2021 USEPA CCR RULE OPERATING RECORD PERIODIC CERTIFICATION REPORT

§257.73(a)(2)-(3), (c), (d[1]), (e) and §257.82

MIAMI FORT POND SYSTEM

Miami Fort Power Plant

North Bend, Ohio

Submitted to

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[1] Except for §257.73(d)(1)(vi).

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EXECUTIVE SUMMARY

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residuals (CCR) Rule [1] certification report (Periodic Certification Report) for the Miami Fort Pond System (MFPS), which comprises of Basin A and Basin B at the Miami Fort Power Plant (MIA) (also known as Miami Fort Power Station) has been prepared in accordance with Rule 40, Code of Federal Regulations (CFR) §257 herein referred to as the "CCR Rule" [1]. The CCR Rule requires that initial certifications for existing CCR surface impoundment, completed in 2016 and subsequently posted on the Miami Fort Power Company, LLC (MFPC) CCR Website ([2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13]) be updated on a five-year basis. For this certification report, MFPS is a single, multi-cell system that comprises of Basin A and Basin B.

The initial certification reports developed in 2016 and 2017 for Basin A and Basin B ([3], [6], , [9], [11], [13]) were independently reviewed by Geosyntec. Additionally, field observations, interviews with plant staff, updated engineering analyses, and evaluations were performed to compare conditions in 2021 at the MFPS relative to the 2016 and 2017 initial certifications. These tasks determined that updates are not required for the Initial Hazard Potential Classification However, due to changes at the site and technical review comments, updates were required and were performed for the:

- History of Construction Report,
- Emergency Action Plan;
- Initial Structural Stability Assessment,
- Initial Safety Factor Assessment, and
- Initial Inflow Design Flood Control System Plan.

Geosyntec's evaluations of the initial certification reports and updated analyses identified that the MFPS meets all requirements for hazard potential classification, history of construction reporting, emergency action plan, structural stability, safety factor assessment, and inflow design flood control system planning, with the exception of the structural integrity of hydraulic structures (§257.73(d)(1)(vi)), which was not included in the scope of this report. **Table 1** provides a summary of the initial 2016 certifications and the updated 2021 periodic certifications.

