Cynthia Vodopivec
Dynegy Miami Fort, LLC
Luminant
6555 Sierra Dr.
Irving, TX 75039

September 29, 2020

Sent via email

Mr. Andrew R. Wheeler, EPA Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Mail Code 5304-P
Washington, DC 20460

Re: Miami Fort Power Station Alternative Closure Demonstration

Dear Administrator Wheeler:

Dynegy Miami Fort, LLC (Dynegy) hereby submits this request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(2) for the Miami Fort Pond System located at the Miami Fort Power Station near North Bend, Ohio. Dynegy is requesting an extension pursuant to 40 C.F.R. § 257.103(f)(2) so that the Miami Fort Pond System may continue to receive CCR and non-CCR wastestreams after April 11, 2021, and complete closure no later than October 17, 2028.

Enclosed is a demonstration prepared by Burns & McDonnell that addresses all of the criteria in 40 C.F.R. § 257.103(f)(2)(i)-(iv) and contains the documentation required by 40 C.F.R. § 257.103(f)(2)(v). As allowed by the agency, in lieu of hard copies of these documents, electronic files were submitted to Kirsten Hillyer, Frank Behan, and Richard Huggins via email. If you have any questions regarding this submittal, please contact Phil Morris at 618-343-7794 or phil.morris@vistracorp.com.

Sincerely,

Cynthia Vodopivec
VP - Environmental Health & Safety

Enclosure

cc: Kirsten Hillyer
Frank Behan
Richard Huggins

CCR Surface Impoundment Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

Dynegy Miami Fort, LLC

Miami Fort Power Station
Project No. 122702

Revision 0
9/28/2020

CCR Surface Impoundment Demonstration for a Site-Specific Alternative to Initiation of Closure Deadline

prepared for

Dynegy Miami Fort, LLC
Miami Fort Power Station
North Bend, Ohio

Project No. 122702

Revision 0
9/28/2020

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

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Certification

I hereby certify, as a Professional Engineer in the state of Ohio, that the information in this document as noted in the above Report Index was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the Dynegy Miami Fort, LLC or others without specific verification or adaptation by the Engineer.

STATE OF OHIO
MATTHEW DAVID BLEYTHING
82440
REGISTERED
PROFESSIONAL ENGINEER

Matthew D. Bleything, P.E.
Ohio License No. 82440

Date: 9/28/2020

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
AST	Above-ground Storage Tank
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
Dynegy	Dynegy Miami Fort, LLC
ELG Rule	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EPA	Environmental Protection Agency
Miami Fort	Miami Fort Power Station
RCRA	Resource Conservation and Recovery Act
SWPPP	Stormwater Pollution Prevention Plan

1.0 EXECUTIVE SUMMARY

Dynegy Miami Fort, LLC (Dynegy) submits this request to the U.S. Environmental Protection Agency (EPA) for approval of a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(2) —"Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain"— for the Miami Fort Pond System located at the Miami Fort Power Station (Miami Fort) in Ohio. The Miami Fort Pond System is a 51-acre CCR surface impoundment used to manage CCR and non-CCR wastestreams at Miami Fort. As discussed below, the boilers at the station will retire and the impoundment will complete closure no later than October 17, 2028. Therefore, Dynegy is requesting an extension pursuant to 40 C.F.R. § 257.103(f)(2) so that the Miami Fort Pond System may continue to receive CCR and non-CCR wastestreams after April 11, 2021, and complete closure no later than October 17, 2028.

2.0 INTRODUCTION

Miami Fort is a 1,100-megawatt coal-fueled electric generating station near North Bend, Ohio. The Miami Fort Pond System is a 51-acre CCR surface impoundment comprised of two hydraulically connected cells (Basins A and B) which operate in series and are hydraulically connected by a 40-inch HDPE pipe that runs through a shared separator dike. Miami Fort uses the Miami Fort Pond System to manage sluiced bottom ash and fly ash, as well as other non-CCR wastewaters. Basin A functions as a primary settling pond for the ash sluice flows and most of the non-CCR flows, which overflow to Basin B for additional residence time and settling prior to permitted discharge. The various non-CCR wastewaters originate from the coal pile runoff pond, FGD runoff pond, cooling tower blowdown, wastewater sumps (including boiler hopper overflows, air heater wash water, boiler blowdown, and miscellaneous plant drains), wastewater treatment effluent tank, boiler wash water, air heater wash water, and other stormwater sources. A site plan is provided on Figure 1 in Appendix A, and the plant water balance diagram is included in Appendix B. Note that Basin A is referred to as SPD-1 Pond-1 (Ash Pond A Cell-1 and Cell-2) on the water balance diagram, and Basin B is referred to as SPD-2 Pond-2 (Ash Pond B).

On April 17, 2015, the Environmental Protection Agency (EPA) issued the federal Coal Combustion Residual (CCR) Rule, 40 C.F.R. Part 257, Subpart D, to regulate the disposal of CCR materials generated at coal-fueled units. The rule is being administered under Subtitle D of the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. § 6901 et seq.). On August 28, 2020, the EPA Administrator issued revisions to the CCR Rule that require all unlined surface impoundments to initiate closure by April 11, 2021, unless an alternative deadline is requested and approved. 40 C.F.R. § 257.101(a)(1) (85 Fed. Reg. 53,516 (Aug. 28, 2020)). Specifically, owners and operators of a CCR surface impoundment may continue to receive CCR and non-CCR wastestreams if the facility will cease operation of the coal-fired boiler(s) and complete closure of the impoundments within certain specified timeframes. 40 C.F.R. § 257.103(f)(2). To qualify for an alternative closure deadline under § 257.103(f)(2), a facility must meet the following four criteria:

1. **§ 257.103(f)(2)(i)** – No alternative disposal capacity is available on-site or off-site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification.
2. **§ 257.103(f)(2)(ii)** - Potential risks to human health and the environment from the continued operation of the CCR surface impoundment have been adequately mitigated;
3. **§ 257.103(f)(2)(iii)** - The facility is in compliance with the CCR rule, including the requirement to conduct any necessary corrective action; and

4. **§ 257.103(f)(2)(iv)** - The coal-fired boilers must cease operation and closure of the impoundment must be completed within the following timeframes:
    a. For a CCR surface impoundment that is 40 acres or smaller, the coal-fired boiler(s) must cease operation and the CCR surface impoundment must complete closure no later than October 17, 2023.
    b. For a CCR surface impoundment that is larger than 40 acres, the coal-fired boiler(s) must cease operation, and the CCR surface impoundment must complete closure no later than October 17, 2028.

Section 257.103(f)(2)(v) sets out the documentation that must be provided to EPA to demonstrate that the four criteria set out above have been met. Therefore, this demonstration is organized based on the documentation requirements of §§ 257.103(f)(2)(v)(A) – (D).

The facility originally identified each basin in the Miami Fort Pond System separately in CCR compliance documents, but it has always operated the basins collectively as a single wastewater treatment system as described above. Thus, consistent with the requirements of the CCR Rule, the compliance documents on Miami Fort's CCR public website have been clarified to reflect the fact that the Miami Fort Pond System is a single, multi-unit system for purposes of the CCR Rule. Accordingly, Dynegy is submitting this demonstration pursuant to § 257.103(f)(2) so the 51-acre Miami Fort Pond System may continue to receive the CCR and non-CCR wastestreams discussed below after April 11, 2021, and complete closure by October 17, 2028.

3.0 DOCUMENTATION OF NO ALTERNATIVE DISPOSAL CAPACITY

To demonstrate that the criteria in § 257.103(f)(2)(i) has been met, the following provides documentation that no alternative disposal capacity is currently available on-site or off-site for each CCR and non-CCR wastestream that Dynegy seeks to continue placing into the Miami Fort Pond System after April 11, 2021. Consistent with the regulations, neither an increase in costs nor the inconvenience of existing capacity was used to support qualification under this criteria. Instead, as EPA explained in the preamble to the proposed Part A revisions, "it would be illogical to require [] facilities [ceasing power generation] to construct new capacity to manage CCR and non-CCR wastestreams." 84 Fed. Reg. 65,941, 65,956 (Dec. 2, 2019). EPA again reiterated in the preamble to the final revisions that "[i]n contrast to the provision under § 257.103(f)(1), the owner or operator does not need to develop alternative capacity because of the impending closure of the coal fired boiler. Since the coal-fired boiler will shortly cease power generation, it would be illogical to require these facilities to construct new capacity to manage CCR and non-CCR wastestreams." 85 Fed. Reg. at 53,547. Thus, new construction or the development of new alternative disposal capacity was not considered a viable option for any wastestream discussed below.

3.1 Site-Layout and Wastewater Processes

The Miami Fort Pond System receives all CCR sluice flows and most of the non-CCR wastewater flows onsite before discharging to the Ohio River via Outfall 002 in accordance with NPDES Permit No. OH0009873. These wastestreams are discussed in more detail in the following sections. The remaining plant process flows (non-contact cooling water and the sanitary treatment flows) are routed to the Ohio River through separate permitted outfalls, as shown on the water balance diagram in Appendix B.

3.2 CCR Wastestreams

Dynegy evaluated each CCR wastestream placed in the Miami Fort Pond System. For the reasons discussed below in Table 3-1, each of the following CCR wastestreams must continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site.

Table 3-1: Miami Fort CCR Wastestreams

CCR Wastestreams	Average Flow (GPD)	Alternative Disposal Capacity Available? YES/NO	Details
Fly Ash (and non-CCR Pyrite) Sluice	8,585,000 (sourced from Cooling Tower Blowdown)	NO	Fly ash is typically captured dry, however startup ash material is sluiced to the Miami Fort Pond System for safety and ash marketing reasons (preventing fires in the filter separator and oil contamination in silo). Dynegy must cease using this flow as ash transport water by December 31, 2023 to comply with ELG regulations. No additional vacuum capacity exists and the hydroveyor flow must remain in service to provide the motive force to convey fly ash to the ash pond; however, this water will no longer have direct contact with ash after modifications are made to the startup procedures.
Bottom Ash Sluice	672,000 (sourced from Cooling Tower Blowdown)	NO	There is not another potential disposal alternative onsite or offsite for this wet-generated CCR wastestream.

Currently, Dynegy utilizes a four-million gallon above-ground storage tank (AST) onsite to store boiler chemical cleaning wastewaters during periodic boiler maintenance. This AST is not a viable alternative for these sluiced CCR wastestreams because it cannot accommodate the volume of these sluiced CCR wastestreams.

As noted above, Dynegy does not have any alternative to create vacuum and convey fly ash beyond the hydroveyor flow (which is sourced from Unit 7 and 8 cooling tower blowdown as shown on the water balance diagram in Appendix B). Even if Dynegy were to develop alternate vacuum capacity, Miami Fort would still need to treat and discharge the total volume of cooling tower blowdown. The other onsite impoundments (the FGD runoff pond and coal pile runoff pond) are non-CCR impoundments and are, therefore, not authorized to receive the CCR sluice flows. As EPA explained in the preamble of the 2015 rule, it is not possible for sites that sluice CCR material to an impoundment to eliminate the impoundment and dispose of the material offsite. *See* 80 Fed. Reg. 21,301, 21,423 (Apr. 17, 2015) ("[W]hile it is possible to transport dry ash off-site to [an] alternate disposal facility that is simply not feasible for wet-generated

CCR. Nor can facilities immediately convert to dry handling systems."). As a result, the conditions at Miami Fort satisfy the demonstration requirement in § 257.103(f)(2)(i). The flow used for this system must remain in service for the facility to continue operating. For the reasons discussed above, the fly ash and pyrite sluice must continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site.

For the bottom ash sluice flow, there is no currently available onsite infrastructure to support dry handling of bottom ash or elimination of this wastestream. Because the boilers will be permanently retired shortly, developing alternative disposal capacity is "illogical," to use EPA's words, and also counterproductive to the work to retire the boilers and close the impoundments. There are no other onsite CCR impoundments to receive and treat these flows, and it is not feasible to dispose of the wet-handled material offsite as discussed for the fly ash stream. For these reasons, the bottom ash sluice will continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site. Consequently, in order to continue to operate and generate electricity, Miami Fort must continue to use the 51-acre CCR surface impoundment to manage the CCR wastestreams discussed above.

3.3 Non-CCR Wastestreams

Dynegy evaluated each non-CCR wastestream placed in the Miami Fort Pond System. For the reasons discussed below in Table 3-2, each of the following CCR wastestreams must continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site.

Table 3-2: Miami Fort Non-CCR Wastestreams

Non-CCR Wastestreams	Average Flow (GPD)	Alternative Disposal Capacity Currently Available? YES/NO	Details
Cooling Tower Blowdown (and non-CCR Pyrites Sluice)	9,257,000	NO	Source flow for CCR sluices listed above; however, this flow would remain even if alternate CCR handling methods were implemented. Would need to modify discharge permit to allow this to discharge directly to the river if it could be separated from the CCR and pyrites wastestreams
FGD Wastewater Treatment Effluent	216,000	NO	Would need to isolate from gypsum pile and coal pile runoff, install additional sump and piping, and discharge from effluent tank to outfall

Non-CCR Wastestreams	Average Flow (GPD)	Alternative Disposal Capacity Currently Available? YES/NO	Details
Gypsum Pile Runoff	64,917	NO	Would need to develop a pond system or a clarifier system to remove TSS and discharge directly to Outfall 002 structure (bypassing current pond system) or a new permitted outfall
Coal Pile Runoff	60,233	NO	Would need to develop a pond system or a clarifier system to remove TSS and discharge directly to Outfall 002 structure (bypassing current pond system) or a new permitted outfall
Boiler Sump Discharge	754,000	NO	Would need to develop a pond system or a clarifier system to remove TSS and discharge directly to Outfall 002 structure (bypassing current pond system) or a new permitted outfall
Reverse Osmosis Discharge	114,000	NO	Would need to install new sump pumps and piping to direct flow to the Outfall 002 structure (bypassing current pond system) or a new permitted outfall

Currently, Dynegy utilizes a four-million-gallon AST onsite to store boiler chemical cleaning wastewaters during periodic boiler maintenance. This AST is not a viable alternative for these sluiced non-CCR wastestreams because this AST must be made available for future boiler chemical cleanings. Furthermore, significant reconfiguration of the sluiced non-CCR wastestreams and supplemental treatment for TSS would be required to utilize this AST.

As noted in Table 3-2, there is potential to discharge a portion of these flows directly to Outfall 002; however, this would require installation of new piping and potentially a new treatment system including ponds, clarifiers, and/or storage tank(s). As stated previously, since Dynegy has elected to pursue the option to permanently cease the use of the coal fired boilers by a date certain, developing alternative disposal capacity is "illogical," to use EPA's words, and also counterproductive to the work to retire the boilers and close the impoundments. There is no currently available infrastructure at the plant to support reroute of these flows. For the reasons discussed above, each of the following non-CCR wastestreams must continue to be placed in the Miami Fort Pond System due to lack of alternative capacity both on and off-site. Consequently, to continue to operate and generate electricity, Miami Fort must continue to use the 51-acre CCR surface impoundment to manage the non-CCR wastestreams discussed above.

4.0 RISK MITIGATION PLAN

To demonstrate that the criteria in § 257.103(f)(2)(ii) has been met, Dynegy has prepared and attached a Risk Mitigation Plan for the Miami Fort Pond System (see Attachment 1).

5.0 DOCUMENTATION AND CERTIFICATION OF COMPLIANCE

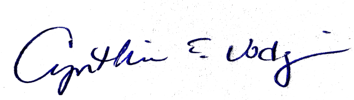
In the Part A rule preamble, EPA reiterates that compliance with the CCR rule is a prerequisite to qualifying for an alternative closure extension, as it "provides some guarantee that the risks at the facility are properly managed and adequately mitigated." 85 Fed. Reg. at 53,543. EPA further stated that it "must be able to affirmatively conclude that facility meets this criterion prior to any continued operation." 85 Fed. Reg. at 53,543. Accordingly, EPA "will review a facility's current compliance with the requirements governing groundwater monitoring systems." 85 Fed. Reg. at 53,543. In addition, EPA will also "require and examine a facility's corrective action documentation, structural stability documents and other pertinent compliance information." 85 Fed. Reg. at 53,543. Therefore, EPA is requiring a certification of compliance and specific compliance documentation be submitted as part of the demonstration. 40 C.F.R. § 257.103(f)(2)(v)(C).

To demonstrate that the criteria in § 257.103(f)(2)(iii) has been met, Dynegy is submitting the following information as required by § 257.103(f)(2)(v)(C):

5.1 Owner's Certification of Compliance - § 257.103(f)(2)(v)(C)(1)

I hereby certify that, based on my inquiry of those persons who are immediately responsible for compliance with environmental regulations for the Miami Fort Pond System, the facility is in compliance with all of the requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments. The Miami Fort CCR compliance website is up-to-date and contains all the necessary documentation and notification postings.

On behalf of Dynegy:



Cynthia Vodopivec
VP - Environmental Health & Safety
September 28, 2020

5.2 Visual representation of hydrogeologic information - § 257.103(f)(2)(v)(C)(2)

Consistent with the requirements of § 257.103(f)(2)(v)(C)(2)(i) – (iii), Dynegy has attached the following items to this demonstration:

- Map(s) of groundwater monitoring well locations in relation to the CCR unit (Attachment 2)

- Well construction diagrams and drilling logs for all groundwater monitoring wells (Attachment 3)
- Maps that characterize the direction of groundwater flow accounting for seasonal variations (Attachment 4)

5.3 Groundwater monitoring results - § 257.103(f)(2)(v)(C)(3)

Tables summarizing constituent concentrations at each groundwater monitoring well from through the first 2020 semi-annual monitoring period are included as Attachment 5.

5.4 Description of site hydrogeology including stratigraphic cross-sections - § 257.103(f)(2)(v)(C)(4)

A description of site hydrogeology and stratigraphic cross-sections of the site are included as Attachment 6.

5.5 Corrective measures assessment - § 257.103(f)(2)(v)(C)(5)

The Miami Fort Pond System initiated an assessment monitoring program on April 9, 2018. Assessment monitoring results identified statistically significant levels (SSLs) of Appendix IV parameters. Accordingly, pursuant to § 257.96, a corrective measures assessment was prepared on September 5, 2019, and is included as Attachment 7. The corrective action discussed in the report was initially prepared for Basin A but will be implemented for the entire Miami Fort Pond System.

5.6 Remedy selection progress report - § 257.103(f)(2)(v)(C)(6)

Pursuant to § 257.97(a), semi-annual remedy selection progress reports were prepared on March 5, 2020, and September 5, 2020, and are included as Attachment 8. Dynegy installed additional wells in August 2020 to bolster the conceptual site and flow modeling efforts and assist in evaluation of the feasibility of monitored natural attenuation. Two rounds of groundwater samples are planned to be collected by the end of 2020.

5.7 Structural stability assessment - § 257.103(f)(2)(v)(C)(7)

Pursuant to § 257.73(d), the initial structural stability assessments for Basin A and Basin B were prepared in October 2016 and are included as Attachment 9.

5.8 Safety factor assessment - § 257.103(f)(2)(v)(C)(8)

Pursuant to § 257.73(e), the initial safety factor assessments for Basin A and Basin B were prepared in October 2016 and are included as Attachment 10.

6.0 DOCUMENTATION OF CLOSURE COMPLETION TIMEFRAME

To demonstrate that the criteria in § 257.103(f)(2)(iv) has been met, "the owner or operator must submit the closure plan required by § 257.102(b) and a narrative that specifies and justifies the date by which they intend to cease receipt of waste into the unit in order to meet the closure deadlines." An addendum to the closure plans is included as Attachment 11.

In order for a CCR surface impoundment over 40 acres to continue to receive CCR and non-CCR wastestreams after the initial April 11, 2021 deadline, the coal-fired boiler(s) at the facility must cease operation and the CCR surface impoundment must complete closure no later than October 17, 2028. As discussed below, the Miami Fort Pond System will cease receipt of waste by June 17, 2027 in order for closure to be completed by this deadline.

Table 6-1 is included below to summarize the major tasks and durations associated with closing the Miami Fort Pond System in place. These durations are consistent with the durations experienced in the closure of over 500 acres of other CCR impoundments already completed by Dynegy and its affiliates to date. The design, permitting, and procurement efforts will take place while the unit is still in operation. The first major construction effort will be to dewater the impoundment. Dynegy will likely release pond water through the existing Outfall 002 and employ pumps as necessary, and potentially an engineered dewatering system such as wellpoints to aid in stabilizing the material. As the water level is lowered and the material is stabilized, the contractor will work across the pond re-grading the existing CCR material to achieve positive drainage. As grading is completed in certain areas, the contractor may begin placing the final cover system which will consist of an 18-inch infiltration layer and 6-inch erosion layer in accordance with the requirements of the CCR Rule. This cover installation will overlap with the grading operations, and finish approximately one month after the grading effort is completed. Once cover is placed, the area will be seeded and stabilized. Two months were included to allow vegetation to establish and post-closure care to be initiated. Closure is essentially completed once the erosion control layer is placed, so these two months provide additional float to the schedule.

Table 6-1: Miami Fort Pond System Closure Schedule

Action	Estimated Timeline (Months)
Spec, bid, and Award Engineering Services for CCR Impoundment Closure	3
Finalize CCR unit closure plan	12
Obtain environmental permits: • State Waste Pollution Control Construction/Operating Permit • NPDES Industrial Wastewater Permit Modification • General NPDES Permit for Storm Water Discharges from Construction Site Activities and Storm Water Pollution Prevention Plan (SWPPP)	21
Spec, bid, and Award Construction Services for CCR Impoundment Closure	3
Date by Which Closure Construction Must be Initiated / Planned Cease Placement Date	June 17, 2027
Dewater Impoundment	3
Regrade CCR Material	10
Install Cover System*	8
Establish Vegetation, Perform Site Restoration Activities, Complete Closure, and Initiate Post-Closure Care	2
Total Estimated Time to Complete Closure	55 months
Date by Which Closure Must be Complete	October 17, 2028

* Activity expected to overlap with grading operations, finishing 1 month after grading is completed

7.0 CONCLUSION

Based upon the information included in and attached to this demonstration, Dynegy has demonstrated that the requirements of 40 C.F.R. § 257.103(f)(2) are satisfied for the 51-acre Miami Fort Pond System. This CCR surface impoundment is needed to continue to manage the CCR and non-CCR wastestreams identified in Section 3.2 and 3.3 above, is larger than 40 acres, and the boilers at the station will cease coal-fired operation and the Miami Fort Pond System will be closed by the October 17, 2028 deadline. Therefore, this CCR unit qualifies for the site-specific alternative deadline for the initiation of closure authorized by 40 C.F.R. § 257.103(f)(2).

Therefore, it is requested that EPA approve Dynegy's demonstration and authorize the Miami Fort Pond System to continue to receive CCR and non-CCR wastestreams notwithstanding the deadline in § 257.101(a)(1) and to grant the alternative deadline of October 17, 2028, by which to complete closure of the impoundment.

APPENDIX A – SITE PLAN

BURNS McDONNELL	**LUMINANT** MIAMI FORT POWER STATION SITE PLAN	project 122702
date 04/13/2020		contract -
designed A. MYERS		dwg **FIGURE 1**

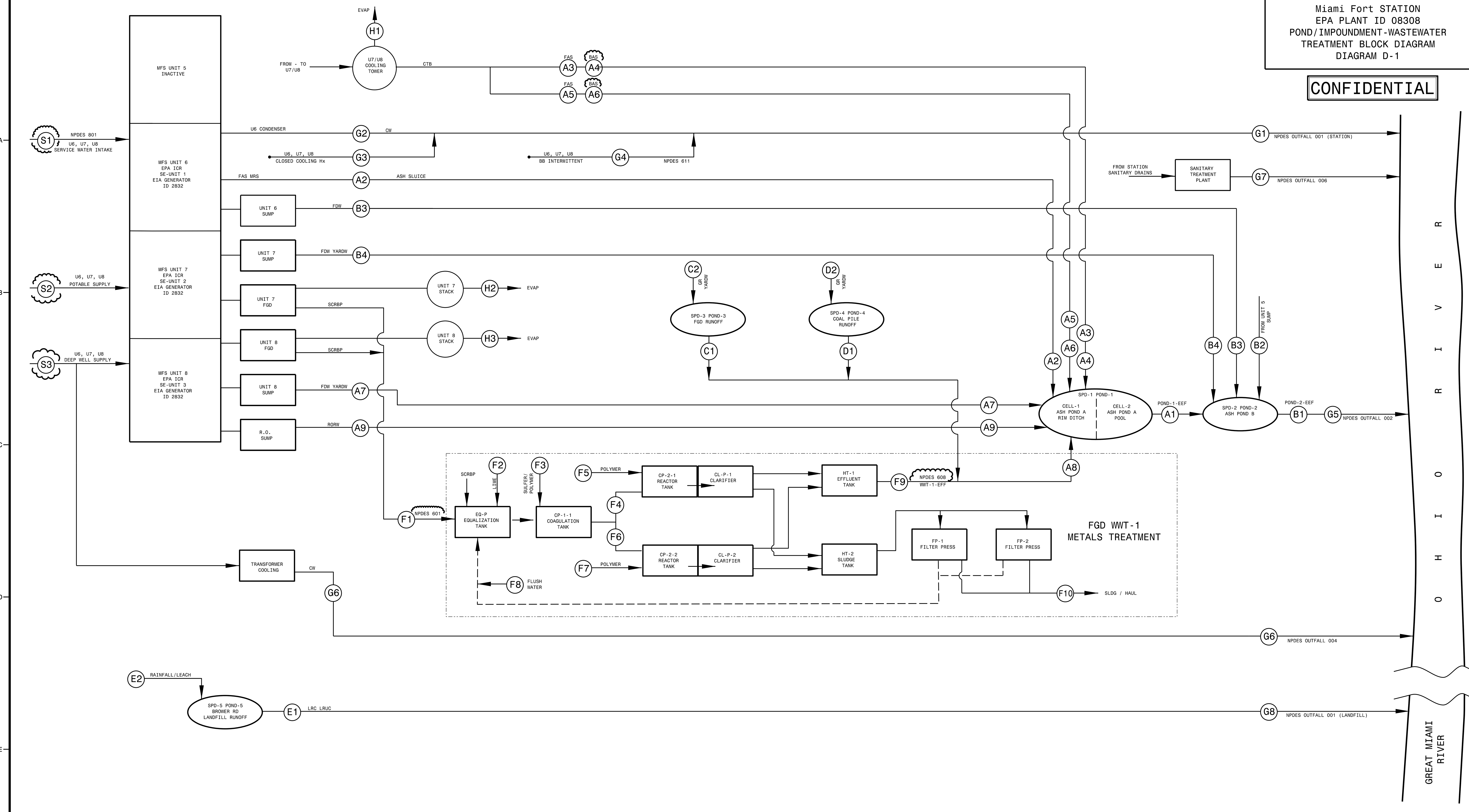
9/28/2020 \\bmcd\dfs\Clients\ENR\VistraEnergy\122702_ALTuseDisposal\Design\Civil\Dwgs\Sketches\MiamiFort_Figure1.dgn

APPENDIX B – WATER BALANCE DIAGRAM

M-2571 REV. 1

Miami Fort STATION
EPA PLANT ID 08308
POND/IMPOUNDMENT-WASTEWATER
TREATMENT BLOCK DIAGRAM
DIAGRAM D-1

CONFIDENTIAL



FLOW LABEL	ICR BLOCK DIAGRAM NAME	STATION NAME	ICR SPREADSHEET DATA
S1	NPDES801	SERVICE WATER INTAKE (OHIO RIVER)	179,000,000 GPD
S2	POTABLE WATER	MUNICIPAL SUPPLY FROM BROWER RD.	216,000 GPD
S3	WELL	STATION WELL WATER	864,000 GPD
	SPD-1/POND-1	ASH POND A	
A1	POND-1-EFF	ASH POND A - DISCHARGE	11,793,000 GPD
A2	FAS/MRS	UNIT 6 FLY ASH SLUICE AND PYRITE SLUICE	2,015,000 GPD
A3	FAS/MRS/CTB	UNIT 7 FLY ASH AND PYRITE SLUICE	4,401,000 GPD
A4	BAS/CTB	UNIT 7 BOTTOM ASH SLUICE	305,000 GPD
A5	FAS/MRS/CTB	UNIT 8 FLY ASH AND PYRITE SLUICE	4,184,000 GPD
A6	BAS/CTB	UNIT 8 BOTTOM ASH SLUICE	367,000 GPD
A7	FDW/YARDW	UNIT 8 SUMP	193,000 GPD
A8	WWT-1-EFF/GPR/CPR	WASTE WATER EFFLUINT/FGDPOND/COAL PILE RUNOFF	214,000 GPD
A9	RORW	RO SUMP (REVERSE OSMOSIS DISCHARGE)	114,000 GPD
	SPD-2/POND-2	ASH POND B	
B1	POND-2-EFF/NPDES 002	DISCHARGE TO OHIO RIVER	12,354,000 GPD
B2	FDW	UNIT 5 IS INACTIVE-SUMP IS FOR MISCELLANEOUS DRAINS ONLY	0 GPD
B3	FDW	UNIT 6 SUMP	368,000 GPD
B4	FDW/YARDW	UNIT 7 SUMP	193,000 GPD
	SPD-3/POND-3	FGD RUNOFF POND	
C1	POND-3-EFF	FGD STORM WATER COLLECTION-COMMON LINE TO ASH POND A	64,917 GPD/ 126 DPY
C2	GR/YARDW	RAINFALL-FGD AREA EAST OF COAL TOWER	64,917 GPD/ 126 DPY

FLOW LABEL	ICR BLOCK DIAGRAM NAME	STATION NAME	ICR SPREADSHEET DATA
	SPD-4/POND-4	COAL PILE RUNOFF DITCH	
D1	POND-4-EFF	COAL PILE SUMP DISCHARGE-COMMON LINE TO ASH POND A	60,233 GPD/ 126 DPY
D2	CPR/YARDW	COAL PILE RUNOFF	60,233 GPD/ 126 DPY
	SPD-5/POND-5	LANDFILL SEDIMENTATION POND	
E1	POND-5-EFF	LANDFILL POND DISCHARGE TO MIAMI RIVER	88,336 GPD/ 126 DPY
E2	LRC/LRUC	LANDFILL RUNOFF	88,336 GPD/ 126 DPY
		WASTEWATER TREATMENT SYSTEMS	
F1	WWT-1/SCRBP	INFLUENT-FROM U7 & U8 FGD HYDROCLONES	216,000 GPD
F2		LIME-EQUALIZATION TANK	9.1 TPD
F3		SULFIDE & POLYMER CHEMICAL FEED TO COAGULATION TANK	5.04 TPD
F4		U7 DENSADEG FEED	122,400 GPD
F5		POLYMER-FEED TO U7 DENSADEG CLARIFIER	3.67 GPD
F6		U8 DENSADEG FEED	122,400 GPD
F7		POLYMER-FEED TO U8 DENSADEG CLARIFIER	3.67 GPD
F8		SERVICE WATER-LINE FLUSHING/POLYMER ETC.	27,360 GPD
F9	WWT-1-EFF/SCRBP	WWT-1-EFF EFFLUENT-COMMON LINE TO ASH POND A	216,000 GPD
F10	SLDG/HAUL	SLUDGE-FILTER PRESS CAKE TO OFFSITE LANDFILL	75 WTPD (50% SOLIDS)

FLOW LABEL	ICR BLOCK DIAGRAM NAME	STATION NAME	ICR SPREADSHEET DATA
		OUTFALLS	
G1	NPDES 001 (STATION)	DISCHARGE TUNNEL FLOWS SHOWN BELOW	140,688,000
G2		U6 CONDENSER COOLING WATER (129,600,000 GPD)	
G3		CLOSED COOLING WATER HEAT EXCHANGERS (10,800,000 GPD)	
G4	NPDES 611/BB	BOILER BLOWDOWN INTERMITTENT (504,000 GPD)	
	NPDES 612	BOILER TUBE CHEMICAL CLEANING (CONTRACT WASTE DISPOSAL)	NO DISCHARGE
G5/B1	NPDES 002	ASH TRANSPORT, FGD WWTP, COAL PILE RUNOFF	12,354,000 GPD
G6	NPDES 004/CW	TRANSFORMER COOLING WATER (OHIO RIVER)	590,000 GPD
G7	NPDES 006	TREATED SANITARY WATER (OHIO RIVER)	70,000 GPD
G8	NPDES 001 (LANDFILL)/LRC/LRUC	BROWER RD. LANDFILL RUNOFF POND (GREAT MIAMI RIVER)	
		EVAPORATION	
H1	EVAP	COOLING TOWER EVAPORATION	13,500,000 GPD
H2	EVAP	U7 BOILER AND FGD STACK EVAPORATION	1,900,000 GPD
H3	EVAP	U8 BOILER AND FGD STACK EVAPORATION	1,900,000 GPD

EPA AND STATION ABBREVIATIONS
AHCW - AIR HEATER CLEANING WATER
BAS - BOTTOM ASH SLUICE
BB - BOILER BLOWDOWN
CPR - COAL PILE RUNOFF
CTB - COOLING TOWER BLOWDOWN
EFF - EFFLUENT
EVAP - EVAPORATION
FAS - FLY ASH SLUICE
FDW - FLOOR DRAIN WASTEWATER
GPR - GYPSUM PILE RUNOFF
GR - GENERAL RUNOFF
HAUL - HAULED OFF SITE FOR DISPOSAL
LEACH - LEACHATE
LRC - LANDFILL RUNOFF-CAPPED LANDFILL
LRUC - LANDFILL RUNOFF-UNCAPPED LANDFILL
MGD - MILLION GALLONS PER DAY
MRS - MILL REJECT SLUICE
RECYC - RECYCLE FLOW
RORW - REVERSE OSMOSIS REJECT WATER
SCRBP - FGD SCRUBBER PURGE
SLDG - SLUDGE
SW - DISCHARGE TO SURFACE WATER
YARDW - YARD DRAIN WASTEWATER

REFERENCES

NPDES FORM 2C DECEMBER 2007
POND/IMPOUNDMENT WASTE WATER TREATMENT BLOCK DIAGRAM

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD
1	6/21/2011	MFS11CF004	RECORD	RAZ	RAZ		JGP	JGP

DESC: Water Balance Modifications

TITLE

WATER BALANCE AND POND/IMPOUNDMENT WASTEWATER TREATMENT BLOCK DIAGRAM

FOR MIAMI FORT STATION - UNITS 6-8

Duke Energy®

SCALE: NONE	DES:	JGN
DWG TYPE: ML	DFTR:	JGN
JOB NO: MFS10CF001	CHKD:	TLJ
DATE: 8-12-10	ENGR:	JGP
FILENAME: MFS_00_S&L_M-2571.DGN	APPD:	JGP

DWG SIZE	DRAWING NO.	REVISION
ARCH E1 30.0"x42.0"	M-2571	1

M-2571 REV. 1

ATTACHMENT 1 – RISK MITIGATION PLAN

RISK MITIGATION PLAN - 40 C.F.R. § 257.103(f)(2)(v)(B)

INTRODUCTION

To demonstrate that the criteria in 40 C.F.R. § 257.103(f)(2)(ii) has been met, Dynegy Miami Fort, L.L.C. has prepared this Risk Mitigation Plan for the Miami Fort Pond System.

