Solids: 79.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 14:05	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			76934	08/24/23 15:41	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 11:31	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 12:51	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:56	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 15:00	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:49	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 16:08	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 13:08	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			76934	08/24/23 14:51	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: B23-2 59-60.5 20230724

Date Collected: 07/24/23 11:00
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-6
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			76993	08/25/23 14:43	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			76093	08/02/23 16:04	TMB	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: B23-2 59-60.5 20230724

Date Collected: 07/24/23 11:00
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-6
Matrix: Solid
Percent Solids: 85.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 14:10	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			76934	08/24/23 15:46	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 11:51	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 12:57	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 14:01	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 15:05	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 15:09	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 16:13	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 13:13	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			76934	08/24/23 14:56	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: Method Blank

Lab Sample ID: MB 140-75970/8-A

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 12:17	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-75971/8-B ^4

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 10:52	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-76044/8-B ^3

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 11:56	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-76084/8-B

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:02	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-76125/8-B

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:06	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-76168/8-B ^5

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:08	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Method Blank

Lab Sample ID: MB 140-76252/8-A

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:14	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Method Blank

Lab Sample ID: MB 140-76270/8-A

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 12:02	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-75970/9-A

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 12:22	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-75971/9-B ^5

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		5			76517	08/15/23 10:57	KNC	EET KNX
	Instrument ID: DUO									

Lab Chronicle

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-76044/9-B ^5
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		5			76517	08/15/23 12:01	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-76084/9-B
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:07	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-76125/9-B
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:11	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-76168/9-B ^5
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:13	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample

Lab Sample ID: LCS 140-76252/9-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:19	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 140-76270/9-A

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 12:07	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-75970/10-A

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 12:27	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-75971/10-B ^5

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		5			76517	08/15/23 11:02	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-76044/10-B ^5

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		5			76517	08/15/23 12:06	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-76084/10-B

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:11	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-76125/10-B

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:16	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-76168/10-B ^5

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:18	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-76252/10-A

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:24	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: Lab Control Sample Dup

Lab Sample ID: LCSD 140-76270/10-A

Date Collected: N/A

Matrix: Solid

Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 12:12	KNC	EET KNX
	Instrument ID: DUO									

Client Sample ID: B23-1 43.5-45 20230711

Lab Sample ID: 140-32884-1 DU

Date Collected: 07/11/23 14:45

Matrix: Solid

Date Received: 07/28/23 13:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			76093	08/02/23 16:04	TMB	EET KNX
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Client Sample ID: B23-12 31.5-33.5 20230712
Date Collected: 07/12/23 14:15
Date Received: 07/28/23 13:45

Lab Sample ID: 140-32884-2 DU
Matrix: Solid
Percent Solids: 77.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			76934	08/24/23 13:34	KNC	EET KNX
	Instrument ID: DUO									
Total/NA	Prep	Total			1.000 g	50 mL	75970	08/09/23 08:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			76934	08/24/23 15:26	KNC	EET KNX
	Instrument ID: DUO									
Step 1	SEP	Exchangeable			5.000 g	25 mL	75971	08/01/23 07:45	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	76022	08/02/23 08:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			76517	08/15/23 11:16	KNC	EET KNX
	Instrument ID: DUO									
Step 2	SEP	Carbonate			5.000 g	25 mL	76044	08/02/23 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	76085	08/03/23 08:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			76517	08/15/23 12:21	KNC	EET KNX
	Instrument ID: DUO									
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	76084	08/03/23 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	76118	08/04/23 08:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			76517	08/15/23 13:26	KNC	EET KNX
	Instrument ID: DUO									
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	76125	08/04/23 08:00	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	76167	08/07/23 08:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			76517	08/15/23 14:31	KNC	EET KNX
	Instrument ID: DUO									
Step 5	SEP	Organic-Bound			5.000 g	75 mL	76168	08/07/23 08:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	76267	08/09/23 08:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			76738	08/21/23 14:34	KNC	EET KNX
	Instrument ID: DUO									
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	76252	08/08/23 11:30	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			76738	08/21/23 15:39	KNC	EET KNX
	Instrument ID: DUO									
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			76934	08/24/23 12:52	KNC	EET KNX
	Instrument ID: DUO									
Step 7	Prep	Residual			1.000 g	50 mL	76270	08/09/23 08:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			76934	08/24/23 14:37	KNC	EET KNX
	Instrument ID: DUO									

Laboratory References:

EET KNX = Eurofins Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

1 2 3 4 5 6 7 8 9 10 11 12 13

Accreditation/Certification Summary

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Laboratory: Eurofins Knoxville

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
	AFCEE	N/A	
ANAB	Dept. of Defense ELAP	L2311	02-13-25
ANAB	Dept. of Energy	L2311.01	02-13-25
ANAB	ISO/IEC 17025	L2311	02-13-25
Arkansas DEQ	State	88-0688	06-16-24
Colorado	State	TN00009	02-29-24
Connecticut	State	PH-0223	09-30-23
Florida	NELAP	E87177	06-30-24
Georgia (DW)	State	906	07-27-25
Hawaii	State	NA	07-27-24
Kansas	NELAP	E-10349	10-31-23
Kentucky (DW)	State	90101	12-31-23
Louisiana (All)	NELAP	83979	06-30-24
Louisiana (DW)	State	LA019	12-31-23
Maryland	State	277	03-31-24
Michigan	State	9933	07-27-25
Nevada	State	TN00009	07-31-24
New Hampshire	NELAP	2999	01-17-24
New Jersey	NELAP	TN001	07-01-24
New York	NELAP	10781	03-31-24
North Carolina (DW)	State	21705	07-31-24
North Carolina (WW/SW)	State	64	12-31-23
Oklahoma	State	9415	08-31-23
Oregon	NELAP	TNI0189	01-01-24
Pennsylvania	NELAP	68-00576	12-01-23
Tennessee	State	02014	07-27-25
Texas	NELAP	T104704380-22-17	08-31-23
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	525-22-279-18762	10-06-25
Utah	NELAP	TN00009	07-31-24
Virginia	NELAP	460176	09-14-23
Washington	State	C593	01-19-24
West Virginia (DW)	State	9955C	12-31-23
West Virginia DEP	State	345	04-30-24
Wisconsin	State	998044300	08-31-24

Method Summary

Client: Geosyntec Consultants Inc
Project/Site: Vistra / Miami Fort - SEP

Job ID: 140-32884-1

Method	Method Description	Protocol	Laboratory
6010B	SEP Metals (ICP) - Total	SW846	EET KNX
6010B SEP	SEP Metals (ICP)	SW846	EET KNX
Moisture	Percent Moisture	EPA	EET KNX
3010A	Preparation, Total Metals	SW846	EET KNX
Acid/Sulfide	Sequential Extraction Procedure, Acid/Sulfide Fraction	TAL-KNOX	EET KNX
Carbonate	Sequential Extraction Procedure, Carbonate Fraction	TAL-KNOX	EET KNX
Exchangeable	Sequential Extraction Procedure, Exchangeable Fraction	TAL-KNOX	EET KNX
Metal Hydroxide	Sequential Extraction Procedure, Metal Hydroxide Fraction	TAL-KNOX	EET KNX
Non-Crystalline	Sequential Extraction Procedure, Non-crystalline Materials	TAL-KNOX	EET KNX
Organic-Bound	Sequential Extraction Procedure, Organic Bound Fraction	TAL-KNOX	EET KNX
Residual	Sequential Extraction Procedure, Residual Fraction	TAL-KNOX	EET KNX
Total	Preparation, Total Material	TAL-KNOX	EET KNX

Protocol References:

EPA = US Environmental Protection Agency
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-KNOX = TestAmerica Laboratories, Knoxville, Facility Standard Operating Procedure.

Laboratory References:

EET KNX = Eurofins Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

Eurofins TestAmerica, Knoxville
5815 Middlebrook Pike

Knoxville, TN 37921-5947
phone 865.291.3000 fax 865.584.4315

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☑ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Client Contact	**Project Manager: Allison Kreinberg**	**Site Contact: NA**	**Date:**	**COC No:**
Geosyntec Consultants, Inc.	**Tel/Fax:**	**Lab Contact: Ryan Henry**	**Carrier:**	__1__ of __1__ COCs
941 Chatham Lane, Suite 103	**Analysis Turnaround Time**			Sampler:
Columbus, OH 43221	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
(614) 468-0421 Phone	TAT if different from Below ______			Walk-in Client:
	☑ 2 weeks			Lab Sampling:
Project Name: Vistra	☐ 1 week			
Site: Miami Fort	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	6010B SEP (As, Fe, Mn)	6010B SEP (Co, Fe, Mn)	Sample Specific Notes:
B23-1 43.5-45 20230711	7/11/2023	1445	G	Solid	1	N	N	X		
B23-12 31.5-33.5 20230712	7/12/2023	1415	G	Solid	1	N	N	X		
B23-12 38.5-39.8 20230712	7/12/2023	1430	G	Solid	1	N	N	X		
B23-12 51.5-53.5 20230712	7/12/2023	1445	G	Solid	1	N	N	X		
B23-2 42-43.6 20230724	7/24/2023	930	G	Solid	1	N	N		X	
B23-2 59-60.5 20230724	7/24/2023	1100	G	Solid	1	N	N		X	

NO CUSTODY SEALS 32.3°c
RECEIVED AMBIENT RT 32°c / CT ~~32.5°c~~ DKD 7-28-23
1 COOLER/BOX FEDX# 7816 7784 6596 ©
DKD 7-28-23

140-32884 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ________

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☑ Archive for ____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No
Custody Seal No.:
Cooler Temp. (°C): Obs'd:______ Corr'd:______ Therm ID No.:______

Relinquished by: Brianna O'Neil-Hankle	Company: Geosyntec	Date/Time: 7/26/23 1800	Received by:	Company: ETA KNX	Date/Time: 7-28-23 13:45
Relinquished by: Brianna O'Neil-Hankle	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.21, dated 4/4/2019

EUROFINS/TESTAMERICA KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

Log In Number:

Review Items	Yes	No	NA	If No, what was the problem?	Comments/Actions Taken
1. Are the shipping containers intact?	✓			☐ Containers, Broken	4
2. Were ambient air containers received intact?			✓	☐ Checked in lab	
3. The coolers/containers custody seal if present, is it intact?			✓	☐ Yes ☐ NA	10
4. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C, VOST: 10°C) Thermometer ID : S673 Correction factor: +0.3°C		✓		☑ Cooler Out of Temp, Client Contacted, Proceed/Cancel ☐ Cooler Out of Temp, Same Day Receipt	
5. Were all of the sample containers received intact?	✓			☐ Containers, Broken	
6. Were samples received in appropriate containers?	✓			☐ Containers, Improper; Client Contacted; Proceed/Cancel	
7. Do sample container labels match COC? (IDs, Dates, Times)	✓			☐ COC & Samples Do Not Match ☐ COC Incorrect/Incomplete ☐ COC Not Received	
8. Were all of the samples listed on the COC received?	✓			☐ Sample Received, Not on COC ☐ Sample on COC, Not Received	
9. Is the date/time of sample collection noted?	✓			☐ COC; No Date/Time; Client Contacted	
10. Was the sampler identified on the COC?		✓		☑ Sampler Not Listed on COC	Labeling Verified by: Date:
11. Is the client and project name/# identified?	✓			☐ COC Incorrect/Incomplete	
12. Are tests/parameters listed for each sample?	✓			☐ COC No tests on COC	pH test strip lot number:
13. Is the matrix of the samples noted?	✓			☐ COC Incorrect/Incomplete	
14. Was COC relinquished? (Signed/Dated/Timed)	✓			☐ COC Incorrect/Incomplete	
15. Were samples received within holding time?	✓			☐ Holding Time - Receipt	
16. Were samples received with correct chemical preservative (excluding Encore)?			✓	☐ pH Adjusted, pH Included (See box 16A) ☐ Incorrect Preservative	
17. Were VOA samples received without headspace?			✓	☐ Headspace (VOA only)	
18. Did you check for residual chlorine, if necessary? (e.g. 1613B, 1668) Chlorine test strip lot number:			✓	☐ Residual Chlorine	
19. For 1613B water samples is pH<9?			✓	☐ If no, notify lab to adjust	
20. For rad samples was sample activity info. Provided?			✓	☐ Project missing info	

	Box 16A: pH Preservation	Box 18A: Residual Chlorine
Preservative:		
Lot Number:		
Exp Date:		
Analyst:		
Date:		
Time:		

Project #: 1400619 PM Instructions:

Sample Receiving Associate: Date: 7-28-23

QA026R32.doc, 062719

ATTACHMENT 5

X-Ray Diffraction Laboratory Analytical Report (2021 and 2023 Field Efforts)

SGS

Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for: *Environmental Services*

Project Number/ LIMS No. *Custom XRD/MI4527-MAR21*

Sample Receipt: *March 22, 2021*

Sample Analysis: *March 29, 2021*

Reporting Date: *Revised April 1, 2021*

Instrument: BRUKER AXS D8 Advance Diffractometer

Test Conditions: Co radiation, 35 kV, 40 mA
Regular Scanning: Step: 0.02°, Step time: 1s, 2θ range: 3-80°

Interpretations : PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software.

Detection Limit : 0.5-2%. Strongly dependent on crystallinity.

Contents:
1) Method Summary
2) Quantitative XRD Results
3) XRD Pattern(s)

Kim Gibbs

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Minerals Services is accredited to the requirements of ISO/IEC 17025.

Mineral Identification and Interpretation:

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

Quantitative Rietveld Analysis:

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	SB-2 36-37' MAR4527-01 (wt %)	SB-2 42-43' MAR4527-02 (wt %)	SB-2 43-44' MAR4527-03 (wt %)	SB-1 64-65' MAR4527-04 (wt %)
Quartz	55.0	70.7	73.6	69.0
Albite	7.8	10.3	12.5	9.9
Microcline	4.1	5.7	4.5	5.5
Chlorite	4.7	1.9	2.3	1.5
Muscovite	17.5	7.1	4.0	3.0
Kaolinite	10.3	3.5	2.4	1.5
Hematite	0.6	0.8	0.7	-
Calcite	-	-	-	7.0
Dolomite	-	-	-	1.9
Ankerite	-	-	-	0.3
Rhodochrosite	-	-	-	0.4
TOTAL	100	100	100	100

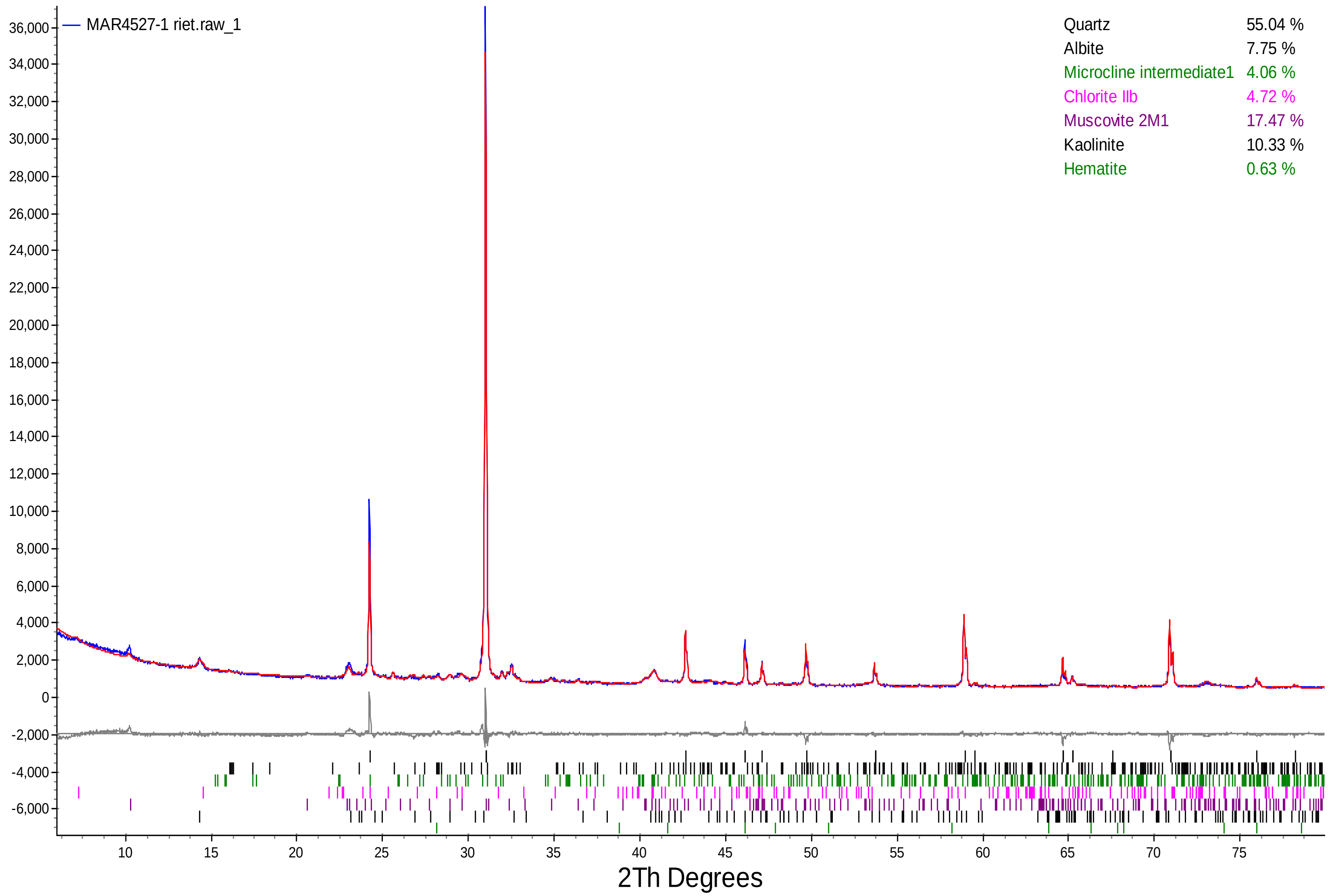
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

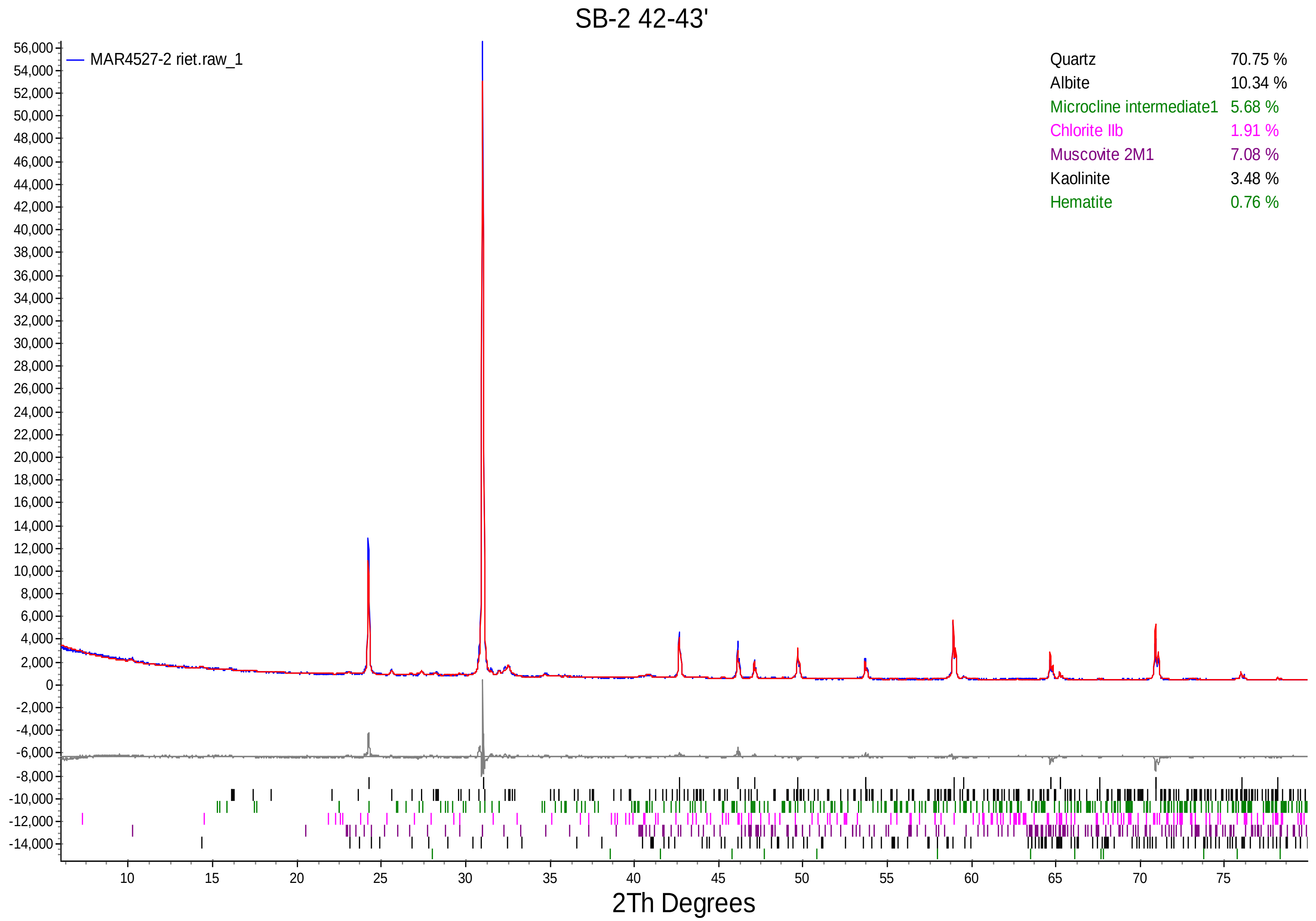
Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

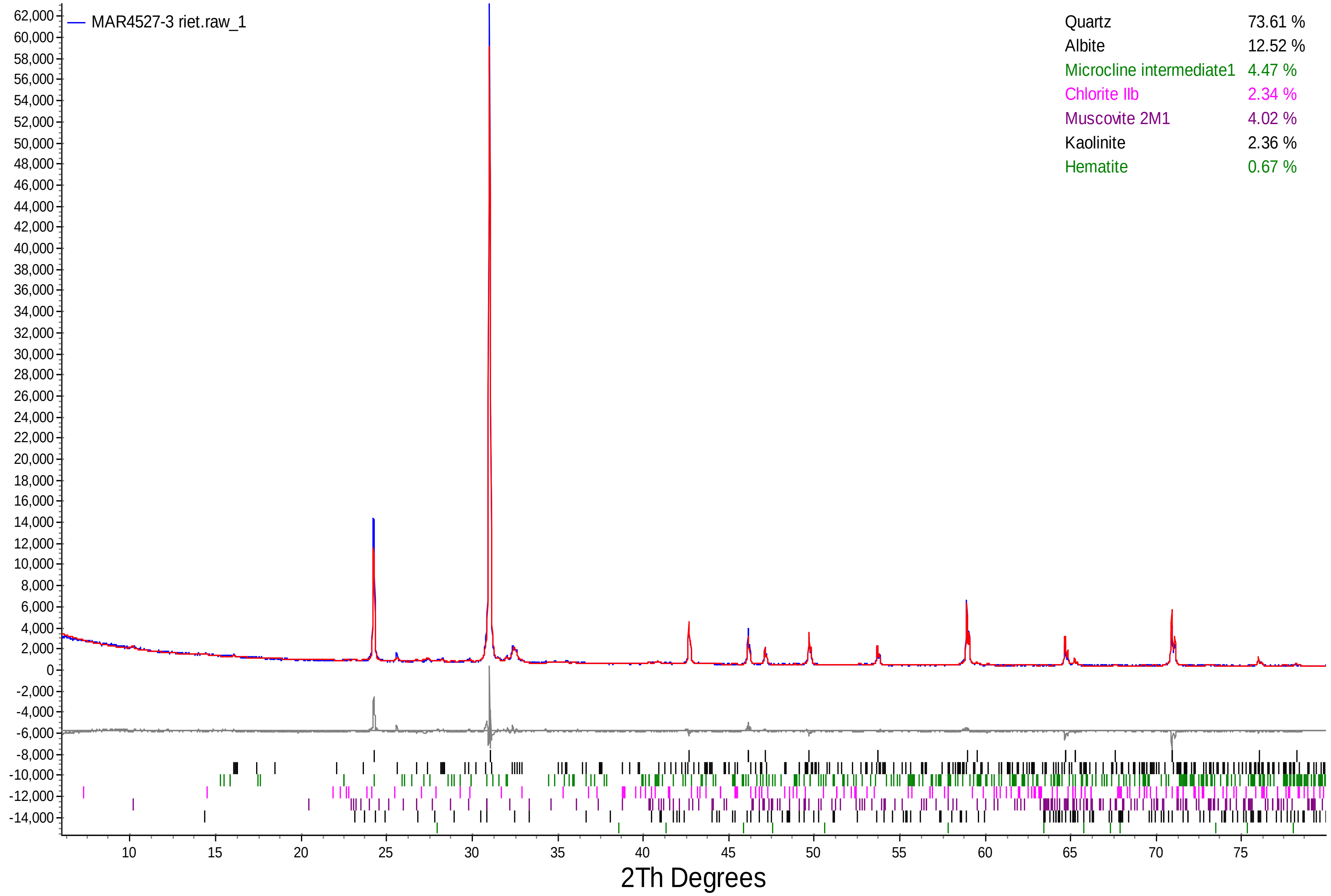
Mineral/Compound	Formula
Quartz	SiO_2
Albite	$NaAlSi_3O_8$
Microcline	$KAlSi_3O_8$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$
Kaolinite	$Al_2Si_2O_5(OH)_4$
Hematite	Fe_2O_3
Calcite	$CaCO_3$
Dolomite	$CaMg(CO_3)_2$
Ankerite	$CaFe(CO_3)_2$
Rhodochrosite	$MnCO_3$

SB-2 36-37'


MAR4527-1 riet.raw_1
Quartz 55.04 %
Albite 7.75 %
Microcline intermediate1 4.06 %
Chlorite IIb 4.72 %
Muscovite 2M1 17.47 %
Kaolinite 10.33 %
Hematite 0.63 %
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
10
15
20
25
30
35
40
45
50
55
60
65
70
75
2Th Degrees


SB-2 42-43'
MAR4527-2 riet.raw_1
Quartz 70.75 %
Albite 10.34 %
Microcline intermediate1 5.68 %
Chlorite IIb 1.91 %
Muscovite 2M1 7.08 %
Kaolinite 3.48 %
Hematite 0.76 %
56,000
54,000
52,000
50,000
48,000
46,000
44,000
42,000
40,000
38,000
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
-8,000
-10,000
-12,000
-14,000
10
15
20
25
30
35
40
45
50
55
60
65
70
75
2Th Degrees

SB-2 43-44'


MAR4527-3 riet.raw_1
Quartz 73.61 %
Albite 12.52 %
Microcline intermediate1 4.47 %
Chlorite IIb 2.34 %
Muscovite 2M1 4.02 %
Kaolinite 2.36 %
Hematite 0.67 %
62,000
60,000
58,000
56,000
54,000
52,000
50,000
48,000
46,000
44,000
42,000
40,000
38,000
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
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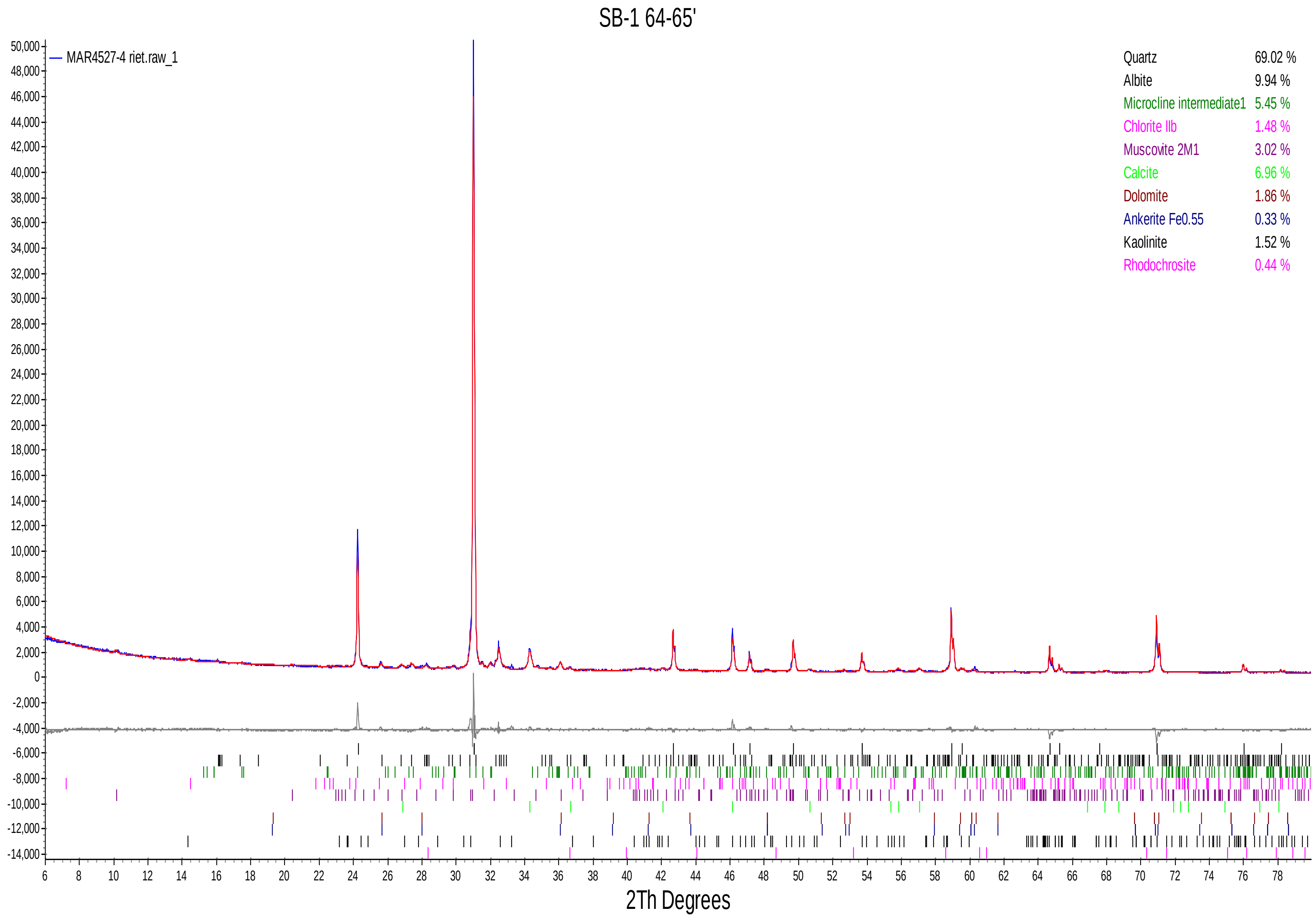
35
40
45
50
55
60
65
70
75
2Th Degrees


SB-1 64-65'
MAR4527-4 riet.raw_1
Quartz 69.02 %
Albite 9.94 %
Microcline intermediate1 5.45 %
Chlorite IIb 1.48 %
Muscovite 2M1 3.02 %
Calcite 6.96 %
Dolomite 1.86 %
Ankerite Fe0.55 0.33 %
Kaolinite 1.52 %
Rhodochrosite 0.44 %
50,000
48,000
46,000
44,000
42,000
40,000
38,000
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
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18,000
16,000
14,000
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6,000
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0
-2,000
-4,000
-6,000
-8,000
-10,000
-12,000
-14,000
6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78
2Th Degrees

SGS Canada Inc.
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Project : Fort Miami MNA

18-March-2021

SiREM Laboratory
Attn : Michael Healey

130 Stone Road W
Guelph, ON
N1G 3Z2, Canada

Phone: 519-822-2265
Fax:519-822-3151

Date Rec. : 11 March 2021
LR Report: **CA13283-MAR21**
Reference: P.O# 800003210A

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: MW-4**	**6: MW-19**
Sample Date & Time					09-Mar-21 15:45	09-Mar-21 16:00
Temp Upon Receipt [°C]	---	---	---	---	6.0	6.0
TOC [mg/L]	12-Mar-21	19:40	15-Mar-21	10:29	2	1
Ag (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.00005	< 0.00005
Al (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.001	0.002
As (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.0002	0.0002
Ba (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.0093	0.141
Be (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.000007	< 0.000007
B (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.142	0.082
Bi (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.000047	0.00061
Ca (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	147	155
Cd (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.00015	0.000047
Co (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.00412	0.00303
Cr (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.00008	< 0.00008
Cu (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.0004	0.0005
Fe (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.007	< 0.007
K (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	1.76	2.05
Li (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.0037	0.0062
Mg (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	39.4	42.8
Mn (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	1.11	0.286
Mo (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.0045	0.0031
Na (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	22.8	25.5
Ni (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.0052	0.0044
Pb (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.00001	0.00005
Sb (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.0009	< 0.0009
Se (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.00005	0.00054
Sn (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.00006	< 0.00006
Sr (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.320	0.194

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: MW-4**	**6: MW-19**
Ti (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.00005	< 0.00005
Tl (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.000027	0.000023
U (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.00058	0.00059
V (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.00002	0.00041
W (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	< 0.00002	0.00004
Y (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.00010	0.00012
Zn (diss) [mg/L]	16-Mar-21	18:20	17-Mar-21	12:46	0.004	0.009

Catharine Arnold

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
CATHARINE ARNOLD
CHEMIST

Catharine Arnold, B.Sc., C.Chem
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OnLine LIMS

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Project : Fort Miami MNA

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Date Rec. : 11 March 2021
LR Report: **CA14286-MAR21**
Reference: P.O# 800003210A

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: SB-2 36-37'**	**6: SB-2 42-43'**	**7: SB-2 43-44'**	**8: SB-1 64-65'**
Sample Date & Time					09-Mar-21 14:54	09-Mar-21 15:00	09-Mar-21 15:15	09-Mar-21 15:30
TS LOI [mg/L]	15-Mar-21	20:58	17-Mar-21	09:17	48900	19600	12400	15300
TOC [%]	18-Mar-21	11:44	18-Mar-21	14:21	0.307	0.283	0.361	0.145
Ag [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	12000	5200	4100	3800
As [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	3.9	6.9	10	8.2
Ba [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	110	43	86	35
Be [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.88	0.34	0.25	0.21
B [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	3	4	3	3
Bi [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.31	0.20	0.13	0.11
Ca [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	1300	1300	2600	24000
Cd [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.21	0.10	0.10	0.08
Co [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	12	7.0	7.6	7.9
Cr [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	17	8.7	8.0	7.6
Cu [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	16	13	11	9.1
Fe [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	23000	19000	15000	14000
K [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	1900	1100	990	790

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: SB-2 36-37'	6: SB-2 42-43'	7: SB-2 43-44'	8: SB-1 64-65'
Li [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	14	5	4	4
Mg [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	2300	1100	1400	3700
Mn [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	150	330	800	240
Mo [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.9	1.8	2.3	1.4
Na [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	120	180	260	260
Ni [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	21	16	16	14
Pb [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	12	8.5	7.0	5.8
Sb [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.6	< 0.5	< 0.5	< 0.5
Sr [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	12	9.4	12	39
Ti [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	140	75	120	150
Tl [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.18	0.09	0.11	0.09
U [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.96	0.76	0.58	0.46
V [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	24	14	11	12
W [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	0.06	0.08	0.06	0.06
Y [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	11	7.2	6.4	5.7
Zn [µg/g]	05-Apr-21	14:43	06-Apr-21	11:29	57	38	31	24

Catharine Arnold

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Date Rec. : 11 March 2021
LR Report: **CA14287-MAR21**
Reference: P.O# 800003210A

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: SB-2 36-37'**	**6: SB-2 42-43'**	**7: SB-2 43-44'**	**8: SB-1 64-65'**	**9: SB-2 36-37'**
Sample Date & Time					09-Mar-21 14:54	09-Mar-21 15:00	09-Mar-21 15:15	09-Mar-21 15:30	
SiO2 [%]	24-Mar-21	11:55	26-Mar-21	09:01	73.8	85.0	86.8	80.2	73.6
Al2O3 [%]	24-Mar-21	11:55	26-Mar-21	09:01	11.5	5.75	4.77	4.58	11.6
Fe2O3 [%]	24-Mar-21	11:55	26-Mar-21	09:01	4.47	3.27	2.69	2.78	4.45
MgO [%]	24-Mar-21	11:55	26-Mar-21	09:01	0.76	0.40	0.44	0.89	0.75
CaO [%]	24-Mar-21	11:55	26-Mar-21	09:01	0.31	0.61	0.86	4.43	0.31
Na2O [%]	24-Mar-21	11:55	26-Mar-21	09:01	0.64	0.81	0.86	0.87	0.64
K2O [%]	24-Mar-21	11:55	26-Mar-21	09:01	2.13	1.29	1.10	1.04	2.14
TiO2 [%]	24-Mar-21	11:55	26-Mar-21	09:01	0.87	0.28	0.25	0.31	0.88
P2O5 [%]	24-Mar-21	11:55	26-Mar-21	09:01	0.14	0.10	0.08	0.06	0.13
MnO [%]	24-Mar-21	11:55	26-Mar-21	09:01	0.03	0.05	0.11	0.05	0.02
Cr2O3 [%]	24-Mar-21	11:55	26-Mar-21	09:01	< 0.01	< 0.01	0.03	< 0.01	0.02
V2O5 [%]	24-Mar-21	11:55	26-Mar-21	09:01	0.01	< 0.01	< 0.01	< 0.01	0.01
LOI [%]	24-Mar-21	11:55	26-Mar-21	09:01	4.76	2.08	1.54	4.63	4.90
Sum [%]	24-Mar-21	11:55	26-Mar-21	09:01	99.5	99.6	99.5	99.8	99.4

OnLine LIMS

0002446275

Catharine Arnold

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CATHARINE ARNOLD

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

ANALYSIS REPORT BBM23-33457

To

F400101 SGS CANADA INC
LISA THOMPSON
185 Concession Street
Lakefield K0L 2H0
ON
CANADA

Order Number	PO#	Date Received	26-Oct-2023
Submission Number	CA19054-AUG23 / 6 Soil	Date Analysed	31-Oct-2023 - 01-Nov-2023
Number of Samples	6	Date Completed	10-Nov-2023
		SGS Order Number	BBM23-33457

Methods Summary

Number of Sample	Method Code	Description
6	G_WGH_KG	Weight of samples received
6	G_PHY01V	Loss on ignition (LOI), Furnace, variable wt, variable temp
6	GO_XRF72	Borate Fusion, XRF, Ore Grade

Comments

Preparation of samples was performed at the SGS Lakefield site.
Analysis of samples was performed at the SGS Burnaby site.