Table 1 – Periodic Certification Summary

	CCR Rule Reference	Requirement Summary	2016 Initial Certification		2021 Periodic Certification	
			Requirement Met?	Comments	Requirement Met?	Comments
Hazard Potential Classification						
3	§257.73(a)(2)	Document hazard potential classification	Yes	Impoundment was determined to have Significant hazard potential classification [2], [3]	Yes	Updates were not determined to be necessary. Geosyntec recommends retaining the Significant hazard potential classifications.
Emergency Action Plan						
4	§257.73(a)(3)(iv)	Prepare written Emergency Action Plan	Yes	A written Emergency Action Plan was prepared [4].	Yes	An updated Emergency Action Plan was prepared and is provided in **Attachment C**.
History of Construction						
5	§257.73(c)(1)	Compile a history of construction	Yes	A History of Construction report was prepared for Basin A and Basin B [5].	Yes	A letter listing updates to the History of Construction report is provided in **Attachment D**.
Structural Stability Assessment						
6	§257.73(d)(1)(i)	Stable foundations and abutments	Yes	Foundations were found to be stable. Abutments are not present ([6], [7]).	Yes	Foundations and abutments were found to be stable after performing updated slope stability analyses.
	§257.73(d)(1)(ii)	Adequate slope protection	Yes	Slope protection is adequate ([6], [7]).	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(iii)	Sufficiency of embankment compaction	Yes	Embankment compaction is sufficient for expected ranges in loading conditions ([6], [7]).	Yes	Dike compaction was found to be sufficient after performing updated slope stability analyses.
	§257.73(d)(1)(iv)	Presence and condition of slope vegetation	Yes	Vegetation is present on interior and exterior slopes and is maintained ([6], [7]).	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(v)(A) and (B)	Adequacy of spillway design and management	Yes	Spillways are adequately designed and constructed to adequately manage flow during the 1000-year flood ([6], [7]).	Yes	Spillways were found to be adequately designed and constructed and are expected to adequately manage flow during the 1,000-year flood, after performing updated hydrologic and hydraulic analyses.
	§257.73(d)(1)(vi)	Structural integrity of hydraulic structures	Yes	Hydraulic structures penetrating the embankments maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation and debris ([6], [7]).	Periodic certification of §257.73(d)(1)(vi) was not included in the scope of this report.	
	§257.73(d)(1)(vii)	Stability of downstream slopes inundated by water body.	Yes	Downstream slopes adjacent to the Ohio River are expected to remain stable during inundation ([6], [7]).	Yes	Downstream slopes inundated by water body were found to be stable after performing updated slope stability analyses.
Safety Factor Assessment						
7	§257.73(e)(1)(i)	Maximum storage pool safety factor must be at least 1.50	Yes	Safety factors were calculated to be 1.63 and higher [10]. Safety factors were calculated to be 2.07 and higher [11].	Yes	Safety factors from updated slope stability analyses were calculated to be 1.63 and higher.
	§257.73(e)(1)(ii)	Maximum surcharge pool safety factor must be at least 1.40	Yes	Safety factors were calculated to be 1.63 and higher [10]. Safety factors were calculated to be 2.07 and higher [11].	Yes	Safety factors from updated slope stability analyses were calculated to be 1.63 and higher.
	§257.73(e)(1)(iii)	Seismic safety factor must be at least 1.00	Yes	Safety factors were calculated to be 1.18 and higher [10]. Safety factors were calculated to be 1.54 and higher [11].	Yes	Safety factors from updated slope stability analyses were calculated to be 1.18 and higher.
	§257.73(e)(1)(iv)	For embankment construction of soils that have susceptible to liquefaction, safety factor must be at least 1.20	Not Applicable	Embankment soils were not susceptible to liquefaction ([10], [11]).	Not Applicable	No changes were identified that may affect this requirement.
Inflow Design Flood Control System Plan						
8	§257.82(a)(1), (2), (3)	Adequacy of inflow design control system plan.	Yes	Flood control system adequately managed inflow and peak discharge during the 1,000-year, 24-hour, Inflow Design Flood ([12], [13]).	Yes	The flood control system was found to adequately manage inflow and peak discharge during the 1,000, 24-hour, Inflow Design Flood, after performing updated hydrologic and hydraulic analyses.
	§257.82(b)	Discharge from CCR Unit	Yes	Discharge from the CCR Unit is routed through a NPDES-permitted outfall during both (PMP/1000-year), 24-hour Inflow Design Flood conditions ([12], [13]).	Yes	Discharge from the CCR Unit is routed through a NPDES-permitted outfall during both (PMP/1000-year), 24-hour Inflow Design Flood conditions, after performing updated hydrologic and hydraulic analyses.

SECTION 1

INTRODUCTION AND BACKGROUND

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residual (CCR) Rule [1] Certification Report was prepared by Geosyntec Consultants (Geosyntec) for Miami Fort Power Plant (MFPC) to document the periodic certification of the Miami Fort Pond System (MFPS) at the Miami Fort Power Plant (MPP), also known as the Miami Fort Power Station (MIA), located at 11021 Brower Road, North Bend, Ohio, 45052. The location of MPP is provided in **Figure 1**, and a site plan showing the location of the MFPS, is provided in **Figure 2**.