- EPA is requiring a risk mitigation plan to "address the potential risk of continued operation of the CCR surface impoundment while the facility moves towards closure of their coal-fired boiler(s), to be consistent with the court's holding in *USWAG* that RCRA requires EPA to set minimum criteria for sanitary landfills that prevent harm to either human health or the environment." 85 Fed. Reg. 53,516, 53,548 (Aug. 28, 2020).

As required by § 257.103(f)(2)(v)(B), the Risk Mitigation Plan must describe the "measures that will be taken to expedite any required corrective action," and contain the three following elements:

- First, "a discussion of any physical or chemical measures a facility can take to limit any future releases to groundwater during operation." 257.103(f)(2)(v)(B)(1). In promulgating this requirement, EPA explained that this "might include stabilization of waste prior to disposition in the impoundment or adjusting the pH of the impoundment waters to minimize solubility of contaminants [and that] [t]his discussion should take into account the potential impacts of these measures on Appendix IV constituents." 85 Fed. Reg. at 53,548.

- Second, "a discussion of the surface impoundment's groundwater monitoring data and any found exceedances; the delineation of the plume (if necessary based on the groundwater monitoring data); identification of any nearby receptors that might be exposed to current or future groundwater contamination; and how such exposures could be promptly mitigated." § 257.103(f)(2)(v)(B)(2).

- Third, "a plan to expedite and maintain the containment of any contaminant plume that is either present or identified during continued operation of the unit." § 257.103(f)(2)(v)(B)(3). In promulgating this final requirement, EPA explained that "the purpose of this plan is to demonstrate that a plume can be fully contained and to define how this could be accomplished in the most accelerated timeframe feasible to prevent further spread and eliminate any potential for exposures." 85 Fed. Reg. at 53,549. In addition, EPA stated that "this plan will be based on relevant site data, which may include groundwater chemistry, the variability of local hydrogeology, groundwater elevation and flow rates, and the presence of any surface water features that would influence rate and direction of contamination movement. For example, based on the rate and direction of groundwater flow and potential for diffusion of the plume, this plan could identify the design and spacing of extraction wells necessary to prevent further downgradient migration of contaminated groundwater." 85 Fed. Reg. at 53,549.

Consistent with these requirements and guidance, Dynegy Miami Fort, L.L.C. plans to continue to mitigate the risks to human health and the environment from the Miami Fort Pond System as detailed in this Risk Mitigation Plan.

1 OPERATIONAL MEASURES TO LIMIT FUTURE RELEASES TO GROUNDWATER – 40 C.F.R. § 257.101(F)(2)(V)(B)(1)

The Miami Fort Pond System is a 51-acre CCR surface impoundment comprised of two cells (Basins A and B) which operate in series and are hydraulically connected by a 40-inch HDPE pipe that runs through a shared non-structural separator dike. Consistent with the requirements of the CCR rule, compliance documents on Miami Fort's CCR public website reflect the characterization of the Miami Fort Pond System as a single multi-unit system for purposes of groundwater monitoring and closure activities.

The Miami Fort CCR surface impoundment receives all CCR transport waters and most of the non-CCR wastewater flows onsite before discharging to the Ohio River via Outfall 002 in accordance with NPDES Permit No. OH0009873.

Fly ash is typically captured dry. Therefore, current operations already limit the addition of fly ash transport waters to the CCR Surface Impoundment.

Bottom ash is transported through the sluice lines into the CCR surface impoundment where it is dewatered and transported offsite for beneficial reuse.

Miami Fort's current physical and chemical treatment operation adequately limit current and future releases to groundwater during operation. Miami Fort will continue this treatment process for the CCR surface impoundment until such time as closure is required per 40 C.F.R. Part 257. The facility's current physical and chemical treatment process is discussed below.

1.1 Current Physical and Chemical Treatment Processes

The Flue Gas Desulfurization waste streams are currently treated in the physical and chemical wastewater treatment system (PC-WWT), where pH is adjusted with hydrated lime (see discussion below on lime softening) and coagulant and flocculant chemicals are added to further bind and settle contaminants out of the wastewater prior to entering the CCR impoundment.

The CCR surface impoundment is also a wastewater treatment settling system which allows the solids generated from the PC-WWT to settle further. As part of normal operations, ash is removed from the impoundment regularly and transported offsite for beneficial reuse.

The ash transport waters are treated prior to entering the CCR surface impoundment with both aluminum sulfate and a polymer (Nalclear 7763). The aluminum sulfate binds with target constituents, coagulating them into larger particles to promote settling. The polymer further promotes settling by attracting the enlarged suspended particles to each other, forming larger groups which eventually develop sufficient density to settle, leaving behind a clear liquid. This coagulation/flocculation process reduces the leaching of CCR constituents to groundwater.

Therefore, the current and future operation encompassing the PC-WWT, the physical removal of solids from the impoundment, and the chemical treatment of the ash transport waters limits current and future releases to groundwater during operation.

No potential safety impacts or exposure to human health or environmental receptors are expected to result from continued operation of the PC-WWT and the impoundment based on current physical and chemical treatment. Miami Fort's current physical and chemical treatment operation adequately limits current and future release to groundwater during operation. Miami Fort will continue this treatment process for the CCR surface impoundment until such time as closure is required per 40 C.F.R. Part 257.

2 GROUNDWATER IMPACTS, RECEPTORS, AND POTENTIAL EXPOSURE MITIGATION - 40 C.F.R. § 257.101(F)(2)(V)(B)(2)

The Miami Fort Pond System is currently in assessment monitoring, with the first statistically significant levels (SSLs) with groundwater protection standard (GWPS) exceedances reported in January 2019. As seen on Table 1, SSL exceedances above the GWPS have been reported for arsenic at two monitoring wells (MW-2 and MW-10), cobalt at MW-4, and molybdenum at MW-6 (see Figure 1 for well locations). Arsenic was also identified as an SSL exceedance at a third well (MW-13) for the first time during the most recent sampling event. Alternate Source Demonstrations (ASDs) have been completed for arsenic following each SSL determination, with the next ASD for arsenic to be completed in October 2020. A Corrective Measures Assessment (CMA) was completed for cobalt and molybdenum in September 2019, a public meeting presenting the results of the CMA held in December 2019, and semiannual remedy selection progress reports were completed in March 2020 and September 2020 (Ramboll, 2020b). The hydrogeologic monitoring plan for the Ash Basins was updated in May 2020 (Ramboll, 2020a).

The current plume delineation of cobalt and molybdenum, identification of nearby receptors that might be exposed to groundwater impacts, progress on the feasibility stage evaluation of potential corrective measures, and potential exposure mitigation are each discussed in greater detail below.

<u>Cobalt and Molybdenum Delineation</u>

For the assessment monitoring period from September 2018 through April 2020 (the latest sampling event), the only Appendix IV constituents with reported SSLs above their respective GWPSs are cobalt and molybdenum. Groundwater quality data and statistical comparison values (values compared to the GWPS to determine SSLs) from the assessment monitoring period are presented on Table 2 with SSLs highlighted for Cobalt and Molybdenum. Well locations with any observed SSLs have been illustrated on Figures 2 and 3 along with maximum comparison values from Table 2. These figures illustrate the maximum extent of cobalt and molybdenum SSLs observed during the assessment monitoring period. There are four wells with observed cobalt SSL exceedances of the GWPS (0.006 mg/L); however, MW-4 is the only well with SSLs on a consistent basis. The other wells with cobalt SSLs were recently added plume delineation wells that have fewer sample results. Two of those wells, MW-15 and MW-16, have not had an exceedance of the GWPS for cobalt in the latest two sampling events (September 2019 and April 2020). There is only one monitoring well (MW-6) with a molybdenum exceedance of the GWPS (0.10 mg/L).

Wells MW-4 and MW-6 with observed cobalt and molybdenum exceedances, respectively, are bounded laterally and vertically by monitoring wells with parameter concentrations below their respective GWPSs and oftentimes below the reporting limit for the parameter. Cobalt observed at MW-4 is bounded to the south by the Ohio River, as there is not enough space to safely install a separate monitoring well between MW-4 and the river.

<u>Receptors</u>

Both the cobalt and molybdenum exceedances are limited in areal and vertical extent. For these two constituents, or any other Appendix IV constituents that might have exceedances of GWPS's in the future, the two primary risks to human health and environmental receptors are via impacted groundwater and surface water. Based on available information neither the ingestion of groundwater and surface water, or dermal contact groundwater pathways are complete. Groundwater and surface water potentially impacted by CCR constituents from the Miami Fort Pond System that is used for residential purposes, including for drinking water, is likely an incomplete exposure pathway for the reasons discussed below. Impacted groundwater potentially migrating to nearby surface water bodies – specifically the Great Miami River and the Ohio River – could be an exposure pathway, but does not pose a risk concern for the reasons discussed below.

Groundwater near the Miami Fort Pond System is within the radius of influence of four industrial pumping wells located to the southeast of the pond (operated by Miami Fort Station) and three industrial wells located to the northwest of the pond (operated by Veolia North America) – see Figure 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 review of the ODNR's interactive Water Well Map was performed to identify water supply wells located within 2,500 feet of the Pond System. The nearest residence is greater than 2,500 feet northeast and upgradient of Basin A. No public water supply (PWS) wells were identified between the Great Miami River and the Ohio River within a ten-mile radius of the MFS.

Elevated molybdenum concentrations as observed in groundwater at monitoring well MW-6 are potentially within the capture zone of Miami Fort Station's industrial wells. Monitoring wells installed between well MW-6 and the industrial wells, specifically MW-4A, MW-15, and MW-16, have molybdenum concentrations ranging from less than 0.005 mg/L to 0.0291 mg/L relative to the GWPS of 0.10 mg/L.

Elevated cobalt concentrations as observed in groundwater at monitoring well MW-4, which is located adjacent to the Ohio River, 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 (i.e. baseflow at the 90^{th} 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 Ash Basins (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 (Attachment 1). An Ohio River Valley Water Sanitation Commission report from October 1998 indicates the nearest water supply intakes are located at river mile 463.2 upstream of the Pond System in the Cincinnati, Ohio metro area; and, at river mile 594.2 downstream of the Pond System in the Louisville, KY metro area. The Pond System is located near river mile 490, meaning the nearest downstream intake is over 100 river miles away.

<u>Exposure Mitigation</u>

Mitigation of future potential exposures to groundwater contamination from continued operation of the Miami Fort Pond System is discussed in detail in the following section.

3 Contaminant Plume Containment: Options Evaluation and Plan - 40 C.F.R. § 257.101(f)(2)(v)(B)(3)

Appropriate corrective measure(s) to address impacted groundwater potentially associated with the Miami Fort Pond System are currently being evaluated as part of the Corrective Measures Assessment (CMA), which is included as an attachment to the alternative closure demonstration letter. The CMA (Ramboll, 2019) evaluates the appropriate corrective measure(s) to address impacted groundwater in the Uppermost Aquifer associated with the Miami Fort Pond System. The evaluation criteria for the CMA are the following: performance; reliability; ease of implementation; potential impacts of the remedies (safety, cross-media, and control of exposure to residual contamination); time required to begin and complete the remedy; and, institutional requirements that may substantially affect implementation of the remedy(s), such as permitting, environmental or public health requirements. The hydrogeological information and conceptual site model (CSM) in support of the CMA process are in the description of hydrogeology attached to the alternative closure demonstration letter.

Although future potential source control measures (e.g. closure in place, closure by removal to off-site landfill, in-situ solidification/stabilization) to mitigate groundwater impacts were considered as part of the CMA process upon closure of the Miami Fort Pond System, the shorter-term options considered for mitigating groundwater impacts relative to cobalt and molybdenum, as presented in the CMA are as follows:

- Monitored Natural Attenuation (MNA)
- Groundwater Cutoff Wall
- In-Situ Chemical Treatment
- Permeable Reactive Barrier
- Groundwater Extraction

One or more of these same groundwater remedial corrective measures developed for mitigating cobalt and molybdenum impacts to groundwater will also apply to other Appendix IV constituents that present a future risk to human health or the environment. Currently, MNA is being evaluated with site-specific characterization data and geochemical analysis as a long term remedial option, combined with source control measures, through application of the USEPA's tiered approach to MNA (USEPA 1999, 2007 and 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.

A full MNA evaluation report will be completed for cobalt and molybdenum in 2021, with the option to add on other Appendix IV constituents, as necessary based on any future exceedances of GWPS's. Currently, based on the latest semiannual remedy selection progress report (Ramboll, 2020b), selection of the source control measure continues to be in the feasibility study phase and will incorporate groundwater flow and transport modeling that is in development. Activities completed since March 5, 2020 include review of existing groundwater and source water data, identification and collection of additional groundwater and source water samples, identification of additional data collection needs to support development of a geochemical conceptual site model, and completion of additional monitoring wells and aquifer testing. These activities are necessary to supplement hydrogeologic site characterization, understand the natural attenuation mechanisms occurring at the site, and to evaluate the natural attenuation of constituents to meet applicable groundwater protection standards.

Other groundwater remedial corrective measures that are potentially available for containing future contaminant plumes, and which can be implemented during continued operation of the Miami Fort Pond System are discussed below.

<u>Groundwater Extraction</u>

This corrective measure includes installation of a series of 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 project components:

- Designing and constructing a groundwater extraction system consisting of a series of extraction wells or trenches located around the perimeter of the contaminant plume and operating at a rate to allow capture of CCR impacted groundwater.
- Designing a system to manage 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.

Installation of a groundwater extraction system, whether wells or trenches, can be expedited with the assumption that there is a good conceptual site model (CSM) of the hydrogeological system around the CCR unit, groundwater flow and transport modeling, and aquifer testing to determine if a well system is the best option for intercepting the groundwater contaminant plume. There is a CSM for the vicinity of the Miami Fort Pond System currently under refinement and a groundwater flow and transport model for evaluation of long-term remedial options, source control and groundwater corrective measures, is under development with completion expected in 2021.

A schematic of a typical groundwater extraction well is shown on Figure 4. Based on site specific hydrogeology and future potential plume width and depth, a groundwater extraction system will typically consist of one to three extraction wells with pitless adapter’s manifolded together with HDPE conveyance pipe to a common tank or lined collection vault prior to treatment at the on-site wastewater treatment plant and discharge via the NPDES permitted outfall.

<u>Groundwater Cutoff Wall</u>

Vertical cutoff walls are 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 migration 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 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. 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. For a cutoff wall to be technically feasible, there must either be a low-permeability lower confining layer into which the barrier can be keyed or under some conditions a hanging cutoff wall can be effective, and it must be at a technically feasible depth.

Permeable Reactive Barrier

Chemical, physical and biological treatment via a Permeable Reactive Barrier (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 include continuous PRBs, in which the reactive media extends across the entire path of the contaminant plume; and funnel-and-gate systems, where barrier walls 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). Additional site investigation is currently underway in 2020 and the geochemical evaluations being conducted as part of the MNA evaluation, including additional field data collection and laboratory studies, will also be available for use in evaluating PRB as a groundwater remedial option.

This is a potential viable option for groundwater corrective measures, to be evaluated further, but is not a short-term solution that can be implemented expeditiously.

In-Situ Chemical Treatment

In-situ chemical treatment for inorganics are being tested and applied with increasing frequency. 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 and molybdenum. Implementation of in-situ chemical treatment requires detailed technical analysis of field hydrogeological and geochemical conditions along with laboratory studies.

This is a potential viable option for groundwater corrective measures, to be evaluated further, but is not a short-term solution that can be implemented expeditiously.

3.1 CONTAINMENT PLAN

Based on the options evaluated for containment of a future potential groundwater contaminant plume originating from the Miami Fort Pond System for one or more Appendix IV constituents exceeding their GWPS(s), the most viable short-term option of those evaluated is a groundwater extraction system, which would allow for capture of impacted groundwater and prevent further plume migration towards potential receptors, which have been identified as the Great Miami River to the west and the Ohio River to the south. The current constituents with exceedances of their respective GWPSs, cobalt and molybdenum, have had their plumes delineated vertically and laterally.

In circumstances where there is not an immediate concern of endangerment to human health or the environment - such as the current case for cobalt and molybdenum exceedances that have been defined vertically and laterally - other longer-term corrective measures are more viable. One method for controlling the current cobalt and molybdenum exceedances, with the expectation that any future GWPS exceedances for other Appendix IV constituents could possibly also be addressed by the same method following constituent-specific evaluation, is MNA. MNA is a potentially viable corrective measure for cobalt and molybdenum that is being evaluated as part of current CMA activities. In addition, this corrective measure will be further enhanced following source control by future closure of the Miami Fort Pond System.

Depending on the location and plume geometry of any future potential Appendix IV exceedances of GWPSs, the specific constituent(s) with exceedances, and distance from potential receptors, the other groundwater corrective measures discussed as part of the corrective options evaluation – groundwater cutoff wall, permeable reactive barrier, and in-situ chemical treatment – are all secondary remedial alternatives available for consideration following the current primary options of groundwater extraction for short-term application and MNA for long-term application.

4 REFERENCES

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USEPA, 2015. Use of Monitored Natural Attenuation for Inorganic Contaminants in Groundwater at Superfund Sites. Directive No. 9283.1-36. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. August 2015.

TABLES

Table 1 - Assessment Monitoring Program Summary, Miami Fort Pond System

Sampling Dates	Analytical Data Receipt Date	Parameters Collected	SSL(s) Appendix IV	SSL(s) Determination Date	ASD Completion Date	CMA Completion / Status
May 7-9, 2018	July 9, 2018	Appendix III Appendix IV	NA	NA	NA	NA
Sept 18-20, 2018	January 2, 2019	Appendix III	--	--	--	--
		Appendix IV Detected[1]	Cobalt (MW-4) Molybdenum (MW-6)	January 7, 2019	NA	Sept 5, 2019 (completed CMA)
			Arsenic (MW-2, MW-10)		April 8, 2019	NA
March 12-14, 2019	April 29, 2019	Appendix III	--	--	--	--
		Appendix IV	Cobalt (MW-4) Molybdenum (MW-6)	July 29, 2019	NA	ongoing
			Arsenic (MW-2, MW-10)		October 28, 2019	NA
June 12-14, 2019 (delineation event)	July 1, 2019	Cobalt and Molybdenum	NA	NA	NA	NA
Sept 9-10, 2019	October 8, 2019	Appendix III	--	--	--	--
		Appendix IV Detected[1]	Cobalt (MW-4) Molybdenum (MW-6)	January 6, 2020	NA	Feasibility study phase of CMA; Public meeting held December 16, 2019
			Arsenic (MW-2, MW-10)		April 6, 2020	NA
April 6-7, 2020	5/4/2020	Appendix III	--	--	--	--
		Appendix IV	Cobalt (4A, MW-4) Molybdenum (MW-6)	August 3, 2020	NA	March 5, 2020 (Semiannual remedy selection progress report)
			Arsenic (MW-2, MW-10, MW-13)		TBD (October 2020)	Sept 5, 2020 (Semiannual remedy selection progress report)

[O: RAB 9/11/20; C: EJT 9/16/20]

Notes:

-- = SSL evaluation not apply to Appendix III parameters
CMA = Corrective Measures Assessment
NA = Not Applicable
TBD = To Be Determined
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.

RAMBOLL

Table 2 - Groundwater Concentrations Delineating Cobalt and Molybdenum Plumes, Miami Fort Ash Pond System

Monitoring Well ID	Parameter:	Cobalt (mg/L)									
	Date:	9/18-20/2018		3/12-14/2019		6/12-14/2019		9/9-10/2019		4/6-7/2020	
	GWPS	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value
4A	0.006	--	--	--	--	--	--	--	--	0.00908	**0.00908**
MW-1	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002
MW-2	0.006	NS	0.00050	0.00098	0.00050	NS	NS	0.00063	0.00051	<0.002	0.00052
MW-3A	0.006	NS	0.00022	0.00223	0.00050	NS	NS	<0.0005	0.00050	<0.002	0.00050
MW-4	0.006	0.01870	**0.00762**	0.00588	**0.00727**	0.0083	**0.0083**	0.01710	**0.00795**	0.02240	**0.00844**
MW-5	0.006	<0.0005	0.00050	<0.0005	0.00050	0.00066	0.00066	0.00052	0.00050	<0.002	0.00050
MW-6	0.006	0.00473	0.00255	0.00258	0.00253	0.0033	0.0033	0.00296	0.00263	0.00263	0.00262
MW-7	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002
MW-8	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	<0.0005	0.00050	<0.002	0.00050
MW-9	0.006	NS	0.00050	<0.0005	0.00050	NS	NS	<0.0005	0.00050	<0.002	0.00050
MW-10	0.006	NS	0.00116	<0.0005	0.00095	NS	NS	<0.0005	-0.00599	<0.002	0.00073
MW-11	0.006	NS	0.00211	0.00061	-0.00457	NS	NS	0.00062	-0.00420	<0.002	-0.00382
MW-12	0.006	0.00193	0.00183	0.00194	0.00183	0.0023	0.0023	0.00256	0.00193	0.00259	0.00193
MW-13	0.006	<0.0005	-0.01049	<0.0005	-0.01040	<0.0005	<0.0005	<0.0005	-0.00836	<0.002	-0.00887
MW-14	0.006	NI	NI	NI	NI	0.00099	0.00099	0.00069	0.00069	<0.002	<0.002
MW-15	0.006	NI	NI	NI	NI	0.0065	**0.0065**	0.00360	0.00360	0.00386	0.00386
MW-16	0.006	NI	NI	NI	NI	0.0096	**0.0096**	0.00267	0.00267	0.00217	0.00217

Monitoring Well ID	Parameter:	Molybdenum (mg/L)									
	Date:	9/18-20/2018		3/12-14/2019		6/12-14/2019		9/9-10/2019		4/6-7/2020	
	GWPS	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value	Result	Comparison Value
4A	0.1	--	--	--	--	--	--	--	--	0.0136	0.0136
MW-1	0.1	0.0383	0.0383	0.0308	0.0308	0.024	0.024	0.021	0.021	0.0273	0.0134
MW-2	0.1	<0.005	0.00364	<0.005	0.0025	NS	NS	<0.005	0.0025	<0.005	0.0050
MW-3A	0.1	<0.005	0.00147	<0.005	0.00147	NS	NS	<0.005	0.00147	<0.005	0.0050
MW-4	0.1	<0.005	0.0050	<0.005	0.0050	<0.005	<0.005	<0.005	0.0050	<0.005	0.0050
MW-5	0.1	0.00900	0.00724	0.00761	0.00672	0.0062	0.0062	0.00543	0.00551	0.00561	0.00551
MW-6	0.1	0.4120	**0.39564**	0.37000	**0.39017**	0.34	**0.34**	0.2890	**0.16779**	0.2890	**0.1370**
MW-7	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MW-8	0.1	0.00668	0.00451	0.00727	0.00481	NS	NS	0.00756	0.00507	0.00656	0.00656
MW-9	0.1	0.0734	0.06091	0.0691	0.06185	NS	NS	0.0494	0.05959	0.0591	0.0595
MW-10	0.1	<0.005	0.0050	<0.005	0.0050	NS	NS	<0.005	0.0050	0.00546	0.0050
MW-11	0.1	<0.005	0.0050	<0.005	0.0050	NS	NS	<0.005	0.0050	<0.005	0.0050
MW-12	0.1	<0.005	0.00263	<0.005	0.00263	<0.005	<0.005	<0.005	0.0050	<0.005	0.0050
MW-13	0.1	0.0122	0.01024	0.0113	0.01005	0.012	0.012	0.0126	0.0110	0.0106	0.0105
MW-14	0.1	NI	NI	NI	NI	0.009	0.009	0.00712	0.00712	0.00689	0.00689
MW-15	0.1	NI	NI	NI	NI	0.021	0.021	0.0269	0.0269	0.0291	0.0291
MW-16	0.1	NI	NI	NI	NI	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

[O: KLT 9/1/20, C: RAB 9/2/2020][U:KLT 9/14/20, C:MGP 9/16/20]

Notes:

< = Not Detected at Reporting Limit

-- = No sample; monitoring well not part of CCR program during sampling event

Bold red highlighted concentration indicates exceedance of GWPS for parameter indicated

GWPS = Groundwater Protection Standard

mg/L = milligrams per liter

NI = Not Installed

NS = Not Sampled

1. Negative comparison values are the result of the Lower Confidence Band around a negative slope.
2. Comparison Values are presented on plume maps.

FIGURES

PROJECT: 72799 | DATED: 9/23/2020 | DESIGNER: STOLZSD

DOWNGRADIENT CCR MONITORING LOCATION
BACKGROUND CCR MONITORING LOCATION
PREVIOUSLY MONITORED CCR LOCATION (12/8/2015-3/8/2017)
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION

0 250 500 Feet

SITE AND WELL LOCATION MAP
POND SYSTEM
(MULTI-UNIT ID: 115)

FIGURE 1

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

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Figure 2_MF_BasinAB_GW_Cobalt Plume Map_2004.mxd

PROJECT: 72799 | DATED: 9/23/2020 | DESIGNER: STOLZSD

COBALT, TOTAL

- NON-DETECT
- DETECTED
- DETECTED, SSL
- CCR MONITORED MULTI-UNIT
- BERM
- RIVER FLOW DIRECTION

ND = NOT DETECTED

0 250 500 Feet

TOTAL COBALT PLUME MAP

FIGURE 2

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

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Figure 3_MF_BasinAB_GW_Molybdenum Plume Map_2004.mxd

PROJECT: 72799 | DATED: 9/23/2020 | DESIGNER: STOLZSD

MOLYBDENUM, TOTAL

- NON-DETECT
- DETECTED
- DETECTED, SSL
- CCR MONITORED MULTI-UNIT
- BERM
- RIVER FLOW DIRECTION

ND = NOT DETECTED

0 250 500 Feet

TOTAL MOLYBDENUM PLUME MAP

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

FIGURE 3

RAMBOLL US CORPORATION
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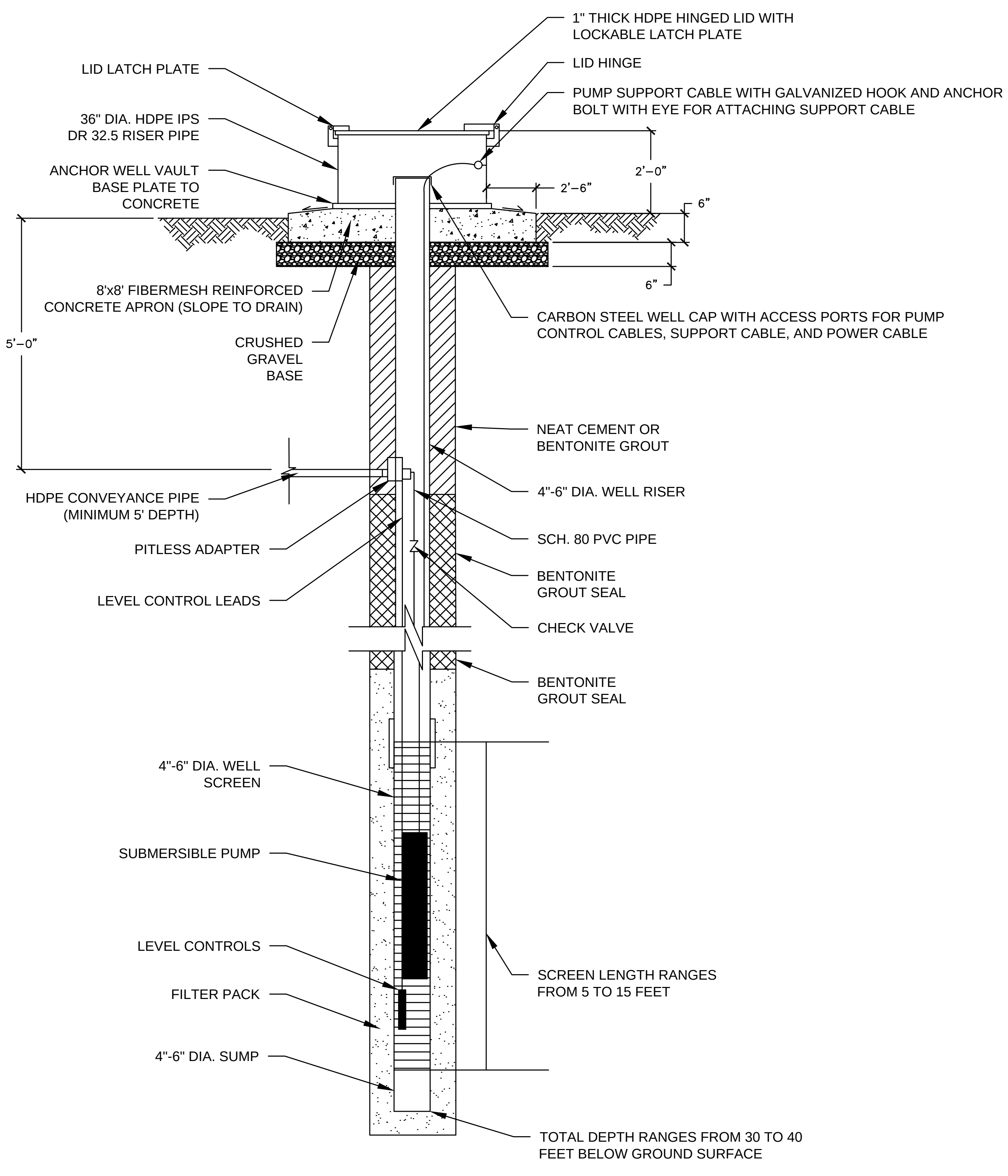

NOTES
1. NOT TO SCALE

TYPICAL HYDRAULIC GRADIENT CONTROL WELL DETAIL

FIGURE 4

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A RAMBOLL COMPANY

DYNEGY MIAMI FORT L.L.C
MIAMI FORT POND SYSTEM
NORTH BEND, OHIO

RAMBOLL

ATTACHMENT 1

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
	=	5.6E+10	L/day	of estimated daily mean discharge rates (11/1986-2/2016) at
				river mile 483.5 provided by U.S. Army Corps' CASCADE model
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.