Authorised Signatory

John Chiang
Laboratory Operations Manager

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WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted. The findings report on the samples provided by the client and are not intended for commercial or contractual settlement purposes.

- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

Order Number PO#
Submission Number CA19054-AUG23 / 6 Soil
Number of Samples 6

ANALYSIS REPORT BBM23-33457

Element	WTKG	LOI	@Al2O3	@CaO	@Cr2O3	@Fe2O3
Method	G_WGH_KG	G_PHY01V	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	-10	0.01	0.01	0.01	0.01
Upper Limit	--	100	100	60	5	100
Unit	kg	%	%	%	%	%
B23-1 43.5-45 20230711	0.02	12.8487	4.65	12.27	<0.01	2.18
B23-12 31.5-33.5 20230712	0.21	7.20928	10.57	0.49	<0.01	3.76
B23-12 38.5-39.8 20230712	0.02	16.3316	5.06	14.05	<0.01	2.52
B23-12 51.5-53.5 20230712	0.02	9.26815	4.76	8.07	<0.01	2.05
B23-2 42-43.6 20230724	0.02	5.04101	10.94	0.42	0.01	4.53
B23-2 59-60.5 20230724	0.02	15.7053	4.79	14.13	0.01	1.97
*Rep B23-12 38.5-39.8 20230712	-	16.2116	-	-	-	-
*Std OREAS 70b	-	6.81864	-	-	-	-
*Rep B23-12 38.5-39.8 20230712	-	-	5.12	14.16	0.01	2.50
*Std OREAS 70b	-	-	7.11	4.28	0.19	7.97
*Blk BLANK	-	-	<0.01	<0.01	<0.01	<0.01
*Std OREAS 751	-	-	15.89	1.05	<0.01	2.40

Element	@K2O	@MgO	Mn3O4	@Na2O	@P2O5	@SiO2
Method	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.01
Upper Limit	70	100	100	60	55	100
Unit	%	%	%	%	%	%
B23-1 43.5-45 20230711	1.04	2.45	0.09	0.83	0.12	63.47
B23-12 31.5-33.5 20230712	1.87	0.80	0.08	0.69	0.14	74.37
B23-12 38.5-39.8 20230712	1.02	3.70	0.09	0.87	0.11	56.47
B23-12 51.5-53.5 20230712	0.98	2.72	0.05	0.84	0.08	70.46
B23-2 42-43.6 20230724	2.03	0.77	0.06	0.80	0.15	74.59
B23-2 59-60.5 20230724	1.06	4.03	0.09	0.92	0.07	57.03
*Rep B23-12 38.5-39.8 20230712	1.03	3.73	0.09	0.86	0.12	55.86

- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

Order Number	PO#
Submission Number	CA19054-AUG23 / 6 Soil
Number of Samples	6

ANALYSIS REPORT BBM23-33457

Element	@K2O	@MgO	Mn3O4	@Na2O	@P2O5	@SiO2
Method	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.01
Upper Limit	70	100	100	60	55	100
Unit	%	%	%	%	%	%
*Std OREAS 70b	0.69	22.43	0.16	1.04	0.06	48.39
*Blk BLANK	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
*Std OREAS 751	2.89	0.51	0.10	3.39	0.28	71.44

Element	@TiO2	@V2O5	Sum
Method	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01	0.01
Upper Limit	100	10	100
Unit	%	%	%
B23-1 43.5-45 20230711	0.25	<0.01	87.44
B23-12 31.5-33.5 20230712	0.80	0.02	93.79
B23-12 38.5-39.8 20230712	0.28	<0.01	84.29
B23-12 51.5-53.5 20230712	0.33	<0.01	90.43
B23-2 42-43.6 20230724	0.84	0.01	95.23
B23-2 59-60.5 20230724	0.22	<0.01	84.42
*Rep B23-12 38.5-39.8 20230712	0.27	<0.01	83.85
*Std OREAS 70b	0.30	<0.01	93.36
*Blk BLANK	<0.01	<0.01	0.02
*Std OREAS 751	0.24	<0.01	98.41

SGS Canada Minerals Burnaby conforms to the requirements of ISO/IEC17025 for specific tests as listed on their scope of accreditation found at https://www.scc.ca/en/search/laboratories/sgs
Tests and Elements marked with an "@" symbol in the report denote ISO/IEC17025 accreditation.

Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for:	*Environmental Services*
Project Number/ LIMS No.	*Custom XRD/MI4557-AUG23*
Sample Receipt:	*August 23, 2023*
Sample Analysis:	*August 28, 2023*
Reporting Date:	*September 29, 2023*

Instrument:	BRUKER AXS D8 Advance Diffractometer
Test Conditions:	Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Regular Scanning: Step: 0.02°, Step time: 0.75s, 2θ range: 6-80°
Interpretations :	PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software.
Detection Limit :	0.5-2%. Strongly dependent on crystallinity.

Contents:

1) Method Summary
2) Quantitative XRD Results
3) XRD Pattern(s)

Huyun Zhou

Zhihai (Adrian) Zhang, Ph.D
Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

ACCREDITATION: SGS Natural Resources Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Canada Inc. - Minerals: https://www.scc.ca/en/search/palcan.

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Member of the SGS Group (SGS SA)

Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Natural Resources is accredited to the requirements of ISO/IEC 17025.

Mineral Identification and Interpretation:

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

Quantitative Rietveld Analysis:

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	**B23-1 43.5-45 20230711** **AUG4557-1** (wt %)	**B23-12 31.5-33.5 20230712** **AUG4557-2** (wt %)	**B23-12 38.5-39.8 20230712** **AUG4557-3** (wt %)	**B23-12 51.5-53.5 20230712** **AUG4557-4** (wt %)	**B23-2 42-43.6 20230724** **AUG4557-5** (wt %)	**B23-2 59-60.5 20230724** **AUG4557-6** (wt %)
Quartz	55.4	61.0	44.9	59.2	61.0	47.5
Albite	7.7	7.5	8.4	9.5	7.8	8.4
Microcline	4.0	0.4	4.6	4.2	0.4	3.7
Calcite	16.4	0.5	17.4	7.8	0.4	15.0
Dolomite	7.1	-	15.0	9.2	-	10.8
Ankerite	2.5	-	1.2	1.1	-	5.3
Actinolite	0.9	0.8	0.9	1.6	0.4	1.2
Diopside	0.8	2.1	0.6	1.3	1.6	2.4
Muscovite	3.5	14.8	4.0	3.8	15.0	4.0
Kaolinite	0.4	8.3	0.9	0.6	8.0	0.4
Chlorite	1.2	2.7	2.0	1.7	2.2	0.5
Magnetite	0.2	0.2	0.2	0.1	0.4	0.4
Montmorillonite	-	0.8	-	-	1.0	-
Biotite	-	1.0	-	-	1.7	-
Rhodochrosite	-	-	-	-	-	0.3
TOTAL	100	100	100	100	100	100

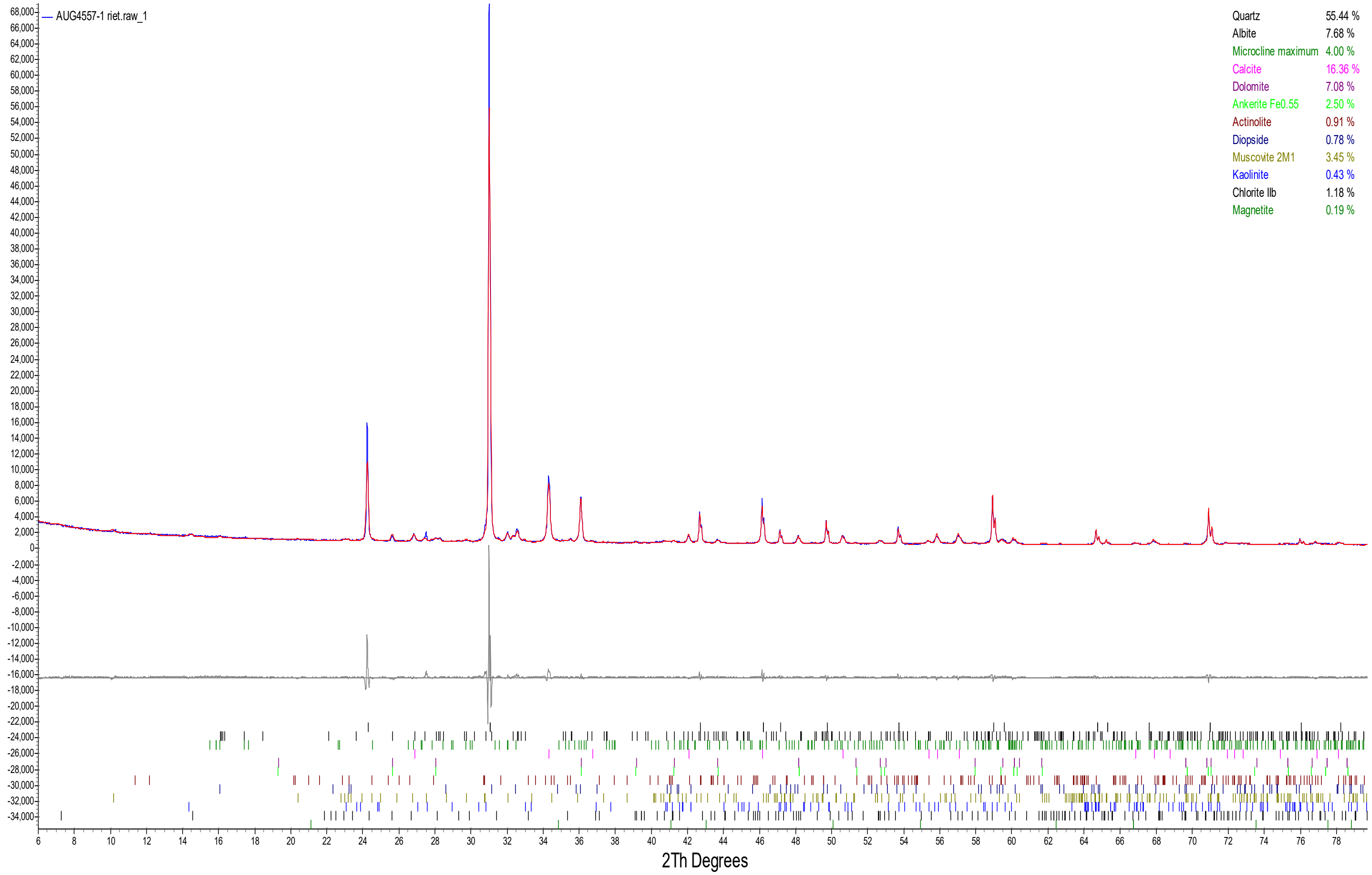
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

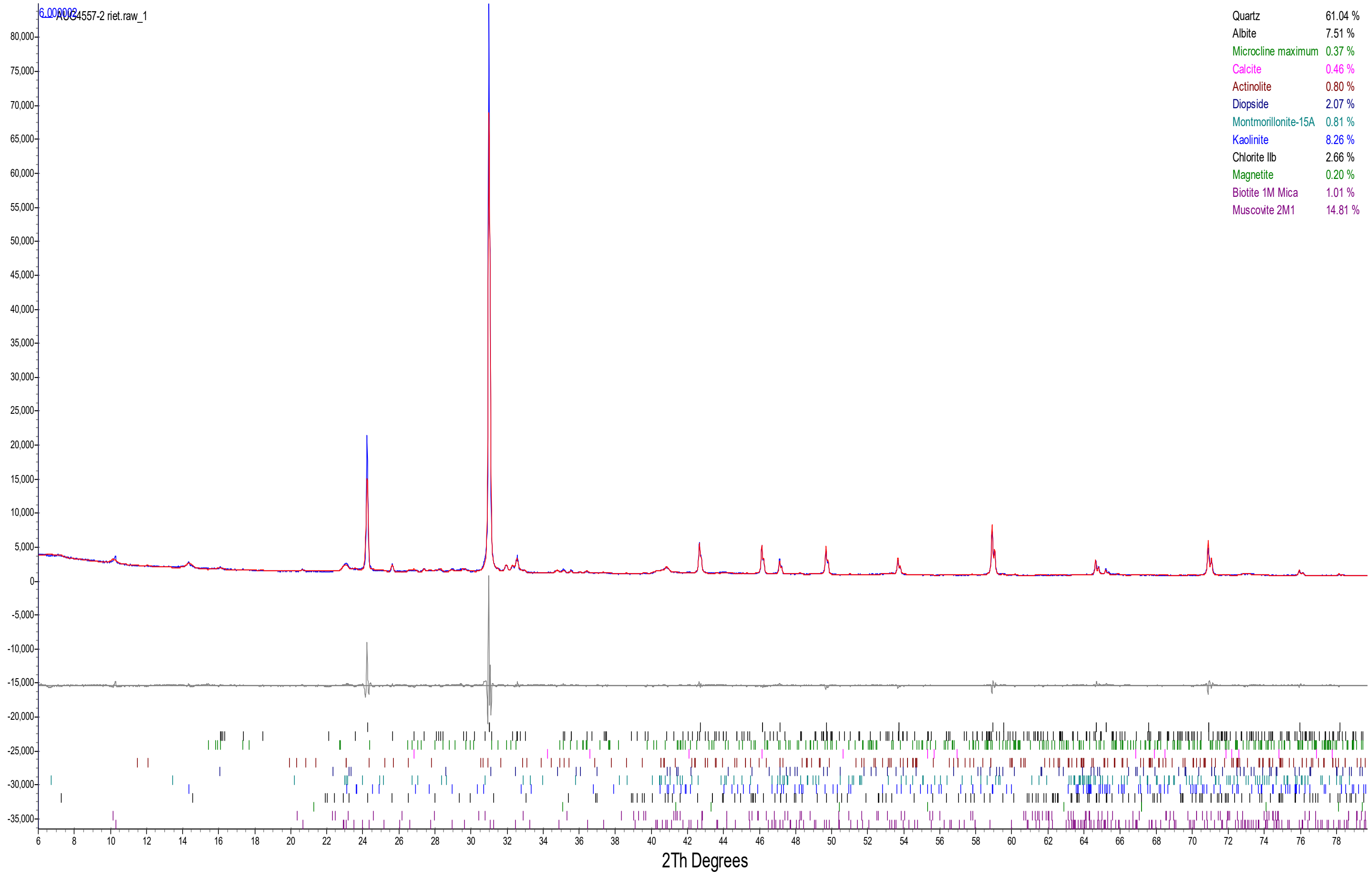
The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

Mineral/Compound	**Formula**
Quartz	SiO_2
Albite	$NaAlSi_3O_8$
Microcline	$KAlSi_3O_8$
Calcite	$CaCO_3$
Dolomite	$CaMg(CO_3)_2$
Ankerite	$CaFe(CO_3)_2$
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$
Diopside	$CaMgSi_2O_6$
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$
Kaolinite	$Al_2Si_2O_5(OH)_4$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Magnetite	Fe_3O_4
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2\cdot 10H_2O$
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$
Rhodochrosite	$MnCO_3$

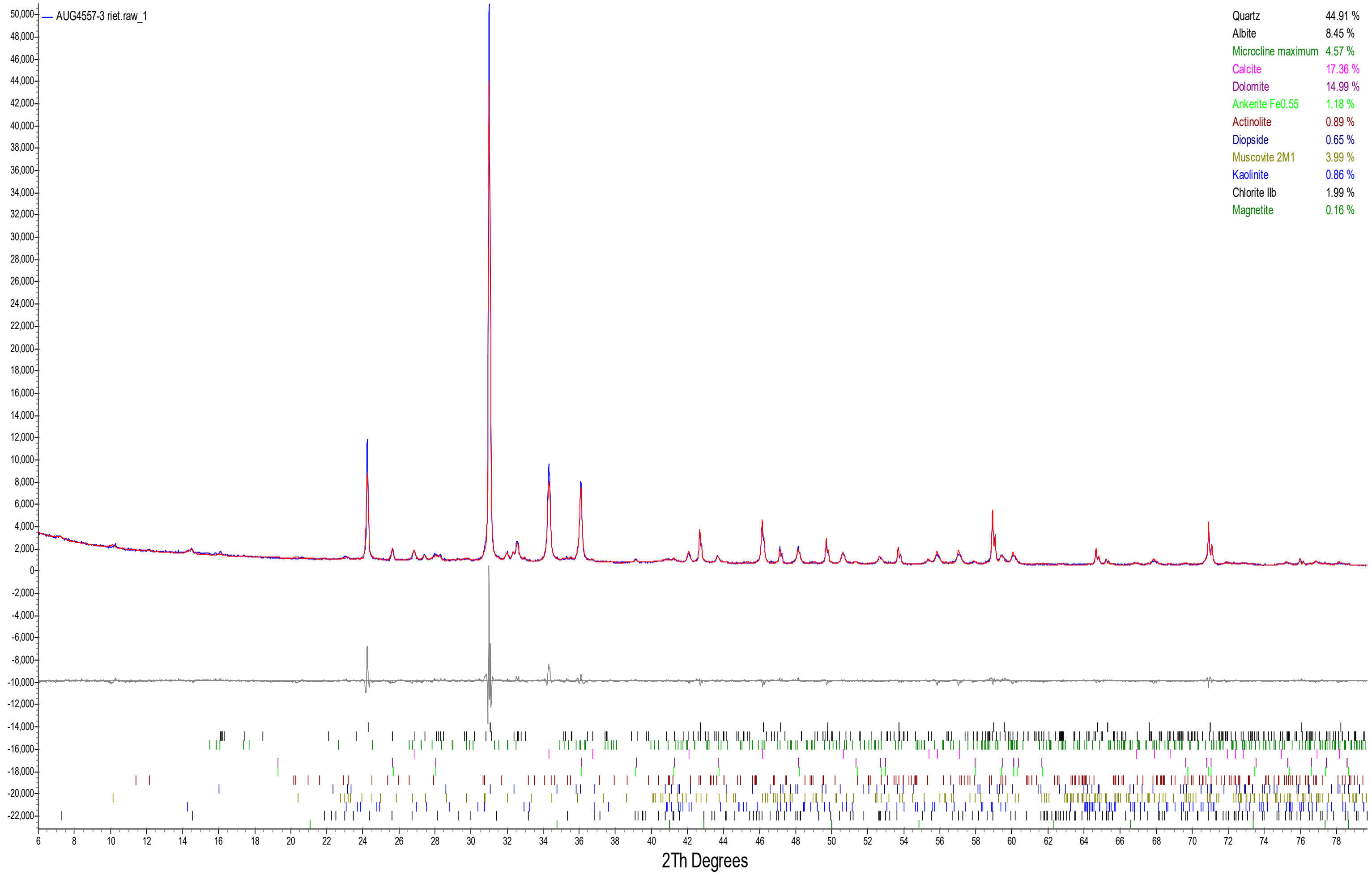
B23-1 43.5-45 20230711



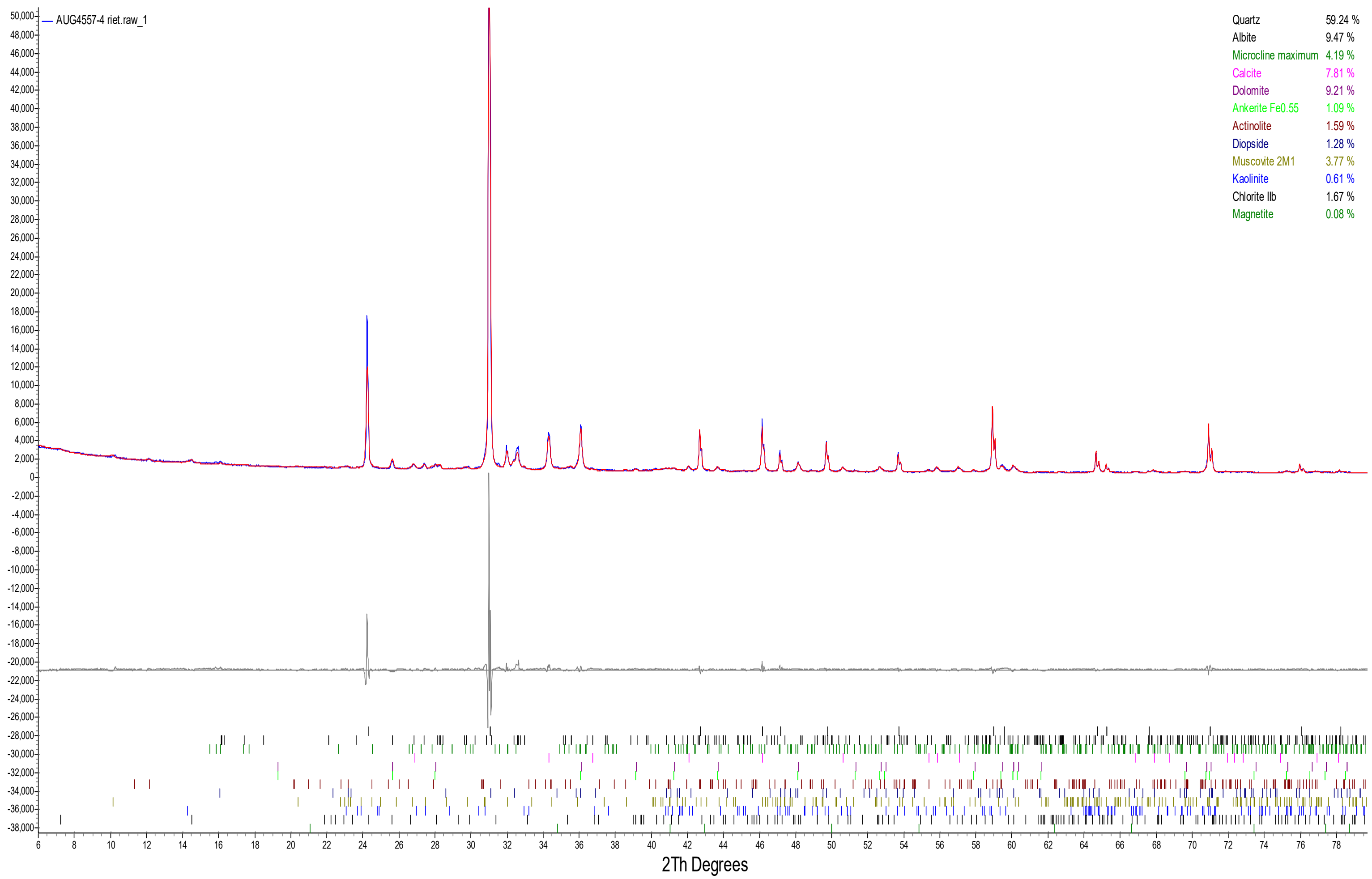
B23-12 31.5-33.5 20230712



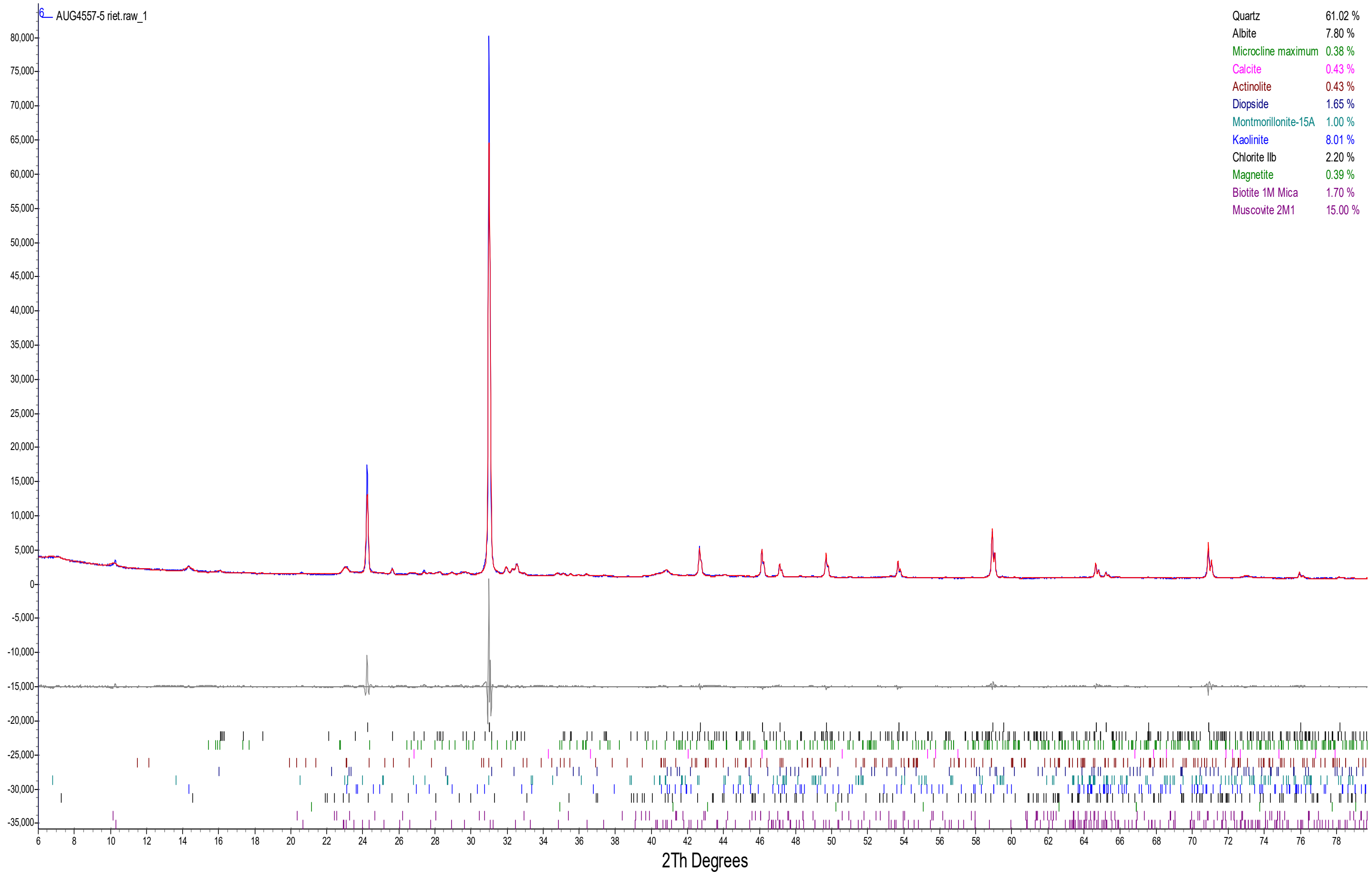
B23-12 38.5-39.8 20230712

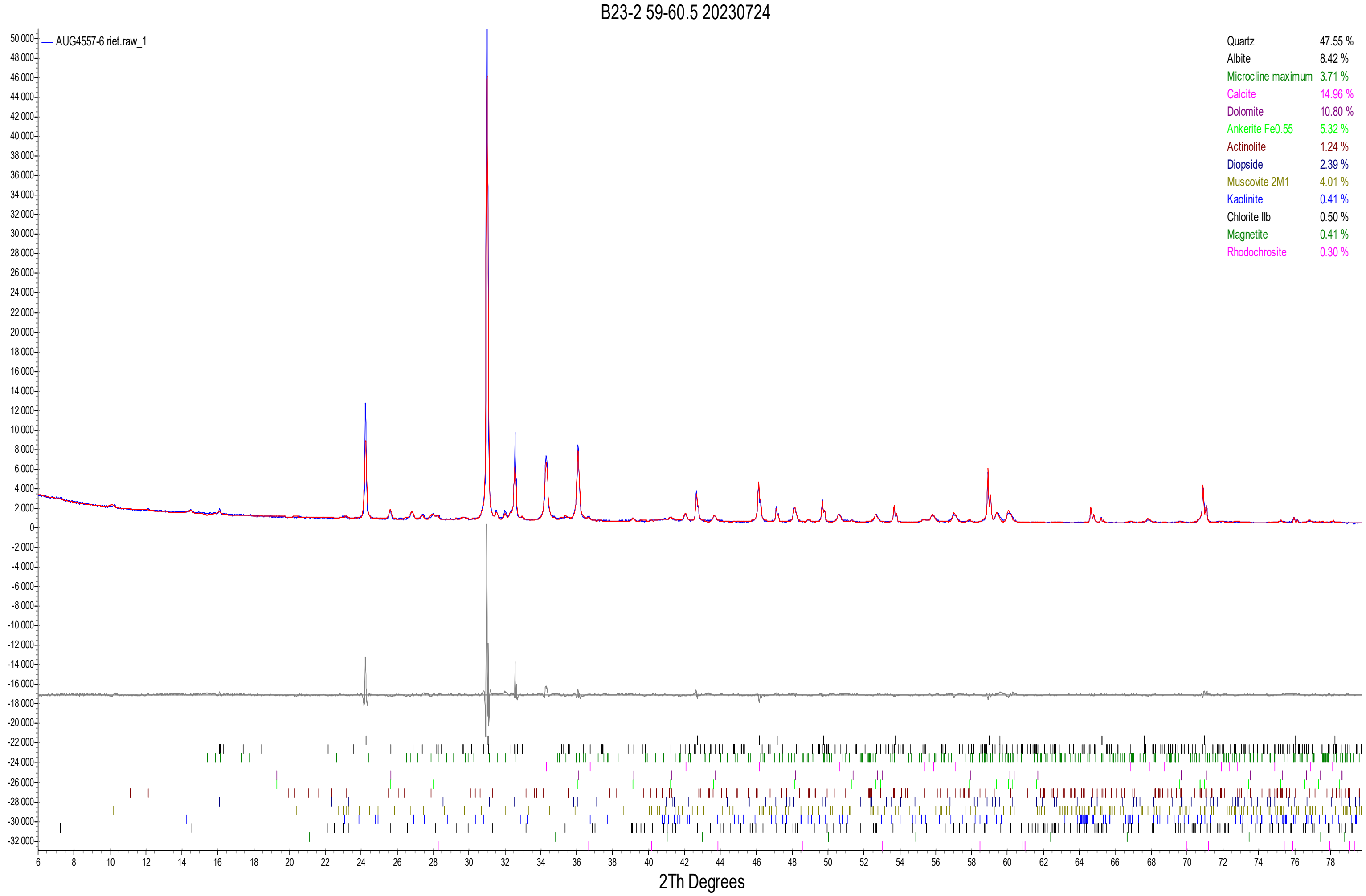


B23-12 51.5-53.5 20230712



B23-2 42-43.6 20230724




B23-2 59-60.5 20230724
AUG4557-6 riet.raw_1
Quartz 47.55 %
Albite 8.42 %
Microcline maximum 3.71 %
Calcite 14.96 %
Dolomite 10.80 %
Ankerite Fe0.55 5.32 %
Actinolite 1.24 %
Diopside 2.39 %
Muscovite 2M1 4.01 %
Kaolinite 0.41 %
Chlorite IIb 0.50 %
Magnetite 0.41 %
Rhodochrosite 0.30 %
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2Th Degrees

Trace Metals - Strong Acid Digest, ICP-MS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#GLP8066

06-October-2023

Geosyntec Consultant
Attn : Allison Kreinberg/Brian Aces

2100 Commonwealth Boulevard, Suit 100
Ann Arbor, Michigan
48108, USA

Phone: 734-794-1545
Fax:

Date Rec. : 14 August 2023
LR Report: **CA19053-AUG23**
Reference: Miami Fort - PO#GLP8066

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: B23-1 43.5-45 20230711	6: B23-12 31.5-33.5 20230712	7: B23-12 38.5-39.8 20230712	8: B23-12 51.5-53.5 20230712
Sample Date & Time					07/11/2023 14:45	07/12/2023 14:15	07/12/2023 14:30	07/12/2023 14:45
Ag [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	< 0.5	< 0.5	< 0.5	< 0.5
Al [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	24000	57000	28000	25000
As [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	6.7	5.4	6.0	4.2
Ba [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	220	420	250	230
Be [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	0.67	2.0	0.78	0.69
Bi [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	< 0.09	0.17	< 0.09	< 0.09
Ca [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	77000	3500	97000	52000
Cd [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	0.06	0.25	0.10	0.08
Co [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	4.3	12	5.4	5.1
Cr [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	62	59	51	42
Cu [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	8.0	16	7.5	5.9
Fe [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	15000	26000	17000	15000
K [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	8200	15000	8700	8100
Li [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	13	42	17	14
Mg [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	14000	4800	22000	16000
Mn [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	600	550	650	380
Mo [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	3.0	1.8	2.4	2.3
Ni [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	10	25	12	11
Pb [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	7	18	8	7
Sb [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	0.2	0.5	0.2	0.1
Sn [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	< 6	6.6	< 6	< 6
Sr [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	170	74	160	110
Ti [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	1000	2500	1100	1400
Tl [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	0.22	0.56	0.24	0.21
U [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	1.2	3.1	1.4	1.3
V [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	24	65	27	29
Y [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	9.3	20	10	9.7
Zn [µg/g]	04-Oct-23	11:48	05-Oct-23	15:17	24	69	29	25

Trace Metals - Strong Acid Digest, ICP-MS

Project : PO#GLP8066

LR Report : **CA19053-AUG23**

Analysis	**9:** **B23-2 42-43.6** **20230724**	**10:** **B23-2 59-60.5** **20230724**
Sample Date & Time	07/24/2023 9:30	07/24/2023 11:00
Ag [µg/g]	< 0.5	< 0.5
Al [µg/g]	59000	27000
As [µg/g]	9.3	6.2
Ba [µg/g]	440	250
Be [µg/g]	2.0	0.73
Bi [µg/g]	0.17	< 0.09
Ca [µg/g]	3100	100000
Cd [µg/g]	0.19	0.11
Co [µg/g]	12	6.6
Cr [µg/g]	59	76
Cu [µg/g]	17	9.4
Fe [µg/g]	31000	14000
K [µg/g]	17000	8800
Li [µg/g]	39	14
Mg [µg/g]	4600	24000
Mn [µg/g]	390	660
Mo [µg/g]	1.9	4.8
Ni [µg/g]	25	14
Pb [µg/g]	19	8
Sb [µg/g]	< 0.8	< 0.8
Se [µg/g]	0.2	0.1
Sn [µg/g]	6.7	< 6
Sr [µg/g]	81	200
Ti [µg/g]	2700	960
Tl [µg/g]	0.60	0.30
U [µg/g]	2.8	1.5
V [µg/g]	69	25
Y [µg/g]	21	9.6
Zn [µg/g]	68	28

Catharine Arnold

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
CATHARINE ARNOLD
CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