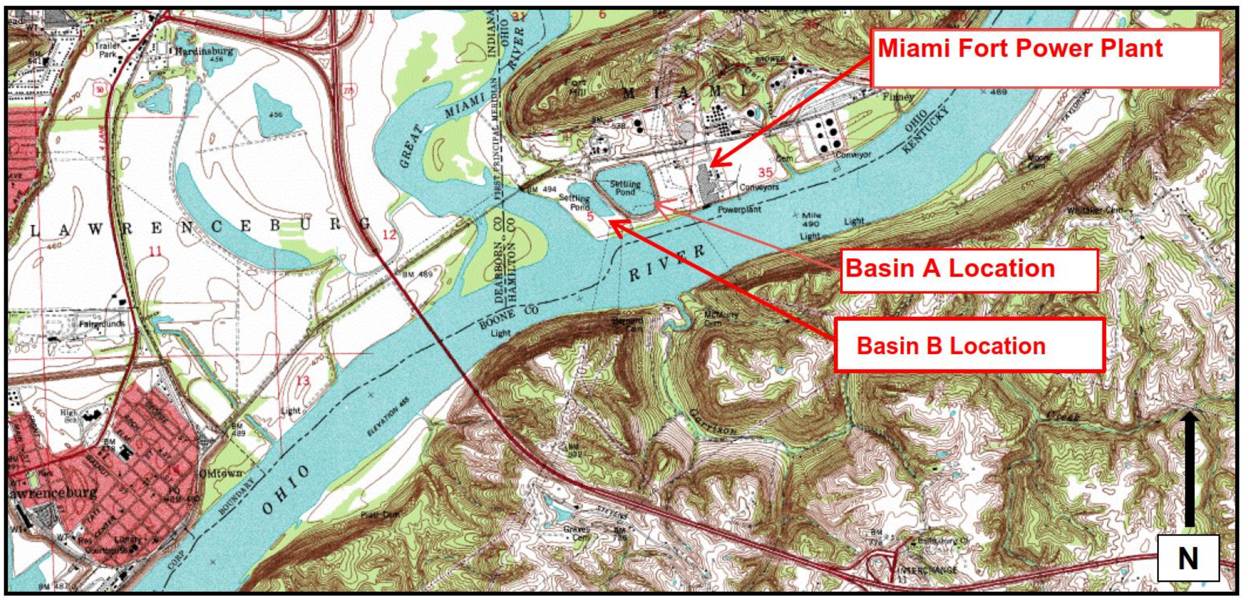

Figure 1 – Site Location Map (from AECOM, 2016)

Figure 2 – Site Plan (from Google Earth [14]**)**

1.1 MFPS Description

The Miami Fort Pond System is a single, multi-cell system that comprises of two basins referred to as Basin A and Basin B. These Basins operate in series and are hydraulically connected by a 40-inch HDPE pipe that runs through a shared separator dike.

Basin A and Basin B serve as wet ash impoundment basins. Water and ash are discharged into Basin A prior to flowing into Basin B, which serves as a settling pond. Basin A also receives stormwater inflow, miscellaneous non-CCR process water from MPP and limited amounts of mechanically stacked CCR. Ash was historically sluiced to Basin B; however, those operations have since ceased [6]. The two basins are effectively one basin system and treated as such.

All outflow is transferred from Basin A to Basin B through a 48-inch diameter corrugated metal pipe (CMP) that runs through a common embankment separating Basin A from Basin B. A 40-inch diameter high-density polyethylene (HDPE) pipe has been sliplined in the upstream pipe end and extends approximately 73 feet into the CMP. Basin B discharges to the Ohio River through a NPDES-permitted outfall via a riser structure [6]. The outfall structure consists of a vertical 36-inch ductile iron riser pipe with an invert elevation of 498 feet[1] with wood pole supports and a

[1] All elevations are in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

trash rack, which leads to a 42-inch buried CMP that ties into the buried inactive spillway of Basin A before discharging to the Ohio River [7].

An unused outfall structure is present in Basin A. The structure consists of vertical 36-inch HDPE riser pipe with wood pole supports and a trash rack, which leads to a 42-inch buried CMP that ties into the buried spillway of Basin B before discharging to the Ohio River via the site's NPDES-permitted outfall. Although this structure is currently not in use, it has not been formally abandoned, and was made inactive by extending the riser using fabricated aluminum plates and stoplogs that extend several feet above the normal pool level in Basin A. The riser is still open on the top and could potentially receive flow at high pool levels but is not activated during the Inflow Design Flood Control System Plan (see **Section 8**) [6].

The crest length of Basin A is approximately 4,500 feet, and the surveyed crest elevation ranges from 507 to 510 feet. Basin A has an area of approximately 30 acres. As currently operated, the normal pool of Basin A is 501.5 feet as controlled by the pipe within the embankment between Basin A and Basin B and plant process inflow. Interior slopes are constructed at 1.5H:1V (horizontal to vertical) to 2H:1V while exterior slopes are constructed at 2H:1V. The embankment consists of compacted clay and compacted CCR (bottom ash and/or fly ash) to serve as drainage blankets. Both interior and exterior slopes are covered in vegetation to protect the slopes against surface erosion. Exterior slope armoring consists of cobble to small boulder-sized concrete rubble and miscellaneous debris between approximate elevations of 471 feet to 478 feet at the toe of the south-facing side of Basin A [6].