ATTACHMENT 2 – MAP OF GROUNDWATER MONITORING WELL LOCATIONS

Y:\Mapping\Projects\22\2285\MXD\Miami_Fort\Figure 1_Well Locations BasinAandB.mxd

PROJECT: 72799 | DATED: 9/23/2020 | DESIGNER: STOLZSD

DOWNGRADIENT CCR MONITORING LOCATION
BACKGROUND CCR MONITORING LOCATION
PREVIOUSLY MONITORED CCR LOCATION (12/8/2015-3/8/2017)
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
CCR MONITORED MULTI-UNIT
BERM
RIVER FLOW DIRECTION

0 250 500 Feet

SITE AND WELL LOCATION MAP
POND SYSTEM
(MULTI-UNIT ID: 115)

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

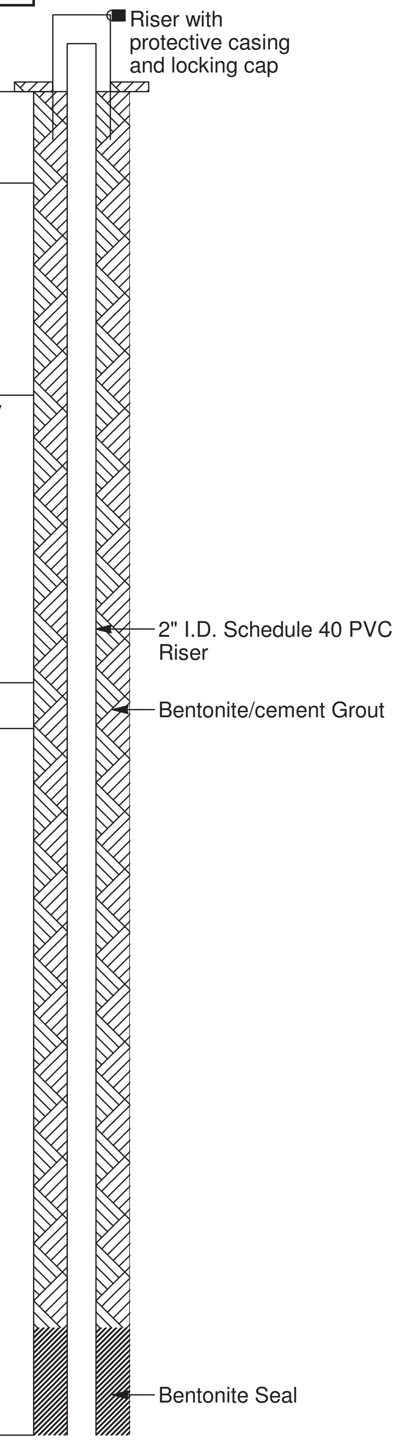
FIGURE 1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

ATTACHMENT 3 – WELL CONSTRUCTION DIAGRAMS AND DRILLING LOGS

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Gray to dark gray TOPSOIL and sand and gravel FILL, loose, poorly sorted, moist to very moist
		100		
				Brownish yellow silty CLAY, soft to very slightly stiff, moist
5				
				grades soft, plastic
		100		
				grades with fine sand
10				
				Brownish yellow silty fine SAND with trace clay, loose, well sorted, very slightly moist
		66		
15				
				grades brown with fine to coarse sand, with angular pebbles and gravel, poorly sorted (fill)
20				
		80		Brown CLAY with trace silt and sand, stiff, very slightly moist
				Brown fine to coarse SAND with angular to rounded pebbles, loose, dry
25				
30		40		
				grades with clay
				grades without clay
				grades with angular gravel
35				
40		50		grades with black organics
				grades without organics
				grades brown to light brown
				grades with less gravel and pebbles
45				NO RECOVERY 45-63.3 feet bgs
50				

WELL CONSTRUCTION DETAIL



Duke Energy - 14947868 - North Bend, OH

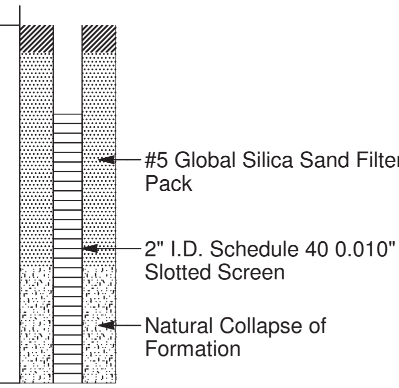
URS

JOB NO. 14947868

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

MONITORING WELL MW-1

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS	WELL CONSTRUCTION DETAIL
50		0			
55					
60		0			



Boring terminated 63' 3" bgs on 12/10/2007.
2" I.D. Schedule 40 PVC monitoring well installed 63' 3" bgs with 10' 0.010" slotted screen.

LEGEND:

Rotosonic

bgs Below ground surface

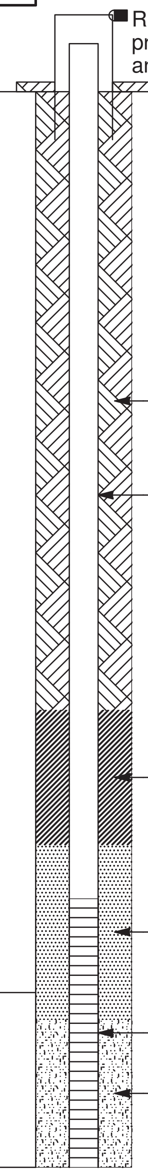
NR Not recorded

DESCRIPTION OF SUBSURFACE MATERIALS

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	Description of Subsurface Materials
0				Brown to dark brown sandy CLAY with silt and trace pebbles and rounded gravel, soft, plastic, moist
		76		
5				
				grades with organics
		80		
				grades with less sand, pebbles, and gravel, stiff, no plasticity
10				
				grades with increasing sand and pebbles, single 3" cobble grades soft, plastic, very moist
		60		
				grades brownish yellow to brown, without organics
15				
		70		
				grades medium stiff to stiff, very slight plasticity to no plasticity
20				
				grades with increasing fine sand, plastic, soft
		100		
25				
				grades gray to dark gray, with increasing silt and sand
		100		
30				
				grades wet
		100		
				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

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

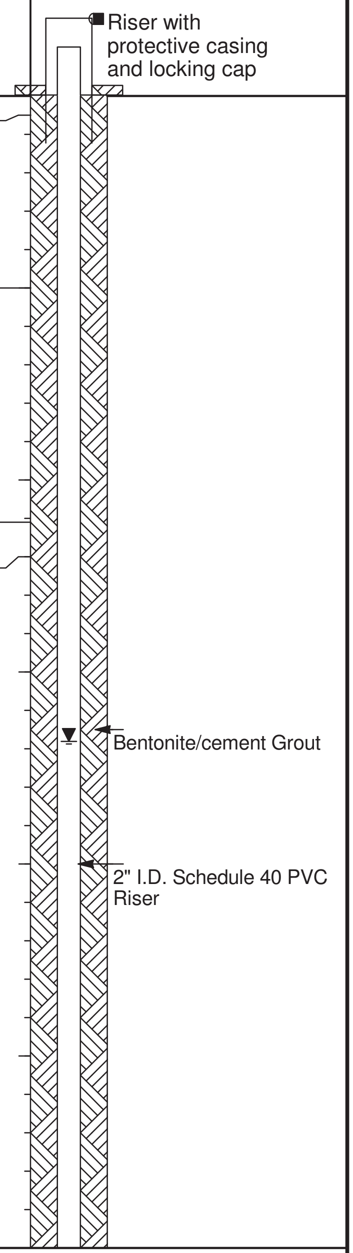
MONITORING WELL MW-2

Project: Duke Energy	Monitoring Well MW-3A
Project Location: Miami Fort Station	
Project Number: 14948624	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	MATERIAL DESCRIPTION
	0		12	83	Yellowish red CLAY TOPSOIL, moist
470					Gray to brownish gray clayey SILT with medium sand and organics, soft, moist to very moist
			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		3	75	grades high plasticity, very moist to wet
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				

WELL CONSTRUCTION DETAILS



URS

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

Monitoring Well MW-3A

Elevation, feet	Depth, feet	Samples: Type	Samples: Blows per 1-foot Interval	Samples: Percent Recovery	Material Description
	30	X	1	100	
440					grades without sand, with trace organics
		X	4	100	grades with sand, without organics
		X	4	100	grades with trace fine sand and increasing silt, without sand lenses, medium plasticity
	35				grades with increasing sand, without organics
435		X	3	100	grades with increasing silt, trace sand, very low plasticity, stiff
		X	6	100	grades with sand, plastic, very soft; grades stiff, very low plasticity, very moist
	40	X	4	100	
430					grades with trace organcis, less sand, increasing silt
		X	8	100	
		X	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
	45				
425		X	7	100	
		X	22	63	grades with increasing diameter gravel
	50	X	13	50	
420					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.
	55				
415					
	60				
410					
	65				
405					
	70				

WELL CONSTRUCTION DETAILS

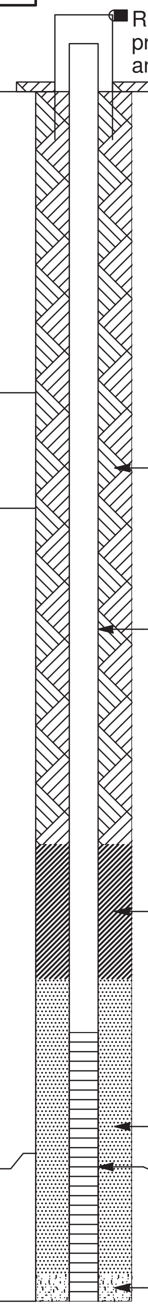
- Bentonite Seal
- Natural Collapse of Formation
- 2" I.D. Schedule 40 0.010" Slotted Screen

URS

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

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

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

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Gray to olive gray sand and gravel FILL with trace organics, loose, very moist
		80		Brownish yellow CLAY with silt and trace organics, very stiff, slightly moist
5				
		60		grades without organics
				grades with abundant gray lenses
10				
		34		
				grades with trace sand and pebbles
15				grades without gray lenses
		50		
				Dark gray fine to coarse SAND and angular GRAVEL (FILL), poorly sorted, loose, dry
20		100		grades coarse gravel concrete in core barrel
		100		
25				Black to dark gray fine to medium SAND, loose, well sorted, wet NO RECOVERY 25-35 feet bgs (at the bottom of the sample run -- sampler rods dropped into ground approxiamtely 7 feet -- suspected void or area of very soft sediment)
30		0		
35				
40		70		Yellowish brown silty CLAY with trace sand, medium stiff to stiff, slightly moist
				grades gray to yellowish brown with gray lenses and organics
45				
50				grades yellowish brown with increasing sand and silt, moist to very moist

WELL CONSTRUCTION DETAIL

- Flush-mounted casing with locking cap
- Benseal Bentonite Granules
- 2" I.D. Schedule 40 PVC Riser
- Bentonite/cement Grout

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
50		70		
55				
				grades with red staining, very soft, very moist
60		100		
				grades medium stiff with less sand
65				Yellowish brown fine to coarse SAND and sub-rounded to rounded GRAVEL, poorly sorted, loose, wet
				grades with less gravel, becoming homogenous sand and pebbles
70		100		
75				

Boring terminated 75' 4" bgs on 12/14/2007.
2" I.D. Schedule 40 PVC monitoring well installed 75' 4" bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL

LEGEND:

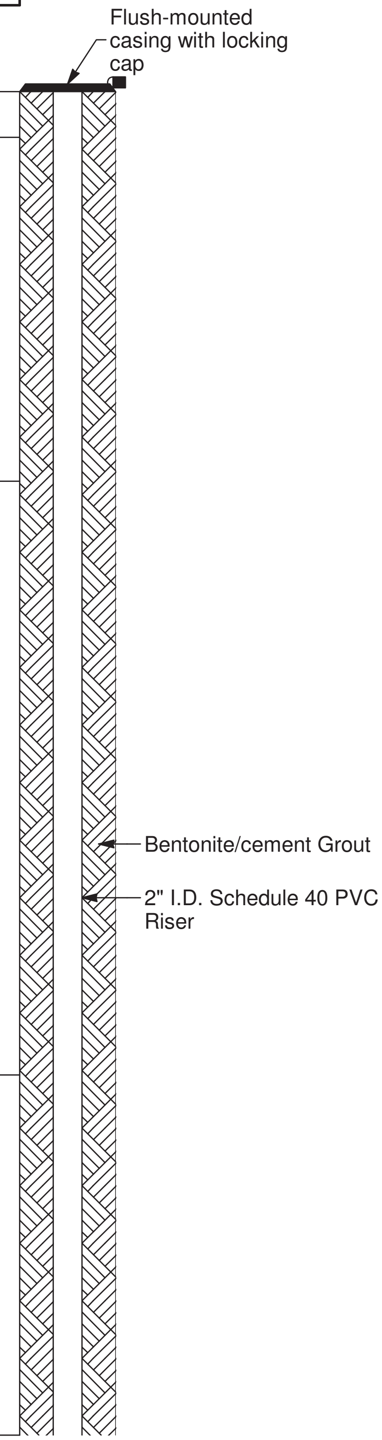
Rotosonic

bgs Below ground surface

NR Not recorded

Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
0				Brown silty CLAY (TOPSOIL), soft, moist
				Brownish yellow silty CLAY, stiff, dry to slightly moist
		60		
				grades with trace sand and pebbles and with organics, very stiff
5				
		70		
10				grades without pebbles and sand
		80		
15				Dark gray fine to coarse SAND and rounded to sub-rounded GRAVEL, loose, poorly sorted, wet
				grades dry
		100		grades dark gray with greenish gray to brownish red lenses, wet
20				
				grades with more sand
				grades dark gray to black with less sand, with increasing pebbles and rounded gravel
25		100		
30				
35		100		
				Brownish yellow to yellowish red CLAY with trace silt, organics, red staining and gray lenses, very stiff, very slightly moist
40				
				grades without staining and organics
45		70		
				grades with increasing sand
				grades with trace rounded gravel
50				

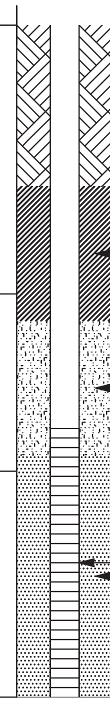
WELL CONSTRUCTION DETAIL



Depth (Feet)	Sample Location	Percent Recovery	USCS Symbol	DESCRIPTION OF SUBSURFACE MATERIALS
50–60	Rotosonic	0		NO RECOVERY 50-60 feet bgs
60–66.5	Rotosonic	90		Brown to brownish yellow fine to coarse SAND and rounded GRAVEL, poorly sorted, loose, wet
66.5–70				Brownish yellow fine to medium SAND, well sorted, loose, wet
70–75	Rotosonic	0		

Boring terminated 75' bgs on 12/13/2007.
2" I.D. Schedule 40 PVC monitoring well installed 75' bgs with 10' 0.010" slotted screen.

WELL CONSTRUCTION DETAIL



LEGEND:

- Rotosonic
- bgs Below ground surface
- NR Not recorded

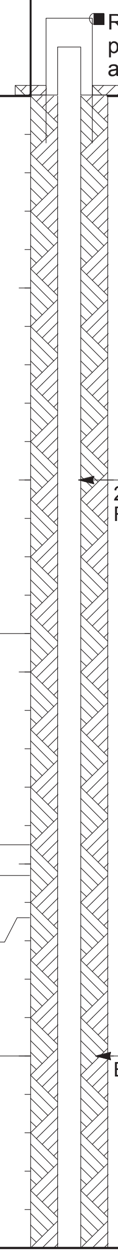
Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well MW-7

Date(s) Drilled	10/23/2015	Logged By	B. Smolenski	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz	Total Depth of Borehole	64.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	507.86 feet, msl
Depth to Groundwater	57.99 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	510.17 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	Percent Recovery	MATERIAL DESCRIPTION
	0	100	Light brown SILT with trace fine gravel, medium stiff, slightly moist to dry
505			grades without gravel, with clay, trace oxidation staining
		40	
	5		grades stiff to very stiff
500			grades with trace fine subrounded gravel
	10		grades clayey, with more fine to medium gravel
495			grades sandy with fine to coarse sand
			Light brown fine to coarse SAND, with trace fines and fine subrounded to round gravel, loose to medium dense, slightly moist
	15		grades more coarse, with fine to medium gravel
490			
		65	Light brown fine to medium sandy GRAVEL, with fines, dense, dry
	20		Light brown fine to coarse SAND, with fines and fine subrounded to round gravel, very dense, dry grades gravelly, more coarse
485			Light brown well graded SAND and GRAVEL, fine to coarse sand, fine to medium subrounded to round gravel, with fines, very dense, dry grades without medium gravel
	25		Light brown gravelly fine to coarse SAND, fine to medium gravel, with fines, very dense, dry
480			grades to fine gravel
		65	grades brown, with less gravel
	30		

WELL CONSTRUCTION DETAILS



URS

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

Monitoring Well MW-7

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30					
475					Brown medium SAND, with some coarse sand, loose to medium dense, slightly moist	
	35				grades to fine sand without coarse sand, with silt	
					grades fine to medium sand, without silt	
470			70			
	40					
465					Brown silt layer, soft, moist	
	45				Brown fine to medium and with black lamina spaced approximately 0.1" apart, medium dense, moist grades without lamina	
460					grades very fine to fine, silty	
	50				grades wet	Bentonite Seal
					Brown sandy SILT, very fine sand, soft, wet	
455					Brown silty very fine to fine SAND, soft, wet	
	55				grades withouth silt, medium sand	
450						#5 Global Silica Sand Filter Pack 2" I.D. Schedule 40 0.010" Slotted Screen
	60				grades with trace black lamina	
445					grades fine grained grades very fine grained, silty	
					Brown very fine sandy SILT, with gray to black curved lamina spaced 1.0-2.0" apart, soft, wet	End Cap
	65				End of boring at 64' bgs	
440						
	70					

DYNEGY MIAMI FORT STATION CCR WELLS.GPJ 1/8/16

URS

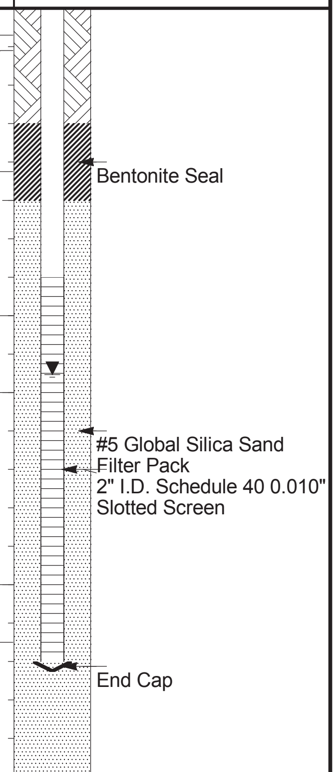
Project: Dynegy	Monitoring Well MW-8
Project Location: Miami Fort Station	
Project Number: 60442412	Sheet 1 of 2

Date(s) Drilled	10/20/2015	Logged By	B. Smolenski	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz	Total Depth of Borehole	50.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	491.60 feet, msl
Depth to Groundwater	39.53 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	493.43 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	Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0	100	Dark brown SILT, with clay and trace gravel, medium stiff to stiff, slightly moist	Riser with protective casing and locking cap
490			grades dark gray to black, with sand, medium stiff	
	5	73		
485				
			grades with more medium to coarse subrounded gravel	
	10			2" I.D. Schedule 40 PVC Riser
480			Brown silty CLAY, with fine to medium subrounded to round gravel, stiff, slightly moist	
	15			
475			Brown gravelly fine to coarse SAND, with fines, angular to subrounded gravel, medium dense, slightly moist	Bentonite/cement Grout
	20	77		
470			Brown silty CLAY layer, medium stiff, moist	
			Brown clayey fine to medium subrounded GRAVEL, with sand, dense, slightly moist	
	25		Brown fine to medium SAND with trace fine gravel, loose, slightly moist	
465			grades to very fine to fine silty sand, with laminations and ripple marks, medium dense	
	30			

Elevation, feet	Depth, feet	Samples: Type	Samples: Percent Recovery	MATERIAL DESCRIPTION
	30		92	Brown very fine sandy SILT, with clay, medium stiff, moist to very moist
				Brown fine SAND with clay, medium dense, wet
460				Brown very fine sandy SILT, with clay, medium stiff, moist to very moist
				Brown fine to medium SAND, medium dense, moist
	35			
455				
				Brown very fine sandy SILT, with clay, medium stiff, very moist
	40		83	Brown sandy fine to coarse subrounded GRAVEL, with fines, loose, wet
450				
	45			Brown fine to coarse SAND with trace fine to medium subrounded gravel, loose, wet
445				Brown fien to medium SAND, medium dense, wet
	50			End of boring at 50' bgs
440				
	55			
435				
	60			
430				
	65			
425				
	70			

WELL CONSTRUCTION DETAILS



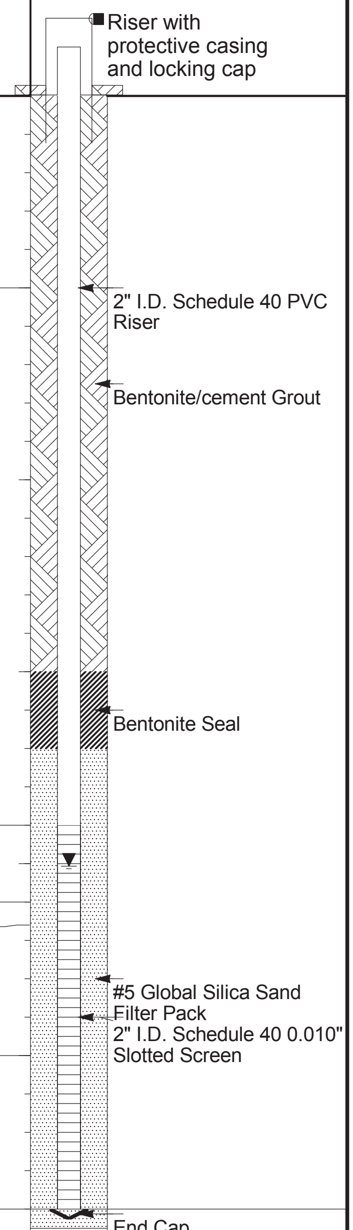
Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well MW-9

Date(s) Drilled	10/20/2015	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	470.54 feet, msl
Depth to Groundwater	20.07 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	473.05 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: Percent Recovery	MATERIAL DESCRIPTION
470	0	100	Dark brown SILT with clay, and trace fine subrounded gravel, stiff, slightly moist
			grades dark gray to black
		93	
465	5		Dark gray silty CLAY, very stiff to hard, dry, trace black wood fragments
			grades brown to reddish brown, without wood fragments
460	10		
455	15		
		93	Brown medium to coarse SAND with fine to medium subrounded gravel, loose, wet
450	20		
			Brown silty clay layer, stiff, moist
			Brown medium to coarse SAND, with fine to medium subrounded gravel, loose, wet
			grades to coarse sand with abundant fine gravel, and trace medium to coarse gravel
445	25		Brown fine to medium subrounded to round GRAVEL, with fine to coarse sand, and trace coarse gravel, loose, wet
			End of boring at 29' bgs
	30		

WELL CONSTRUCTION DETAILS



URS

Project: Dynegy

Project Location: Miami Fort Station

Project Number: 60442412

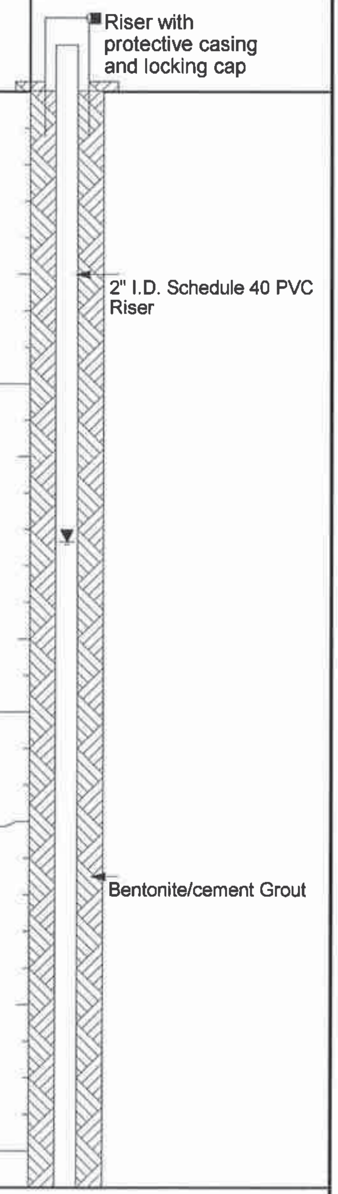
Monitoring Well MW-10

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					

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION
	0		74		Brown SILT, with clay and fine angular to sub rounded gravel, soft, slightly moist
470					
					Grades with more clay and gravel, medium stiff
	5				
465					Grades without gravel and more clay, very stiff, moist
					Brown CLAY, with silt, medium stiff, moist
	10		48		
460					
	15				
455					
					Brown SILT, with some clay and very fine sand, soft, moist
			93		Grades with less silt and more fine sand
	20				Brown fine SAND, with silt and clay, loose, soft, moist
450					
					Grades with less silt and clay
	25				
445					
					Grades gray and brown
					Grades with trace silt and without clay, few pieces of organic matter
			88		Gray and brown fine SAND, with trace silt, loose, moist
	30				

WELL CONSTRUCTION DETAILS



AECOM

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

Monitoring Well MW-10

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Percent Recovery	SAMPLES Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
440	30					
435	35				Grades with some medium sand	
					Grades to medium sand	
			58		Grades wet	
430	40					
					Grades with silt, more dense	
						Bentonite Seal
425	45				Grades with fine and coarse sand	
					Brown and gray fine to coarse SAND wtih fine to coarse rounded gravel, loose, wet	
			88			
420	50					#5 Global Silica Sand Filter Pack
					Brown medium SAND, loose, wet	
415	55					2" I.D. Schedule 40 0.010" Slotted Screen
						End Cap
					End of boring at 59'	
410	60					
405	65					
	70					

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

AECOM

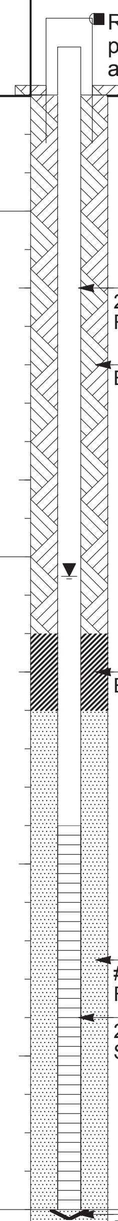
Project: Dynegy
Project Location: Miami Fort Station
Project Number: 60442412

Monitoring Well MW-10S

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

WELL CONSTRUCTION DETAILS



URS

Project: Dynegy	Monitoring Well MW-11
Project Location: Miami Fort Station	
Project Number: 60442412	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	Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0	69	Gray coarse angluar limestone GRAVEL, with fines, medium dense, slightly moist (FILL)	Riser with protective casing and locking cap
470			Brown and tan with reddish mottled SILT with trace fine gravel, very stiff, moist	
			Grades with fine sand	
	5		Brown with red mottled fine SAND, soft, moist	2" I.D. Schedule 40 PVC Riser
465			Dark gray SILT with some clay, stiff, moist, trace organci matter	
			Grades with more clay	
	10	42	Gray and brown CLAY, with some silt, soft, moist	
460			Gray and brown SILT, with fine sand and some clay, soft, moist	
	15			
455			Grades with less clay	
	20	56	Grades gray without clay	
450				Bentonite/cement Grout
			Gray very fine SAND with silt, soft, moist	
	25			
445				
	30	53	Grades with dark gray and black wood fragments	

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

Monitoring Well MW-11

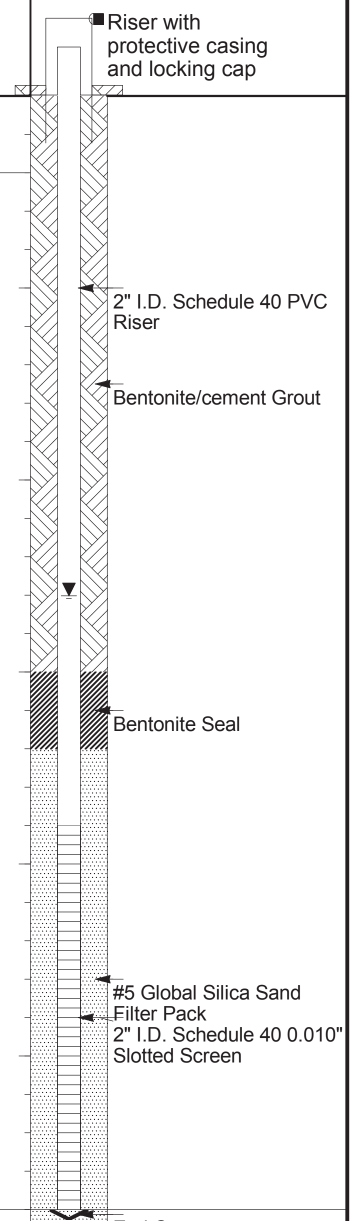
Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30					
440					Grades without wood fragments	
	35					
435					Grades with less silt	
			83			
	40					
					Gray fine to coarse SAND with rounded fine gravel, loose, moist	
430					Grades to fine sand and without gravel	
	45					Bentonite Seal
425					Grades brown and gray	
					Grades fine to coarse sand with rounded fine to medium gravel	
			80			
	50				Grades wet	#5 Global Silica Sand Filter Pack
420					Alternating reddish brown CLAY lens and fine to coarse SAND with rounded fine to coarse gravel, soft, wet	
	55					2" I.D. Schedule 40 0.010" Slotted Screen
415						
					Boring terminated at 59'	End Cap
	60					
410						
	65					
405						
	70					

Project: Dynegy	**Monitoring Well MW-11S**
Project Location: Miami Fort Station	
Project Number: 60442412	Sheet 1 of 1

Date(s) Drilled	**10/22/2015**	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	**471.83 feet, msl**
Depth to Groundwater	**13.02 ft bgs**	Seal Material	**Hydrated 3/8-inch Bentonite Chips**	Top of PVC Elevation	**473.64 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	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION
	0		100		Gray coarse angluar limestone GRAVEL, with fines, medium dense, slightly moist (FILL)
470					Dark gray SILT with clay and trace fine to coarse angular to subrounded gravel, very stiff, dry to slightly moist, with oxidation staining grades yellowish-brown, medium stiff to stiff
			0		No recovery from 4.0-19.0' Lithology inferred
	5				
465					
	10				
460					
	15				
455					
			100		Gray clayey SILT, very soft to soft, wet, with trace black wood fragments, and trace fine sand lamina
	20				
450					
	25				
445					
					End of boring at 29' bgs.
	30				

WELL CONSTRUCTION DETAILS



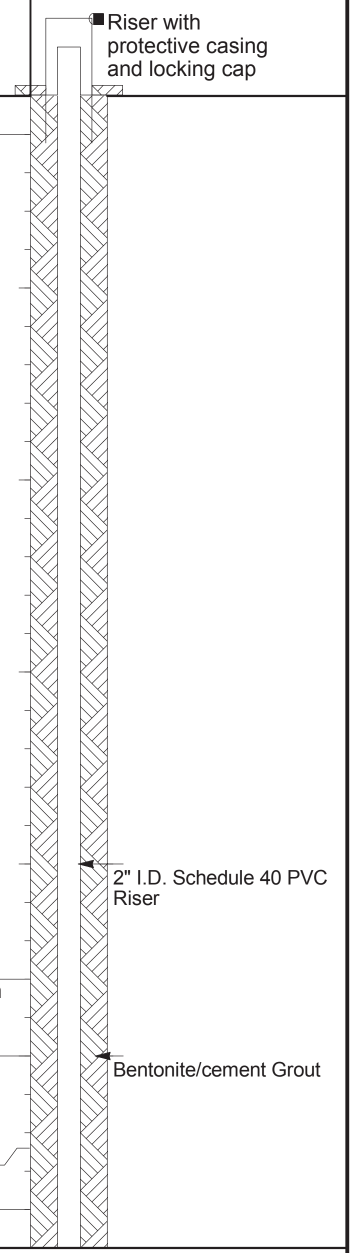
URS

Project: Dynegy	Monitoring Well MW-12
Project Location: Miami Fort Station	Sheet 1 of 2
Project Number: 60442412	

Date(s) Drilled	10/21/2015	Logged By	B. Smolenski	Checked By	M. Wagner
Drilling Method	Rotosonic	Drilling Contractor	Frontz	Total Depth of Borehole	64.0 feet
Drill Rig Type	Rotosonic	Sampler Type	Sonic Sleeve	Surface Elevation	506.01 feet, msl
Depth to Groundwater	53.51 ft bgs	Seal Material	Hydrated 3/8-inch Bentonite Chips	Top of PVC Elevation	508.44 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	Samples: Percent Recovery	Samples: Graphic Log	MATERIAL DESCRIPTION
	0		100		Dark brown SILT with some clay and fine gravel, loose, slightly moist
505					Reddish brown silty CLAY, with trace fine to medium subrounded gravel, stiff, slightly moist, with trace dark gray mottling
			63		
500	5				
					grades very stiff
495	10				grades hard, dry, with light brown banding
490	15				
			100		
485	20				grades gray and brown mottled
					Black sandy SILT, with trace gravel and glassy black angular gravel, medium stiff, moist
480	25				Black fine to medium SAND, with trace angualr, glassy gravel, loose, moist
					red brick fragment
					Gray SILT, very hard, dry
			100		Brown silty CLAY, hard, dry to slightly moist, with gray mottling and trace
	30				