ATTACHMENT 6

Iron Pourbaix Diagrams

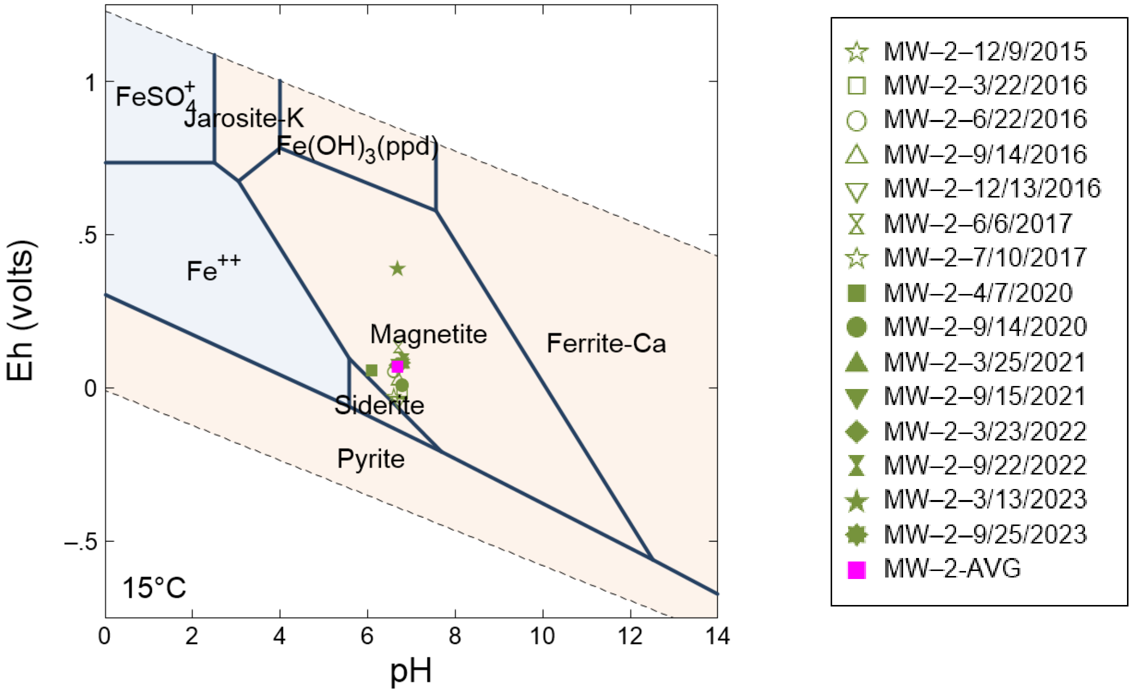


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-3.332}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.694}$, a [Cl^-] = $10^{-3.119}$, a [Na^+] = $10^{-3.192}$, a [K^+] = $10^{-4.494}$, a [HCO_3^-] = $10^{-2.273}$, a [SO_4^{--}] = $10^{-3.703}$, a [$As(OH)_4^-$] = $10^{-6.357}$, a [Mn^{++}] = $10^{-5.179}$; Suppressed: Goethite, Hematite, Scorodite

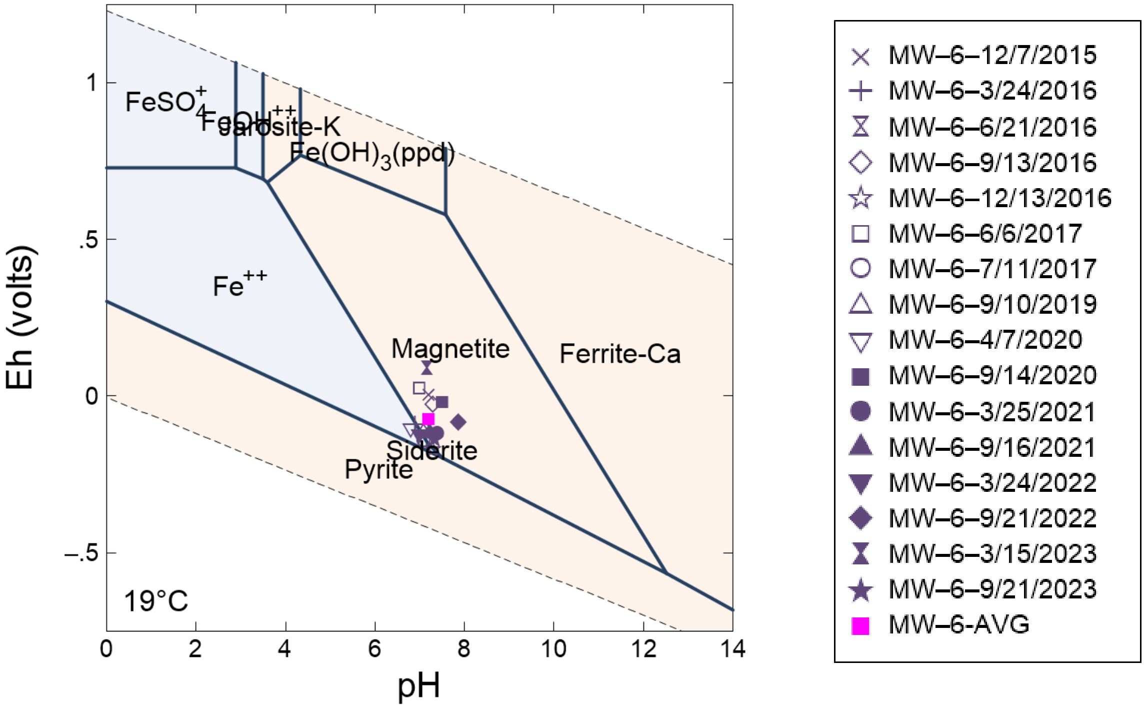


Diagram Fe^{++}, T = 19 °C , P = 1.013 bars, a [main] = $10^{-4.981}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.994}$, a [Cl^-] = $10^{-2.099}$, a [Na^+] = $10^{-2.653}$, a [K^+] = $10^{-3.796}$, a [HCO_3^-] = $10^{-2.302}$, a [SO_4^{--}] = $10^{-3.492}$, a [$As(OH)_4^-$] = $10^{-6.959}$, a [Mn^{++}] = $10^{-4.666}$; Suppressed: Goethite, Hematite, Scorodite

Notes: Groundwater samples from monitoring wells MW-2 and MW-6 which contain analytical results for all major ions are plotted on the Pourbaix diagrams with the average result.

Iron Pourbaix Diagrams
Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
X

Columbus, Ohio
March 2024

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Appendices**

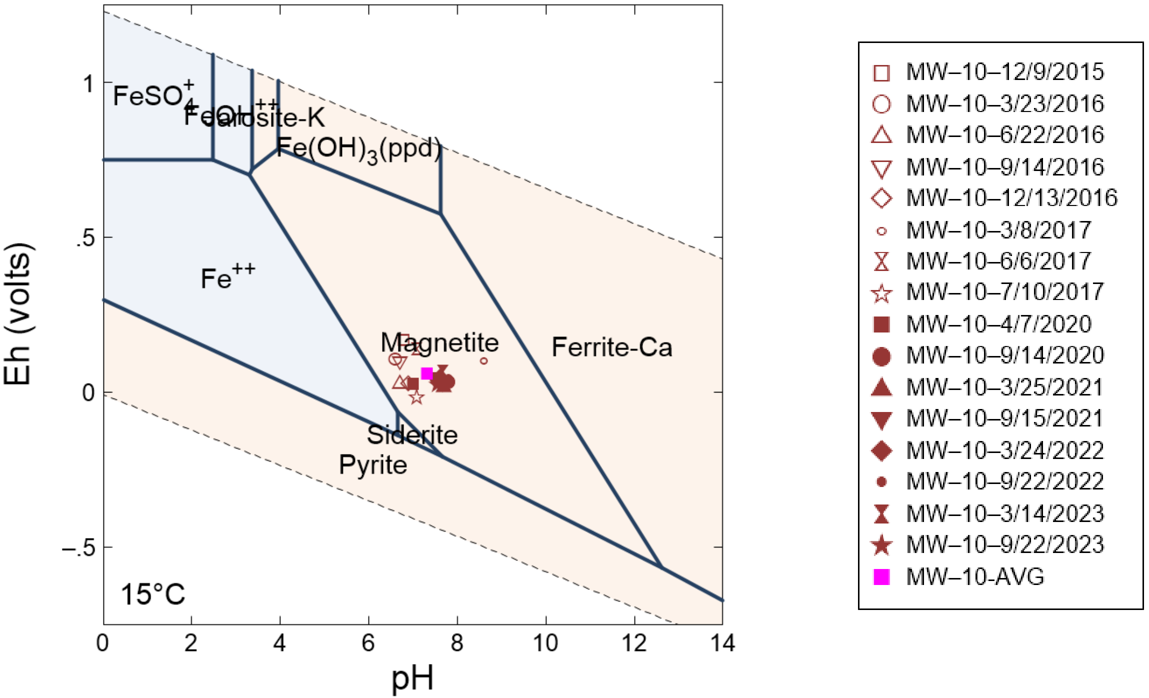


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-4.}$[illegible], a [H_2O] = 1, a [Ca^{++}] = $10^{-2.827}$, a [Cl^-] = $10^{-3.129}$, a [Na^+] = $10^{-3.085}$, a [K^+] = $10^{-4.124}$, a [HCO_3^-] = $10^{-2.31}$, a [SO_4^{--}] = $10^{-3.961}$, a [$As(OH)_4^-$] = $10^{-6.357}$, a [Mn^{++}] = $10^{-5.179}$; Suppressed: Goethite, Hematite, Scorodite

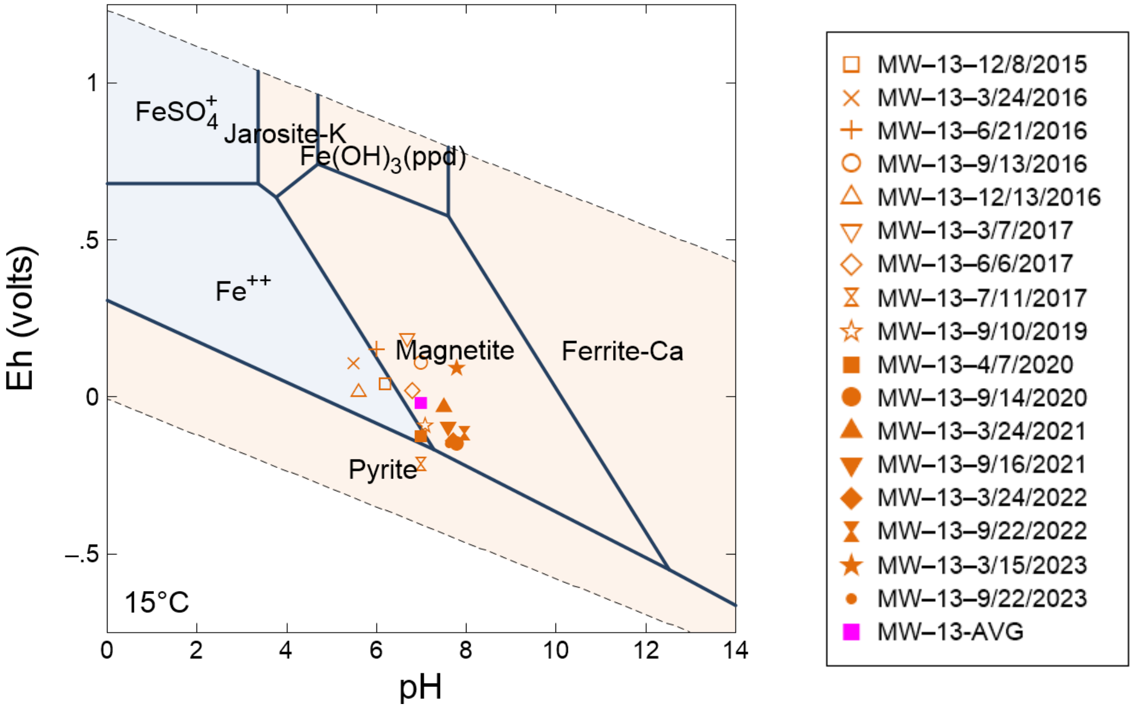


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-4.783}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.787}$, a [Cl^-] = $10^{-3.163}$, a [Na^+] = $10^{-2.979}$, a [K^+] = $10^{-4.375}$, a [HCO_3^-] = $10^{-2.973}$, a [SO_4^{--}] = $10^{-2.699}$, a [$As(OH)_4^-$] = $10^{-6.888}$, a [Mn^{++}] = $10^{-6.197}$; Suppressed: Goethite, Hematite, Scorodite

Notes: Groundwater samples from monitoring wells MW-10 and MW-13 which contain analytical results for all major ions are plotted on the Pourbaix diagrams with the average result.

Iron Pourbaix Diagrams
Miami Fort Pond System
North Bend, Ohio

Geosyntec
consultants

Figure
X

Columbus, Ohio
March 2024

\\stlouisms-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**

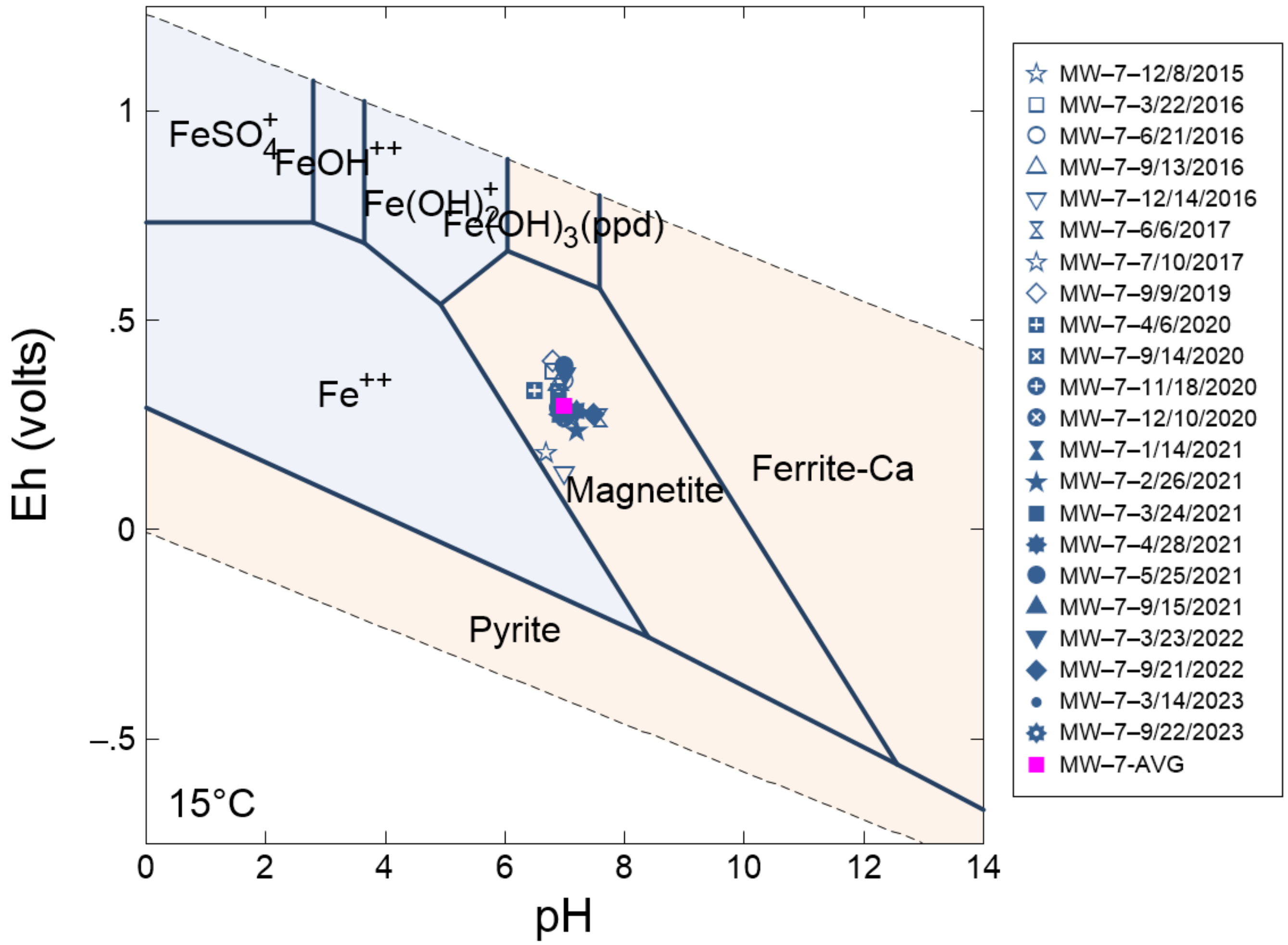


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-6.761}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.767}$, a [Cl^-] = $10^{-3.767}$, a [Na^+] = $10^{-3.77}$, a [K^+] = $10^{-4.407}$, a [HCO_3^-] = $10^{-2.376}$, a [SO_4^{--}] = $10^{-3.632}$, a [$As(OH)_4^-$] = $10^{-7.697}$, a [Mn^{++}] = $10^{-6.955}$; Suppressed: Goethite, Hematite, Scorodite

\\stlouisms-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**

Notes: Groundwater samples from monitoring well MW-7 which contain analytical results for all major ions are plotted on the Pourbaix diagram with the average result.

Iron Pourbaix Diagrams
Miami Fort Pond System
North Bend, Ohio

Geosyntec
consultants

Figure
X

Columbus, Ohio
March 2024

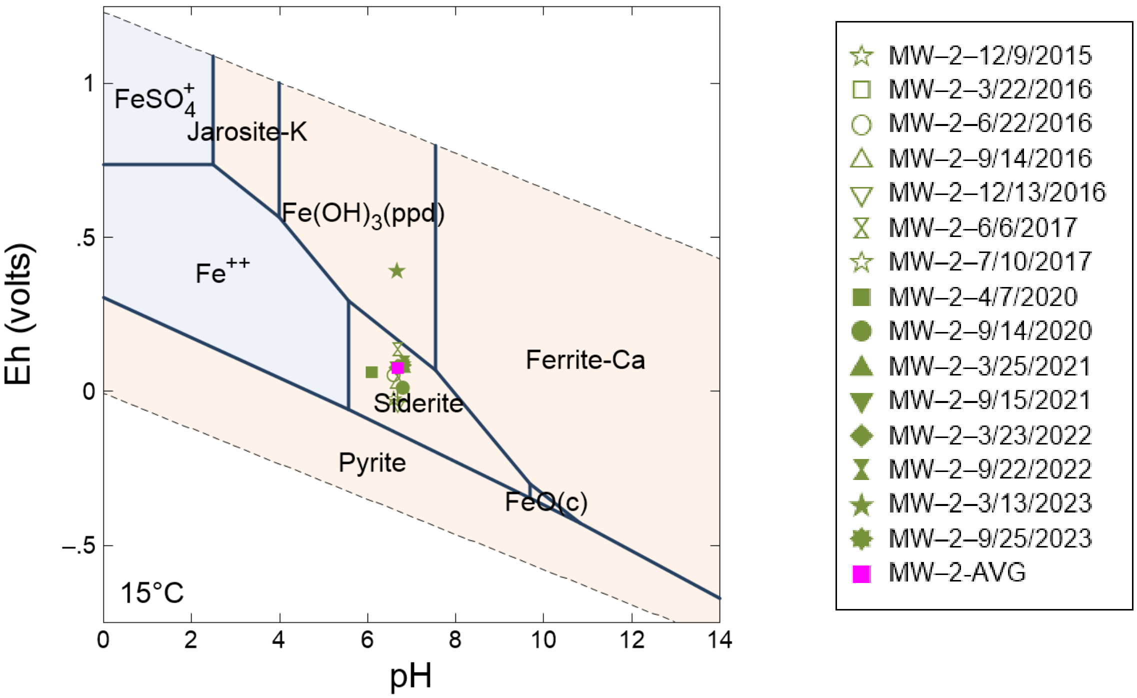


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-3.332}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.694}$, a [Cl^-] = $10^{-3.119}$, a [Na^+] = $10^{-3.192}$, a [K^+] = $10^{-4.494}$, a [HCO_3^-] = $10^{-2.273}$, a [SO_4^{--}] = $10^{-3.703}$, a [$As(OH)_4^-$] = $10^{-6.357}$, a [Mn^{++}] = $10^{-5.179}$; Suppressed: Goethite, Hematite, Magnetite, Scorodite

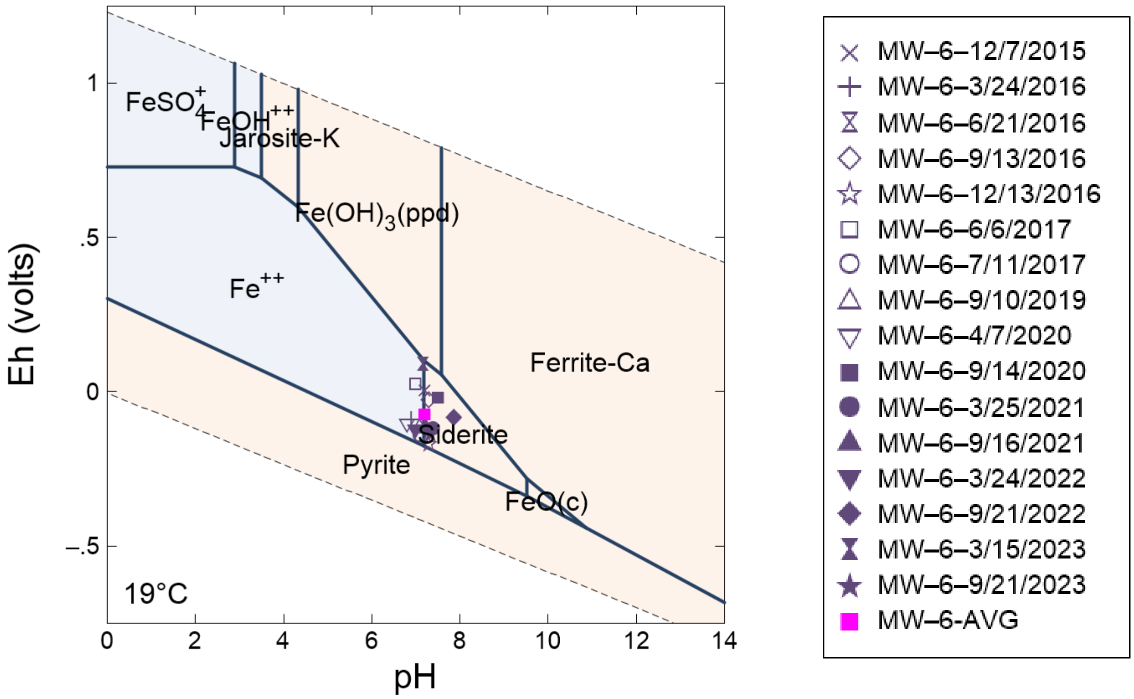


Diagram Fe^{++}, T = 19 °C , P = 1.013 bars, a [main] = $10^{-4.981}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.994}$, a [Cl^-] = $10^{-2.099}$, a [Na^+] = $10^{-2.653}$, a [K^+] = $10^{-3.796}$, a [HCO_3^-] = $10^{-2.302}$, a [SO_4^{--}] = $10^{-3.492}$, a [$As(OH)_4^-$] = $10^{-6.959}$, a [Mn^{++}] = $10^{-4.666}$; Suppressed: Goethite, Hematite, Magnetite, Scorodite

Notes: Groundwater samples from monitoring wells MW-2 and MW-6 which contain analytical results for all major ions are plotted on the Pourbaix diagrams with the average result.

Iron Pourbaix Diagrams (Magnetite Suppressed)
Miami Fort Pond System
North Bend, Ohio

Geosyntec
consultants

Figure
X

Columbus, Ohio

April 2024

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Appendices**

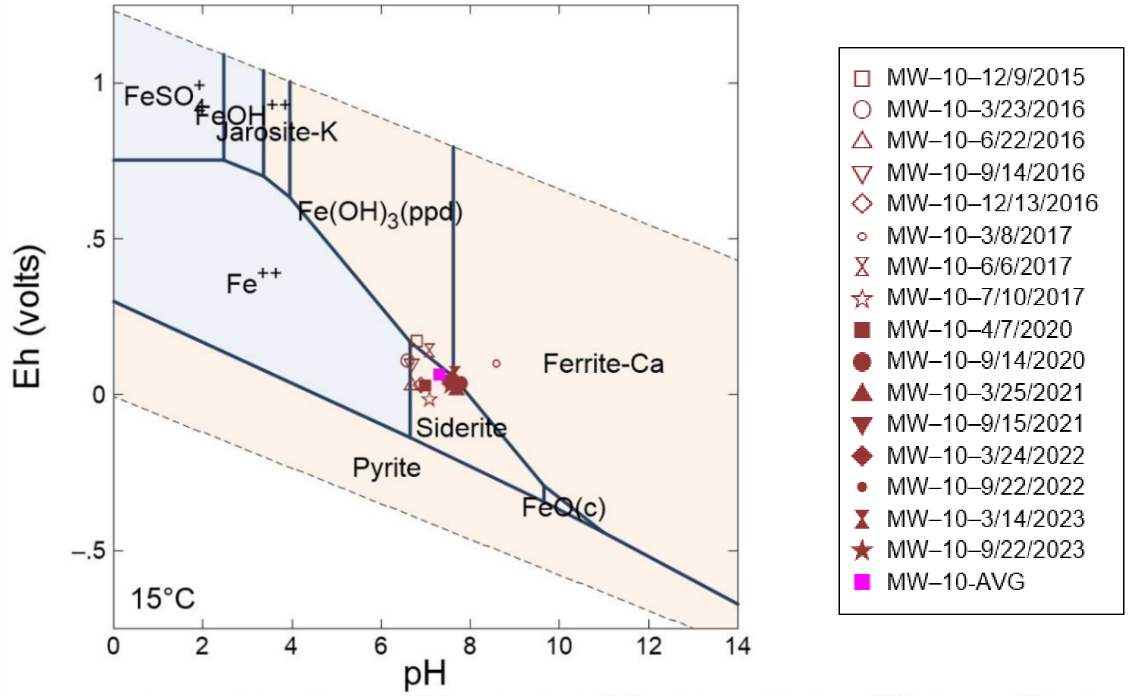


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-4.379}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.827}$, a [Cl$^-$] = $10^{-3.129}$, a [Na$^+$] = $10^{-3.085}$, a [K$^+$] = $10^{-4.124}$, a [HCO$_3^-$] = $10^{-2.31}$, a [SO$_4^{--}$] = $10^{-3.961}$, a [As(OH)$_4^-$] = $10^{-6.357}$, a [Mn^{++}] = $10^{-5.179}$; Suppressed: Goethite, Hematite, Magnetite, Scorodite

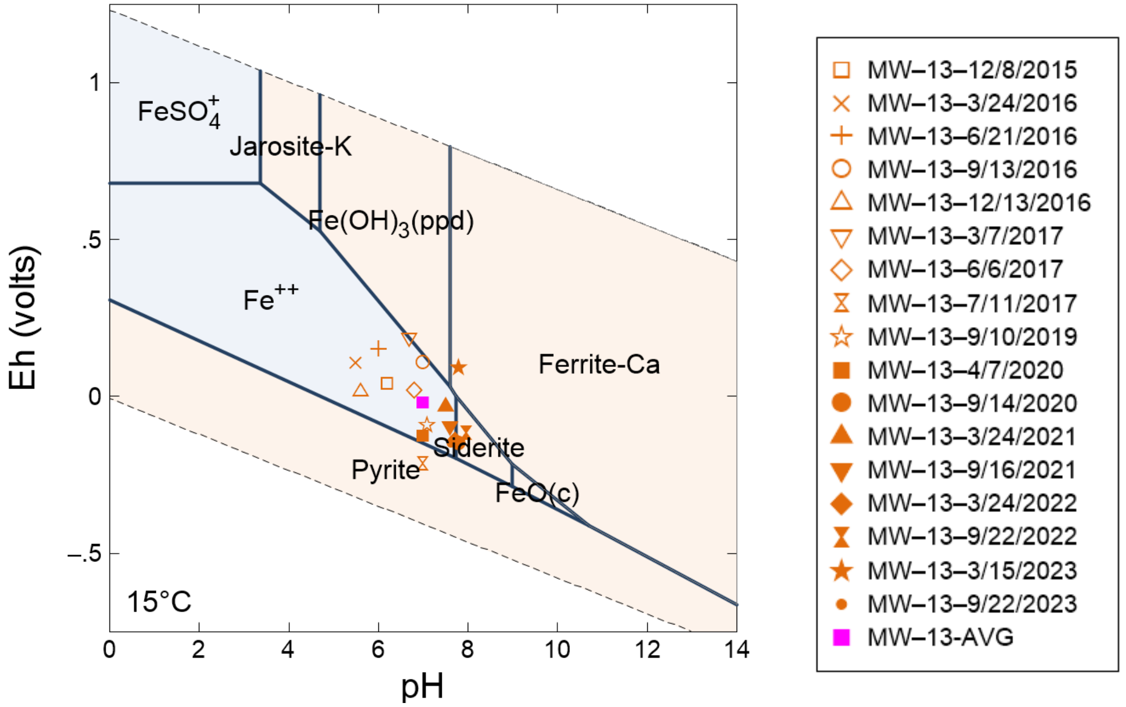


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-4.783}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.787}$, a [Cl$^-$] = $10^{-3.163}$, a [Na$^+$] = $10^{-2.979}$, a [K$^+$] = $10^{-4.375}$, a [HCO$_3^-$] = $10^{-2.973}$, a [SO$_4^{--}$] = $10^{-2.699}$, a [As(OH)$_4^-$] = $10^{-6.888}$, a [Mn^{++}] = $10^{-6.197}$; Suppressed: Goethite, Hematite, Magnetite, Scorodite

Notes: Groundwater samples from monitoring wells MW-10 and MW-13 which contain analytical results for all major ions are plotted on the Pourbaix diagrams with the average result.

Iron Pourbaix Diagrams (Magnetite Suppressed)

Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
X

Columbus, Ohio

April 2024

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**

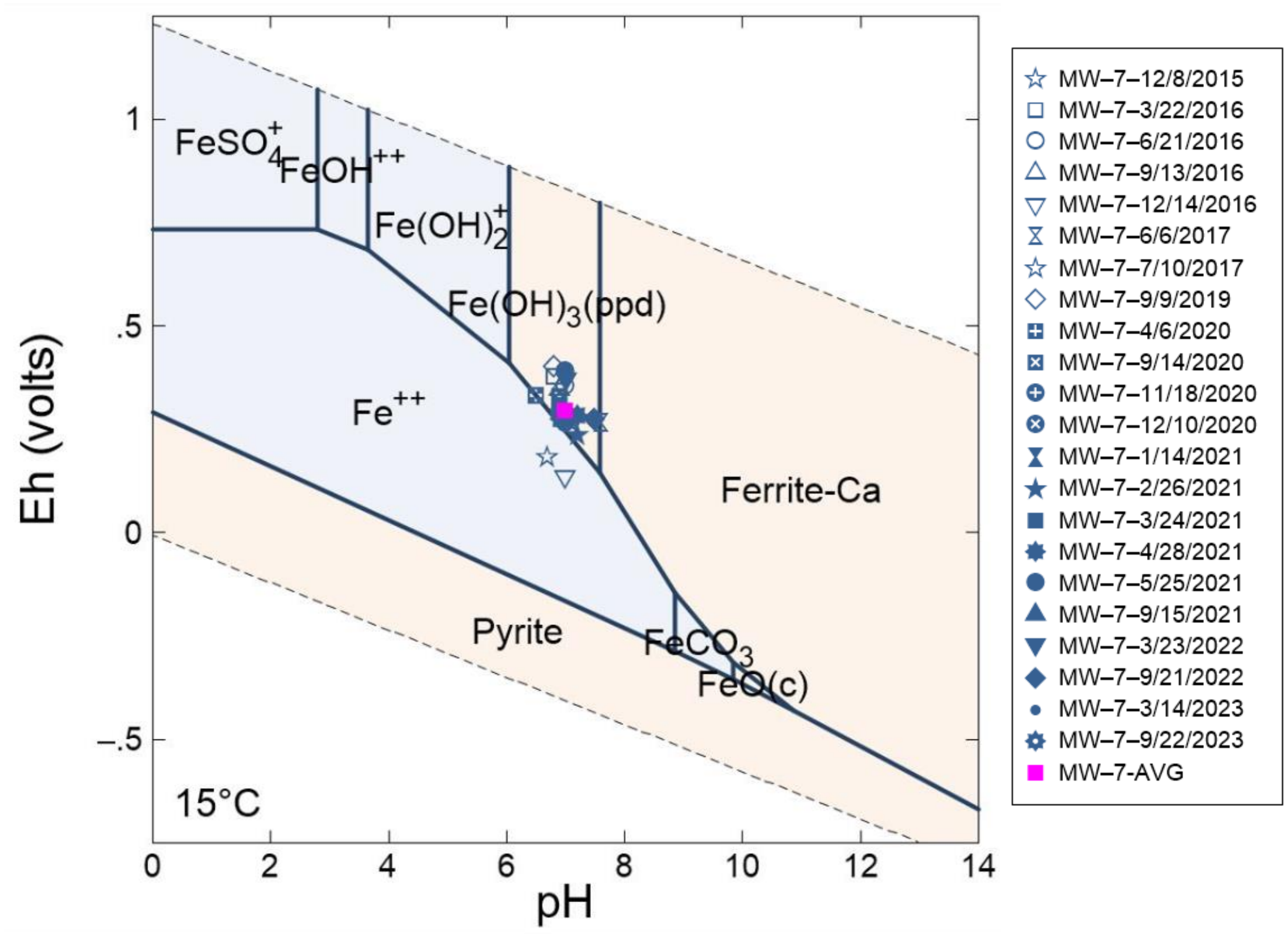


Diagram Fe^{++}, T = 15 °C , P = 1.013 bars, a [main] = $10^{-6.761}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.767}$, a [Cl^-] = $10^{-3.767}$, a [Na^+] = $10^{-3.77}$, a [K^+] = $10^{-4.407}$, a [HCO_3^-] = $10^{-2.376}$, a [SO_4^{--}] = $10^{-3.632}$, a [$As(OH)_4^-$] = $10^{-7.697}$, a [Mn^{++}] = $10^{-6.955}$; Suppressed: Goethite, Hematite, Magnetite, Scorodite

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**

Notes: Groundwater samples from monitoring well MW-7 which contain analytical results for all major ions are plotted on the Pourbaix diagram with the average result.