Basin B has an area of approximately 20 acres. As currently operated, the normal pool elevation of Basin B is 499.4 feet, as controlled by the outfall riser structure and plant process inflow. The crest length of Basin B is approximately 4,000 feet and the crest elevation ranges from 506 to 511 feet. Interior slopes were constructed at a 2H:1V (horizontal: vertical) orientation while the exterior slopes were constructed at a 3H:1V orientation with a 12-ft wide midslope bench near El. 480 ft [7].

Initial certifications for the MFPS for Hazard Potential Classification (§257.73(a)(2)), the Emergency Action Plan (§257.73(a)(3)), History of Construction (§257.73(c)), Structural Stability Assessment (§257.73(d)), Safety Factor Assessment (§257.73(e)(1)), and Inflow Design Flood Control System Plan (§257.82) were completed by Stantec and AECOM in 2016 and 2017 and subsequently posted to MFPC's CCR Website ([2], [4], [5], [6], [8], [9], [10], [11], [12], [13]). Additional documentation for the initial certifications included detailed operating record reports containing calculations and other information prepared for the hazard potential classification by Stantec [3] and the for the structural stability assessment, safety factor assessment, and inflow design flood control system plan by AECOM [7]. These operating record reports were not posted to MFPC's CCR Website.

1.2 Report Objectives

These following objectives are associated with this report:

- Compare site conditions from 2015/2016, when the initial certifications were developed, to site conditions in 2020/2021, when data for the periodic certification was obtained, and evaluate if updates are required to the:
  - §257.73(a)(2) Hazard Potential Classification ([2], [3]);
  - §257.73(a)(3) Emergency Action Plan [4];
  - §257.73(c) History of Construction [5];
  - §257.73(d) Structural Stability Assessment ([8], [9]);
  - §257.73(e) Safety Factor Assessment ([10], [11]), and/or
  - §257.82 Inflow Design Flood Control System Plan ([12], [13]).
- Independently review the Hazard Potential Classification ([2], [3], [15], [16]), Emergency Action Plan [4], Structural Stability Assessment ([6], [7], [8], [9]), Safety Factor Assessment ([6], [7], [10], [11]), and Inflow Design Flood Control System Plan ([6], [7], [12], [13]) reports to determine if updates may be required based on technical considerations.
  - The History of Construction report [5] was not independently reviewed for technical considerations, as this report contained historical information primarily developed prior to promulgation of the CCR Rule [1] for the CCR units at MPP, and did not include calculations or other information used to certify performance and/or integrity of the impoundments under §257.73(a)(2)-(3), §257.73(c)-(e), or §257.82.
- If updates are required, they will be performed and documented within this report.
- Confirm that the MFPS meets all of the requirements associated with §257.73(a)(2)-(3), (c), (d), (e), and §257.82, or, if the MFPS does not meet all requirements, provide recommendations for compliance with these sections of the CCR Rule [1].

SECTION 2

COMPARISON OF INITIAL AND PERIODIC SITE CONDITIONS

2.1 Overview

This section describes the comparison of conditions at the MFPS between the start of the initial CCR certification program in 2015 and 2016 (initial conditions) and subsequent collection of periodic certification site data in 2020 and 2021 (periodic conditions).

2.2 Review of Annual Inspection Reports

Annual onsite inspections for the MFPS were performed between 2016 and 2020 ([17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28]) and were certified by a licensed professional engineer in accordance with §257.83(b). Each inspection report stated the following information, relative to the previous inspection:

- A statement that no changes in geometry of the impounding structure were observed since the previous inspection;
- Information on maximum recorded instrumentation readings and water levels;
- Approximate volumes of impounded water and CCR at the time of inspection;
- A statement that no appearances of actual or potential structural weakness or other disruptive conditions were observed; and
- A statement that no other changes which may have affected the stability or operation of the impounding structure were observed.