WELL CONSTRUCTION DETAILS



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

Monitoring Well MW-12

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				black mottling	
475						
	35				grades with fine sand	
470						
			100			
	40				grades medium stiff, moist	
465						
	45					
460					grades soft	
					grades sandy	
			100			
	50					
455						Bentonite Seal
					Brown clayey, silty, fine SAND	
	55				grades with black staining and oxidation banding	
450					Brown sandy SILT, with clay, soft to medium stiff, very mosit, with black mottling and oxidation staining	
					grades with lamination, and sandy seams spaced approximately 6" apart	
					Brown sandy fine to medium subrounded-round GRAVEL, with fines, medium dense, wet	#5 Global Silica Sand Filter Pack
			66			2" I.D. Schedule 40 0.010" Slotted Screen
	60					
445						
					Brown medium to coarse SAND, with trace fine to medium subrounded to round gravel, loose, wet	
					Brown fine to medium GRAVEL, with trace sand, loose, wet	
					End of boring at 64' bgs	End Cap
	65					
440						
	70					

URS

Project: Dynegy	Monitoring Well
Project Location: Miami Fort Station	MW-13
Project Number: 60442412	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					

Elevation, feet	Depth, feet	SAMPLES: Type	Percent Recovery	Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0		68		Brown SILT with coarse sand and trace gravel, medium stiff, moist	Riser with protective casing and locking cap
					Grades softer	
475					Grades stiff	
	5				Grades very stiff	2" I.D. Schedule 40 PVC Riser
					Grades with more gravel	
					Brown and gray SAND with rounded gravel, loose, moist	
470						
	10		95		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	
465						
	15				Grades with more silt, brown	
					Brown SILT with trace clay and fine sand, soft, moist	
460					Medium brown fine SAND with silt, soft, moist	
	20		64		Grades reddish brown, very soft	
455						Bentonite/cement Grout
	25					
450					Red and brown mottled CLAY, stiff, moist	
			69		Gray fine SAND with silt and trace clay, very soft, moist	
	30					

AECOM

Project: Dynegy Project Location: Miami Fort Station Project Number: 60442412	**Monitoring Well** **MW-13** Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				Grades without clay	
445						
	35				Grades with trace fine gravel, less silt	
					Grades with some medium sand	
440						
			63		Grades fine to coarse sand, brown and gray, loose, wet	
	40					
435						
					Grades gray with some fine to coarse gravel	
	45					Bentonite Seal
					Grades with few brown silt lenses	
					Grades without silt	
430						
			70			
	50					#5 Global Silica Sand Filter Pack
425						
	55					2" I.D. Schedule 40 0.010" Slotted Screen
420						
					Boring terminated at 59'	End Cap
	60					
415						
	65					
410						
	70					

AECOM

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	SAMPLES: Percent Recovery	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	0		100	Reddish brown silty CLAY, trace fine angular coal fragments, very stiff, dry, with black mottling	Riser with protective casing and locking cap
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					2" I.D. Schedule 40 PVC Riser
	10			grades reddish brown	Bentonite/cement Grout
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	Bentonite Seal
455					
	25			grades with black mottling and oxidation staining	
				grades fine to medium grained, with less fines	
450					#5 Global Silica Sand Filter Pack
			100	Reddish brown CLAY, with silt, medium stiff to stiff, slightly moist, with fine to	2" I.D. Schedule 40 0.010"
	30				

URS

Project: Dynegy **Project Location:** Miami Fort Station **Project Number:** 60442412	**Monitoring Well MW-13S** Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES: Type	SAMPLES: Percent Recovery	SAMPLES: Graphic Log	MATERIAL DESCRIPTION	WELL CONSTRUCTION DETAILS
	30				medium grained sand layers spaced approximately 6" apart, black mottling, and oxidation staining	Slotted Screen
445						
					End of boring at 34' bgs	End Cap
	35					
440						
	40					
435						
	45					
430						
	50					
425						
	55					
420						
	60					
415						
	65					
410						
	70					

RAMBOLL

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Miami Fort Power Station		MW-14

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Rick Tustin Cascade Drilling	5/29/2019	5/29/2019	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-14	Feet (NAVD88)	476.83 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 412,784.14 N, 1,313,291.31 E E / W
1/4 of 1/4 of Section , T N, R
Lat 39° 6' 37.2444"
Long -84° 48' 33.6901"
Local Grid Location: Feet ☐ N ☐ S Feet ☐ E ☐ W

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

Sample 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		1.5 3.0 4.5 6.0 7.5 9.0	0 - 11.5' **FILL, WELL-GRADED SAND WITH GRAVEL:** (SW)g, dark gray (10YR 4/1), angular to subangular fine to coarse sand, trace to little clay, little roots, moist. 1.5' no roots. 6.5' grades to reddish yellow, increase in clay content, moist.	(FILL) (SW)g									
2 CS	120 60		10.5											
			12.0 13.5 15.0 16.5	11.5 - 17.5' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace fine to medium sand, trace subrounded gravel, medium plasticity, stiff, moist.	CL/ML				1.5 1.5 1.5 1.5					
			18.0 19.5	17.5 - 40' **SANDY LEAN CLAY:** s(CL), reddish yellow to reddish brown (5YR 5/4), very fine to fine sand, trace subrounded fine gravel, low plasticity, firm, moist to wet.	s(CL)									

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

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

RAMBOLL

Boring Number MW-14

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
3 CS	120 120			17.5 - 40' **SANDY LEAN CLAY:** s(CL), reddish yellow to reddish brown (5YR 5/4), very fine to fine sand, trace subrounded fine gravel, low plasticity, firm, moist to wet. *(continued)*					0.25					
			21.0						0.5					
				20' sand content increases.					0.75					
			22.5						0.5					
			24.0						0.25					
			25.5	25' sand content decreases.					0.5					
									0.25					
			27.0						0.5					
			28.5						0.75					
									0.5					
4 CS	120 120		30.0	30' sand content increases.	s(CL)				0.5					
									0.25					
			31.5						0.5					
			33.0						0.75					
			34.5						0.5					
				34.5' sand content decreases.					0.25					
			36.0	36' grades to gray.					0.5					
			37.5						0.25					
				37.5' sand content increases.					0.5					
			39.0						0.5					
5 CS	120 120		40.5	40 - 85' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium, little fine to coarse subrounded to rounded gravel, loose, wet.										
			42.0											
			43.5											
			45.0											
			46.5		(SP)g									
			48.0	48' - 50' some rounded medium to coarse gravel.										
			49.5											
6 CS	120 120		51.0											Began pumping water due to heaving sand.
			52.5											

RAMBOLL

Boring Number MW-14

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			54.0	40 - 85' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium, little fine to coarse subrounded to rounded gravel, loose, wet. *(continued)*										
			55.5											
			57.0											
			58.5	58' - 60' grades to very fine to fine sand.										
7 CS	120 120		60.0	60' - grades to fine to medium sand, little subrounded to rounded fine to coarse gravel.										
			61.5											
			63.0											
			64.5	65' - 67' grades to medium to coarse sand.										
			66.0											
			67.5	67' grades to fine to medium sand, little rounded fine to coarse gravel.										
			69.0		(SP)g									
8 CS	120 120		70.5											
			72.0											
			73.5											
			75.0											
			76.5											
			78.0											
			79.5											
9 CS	60 60		81.0											
			82.5											
			84.0											
				85' End of Boring.										

RAMBOLL

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Miami Fort Power Station		MW-15

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Rick Tustin Cascade Drilling	5/28/2019	5/29/2019	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-15	Feet (NAVD88)	494.29 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 413,749.32 N, 1,314,079.25 E E / W
1/4 of 1/4 of Section , T N, R

Lat 39° 6' 46.9805"
Long -84° 48' 24.0094"

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

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

Sample 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		1.5	0 - 2.5' **FILL, WELL-GRADED GRAVEL WITH SAND:** (GW)s, gray (10YR 6/1), angular to subangular, fine to coarse, dry.	(FILL) (GW)s									
			3.0	2.5 - 6' **SILTY CLAY** CL/ML, reddish brown (5YR 4/3), trace subrounded fine to coarse gravel, trace fine to coarse sand, medium plasticity, stiff, dry to moist.	CL/ML				1.75					
			4.5						1.5					
									1.5					
			6.0						1.75					
			7.5	6 - 13.5' **SANDY LEAN CLAY:** s(CL), reddish brown (5YR 4/3) with gray mottling, fine to medium sand, trace subrounded to rounded fine to coarse gravel, low plasticity, firm, moist.	s(CL)				0.5					
									0.5					
			9.0						0.5					
2 CS	120 84		10.5						0.5					
									0.5					
			12.0						0.5					
									0.5					
			13.5	13.5 - 45.5' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, firm, moist.	CL/ML				0.5					
			15.0						2.5					
									2.5					
			16.5						2.5					
			18.0											
			19.5											

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

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

RAMBOLL

Boring Number MW-15

Sample 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
3 CS	120 84		21.0, 22.5, 24.0, 25.5, 27.0, 28.5	13.5 - 45.5' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, firm, moist. *(continued)*	CL/ML				1.5, 2, 2, 1.75, 1.5, 2, 1.5					
4 CS	120 120		30.0, 31.5, 33.0, 34.5, 36.0, 37.5, 39.0	30' firm to stiff.					0.75, 0.75, 0.75, 0.5, 0.75, 0.5, 0.75, 0.75, 1, 0.75					
5 CS	120 120		40.5, 42.0, 43.5, 45.0	40' soft.					0.5, 0.5, 0.5, 0.5, 0.5					
			46.5	45.5 - 46.5' **WELL-GRADED SAND WITH GRAVEL:** (SW)g, dark yellowish brown (10YR 4/4), subrounded to rounded, fine to coarse, wet.	(SW)g				0.5					
			48.0, 49.5	46.5 - 75' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet.	(SP)g									
6 CS	120 120		51.0, 52.5											

RAMBOLL

Boring Number MW-15

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			54.0	46.5 - 75' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. *(continued)*										
			55.5											
			57.0											
			58.5											
7 CS	120 120		60.0											Began pumping water due to heaving sand.
			61.5											
			63.0											
			64.5		(SP)g									
			66.0											
			67.5											
			69.0											
8 CS	60 60		70.5											
			72.0											
			73.5											
			75.0	75' End of Boring..										

RAMBOLL

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Miami Fort Power Station		MW-16

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Rick Tustin Cascade Drilling	5/24/2019	5/28/2019	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-16	Feet (NAVD88)	494.12 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 413,739.21 N, 1,314,081.83 E E / W
1/4 of 1/4 of Section , T N, R
Lat 39° 6' 46.8813"
Long -84° 48' 23.9734"
Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

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

Sample 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 96		1.5	0 - 2.5' **FILL, WELL-GRADED GRAVEL WITH SAND:** (GW)s, gray (10YR 6/1), angular to subangular fine to coarse sand, dry.	(FILL) (GW)s									
			3.0 4.5	2.5 - 5.2' **SILTY CLAY** CL/ML, reddish brown (5YR 4/3), trace subrounded fine to coarse gravel, trace fine to coarse sand, medium plasticity, stiff, moist.	CL/ML				1.5 1.5 1.5					
			6.0 7.5 9.0	5.2 - 14.5' **SANDY LEAN CLAY:** s(CL), reddish brown (5YR 4/3) with gray mottling, fine to medium sand, trace subrounded to rounded medium to coarse gravel, low plasticity, firm, moist.	s(CL)				0.5 0.5 0.5					
2 CS	120 90		10.5 12.0 13.5						0.5 0.5 0.5 0.5					
			15.0 16.5 18.0 19.5	14.5 - 45' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, stiff to very stiff, moist.	CL/ML				2 2.75 2.5					

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

Signature	Firm	
SH Wk	Ramboll ,	Tel: Fax:

RAMBOLL

Boring Number MW-16

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
3 CS	120 96			14.5 - 45' **SILTY CLAY** CL/ML, reddish yellow to reddish brown (5YR 5/4), trace subrounded fine to coarse gravel, low plasticity, stiff to very stiff, moist. *(continued)*										
			21.0						1.5					
									2					
			22.5						1.5					
			24.0						1.5					
									2.5					
			25.5						2					
			27.0						1.5					
									1.5					
			28.5											
4 CS	120 120		30.0	30' firm to stiff.					0.75					
			31.5						0.5					
			33.0		CL/ML				0.75					
									0.5					
			34.5						1					
			36.0						1					
									0.75					
			37.5						0.75					
			39.0						1					
									0.75					
5 CS	120 120		40.5	40' soft.					0.5					
			42.0						0.5					
									0.5					
			43.5	43.5' grades to gray.					0.5					
			45.0						0.5					
				45 - 47.6' **WELL-GRADED SAND WITH GRAVEL:** (SW)g, dark yellowish brown (10YR 4/4), subrounded to rounded, fine to coarse, wet. 45.5' black laminae (1" thick layer).	(SW)g									
			46.5											
			48.0	47.5' black laminae (2" thick layer).										
				47.6 - 110' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. 48.5' black laminae (1" thick layer).	(SP)g									
			49.5											
6 CS	120 120		51.0											
			52.5											

RAMBOLL

Boring Number MW-16

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			54.0	47.6 - 110' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. *(continued)*										
			55.5											
			57.0											
			58.5											
7 CS	120 120		60.0											
			61.5											
			63.0											
			64.5											
			66.0											
			67.5											
			69.0											
8 CS	120 120		70.5		(SP)g									Began pumping water due to heaving sand.
			72.0											
			73.5											
			75.0											
			76.5											
			78.0											
			79.5											
9 CS	120 120		81.0											
			82.5											
			84.0											
			85.5											

RAMBOLL

Boring Number MW-16

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			87.0	47.6 - 110' **POORLY-GRADED SAND WITH GRAVEL:** (SP)g, yellowish brown (10YR 5/8), fine to medium sand, little subrounded to rounded fine to coarse gravel, wet. *(continued)*										
			88.5											
10 CS	120 120		90.0											
			91.5											
			93.0											
			94.5											
			96.0	96' grades to medium to coarse sand, little subrounded to rounded gravel.										
			97.5											
			99.0		(SP)g									
11 CS	120 96		100.5	100' grades to fine to medium sand, trace subrounded to rounded gravel.										
			102.0											
			103.5											
			105.0											
			106.5											
			108.0											
			109.5											
				110' End of Boring..										

Pumping Test Report

4A

Well No. 4 Pump Head No. ______
Date 08/20/2014 Project No. 3114-H
Foreman Steve Colburn
Helper Tim Crowe

Customer: DUKE Energy, Location: Miami Fort Generating Station

Column/Drop Pipe: dia. 8", lengths 90', connections T & C, coating ______

Lineshaft: dia./lengths 1 ½" w/ 1 11/16" sleeves, threads 8, material ______

Bowl: make Layne & Bowler, model 15DRHC, stages 6, material CI / Brz.

Suction Pipe: dia. 8", lengths 23', bowl connection Threaded, material PVC

Motor: type VHS, make GE, hp. 100, rpm 1180, volts 2200, frame N6311

Well: dia. 38" x 26", depth 129', screen dia./length 26" / 30', screen material SS, static 51' 3"

Orifice Size: 8" x 6", Water discharged 100 feet from well, into Grass / Weeds.

Elapsed Time	Orifice Reading	GPM	Pumping Level	Drawdown	Discharge Lbs.	Pressure Feet	Pumping Head	Specific Capacity	Running Amps	Comments
		0	51.3	0	120	277.2	328.5			
5	34.0		91.0							Dirty
10	34.0		91.3							Dirty
15	34.0		91.4							Clear
20	34.0	923	91.5	40.3	90	207.9	299.4	22.9		Clear
5	53.5		97.2							Clear
10	53.5		97.0							Clear
15	53.5		96.8							Clear
20	53.5	1158	96.3	45.0	60	138.6	234.9	25.7	31 - 29 - 30	Clear
5	67.0		102.7							
10	67.0		101.8							
15	67.0		101.2							
20	67.0	1295	101.0	49.8	30	69.3	170.3	26.0	32 - 31 - 29	
5	89.0		118.0							Dirty
			Broke	Suction						

PO Box 369 5650-2 Groveport Road Groveport, Ohio 43125-0369 Phone 614-492-9282 Fax 614-497-0567

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Miami Fort Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-14
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 39° 6' 37.2" Long. -84° 48' 33.7" or	
Facility ID	St. Plane 412,784 ft. N, 1,313,291 ft. E. E/W	Date Well Installed: 05/29/2019
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Rick Tustin, Cascade Drilling
Distance from Waste/Source ft. / State: OH	Location of Well Relative to Waste/Source: u ☐ Upgradient; s ☐ Sidegradient; d ☒ Downgradient; n ☐ Not Known / Gov. Lot Number	

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 479.89 ft. (NAVD88)

C. Land surface elevation 476.8 ft. (NAVD88)

D. Surface seal, bottom 475.8 ft. (NAVD88) or 1.0 ft.

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

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Sonic Other ☒

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

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Distilled water from power station

E. Bentonite seal, top 406.8 ft. (NAVD88) or 70.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 403.8 ft. (NAVD88) or 73.0 ft.

H. Screen joint, top 401.8 ft. (NAVD88) or 75.0 ft.

I. Well bottom 391.8 ft. (NAVD88) or 85.0 ft.

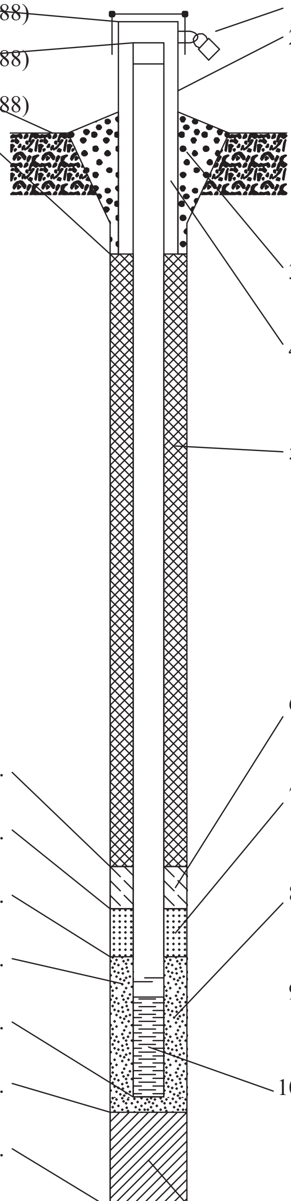
J. Filter pack, bottom 391.8 ft. (NAVD88) or 85.0 ft.

K. Borehole, bottom 391.8 ft. (NAVD88) or 85.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ Other ☐
   d. Additional protection? ☒ Yes ☐ No. If yes, describe: 3 Steel Bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. 9.5 Lbs/gal mud weight . . . Bentonite slurry ☒
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 12.04 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. Not applicable
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Global Drilling Suppliers, Quartz Sand Pack
   b. Volume added 2.1 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
    b. Manufacturer Johnson
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge. Date Modified: 6/19/2019

Signature	Firm	
SH W[signature]	Ramboll ,	Tel: Fax:

![RAMBOLL]

MONITORING WELL CONSTRUCTION

Facility/Project Name: Miami Fort Power Station	Local Grid Location of Well: ____ft. ☐ N. ☐ S. ____ft. ☐ E. ☐ W.	Well Name: MW-15
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 39° 6' 47.0" Long. -84° 48' 24.0" or	
Facility ID	St. Plane 413,749 ft. N, 1,314,079 ft. E. E/W	Date Well Installed: 05/29/2019
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ____1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Rick Tustin, Cascade Drilling
Distance from Waste/Source: ft. — State: OH	Location of Well Relative to Waste/Source: u ☐ Upgradient; s ☐ Sidegradient; d ☒ Downgradient; n ☐ Not Known — Gov. Lot Number	

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 497.52 ft. (NAVD88)

C. Land surface elevation 494.3 ft. (NAVD88)

D. Surface seal, bottom 493.3 ft. (NAVD88) or 1.0 ft.

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

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐; Hollow Stem Auger ☐; Sonic — Other ☒

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

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Distilled water from power station

E. Bentonite seal, top 434.3 ft. (NAVD88) or 60.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 431.3 ft. (NAVD88) or 63.0 ft.

H. Screen joint, top 429.3 ft. (NAVD88) or 65.0 ft.

I. Well bottom 419.3 ft. (NAVD88) or 75.0 ft.

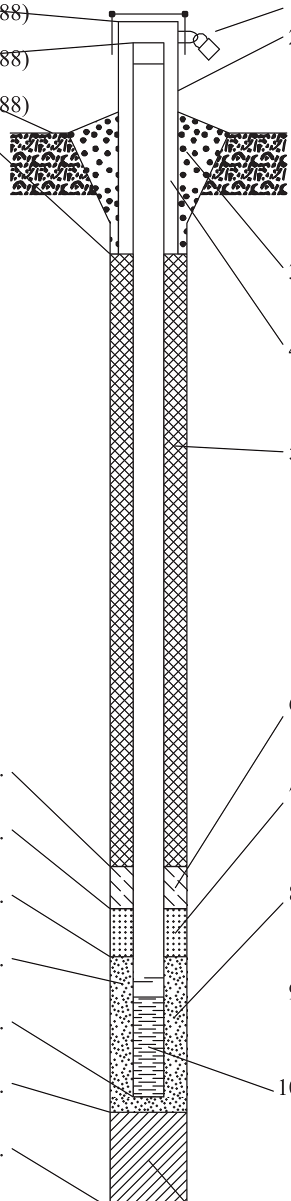
J. Filter pack, bottom 419.3 ft. (NAVD88) or 75.0 ft.

K. Borehole, bottom 419.3 ft. (NAVD88) or 75.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒; Other ☐
   d. Additional protection? ☒ Yes ☐ No — If yes, describe: 3 Steel Bollards
3. Surface seal: Bentonite ☐; Concrete ☒; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐; Sand — Other ☒
5. Annular space seal:
   a. Granular/Chipped Bentonite ☐
   b. ____Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. 9.5 Lbs/gal mud weight . . . Bentonite slurry ☒
   d. ____% Bentonite . . . Bentonite-cement grout ☐
   e. 10.29 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐; Tremie pumped ☒; Gravity ☐
6. Bentonite seal:
   a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. Not applicable
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Global Drilling Suppliers, Quartz Sand Pack
   b. Volume added 2.1 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒; Flush threaded PVC schedule 80 ☐; Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒; Continuous slot ☐; Other ☐
    b. Manufacturer: Johnson
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒; Other ☐

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

Date Modified: 6/19/2019

Signature	Firm	
[signature]	Ramboll ,	Tel: Fax:

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Miami Fort Power Station	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-16
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 39° 6' 46.9" Long. -84° 48' 24.0" or	
Facility ID	St. Plane 413,739 ft. N, 1,314,082 ft. E. E /W	Date Well Installed: 05/28/2019
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Rick Tustin, Cascade Drilling
Distance from Waste/Source: ft. / State: OH	Location of Well Relative to Waste/Source: u ☐ Upgradient; s ☐ Sidegradient; d ☒ Downgradient; n ☐ Not Known / Gov. Lot Number	

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 497.29 ft. (NAVD88)

C. Land surface elevation 494.1 ft. (NAVD88)

D. Surface seal, bottom 493.1 ft. (NAVD88) or 1.0 ft.

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

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐; Hollow Stem Auger ☐; Sonic — Other ☒

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

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Distilled water from power station

E. Bentonite seal, top 399.1 ft. (NAVD88) or 95.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 396.1 ft. (NAVD88) or 98.0 ft.

H. Screen joint, top 394.1 ft. (NAVD88) or 100.0 ft.

I. Well bottom 384.1 ft. (NAVD88) or 110.0 ft.

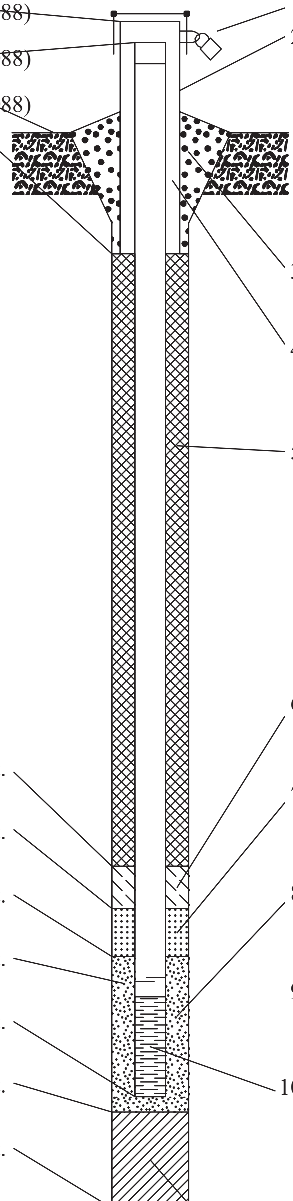
J. Filter pack, bottom 384.1 ft. (NAVD88) or 110.0 ft.

K. Borehole, bottom 384.1 ft. (NAVD88) or 110.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒; Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: 3 Steel Bollards
3. Surface seal: Bentonite ☐; Concrete ☒; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐; Sand — Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. 9.5 Lbs/gal mud weight . . . Bentonite slurry ☒
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 16.41 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐; Tremie pumped ☒; Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. Not applicable
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Global Drilling Suppliers, Quartz Sand Pack
   b. Volume added 2.1 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒; Flush threaded PVC schedule 80 ☐; Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒; Continuous slot ☐; Other ☐
    b. Manufacturer Johnson
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒; Other ☐

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

Date Modified: 6/19/2019

Signature	Firm	
[signature]	Ramboll ,	Tel: Fax:

ATTACHMENT 4 – MAPS OF THE DIRECTION OF GROUNDWATER FLOW

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

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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

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

N

0 150 300

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

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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

453.43 GROUNDWATER ELEVATION (FEET, MSL), MEASURED DECEMBER 12, 2016

(459.50) GROUNDWATER ELEVATION (FEET, MSL) NOT USED IN CONTOUR INTERPOLATION, MEASURED DECEMBER 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-
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

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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

455.14 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

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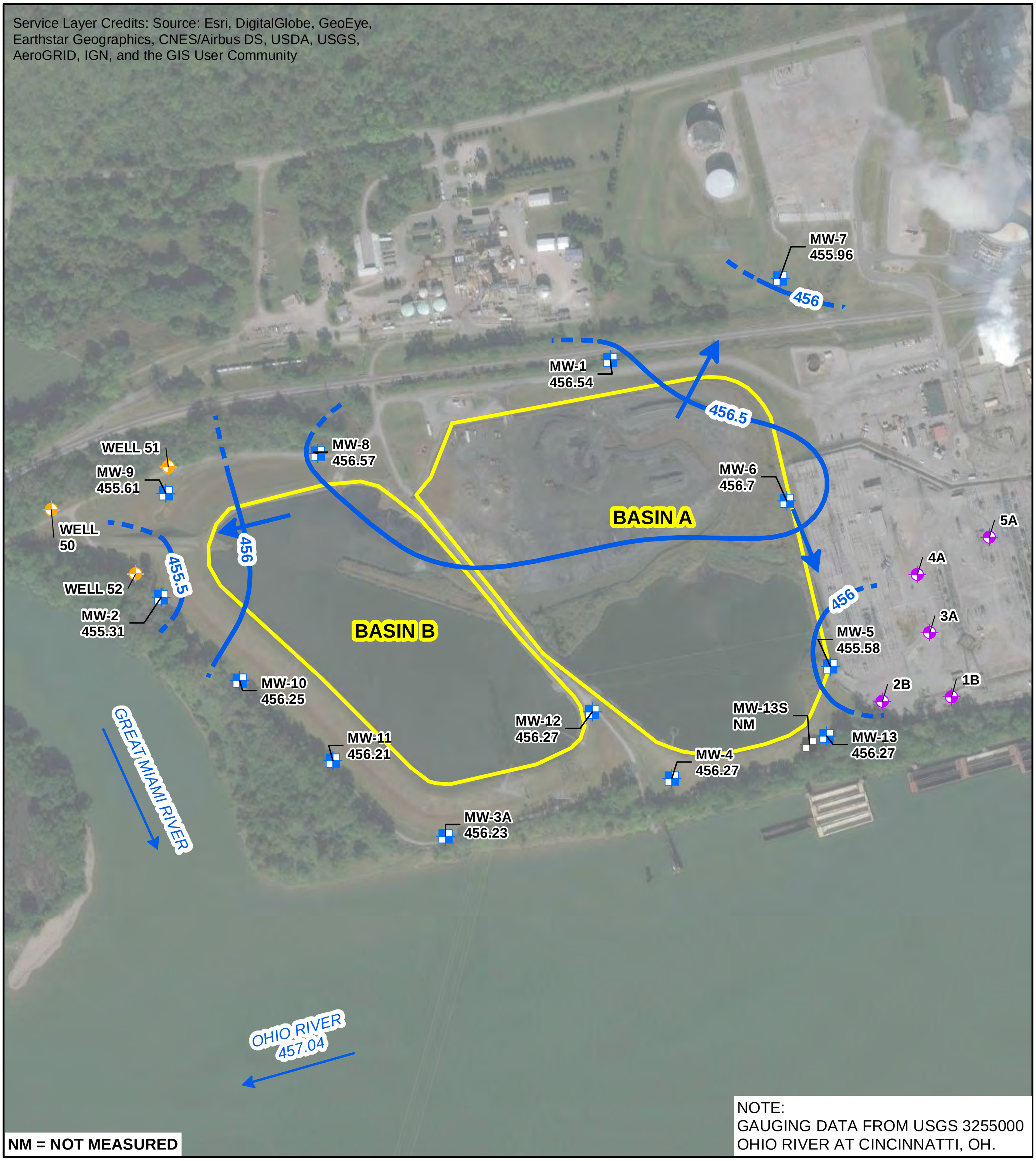

CCR MONITORING WELL LOCATION

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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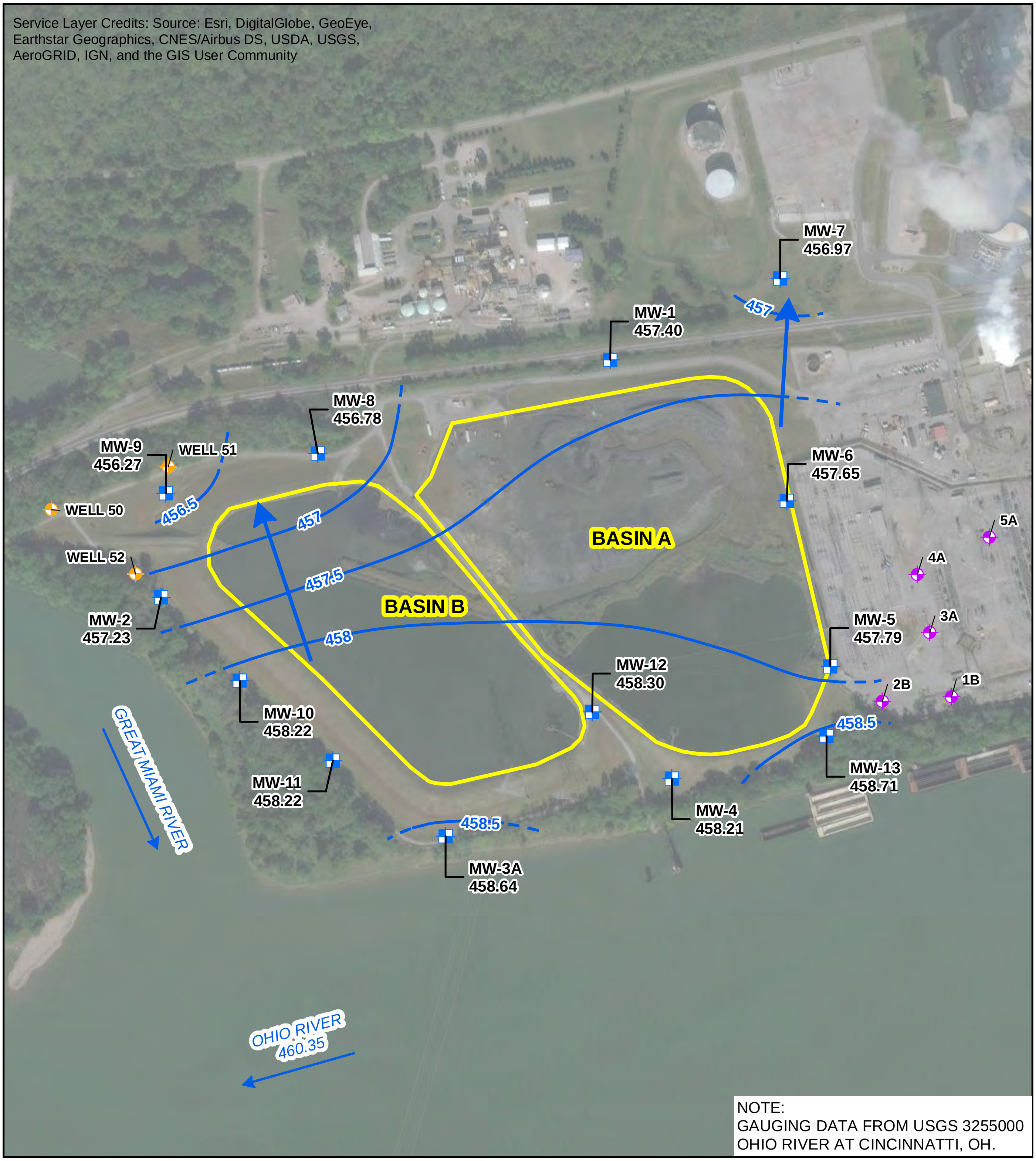

CCR MONITORING WELL LOCATION
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS
GROUNDWATER ELEVATION CONTOUR (0.5-FOOT CONTOUR INTERVAL. NAVD 88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