Iron Pourbaix Diagrams (Magnetite Suppressed)

Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
X

Columbus, Ohio

April 2024

ATTACHMENT 7

Arsenic Pourbaix Diagrams

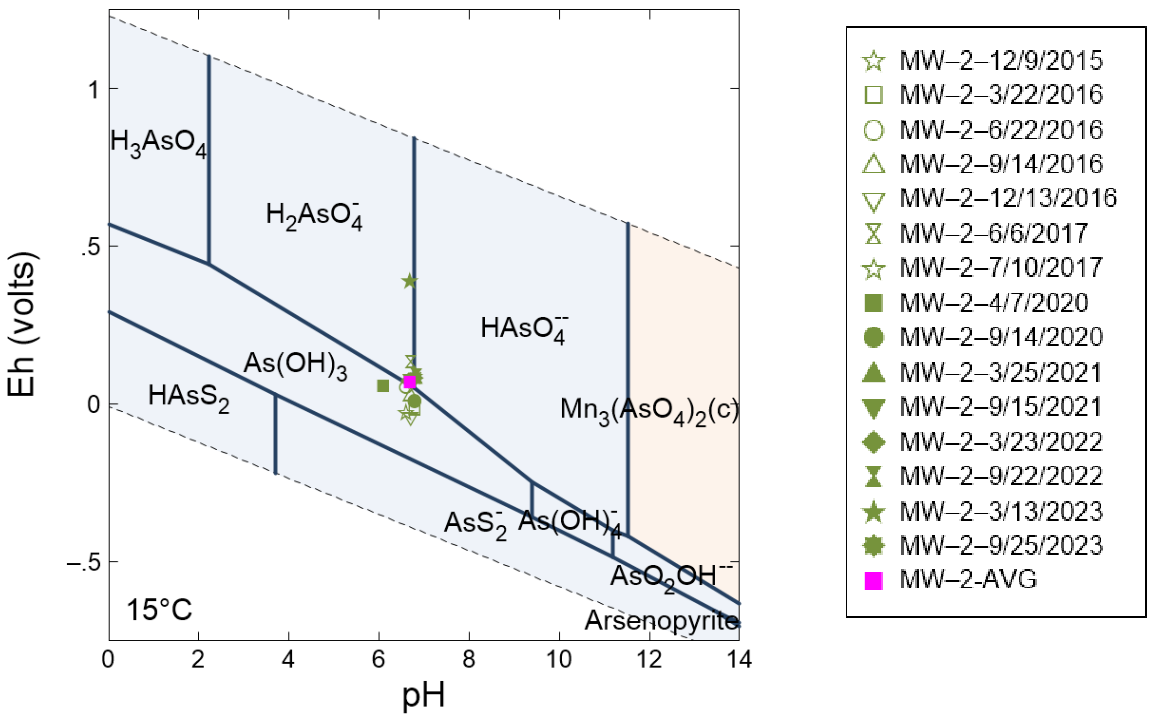


Diagram $As(OH)_4^-$ T = 15 °C , P = 1.013 bars, a [main] = $10^{-6.357}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.694}$, a [Cl^-] = $10^{-3.119}$, a [Na^+] = $10^{-3.192}$, a [K^+] = $10^{-4.494}$, a [HCO_3^-] = $10^{-2.273}$, a [Fe^{++}] = $10^{-3.332}$, a [SO_4^{--}] = $10^{-3.703}$, a [Mn^{++}] = $10^{-5.179}$; Suppressed: Orpiment, Realgar, Scorodite

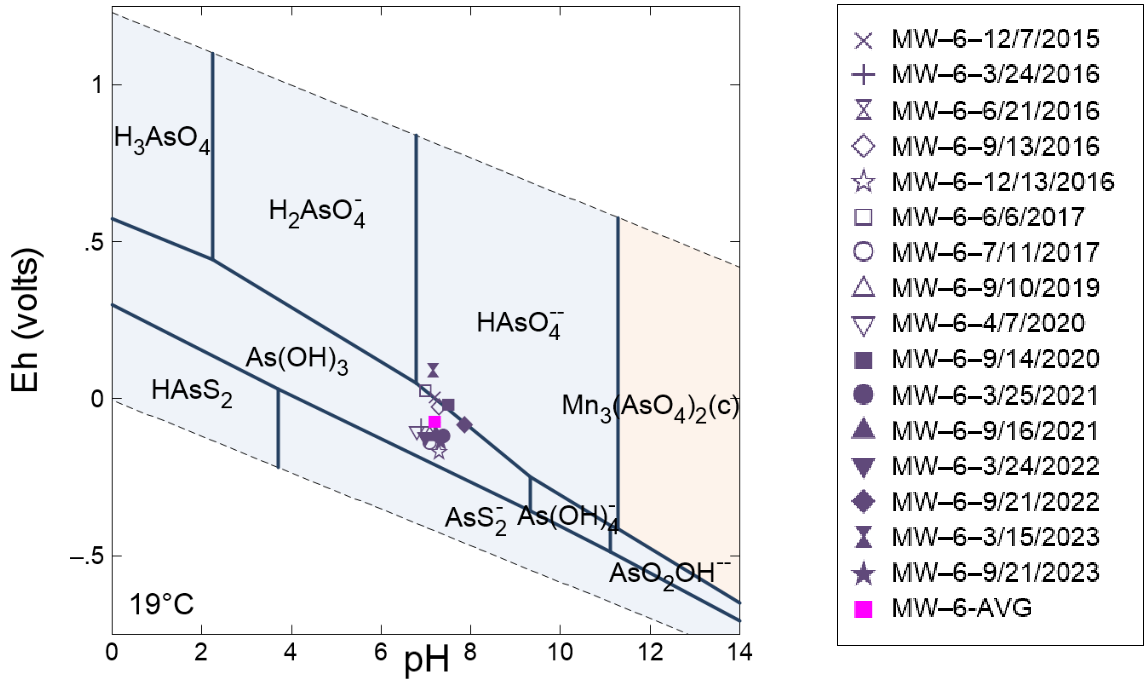


Diagram $As(OH)_4^-$ T = 19 °C , P = 1.013 bars , a [main] = $10^{-6.959}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.994}$, a [Cl^-] = $10^{-2.099}$, a [Na^+] = $10^{-2.653}$, a [K^+] = $10^{-3.796}$, a [HCO_3^-] = $10^{-2.302}$, a [Fe^{++}] = $10^{-4.981}$, a [SO_4^{--}] = $10^{-3.492}$, a [Mn^{++}] = $10^{-4.666}$, Suppressed: Orpiment, Realgar, Scorodite

Notes: Groundwater samples from monitoring wells MW-2 and MW-6 which contain analytical results for all major ions are plotted on the Pourbaix diagrams with the average result.

Arsenic Pourbaix Diagrams

Miami Fort Pond System
North Bend, Ohio

Geosyntec
consultants

Figure
X

Columbus, Ohio

March 2024

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 ASD Update\Report\Appendices

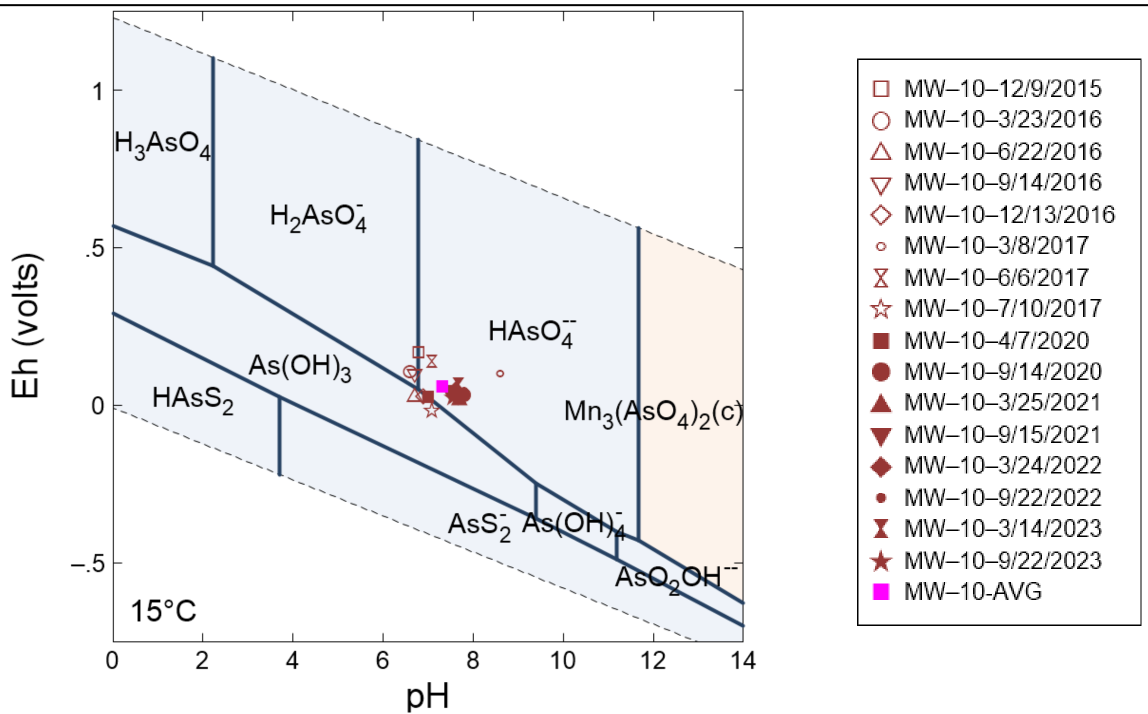


Diagram $As(OH)_4^-$, T = 15 °C , P = 1.013 bars, a [main] = $10^{-6.504}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.827}$, a [Cl^-] = $10^{-3.129}$, a [Na^+] = $10^{-3.085}$, a [K^+] = $10^{-4.124}$, a [HCO_3^-] = $10^{-2.31}$, a [Fe^{++}] = $10^{-4.379}$, a [SO_4^{--}] = $10^{-3.961}$, a [Mn^{++}] = $10^{-5.186}$,

Suppressed: Orpiment, Realgar, Scorodite

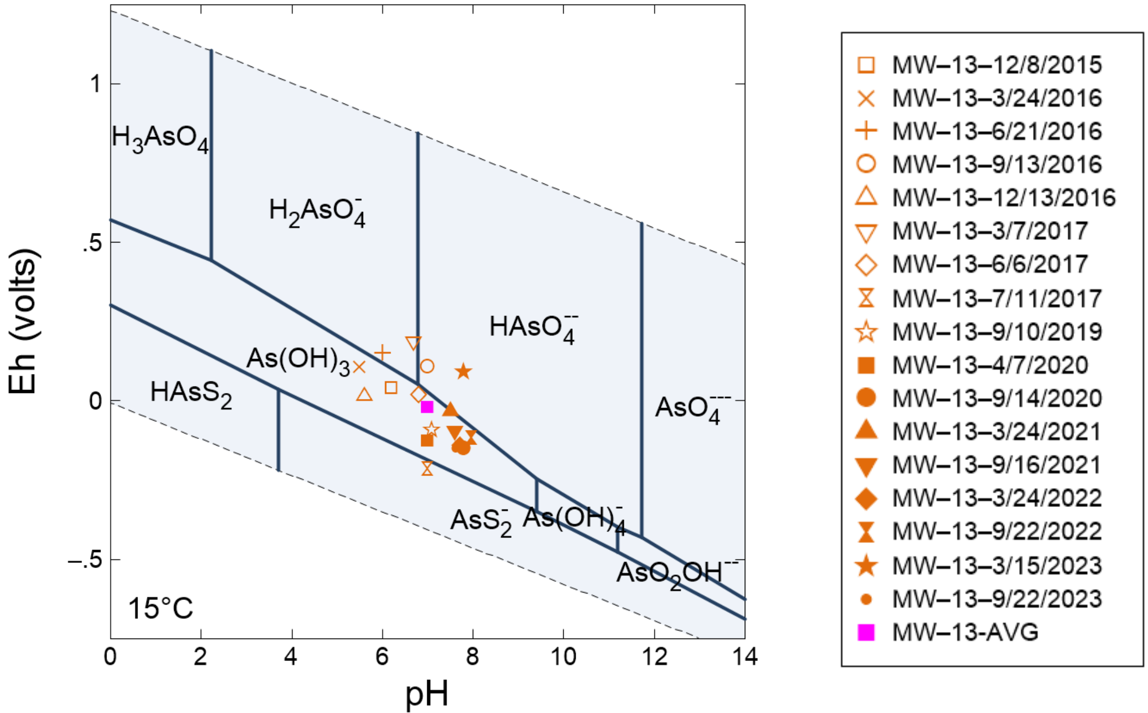


Diagram $As(OH)_4^-$, T = 15 °C , P = 1.013 bars, a [main] = $10^{-[illegible]}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.787}$, a [Cl^-] = $10^{-3.163}$, a [Na^+] = $10^{-2.979}$, a [K^+] = $10^{-4.375}$, a [HCO_3^-] = $10^{-2.973}$, a [Fe^{++}] = $10^{-4.783}$, a [SO_4^{--}] = $10^{-2.699}$, a [Mn^{++}] = $10^{-6.197}$, a [Mg^{++}] = $10^{-3.088}$,

Suppressed: Orpiment, Realgar, Scorodite

Notes: Groundwater samples from monitoring wells MW-10 and MW-13 which contain analytical results for all major ions are plotted on the Pourbaix diagrams with the average result.

Arsenic Pourbaix Diagrams

Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
X

Columbus, Ohio

March 2024

\\stlouisms-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**

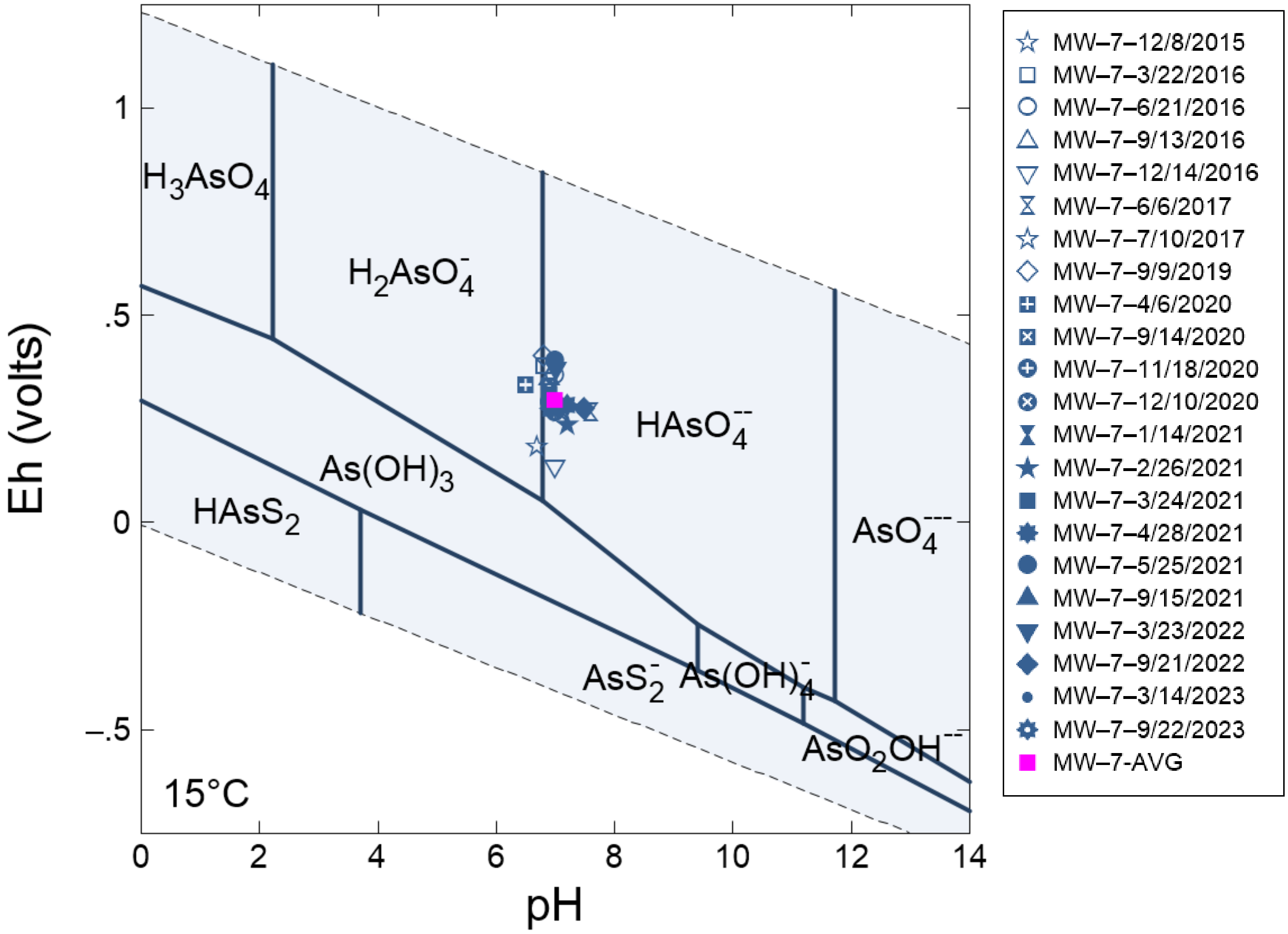


Diagram $As(OH)_4^-$, T = 15 °C , P = 1.013 bars, a [main] = $10^{-7.697}$, a [H_2O] = 1, a [Ca^{++}] = $10^{-2.767}$, a [Cl^-] = $10^{-3.767}$, a [Na^+] = $10^{-3.77}$, a [K^+] = $10^{-4.407}$, a [HCO_3^-] = $10^{-2.376}$, a [Fe^{++}] = $10^{-6.761}$, a [SO_4^{--}] = $10^{-3.632}$, a [Mn^{++}] = $10^{-6.955}$; Suppressed: Orpiment, Realgar, Scorodite

\\stlouismo-01\company\Projects_post_2014\GLP8003_Miami Fort_Vistra MNA Evaluations\2023-08 **ASD Update\Report\Figures**

Notes: Groundwater samples from monitoring well MW-7 which contain analytical results for all major ions are plotted on the Pourbaix diagram with the average result.

Arsenic Pourbaix Diagrams

Miami Fort Pond System
North Bend, Ohio

Geosyntec
consultants

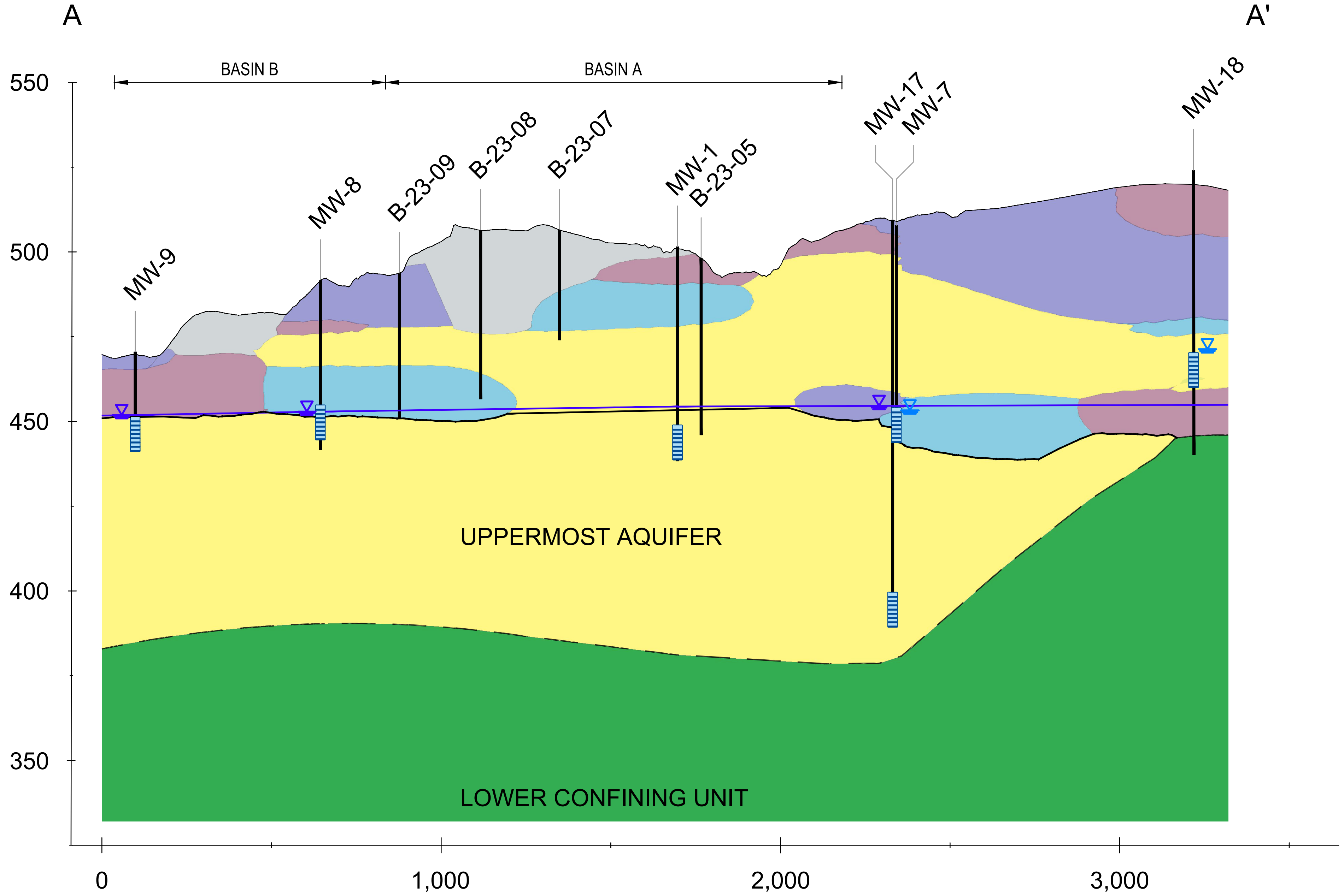
Figure
X

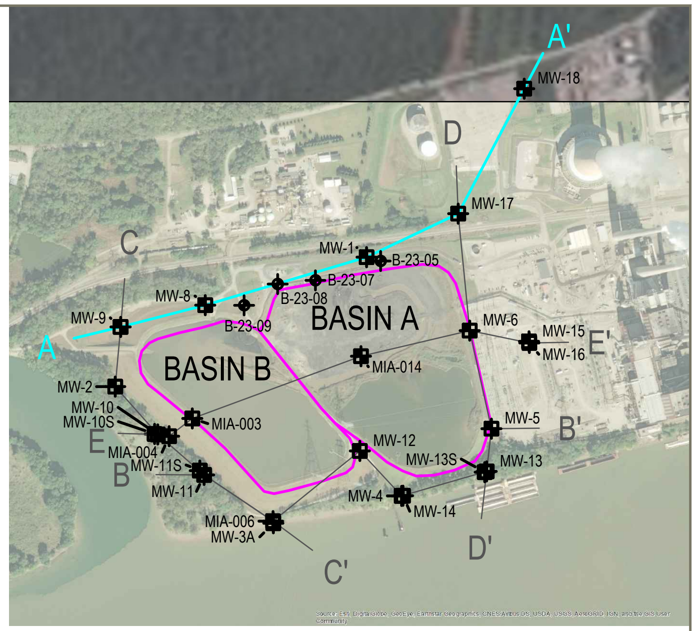
Columbus, Ohio

March 2024

APPENDIX C
GEOLOGIC CROSS-SECTIONS

PROJECT: ####   DATED: 2/3/2025   DESIGNER: LEMMONBN   C:\DC\ACCDocs\Ramboll Gruppen AS\RUS-1940104036 Miami Fort\Project Files\4 Delivery\40 WIP\400 Environmental\Drawings\Miami Fort Cross Sections.dwg





LEGEND

- ▨ COAL COMBUSTION RESIDUALS (CCR)
- ▨ FILL
- ▨ CLAY (CL/CH)
- ▨ SILT (ML)
- ▨ SILT AND FINE SAND
- ▨ SAND AND GRAVEL (SP/SM/SW)
- ▨ BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)

- ▤ WELL SCREEN INTERVAL
- ▽ UPPER AQUIFER POTENTIOMETRIC SURFACE
- ▽ MONITORING WELL DEPTH TO WATER

40'
0
400'

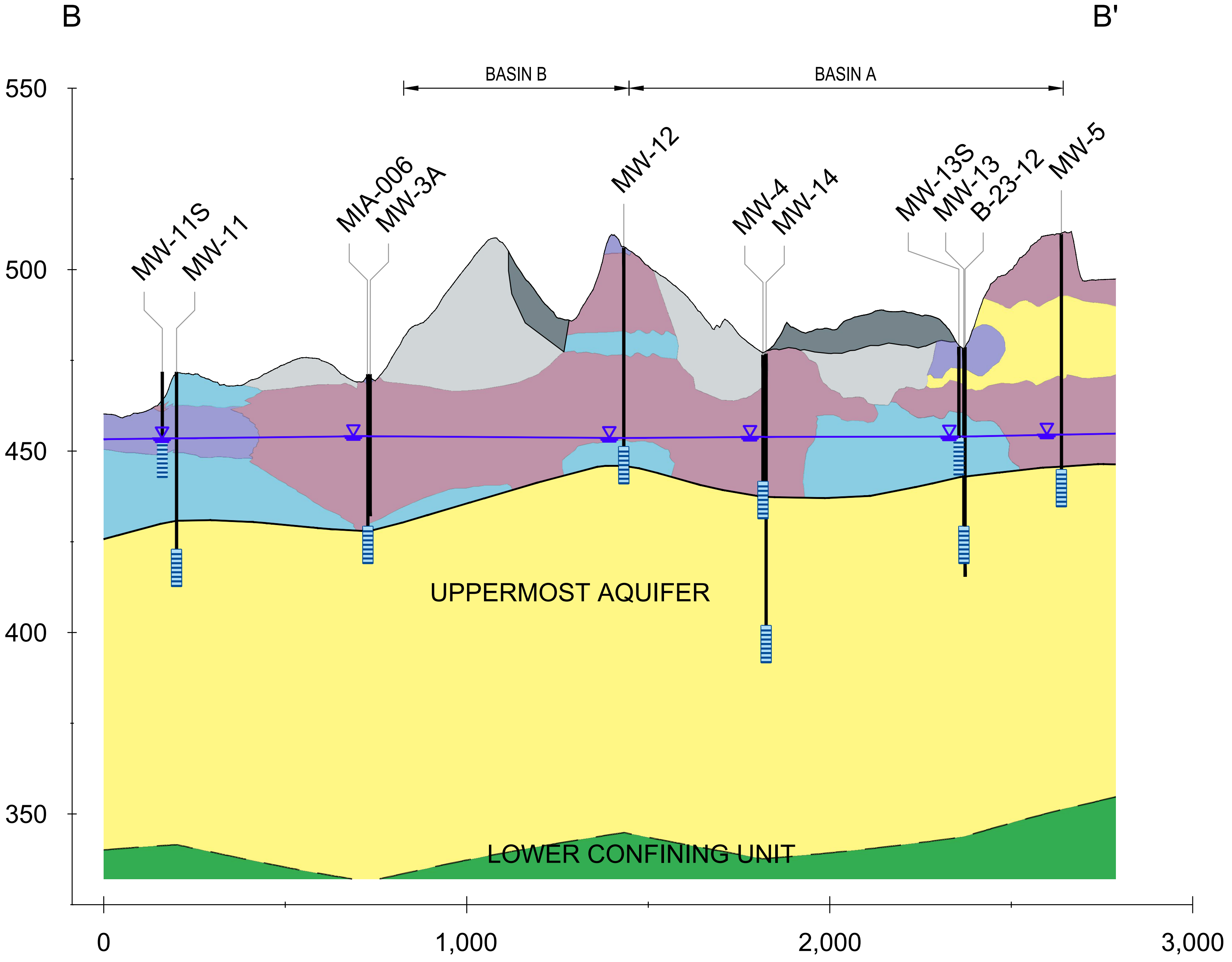
GEOLOGIC CROSS SECTION A-A'

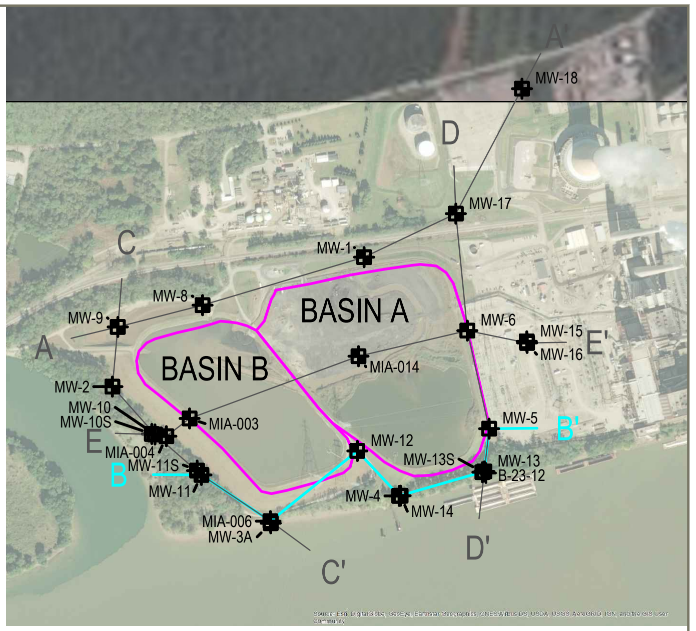
MIAMI FORT ASH PONDS
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

RAMBOLL

PROJECT: #### DATED: 2/3/2025 DESIGNER: LEMMONBN C:\DC\ACCDocs\Ramboll Gruppen AS\RUS-1940104036 Miami Fort\Project Files\4 Delivery\40 WIP\400 Environmental\Drawings\Miami Fort Cross Sections.dwg



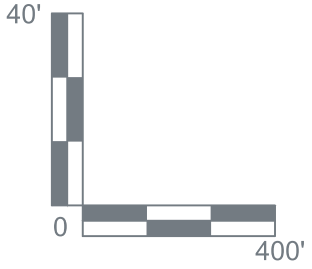


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

▨ COAL COMBUSTION RESIDUALS (CCR)
▨ FILL
▨ CLAY (CL/CH)
▨ SILT (ML)
▨ SILT AND FINE SAND
▨ SAND AND GRAVEL (SP/SM/SW)
▨ BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)

▤ WELL SCREEN INTERVAL
▽ UPPER AQUIFER POTENTIOMETRIC SURFACE
▽ MONITORING WELL DEPTH TO WATER



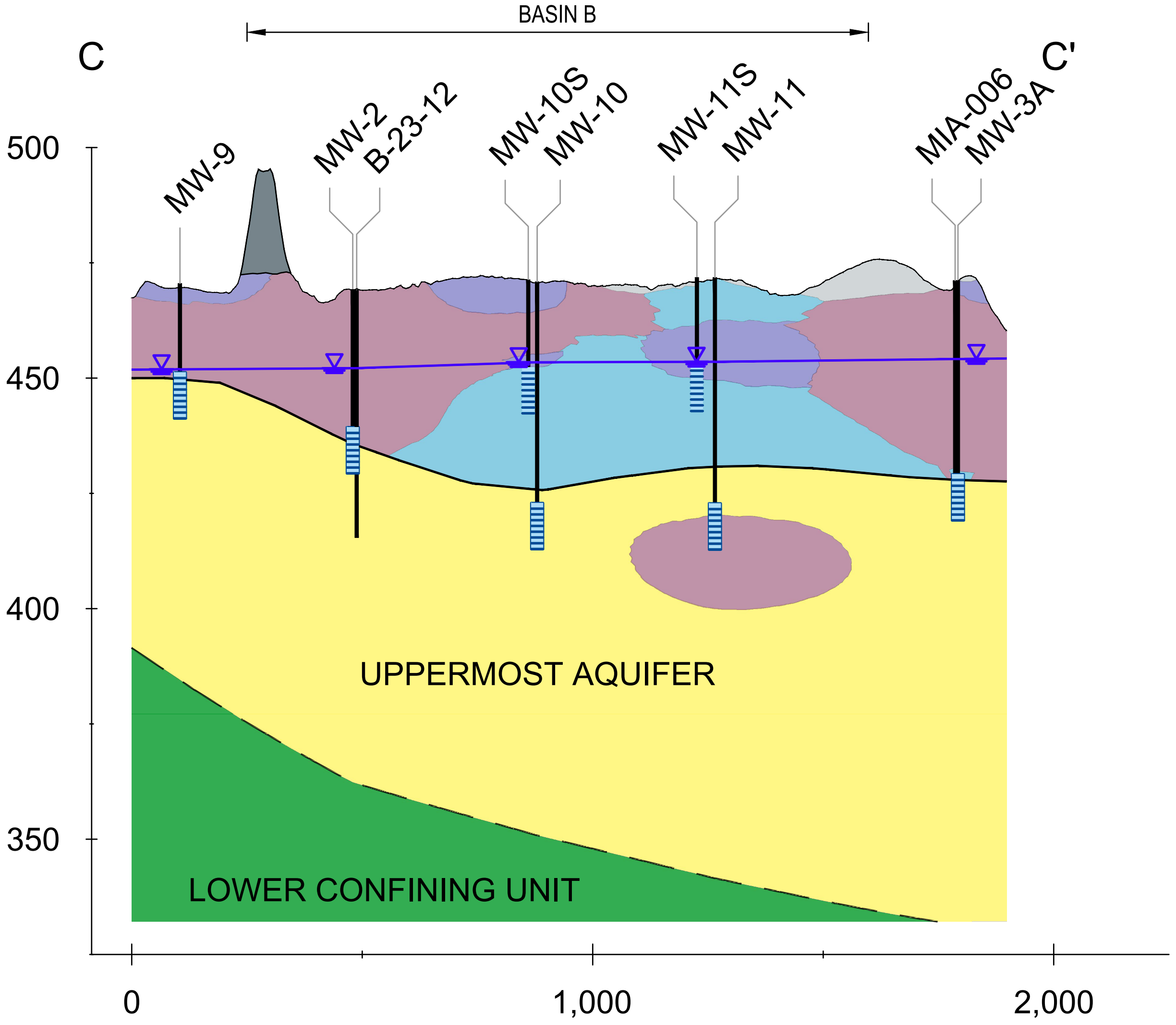
GEOLOGIC CROSS SECTION B-B'

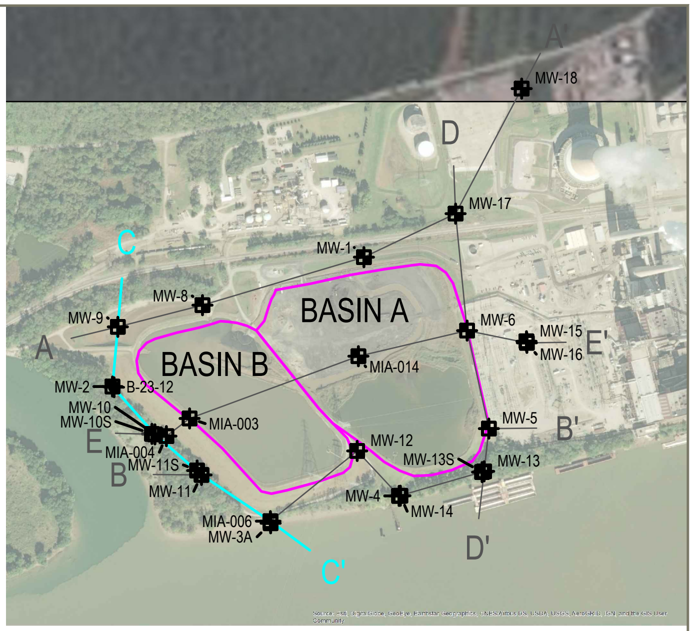
MIAMI FORT ASH PONDS
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

RAMBOLL

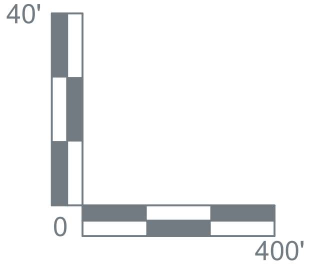
PROJECT: ####   DATED: 2/3/2025   DESIGNER: LEMMONBN   C:\DC\ACCDocs\Ramboll Gruppen AS\RUS-1940104036 Miami Fort\Project Files\4 Delivery\40 WIP\400 Environmental\Drawings\Miami Fort Cross Sections.dwg





LEGEND

■	COAL COMBUSTION RESIDUALS (CCR)
■	FILL
■	CLAY (CL/CH)
■	SILT (ML)
■	SILT AND FINE SAND
■	SAND AND GRAVEL (SP/SM/SW)
■	BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)
▤	WELL SCREEN INTERVAL
▽	UPPER AQUIFER POTENTIOMETRIC SURFACE
▽	MONITORING WELL DEPTH TO WATER



GEOLOGIC CROSS SECTION C-C'

MIAMI FORT ASH PONDS
MIAMI FORT POWER STATION
NORTH BEND, OHIO

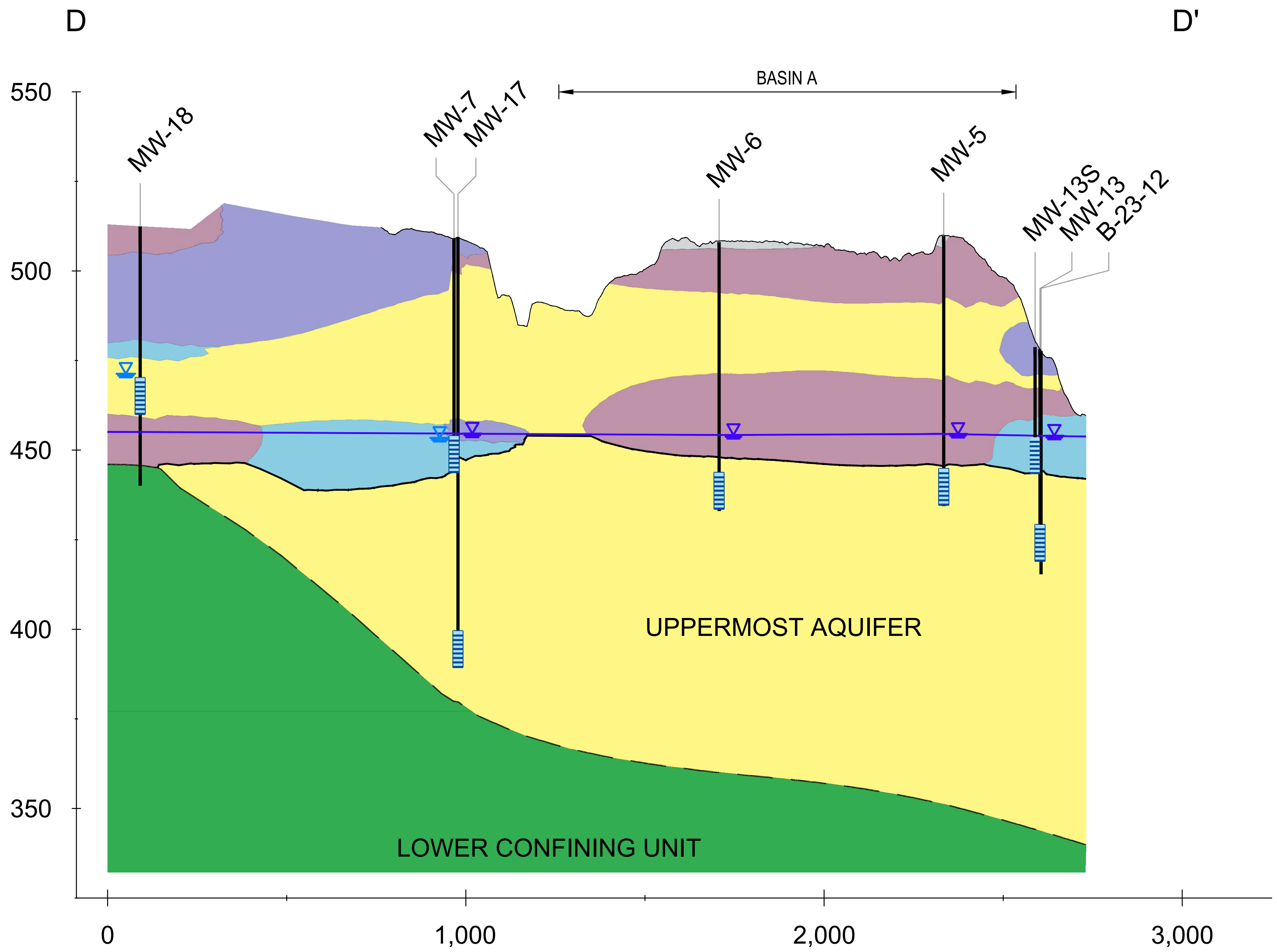
RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