In summary, the reports did not indicate any significant changes to the MFPS between 2015 and 2020. No signs of instability, structural weakness, or changes which may have affected the operation or stability of the MFPS were noted in the inspection reports.

2.3 Review of Instrumentation Data

Eight piezometers, B-A-1111, B-A-1112, B-B-1103, B-B-1104, B-B1105, B-B-1106, B-001, and B-002 are present at the MFPS and were monitored by MPP between January 1, 2015 and May 5, 2021 [29]. Geosyntec reviewed the piezometer data to evaluate if significant fluctuations, partial increases in phreatic levels, may have occurred between development of the initial structural stability and factor of safety certifications ([6], [7], [8], [9], [10], [11]) and May 5, 2021. Available piezometer readings are plotted in **Attachment A**.

From the available piezometric measurements it can be inferred that phreatic levels have increased, up to 13 ft, for some areas of the dikes. These changes indicate different phreatic levels than those utilized for the initial structural stability and factor of safety certifications ([6], [7], [8], [9], [10], [11]).

2.4 Comparison of Initial to Periodic Surveys

The initial survey of the MFPS, conducted by ESP Associates, P.A. (ESP) in 2015 [30], was compared to the periodic survey of the MFPS, conducted by IngenAE, LLC (IngenAE) in 2020 [31], using AutoCAD Civil3D 2021 software. This comparison quantified changes in the volume of CCR placed within the MFPS and considered volumetric changes above and below the starting water surface elevation (SWSE) used for the 2016 §257.82 inflow design flood control plan hydraulic analysis ([6], [7]). Potential changes to embankment geometry were also evaluated. This comparison is presented in a plan view isopach map denoting changes in ground surface elevations in **Drawing 1,** and a plan view isopach map denoting changes in ground surface elevation in **Drawing 2**. A summary of the water elevations and changes in CCR volumes are provided in **Table 2** and **Table 3** for Basin A and Basin B, respectively.

Table 2 – Initial to Periodic Survey Comparison – Basin A

Initial Surveyed Pool Elevation (ft)	501.3
Periodic Surveyed Pool Elevation (ft)	501.3
Initial §257.82 Starting Water Surface Elevation (SWSE) (ft)	501.5
Total Change in CCR Volume (CY)	31,733[2]
Change in CCR Volume Above SWSE (CY)	14,133
Change in CCR Volume Below SWSE (CY)	17,600

Table 3 – Initial to Periodic Survey Comparison – Basin B

Initial Surveyed Pool Elevation (ft)	499.1
Periodic Surveyed Pool Elevation (ft)	499.1
Initial §257.82 Starting Water Surface Elevation (SWSE) (ft)	499.4
Total Change in CCR Volume (CY)	27,694
Change in CCR Volume Above SWSE (CY)	1,729
Change in CCR Volume Below SWSE (CY)	25,965

The comparison indicated that approximately a net of approximately 16,000 cubic yards (CY) of CCR was placed above the SWSE in the MFPS between the initial and periodic surveys, thereby leading to a potential for the peak water surface elevation (PWSE) to increase during the inflow design 1,000-year flood event. No significant changes to embankment geometry appeared to have occurred between the initial and periodic surveys.

[2] Positive values indicate net fill, negative values indicate net cut.

2.5 Comparison of Initial to Periodic Aerial Photography

Initial aerial photographs of the MFPS sourced from Google Earth in 2015 [14] were compared to periodic aerial photographs collected by ESP in 2021 [30] to visually evaluate if potential site changes (i.e., changes to the embankment, outlet structures, limits of CCR, other appurtenances) may have occurred. A comparison of these aerial photographs is provided in **Drawing 3**, and the following changes were identified:

- General grading of the bottom ash and dry material handling area within Basin A is changed because of observed relocations and handling of stockpiles;
- No changes observed to the geometry of the perimeter or interior embankments; and
- Some maintenance dredging of accumulated sediment at the mouth of Basin B inlet pipe from Basin A is observed.