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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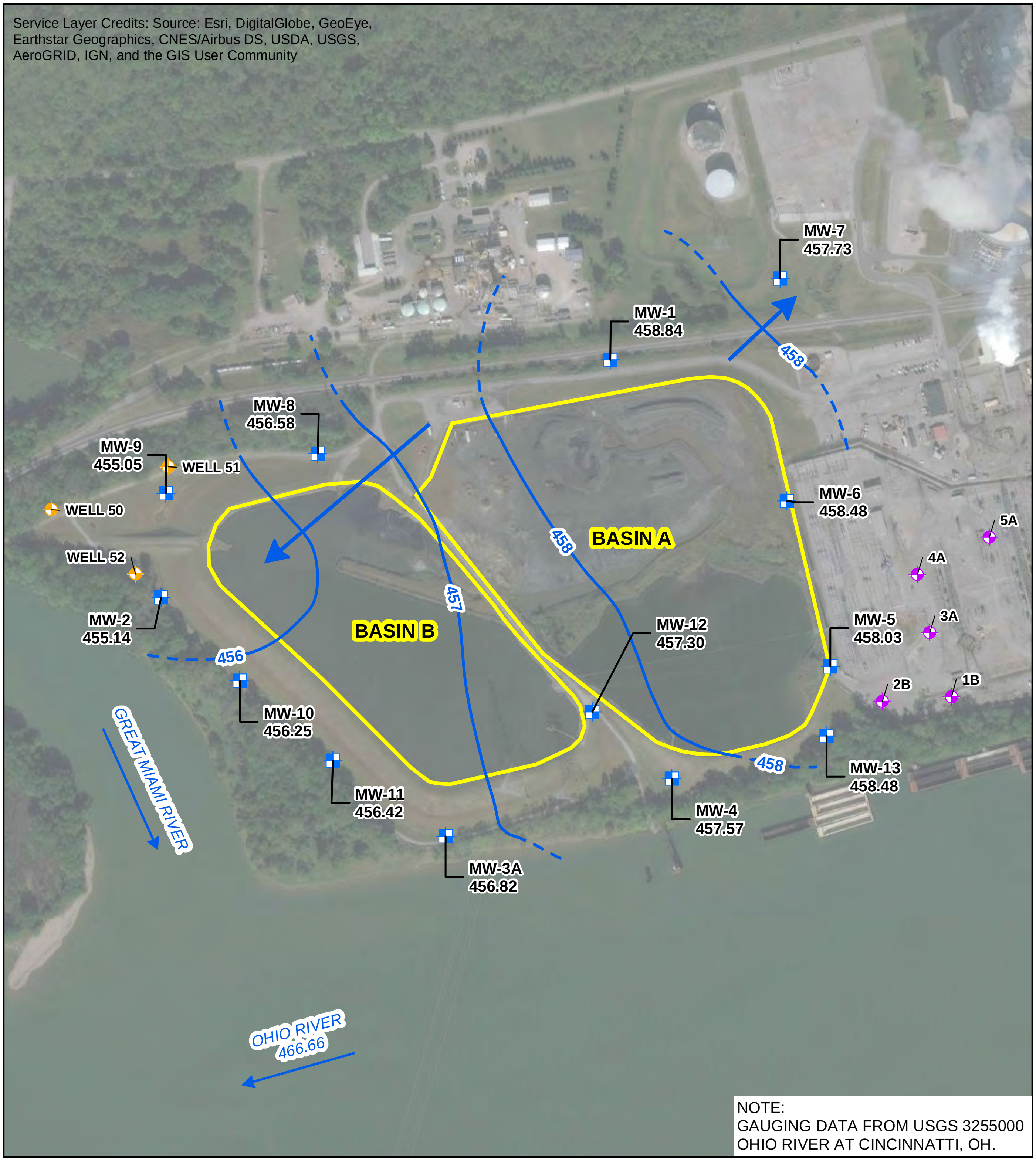

CCR MONITORING WELL LOCATION
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION
GROUNDWATER ELEVATION CONTOUR (1-FOOT CONTOUR INTERVAL, NAVD 88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED UNIT

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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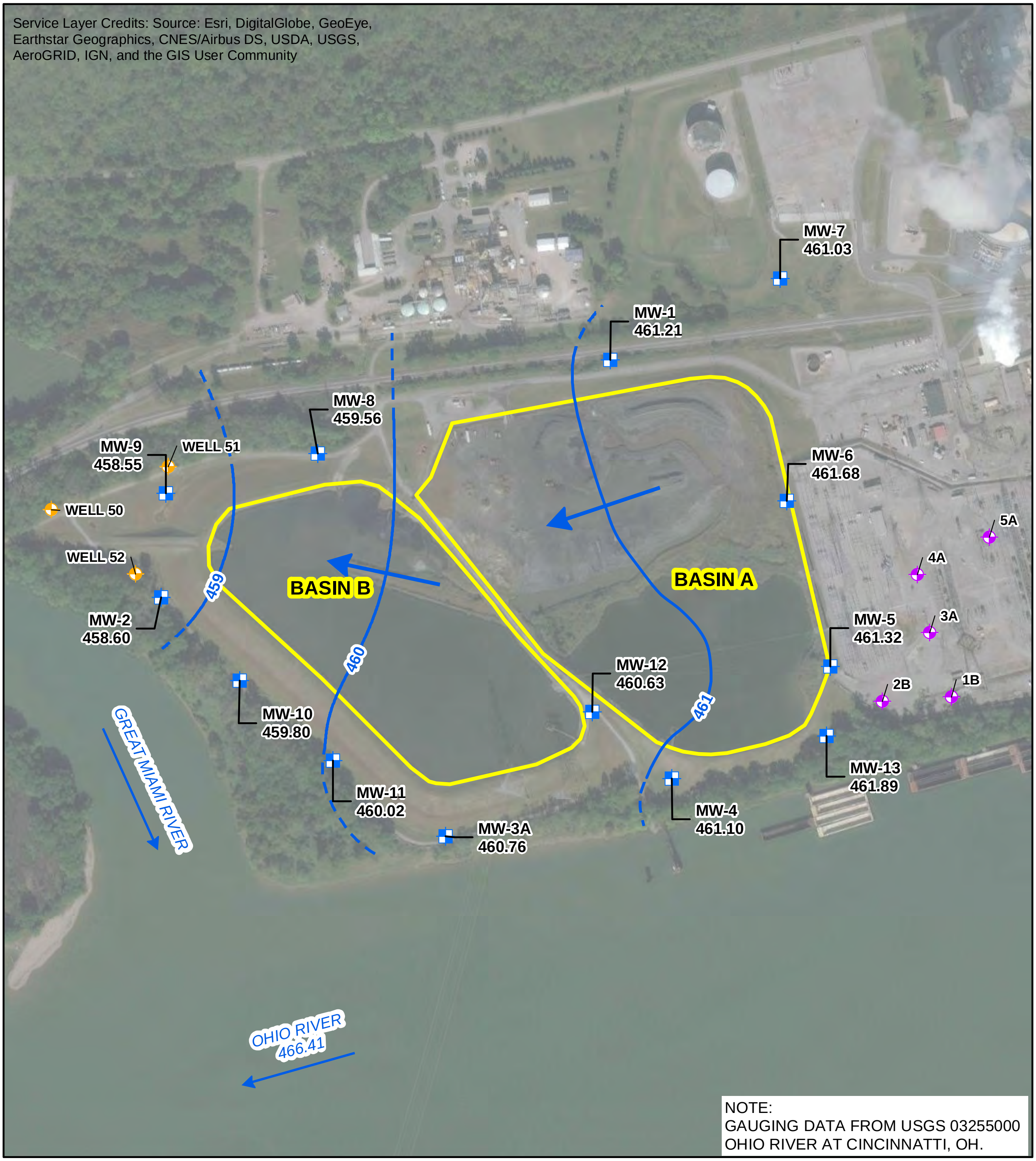

LEGEND

- 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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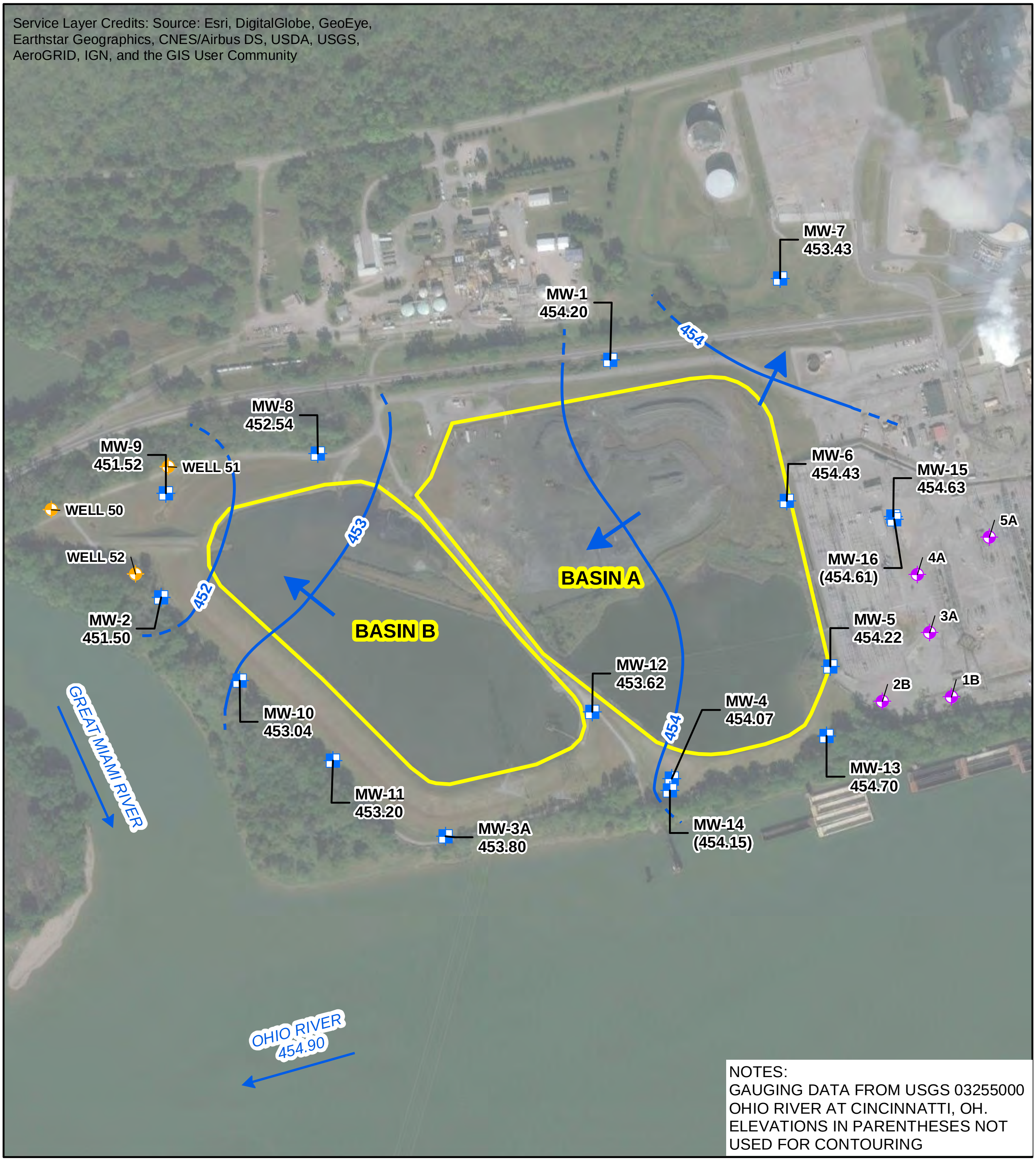

NOTES:
GAUGING DATA FROM USGS 03255000
OHIO RIVER AT CINCINNATTI, OH.
ELEVATIONS IN PARENTHESES NOT
USED FOR CONTOURING

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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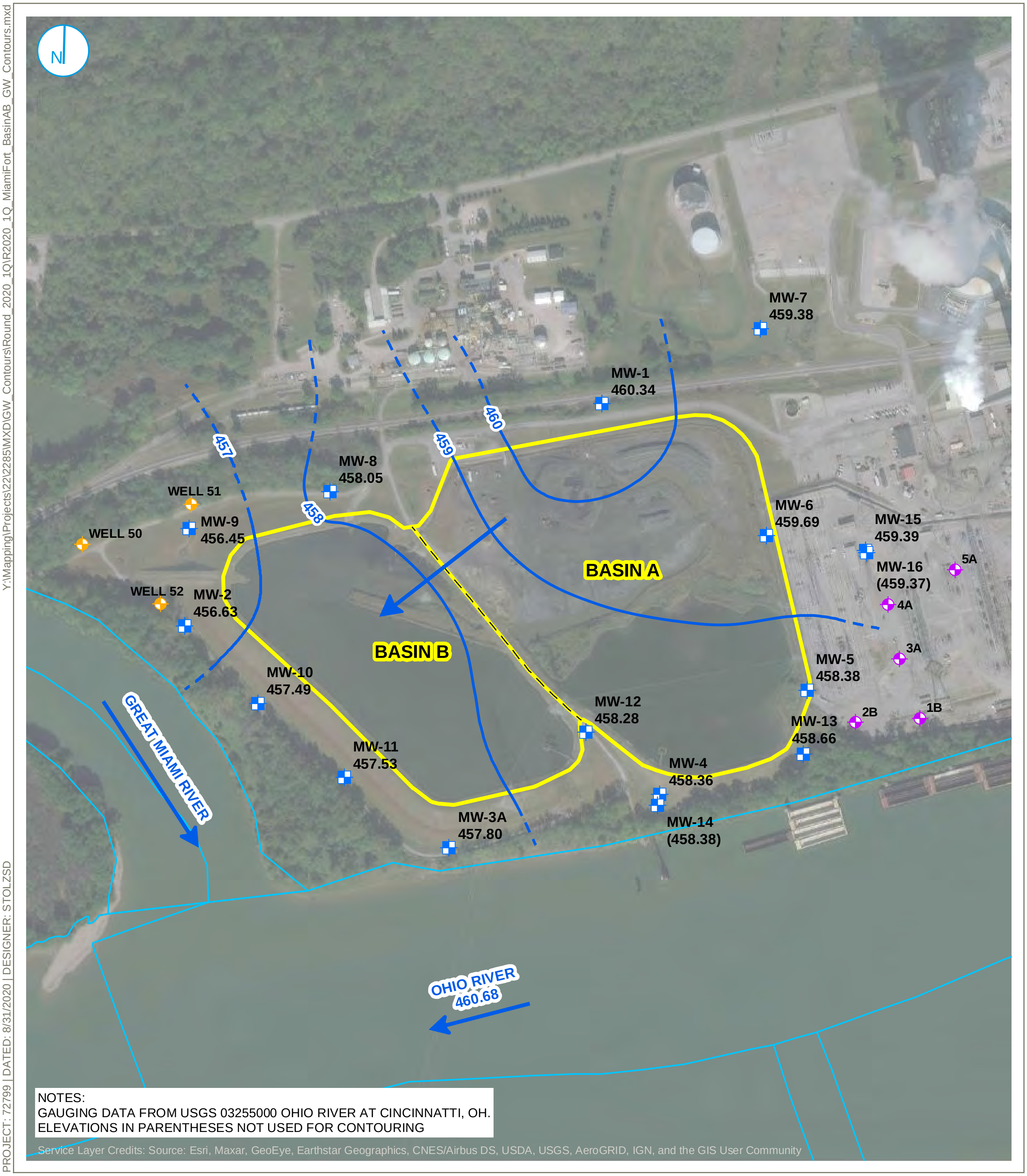
PROJECT: 72799 | DATED: 8/31/2020 | DESIGNER: STOLZSD



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

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

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

RAMBOLL

ATTACHMENT 5 – TABLES SUMMARIZING CONSTITUENT CONCENTRATIONS AT EACH MONITORING WELL

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
Background Wells								
MW-7	12/8/2015	0.205	130	10.3	0.119	7.1	54.2	519
MW-7	3/22/2016	0.0645	159	4.73	0.128	6.8	39.4	468
MW-7	6/21/2016	0.0961	120	<30	<10	7.0	53.6	478
MW-7	9/13/2016	0.112	109	7.14	<1	6.9	49.3	494
MW-7	12/14/2016	0.0837	118	5.98	<1	7.0	<50	456
MW-7	3/8/2017	0.0803	104	6.46	<1	9.4	39.1	450
MW-7	6/6/2017	<0.08	102	6.15	<1	7.6	50.6	476
MW-7	7/10/2017	0.0887	108	7.84	<1	6.7	<100	474
MW-7	11/13/2017	0.100	121	7.48	<1	6.7	<100	483
MW-7	5/7/2018	NA	NA	NA	NA	7.0	NA	NA
MW-7	5/8/2018	<1	116	6.85	<1	NA	59.5	517
MW-7	9/20/2018	0.0949	111	4.91	<1	6.6	<50	453
MW-7	3/13/2019	0.0828	108	4.29	<1	7.2	50.4	449
MW-7	6/14/2019	NA	110	5.09	NA	6.9	43.6	476
MW-7	9/9/2019	0.267	112	5.02	<1	6.8	46.9	470
MW-7	4/6/2020	0.076	106	7.56	<0.15	6.5	38.2	458
Downgradient Wells								
MW-1	12/8/2015	1.90	217	54.6	0.333	7.0	492	1050
MW-1	3/22/2016	1.15	274	48.2	0.373	7.1	420	989
MW-1	6/21/2016	1.47	203	<30	<1	7.0	107	988
MW-1	9/13/2016	1.20	237	50.8	<1	7.0	550	1160
MW-1	12/14/2016	0.737	181	<60	<1	7.1	308	819
MW-1	3/7/2017	0.711	162	57.3	<1	8.1	333	852
MW-1	6/6/2017	0.799	187	71.5	<1	7.3	350	876
MW-1	7/10/2017	0.798	168	<60	<1	6.9	348	836
MW-1	11/13/2017	0.537	125	54.3	<1	6.7	290	589
MW-1	5/7/2018	NA	NA	NA	NA	7.0	NA	NA
MW-1	5/8/2018	<1	135	39.9	<1	NA	325	828
MW-1	9/18/2018	0.926	193	45.6	<1	7.0	384	925
MW-1	3/13/2019	0.797	182	37.4	<1	7.2	450	1010
MW-1	6/12/2019	NA	154	17.6	NA	7.2	284	779
MW-1	9/9/2019	0.700	164	23.3	<1	6.8	407	895
MW-1	4/6/2020	0.721	175	46.8	0.328	7.0	364	863
MW-2	12/9/2015	1.90	147	30.8	0.115	6.8	71.5	651
MW-2	3/22/2016	0.958	185	25.9	0.184	6.8	59.8	641
MW-2	6/22/2016	1.17	140	27.6	<1	6.6	59.9	655
MW-2	9/14/2016	1.13	139	32.4	<1	6.7	63.8	645
MW-2	12/13/2016	1.06	139	29.8	<1	6.7	62.2	652
MW-2	3/8/2017	1.23	138	23.1	<1	8.5	53.8	690
MW-2	6/6/2017	0.485	148	<30	<1	6.7	33.5	695
MW-2	7/10/2017	0.322	134	28.1	<1	6.6	27.1	690
MW-2	11/13/2017	0.794	135	31.3	<1	6.2	<50	595
MW-2	5/7/2018	NA	NA	NA	NA	6.8	NA	NA
MW-2	5/8/2018	<1	116	33.0	<1	NA	61.8	643
MW-2	9/19/2018	1.37	144	35.9	<1	6.6	83.5	663
MW-2	3/13/2019	0.818	110	34.0	<1	7.2	68.5	541
MW-2	9/9/2019	1.54	142	32.4	<1	6.6	62.6	668
MW-2	4/7/2020	2.63	126	29.3	<0.15	6.1	30.4	592
MW-2	6/12/2020	0.911	NA	NA	NA	NA	NA	NA

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-3A	12/9/2015	0.144	50.0	29.0	0.169	7.3	16.1	243
MW-3A	3/22/2016	0.0512	69.0	27.6	0.203	7.0	7.40	264
MW-3A	6/22/2016	0.0640	48.9	26.6	<1	7.1	12.7	256
MW-3A	9/14/2016	0.0885	49.4	29.3	<1	7.3	16.6	238
MW-3A	12/13/2016	0.0629	49.1	<30	<1	7.4	14.0	256
MW-3A	3/8/2017	<0.08	43.0	28.7	<1	9.1	12.8	248
MW-3A	6/6/2017	<0.08	56.7	<30	<1	7.0	6.56	289
MW-3A	7/10/2017	<0.08	54.1	28.8	<1	6.9	11.6	251
MW-3A	11/14/2017	<0.08	47.0	26.8	<1	7.0	8.32	255
MW-3A	5/7/2018	NA	NA	NA	NA	7.3	NA	NA
MW-3A	5/9/2018	<1	56.4	25.6	<1	NA	23.3	314
MW-3A	9/19/2018	<0.08	52.0	37.0	<1	7.1	13.5	252
MW-3A	3/13/2019	<0.08	57.0	21.1	<1	7.5	37.3	271
MW-3A	9/10/2019	0.102	49.7	25.6	<1	7.2	18.3	246
MW-3A	4/7/2020	0.0378	70.3	21.3	<0.15	6.6	34.4	325
MW-4	12/7/2015	0.359	135	29.7	0.245	6.7	338	756
MW-4	3/24/2016	0.332	271	21.4	0.265	6.1	639	1150
MW-4	6/21/2016	0.378	198	25.9	<1	6.1	726	1140
MW-4	9/13/2016	0.323	182	24.1	<1	6.2	505	991
MW-4	12/13/2016	0.264	146	25.4	<1	6.3	420	788
MW-4	3/7/2017	0.329	216	23.1	<1	7.1	680	1180
MW-4	6/6/2017	0.563	367	19.0	<1	6.0	<2500	2240
MW-4	7/11/2017	0.599	317	19.3	<1	5.8	1270	1930
MW-4	11/14/2017	0.259	153	27.3	<1	6.1	432	840
MW-4	5/7/2018	NA	NA	NA	NA	5.9	NA	NA
MW-4	5/9/2018	<1	221	24.0	<1	NA	992	1300
MW-4	9/20/2018	0.750	370	17.4	<1	5.5	1470	2070
MW-4	3/12/2019	0.267	145	28.7	<1	6.5	355	738
MW-4	6/13/2019	NA	183	25.9	NA	6.2	523	1010
MW-4	9/10/2019	0.582	350	<15	<5	5.5	1450	2250
MW-4	4/7/2020	0.774	439	16.1	<0.15	5.3	1610	2170
4A	8/9/2019	NA	190	110	NA	NA	310	860
4A	4/6/2020	5.31	155	134	<0.15	7.2	316	<20
MW-5	12/8/2015	4.82	155	138	0.131	7.4	235	783
MW-5	3/24/2016	3.06	192	135	0.179	7.3	247	710
MW-5	6/21/2016	14.6	294	398	<1	7.2	620	1630
MW-5	9/13/2016	19.9	363	430	<1	7.1	640	2120
MW-5	12/13/2016	17.7	308	317	<1	7.3	574	1660
MW-5	3/8/2017	4.85	172	134	<1	9.1	320	849
MW-5	6/6/2017	4.41	195	<150	<1	7.5	274	852
MW-5	7/11/2017	5.17	184	137	<1	7.2	335	893
MW-5	11/14/2017	5.37	180	175	<1	7.0	302	811
MW-5	5/7/2018	NA	NA	NA	NA	7.2	NA	NA
MW-5	5/9/2018	4.19	171	115	<1	NA	327	845
MW-5	9/20/2018	2.92	131	42.1	<1	6.6	177	573
MW-5	3/12/2019	4.08	171	939	<1	7.5	233	781
MW-5	6/14/2019	NA	432	521	NA	7.0	735	2240
MW-5	9/10/2019	19.5	370	510	<5	6.8	566	2670
MW-5	4/7/2020	34.6	366	535	<0.15	6.5	535	1790

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-6	12/7/2015	23.8	98.7	612	0.922	7.2	38.4	1480
MW-6	3/24/2016	22.1	87.4	481	1.27	6.9	55.6	1050
MW-6	6/21/2016	12.8	53.1	218	1.60	7.2	6.38	627
MW-6	9/13/2016	7.42	43.3	131	1.53	7.3	16.1	526
MW-6	12/13/2016	5.32	44.3	125	1.56	7.3	24.3	478
MW-6	3/7/2017	12.6	82.4	307	1.37	7.9	187	990
MW-6	6/6/2017	30.2	123	571	1.36	7.0	<250	1680
MW-6	7/11/2017	23.2	93.7	456	1.35	7.1	126	1380
MW-6	11/14/2017	23.3	116	503	1.28	6.8	311	1640
MW-6	5/7/2018	NA	NA	NA	NA	7.1	NA	NA
MW-6	5/9/2018	41.1	129	102	<1	NA	44.1	2260
MW-6	9/20/2018	15.3	69.5	269	1.28	6.9	92.3	1050
MW-6	3/12/2019	4.10	40.6	135	1.21	7.6	20.5	534
MW-6	6/14/2019	NA	44.5	119	NA	7.3	14.2	557
MW-6	9/10/2019	1.46	46.7	166	1.03	7.1	6.44	572
MW-6	4/7/2020	3.71	52.9	193	0.777	6.8	22.4	590
MW-8	12/9/2015	2.04	125	52.2	0.200	7.2	349	816
MW-8	3/22/2016	4.99	269	43.6	0.178	7.1	437	1010
MW-8	6/21/2016	2.04	147	<150	<1	7.1	371	843
MW-8	9/14/2016	1.23	123	48.5	<1	7.1	272	691
MW-8	12/13/2016	1.65	159	43.6	<1	7.1	363	833
MW-8	3/7/2017	1.77	151	47.2	<1	8.0	401	910
MW-8	6/6/2017	3.84	159	48.2	<1	6.7	383	822
MW-8	7/10/2017	3.07	139	47.8	<1	7.0	323	751
MW-8	11/13/2017	2.63	136	46.9	<1	6.6	295	733
MW-8	5/7/2018	NA	NA	NA	NA	7.2	NA	NA
MW-8	5/8/2018	<1	110	43.0	<1	NA	233	641
MW-8	9/19/2018	1.81	155	40.0	<2	7.2	342	800
MW-8	3/14/2019	0.906	120	40.5	<1	7.4	258	676
MW-8	9/9/2019	1.00	123	40.2	<1	7.0	258	666
MW-8	4/7/2020	1.54	137	40.4	0.187	6.5	288	711
MW-9	12/9/2015	4.81	144	77.2	0.509	7.3	379	876
MW-9	3/22/2016	3.36	163	69.5	0.445	7.1	341	848
MW-9	6/22/2016	3.50	139	65.6	<1	7.1	342	806
MW-9	9/14/2016	3.87	161	77.0	<1	7.1	399	854
MW-9	12/13/2016	5.16	184	84.2	<1	7.2	410	815
MW-9	3/8/2017	2.98	142	63.6	<1	9.0	383	814
MW-9	6/6/2017	2.71	176	62.3	<1	6.9	515	849
MW-9	7/10/2017	2.50	175	58.8	<1	6.9	381	866
MW-9	11/13/2017	2.44	157	64.5	<1	6.7	396	839
MW-9	5/7/2018	NA	NA	NA	NA	7.1	NA	NA
MW-9	5/8/2018	2.14	148	59.5	<1	NA	375	829
MW-9	9/19/2018	4.14	179	74.5	<5	7.0	380	886
MW-9	3/13/2019	2.59	152	69.5	<1	7.3	363	872
MW-9	9/9/2019	2.88	172	65.8	<1	6.9	405	889
MW-9	4/7/2020	2.57	172	65.2	0.345	6.5	410	899

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-10S[2]	12/9/2015	2.02	142	21.5	0.150	6.8	72.0	682
MW-10S[2]	3/23/2016	0.540	196	11.3	0.224	6.6	32.8	629
MW-10S[2]	6/22/2016	0.560	138	11.9	<1	6.7	16.6	624
MW-10S[2]	9/14/2016	0.649	137	12.5	<1	6.7	15.8	614
MW-10S[2]	12/13/2016	0.743	167	11.8	<1	6.9	13.1	648
MW-10S[2]	3/8/2017	0.835	150	11.5	<1	8.6	14.5	703
MW-10	6/6/2017	0.0895	67.1	53.5	<1	7.1	10.3	360
MW-10	7/10/2017	0.135	72.7	45.7	<1	7.1	<5	351
MW-10	11/14/2017	<0.08	51.5	31.7	<1	7.2	18.3	298
MW-10	5/7/2018	NA	NA	NA	NA	7.6	NA	NA
MW-10	5/8/2018	<1	55.4	37.1	<1	NA	18.2	318
MW-10	9/19/2018	0.0839	53.1	30.5	<1	7.4	14.5	275
MW-10	3/13/2019	0.115	58.2	955	<1	7.8	9.18	301
MW-10	9/10/2019	0.102	47.5	24.4	<1	7.5	18.8	232
MW-10	4/7/2020	0.0901	64.7	46.2	0.227	7.0	25.3	358
MW-11S[2]	12/9/2015	0.161	145	15.1	0.266	7.0	15.2	648
MW-11S[2]	3/23/2016	0.0417	211	8.42	0.400	6.9	2.64	651
MW-11S[2]	6/22/2016	0.0492	157	9.87	<1	6.9	<5	651
MW-11S[2]	9/14/2016	0.0738	161	9.73	<1	7.0	<5	645
MW-11S[2]	12/14/2016	0.0466	160	8.89	<1	7.0	<5	646
MW-11S[2]	3/8/2017	<0.08	156	18.7	<1	8.8	15.8	758
MW-11	6/6/2017	<0.08	58.5	38.0	<1	7.3	35.5	321
MW-11	7/10/2017	0.0917	55.3	39.5	<1	7.4	<50	314
MW-11	11/14/2017	0.0824	54.8	34.6	<1	7.3	<50	306
MW-11	5/7/2018	NA	NA	NA	NA	7.8	NA	NA
MW-11	5/8/2018	<1	55.5	38.8	<1	NA	31.9	303
MW-11	9/19/2018	0.0872	53.0	27.1	<1	7.8	42.5	276
MW-11	3/13/2019	0.0814	48.0	591	<1	7.9	30.4	265
MW-11	9/10/2019	0.102	47.5	21.1	<1	7.4	34.9	230
MW-11	4/7/2020	0.0656	73.1	61.3	<0.15	7.0	36.1	408
MW-12	12/7/2015	5.86	160	155	0.091	6.4	377	926
MW-12	3/24/2016	4.49	226	141	0.163	6.2	364	908
MW-12	6/21/2016	5.75	164	159	<1	5.9	443	979
MW-12	9/13/2016	6.02	184	168	<1	5.9	432	992
MW-12	12/13/2016	6.46	187	163	<1	6.0	452	1060
MW-12	3/7/2017	5.97	185	172	<1	7.0	525	1120
MW-12	6/6/2017	7.48	216	190	<1	6.3	544	1240
MW-12	7/11/2017	7.30	197	213	<1	5.4	603	1250
MW-12	11/14/2017	8.37	203	214	<1	5.3	617	1240
MW-12	5/7/2018	NA	NA	NA	NA	6.1	NA	NA
MW-12	5/8/2018	7.30	197	166	<1	NA	508	1090
MW-12	9/20/2018	8.28	193	161	<1	5.6	458	1080
MW-12	3/13/2019	6.48	197	166	<1	6.3	460	1030
MW-12	6/12/2019	NA	209	193	NA	6.0	502	1220
MW-12	9/10/2019	7.80	167	174	<1	5.5	<5	1110
MW-12	4/7/2020	9.31	166	159	<0.15	5.2	472	894

Sample Location	Date Sampled	Boron, total (mg/L)	Calcium, total (mg/L)	Chloride, total (mg/L)	Fluoride, total (mg/L)	pH (s.u.)	Sulfate, total (mg/L)	Total Dissolved Solids (mg/L)
MW-13S[2]	12/8/2015	1.11	288	33.1	0.0708	6.2	947	1680
MW-13S[2]	3/24/2016	0.689	394	23.9	0.0702	5.5	1060	1620
MW-13S[2]	6/21/2016	0.795	265	<30	<1	6.0	1060	1600
MW-13S[2]	9/13/2016	0.826	270	25.0	<1	7.0	1070	1590
MW-13S[2]	12/13/2016	0.845	251	24.4	<1	5.6	949	1490
MW-13S[2]	3/7/2017	0.665	244	25.0	<1	6.7	976	1480
MW-13	6/6/2017	0.0828	52.7	<30	<1	6.8	58.4	289
MW-13	7/11/2017	0.156	42.3	26.3	<1	7.0	56.7	264
MW-13	11/14/2017	0.124	40.5	26.5	<1	7.2	<250	247
MW-13	5/7/2018	NA	NA	NA	NA	7.9	NA	NA
MW-13	5/9/2018	<1	41.0	15.2	<1	NA	61.2	249
MW-13	9/19/2018	0.0814	38.3	27.5	<2	7.6	47.2	234
MW-13	3/12/2019	0.157	43.4	30.6	<1	8.0	51.2	261
MW-13	6/13/2019	NA	46.6	29.6	NA	7.6	56.3	268
MW-13	9/10/2019	0.211	45.1	30.3	<1	7.1	64.5	242
MW-13	4/7/2020	0.0716	41.3	28.7	<0.15	7.0	51.2	464
MW-14	6/13/2019	NA	39.7	28.4	NA	8.0	41.9	245
MW-14	9/10/2019	0.161	40.7	29.7	<1	7.9	39.8	195
MW-14	4/6/2020	0.0723	41.6	32.6	<0.15	7.2	39.8	235
MW-15	6/12/2019	NA	114	189	NA	7.3	14.5	653
MW-15	9/10/2019	0.453	103	191	<1	7.0	13.6	688
MW-15	4/6/2020	0.366	113	165	0.215	7.2	59.0	659
MW-16	6/12/2019	NA	200	118	NA	6.9	220	1010
MW-16	9/10/2019	0.119	170	55.8	<1	6.7	118	1010
MW-16	4/6/2020	0.104	186	126	<0.15	6.8	89.2	912

Notes:
1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; s.u. - standard units.
2. Previously monitored CCR locations MW-10S, MW-11S, and MW-13S were replaced by CCR monitoring locations MW-10, MW-11 and MW-13, respectively, which are screened deeper into the uppermost aquifer.