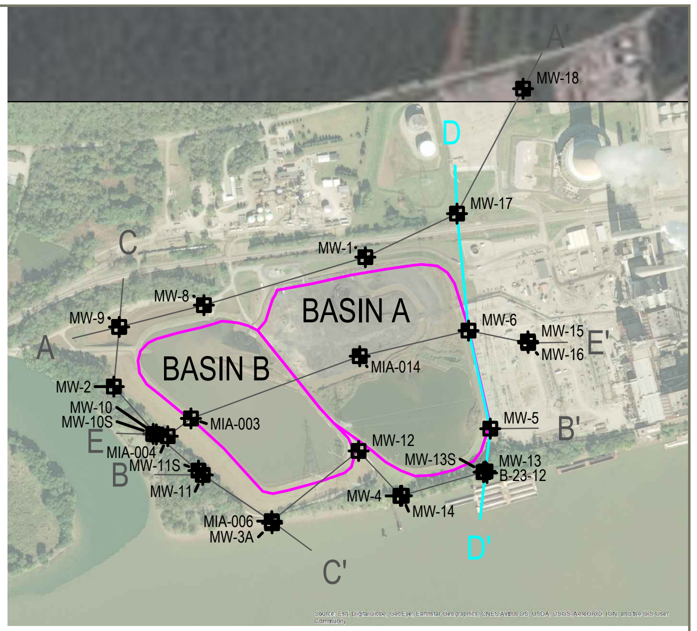
PROJECT: ####

DATED: 2/3/2025

DESIGNER: LEMMONBN

C:\DC\ACCDocs\Ramboll Gruppen AS\RUS-1940104036 Miami Fort\Project Files\4 Delivery\40 WIP\400 Environmental\Drawings\Miami Fort Cross Sections.dwg





LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- FILL
- CLAY (CL/CH)
- SILT (ML)
- SILT AND FINE SAND
- SAND AND GRAVEL (SP/SM/SW)
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)

- WELL SCREEN INTERVAL
- UPPER AQUIFER POTENTIOMETRIC SURFACE
- MONITORING WELL DEPTH TO WATER

40'
0
400'

GEOLOGIC CROSS SECTION D-D'

MIAMI FORT ASH PONDS
MIAMI FORT POWER STATION
NORTH BEND, OHIO

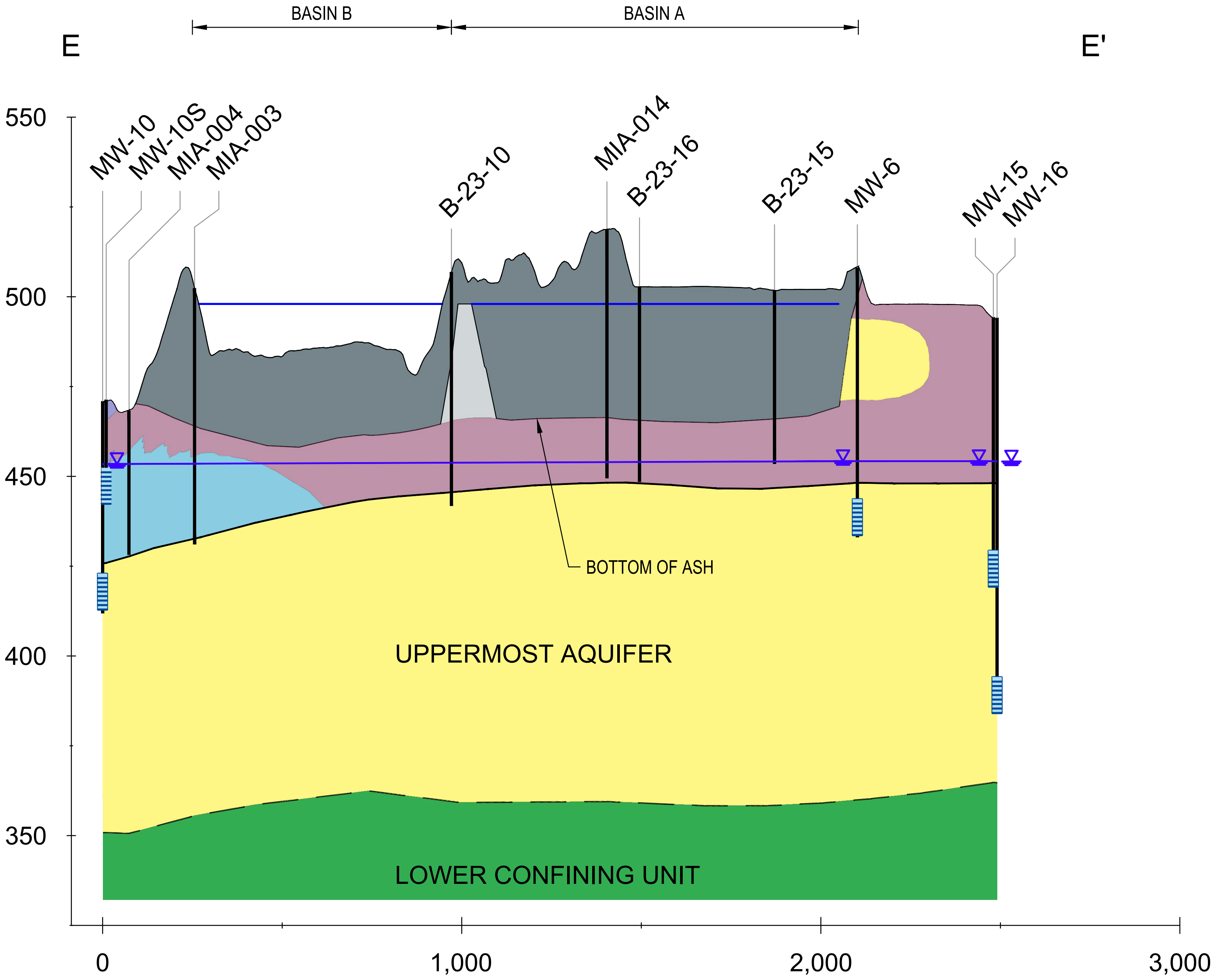
RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

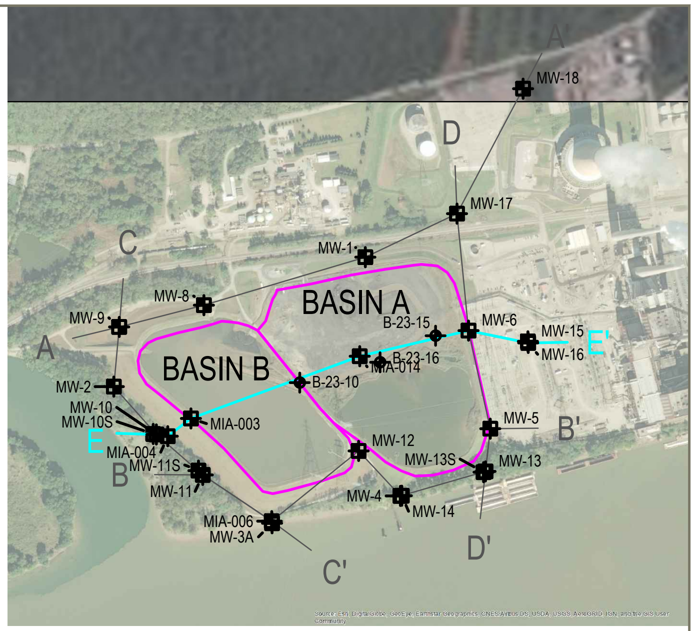
C:\DCACCDocs\Ramboll Gruppen AS\RUS-1940104036 Miami Fort\Project Files\4 Delivery\40 WIP\400 Environmental\Drawings\Miami Fort Cross Sections.dwg

DESIGNER: LEMMONBN

DATED: 2/3/2025

PROJECT: ####

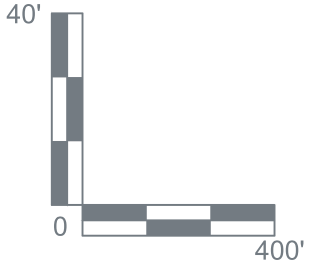




LEGEND

⬛ COAL COMBUSTION RESIDUALS (CCR)
⬜ FILL
🟫 CLAY (CL/CH)
🟪 SILT (ML)
🟦 SILT AND FINE SAND
🟨 SAND AND GRAVEL (SP/SM/SW)
🟩 BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)

▤ WELL SCREEN INTERVAL
▽ UPPER AQUIFER POTENTIOMETRIC SURFACE
▽ MONITORING WELL DEPTH TO WATER



GEOLOGIC CROSS SECTION E-E'

MIAMI FORT ASH PONDS
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

RAMBOLL

APPENDIX D
GROUNDWATER ELEVATION CONTOUR MAPS, 2015-2022

OPERATING RECORD
REVISION 2

40 C.F.R. § 257.91

GROUNDWATER ELEVATION CONTOUR MAPS
MONITORING PERIOD 2015 - 2021

LOCATION: MIAMI FORT POWER STATION
LEGAL ENTITY: DYNEGY MIAMI FORT, LLC
UNIT IDENTIFICATION NUMBER: 115
UNIT NAME: POND SYSTEM

UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.51 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED DECEMBER 8, 2015

(458.74) GROUNDWATER ELEVATION (FEET, MSL)
NOT USED IN CONTOUR INTERPOLATION,
MEASURED DECEMBER 8, 2015

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE ______________________

DATE ______________________

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 8, 2015
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

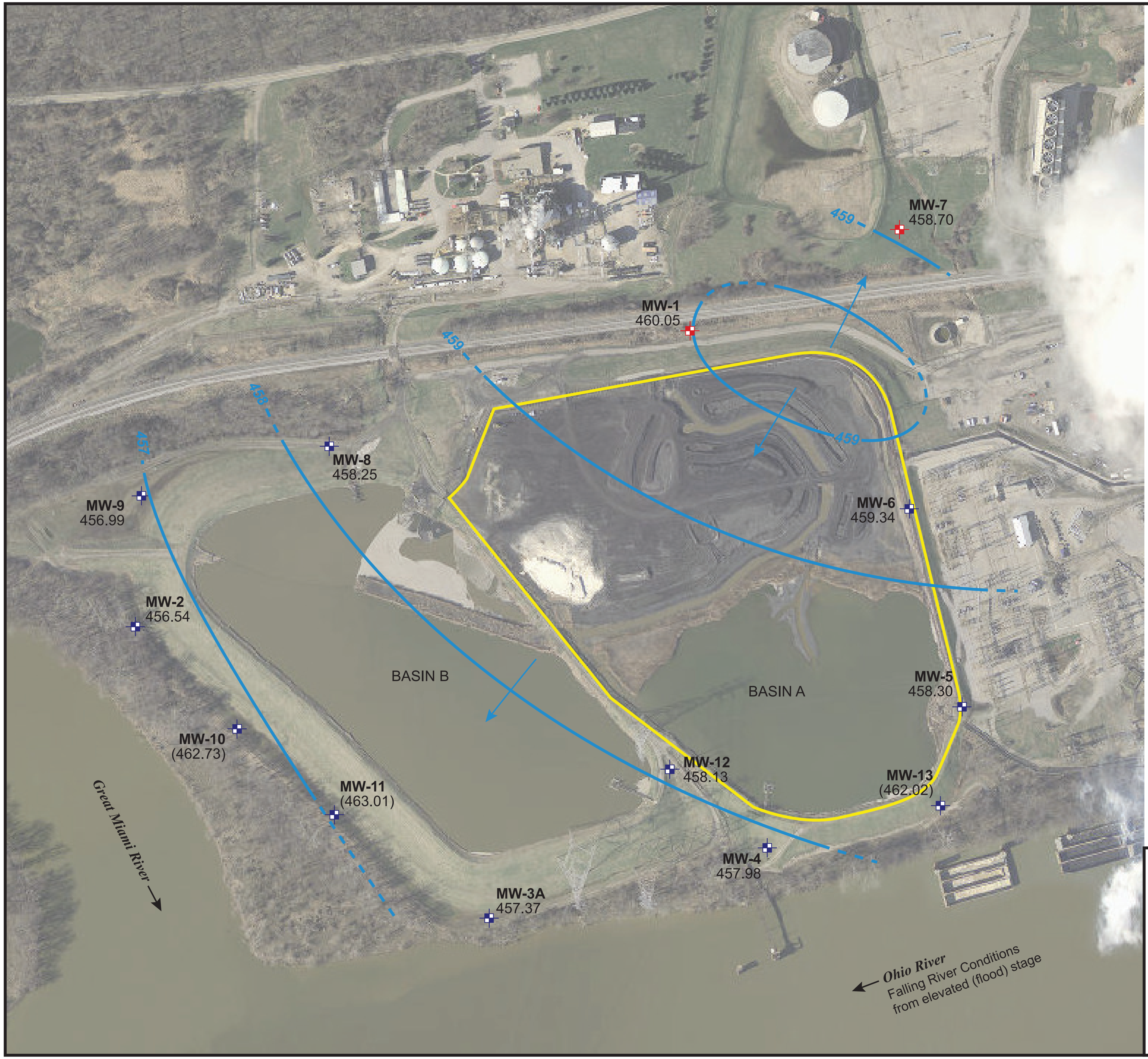
DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

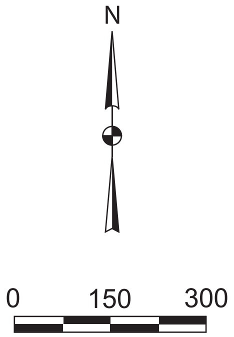
J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\MFS\MFS PIEZ\basin a fig1_12-15.ai

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\T\MFS\MFS PIEZ\basin a fig1_3-16.ai



—	UNIT BOUNDARY
✚	DOWNGRADIENT MONITORING WELL LOCATION
✚	UPGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
458.70	GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 21, 2016
(462.02)	GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED MARCH 21, 2016

AERIAL SOURCE: CAGIS



SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 21, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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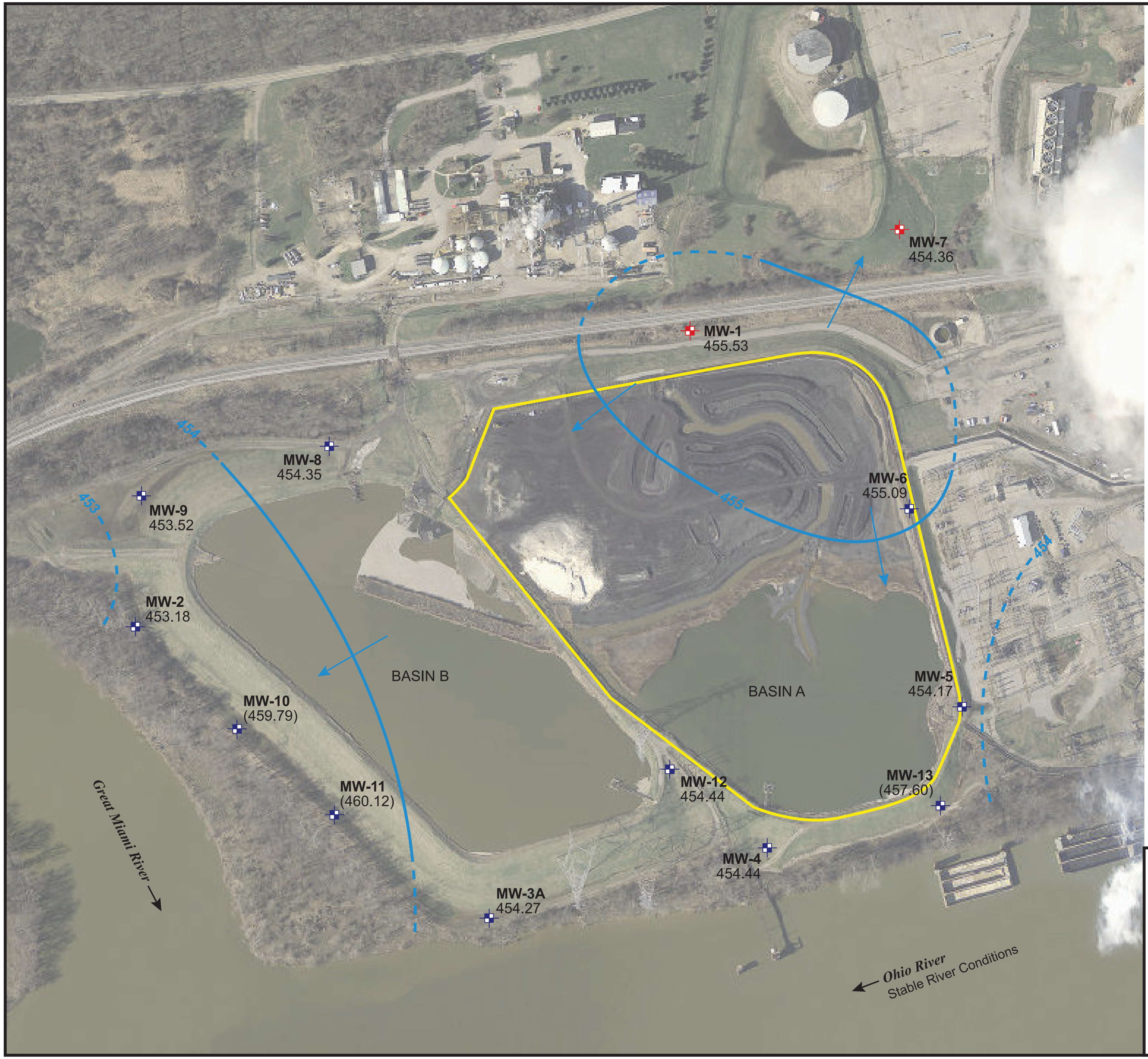

🟨	UNIT BOUNDARY
✚	DOWNGRADIENT MONITORING WELL LOCATION
✚	UPGRADIENT MONITORING WELL LOCATION
🟦	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
454.36	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JUNE 20, 2016
(457.60)	GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED JUNE 20, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 20, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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—	UNIT BOUNDARY
⊕	DOWNGRADIENT MONITORING WELL LOCATION
⊕	UPGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
453.46	GROUNDWATER ELEVATION (FEET, MSL), MEASURED SEPTEMBER 12, 2016
(459.64)	GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED SEPTEMBER 12, 2016

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

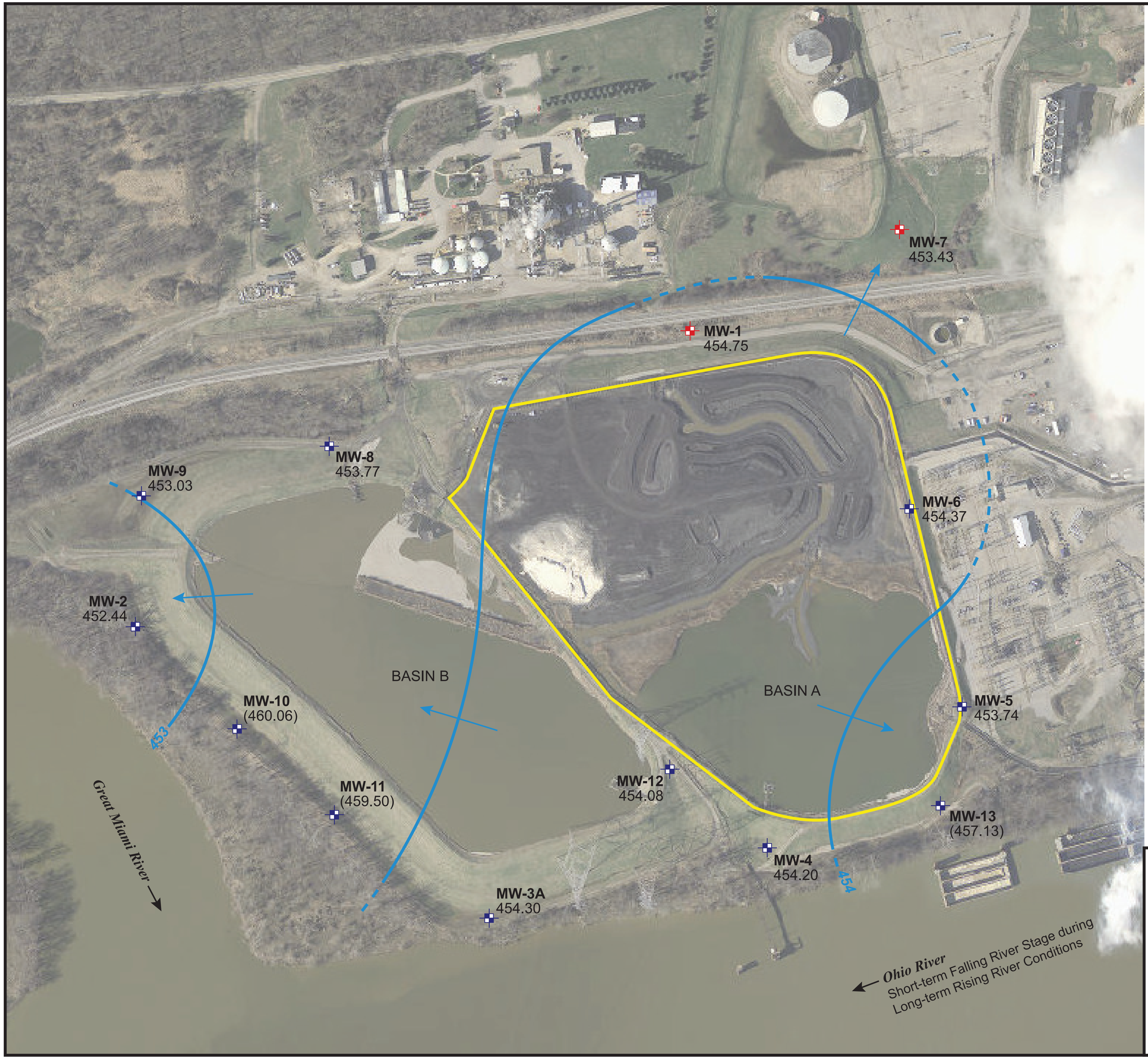
FIGURE 1
GROUNDWATER SURFACE MAP-
SEPTEMBER 12, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
12/28/16	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\TI\MFS\MFS PIEZ\basin a fig1_12-16.ai



Certified By:

SIGNATURE ____________

DATE ____________

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
DECEMBER 12, 2016
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
01/05/16	0	ALW	MAW

JOB NO. 60442412

AECOM

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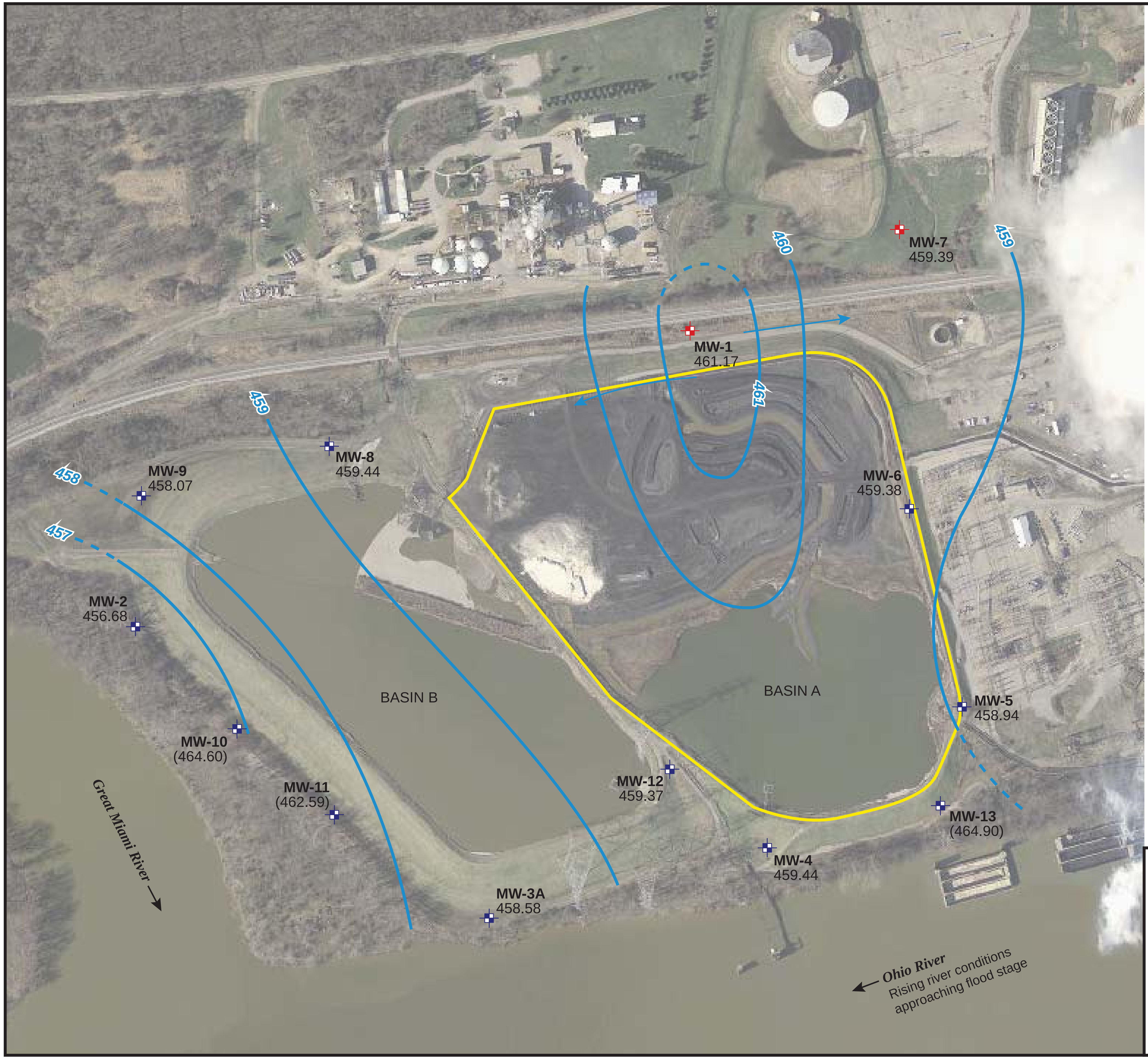

▬	UNIT BOUNDARY
⌖	DOWNGRADIENT MONITORING WELL LOCATION
⌖	UPGRADIENT MONITORING WELL LOCATION
▬	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
459.38	GROUNDWATER ELEVATION (FEET, MSL), MEASURED MARCH 7, 2017
(464.90)	GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED MARCH 7, 2017

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
MARCH 7, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/09/17	0	ALW	MAW

JOB NO. 60442412

AECOM

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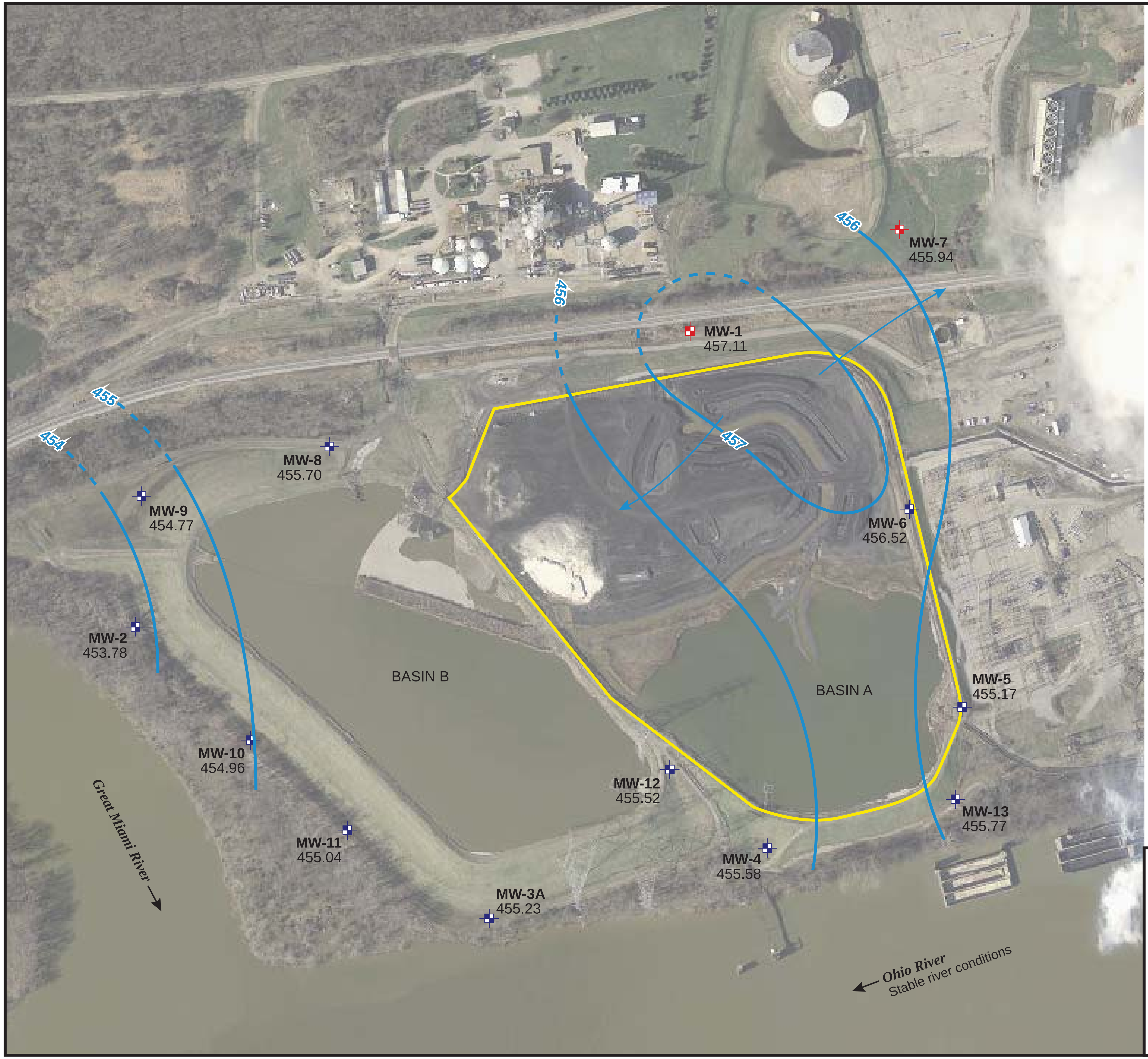


UNIT BOUNDARY

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

WATER TABLE CONTOUR
(INFERRED FROM AVAILABLE MONITORING DATA)

GROUNDWATER FLOW DIRECTION

455.94 GROUNDWATER ELEVATION (FEET, MSL),
MEASURED JUNE 5, 2017

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort Station
Hamilton County, Ohio

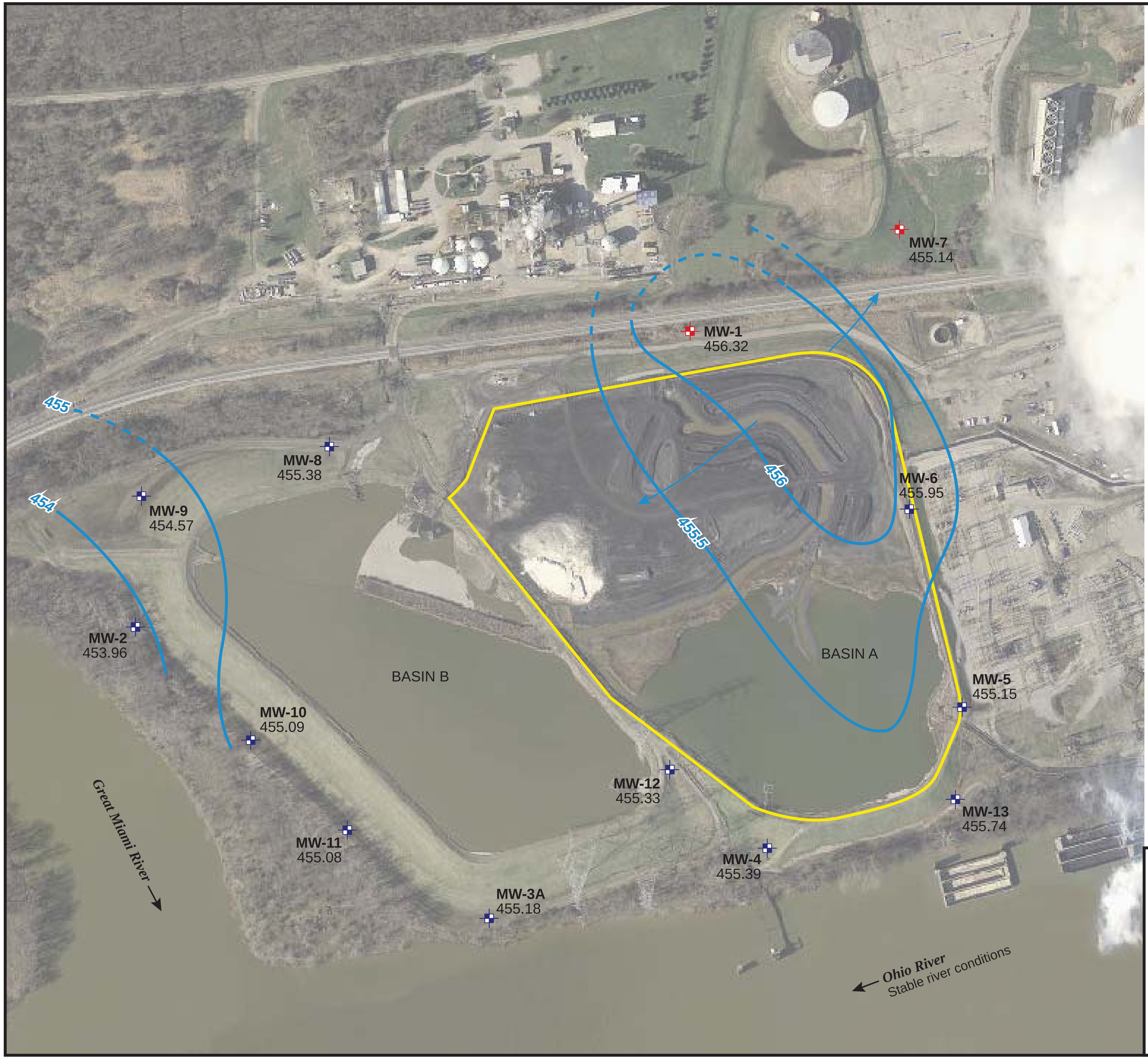
FIGURE 1
GROUNDWATER SURFACE MAP-
JUNE 5, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/06/17	0	ALW	MAW

JOB NO. 60442412

AECOM

J:\Project\D\Dynegy\60442412 Miami Fort and Zimmer CCR 2015-2017\Data-Tech\MFS\MFS PIEZ\basin a fig1_7-17.ai



—	UNIT BOUNDARY
⊕	DOWNGRADIENT MONITORING WELL LOCATION
⊕	UPGRADIENT MONITORING WELL LOCATION
—	WATER TABLE CONTOUR (INFERRED FROM AVAILABLE MONITORING DATA)
→	GROUNDWATER FLOW DIRECTION
455.14	GROUNDWATER ELEVATION (FEET, MSL), MEASURED JULY 10, 2017

AERIAL SOURCE: CAGIS

N

0 150 300
SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

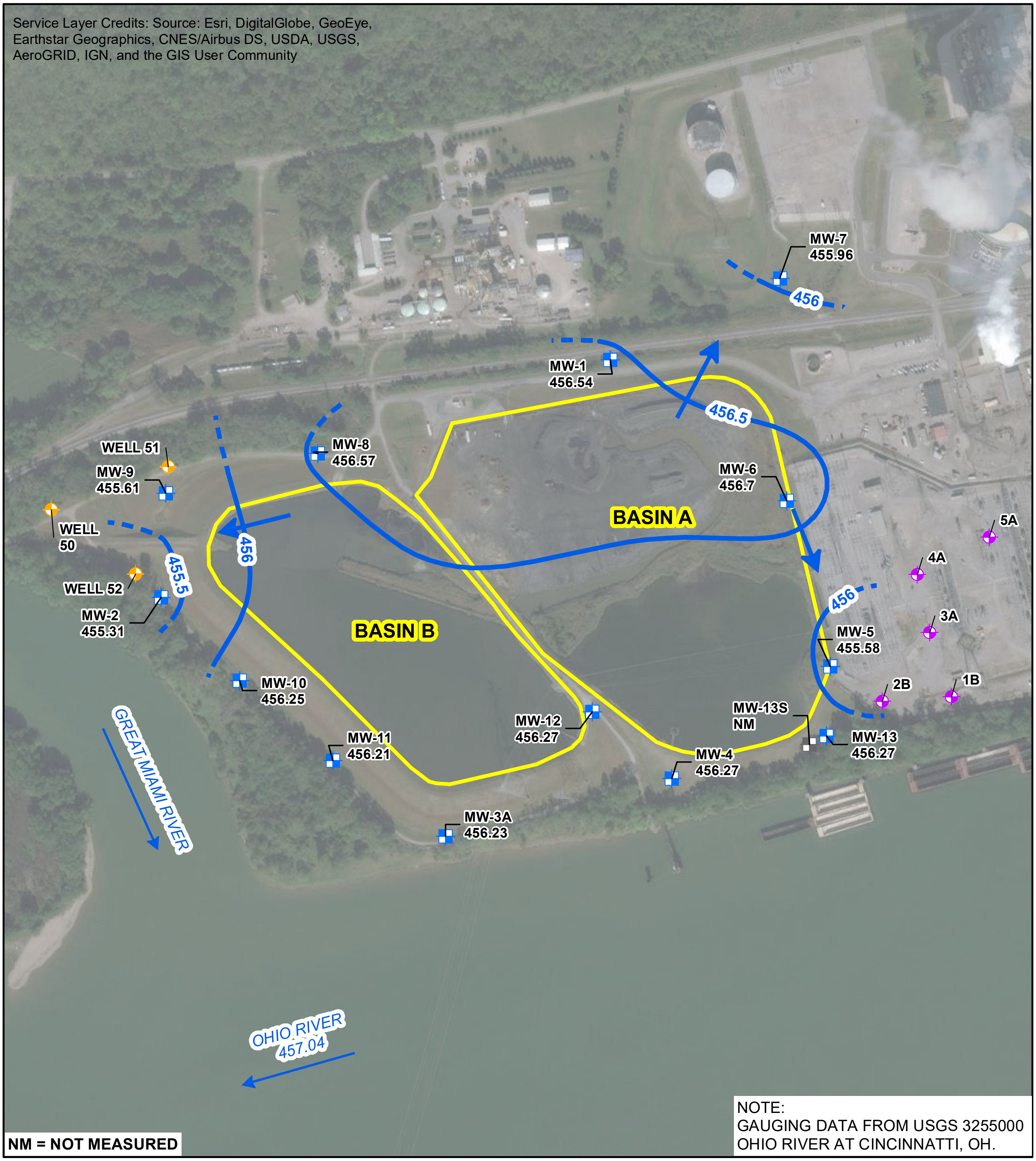
Miami Fort Station
Hamilton County, Ohio

FIGURE 1
GROUNDWATER SURFACE MAP-
JULY 10, 2017
BASIN A (UNIT ID: 111)
CCR SAMPLING AND ANALYSIS PLAN

DATE	REV NO.	DWG. BY	CHKD. BY
09/06/17	0	ALW	MAW

JOB NO. 60442412

AECOM



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

NM = NOT MEASURED

NOTE:
GAUGING DATA FROM USGS 3255000
OHIO RIVER AT CINCINNATTI, OH.