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
Background Wells																
MW-7	12/8/2015	<0.0005	0.00143	0.0997	<0.001	<0.0004	0.000574	<0.0005	0.119	<0.0002	0.0082	<0.0001	0.00231	0.448	0.000740	<0.0005
MW-7	3/22/2016	<0.00418	<0.00295	0.133	<0.000875	<0.00025	<0.0025	<0.000543	0.128	<0.000433	0.00949	<0.0001	<0.0025	0.464	<0.00398	<0.00138
MW-7	6/21/2016	<0.002	<0.001	0.111	<0.001	<0.001	<0.002	<0.0005	<10	<0.001	<0.05	<0.0002	<0.005	0.383	<0.005	<0.001
MW-7	9/13/2016	<0.002	<0.001	0.0997	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.670	<0.005	<0.001
MW-7	12/14/2016	<0.002	<0.001	0.0996	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.735	<0.005	<0.001
MW-7	3/8/2017	<0.002	<0.001	0.0874	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.411	<0.005	<0.001
MW-7	6/6/2017	<0.002	<0.001	0.0969	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.504	<0.005	<0.001
MW-7	7/10/2017	<0.002	<0.001	0.0903	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.386	<0.005	<0.001
MW-7	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-7	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.386	<0.01	<0.002
MW-7	9/20/2018	NA	<0.001	0.0983	NA	NA	<0.002	<0.0005	<1	NA	NA	NA	<0.005	0.567	NA	NA
MW-7	3/13/2019	<0.002	<0.001	0.0942	<0.001	<0.001	0.00218	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.337	<0.005	<0.001
MW-7	6/14/2019	NA	NA	NA	NA	NA	NA	<0.0005	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-7	9/9/2019	NA	<0.001	0.107	<0.001	<0.001	0.00313	<0.0005	<1	<0.001	0.00524	<0.0002	<0.005	0.464	<0.005	<0.001
MW-7	4/6/2020	<0.004	<0.002	0.088	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00421	<0.0002	<0.005	1.07	<0.002	<0.002
Downgradient Wells																
MW-1	12/8/2015	<0.0005	0.00229	0.0484	<0.001	<0.0004	<0.0005	<0.0005	0.333	0.000222	0.0707	<0.0001	0.0405	0.564	<0.0006	<0.0005
MW-1	3/22/2016	<0.00418	<0.00295	0.0602	<0.000875	<0.00025	<0.0025	<0.000543	0.373	<0.000433	0.0616	<0.0001	0.0513	0.394	<0.00398	<0.00138
MW-1	6/21/2016	<0.002	<0.001	0.0452	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0353	0.237	<0.005	<0.001
MW-1	9/13/2016	<0.002	<0.001	0.0515	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.053	<0.0002	0.0405	0.556	<0.005	<0.001
MW-1	12/14/2016	<0.002	<0.001	0.0371	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.059	<0.0002	0.0502	0.0493	<0.005	<0.001
MW-1	3/7/2017	<0.002	<0.001	0.0339	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0406	0.186	<0.005	<0.001
MW-1	6/6/2017	<0.002	<0.001	0.0373	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0357	0.178	<0.005	<0.001
MW-1	7/10/2017	<0.002	<0.001	0.0358	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.039	0.112	<0.005	<0.001
MW-1	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-1	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	0.0276	0.400	<0.01	<0.002
MW-1	9/18/2018	NA	<0.001	0.0512	NA	NA	<0.002	<0.0005	<1	NA	NA	NA	0.0383	0.344	NA	NA
MW-1	3/13/2019	<0.002	<0.001	0.0512	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0304	<0.0002	0.0308	0.514	<0.005	<0.001
MW-1	6/12/2019	NA	NA	NA	NA	NA	NA	<0.0005	NA	NA	NA	NA	0.0241	NA	NA	NA
MW-1	9/9/2019	NA	<0.001	0.0482	<0.001	<0.001	0.00289	<0.0005	<1	<0.001	0.0228	<0.0002	0.021	0.0553	<0.005	<0.001
MW-1	4/6/2020	<0.004	<0.002	0.0424	<0.002	<0.001	<0.002	<0.002	0.328	<0.005	0.0258	<0.0002	0.0273	1.87	<0.002	<0.002
MW-2	12/9/2015	<0.0005	0.0309	0.516	<0.001	<0.0004	0.00288	0.00167	0.115	0.00315	0.00495	<0.0001	0.000942	1.54	0.000677	<0.0005
MW-2	3/22/2016	<0.00418	0.0469	0.620	<0.000875	<0.00025	<0.0025	0.00073	0.184	0.0013	0.00436	<0.0001	<0.0025	2.19	<0.00398	<0.00138
MW-2	6/22/2016	<0.002	0.0320	0.462	<0.001	<0.001	<0.002	0.00206	<1	<0.001	<0.05	<0.0002	<0.005	0.705	<0.005	<0.001
MW-2	9/14/2016	<0.002	0.0362	0.464	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.929	<0.005	<0.001
MW-2	12/13/2016	<0.002	0.0340	0.444	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.58	<0.005	<0.001
MW-2	3/8/2017	<0.002	0.0270	0.416	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.752	<0.005	<0.001
MW-2	6/6/2017	<0.002	0.0350	0.474	<0.001	<0.001	<0.002	0.000763	<1	0.00165	<0.05	<0.0002	<0.005	0.735	<0.005	<0.001
MW-2	7/10/2017	0.0024	0.0368	0.438	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.586	<0.005	<0.001

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-2	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-2	5/8/2018	<0.003	0.0263	0.345	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.596	<0.01	<0.002
MW-2	9/19/2018	NA	0.0245	0.480	NA	NA	0.00205	NA	<1	NA	NA	NA	<0.005	0.915	NA	NA
MW-2	3/13/2019	<0.002	0.0224	0.331	<0.001	<0.001	0.00223	0.000977	<1	0.00219	<0.005	<0.0002	<0.005	0.599	<0.005	<0.001
MW-2	9/9/2019	NA	0.0232	0.501	<0.001	<0.001	0.00313	0.000626	<1	0.00122	<0.005	<0.0002	<0.005	0.704	<0.005	<0.001
MW-2	4/7/2020	<0.004	0.0277	0.440	<0.002	<0.001	0.00203	<0.002	<0.15	<0.005	<0.02	<0.0002	<0.005	1.66	<0.002	<0.002
MW-3A	12/9/2015	<0.0005	0.00540	0.124	<0.001	<0.0004	0.000822	0.000717	0.169	0.000936	<0.004	<0.0001	0.00147	0.575	<0.0006	<0.0005
MW-3A	3/22/2016	<0.00167	0.00888	0.186	<0.00035	<0.0001	<0.001	0.000222	0.203	0.000588	0.00363	<0.0001	<0.001	0.899	<0.00159	<0.00055
MW-3A	6/22/2016	<0.002	0.00614	0.135	<0.001	<0.001	<0.002	0.000989	<1	0.00118	<0.05	<0.0002	<0.005	0.366	<0.005	<0.001
MW-3A	9/14/2016	<0.002	0.00531	0.127	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.146	<0.005	<0.001
MW-3A	12/13/2016	<0.002	0.00552	0.123	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.912	<0.005	<0.001
MW-3A	3/8/2017	<0.002	0.00459	0.109	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.581	<0.005	<0.001
MW-3A	6/6/2017	<0.002	0.00847	0.152	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.617	<0.005	<0.001
MW-3A	7/10/2017	0.00204	0.00732	0.141	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.455	<0.005	<0.001
MW-3A	5/9/2018	<0.003	0.017	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.477	<0.01	<0.002
MW-3A	9/19/2018	NA	0.00854	0.126	NA	NA	<0.002	NA	<1	NA	NA	NA	<0.005	0.400	NA	NA
MW-3A	3/13/2019	<0.002	0.00919	0.130	<0.001	<0.001	0.00244	0.00223	<1	0.00414	<0.005	<0.0002	<0.005	0.666	<0.005	<0.001
MW-3A	9/10/2019	NA	0.00739	0.124	<0.001	<0.001	0.00258	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.558	<0.005	<0.001
MW-3A	4/7/2020	<0.004	0.0208	0.138	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.0033	<0.0002	<0.005	1.19	<0.002	<0.002
MW-4	12/7/2015	<0.0005	0.00345	0.0159	<0.001	0.000481	0.00446	0.00503	0.245	0.00144	0.0058	<0.0001	0.00504	0.480	0.000772	<0.0005
MW-4	3/24/2016	<0.00418	0.00482	0.0300	<0.000875	0.00086	0.00263	0.0139	0.265	0.0042	0.00736	<0.0001	<0.0025	0.598	<0.00398	<0.00138
MW-4	6/21/2016	<0.002	0.00163	0.0576	<0.001	<0.001	<0.002	0.0121	<1	0.00101	<0.05	<0.0002	<0.005	0.34	<0.005	<0.001
MW-4	9/13/2016	<0.002	<0.001	0.0148	<0.001	<0.001	<0.002	0.0082	<1	<0.001	<0.05	<0.0002	<0.005	0.476	<0.005	<0.001
MW-4	12/13/2016	<0.002	0.0011	0.0128	<0.001	<0.001	<0.002	0.00642	<1	<0.001	<0.05	<0.0002	<0.005	0.393	<0.005	<0.001
MW-4	3/7/2017	<0.002	0.0010	0.0270	<0.001	<0.001	<0.002	0.00839	<1	<0.001	<0.05	<0.0002	<0.005	0.0878	<0.005	<0.001
MW-4	6/6/2017	0.00226	0.00193	0.0199	<0.001	<0.001	<0.002	0.015	<1	0.00111	<0.05	<0.0002	<0.005	0.528	<0.005	<0.001
MW-4	7/11/2017	<0.002	0.00188	0.0202	<0.001	<0.001	<0.002	0.0182	<1	0.00112	<0.05	<0.0002	<0.005	0.621	<0.005	<0.001
MW-4	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-4	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	0.0127	<1	<0.005	<0.04	<0.0002	<0.01	0.186	<0.01	<0.002
MW-4	9/20/2018	NA	0.00206	0.0370	NA	NA	NA	0.0187	<1	NA	NA	NA	<0.005	0.611	NA	NA
MW-4	3/12/2019	<0.002	0.00205	0.0118	<0.001	<0.001	0.00313	0.00588	<1	0.00131	0.00596	<0.0002	<0.005	0.369	<0.005	<0.001
MW-4	6/13/2019	NA	NA	NA	NA	NA	NA	0.00827	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-4	9/10/2019	NA	<0.001	0.0197	<0.001	0.00102	0.00296	0.0171	<5	<0.001	0.0068	<0.0002	<0.005	0.382	<0.005	<0.001
MW-4	4/7/2020	<0.004	0.00478	0.0337	<0.002	0.00193	0.00358	0.0224	<0.15	<0.005	0.00897	<0.0002	<0.005	2.97	0.00222	<0.002
4A	4/6/2020	<0.004	<0.002	0.104	<0.002	<0.001	0.00225	0.00908	<0.15	<0.005	0.00802	<0.0002	0.0136	2	<0.002	<0.002
4A	6/12/2020	NA	NA	NA	NA	NA	NA	0.0120	NA	NA	NA	NA	NA	NA	NA	NA

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-5	12/8/2015	<0.0005	0.00205	0.0559	<0.001	<0.0004	0.000792	0.000671	0.131	0.000742	0.00724	<0.0001	0.00581	0.323	<0.0006	<0.0005
MW-5	3/24/2016	<0.00418	<0.00295	0.0685	<0.000875	<0.00025	<0.0025	<0.000543	0.179	<0.000433	0.00625	<0.0001	0.0055	0.796	<0.00398	<0.00138
MW-5	6/21/2016	<0.002	<0.001	0.0826	<0.001	<0.001	<0.002	0.000696	<1	<0.001	<0.05	<0.0002	<0.005	0.211	<0.005	<0.001
MW-5	9/13/2016	<0.002	0.00164	0.0783	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	0.295	<0.005	<0.001
MW-5	12/13/2016	<0.002	<0.001	0.0714	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00603	0.389	<0.005	<0.001
MW-5	3/8/2017	<0.002	<0.001	0.0389	<0.001	0.00105	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00751	0.100	<0.005	<0.001
MW-5	6/6/2017	<0.002	0.00105	0.0454	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00606	0.915	<0.005	<0.001
MW-5	7/11/2017	<0.002	<0.001	0.0380	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00796	0.384	<0.005	<0.001
MW-5	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-5	5/9/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.0498	<0.01	<0.002
MW-5	9/20/2018	NA	<0.001	0.0458	NA	NA	NA	<0.0005	<1	NA	NA	NA	0.009	0.721	NA	NA
MW-5	3/12/2019	<0.002	<0.001	0.0734	<0.001	<0.001	0.00274	<0.0005	<1	<0.001	0.00674	<0.0002	0.00761	0.195	<0.005	<0.001
MW-5	6/14/2019	NA	NA	NA	NA	NA	NA	0.000661	NA	NA	NA	NA	0.00616	NA	NA	NA
MW-5	9/10/2019	NA	<0.001	0.120	<0.001	<0.001	0.00264	0.000522	<5	<0.001	<0.05	<0.0002	0.00543	0	<0.005	<0.001
MW-5	4/7/2020	<0.004	<0.002	0.0935	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.0118	<0.0002	0.00561	1.81	<0.002	<0.002
MW-6	12/7/2015	<0.0005	0.00251	0.474	<0.001	<0.0004	<0.0005	0.00472	0.922	0.000296	0.0208	<0.0001	0.54	0.997	0.000606	<0.0005
MW-6	3/24/2016	<0.00418	<0.00295	0.460	<0.000875	<0.00025	<0.0025	0.00472	1.27	<0.000433	0.0155	<0.0001	0.478	0.445	<0.00398	<0.00138
MW-6	6/21/2016	<0.002	0.00231	0.346	<0.001	<0.001	<0.002	0.00378	1.60	<0.001	<0.05	<0.0002	0.579	0.252	<0.005	<0.001
MW-6	9/13/2016	<0.002	0.00193	0.257	<0.001	<0.001	<0.002	0.00202	1.53	<0.001	<0.05	<0.0002	0.661	0.762	<0.005	<0.001
MW-6	12/13/2016	<0.002	0.00224	0.235	<0.001	<0.001	<0.002	0.00173	1.56	<0.001	<0.05	<0.0002	0.637	0.347	<0.005	<0.001
MW-6	3/7/2017	<0.002	0.00214	0.249	<0.001	<0.001	<0.002	0.00342	1.37	<0.001	<0.05	<0.0002	0.523	0.440	<0.005	<0.001
MW-6	6/6/2017	<0.002	0.00485	0.292	<0.001	<0.001	<0.002	0.00738	1.36	<0.001	<0.05	<0.0002	0.38	0.357	<0.005	<0.001
MW-6	7/11/2017	<0.002	0.0051	0.272	<0.001	<0.001	<0.002	0.00758	1.35	<0.001	<0.05	<0.0002	0.366	0.582	<0.005	<0.001
MW-6	11/14/2017	NA	NA	NA	NA	NA	NA	NA	1.28	NA	NA	NA	NA	NA	NA	NA
MW-6	5/9/2018	<0.003	0.0101	0.250	<0.004	<0.005	<0.005	0.0113	<1	<0.005	<0.04	<0.0002	0.369	0.532	<0.01	<0.002
MW-6	9/20/2018	NA	0.0107	0.632	NA	NA	NA	0.00473	1.28	NA	NA	NA	0.412	0.905	NA	NA
MW-6	3/12/2019	<0.002	0.00946	0.357	<0.001	<0.001	0.00272	0.00258	1.21	<0.001	0.00925	<0.0002	0.37	0.532	<0.005	<0.001
MW-6	6/14/2019	NA	NA	NA	NA	NA	NA	0.00330	NA	NA	NA	NA	0.344	NA	NA	NA
MW-6	9/10/2019	NA	0.0104	0.787	<0.001	<0.001	0.00261	0.00296	1.03	<0.001	0.00936	<0.0002	0.289	0.846	<0.005	<0.001
MW-6	4/7/2020	<0.004	0.00851	0.390	<0.002	<0.001	0.00253	0.00263	0.777	<0.005	0.00884	<0.0002	0.289	0.675	<0.002	<0.002
MW-8	12/9/2015	<0.0005	0.00153	0.0324	<0.001	<0.0004	<0.0005	0.000568	0.200	<0.0002	0.0124	<0.0001	<0.0005	0.873	<0.0006	<0.0005
MW-8	3/22/2016	<0.00418	<0.00295	0.0456	<0.000875	<0.00025	<0.0025	<0.000543	0.178	<0.000433	0.0344	<0.0001	0.00974	0.862	<0.00398	<0.00138
MW-8	6/21/2016	<0.002	<0.001	0.0374	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00938	0.527	<0.005	<0.001
MW-8	9/14/2016	<0.002	<0.001	0.0389	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00753	0.374	<0.005	<0.001
MW-8	12/13/2016	<0.002	<0.001	0.0440	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00765	0.638	<0.005	<0.001
MW-8	3/7/2017	<0.002	<0.001	0.0341	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00573	0.645	<0.005	<0.001
MW-8	6/6/2017	<0.002	<0.001	0.0352	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00674	0.698	<0.005	<0.001
MW-8	7/10/2017	<0.002	<0.001	0.0347	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00688	0.476	<0.005	<0.001
MW-8	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-8	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	0.0066	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.439	<0.01	<0.002
MW-8	9/19/2018	NA	<0.001	0.0508	NA	NA	<0.002	NA	<2	NA	NA	NA	0.00668	1.03	NA	NA
MW-8	3/14/2019	<0.002	<0.001	0.0348	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0169	<0.0002	0.00727	0.182	<0.005	<0.001
MW-8	9/9/2019	NA	<0.001	0.0442	<0.001	<0.001	0.00267	<0.0005	<1	<0.001	0.0108	<0.0002	0.00756	0.591	<0.005	<0.001
MW-8	4/7/2020	<0.004	<0.002	0.0345	<0.002	<0.001	<0.002	<0.002	0.187	<0.005	0.0179	<0.0002	0.00656	1.97	0.00202	<0.002

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-9	12/9/2015	<0.0005	0.00232	0.137	<0.001	<0.0004	0.000776	0.00071	0.509	0.000644	0.0141	<0.0001	0.0772	0.388	<0.0006	<0.0005
MW-9	3/22/2016	<0.00418	<0.00295	0.113	<0.000875	<0.00025	<0.0025	<0.000543	0.445	<0.000433	0.011	<0.0001	0.0557	0.309	<0.00398	<0.00138
MW-9	6/22/2016	<0.002	<0.001	0.118	<0.001	<0.001	<0.002	0.000761	<1	<0.001	<0.05	<0.0002	0.0795	0.348	<0.005	<0.001
MW-9	9/14/2016	<0.002	<0.001	0.119	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0743	0.479	<0.005	<0.001
MW-9	12/13/2016	<0.002	<0.001	0.119	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0803	0.306	<0.005	<0.001
MW-9	3/8/2017	<0.002	<0.001	0.0773	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.054	0.236	<0.005	<0.001
MW-9	6/6/2017	<0.002	<0.001	0.0895	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0715	0.168	<0.005	<0.001
MW-9	7/10/2017	<0.002	<0.001	0.116	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0704	0.227	<0.005	<0.001
MW-9	11/13/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-9	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	0.0595	0.235	<0.01	<0.002
MW-9	9/19/2018	NA	<0.001	0.133	NA	NA	<0.002	NA	<5	NA	NA	NA	0.0734	0.536	NA	NA
MW-9	3/13/2019	<0.002	<0.001	0.107	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	0.0116	<0.0002	0.0691	0.163	<0.005	<0.001
MW-9	9/9/2019	NA	<0.001	0.112	<0.001	<0.001	0.00283	<0.0005	<1	<0.001	0.00948	<0.0002	0.0494	0.252	<0.005	<0.001
MW-9	4/7/2020	<0.004	<0.002	0.0928	<0.002	<0.001	<0.002	<0.002	0.345	<0.005	<0.01	<0.0002	0.0591	2.32	<0.002	<0.002
MW-10S[2]	12/9/2015	0.000637	0.00427	0.295	<0.001	<0.0004	0.000854	0.00941	0.150	0.000488	0.00432	<0.0001	0.00395	0.742	0.00067	<0.0005
MW-10S[2]	3/23/2016	<0.00418	0.0368	0.569	<0.000875	<0.00025	<0.0025	0.00811	0.224	0.000505	0.0044	<0.0001	0.00755	1.79	<0.00398	<0.00138
MW-10S[2]	6/22/2016	<0.002	0.0353	0.437	<0.001	<0.001	<0.002	0.00373	<1	<0.001	<0.05	<0.0002	0.00501	1.10	<0.005	<0.001
MW-10S[2]	9/14/2016	<0.002	0.0373	0.429	<0.001	<0.001	<0.002	0.00320	<1	<0.001	<0.05	<0.0002	<0.005	1.06	<0.005	<0.001
MW-10S[2]	12/13/2016	<0.002	0.0481	0.468	<0.001	<0.001	<0.002	0.00408	<1	<0.001	<0.05	<0.0002	0.00627	0.890	<0.005	<0.001
MW-10S[2]	3/8/2017	<0.002	0.0245	0.350	<0.001	<0.001	<0.002	0.00355	<1	<0.001	<0.05	<0.0002	<0.005	0.831	<0.005	<0.001
MW-10	6/6/2017	<0.002	0.0161	0.196	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.08	<0.005	<0.001
MW-10	7/10/2017	<0.002	0.0169	0.200	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	<0.005	1.14	<0.005	<0.001
MW-10	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-10	5/8/2018	<0.003	0.0149	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.293	<0.01	<0.002
MW-10	9/19/2018	NA	0.0130	0.145	NA	NA	<0.002	NA	<1	NA	NA	NA	<0.005	0.595	NA	NA
MW-10	3/13/2019	<0.002	0.0169	0.164	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.978	<0.005	<0.001
MW-10	9/10/2019	NA	0.0221	0.163	<0.001	<0.001	0.00265	<0.0005	<1	<0.001	<0.005	<0.0002	<0.005	0.860	<0.005	<0.001
MW-10	4/7/2020	<0.004	0.0177	0.175	<0.002	<0.001	<0.002	<0.002	0.227	<0.005	0.00226	<0.0002	0.00546	0.684	<0.002	<0.002
MW-11S[2]	12/9/2015	<0.0005	0.00896	0.325	<0.001	<0.0004	0.00104	0.00694	0.266	0.00072	<0.004	<0.0001	0.00569	0.680	0.00107	<0.0005
MW-11S[2]	3/23/2016	<0.00418	0.0492	0.486	<0.000875	<0.00025	<0.0025	0.00803	0.400	0.00114	0.00357	<0.0001	0.00568	1.44	<0.00398	<0.00138
MW-11S[2]	6/22/2016	<0.002	0.0377	0.353	<0.001	<0.001	0.00253	0.00630	<1	0.00191	<0.05	<0.0002	0.00651	1.73	<0.005	<0.001
MW-11S[2]	9/14/2016	<0.002	0.0538	0.349	<0.001	<0.001	<0.002	0.00504	<1	0.00132	<0.05	<0.0002	0.00552	0.969	<0.005	<0.001
MW-11S[2]	12/14/2016	<0.002	0.0502	0.353	<0.001	<0.001	0.00287	0.00481	<1	0.00225	<0.05	<0.0002	<0.005	2.42	<0.005	<0.001
MW-11S[2]	3/8/2017	<0.002	0.0584	0.384	<0.001	<0.001	0.00288	0.00511	<1	0.00272	<0.05	0.000577	0.00532	1.37	<0.005	<0.001
MW-11	6/6/2017	<0.002	0.00874	0.224	<0.001	<0.001	<0.002	0.000854	<1	<0.001	<0.05	<0.0002	<0.005	0.811	<0.005	<0.001
MW-11	7/10/2017	<0.002	0.00926	0.211	<0.001	<0.001	<0.002	0.00122	<1	<0.001	<0.05	<0.0002	<0.005	0.654	<0.005	<0.001
MW-11	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-11	5/8/2018	<0.003	0.00884	0.241	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.68	<0.01	<0.002
MW-11	9/19/2018	NA	0.00894	0.220	NA	NA	<0.002	NA	<1	NA	NA	NA	<0.005	0.654	NA	NA
MW-11	3/13/2019	<0.002	0.00877	0.186	<0.001	<0.001	<0.002	0.000609	<1	<0.001	<0.005	<0.0002	<0.005	0.556	<0.005	<0.001
MW-11	9/10/2019	NA	0.0114	0.217	<0.001	<0.001	0.0027	0.000621	<1	<0.001	<0.005	<0.0002	<0.005	0.743	<0.005	<0.001
MW-11	4/7/2020	<0.004	0.0148	0.313	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00366	<0.0002	<0.005	1.74	<0.002	<0.002

Sample Location	Date Sampled	Antimony, total (mg/L)	Arsenic, total (mg/L)	Barium, total (mg/L)	Beryllium, total (mg/L)	Cadmium, total (mg/L)	Chromium, total (mg/L)	Cobalt, total (mg/L)	Fluoride, total (mg/L)	Lead, total (mg/L)	Lithium, total (mg/L)	Mercury, total (mg/L)	Molybdenum, total (mg/L)	Radium-226 + Radium 228, tot (pCi/L)	Selenium, total (mg/L)	Thallium, total (mg/L)
MW-12	12/7/2015	<0.0005	0.0022	0.0322	<0.001	0.00127	0.000904	0.00200	0.091	0.000664	0.00719	<0.0001	0.00263	0.656	0.000639	<0.0005
MW-12	3/24/2016	<0.00418	<0.00295	0.0228	<0.000875	0.00217	<0.0025	0.00210	0.163	<0.000433	0.00754	<0.0001	<0.0025	0.324	<0.00398	<0.00138
MW-12	6/21/2016	<0.002	<0.001	0.0196	<0.001	0.00218	<0.002	0.00208	<1	<0.001	<0.05	<0.0002	<0.005	0.223	<0.005	<0.001
MW-12	9/13/2016	<0.002	<0.001	0.0195	<0.001	0.00114	<0.002	0.00183	<1	<0.001	<0.05	<0.0002	<0.005	0.385	<0.005	<0.001
MW-12	12/13/2016	<0.002	<0.001	0.0231	<0.001	0.00422	<0.002	0.00178	<1	<0.001	<0.05	<0.0002	<0.005	0.398	<0.005	<0.001
MW-12	3/7/2017	<0.002	<0.001	0.0173	<0.001	0.00277	<0.002	0.00206	<1	<0.001	<0.05	<0.0002	<0.005	0.735	<0.005	<0.001
MW-12	6/6/2017	<0.002	<0.001	0.0171	<0.001	0.00285	<0.002	0.00214	<1	<0.001	<0.05	<0.0002	<0.005	0.19	<0.005	<0.001
MW-12	7/11/2017	<0.002	<0.001	0.0154	<0.001	0.00179	<0.002	0.00263	<1	<0.001	<0.05	<0.0002	<0.005	0.387	<0.005	<0.001
MW-12	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-12	5/8/2018	<0.003	<0.005	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	<0.01	0.219	<0.01	<0.002
MW-12	9/20/2018	NA	<0.001	0.0202	NA	NA	NA	0.00193	<1	NA	NA	NA	<0.005	0.352	NA	NA
MW-12	3/13/2019	<0.002	<0.001	0.0198	<0.001	0.00106	0.00227	0.00194	<1	<0.001	0.00642	0.000248	<0.005	0.360	<0.005	<0.001
MW-12	6/12/2019	NA	NA	NA	NA	NA	NA	0.00227	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-12	9/10/2019	NA	<0.001	0.0162	<0.001	0.00179	0.00337	0.00256	<1	<0.001	0.00706	0.001	<0.005	0.0927	<0.005	<0.001
MW-12	4/7/2020	<0.004	<0.002	<0.02	<0.002	0.00165	<0.002	0.00259	<0.15	<0.005	0.00433	0.000369	<0.005	0	<0.002	<0.002
MW-13S[2]	12/8/2015	<0.0005	0.00303	0.0341	<0.001	0.000689	0.000881	0.0168	0.0708	0.000612	0.0103	<0.0001	<0.0005	0.473	0.000781	<0.0005
MW-13S[2]	3/24/2016	<0.00418	<0.00295	0.0247	<0.000875	0.00111	<0.0025	0.0132	0.0702	<0.000433	0.00916	<0.0001	<0.0025	0.609	<0.00398	<0.00138
MW-13S[2]	6/21/2016	<0.002	0.00239	0.0298	<0.001	0.00119	0.004	0.0114	<1	0.00218	<0.05	<0.0002	<0.005	1.13	<0.005	<0.001
MW-13S[2]	9/13/2016	<0.002	0.00123	0.0178	<0.001	0.00167	<0.002	0.00589	<1	<0.001	<0.05	<0.0002	<0.005	0.376	<0.005	<0.001
MW-13S[2]	12/13/2016	<0.002	<0.001	0.0140	<0.001	0.00216	<0.002	0.00506	<1	<0.001	<0.05	<0.0002	<0.005	0.329	<0.005	<0.001
MW-13S[2]	3/7/2017	<0.002	0.00107	0.0160	<0.001	0.00194	<0.002	0.00427	<1	<0.001	<0.05	<0.0002	<0.005	0.724	<0.005	<0.001
MW-13	6/6/2017	<0.002	0.00897	0.179	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.00974	1.06	<0.005	<0.001
MW-13	7/11/2017	<0.002	0.00749	0.163	<0.001	<0.001	<0.002	<0.0005	<1	<0.001	<0.05	<0.0002	0.0101	0.584	<0.005	<0.001
MW-13	11/14/2017	NA	NA	NA	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA
MW-13	5/9/2018	<0.003	0.0173	<0.2	<0.004	<0.005	<0.005	<0.005	<1	<0.005	<0.04	<0.0002	0.0123	0.746	<0.01	<0.002
MW-13	9/19/2018	NA	0.0129	0.132	NA	NA	NA	<0.0005	<2	NA	NA	NA	0.0122	0.913	NA	NA
MW-13	3/12/2019	<0.002	0.0107	0.161	<0.001	<0.001	0.00261	<0.0005	<1	<0.001	0.00647	<0.0002	0.0113	0.415	<0.005	<0.001
MW-13	6/13/2019	NA	NA	NA	NA	NA	NA	<0.0005	NA	NA	NA	NA	0.0123	NA	NA	NA
MW-13	9/10/2019	NA	0.019	0.206	<0.001	<0.001	0.00301	<0.0005	<1	<0.001	0.00674	<0.0002	0.0126	0.373	<0.005	<0.001
MW-13	4/7/2020	<0.004	0.0223	0.205	<0.002	<0.001	<0.002	<0.002	<0.15	<0.005	0.00554	<0.0002	0.0106	0.854	<0.002	<0.002
MW-14	6/13/2019	NA	NA	NA	NA	NA	NA	0.000986	NA	NA	NA	NA	0.00896	NA	NA	NA
MW-14	9/10/2019	NA	0.00154	0.0430	<0.001	<0.001	0.00326	0.000685	<1	<0.001	0.00526	<0.0002	0.00712	0.330	<0.005	<0.001
MW-14	4/6/2020	<0.004	<0.002	0.0371	<0.002	<0.001	0.00212	<0.002	<0.15	<0.005	0.00415	<0.0002	0.00689	0.120	<0.002	<0.002
MW-15	6/12/2019	NA	NA	NA	NA	NA	NA	0.00652	NA	NA	NA	NA	0.0206	NA	NA	NA
MW-15	9/10/2019	NA	0.00373	0.0815	<0.001	<0.001	0.00302	0.00360	<1	<0.001	0.00799	<0.0002	0.0269	0.589	<0.005	<0.001
MW-15	4/6/2020	<0.004	<0.002	0.0964	<0.002	<0.001	<0.002	0.00386	0.215	<0.005	0.0074	<0.0002	0.0291	0.607	<0.002	<0.002
MW-16	6/12/2019	NA	NA	NA	NA	NA	NA	0.00957	NA	NA	NA	NA	<0.005	NA	NA	NA
MW-16	9/10/2019	NA	<0.001	0.0901	<0.001	<0.001	0.00287	0.00267	<1	<0.001	0.011	<0.0002	<0.005	0.0761	<0.005	<0.001
MW-16	4/6/2020	<0.004	<0.002	0.0997	<0.002	<0.001	0.00202	0.00217	<0.15	<0.005	0.0114	<0.0002	<0.005	0.672	<0.002	<0.002

Notes:

1. Abbreviations: mg/L - milligrams per liter; NA - not analyzed; pCi/L - picocurie per liter;
2. Previously monitored CCR locations MW-10S, MW-11S, and MW-13S were replaced by CCR monitoring locations MW-10, MW-11 and MW-13, respectively, which are screened deeper into the uppermost aquifer.

ATTACHMENT 6 – SITE HYDROGEOLOGY AND STRATIGRAPHIC CROSS-SECTIONS OF THE SITE

CONCEPTUAL SITE MODEL AND DESCRIPTION OF SITE HYDROGEOLOGY (MIAMI FORT POND SYSTEM)

The Miami Fort Power Station (Miami Fort) conceptual site model (CSM) and Description of Site Hydrogeology for the Miami Fort Pond System (Pond System) located near North Bend, Ohio are described in the following sections.

REGIONAL SETTING

Miami Fort Power Station 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 (see monitoring well location map attached to this demonstration). The 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.

Geologic units present at the Site include unlithified geologic materials (alluvial deposits, glacial outwash [Uppermost Aquifer]) and Ordovician-aged bedrock.

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. The thickness of the outwash deposits is approximately 120 feet (ft) above bedrock. A thick silt cap is also present locally on top of the outwash deposits. Cross-sections were prepared illustrating the lithology beneath Basins A and B and attached to this demonstration.

The bedrock immediately underlying the glacial deposits is of sedimentary origin and belongs to the Cincinnatian series (blue-gray limestone of the Fairview and Kope formations). The dominant sediments are the Richmond shales, the Maysville limestone, and the Eden shales. These rock units average approximately 800 ft in thickness. Situated near the crest of the Cincinnati arch, these bedrock units have a regional dip of about 10 ft per mile to the west (Burgess & Niple, Limited Engineers and Architects, 1988). Depth to bedrock beneath the Site varies between approximately 110 to 120 ft below ground surface (bgs) dependent on proximity to the edge of the valley wall north of the basins. 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).

SITE GEOLOGY

The geology of the Site was evaluated during previous investigations. Deposits include the following units (beginning at ground surface):

- Alluvial Deposits - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits range in depth from approximately 20 to 60 ft below the present ground surface. A silty, sandy clay layer is the primary component of the alluvial deposits. The clay ranges in elevation from 428 ft above mean sea level North American Vertical Datum of 1988 (msl) in the southwest corner of Basin B near the confluence of the Ohio River and the Great Miami River to

495 ft msl beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall north of the Site and thickens towards the Ohio River. The clay is thickest beneath the southern half of Basin A and Basin B, 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) - Deposits consisting of sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits is approximately 100 ft; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally on top of the outwash deposits and ranges in thickness from 4 ft 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 dependent on proximity to the edge of the valley wall north of the basins. 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).

SITE HYDROGEOLOGY

The Pond System CCR groundwater monitoring system consists of seventeen monitoring wells installed in the uppermost aquifer and adjacent to the Pond System (MW-1, MW-2, MW-3A, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, 4A). (see Monitoring Well Location Map, and Well Construction Diagrams and Drilling Logs attached to this demonstration). The Pond System utilizes one background monitoring well (MW-7) as part of the CCR groundwater monitoring system.

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 back-filled 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.

Well yields from the Great Miami River aquifer, ranging up to 3,000 gallons per minute (gpm), are possible (Spieker, 1968) due in part to induced infiltration from the river. Transmissivities in this aquifer generally range between 3×10^5 to 5×10^5 gallons per day per foot (gpd/ft) near the Great Miami River (Spieker, 1968), with a storage coefficient of around 0.2. Pumping rates measured from four of Miami Fort's production wells range from 1,000 to 1,500 gpm.

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

Hydraulic Conductivity

Hydraulic conductivity testing has not been conducted at the Pond System because typical aquifer testing methods, such as slug testing, are ineffective in highly transmissive aquifers like the Uppermost Aquifer.

Groundwater Elevations and Flow Direction

Groundwater elevations vary coincidentally with the elevation of the Ohio River pool elevation. Groundwater elevations in the Uppermost Aquifer typically range from approximately 450 to 465 ft msl. Groundwater elevation contour maps based on groundwater measurements collected at the Pond System from September 2018 through September 2019 are presented included in the groundwater flow maps attached to this demonstration.

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. The minimal 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. Horizontal hydraulic gradients were calculated using groundwater elevations measured from September 2018 to September 2019. Across Basin A, the horizontal hydraulic gradient ranged from approximately 0.0010 to 0.0026 feet per foot (ft/ft). Across Basin B, the horizontal hydraulic gradient was between 0.0018 and 0.0028 ft/ft.

Vertical hydraulic gradient was calculated across the Uppermost Aquifer using nested well pairs MW-4/MW-14 and MW-15/MW-16 for groundwater measurements for September 2019. East of Basin A, at well pair MW-15/MW-16, the vertical hydraulic gradient was calculated as an upward gradient at -0.0020 ft/ft. South of the divider dike, at well pair MW-4/MW-14, the vertical hydraulic gradient was calculated as a downward 0.0006 ft/ft.

Site-specific hydraulic conductivity values are not available; therefore, groundwater flow velocity was not calculated.

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.

Burgess & Niple, Limited Engineers and Architects, January 1988. *Cincinnati Gas & Electric Company Miami Fort Station Lawrenceburg Road Ash Landfill*.

Spieker, Andrew M., 1968. *Ground Water Hydrology and Geology of the Lower Great Miami River Aquifer, Ohio.* U.S. Geological Survey Prof. Paper 605-A.

DOWNGRADIENT MONITORING WELL LOCATION

UPGRADIENT MONITORING WELL LOCATION

A —— A′ GEOLOGIC CROSS-SECTION LOCATION

RIVER FLOW DIRECTION

AERIAL SOURCE: CAGIS

N

0 150 300

SCALE IN FEET

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

SITE AND GEOLOGIC CROSS-SECTION LOCATION MAP

DATE	REV NO.	DWG. BY	CHKD. BY
03/21/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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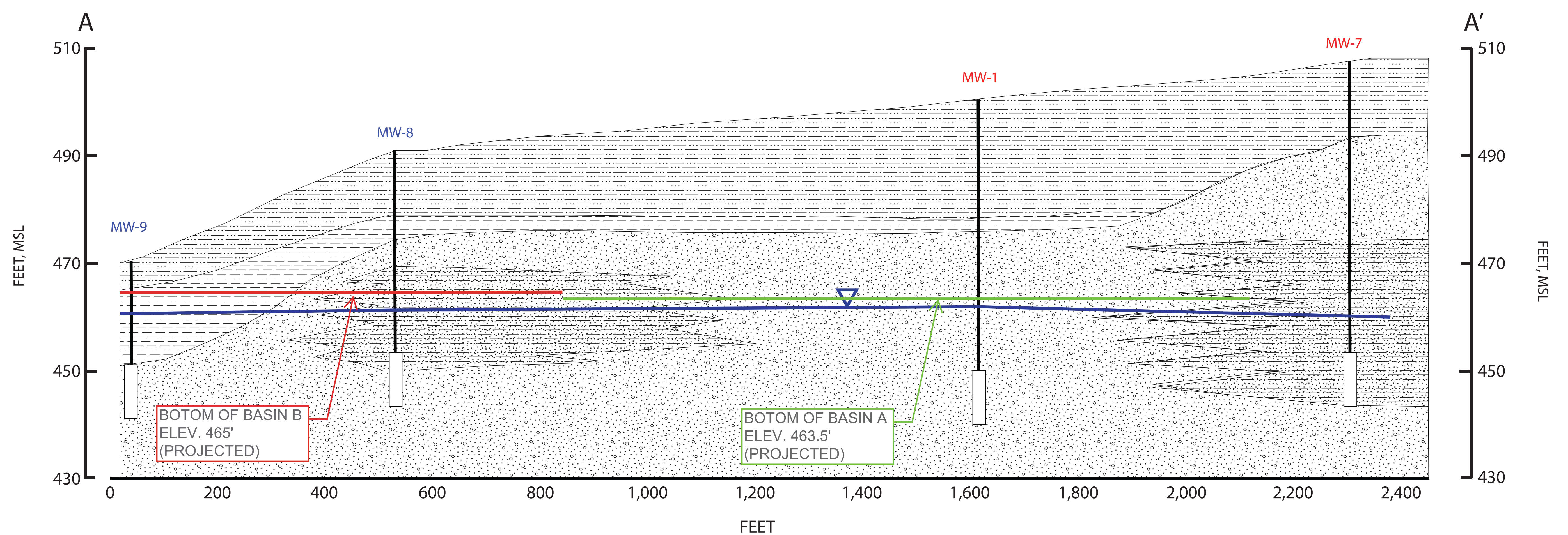

REVISION NOTE:
GREEN LINE DEPICTS BOTTOM OF BASIN A (ELEVATION 463.5'). RED LINE DEPICTS BOTTOM OF BASIN B (ELEVATION 465'). (RAMBOLL, 9/9/2020)

LEGEND

- SILT
- SILT AND FINE SAND
- CLAY / SILTY CLAY
- SAND AND GRAVEL

- MW-7 UPGRADIENT MONITORING WELL LOCATION
- MW-8 DOWNGRADIENT MONITORING WELL LOCATION
- POTENTIOMETRIC SURFACE ON 03-18-16

- MONITORING WELL RISER
- MONITORING WELL SCREEN

20 feet
200 feet
(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION A-A'

DATE	REV NO.	DWG. BY	CHKD. BY
03/21/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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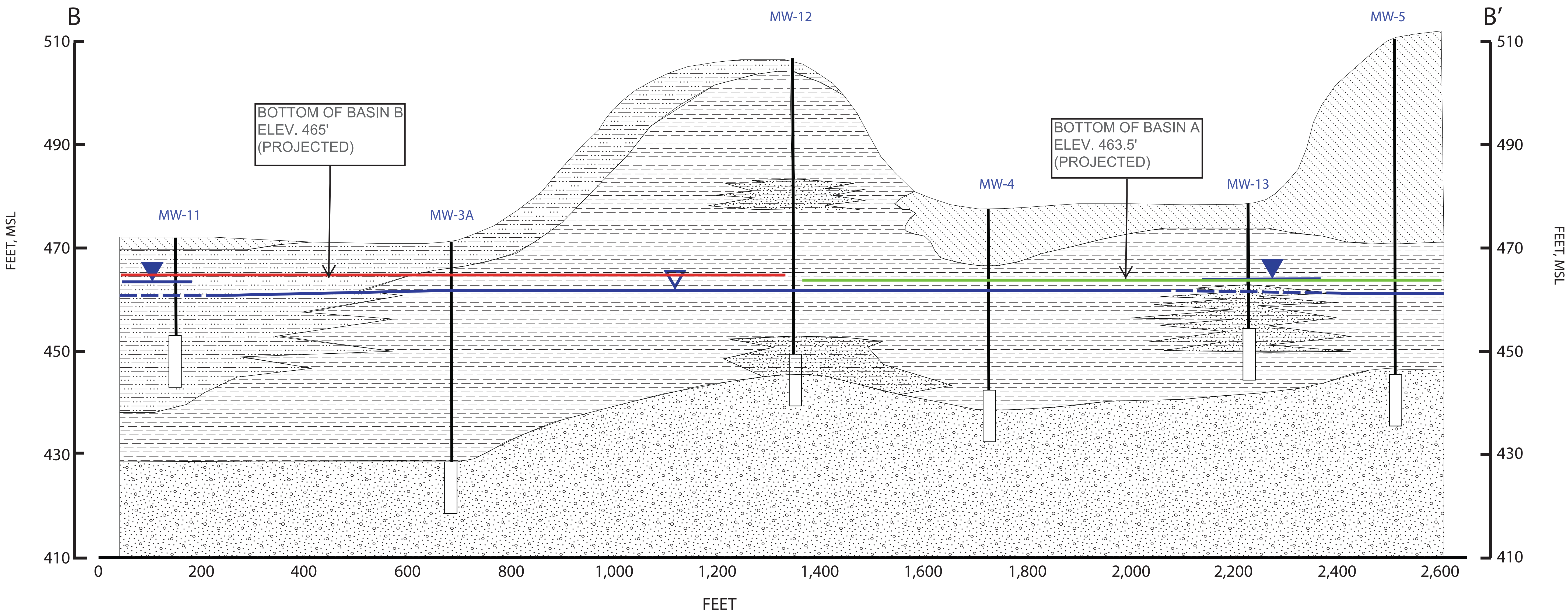

LEGEND

GRAVEL / SAND / CLAY FILL

SAND

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

REVISION NOTE:
GREEN LINE DEPICTS BOTTOM OF BASIN A (ELEVATION 463.5'). RED LINE DEPICTS BOTTOM OF BASIN B (ELEVATION, 465'). (RAMBOLL, 9/9/2020)

MW-11 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 03-18-16 (DASHED WHERE INFERRED)

PERCHED POTENTIOMETRIC SURFACE ON 03-18-16

MONITORING WELL RISER

MONITORING WELL SCREEN

20 feet

200 feet

(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION B-B'

DATE	REV NO.	DWG. BY	CHKD. BY
03/22/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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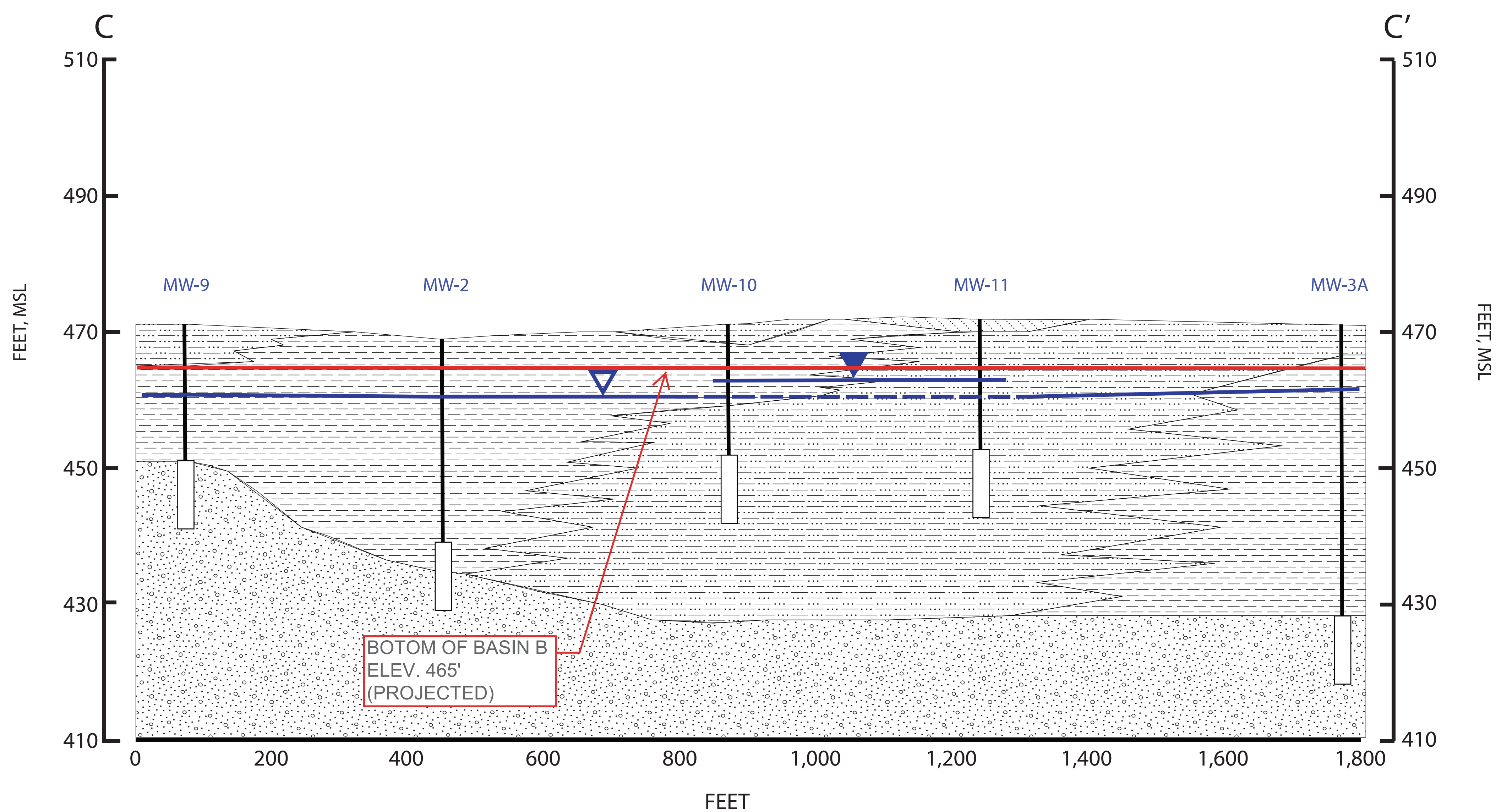

REVISION NOTE:
RED LINE DEPICTS BOTTOM OF BASIN B
(ELEVATION 465').
(RAMBOLL, 9/9/2020)

LEGEND

- GRAVEL FILL
- SILT
- CLAY / SILTY CLAY
- SAND AND GRAVEL

MW-9 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 03-18-16 (DASHED WHERE INFERRED)

PERCHED POTENTIOMETRIC SURFACE ON 03-18-16

MONITORING WELL RISER

MONITORING WELL SCREEN

20 feet

200 feet

(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION C-C'

DATE	REV NO.	DWG. BY	CHKD. BY
03/22/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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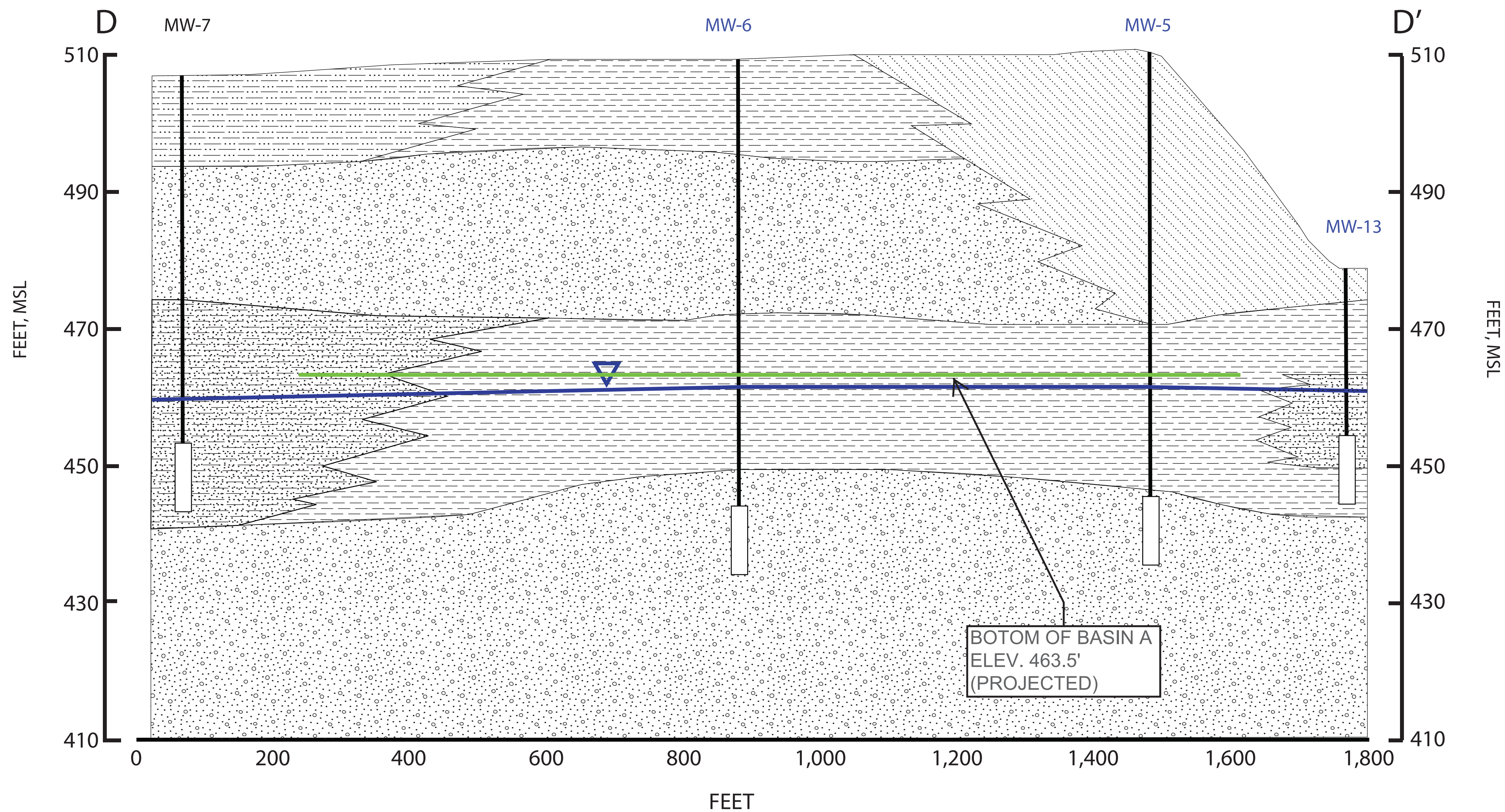

REVISION NOTE:
GREEN LINE DEPICTS BOTTOM OF BASIN A
(ELEVATION 463.5').
(RAMBOLL, 9/9/2020)

LEGEND

GRAVEL FILL

SILT

SILT AND FINE SAND

CLAY / SILTY CLAY

SAND AND GRAVEL

MW-7 UPGRADIENT MONITORING WELL LOCATION

MW-6 DOWNGRADIENT MONITORING WELL LOCATION

POTENTIOMETRIC SURFACE ON 03-18-16

MONITORING WELL RISER

MONITORING WELL SCREEN

20 feet

200 feet

(Vertical Exaggeration = 10x)

Certified By:

SIGNATURE

DATE

DYNEGY

Miami Fort
Hamilton County, Ohio

GEOLOGIC CROSS-SECTION D-D'

DATE	REV NO.	DWG. BY	CHKD. BY
03/22/16	0	JMA	MAW

JOB NO. 60442412

AECOM

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ATTACHMENT 7 – CORRECTIVE MEASURES ASSESSMENT

Corrective Measures Assessment

Miami Fort Basin A
Miami Fort Power Station
11021 Brower Road
North Bend, Ohio

Dynegy Miami Fort, LLC

September 5, 2019

OBG
Part of Ramboll

SEPTEMBER 5, 2019 | PROJECT #72858

Corrective Measures Assessment

Miami Fort Basin A
Miami Fort Power Station
11021 Brower Road
North Bend, Ohio

Prepared for:

Dynegy Miami Fort, LLC

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1 INTRODUCTION

O'Brien & Gere Engineers, Inc, part of Ramboll (OBG) has prepared this Corrective Measures Assessment (CMA) for Basin A (Basin A; CCR Unit ID 111) located at the Miami Fort Power Station (MFS) in North Bend, Ohio. This CMA report complies with the requirements of Title 40 of the Code of Federal Regulations (C.F.R.) § 257, Subpart D Standards for the Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments (CCR Rule). Under the 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 alternate source demonstration demonstrating that a source other than the CCR unit has caused the contamination. This CMA is responsive to the 40 C.F.R. § 257.96 and § 257.97 requirements for assessing potential corrective measures to address the exceedance of the GWPS for cobalt and molybdenum in the Uppermost Aquifer.

This CMA is the first step in developing a long-term corrective action plan and has been prepared to evaluate applicable remedial measures to address cobalt and molybdenum SSLs in the Uppermost Aquifer. The results of the CMA will be used to guide whether additional site-specific data are necessary to develop a long-term corrective action plan for the Uppermost Aquifer, consistent with 40 C.F.R. § 257.96 and § 257.97 requirements.

1.1 CORRECTIVE MEASURES ASSESSMENT OBJECTIVES AND METHODOLOGY

The objective of this CMA is to begin the process of evaluating appropriate corrective measure(s) to address impacted groundwater in the Uppermost Aquifer potentially associated with Basin A at the MFS. 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

The evaluation criteria are defined below to provide a common understanding and consistent application. The 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 does not explicitly address and document compliance with each of the specific elements included in the definitions below. Rather, the evaluation considered the elements qualitatively, applying engineering judgement, 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 the applicability and effectiveness of a corrective measure. 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 MFS is owned and operated by Dynegy Miami Fort, LLC. The station is located in the southwest corner of the State of Ohio on the north shore of the Ohio River, at the confluence with the Great Miami River, as shown in Figure 1. The facility is located within Hamilton County, 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 MFS and the boundary with the State of Kentucky lies just offshore to the south, within the Ohio River.

The MFS 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. Basin A is located in the southwest corner of the MFS property.

Basin A is an unlined surface impoundment (SI) approximately 30 acres in size. It was originally constructed sometime prior to 1959 with a vertical expansion around 1976. Basin A receives effluent from the sluice lines, which primarily transport bottom ash products as well as FGD effluent and some fly ash and miscellaneous yard drainage (AECOM, 2017). The basin 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, Veolia's production wells to the northwest, and MFS's electric switch yard and production wells to the east. Figure 2 is a site plan showing the basin, monitoring wells, and production wells.

2.2 GEOLOGY AND HYDROGEOLOGY

The geologic units present beneath Basin A at MFS include fill, alluvial deposits, glacial outwash (Uppermost Aquifer) and bedrock, as described below:

- Fill Unit – (CCR within Basin A). The CCR consists primarily of bottom ash, 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 - The alluvial deposits consist of clay, silt and fine sand deposited by the Ohio River floodwaters. These alluvial deposits range in depth from approximately 20 to 60 feet below the present ground surface. A silty, sandy clay layer is the primary component of the alluvial deposits. The clay ranges in elevation from 428 feet (ft) above mean sea level (msl) in the southwest near the confluence of the Ohio River and the Great Miami River to 495 ft msl beneath the northeast corner of Basin A. The clay is thin, or absent, near the valley wall and thickens towards the Ohio River. The clay is thickest beneath the southern half of Basin A, 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) - Deposits consisting of sands and gravels deposited during the Illinoian and Wisconsin stages of the Pleistocene. The thickness of the outwash deposits is approximately 100 feet; the outwash deposits directly overlie bedrock. A silt and fine sand layer is present locally on top of the outwash deposits and ranges in thickness from 4 ft to 30 ft; however, it is not present below all of Basin A.
- 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 feet below ground surface (bgs) dependent on proximity to the edge of the valley wall north of Basin A. 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.

The glacial outwash deposits (Uppermost Aquifer) underlying Basin A are part of the Ohio River Valley Fill Aquifer; a buried valley aquifer. The valley was cut into the bedrock by pre-glacial and glacial streams and subsequently back-filled with deposits of sand, gravel and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. 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 (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. (IDNR, 2006). Three production wells, located northwest of Basin B, are operated by Veolia for process (non-potable) water. The MFS operates four production wells east-southeast of Basin A for cooling water. Pumping rates measured at the cooling water production wells range from 1,000 gpm to 1,500 gpm. The majority of the water withdrawn by these wells is from induced flow from the Ohio River (ODNR, undated).

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.

The groundwater potentiometric surface on site was encountered at depths of 25 to 55 feet bgs, approximately 455 to 460 ft msl, coincident with the approximate pool elevation of the Ohio River. Groundwater flow is generally to the west/northwest towards the Great Miami River and Veolia's production wells, and east/southeast towards MFS production wells. 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 (AECOM, 2017).

2.3 GROUNDWATER QUALITY

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. Alternate 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 Basin A on April 9, 2018. Assessment Monitoring results identified statistically significant levels (SSLs) of the Appendix IV parameters cobalt and molybdenum over the GWPS of 0.006 milligrams per Liter (mg/L) and 0.10 mg/L, respectively. SSLs for total cobalt were identified in downgradient monitoring well MW-4 where concentrations ranged from 0.00503 mg/L to 0.0187 mg/L. SSLs for total molybdenum were identified in downgradient monitoring well MW-6 where concentrations ranged from 0.344 mg/L to 0.661 mg/L. No other SSLs have been identified for Basin A. Monitoring well locations are shown on Figure 2.

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.

3.1 OBJECTIVES OF THE CORRECTIVE MEASURES

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 Basin A, 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
  - Closure by Removal (Off-Site Landfill)
  - In-Situ Solidification/Stabilization
- Potential Groundwater Remedial Corrective measures
  - Monitored Natural Attenuation (MNA)
  - Groundwater Cutoff Wall
  - In-Situ Chemical Treatment
  - Permeable Reactive Barrier
  - Groundwater Extraction

3.2 POTENTIAL SOURCE CONTROL CORRECTIVE MEASURES

3.2.1 Closure in Place

Closure in place (CIP) includes 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 and molybdenum impact in the Uppermost Aquifer.

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

- Removal of free water and grading the CCR to allow cover system construction.

- Relocating and/or reshaping the existing CCR and cover material within the impoundment to achieve acceptable grades for closure. Borrow soil may be used to supplement fill volume, if necessary, to reach final design grades.
- Constructing a cover system that complies with the 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 (Off-Site Landfill)

Closure by removal (CBR) includes 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.

CBR would require transporting CCR to an off-site location for disposal, as the MFS property does not have the space required for siting a new on-site landfill. This would result in increased risk to the public, increased greenhouse gas emissions and carbon footprint, and increased potential for fugitive dust exposure. Transporting ash to an off-site landfill also presents concerns about available landfill capacity and community impacts, safety concerns and project duration.

3.2.3 In Situ Solidification/Stabilization

In situ solidification/stabilization (ISS) is a 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 includes 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 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 was 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 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, 2007, and 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 and molybdenum have the potential to be sorbed onto iron hydroxides or organic matter in the aquifer materials, depending on the geochemical conditions, but are typically mobile (EPRI, 2012). Physical and chemical mechanisms are available natural attenuation processes acting upon CCR constituents such as cobalt and molybdenum. 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 includes installation of a series of 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 project components:

- Designing and constructing a groundwater extraction system consisting of a series of extraction wells or trenches located around the perimeter of the site and operating at a rate to allow capture of CCR impacted groundwater within the Uppermost Aquifer.

- Designing a system to manage 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 sorbed contaminants (desorption rate limited cleanup process) can inhibit effective remediation. 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 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. In order for a cutoff wall to be technically feasible, there must be a low-permeability lower confining layer into which the barrier can be keyed, and it must be at a technically feasible depth.

3.3.4 Permeable Reactive Barrier

Chemical treatment via a Permeable Reactive Barrier (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 include continuous PRBs, in which the reactive media extends across the entire path of the contaminant plume; and funnel-and-gate systems, where barrier walls 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 (Gavaskar et al., 1998; cited by 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 and molybdenum.

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

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 1 with the retained corrective measures to allow a qualitative evaluation of the ability of each corrective measure to address SSLs for cobalt and molybdenum in the Uppermost Aquifer. The goal is to understand which corrective measures could be used, either independently or in combination, to protect human health and the environment by attaining GWPS, as discussed in the following report sections.

4.2 POTENTIAL SOURCE CONTROL CORRECTIVE MEASURE EVALUATION

Based on the corrective measure review presented in Section 3, the following source control corrective measures are potentially viable to address SSLs in the Uppermost Aquifer:

- Potential Source Control Corrective measures
  - Closure in Place
  - Closure by Removal (Off-Site Landfill)
  - In-Situ Solidification/Stabilization

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

4.2.1 Closure in Place

CIP is a widely accepted corrective measure for source control of CCR and is routinely approved by the Ohio Environmental Protection Agency (OEPA). 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. CIP is a reliable remedial technology that does not require active systems to operate and requires limited maintenance.

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 for short term exposure.

Implementation of CIP only requires commonly performed construction and earthwork activities as described in Section 3.2 and can typically be completed in 3 to 5 years, including design, permitting and construction. CIP requires approval by the OEPA to be implemented.

4.2.2 Closure by Removal (Off-Site Landfill)

CBR is a widely accepted corrective measure with regard to source control of CCR. CBR is a reliable corrective 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; and, site access is limited.

CBR of Basin A could be completed in approximately 11 to 14 years, including design, permitting, and construction. During that timeframe the transport of the CCR could lead to increased risk to the public, particularly for the off-site disposal, increased greenhouse gas emissions and carbon footprint, and increased potential for fugitive dust exposure.

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 at the MFS on which to site or construct an on-site landfill, requiring that only off-site landfill alternatives be considered.

4.2.3 In-Situ Solidification/Stabilization

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

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.