▣	CCR MONITORING WELL LOCATION
▨	NON-CCR UNIT MONITORING WELL LOCATION
⊕	MIAMI FORT PRODUCTION WELLS
⊕	VEOLIA PRODUCTION WELLS
—	GROUNDWATER ELEVATION CONTOUR (0.5-FOOT CONTOUR INTERVAL, NAVD 88)
- - -	INFERRED GROUNDWATER ELEVATION CONTOUR
→	GROUNDWATER FLOW DIRECTION
☐	CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
NOVEMBER 14-15, 2017

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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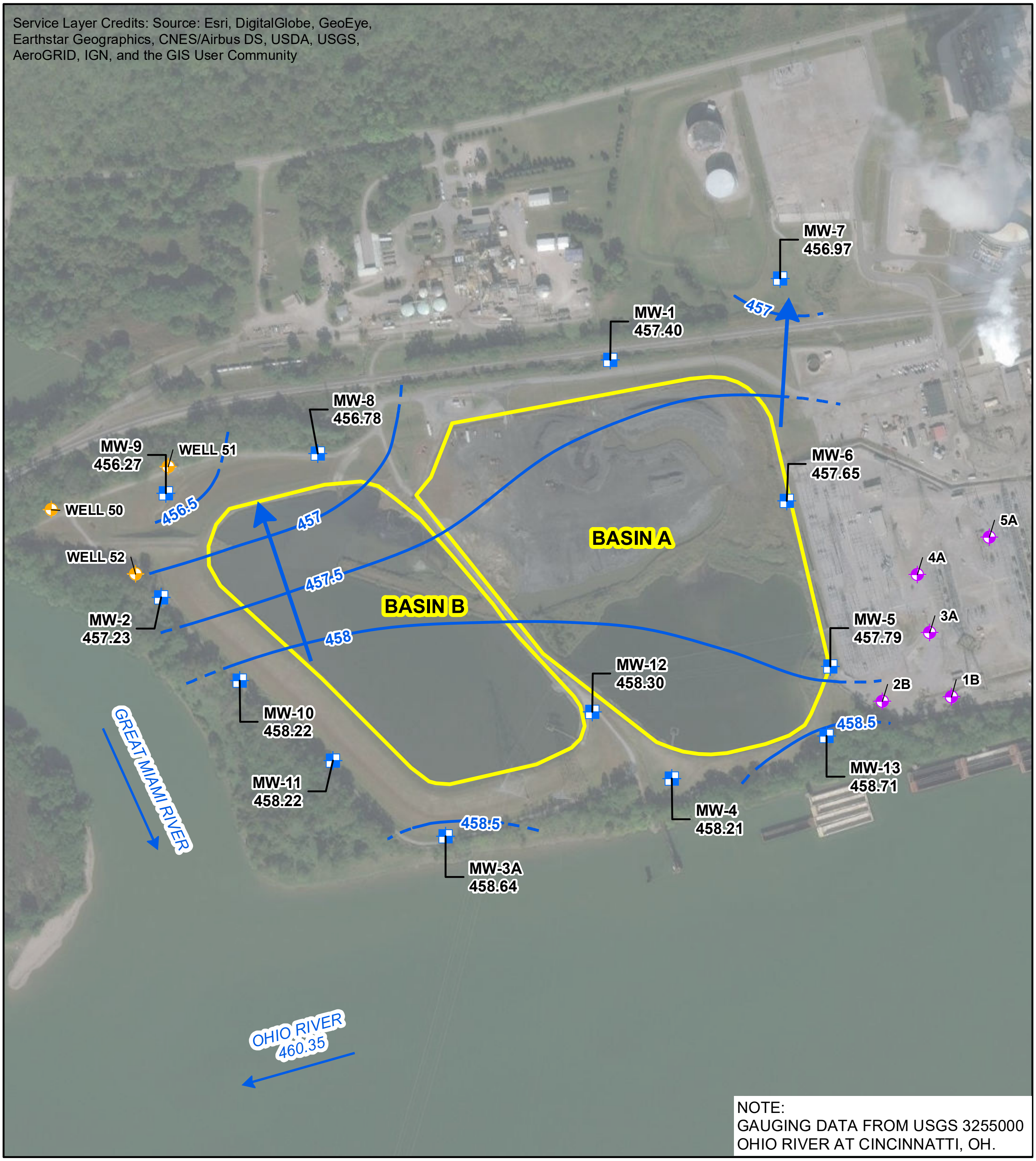

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 3255000
OHIO RIVER AT CINCINNATTI, OH.

✚ CCR MONITORING WELL LOCATION
⊕ MIAMI FORT PRODUCTION WELLS
⊕ VEOLIA PRODUCTION WELLS
— GROUNDWATER ELEVATION CONTOUR (0.5-FOOT CONTOUR INTERVAL. NAVD 88)
- - INFERRED GROUNDWATER ELEVATION CONTOUR
➜ GROUNDWATER FLOW DIRECTION
▭ CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
MAY 7, 2018

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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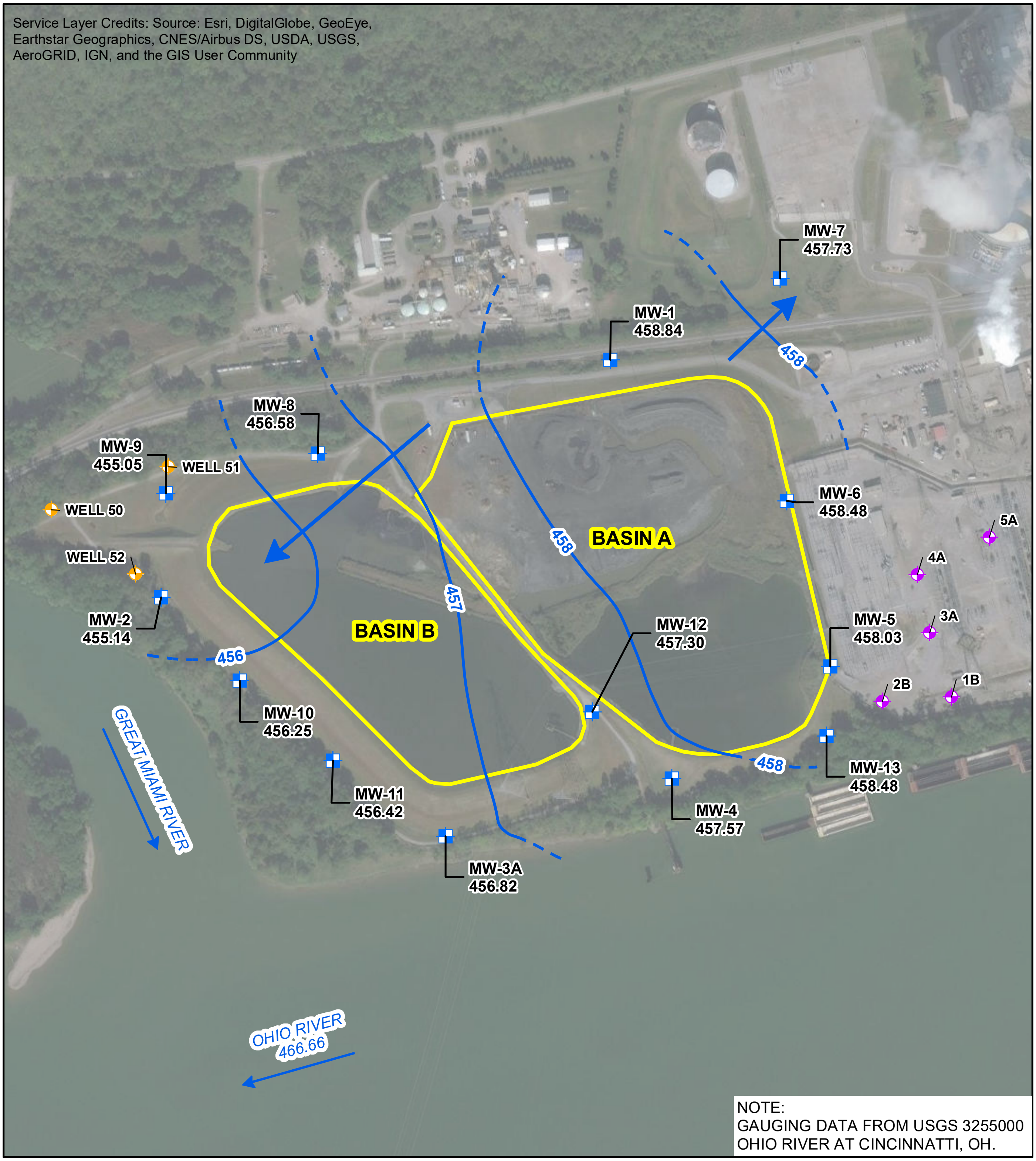

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 3255000
OHIO RIVER AT CINCINNATTI, OH.

- ⊞ CCR MONITORING WELL LOCATION
- ⊕ MIAMI FORT PRODUCTION WELLS
- ⊕ VEOLIA PRODUCTION
- — GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- → GROUNDWATER FLOW DIRECTION
- ▭ CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 18, 2018

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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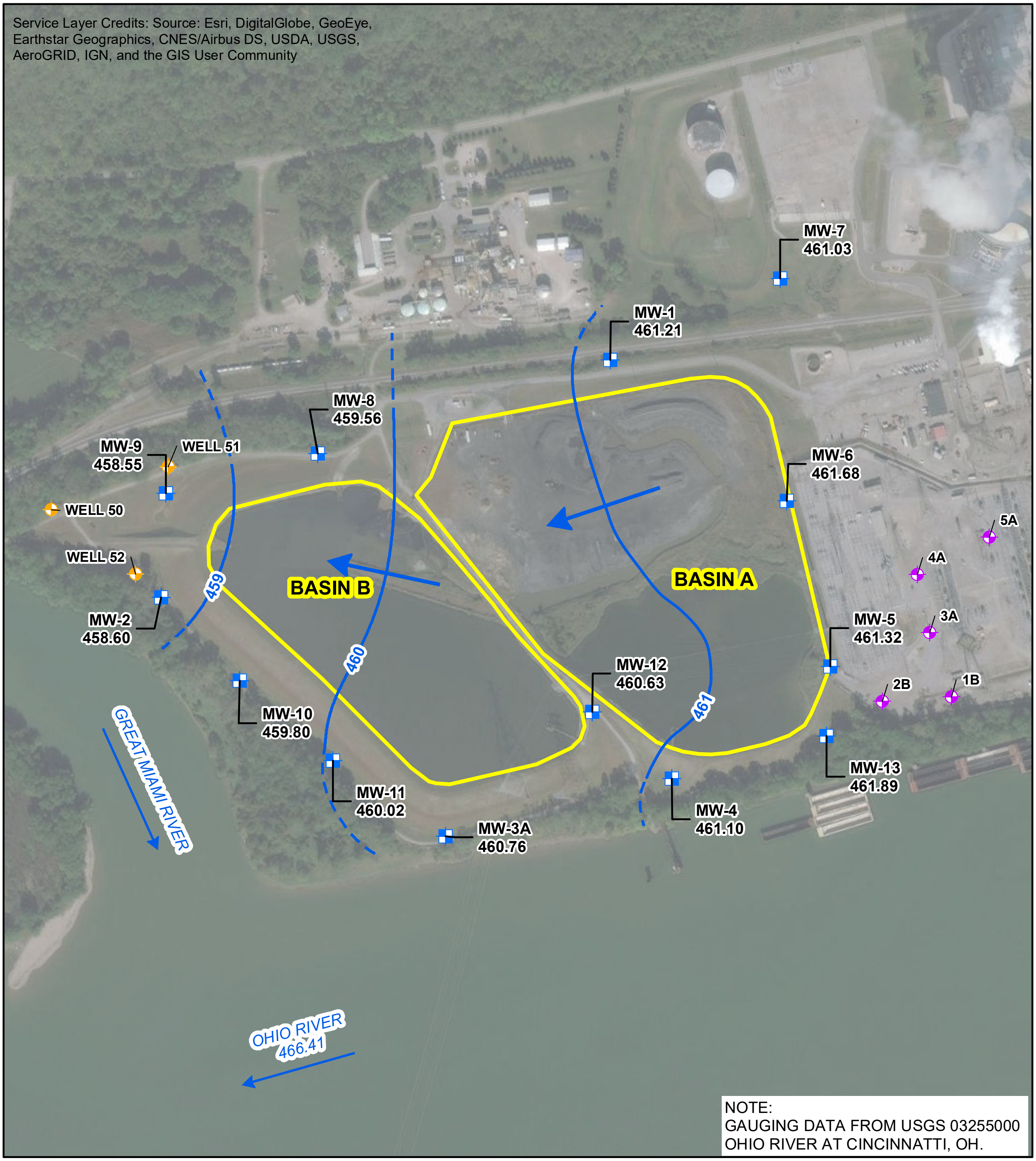

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTE:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATTI, OH.

LEGEND

- ■ CCR MONITORING WELL LOCATION
- ⊕ MIAMI FORT PRODUCTION WELLS
- ⊕ VEOLIA PRODUCTION WELLS
- — GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- → GROUNDWATER FLOW DIRECTION
- ▭ CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
MARCH 11, 2019

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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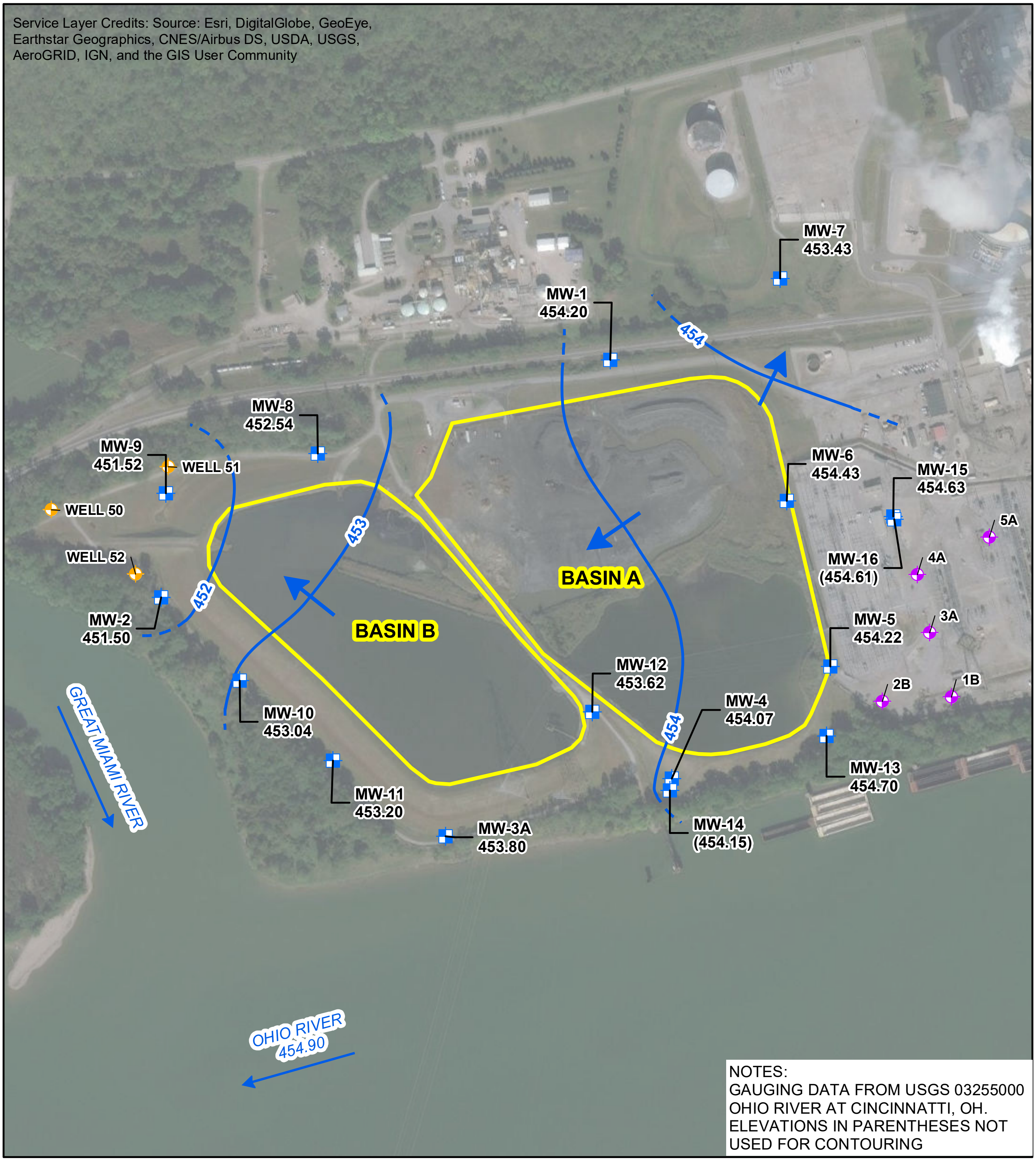
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:
GAUGING DATA FROM USGS 03255000 OHIO RIVER AT CINCINNATTI, OH.
ELEVATIONS IN PARENTHESES NOT USED FOR CONTOURING

LEGEND
- ⊞ CCR MONITORING WELL LOCATION
- ⊕ MIAMI FORT PRODUCTION WELLS
- ⊕ VEOLIA PRODUCTION WELLS
- — GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- ➜ GROUNDWATER FLOW DIRECTION
- ▭ CCR MONITORED UNIT

MIAMI FORT BASIN A (UNIT ID: 111)
AND MIAMI FORT BASIN B (UNIT ID: 112)
GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 9, 2019

CCR RULE GROUNDWATER MONITORING
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 125 250 500
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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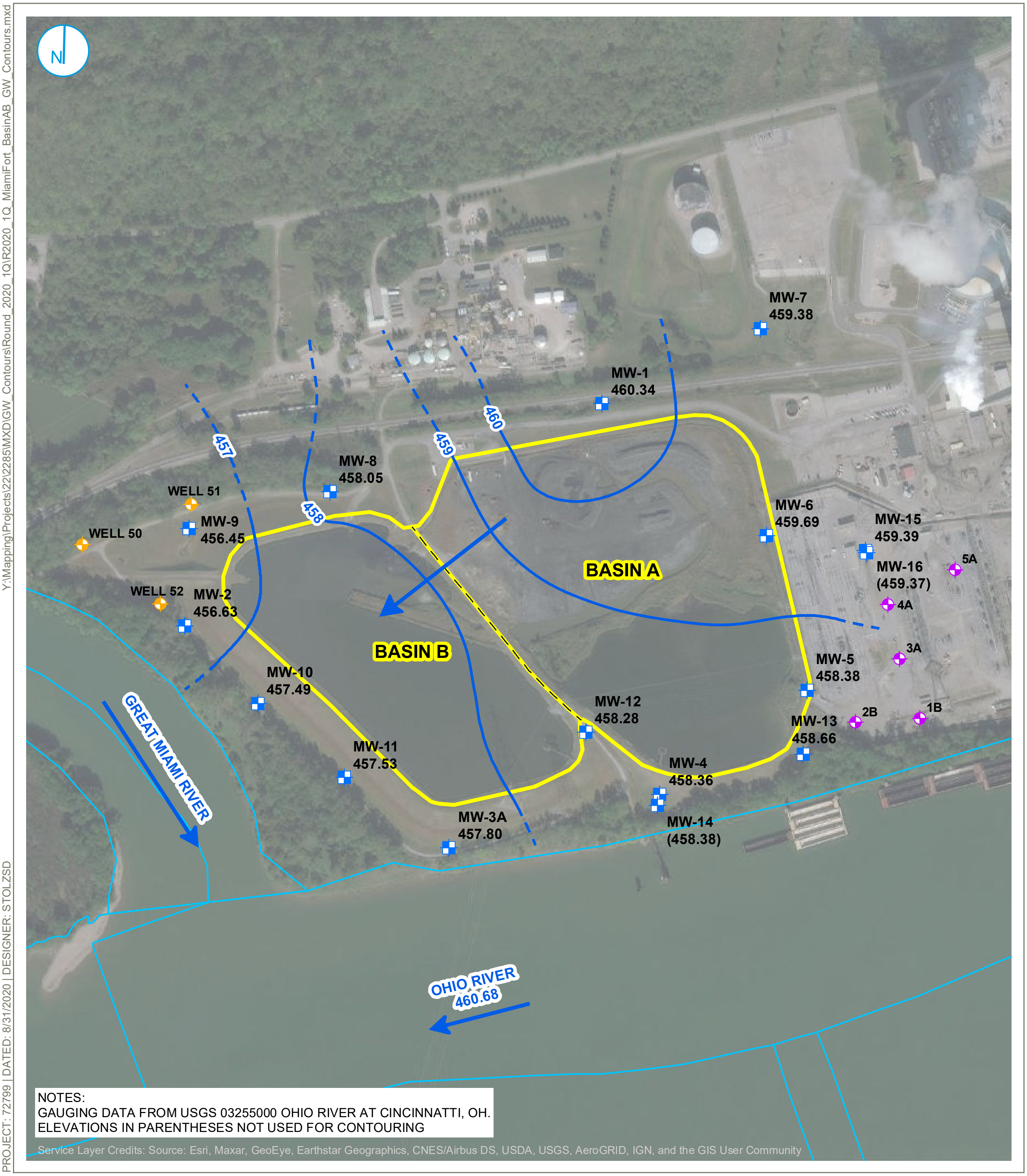

NOTES:
GAUGING DATA FROM USGS 03255000 OHIO RIVER AT CINCINNATI, OH.
ELEVATIONS IN PARENTHESES NOT USED FOR CONTOURING

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

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PROJECT: 72799 | DATED: 8/31/2020 | DESIGNER: STOLZSD

- ⊞ CCR MONITORING WELL LOCATION
- ⊕ MIAMI FORT PRODUCTION WELLS
- ⊕ VEOLIA PRODUCTION WELLS
- ☐ CCR MONITORED MULTI-UNIT
- ☐ CCR UNIT
- ← RIVER FLOW DIRECTION
- — SURFACE WATER FEATURE
- — GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- ➡ GROUNDWATER FLOW DIRECTION

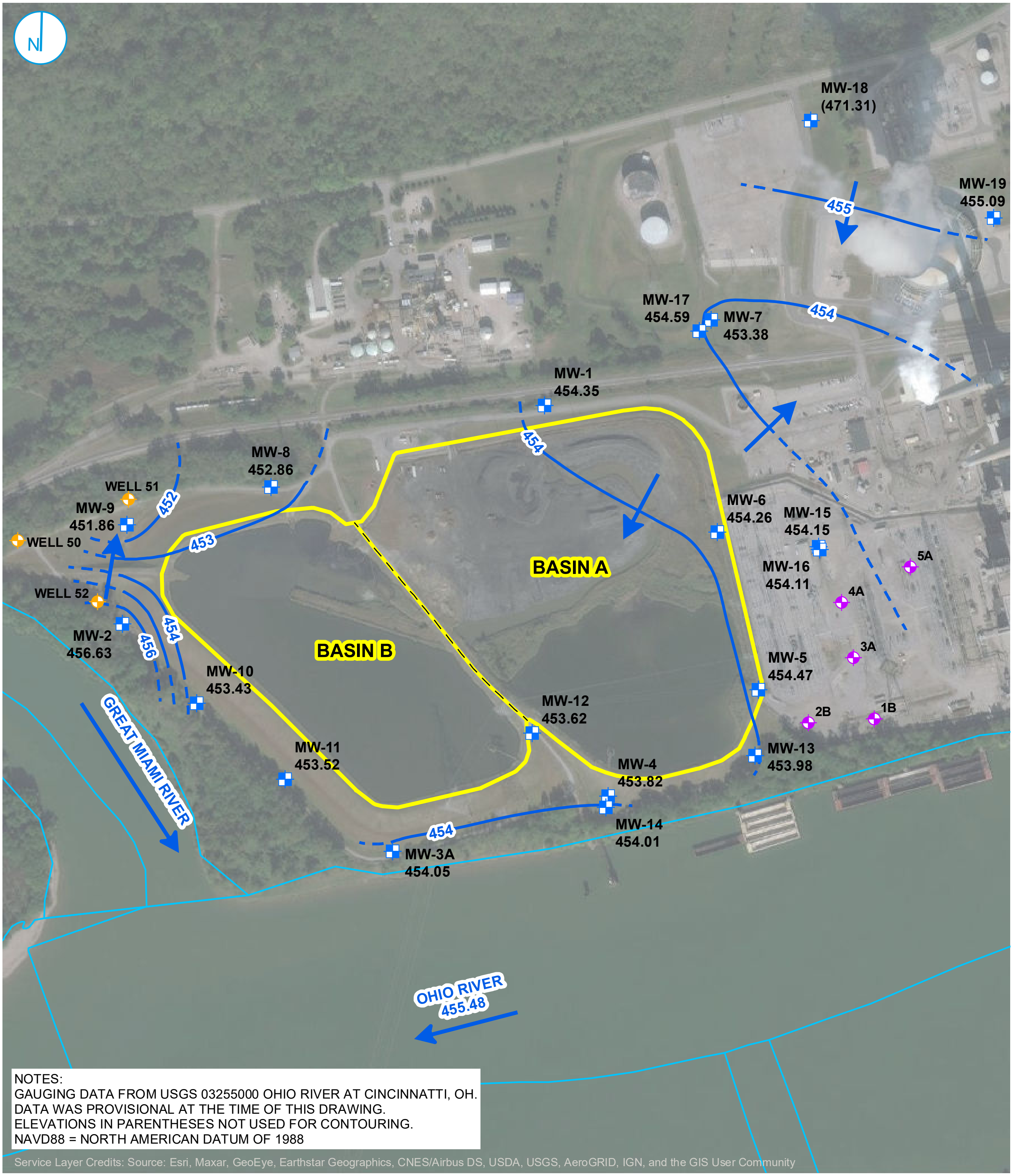
0 250 500
Feet

GROUNDWATER ELEVATION CONTOUR MAP
APRIL 6, 2020

FIGURE 5

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



NOTES:
GAUGING DATA FROM USGS 03255000 OHIO RIVER AT CINCINNATI, OH. DATA WAS PROVISIONAL AT THE TIME OF THIS DRAWING.
ELEVATIONS IN PARENTHESES NOT USED FOR CONTOURING.
NAVD88 = NORTH AMERICAN DATUM OF 1988

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

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PROJECT: 72799 | DATED: 10/5/2020 | DESIGNER: STOLZSD

- CCR MONITORING WELL LOCATION
- MIAMI FORT PRODUCTION WELLS
- VEOLIA PRODUCTION WELLS
- CCR MONITORED MULTI-UNIT
- CCR UNIT
- RIVER FLOW DIRECTION
- SURFACE WATER FEATURE
- GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

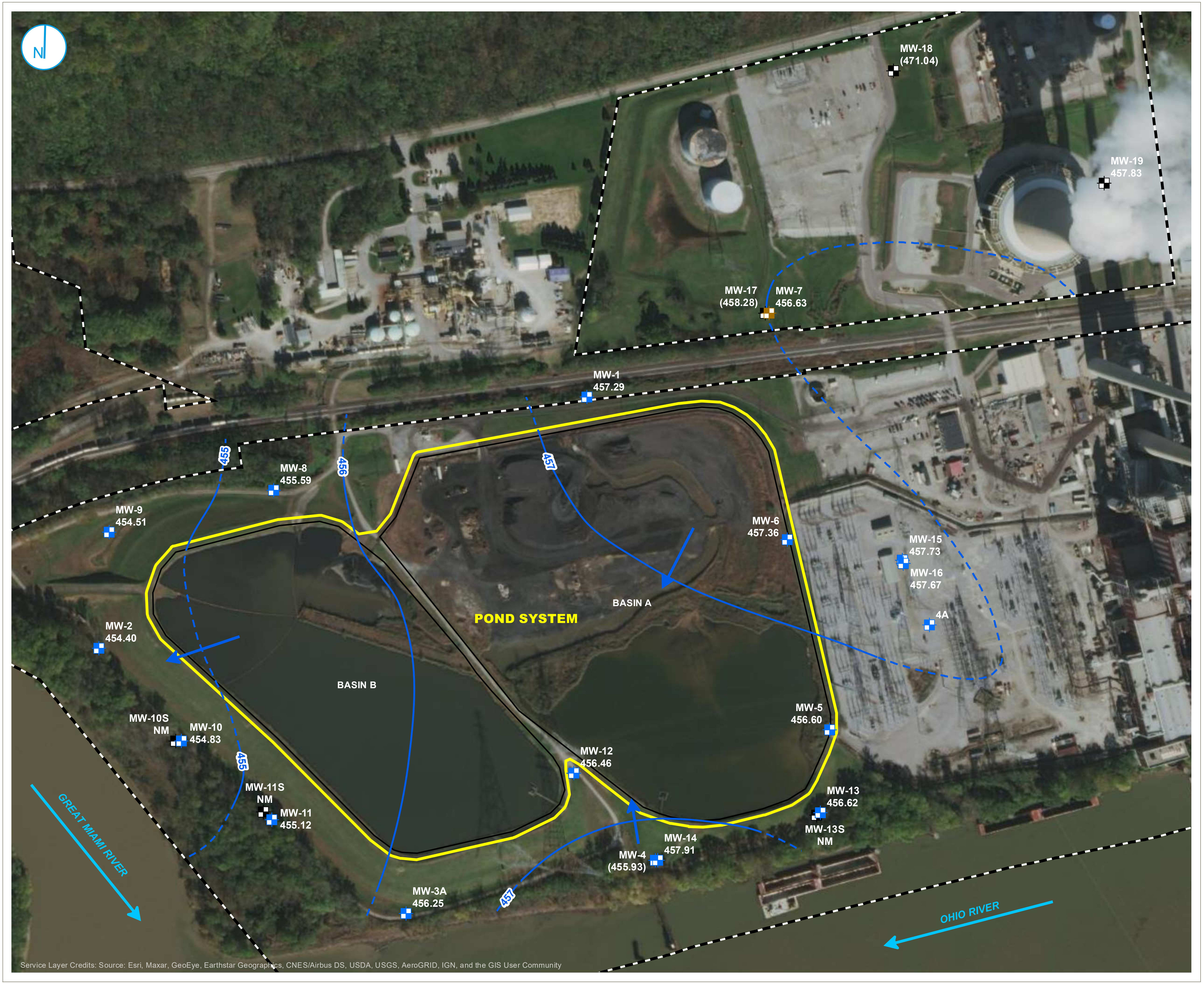
0 250 500 Feet

GROUNDWATER ELEVATION CONTOUR MAP

SEPTEMBER 14, 2020

MIAMI FORT POND SYSTEM (UNIT ID: 115)
MIAMI FORT POWER STATION
NORTH BEND, OHIO

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



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

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PROJECT: 169000XXXX | DATED: 3/18/2022 | DESIGNER: galarmmc

- ▣ BACKGROUND WELL
- ▣ COMPLIANCE WELL
- ▣ MONITORING WELL
- — GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- - - INFERRED GROUNDWATER ELEVATION CONTOUR
- → GROUNDWATER FLOW DIRECTION
- ☐ PART 257 REGULATED UNIT (SUBJECT UNIT)
- ☐ SITE FEATURE
- ☐ PROPERTY BOUNDARY