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 SSLs in the Uppermost Aquifer:

- Potential Groundwater Corrective measures
  - Monitored Natural Attenuation (MNA)
  - Groundwater Cutoff Wall
  - In-Situ Chemical Treatment
  - Permeable Reactive Barrier
  - Groundwater Extraction

These corrective measures are discussed below relative to their ability to effectively address the SSLs for cobalt and molybdenum 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 a widely accepted corrective measure for groundwater remediation and is routinely approved by state and federal regulators when paired with source control. The performance of MNA as a groundwater corrective measure can vary based on site-specific conditions and would require additional data collection to support the design and regulatory approval consistent with the USEPA's tiered approach to MNA (USEPA 1999, 2007, and 2015). MNA would be implemented as a finishing step in combination with source control corrective measures or other groundwater corrective measures described in Section 3.

MNA is a relatively reliable groundwater corrective measure because operation and maintenance requirements are limited. However, the reliability can also vary based on site-specific hydrogeologic and geochemical conditions. Additional groundwater sample collection and analyses would be required to characterize potential attenuation mechanisms as discussed above. Following characterization and approval, implementation of MNA would be relatively easy and may consist of installing additional monitoring wells. Implementation could be completed within 1 year. Time of construction could be reduced if existing groundwater monitoring well systems could be utilized for MNA.

No potential safety impacts or exposure to human health or environmental receptors are expected to result from implementing MNA. Timeframes to achieve GWPS are dependent on site-specific conditions, which require detailed technical analysis. MNA requires approval by the OEPA to be implemented.

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 and possibly groundwater fate and transport modeling to support the design and regulatory approval.

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 Basin A. 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. Cutoff walls could be used in conjunction with a pumping system to control groundwater movement. Source control measures (Section 3.2) may also reduce the mass loading to the Uppermost Aquifer, thus reducing the total contaminant mass that would need to be pumped to attain GWPS. 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 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, which require detailed technical analysis. Groundwater extraction requires approval by the OEPA to be implemented.

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. In addition, ongoing operation and maintenance would be needed to ensure performance over time. Construction 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 MFS 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.

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 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 upper aquifer suggest that a barrier wall would have the desired contrast in hydraulic conductivities.

Additional data collection and analyses would be required to design a cutoff wall. Construction could be completed within 2 to 3 years. Time of implementation is approximately 5 to 8 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 and molybdenum is not well established and more research is needed (EPRI, 2006), therefore, performance is unknown. PRB treatment of cobalt and molybdenum 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 (ITRC, 2005). Implementation of PRBs may have design challenges associated with both groundwater hydraulics and plume configuration.

Funnel-and-gate PRBs inherently alter the existing groundwater flow system. 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 the OEPA to be implemented.

4.3.5 In-Situ Chemical Treatment

In-situ chemical treatment of cobalt and molybdenum is not well established and more research is needed (EPRI, 2006); therefore, performance is unknown. Chemical treatment of cobalt and molybdenum 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.

Injections of reactive media could be completed within 1 to 2 years. Time of implementation is approximately 5 to 8 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 approval (UIC).

5 REMEDY SELECTION PROCESS

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
  - Closure in Place
  - Closure by Removal (Off-Site Landfill)
  - In-Situ Solidification/Stabilization
- Potential Groundwater Corrective measures
  - Monitored Natural Attenuation (MNA)
  - Groundwater Extraction
  - Groundwater Cutoff Wall
  - Permeable Reactive Barrier
  - In-Situ Chemical Treatment

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 § 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 § 257.98(d)

5.2 FUTURE ACTIONS

Semiannual reports per § 257.97 will be prepared to describe the progress in selecting and designing the remedy that addresses SSLs for cobalt and molybdenum in the Uppermost Aquifer. A final report describing the selected remedy and how it meets the standards listed above will also be prepared, per § 257.97. The corrective action plan may incorporate one or more of the corrective measures identified in this CMA to address impacts from CCR constituents in the Uppermost Aquifer.

6 REFERENCES

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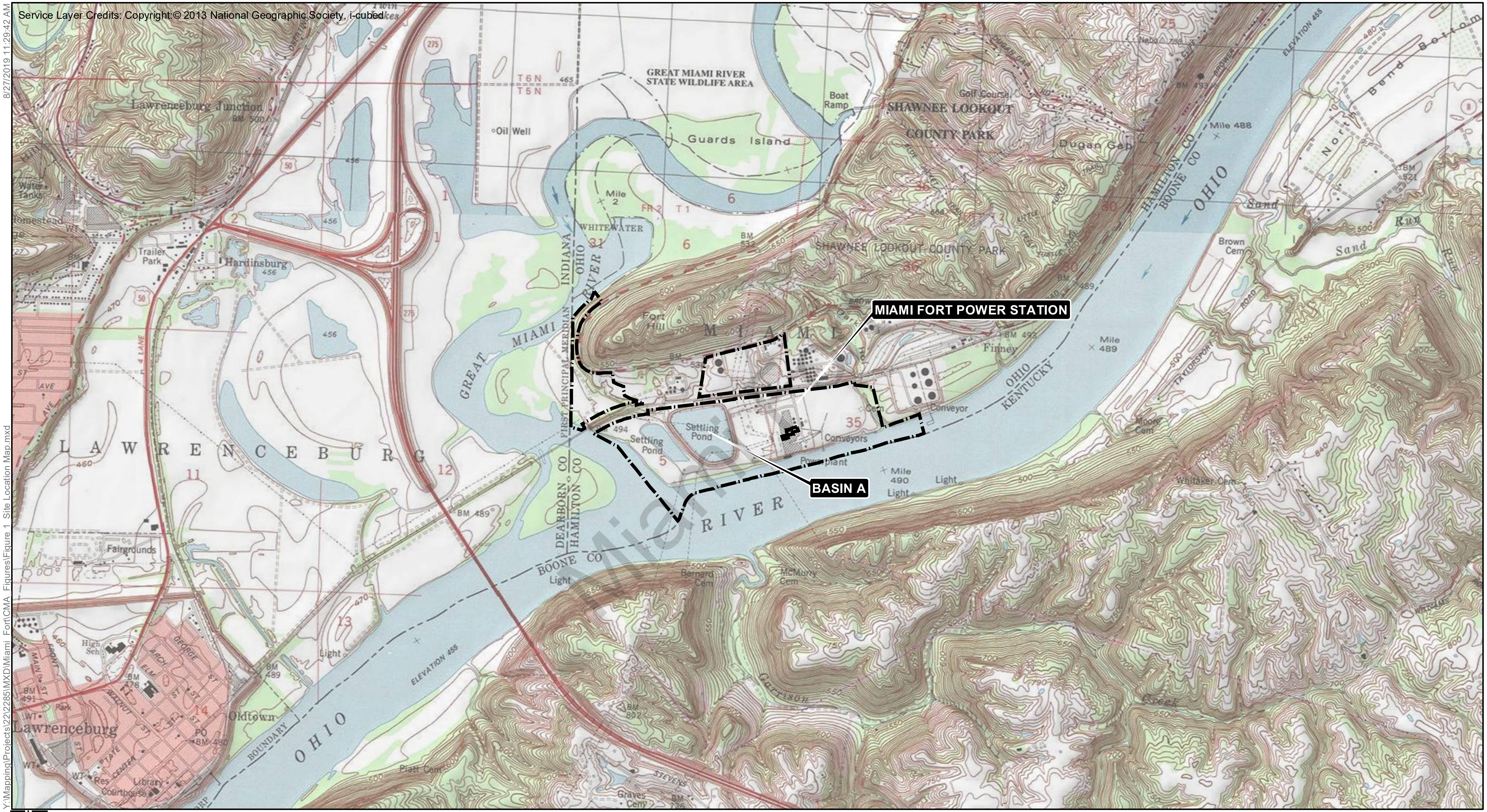
Tables

Table 1. Corrective Measures Assessment Matrix
Corrective Measures Assessment
Miami Fort Basin A, North Bend, Ohio
September 4, 2019

	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**	Widely accepted, routinely approved; variable performance based on site-specific conditions.	Reliable technology.	Commonly performed construction and earthwork.	Controls exposure to CCR. Some potential short term exposure during construction.	3 to 5 years.	Dependent on selected groundwater remediation technology.	Requires regulatory approval processes.
	Closure By Removal (Off-Site Landfill)	Widely accepted, good performance with regard to source control.	Reliable technology.	Commonly performed earthwork. Dewatering can be problematic.	Significant exposure potential.	12 to 15 years.	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.	Some potential short term exposure during construction.	Dependent on application volume.	Dependent on selected groundwater remediation technology.	Requires regulatory approval processes.
Groundwater Remediation Corrective Measures	**MNA**	Widely accepted, routinely approved; variable performance based on site-specific conditions.	Reliable, but dependent on site-specific conditions.	Easy.	None identified.	2 to 3 years.	Dependent on site-specific conditions.	Requires regulatory approval processes.
	Groundwater Extraction	Widely accepted, routinely approved; variable performance based on site-specific conditions.	Reliable if properly designed, constructed and maintained.	Design challenges due to groundwater hydraulics and plume configuration. Extracted groundwater would require management.	Alters groundwater flow system. Potential for some limited exposure to extracted groundwater.	3 to 4 years.	Dependent on site-specific conditions.	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 the Uppermost Aquifer.	Reliable if properly designed and constructed (if feasible).	Widely used, established technology. May be difficult due to required depth and keying wall into bedrock.	Alters groundwater flow system.	5 to 8 years.	Needs to be combined with other remediation technology(ies). Time required to attain GWPS dependent on combined technologies.	Requires regulatory approval processes.
	Permeable Reactive Barrier	Permeable Reactive Barrier treatment not well established for cobalt or molybdenum.	Variable reliability based on site-specific groundwater hydraulics and geochemical conditions.	Design challenges associated with groundwater hydraulics and plume configuration.	Alters groundwater flow system.	6 to 9 years.	Dependent on site-specific conditions.	Requires regulatory approval processes.
	In-Situ Chemical Treatment	In-Situ treatment not well established for cobalt or molybdenum.	Variable reliability based on site-specific geochemical conditions.	Design challenges associated with groundwater hydraulics.	Alters groundwater geochemistry.	5 to 8 years.	Dependent on site-specific conditions.	May require Underground Injection Control approval.

Notes:
[1]Time required to begin and implement remedy includes design, permitting and construction.

Figures



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APPROXIMATE PROPERTY BOUNDARY

CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT BASIN A
MIAMI FORT POWER STATION
NORTH BEND, OHIO

SITE LOCATION MAP

0 500 1,000 2,000
Feet

N

OBG
Part of Ramboll

FIGURE 2

Y:\Mapping\Projects\22\2285\MXD\Miami Fort\CMA Figures\Figure 2 CCR GW Monitoring System.mxd 9/4/2019 12:15:57 PM

BASIN A UNIT BOUNDARY
BASIN A DOWNGRADIENT MONITORING WELL
BACKGROUND MONITORING WELL
BASIN B DOWNGRADIENT MONITORING WELL
MIAMI FORT PRODUCTION WELLS
VEOLIA PRODUCTION WELLS

CORRECTIVE MEASURES ASSESSMENT
MIAMI FORT BASIN A
MIAMI FORT POWER STATION
NORTH BEND, OHIO

0 75 150 300
Feet

N

CCR GROUNDWATER MONITORING SYSTEM

OBG
Part of Ramboll

OBG

Part of Ramboll

ATTACHMENT 8 – SEMI-ANNUAL REMEDY SELECTION PROGRESS REPORTS (MARCH 5, 2020 AND SEPTEMBER 5, 2020)

RAMBOLL

ENVIRONMENT
& HEALTH

March 5, 2020

SEMIANNUAL REMEDY SELECTION PROGRESS REPORT
MIAMI FORT BASIN A

In accordance with Title 40 Code of Federal Regulations (C.F.R.) § 257.97(a), the owner or operator of a coal combustion residuals (CCR) unit must prepare a semiannual report describing the progress in selecting and designing a remedy for statistically significant levels (SSLs) of constituents listed in Appendix IV of 40 C.F.R. Part 257 over the groundwater protection standards established in accordance with 40 C.F.R. § 257.95(h).

This report is for Basin A at Miami Fort Power Station.

As stated in the notification dated February 6, 2019, SSLs for total cobalt and total molybdenum were identified at Basin A during assessment monitoring completed in accordance with 40 C.F.R. § 257.95.

A Corrective Measures Assessment (CMA) was completed for Basin A on September 5, 2019 as required by 40 C.F.R. § 257.96. The CMA identified three potential source control measures and five potential groundwater corrective measures for further evaluation.

A public meeting was held on December 16, 2019 at the Miami Township Community Center in North Bend, Ohio to discuss the results of the of the CMA in accordance with 40 C.F.R. § 257.96(e).

Selection of the source control measure is currently in the feasibility study phase and will incorporate groundwater flow and transport modeling. Selection of the groundwater corrective measure is currently in the monitored natural attenuation (MNA) feasibility study phase.

September 5, 2020

SEMIANNUAL REMEDY SELECTION PROGRESS REPORT
MIAMI FORT POND SYSTEM

In accordance with Title 40 Code of Federal Regulations (C.F.R.) § 257.97(a), the owner or operator of a coal combustion residuals (CCR) unit must prepare a semiannual report describing the progress in selecting and designing a remedy for statistically significant levels (SSLs) of constituents listed in Appendix IV of 40 C.F.R. Part 257 over the groundwater protection standards established in accordance with 40 C.F.R. § 257.95(h).

This report is for activities occurring between March 5, 2020 and September 5, 2020 at the Miami Fort Pond System located at the Miami Fort Power Station.

As stated in the March 5, 2020 Semiannual Remedy Selection Progress Report, A Corrective Measures Assessment (CMA) was completed for Basin A of the Miami Fort Pond System on September 5, 2019 as required by 40 C.F.R. § 257.96. The CMA identified three potential source control measures and five potential groundwater corrective measures for further evaluation.

In May of 2020, the Pond System Groundwater Monitoring System Certification, Rev 0 was prepared, and the Miami Fort Statistical Method Certification, Rev 1 was updated to reflect the characterization of the Miami Fort Pond System as a single multi-unit system for purposes of groundwater monitoring and closure activities.

As stated in the notification letter dated August 13, 2020, SSLs for total arsenic, total cobalt, and total molybdenum were identified at the Pond System during assessment monitoring completed in accordance with 40 C.F.R. § 257.95.

Selection of the source control measure continues to be in the feasibility study phase and will incorporate groundwater flow and transport modeling that is in development. Selection of the groundwater remedy continues to be in the monitored natural attenuation (MNA) feasibility study phase. Activities completed since March 5, 2020 include review of existing groundwater and source water data, identification and collection of additional groundwater and source water samples, identification of additional data collection needs to support development of a geochemical conceptual site model, and completion of additional monitoring wells and aquifer testing. These activities are necessary to supplement hydrogeologic site characterization, understand the natural attenuation mechanisms occurring at the site, and to evaluate the natural attenuation of constituents to meet applicable groundwater protection standards. Ongoing corrective measures assessment activities address the entire multi-unit Miami Fort Pond System.

ATTACHMENT 9 – STRUCTURAL STABILITY ASSESSMENT

Submitted to
Miami Fort Power Station
11080 Brower Road
North Bend, OH 45052

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Basin A

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin A at the Miami Fort Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). Basin A is located near North Bend, Ohio in Hamilton County, approximately 0.2 miles west of the Miami Fort Power Station. Basin A serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin A is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(1)
The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of Basin A is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of Basin A were found to be consistent with recognized and generally accepted good engineering practices.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. Basin A is a ring dike structure and does not have abutments.

The foundation consists of very soft to very stiff alluvial clays, overlying very soft to very stiff alluvial silts and clays, which in turn overlies medium dense to dense sand and gravel. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin A at Miami Fort Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of cyclic softening in the foundation, and were found to satisfy the criteria in §257.73(e)(1)(iv) applicable to dikes. A review of operational and maintenance procedures as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, Basin A was designed and constructed with stable foundations. Operational and maintenance procedures are in place to address any issues related to the stability of foundations; therefore, Basin A meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at Basin A. No evidence of significant areas of erosion or wave action was observed. The interior slopes are protected with vegetation and stacked CCRs, and the exterior slopes are protected with vegetation and concrete riprap. Operational and maintenance procedures are in place to repair the vegetation, stacked CCRs, and concrete riprap as needed to protect against surface erosion or wave action. Sudden drawdown of the pool in Basin A is not expected to occur due to the configuration of the outfall structures; therefore, slope protection to protect against the adverse effects of sudden drawdown is not required. Therefore, Basin A meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of medium stiff to very stiff material, which is indicative of mechanically compacted dikes. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin A at Miami Fort Power Station* (October 2016); therefore, the original design and construction of Basin A included sufficient density and dike compaction. Operational and maintenance procedures are in place to identify and mitigate deficiencies in order to maintain sufficient compaction of the dikes to withstand the range of loading conditions. Therefore, Basin A meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))[1]

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior and interior slopes is adequate as no substantial bare or overgrown areas were observed. Stacked CCRs on the interior slopes and concrete riprap on the exterior slopes is present in some areas, which is used as an alternate form of slope protection, and is adequate as significant areas of erosion or wave action not observed. Therefore, the original design and construction of Basin A included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance procedures are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, Basin A meets the requirements in §257.73(d)(1)(iv).

[1] As modified by court order issued June 14, 2016, Utility Solid Waste Activities Group v. EPA, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:

(A) All spillways must be either:

(1) of non-erodible construction and designed to carry sustained flows; or

(2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(3) 100-year flood for a low hazard potential CCR surface impoundment.

The primary spillway was evaluated using design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the 1,000-year flood event for the significant hazard potential Basin A. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2). A secondary spillway is also present at Basin A, but it is not activated during the 1,000-year flood event and is therefore not considered in the evaluation of §257.73(d)(1)(v)(B).

The primary spillway is constructed of high-density polyethylene (HDPE) pipe sliplined into a corrugated metal pipe (CMP), which are non-erodible materials designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Basin A at Miami Fort Power Station* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillway and remove debris or other obstructions from the spillway, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, Basin A meets the requirements in §257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit designed, constructed, operated, and maintained with hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

Two hydraulic structures are present at Basin A: the primary spillway and an inactive secondary spillway. Both structures are constructed of HDPE and CMP pipes. The stability and structural integrity of both spillways, which pass through the dikes of Basin A, were evaluated using design drawings, operational and maintenance procedures, closed-circuit television (CCTV) pipe inspections, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of Basin A.

The CCTV pipe inspection of both spillways covered their complete length and found the pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structures. Therefore, Basin A meets the requirements in §257.73(d)(1)(vi).

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

CCR unit designed, constructed, operated, and maintained with, for CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The structural stability of the downstream slopes of Basin A was evaluated by comparing the location of Basin A relative to adjacent water bodies using published Federal Emergency Management Agency Flood Insurance Rate Maps, aerial imagery, and conditions observed in the field by AECOM.

Based on this evaluation, the Ohio River is adjacent to the southern downstream slopes of Basin A. No other downstream rivers, streams, or lakes are adjacent to the downstream slopes of Basin A. A sudden drawdown slope stability analysis was performed at a cross-section identified as critical for sudden drawdown slope stability. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition (El. 490 feet) to an empty pool condition, which thereby is an evaluation of both sudden drawdown and low pool conditions. The resulting factor of safety was found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from flood to normal pool, as factor of safety criteria for sudden drawdown slope stability is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, Basin A meets the requirements listed in §257.73(d)(1)(vii).

3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin A

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A MODEER JR

Printed Name

10/13/16

Date

STATE OF OHIO
VICTOR A. MODEER JR
PE.79465
REGISTERED
PROFESSIONAL ENGINEER

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Submitted to
Miami Fort Power Station
11080 Brower Road
North Bend, OH 45052

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

Basin B

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin B at the Miami Fort Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). Basin B is located near North Bend, Ohio in Hamilton County, approximately 0.4 miles west of the Miami Fort Power Station. Basin B serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin B is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(1)
The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of Basin B is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of Basin B were found to be consistent with recognized and generally accepted good engineering practices.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. Basin B is a ring dike structure and does not have abutments.

The foundation consists of very soft to very stiff alluvial clays, overlying very soft to very stiff alluvial silts and clays, which in turn overlie medium dense to dense sand and gravel. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin B at Miami Fort Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of cyclic softening in the foundation, and were found to satisfy the criteria in §257.73(e)(1)(iv) applicable to dikes. A review of operational and maintenance procedures as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, Basin B was designed and constructed with stable foundations. Operational and maintenance procedures are in place to address any issues related to the stability of foundations; therefore, Basin B meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at Basin B. No evidence of significant areas of erosion or wave action was observed. The interior and exterior slopes are protected vegetation. Operational and maintenance procedures are in place to repair the vegetation as needed to protect against surface erosion or wave action. Sudden drawdown of the pool in Basin B is not expected to occur due to the configuration of the spillway structure. Therefore, slope protection to protect against the adverse effects of sudden drawdown is not required as sudden drawdown conditions are not expected to occur. Therefore, Basin B meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of loose to very dense material that is dense on average, which is indicative of mechanically compacted dikes. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Basin B at Miami Fort Power Station* (October 2016); therefore, the original design and construction of Basin B included sufficient dike compaction. Operational and maintenance procedures are in place to identify and mitigate deficiencies in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, Basin B meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))[1]

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior and interior slopes is adequate as no substantial bare or overgrown areas were observed. Therefore, the original design and construction of Basin B included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance procedures are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, Basin B meets the requirements in §257.73(d)(1)(iv).

[1] As modified by court order issued June 14, 2016, Utility Solid Waste Activities Group v. EPA, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in [paragraph (A) and (B)]:

(A) All spillways must be either:

(1) of non-erodible construction and designed to carry sustained flows; or

(2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(3) 100-year flood for a low hazard potential CCR surface impoundment.

The spillway was evaluated using design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the 1,000-year flood event for the significant hazard potential Basin B. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The spillway is constructed of ductile iron and corrugated metal (CMP) pipes, which are non-erodible materials designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Basin B at Miami Fort Power Station* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillway and remove debris or other obstructions from the spillway, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, Basin B meets the requirements in §257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit designed, constructed, operated, and maintained with hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

Two hydraulic structures are present at Basin B, the ductile iron and CMP primary spillway and a high-density polyethylene (HDPE) and CMP hydraulic structure located between Basin A (an adjacent CCR Unit) and Basin B. The stability and structural integrity of both spillways, which pass through the dikes of Basin B, were evaluated using design drawings, operational and maintenance procedures, closed-circuit television (CCTV) pipe inspections, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of Basin B.

The CCTV pipe inspection of both spillways covered their complete length and found the pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structures. Therefore, Basin B meets the requirements in §257.73(d)(1)(vi).

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

CCR unit designed, constructed, operated, and maintained with, for CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The structural stability of the downstream slopes of Basin B was evaluated by comparing the location of Basin B relative to adjacent water bodies using published Federal Emergency Management Agency Flood Insurance Rate Maps, aerial imagery, and conditions observed in the field by AECOM.

Based on this evaluation, the Ohio River is adjacent to the southern downstream slopes of Basin B. No other downstream rivers, streams, or lakes are adjacent to the downstream slopes of Basin B. A sudden drawdown slope stability analysis was performed at three cross-sections identified as critical for sudden drawdown slope stability. The analysis considered drawdown of the pool in the Ohio River from the 100-year flood condition (El. 490 feet) to an empty pool condition, which thereby is an evaluation of both sudden drawdown and low pool conditions. The resulting factors of safety were found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from food to normal pool, as factor of safety criteria for sudden drawdown slope stability is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, Basin B meets the requirements listed in §257.73(d)(1)(vii).

3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin B

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A MODEER JR

Printed Name

10/13/16

Date

STATE OF OHIO
VICTOR A. MODEER JR
PE.79465
REGISTERED
PROFESSIONAL ENGINEER

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ATTACHMENT 10 – SAFETY FACTOR ASSESSMENT

AECOM

Submitted to
Miami Fort Power Station
11080 Brower Road
North Bend, OH 45052

Submitted by
AECOM
1001 Highlands Plaza Drive West
Suite 300
St. Louis, MO 63110

October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Basin A

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin A at the Miami Fort Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). Basin A is located near North Bend, Ohio in Hamilton County, approximately 0.2 miles west of the Miami Fort Power Station. Basin A serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin A is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the initial safety factor assessment for an existing CCR surface impoundment be completed by October 17, 2016.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial safety factor assessment meets the requirements of 40 CFR § 257.73(e). The owner or operator must prepare a safety factor assessment every five years.

2 Initial Safety Factor Assessment

40 CFR §257.73(e)(1)

The owner or operator must conduct initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.

(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.

(iii) The calculated seismic factor of safety must equal or exceed 1.00.

(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

A geotechnical investigation program and stability analyses were performed to evaluate the design, performance, and condition of the earthen dikes of Basin A. The exploration consisted of hollow-stem auger borings, cone penetration tests, and laboratory program including strength and index testing. Data collected from the geotechnical investigation, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents were utilized to perform the safety factor assessment and geotechnical analyses.

In general, the subsurface conditions at Basin A consist of medium stiff to very stiff lean clay embankment fill, overlying very soft to very stiff alluvial clay, overlying very soft to very stiff alluvial silts and silty clays, which in turn overlies medium dense sand and gravel. The phreatic surface in the subsurface is typically at or slightly above the embankment/foundation interface.

Four (4) representative cross sections were analyzed using limit equilibrium slope stability analysis software to evaluate stability of the perimeter dike system and foundations. The cross sections were located to represent critical surface geometry, subsurface stratigraphy, and phreatic conditions across the site. Each cross section was evaluated for each of the loading conditions stipulated in §257.73(e)(1).

The Soils Susceptible to Liquefaction loading condition, §257.73(e)(1)(iv), was not evaluated because a liquefaction susceptibility evaluation did not find soils susceptible to liquefaction within the Basin A dikes. As a result, this loading condition is not applicable to the Basin A dikes at the Miami Fort Power Station.

Results of the Initial Safety Factor Assessments for the critical cross-section for each loading condition (i.e., the lowest calculated factor of safety out of the cross sections analyzed for each loading condition), are listed in **Table 1**.

Table 1 – Summary of Initial Safety Factor Assessments

Loading Conditions	§257.73(e)(1) Subsection	Minimum Factor of Safety	Calculated Factor of Safety
Maximum Storage Pool Loading	(i)	1.50	1.63
Maximum Surcharge Pool Loading	(ii)	1.40	1.63
Seismic	(iii)	1.00	1.18
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, Basin A meets the requirements in §257.73(e)(1).

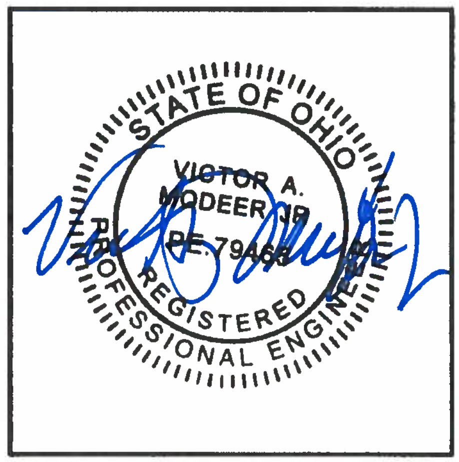
3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin A

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial safety factor assessment dated October 13, 2016 meets the requirements of 40 CFR §257.73(e).

VICTOR A MODEER JR
Printed Name

10/13/16
Date



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Submitted to
Miami Fort Power Station
11080 Brower Road
North Bend, OH 45052

Submitted by
AECOM
1001 Highlands Plaza Drive West
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October 2016

CCR Rule Report: Initial Safety Factor Assessment

For

Basin B

At Miami Fort Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin B at the Miami Fort Power Station meets the safety factor assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e). Basin B is located near North Bend, Ohio in Hamilton County, approximately 0.4 miles west of the Miami Fort Power Station. Basin B serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin B is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the initial safety factor assessment for an existing CCR surface impoundment be completed by October 17, 2016.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial safety factor assessment meets the requirements of 40 CFR § 257.73(e). The owner or operator must prepare a safety factor assessment every five years.

2 Initial Safety Factor Assessment

40 CFR §257.73(e)(1)
The owner or operator must conduct initial and periodic safety factor assessments for each CCR unit and document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors specified in (e)(1)(i) through (iv) of this section for the critical cross section of the embankment. The critical cross section is the cross section anticipated to be the most susceptible of all cross sections to structural failure based on appropriate engineering considerations, including loading conditions. The safety factor assessments must be supported by appropriate engineering calculations.

(i) The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
(ii) The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
(iii) The calculated seismic factor of safety must equal or exceed 1.00.
(iv) For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

A geotechnical investigation program and stability analyses were performed to evaluate the design, performance, and condition of the earthen dikes of Basin B. The exploration consisted of hollow-stem auger borings, cone penetration tests, and laboratory program including strength and index testing. Data collected from the geotechnical investigation, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents were utilized to perform the safety factor assessment and geotechnical analyses.

In general, the subsurface conditions at the Basin B consist of compacted ash embankment fill with a lean clay cover, overlying very soft to very stiff alluvial clay, overlying very soft to very stiff alluvial silts and silty clays, which in turn overlies medium dense sand and gravel. The phreatic surface in the subsurface is typically above the embankment/foundation interface.

Four (4) representative cross sections were analyzed using limit equilibrium slope stability analysis software to evaluate stability of the perimeter dike system and foundations. The cross sections were located to represent critical surface geometry, subsurface stratigraphy, and phreatic conditions across the site. Each cross section was evaluated for each of the loading conditions stipulated in §257.73(e)(1).

The Soils Susceptible to Liquefaction loading condition, §257.73(e)(1)(iv), was not evaluated because a liquefaction susceptibility evaluation did not find soils susceptible to liquefaction within the Basin B dikes. As a result, this loading condition is not applicable to the Basin B dikes at the Miami Fort Power Station.

Results of the Initial Safety Factor Assessments for the critical cross-section for each loading condition (i.e., the lowest calculated factor of safety out of the cross sections analyzed for each loading condition) are listed in **Table 1.**.

Table 1 – Summary of Initial Safety Factor Assessments

Loading Conditions	§257.73(e)(1) Subsection	Minimum Factor of Safety	Calculated Factor of Safety
Maximum Storage Pool Loading	(i)	1.50	2.07
Maximum Surcharge Pool Loading	(ii)	1.40	2.07
Seismic	(iii)	1.00	1.54
Soils Susceptible to Liquefaction	(iv)	1.20	Not Applicable

Based on this evaluation, Basin B meets the requirements in §257.73(e)(1).

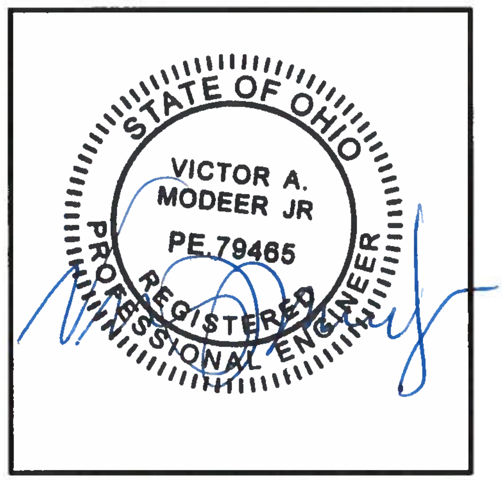
3 Certification Statement

CCR Unit: Miami Fort Power Station; Basin B

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial safety factor assessment dated October 13, 2016 meets the requirements of 40 CFR §257.73(e).

VICTOR A MODEER JR.
Printed Name

10/13/16
Date



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ATTACHMENT 11 – AMENDED CLOSURE PLAN (SEPTEMBER 2020)

ADDENDUM NO. 1
MIAMI FORT POND SYSTEM CLOSURE PLAN

This Addendum No. 1 to the Closure Plans for Existing Coal Combustion Residuals (CCR) Impoundments for Basins A and B (Pond System) at the Miami Fort Power Station, Revision 0 – October 17, 2016 has been prepared to meet the requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) Section 257.103(f)(2)(v)(D) as a component of the demonstration that the Miami Fort Pond System qualifies for a site-specific alternative deadline to initiate closure due to permanent cessation of a coal-fired boiler by a certain date.

In May of 2020, the Pond System Groundwater Monitoring System Certification, Rev 0 was prepared and the Miami Fort Statistical Method Certification, Revision 1 was updated to reflect the characterization of the Miami Fort Pond System (Basins A and B) as a single multi-unit system for purposes of groundwater monitoring and closure activities.

The Miami Fort Pond System will begin construction of closure and cease receipt and placement of CCR and non-CCR wastestreams no later than June 17, 2027 as indicated in the Miami Fort Power Station Alternative Closure Demonstration dated September 29, 2020. Closure will be completed by October 17, 2028 within the 5-year timeframe included in the Closure Schedule identified in the Miami Fort Pond System Closure Plans (Basin A and Basin B) in accordance with 40 C.F.R. § 257.102(f)(ii).

All other aspects of the Closure Plans remain unchanged.

CERTIFICATION

I, Nicole M. Pagano, a Qualified Professional Engineer in good standing in the State of Ohio, certify that the information in this addendum 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: 9/29/2020

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