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
NM = NOT MEASURED

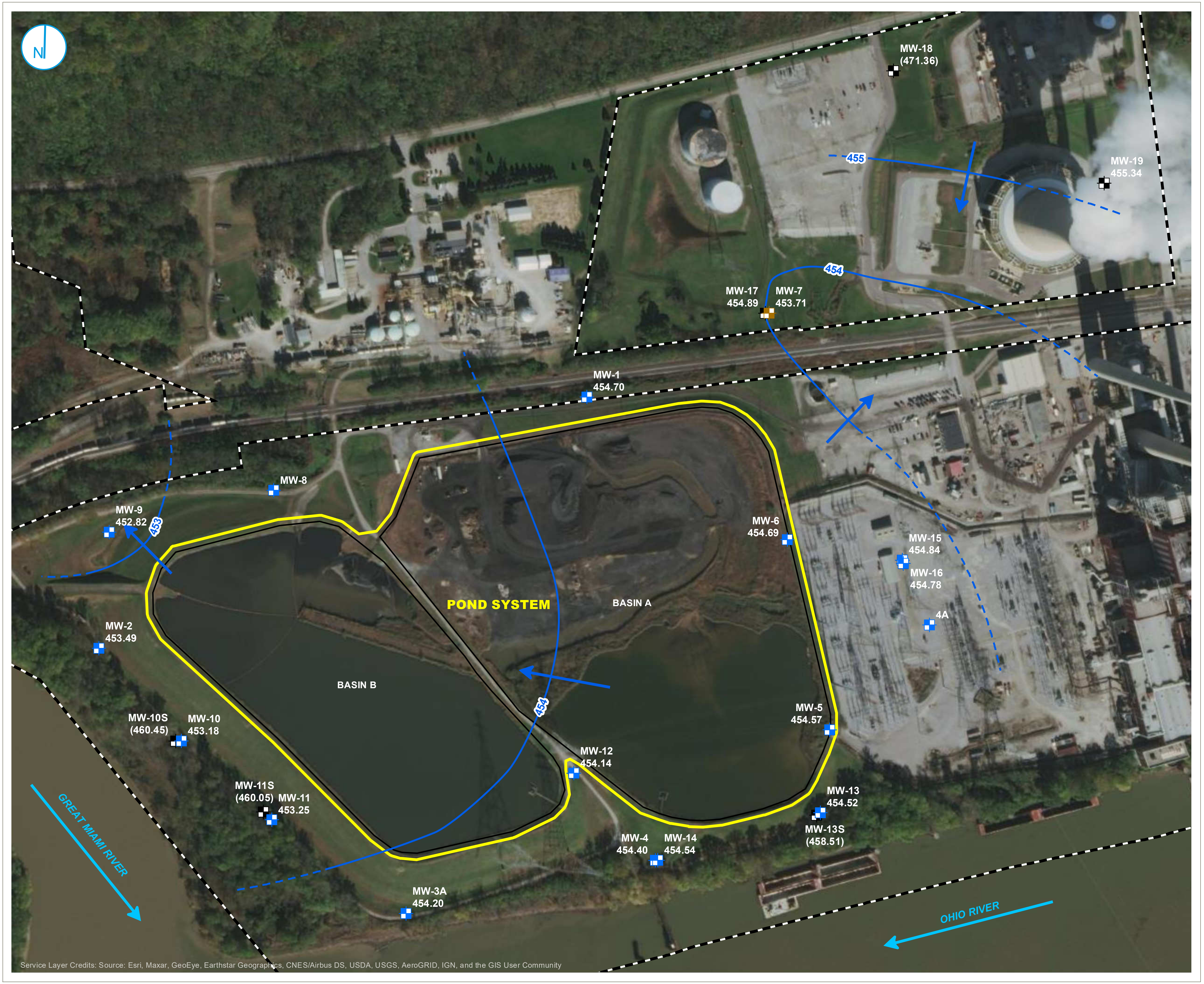
0 150 300
Feet

POTENTIOMETRIC SURFACE MAP
MARCH 24, 2021

2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
COMPLIANCE WELL
MONITORING WELL
GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
PART 257 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
PROPERTY BOUNDARY

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
NM = NOT MEASURED

0 150 300
Feet

POTENTIOMETRIC SURFACE MAP
SEPTEMBER 15, 2021

2021 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

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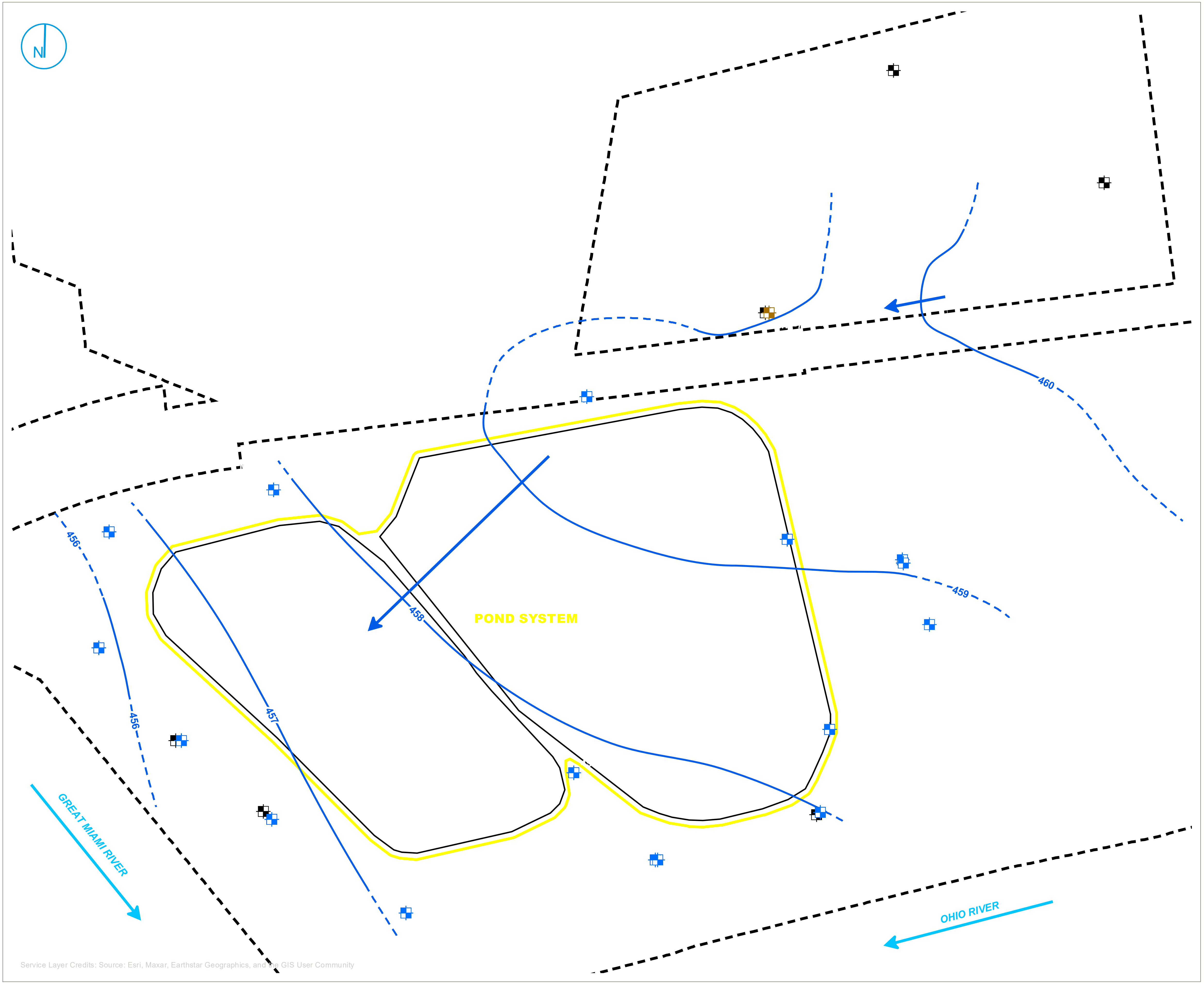

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 12/7/2022 | DESIGNER: galarmmc

- BACKGROUND WELL
- COMPLIANCE WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- PART 257 REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- PROPERTY BOUNDARY

NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 150 300 Feet

POTENTIOMETRIC SURFACE MAP
MARCH 23-24, 2022

2022 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

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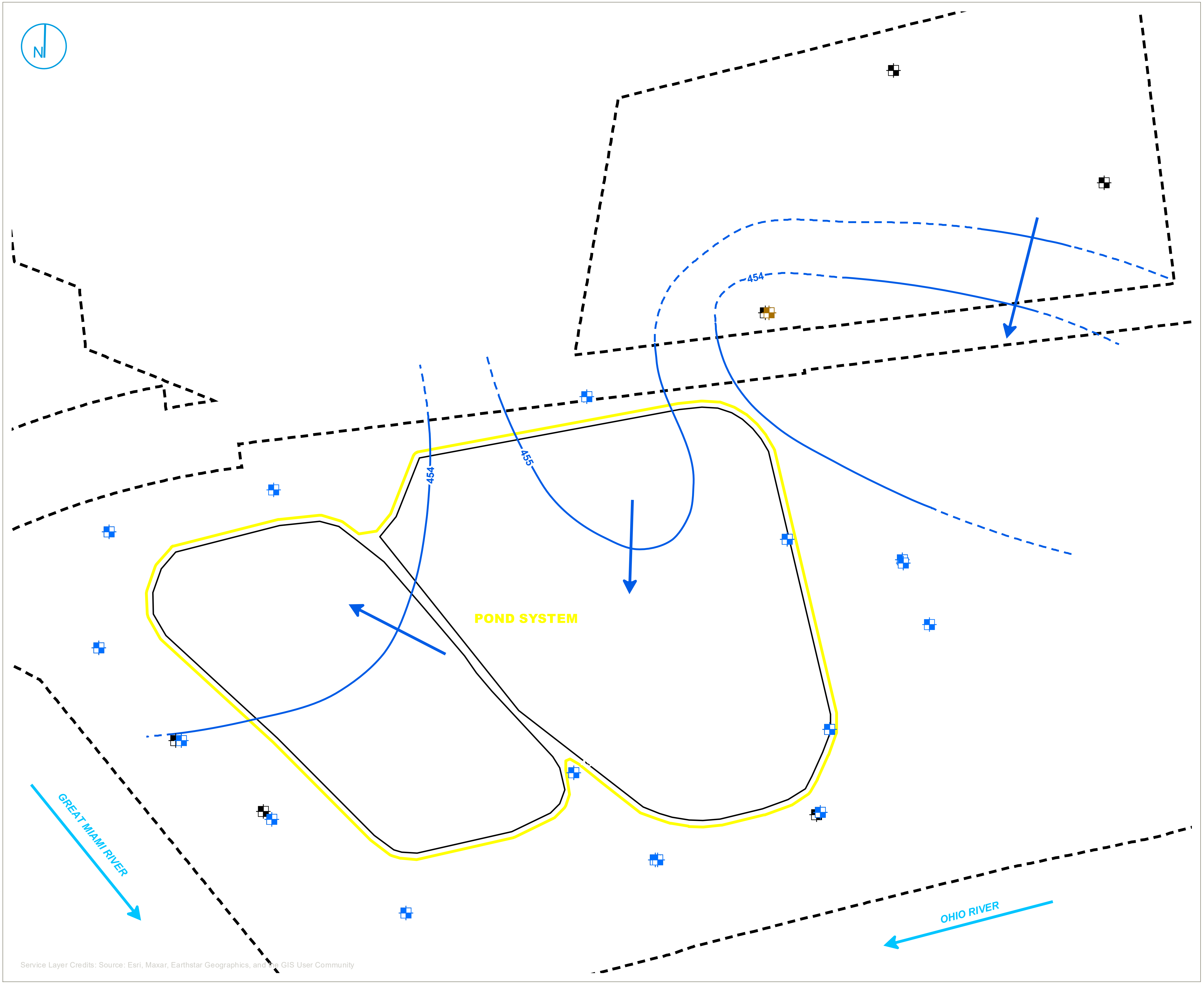

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 1/13/2023 | DESIGNER: galarnmc

- COMPLIANCE WELL
- BACKGROUND WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (1-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- PART 257 REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- PROPERTY BOUNDARY

NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

0 150 300 Feet

POTENTIOMETRIC SURFACE MAP
SEPTEMBER 21, 2022

2022 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

APPENDIX E
VERTICAL HYDRAULIC GRADIENTS (TABLE 3-2 FROM THE HYDROGEOLOGIC CHARACTERIZATION REPORT [RAMBOLL, 2025]) AND HORIZONTAL HYDRAULIC GRADIENTS AND GROUNDWATER FLOW VELOCITES (TABLE 3-2 FROM THE HYDROGEOLOGIC CHARACTERIZATION REPORT [RAMBOLL, 2025])

TABLE E1. VERTICAL HYDRAULIC GRADIENTS
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Date	MW-4 Groundwater Elevation [1] (Shallow)	MW-14 Groundwater Elevation [1] (Deep)	Head Change (ft)	Distance Change [2] (ft)	Vertical Hydraulic Gradient [3] (dh/dl)	
9/9/2019	454.07	454.15	-0.08	39.69	-0.0020	up
4/6/2020	458.36	458.38	-0.02	39.69	-0.0005	flat
9/14/2020	453.82	454.01	-0.19	39.69	-0.0048	up
11/17/2020	454.51	454.71	-0.20	39.69	-0.0050	up
12/10/2020	455.03	455.12	-0.09	39.69	-0.0023	up
1/14/2021	455.38	455.51	-0.13	39.69	-0.0033	up
2/25/2021	455.79	457.21	-1.42	39.69	-0.0358	up
3/24/2021	455.93	457.91	-1.98	39.69	-0.0499	up
9/15/2021	454.40	454.54	-0.14	39.69	-0.0035	up
3/23/2022	457.85	457.98	-0.13	39.69	-0.0033	up
9/21/2022	454.73	454.73	0.00	39.69	0.0000	flat
3/13/2023	457.41	456.65	0.76	39.69	0.0191	down
9/21/2023	452.27	454.27	-2.00	39.69	-0.0504	up
3/25/2024	455.32	455.46	-0.14	39.69	-0.0035	up
9/9/2024	453.89	454.04	-0.15	39.69	-0.0038	up
			Middle of screen elevation MW-4			436.5
			Middle of screen elevation MW-14			396.8

Date	MW-15 Groundwater Elevation [1] (Shallow)	MW-16 Groundwater Elevation [1] (Deep)	Head Change (ft)	Distance Change [2] (ft)	Vertical Hydraulic Gradient [3] (dh/dl)	
9/9/2019	454.63	454.61	0.02	35.20	0.0006	flat
4/6/2020	459.39	459.37	0.02	35.20	0.0006	flat
9/14/2020	454.15	454.11	0.04	35.20	0.0011	flat
11/17/2020	454.77	454.73	0.04	35.20	0.0011	flat
12/10/2020	455.19	455.15	0.04	35.20	0.0011	flat
1/14/2021	455.98	455.91	0.07	35.20	0.0020	down
2/25/2021	456.96	456.94	0.02	35.20	0.0006	flat
3/24/2021	457.73	457.67	0.06	35.20	0.0017	down
9/15/2021	454.84	454.78	0.06	35.20	0.0017	down
3/23/2022	459.04	459.02	0.02	35.20	0.0006	flat
9/21/2022	454.87	454.52	0.35	35.20	0.0099	down
3/13/2023	457.51	457.47	0.04	35.20	0.0011	flat
9/21/2023	454.23	454.19	0.04	35.20	0.0011	flat
3/25/2024	456.48	456.50	-0.02	35.20	-0.0006	flat
9/9/2024	453.92	453.92	0.00	35.20	0.0000	flat
			Middle of screen elevation MW-15			424.3
			Middle of screen elevation MW-16			389.1

TABLE E1. VERTICAL HYDRAULIC GRADIENTS
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Date	MW-7 Groundwater Elevation [1] (Shallow)	MW-17 Groundwater Elevation [1] (Deep)	Head Change (ft)	Distance Change [2] (ft)	Vertical Hydraulic Gradient [3] (dh/dl)	
9/14/2020	453.38	454.59	-1.21	58.91	-0.0205	up
11/17/2020	453.50	454.72	-1.22	59.03	-0.0207	up
12/10/2020	453.93	455.16	-1.23	54.40	-0.0226	up
1/14/2021	455.54	456.77	-1.23	54.40	-0.0226	up
2/25/2021	455.08	456.33	-1.25	54.40	-0.0230	up
3/24/2021	456.63	458.28	-1.65	54.40	-0.0303	up
9/15/2021	453.71	454.89	-1.18	59.24	-0.0199	up
3/23/2022	458.75	459.94	-1.19	54.40	-0.0219	up
9/21/2022	453.77	455.01	-1.24	59.30	-0.0209	up
3/13/2023	456.88	457.08	-0.20	54.40	-0.0037	up
9/21/2023	453.29	456.52	-3.23	58.82	-0.0549	up
3/25/2024	455.37	456.57	-1.20	54.40	-0.0221	up
9/9/2024	452.98	454.20	-1.22	58.51	-0.0209	up
			Middle of screen elevation MW-7			448.87
			Middle of screen elevation MW-17			394.5

Date	MW-10S Groundwater Elevation [1] (PMP)	MW-10 Groundwater Elevation [1] (UA)	Head Change (ft)	Distance Change [2] (ft)	Vertical Hydraulic Gradient [3] (dh/dl)	
9/9/2019	459.81	452.59	7.22	54.40	0.1327	down
4/6/2020	463.88	457.04	6.84	54.40	0.1257	down
9/14/2020	460.08	452.98	7.10	54.40	0.1305	down
11/17/2020	460.91	453.83	7.08	54.40	0.1301	down
12/10/2020	461.45	453.93	7.52	54.40	0.1382	down
1/14/2021	462.63	454.06	8.57	54.40	0.1575	down
2/25/2021	462.70	457.81	4.89	54.40	0.0899	down
9/15/2021	460.45	453.18	7.27	54.40	0.1336	down
3/23/2022	463.91	456.78	7.13	54.40	0.1311	down
9/21/2022	460.35	454.28	6.07	54.40	0.1116	down
3/13/2023	463.35	455.17	8.18	54.40	0.1504	down
9/21/2023	459.91	453.98	5.93	54.40	0.1090	down
3/25/2024	462.79	454.62	8.17	54.40	0.1502	down
9/9/2024	459.69	453.39	6.30	54.40	0.1158	down
			Middle of screen elevation MW-10S			446.78
			Middle of screen elevation MW-10			417.90

TABLE E1. VERTICAL HYDRAULIC GRADIENTS
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Date	MW-11S Groundwater Elevation [1] (PMP)	MW-11 Groundwater Elevation [1] (UA)	Head Change (ft)	Distance Change [2] (ft)	Vertical Hydraulic Gradient [3] (dh/dl)	
9/9/2019	459.43	452.78	6.65	54.40	0.1222	down
4/6/2020	464.92	457.11	12.14	54.40	0.2232	down
9/14/2020	460.50	453.10	3.39	54.40	0.0623	down
11/17/2020	459.30	453.88	6.20	54.40	0.1140	down
12/10/2020	460.01	454.03	5.98	54.40	0.1099	down
1/14/2021	461.87	454.27	7.60	54.40	0.1397	down
2/25/2021	461.04	457.85	3.19	54.40	0.0586	down
9/15/2021	460.05	453.25	6.80	54.40	0.1250	down
3/23/2022	465.09	456.82	8.27	54.40	0.1520	down
9/21/2022	459.50	454.04	5.46	54.40	0.1004	down
3/13/2023	462.77	455.38	7.39	54.40	0.1358	down
9/21/2023	459.15	453.56	5.59	54.40	0.1028	down
3/25/2024	462.42	454.62	7.80	54.40	0.1434	down
9/9/2024	458.64	453.37	5.27	54.40	0.0969	down
			Middle of screen elevation MW-11S			447.30
			Middle of screen elevation MW-11			417.81

Date	MW-13S Groundwater Elevation [1] (PMP)	MW-13 Groundwater Elevation [1] (UA)	Head Change (ft)	Distance Change [2] (ft)	Vertical Hydraulic Gradient [3] (dh/dl)	
9/9/2019	457.56	454.18	3.38	54.40	0.0621	down
4/6/2020	462.23	458.14	4.09	54.40	0.0752	down
9/14/2020	456.83	453.46	3.37	54.40	0.0619	down
11/17/2020	452.11	454.54	-2.43	57.64	-0.0422	up
12/10/2020	457.57	455.10	2.47	54.40	0.0454	down
1/14/2021	454.24	460.05	-5.81	54.40	-0.1068	up
2/25/2021	461.62	457.35	4.27	54.40	0.0785	down
9/15/2021	458.51	454.52	3.99	54.40	0.0733	down
3/23/2022	460.83	457.91	2.92	54.40	0.0537	down
9/21/2022	456.69	454.61	2.08	54.40	0.0382	down
3/13/2023	460.47	456.48	3.99	54.40	0.0733	down
9/21/2023	456.24	453.73	2.51	54.40	0.0461	down
3/25/2024	459.88	455.20	4.68	54.40	0.0860	down
9/9/2024	456.12	453.62	2.50	54.40	0.0460	down
			Middle of screen elevation MW-13S			448.54
			Middle of screen elevation MW-13			424.13

[O: LDC 11/14/24, C: BJD 2/1/2024]

TABLE E1. VERTICAL HYDRAULIC GRADIENTS
CORRECTIVE MEASURES ASSESSMENT REVISION 3
POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Notes:

[1] All elevations are referenced to North American Vertical Datum of 1988 (NAVD88).

[2] Distance change was calculated using the midpoint of the piezometer screen and water table surface. If the water table surface was above the top of the monitoring well screen, then distance change was calculated using the midpoint of both screens.

[3] Vertical gradients between ±0.0015 are considered flat, and typically have less than 0.02 foot difference in groundwater elevation between wells.

dh = head change
dl = distance change
ft = foot/feet

TABLE E2. HORIZONTAL HYDRAULIC GRADIENTS AND GROUNDWATER FLOW VELOCITY

CORRECTIVE MEASURES ASSESSMENT REVISION 3

POND SYSTEM

MIAMI FORT POWER PLANT

NORTH BEND, OHIO

$V = K i \;/\; n_e$

V = Groundwater Velocity [1]
K = Hydraulic Conductivity [2]
i = hydraulic gradient
n_e = Effective Porosity [3] cm3/s

Basin A

Date	Approximate Flow Direction	Transmissivity Estimate (gallons per day/ft)	Average Uppermost Aquifer Thickness (feet)	Average Hydraulic Conductivity (cm/s)[2]	Horizontal Hydraulic Gradient (ft/ft)[1]	Effective Porosity[3]	Velocity (ft/day)
3/13/2023	West/Southwest	50000	77	3.06E-02	0.0013	0.30	0.37
9/23/2023	West/Northwest	50000	77	3.06E-02	0.0005	0.30	0.15
3/1/2624	West	50000	77	3.06E-02	0.0005	0.30	0.13
9/9/2024	West/Northwest	50000	77	3.06E-02	0.0001	0.30	0.02

[O: BJD 1/25/25, C: NMP 2/2/25]

Basin B

Date	Approximate Flow Direction	Transmissivity Estimate (gallons per day/ft)	Average Uppermost Aquifer Thickness (feet)	Average Hydraulic Conductivity (cm/s)[2]	Horizontal Hydraulic Gradient (ft/ft)[1]	Effective Porosity[3]	Velocity (ft/day)
3/13/2023	South/Southwest	50000	61	3.87E-02	0.0011	0.30	0.40
9/23/2023	Radially	50000	61	3.87E-02	0.0006	0.30	0.21
3/1/2624	Radially	50000	61	3.87E-02	0.0013	0.30	0.47
9/9/2024	Radially	50000	61	3.87E-02	0.0008	0.30	0.30

[O: BJD 1/25/25, C: NMP 2/2/25]

Notes:

cm/s = centimeters per second
ft/day = foot/feet per day
ft/ft = feet per foot
1. Horizontal hydraulic gradient calculated using groundwater elevation contour maps generated for each sampling event.
2. Effective porosity was estimated to be 0.30 in the Uppermost Aquifer.
3. Hydraulic conductivity (K) value estimated from transmissivity (T) and Uppermost Aquifer thickness (b), such that K = T/b.

APPENDIX F
TECHNICAL MEMORANDUM – MIAMI FORT POND SYSTEM MONITORED NATURAL ATTENUATION (MNA) EVALUATION (GEOSYNTEC CONSULTANTS, 2020)

Geosyntec consultants

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TECHNICAL MEMORANDUM

Date:	November 30, 2020
To:	Brian Voelker - Vistra
Copies to:	Stu Cravens and Phil Morris - Vistra
From:	Allison Kreinberg, Bob Glazier, Nathan Higgerson - Geosyntec Consultants
Subject:	Miami Fort Pond System Monitored Natural Attenuation (MNA) Evaluation Update

Geosyntec is evaluating the feasibility of monitored natural attenuation (MNA), in combination with coal combustion residual (CCR) unit source control measures, as a groundwater remedy for statistically significant levels (SSLs) of cobalt above the groundwater protection standard (GWPS) at the Miami Fort Pond System. As discussed in Section 2.3 of the Corrective Measures Assessment (CMA), an SSL of cobalt was identified at downgradient monitoring well MW-4. The tiered evaluation is being completed in accordance with USEPA guidance[1,2] to assess whether MNA, in combination with source control, is likely to be the viable remedy based on current and potential post-closure site conditions. The findings of the study completed to-date and the additional data collection required to develop multiple lines of evidence to support the evaluation of MNA in accordance with USEPA guidance are summarized below.

MNA EVALUATION

The selection of MNA, with source control, as a remedy for groundwater constituents will be based on a multiple lines of evidence approach, as outlined in the USEPA guidance. The multiple lines of evidence approach for the Miami Fort Pond System will be based upon (i) source control to mitigate further loading of cobalt mass to groundwater; (ii) delineation of the nature and extent of cobalt impacts in groundwater; and (iii); a successful evaluation of favorable site conditions that result in the attenuation of cobalt in groundwater leading to stable or declining trends of cobalt in groundwater following source control implementation.

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[1] USEPA. 2007. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, Volume I – Technical Basis for Assessment. EPA/600/R-07/139. October.

[2] USEPA. 2015. Use of Monitored Natural Attenuation for Inorganic Contaminants in Groundwater at Superfund Sites. Directive No. 9283.1-36. August.

KEY CONDITIONS

The status of key conditions which will support the selection of MNA, in combination with source control, as a groundwater remedy is summarized below. These conditions were assessed as Tier 1 of the evaluation.

Site Geology and Hydrogeology

As noted in Section 2.2 of the CMA, the uppermost aquifer at the site is a glacial outwash consisting of sands and gravels overlain by alluvial silts and clays. These alluvial sediments are likely to provide sufficient attenuation capacity. Thus, the geologic and hydrogeologic conditions at the site are favorable for reliable performance monitoring.

Cobalt Delineation

As discussed in Section 2.3 of the CMA, the cobalt impacts at MW-4 are vertically delineated via groundwater monitoring well MW-14. There is insufficient space downgradient of MW-4 to install another delineation well before reaching the Ohio River. In lieu of using downgradient groundwater monitoring wells for delineation, the anticipated contribution of cobalt from groundwater to the Ohio River was calculated.

The current average concentration of cobalt at MW-4 is 12.3 micrograms per liter (µg/L), with a maximum reported value of 22.4 µg/L. Even without surface water dilution, the concentrations observed at MW-4 are below the Ohio Environmental Protection Agency (OEPA) aquatic life risk screening level established in OAC 3745-1[3]. OEPA does not currently have a human exposure surface water screening level for cobalt. Calculations completed by Ramboll (provided as Appendix A and included as an attachment to the Risk Mitigation Plan submitted with the Part A extension application) show that, with mixing during low flow conditions of the Ohio River, contributions of cobalt to the Ohio River will result in a negligible increase of 0.00076 µg/L in surface water concentrations in the Ohio River. USEPA guidance states that MNA should not be used at sites where concentrations result in “impacts to environmental resources that would be unacceptable to the overseeing regulatory authority”. However, the initial evaluation suggests that the contribution of cobalt to the Ohio River do not represent a potential risk for human or ecological receptors. Thus, delineation is sufficient to proceed with an MNA evaluation. An additional evaluation of the surface water-groundwater interface will be completed in 2021 after protocols and methodologies specific to the site have been established.

Source Control

Source control measures will be implemented in the future. Per Section 5.1 of the CMA, closure in place, closure by removal (off-site landfill), and in-situ solidification/stabilization were

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[3] Ohio Administrative Code (OAC). 2018. 3745-1. State of Ohio Water Quality Standards. Rev. May 2018.

retained as potential source control measures. It is assumed that MNA will be paired with one of the retained potential source control measures, which will result in a decrease in the input of cobalt to the groundwater system and a subsequent reduction in concentration at MW-4.

Cobalt Attenuation

According to USEPA guidance, the groundwater plume should be stable or decreasing. While there is variability in cobalt concentrations at MW-4 (Figure 1), Mann-Kendall analysis shows that there is not a significant increasing trend (Appendix B).

Cobalt readily undergoes attenuation in soils due to favorable adsorption onto clay minerals, iron and manganese oxides, and organic matter[4]. Amorphous iron oxides were found to readily remove cobalt from the aqueous phase, with minimal subsequent desorption observed[5]. Cobalt adsorption onto soils increases with increasing pH with a marked increase above pH 7. Oxidation-reduction (redox) conditions in groundwater do not appear to directly affect cobalt sorption behavior below pH 9.5; however, changes in redox conditions can affect the stability of iron oxides to which cobalt is attenuated.

A review of geochemical conditions at the Pond System suggests that cobalt is likely attenuated via interactions with iron-containing solid phases. Groundwater samples collected during the April 2020 event were analyzed for total and dissolved iron. For locations where cobalt was detected, there appears to be a correlation between cobalt and total iron, with higher iron associated with higher cobalt concentrations (Figure 2). A reduction potential (Eh)-pH diagram was developed to model iron speciation in groundwater at MW-4 (Figure 3). The ORP values measured during groundwater sampling at MW-4 were converted to Eh[6] (shown in volts [V]) and plotted against the measured pH values to show the predominant iron species in groundwater during each event. Groundwater samples with higher cobalt concentrations (shown with orange symbology on Figure 3) are typically associated with lower pH values and somewhat with lower Eh values. Under these conditions, a greater percentage of iron is present in its more mobile Fe^{2+} form and could result in the dissolution of iron oxides. These results suggest that cobalt attenuation at the site is influenced by the stability of iron-containing solid phases.

These findings adequately meet the requirements of Tier 1 of the MNA evaluation in accordance with USEPA guidance. However, additional data are required to sufficiently develop all lines of evidence and complete a full tiered evaluation.

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[4] Borggaard, O. K. 1987. Influence of iron oxides on cobalt adsorption by soils. *J. Soil Sci.*, **38**, 229-238.

[5] McLaren, R. G., Lawson, D.M., Swift, R. S. 1986. Sorption and Desorption of Cobalt by Soils and Soil Components. *J. Soil Sci.*, **37**, 413-426.

[6] Field ORP measurements are typically recorded using an Ag/AgCl electrode (or similar), whereas Eh is defined as the voltage reading compared to the Standard Hydrogen Electrode (SHE). A conversion between the Ag/AgCl electrode and the SHE can be made by adding an offset voltage to the measured ORP value. Thus, Eh = ORP + 0.2V.

ADDITIONAL EVALUATION

As part of the tiered evaluation, additional efforts are planned for completion in 2021 to support the existing findings that MNA, in combination with source control, may be an appropriate groundwater remedy at the Miami Fort Pond System. For each tier of the remaining evaluation, the following scope of work is planned to collect sufficient additional information:

- <u>Tier 2 (Demonstrate the attenuation mechanism and rate):</u> Solid phase material will be collected adjacent to MW-4 to better characterize the reactive phases which are present and can attenuate cobalt. Potential analytical techniques to characterize the reactive phase include X-ray diffraction (XRD), sequential phase extraction (SEP), analysis of total metals, and analysis of total organic carbon (TOC). Rates are described in Tier 3 below.
- <u>Tier 3 (Demonstrate that the aquifer capacity is sufficient for attenuation and the mechanism is sufficiently irreversible)</u>: Bench-scale adsorption isotherm and/or column tests will be run to evaluate the attenuation capacity and rate of the aquifer system. Groundwater with elevated cobalt concentrations should be exposed to unimpacted aquifer solids collected from an upgradient location in these tests. Desorption isotherm tests and/or column flushing tests should be run to evaluate the stability of the attenuation mechanism. For these tests, unimpacted site groundwater should be mixed with aquifer solids that have attenuated cobalt. Additional design considerations will be determined based on the results of the Tier 2 analyses.
- <u>Tier 4 (Long-Term Monitoring)</u>: Based on the results of the Tier 2 and Tier 3 tests, a performance monitoring plan will be developed to evaluate the efficacy of MNA at the site. The performance monitoring plan will also include potential supplemental remedies, if needed. These other potential remedies will be evaluated in parallel with the tiered evaluation in accordance with 40 C.F.R. § 257.97 in the performance monitoring plan.

EVALUATION CRITERIA

MNA was evaluated to assess whether it will likely meet the criteria outlined in 40 C.F.R. § 257.96(c) as a potential corrective action. This evaluation is summarized below and in Table 3 of the CMA.

<u>MNA Performance</u>

Based on the initial evaluation described herein and cobalt's geochemical behavior, MNA performance at the Pond System is likely to achieve the performance criteria outlined in 40 C.F.R. § 257.97. Completion of the tiered evaluation and assessment of cobalt concentrations under closure conditions, and stability of the attenuated cobalt, are required to fully assess MNA performance relative to the performance criteria.

Reliability of MNA

The reliability of MNA is dependent on site-specific conditions. As discussed above, it appears that cobalt attenuation at the site is controlled by iron-containing solid phases. This iron-cobalt relationship is well documented in academic literature cited above. Additional evaluation is required to understand the site-specific attenuation mechanism, capacity, and rate, all of which will provide more information on the reliability of MNA.

Ease of implementation of MNA

MNA is relatively easy to implement compared to other potential remedies which require construction, earthwork, or engineering design. Additional efforts required to implement MNA include completion of the tiered investigation and implementation of the performance monitoring plan. These efforts do not require specialized equipment or contractors.

Potential impacts (including safety impacts, cross-media impacts, and control of exposure to any residual contamination)

Potential impacts are not anticipated with MNA. MNA relies on processes that are naturally occurring in the aquifer; therefore, cross-media impacts are unlikely. Large scale handling of impacted materials (such as during groundwater extraction) is not required, reducing the potential for exposure to residuals during implementation. Conservative calculations indicate that there are currently no exceedances of the relevant regulatory criteria in the Ohio River; this will be further assessed in the groundwater-surface water interface evaluation.

Time required to begin and complete MNA

USEPA guidance states that "natural attenuation should achieve site-specific objections within a time frame that is reasonable compared to that offered by more active methods"[7]. When considering a reasonable time frame, USEPA recommends consideration of factors such as contaminant properties, exposure risk, classification of the protected resource, and potential for plume stability. As discussed above, delineation of impacts is complete and there is no current calculated exceedance of human or aquatic risk-based criteria for potential receptors in the Ohio River. Cobalt, which is known to attenuate via interactions with aquifer solids, appears to be present in stable concentrations at MW-4.

Additional efforts are planned to complete the tiered MNA evaluation and assess the attenuation capacity of the aquifer to predict future stability. The collection of this additional information does not require specialized contractors and can be completed within one year. The time required to attain the groundwater protection standard at MW-4 can be estimated once additional information is developed regarding the attenuation rate and likely decline in concentrations after

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[7] USEPA. 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. OSWER Directive 9200.4-17P. April.

implementation of source control. Because the time to completion will depend on the source decay rate, it is anticipated that MNA would have a similar cleanup time as other potential corrective actions, such as groundwater extraction. It is anticipated that the timeframe is reasonable and within the guidance provided by USEPA.

Institutional requirements, such as state or local permit requirements, that may substantially affect implementation of MNA

MNA requires approval by OEPA to be implemented. Existing OEPA guidance relies on the same principals as the USEPA guidance, which are being followed in this evaluation[8]. OEPA notes that "A monitored natural attenuation plan requires a study of the processes (based on extensive monitoring) to establish that natural attenuation is already occurring and the rate of attenuation of contaminants of concern"[9]. The tiered investigation described herein is designed to address these criteria; thus, state permitting is not expected to substantially affect MNA implementation.

CONCLUSIONS

Based on the analysis completed to-date, MNA combined with source control appears to be a promising groundwater remedy at the Miami Fort Pond System when reviewed against the requirements in 40 C.F.R. § 257.96(c). Further investigation will be completed in 2021 to collect sufficient evidence to support the tiered MNA evaluation, which will include an analysis of the attenuation mechanism, rate, and aquifer capacity to establish multiple lines of evidence in accordance with USEPA guidance.

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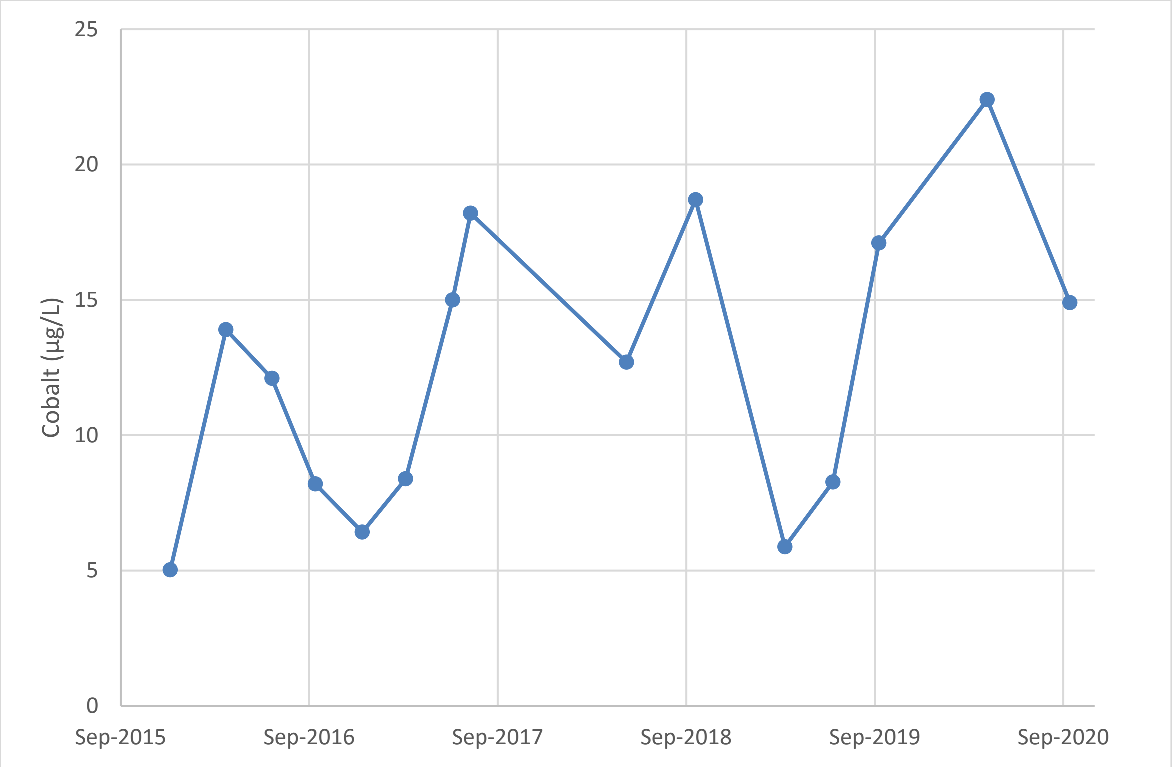
[8] OEPA. 2001. Remediation Using Monitored Natural Attenuation – Division of Environmental Response and Revitalization Remedial Response Program Fact Sheet. January.

[9] OEPA. 2002. Distinction Between Monitored Natural Attenuation and Enhanced Monitoring at DERR Remedial Sites – Technical Decision Compendium. October.

FIGURES



Notes: Cobalt concentrations are shown as micrograms per liter (µg/L).

MW-4 Cobalt Time Series Graph

Miami Fort Pond System
North Bend, Ohio

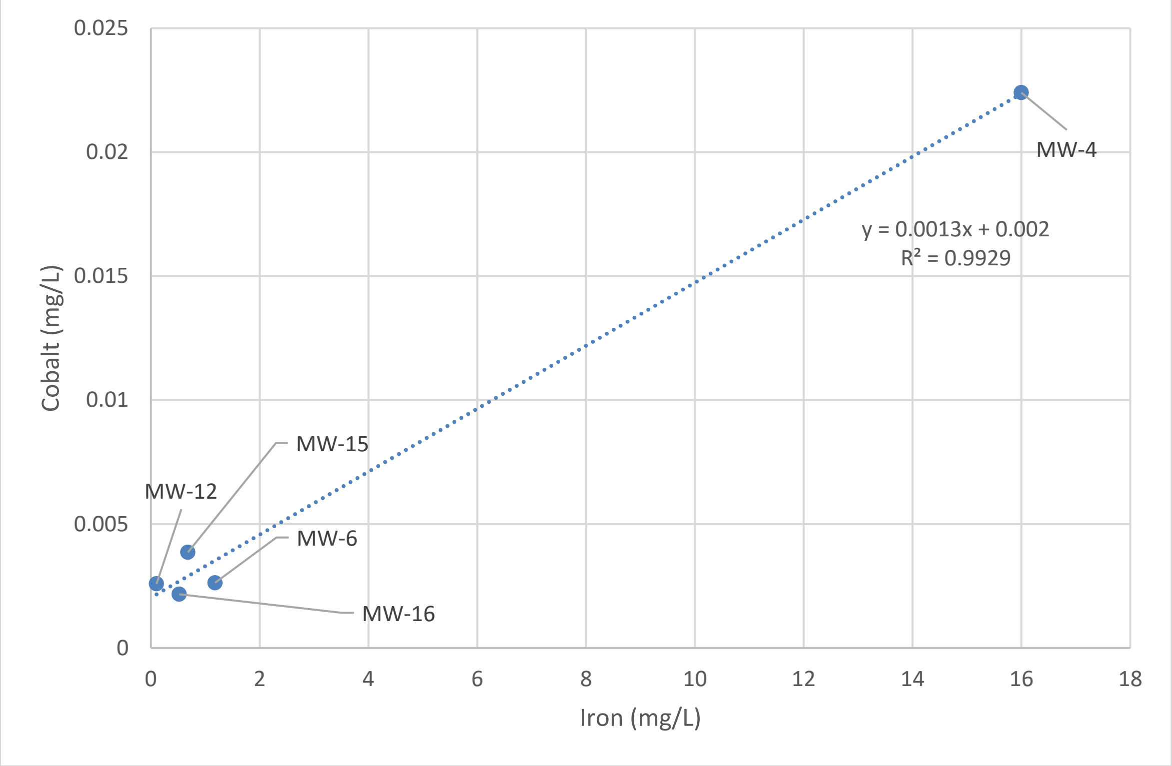
Geosyntec consultants

Figure
1

Columbus, OH

2020/11/23

internal info: path, date revised, author



Notes: April 2020 data are shown. Only locations where cobalt was detected are shown. Cobalt and iron concentrations are shown as milligrams per liter (mg/L).

Iron v. Cobalt Scatter Plot

Miami Fort Pond System
North Bend, Ohio

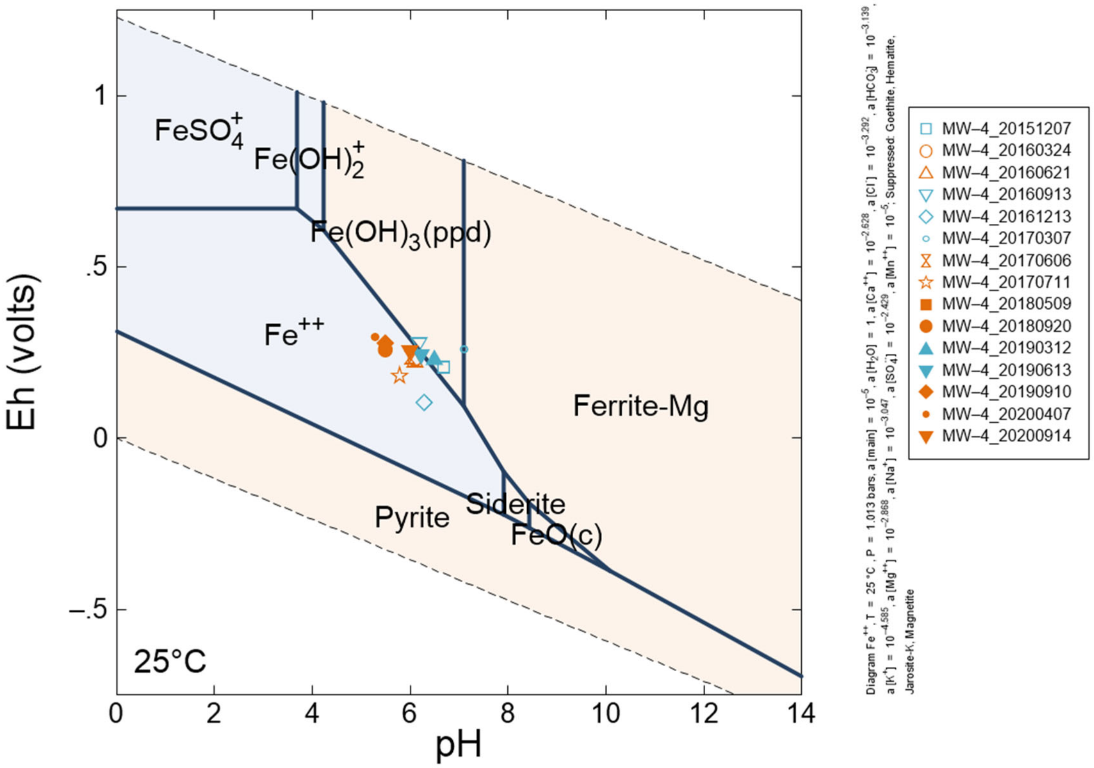
Geosyntec consultants

Figure
2

Columbus, OH

2020/11/30

internal info: path, date revised, author



Notes: Average groundwater concentrations for major solutes at MW-4 and an assumed iron activity of 10^{-5} molal were used as input parameters. Groundwater field measurements at MW-4 are shown in the scatter plot. Events which had a reported cobalt concentration greater than 0.01 mg/L are shown in orange.

MW-4 Iron Eh-pH Diagram

Miami Fort Pond System
North Bend, Ohio

Geosyntec consultants

Figure
3

Columbus, OH

2020/11/24

internal info: path, date revised, author

APPENDIX A

Ohio River Mixing Calculation

Mixing Calculation Showing Effect of Cobalt Loading on Ohio River Quality at Low Flow

Baseflow (90th percentile daily mean low flow)		22,697	cfs	Source[1]: ORSANCO, calculated as the 90th percentile low of estimated daily mean discharge rates (11/1986-2/2016) at river mile 483.5 provided by U.S. Army Corps' CASCADE model
	=	5.6E+10	L/day	
Cobalt loading rate				
Maximum Cobalt Concentration in Groundwater		0.0187	mg/L	Maximum Concentration Well MW-4 - 9/2018
Maximum Hydraulic Conductivity (Uppermost Aquifer)		0.123	cm/s	Source[2]: USGS, maximum hydraulic conductivity (350 ft/d) based on area aquifer tests conducted in alluvial deposits
Hydraulic Gradient		0.0008		Calculated based on June 2019 groundwater elevations
Basin A Discharge Zone Thickness		64	ft	Estimated maximum depth of impacts in Uppermost Aquifer[3]
Basin A Discharge Zone Length		890	ft	Estimated maximum length of impacts in Uppermost Aquifer[4]
Q = KIA				
K = Max Hydraulic Conductivity		0.0041	ft/s	
I = Hydraulic Gradient		0.0008		
A = Cross-Sectional Area		56,960	ft^2	
Q (per second)		0.17	cfs	
Q (per day)		423,400	L/day	
Loading Rate (L)		7,900	mg/day	= C_{max} * Q
	L =	0.02	lb/day	
Cobalt concentration increase in Ohio River at low flow due to loading from Basin A				
	d_B =	0.00000014	mg/L	= $L/Q_{90th\ low}$
Cobalt concentration increase near-shore in Ohio River at low flow due to loading from the Basin A				
Assumes loading distributed within 328 feet (100 meters) of shoreline		0.00000076	mg/L	River is approximately 1750 ft wide
Typical Cobalt laboratory detection limit		0.000075	mg/L	Source: Test America Report for 9/2018 Sampling Event

Conclusion:

The calculated cobalt concentration increase in the Ohio River at ***low flow*** due to groundwater loading from the Basin A is less than the typical cobalt detection limit, indicating that increases due to impacted discharge would not be detectable. These calculations indicate that the effects of cobalt loading in groundwater discharge to the Ohio River are negligible.

Notes

[1] Ohio River Valley Water Sanitation Commission (ORSANCO), 2019. Historical Flow Data. Prepared by U.S. Army Corps of Engineers. Accessed August 28, 2019. http://www.orsanco.org/data/flow/

[2] United States Geological Survey (USGS), 1999. Hydrogeology and Simulation of Ground-Water Flows in the Ohio River Alluvial Aquifer Near Carrollton, Kentucky, Report 98-4215. Prepared by M.D. Unkthank, in cooperation with the Carrol County Water-Supply Board.1999.

[3] Upper limit estimated as average June 2019 groundwater elevations from MW-12, MW-4 and MW-13 . Lower limit estimated as base of MW-14 well screen elevation.

[4] Estimated as linear distance from MW-12 to MW-4 to MW-13.

APPENDIX B

Mann-Kendall Analysis - Cobalt Concentrations at MW-4

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.111/25/2020 12:32:20
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	0.99
Level of Significance	0.01

MF-MW-4_Co

General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	15
Number Values Reported (n)	15
Minimum	0.00503
Maximum	0.0224
Mean	0.0125
Geometric Mean	0.0114
Median	0.0127
Standard Deviation	0.00531
Coefficient of Variation	0.425

Mann-Kendall Test

M-K Test Value (S)	37
Tabulated p-value	0.037
Standard Deviation of S	20.21
Standardized Value of S	1.782
Approximate p-value	0.0374

Insufficient evidence to identify a significant trend at the specified level of significance.

APPENDIX G
TECHNICAL MEMORANDUM – MIAMI FORT POND SYSTEM CORRECTIVE MEASURES ASSESSMENT UPDATE

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TECHNICAL MEMORANDUM

Date:	March 3, 2022
To:	Brian Voelker – Vistra
Copies to:	Stu Cravens and Phil Morris – Vistra
From:	Allison Kreinberg, Ryan Fimmen – Geosyntec Consultants
Subject:	Miami Fort Pond System Corrective Measures Assessment Update

EXECUTIVE SUMMARY

Geosyntec Consultants, Inc. (Geosyntec) has prepared this technical memorandum as an addendum to the existing Corrective Measures Assessment (CMA)[1] for the Miami Fort Pond System (the Site). This memo provides an update on the ongoing remedy selection progress, including providing additional details on aspects of the groundwater corrective measures evaluation and closure design.

Topics covered in this memorandum include:

- An update on the evaluation of monitored natural attenuation (MNA) as a potential component of a selected groundwater remedy;
- Information regarding plans for dewatering the coal combustion residual (CCR) material as part of closure activities; and,
- Information regarding plans to minimize vertical and lateral infiltration of groundwater during and following closure activities.

MNA EVALUATION PROGRESS

The CMA reviewed multiple potential groundwater remedies, including MNA, to address statistically significant levels (SSLs) of cobalt above the groundwater protection standard (GWPS) at the Site.

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[1] Ramboll Americas Engineering Solutions, Inc. (Ramboll). 2020. *Corrective Measures Assessment Revision 2 – Miami Fort Pond System, Miami Fort Power Station, North Bend, Ohio*. Report to Dynegy Miami Fort, LLC., November.

A tiered evaluation is being completed in accordance with United States Environmental Protection Agency (USEPA) guidance[2] to assess whether MNA, in combination with source control, is a viable remedy based on current and potential post-closure site conditions. According to the USEPA guidance, a tiered MNA evaluation should include:

- Tier I: Demonstration that the groundwater plume is not expanding, and that sorption of the contaminant onto aquifer solids is occurring where immobilization is the predominant attenuation process;
- Tier II: Determination of the attenuation mechanism(s) and rate of the attenuation process(es);
- Tier III: Determination of aquifer capacity to attenuate the mass of contaminant within the plume and the stability of the immobilized contaminant to resist re-mobilization under current and future anticipated conditions; and
- Tier IV: Design of a performance monitoring program based on the mechanistic understanding developed for the attenuation process, and establish a contingency plan tailored to site-specific characteristics.

MNA as a potential groundwater remedy is supported by Tier II and III evaluations, which demonstrate a cobalt attenuation mechanism (i.e., adsorption). The findings of the study completed to-date and the additional data collection planned to develop multiple lines of evidence to support the evaluation of MNA in accordance with USEPA guidance are summarized below.

Tier I Analysis – Initial Considerations and Source Control

The uppermost aquifer at the Site is a glacial outwash consisting of sands and gravels overlain by alluvial silts and clays, as described in Section 2.1.2 of the CMA. The alluvium is likely to provide sufficient attenuation capacity via adsorption of dissolved cobalt to the slit and clay fractions to prevent off-site migration of dissolved cobalt. A monitoring well network was installed in 2017 in accordance with 40 C.F.R. § 257.91 to adequately characterize groundwater flow at the Site and accurately represent the quality of background groundwater (**Figure 1**). Cobalt impacts at MW-4 are vertically delineated via groundwater monitoring well MW-14, but there is insufficient space downgradient of MW-4 to install a lateral delineation well before reaching the Ohio River. The anticipated contribution of cobalt from groundwater to the Ohio River was calculated instead[3]. The initial evaluation suggested that the contribution of cobalt to the Ohio River did not represent a potential risk for human or ecological receptors. Results indicate suitable conditions to proceed with an MNA evaluation.

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[2] USEPA, 2007. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water – Volume 1, Technical Basis for Assessment, Publication EPA/600/R-07/139. October.

[3] Geosyntec. 2020. *Monitored Natural Attenuation Evaluation Update Technical Memorandum – Miami Fort Pond System, Miami Fort Power Station, North Bend, Ohio.* Memo to Dynegy Miami Fort, LLC., November.

An initial characterization was completed to identify if attenuation can occur for cobalt under the known site conditions, with the objective of identifying the predominant attenuation mechanism(s) for cobalt. It is known that cobalt readily undergoes chemical attenuation in soils due to adsorption onto clay minerals, iron- and manganese-oxides, and organic matter[4] with minimal desorption[5]. Geochemical modeling using groundwater data and an approximation of expected mineralogy of the aquifer solids from the area of MW-4 was completed to evaluate the potential for adsorption as an attenuation mechanism. Geochemical model results indicated the potential for cobalt attenuation via adsorption, with more than 60% of aqueous cobalt predicted to sorb to aquifer solids, including iron oxides. These results indicate cumulative removal via adsorption is expected to provide substantial attenuation as cobalt migrates downgradient and sorbs to aquifer solids along the groundwater flow path.

Closure in place, closure by removal (off-site landfill), and in-situ solidification/stabilization were retained as potential source control measures based on criteria outlined in 40 C.F.R. § 257.96. It is assumed that MNA will be paired with one of the retained potential source control measures, which would decrease the input of cobalt to the groundwater system and further reduce aqueous concentrations at MW-4.

<u>Tier II Analysis – Constituent Attenuation Mechanisms</u>

Field investigations were completed in February 2021 to collect site materials for use in the Tier II MNA evaluation. Solid phase material (from location SB-2) was collected adjacent to MW-4 to better characterize soil mineralogy and potential reactive phases that can attenuate cobalt. These materials were analyzed to evaluate if they indicate conditions favorable for removal of cobalt from groundwater via chemical attenuation processes. Analytical techniques to characterize soil mineralogy and reactive phases included X-ray diffraction (XRD), sequential extraction procedure (SEP), analysis of total metals, and analysis of total organic carbon (TOC).

XRD analyses provide mineralogical characterization, whereas SEP testing can provide insight into the attenuation mechanism, capacity, and reversibility under different aqueous conditions. Results from the XRD analysis identified the presence of clays and iron oxides, including hematite, at MW-4 (**Table 1**). The SEP analysis found that the highest levels of cobalt were associated with the amorphous and crystalline iron and manganese oxide phases downgradient of the Pond System (**Table 2**). Cobalt was also identified during the acid-extractable phase, which represents more recalcitrant minerals such as sulfides. Both the XRD and SEP data align with the conceptual site model that cobalt is associated with iron-bearing minerals in the aquifer solids via adsorption.

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[4] Borggaard, O. K. 1987 Influence of iron oxides on cobalt adsorption by soils. *J. Soil Sci.*, **38**, 229-238

[5] McLaren, R. G., Lawson, D. M., Swift, R. S. 1986. Sorption and Desorption of Cobalt by Soils and Soil Components. *J. Soil Sci.*, **37**, 413-426

Chemical attenuation of cobalt via interactions with oxide minerals and sulfide phases therefore appears to be present at the Site.

Batch attenuation testing was performed in 2021 to further evaluate the Tier I/II findings that cobalt undergoes chemical attenuation as predicted by the geochemical model and Site characterization data analyses. The goal of the batch attenuation testing was to develop a Site-specific partition coefficient for cobalt, which represents the relative propensity for cobalt to be associated with the solid versus the aqueous phase.

Groundwater from MW-4 was spiked to achieve an elevated starting target concentration and then mixed with aquifer solids collected adjacent to MW-4 at five different solid-to-liquid ratios. Data obtained from the test was used to construct a 5-point attenuation isotherm for cobalt. Mathematical fitting was used to calculate a linear (K_d) adsorption distribution coefficient. The relatively high K_d value of 1575 L/kg for cobalt derived from the batch attenuation test was selected as being most representative of Site conditions. The linear transformation resulted in a high correlation coefficient (R^2=0.93), indicating a good fit to the model data (**Figure 2**). The selected cobalt K_d value of 1575 L/kg is comparable to those observed at other sites with sands, gravels, and alluvial silts and clays[6]. Further, the calculated K_d value is consistent with the geochemical modeling, which predicted low cobalt mobility in the groundwater system due to adsorption to iron-oxide surfaces. The results of the batch attenuation testing are favorable for the selection of MNA as a component of the groundwater corrective action, as they provide evidence for the removal of cobalt from the environment via chemical attenuation of cobalt.

Tier III – Evaluation of Attenuation Stability

Batch desorption testing was completed in 2021 to support the Tier III evaluation, which aims to understand the reversibility of the cobalt attenuation processes occurring at the Site. Changes in cobalt concentrations or in ambient geochemical conditions (e.g., pH, ORP) could reduce the occurrence or stability of the attenuated cobalt, thereby resulting in potential subsequent releases to the environment. These conditions were evaluated through batch desorption testing. While variable redox conditions were evaluated, the pH conditions of the microcosms were not adjusted because the pH at the background location is comparable to current downgradient pH conditions, and therefore pH conditions are not anticipated to change under future use scenarios.

The mass of cobalt desorbed averaged 3.1% across all three desorption treatments, with the greatest desorption under reducing conditions (8.2%) and the lowest under oxidizing conditions (0.2%). The relatively low extent of desorption indicates high stability of attenuated complexes between cobalt and the soil matrix, which is consistent with the relatively high Site-specific partition coefficient (K_d) that was determined for cobalt. Further, the consistently low desorption indicates that cobalt associated with the soil solids at the Site will remain largely immobilized. Tier II/III

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[6] USEPA. 2005. Partition coefficients for metals in surface water, soil, and waste. Rep. EPA/600/R-05, 74. July.

results demonstrate that cobalt immobilization (via adsorption) is in effect and that the process is highly stable. Natural chemical attenuation can therefore remove from the environmental as much of the released mass of cobalt as is feasible (per 40 C.F.R. § 257.97(b)(4)) and is protective of human health and the environment (per 40 C.F.R. 257.97(b)(1)).

Tier IV – Long-term Monitoring and Remedy Evaluation

If MNA is selected as a component of the groundwater corrective action, then a long-term monitoring (LTM) plan and contingency plan will be developed as part of Tier IV of the MNA evaluation. The LTM plan is required to design a monitoring program that will evaluate the performance of the MNA remedy and the progress of the natural attenuation processes at the Site, following completion of source control measures.

Tier IV of the MNA evaluation also calls for a consideration of the contingency plan if the observed declines in groundwater concentrations of cobalt are not consistent with the groundwater fate and transport model predictions. Alternatively, the contingency plan may need to be considered if Site conditions which are identified as key for MNA performance are no longer present. The contingency plan may specify a technology that is different from MNA, or it may call for modifications to the selected MNA remedy depending on observed changes in Site conditions or performance.

Ongoing Efforts

To establish whether the attenuation rates identified are sufficient for attaining the GWPS, Ramboll is developing a groundwater fate and transport model to predict how groundwater concentrations of cobalt will decline following completion of source control measures. Modeling efforts began in 2020. In combination with the model being developed by Ramboll, which will predict the decline in aqueous cobalt concentrations due to physical attenuation mechanisms, the results of the batch attenuation testing described in the Tier II analysis will be used to understand rates of chemical attenuation mechanisms.

A review of the chemical attenuation capacity for the aquifer will be completed to understand if sufficient capacity is available in the downgradient aquifer to attenuate cobalt via chemical attenuation processes (i.e., adsorption). The Site-specific partition coefficient calculated from the batch attenuation test will be used to estimate the chemical attenuation capacity of the aquifer downgradient of the Site. The potential total mass flux for cobalt will be calculated using the estimated mass of cobalt migrating toward the Ohio River predicted by the groundwater fate and transport model. The total estimated discharged mass will include both historical and future post-closure periods. The chemical attenuation capacity will then be compared to the estimated mass flux of cobalt to (1) evaluate whether sufficient capacity is available to reduce groundwater concentrations to below the GWPS, and (2) predict timeframes to reduce aqueous cobalt concentrations to below the GWPS.

MNA Evaluation Preliminary Conclusions

A tiered MNA evaluation is being developed to assess if Site conditions are favorable for the implementation of MNA as a groundwater corrective measure in combination with source control measures. The evaluation completed thus far found that chemical attenuation of cobalt is expected based on the results of site characterization and batch attenuation testing efforts, demonstrating that immobilization via adsorption occurs and is relatively irreversible. Further analysis is ongoing to determine if there is sufficient capacity in the aquifer system through chemical attenuation alone to attenuate the predicted future contaminant mass flux of cobalt, or whether MNA of cobalt would be achieved through a combination of both physical and chemical mechanisms. If MNA is selected as a component of the groundwater corrective action, then a LTM plan and contingency plan will be developed.

While MNA combined with source control appears to be a promising groundwater remedy at the Miami Fort Pond System, additional investigation is required to increase the density and resolution of the Uppermost Aquifer data to facilitate design of a groundwater extraction system, cutoff wall, and/or permeable reactive barrier, if necessary, to evaluate other corrective measures. Groundwater flow and transport modeling is in development to support selection and design of the groundwater remedy. The groundwater remedy will be selected following completion of the groundwater flow and transport model and evaluation of all potential corrective measures.

FREE LIQUID REMOVAL DURING CLOSURE

As described in Section 5 of the CMA, closure in place (CIP), either alone or potentially with in-situ solidification/stabilization (ISS), were selected as potential source control corrective measures. Prior to installing a final cover system, free liquids will be eliminated by either removing liquid wastes or by removing liquid wastes and solidifying the remaining wastes and waste residues.

If CIP without ISS was selected as the source control corrective measure, prior to installing a final cover system, free liquids would be eliminated by removing liquid waste by using engineering measures to remove liquids that are readily separable under ambient temperature and pressure are being evaluated.

If ISS was utilized with CIP, the final product of the ISS process is a relatively impermeable material that acts as a hydraulic barrier to groundwater flow and does not have liquids that are readily separable under ambient temperature and pressure. Free liquids outside of areas improved by ISS would still be eliminated by removing liquids waste with engineering measures designed to remove liquids that are readily separable under ambient temperature and pressure.

MINIMIZATION OF POST-CLOSURE INFILTRATION

Source control via CIP, potentially with ISS, will, to the maximum extent feasible, minimize the post-closure vertical infiltration of liquids into the retained CCR through the installation of a final cover system. While design of the final cover system will depend on the selected corrective measure, it is likely to contain the following features:

- An LLDPE geomembrane low-permeability layer which would be placed on a prepared subgrade to control and minimize vertical infiltration into the surface impoundment. The geomembrane will be constructed on a subgrade that is free of sharp rocks or other debris and will be protected from damage by installing a geotextile cushion layer and a total of two feet of cover soil and topsoil over the top of the membrane.
- Surface stormwater will be routed off of the top of the final cover by the construction of a free-draining post-closure stormwater management system, including channels and letdown structures. The stormwater management system will drain by gravity and preclude water impoundment on top of the final cover system, thereby minimizing vertical post-closure infiltration into the CCR.

Groundwater modeling will be completed as part of the corrective measures selection process. The modeling will assess the potential for lateral migration of water into and out of the remaining CCR material; this potential would be considered as part of the selection of groundwater corrective measures.

TABLES

Table 1: X-Ray Diffraction Results
Miami Fort Power Station

Site Material		SB-2		
Sample Depth (ft bgs)				
Mineral	**Mineral Composition**	**36-37'**	**42-43'**	**43-44'**
Quartz	SiO_2	55	71	74
Calcite	$CaCO_3$	--	--	--
Albite	$NaAlSi_3O_8$	7.80	10.30	12.50
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	17.50	7.10	4.00
Dolomite	$CaMg(CO_3)_2$	--	--	--
Microcline	$KAlSi_3O_8$	4.10	5.70	4.50
Ankerite	$CaFe(CO_3)_2$	--	--	--
Rhodochrosite	$MnCO_3$	--	--	--
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	4.7	1.9	2.3
Hematite	Fe_2O_3	0.6	0.8	0.7
Kaolinite	$Al_2Si_2O_5(OH)_4$	10.3	3.5	2.4

Notes:

All samples represented as weight percent normalized to a sum of 100%. A quantity of amorphous material has not been determined.

-- - not detected

Table 2: Sequential Extraction Procedure Results
Miami Fort Power Station

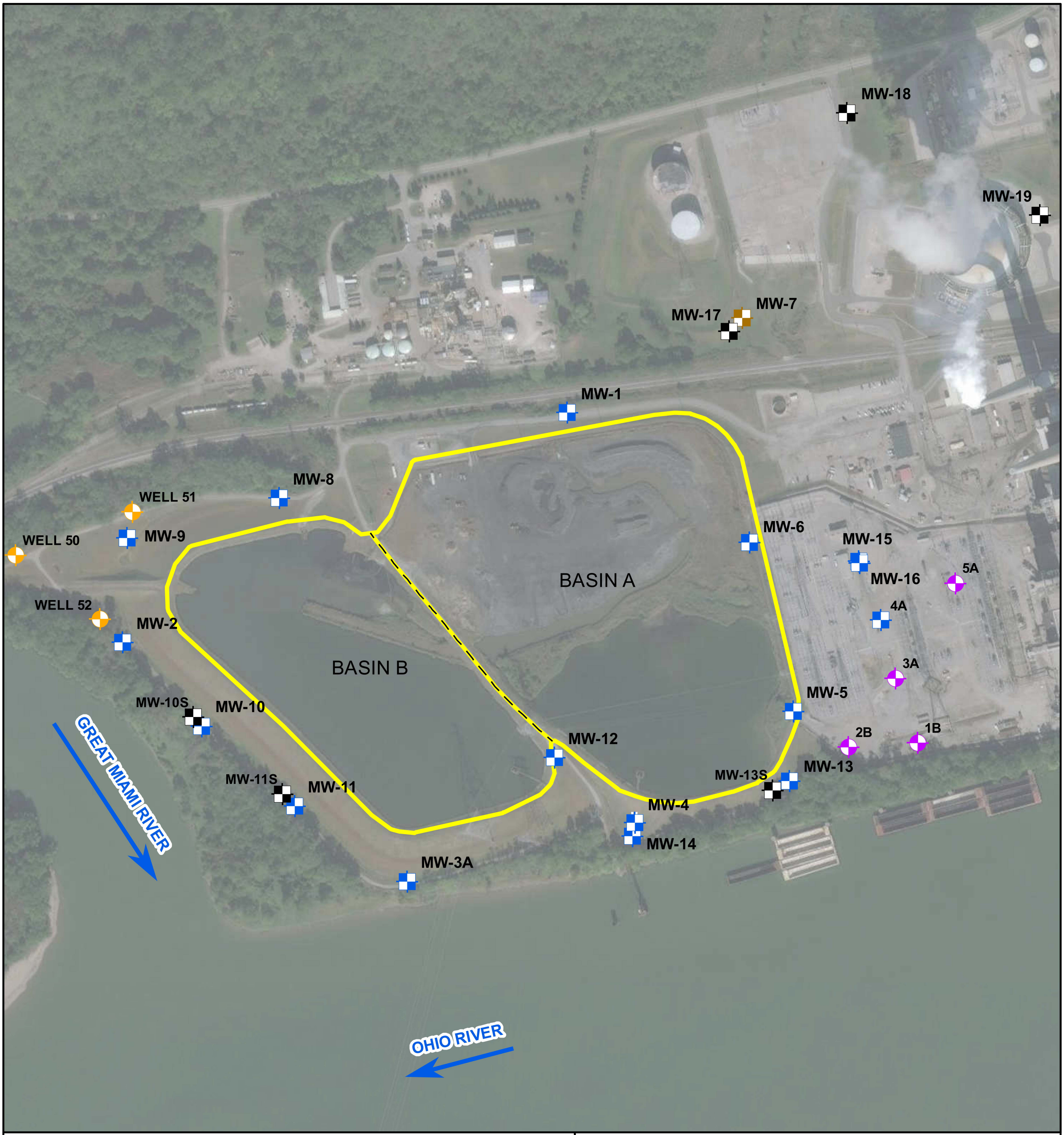
Analyte	Fraction	SB-2
Cobalt	Exchangeable	0.79
	Carbonate	0.59
	Amorphous Fe/Mn Oxides	1.4
	Crystalline Fe/Mn Oxides	4.1
	Organic-Bound	ND
	Acid/Sulfide	2.7
	Residual	0.9
	Total	8.7

Notes:

All results are reported in mg of constituent/kg of total sample mass.

ND - not detected

FIGURES



Legend

- Downgradient CCR Monitoring Well
- Background CCR Monitoring Well
- Monitoring Well
- Miami Fort Production Wells
- Veolia Production Wells
- 🟨 CCR Monitored Multi-Unit
- Berm
- ← River Flow Direction

Notes

- Figure originally from "Corrective Measures Assessment - Miami Fort Pond System" (Ramboll, 2020)

500 250 0 500
Feet

Site and Well Location Map

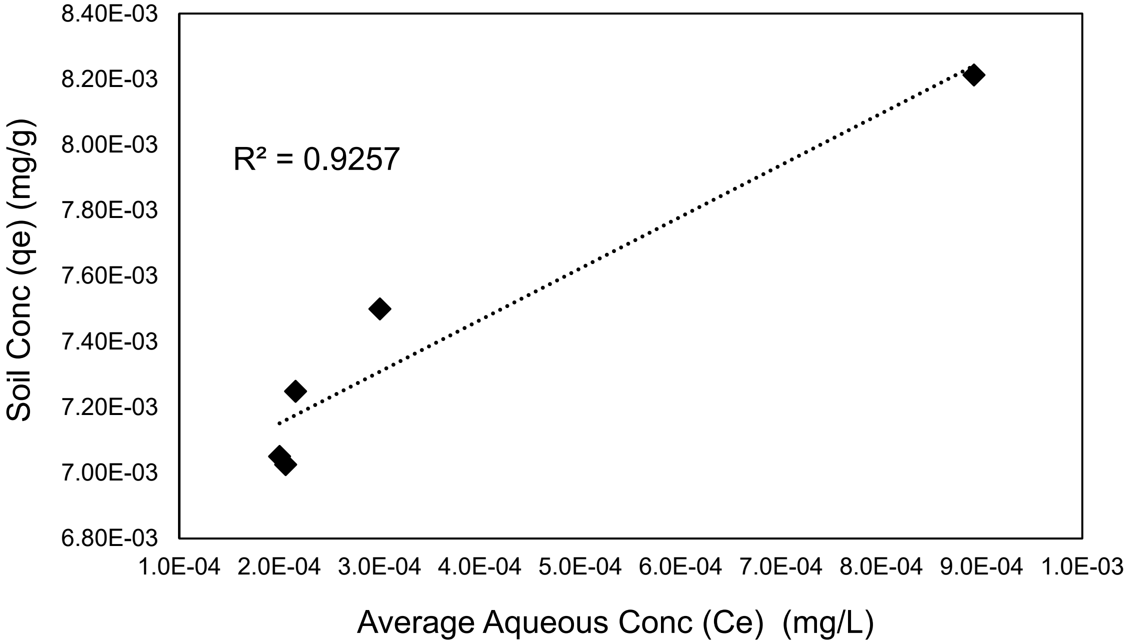
Miami Fort Power Station
North Bend, Ohio

Geosyntec
consultants

Columbus, Ohio

January 2022

Figure
1



Notes: Linear isotherm of cobalt at the Miami Fort Pond System. Each data point represents a different soil:water ratio, increasing from 2:1 to 1:20 moving left to right.

Linear Isotherm of Cobalt

Geosyntec consultants

Columbus, Ohio

February 2022

Figure

2