2.6 Comparison of Initial to Periodic Site Visits

An initial site visit to the MFPS was conducted by AECOM in 2015 and documented with a Site Visit Summary and corresponding photographs ([32], [33]). A periodic site visit was conducted by Geosyntec on June 03, 2021, with Mr. Panos Andonyadis, P.E. conducting the site visit. The site visit was intended to evaluate potential changes at the site since the initial certifications were prepared (i.e., modification to the embankment, outlet structures or other appurtenances, limits of CCR, maintenance programs, repairs), in addition to performing visual observations of the MFPS to evaluate if the structural stability requirements (§257.73(d)) were still met. The site visit included walking the perimeter of the MFPS, visually observing conditions, recording filed notes, and collecting photographs. The site visit is documented in a photographic log provided in **Attachment B**. A summary of significant findings from the periodic site visit is provided below:

- The perimeter and interior embankments appear to be structurally stable as no signs of structural or foundation instability were observed
- The perimeter and interior embankments appear to have adequate vegetative cover with only isolated locations demonstrating signs of erosion that are planned for maintenance before October 2021.
- No significant changes were observed since the previous certification.

2.7 Interview with Power Plant Staff

An interview with Mr. Trevor Tallent and Ms. Desiree Loveless of MPP a was conducted by Mr. Panos Andonyadis, P.E. of Geosyntec on June 03, 2021. Mr. Tallent was employed at MPP between 2020 and 2021 and Ms. Loveless was MPP's parent company between 2015 and 2021. The interview included a discussion of included a discussion of potential changes that that may have occurred at the MFPS since development of the initial certifications ([2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13]). A summary of the interview is provided below.

- Were any construction projects completed for the MFPS since 2015, and, if so, are design drawings and/or details available?
    - No new construction projects were completed since 2015.
- Were there any changes to the purpose of the MFPS since 2015?
    - No new changes to the purpose of the MFPS basins or MPP since 2015.
- Were there any changes to the instrumentation program and/or physical instruments for the MFPS since 2015?
    - No changes in the instrumentation program for monitoring the MFPS embankments.
- Have area-capacity curves for the MFPS been prepared since 2015?
    - No.
- Were there any changes to spillways and/or diversion features for the MFPS completed since 2015?
    - No.
- Were there any changes to construction specifications, surveillance, maintenance, and repair procedures for the MFPS since 2015?
    - No.
- Were there any instances of embankment and/or structural instability for the MFPS since 2015?
    - In 2018 a seep was observed in the southern embankment of Basin B, on the downstream side. The seep was investigated and a damaged drainage pipe for the toe drainage system was uncovered and repaired.
- Are updates required to Initial Emergency Action Plan for the MPP [4], including, but not limited to, plant and site staff roles/responsibilities, contact information, emergency equipment and material sources, emergency preparedness information, or other portions of the Initial emergency Action Plan?

- The plan will need to be updated with new personnel information.

SECTION 3

HAZARD POTENTIAL CLASSIFICATION - §257.73(a)(2)

3.1 Overview of Initial HPC

The Initial Hazard Potential Classification (Initial HPC) was prepared by Stantec Consulting Services, Inc. (Stantec) in 2016 ([2], [3], [15], [16]), following the requirements of §257.73(a)(2). The Initial HPC included the following information:

- A visual analysis of potential hazards associated with a failure of the MFPS perimeter embankment.
- A dam breach analysis was completed for the eastern dike of Basin A.
- A dam breach analysis was completed for the northern, western and southern dikes of Basin B.
- Evaluation of potential breach flow paths were evaluated using elevation data and aerial imagery to evaluate potential impacts to downstream structures, infrastructure, frequently occupied facilities/areas, and waterways ([2], [3]).
- While a breach map is not included within the Initial HPC, it is included within the §257.73(a)(3) Initial Emergency Action Plan (Initial EmAP) [4].

The visual analysis indicated that none of the breach scenarios for Basin A or Basin B appeared to impact occupied structures. The Initial HPC concluded that a breach would not be likely to result in a probable loss of human life, although a breach could cause CCR to be released into the Ohio River and/or Greater Miami River, thereby causing environmental damage. The Initial HPC therefore recommended a "Significant" hazard potential classification for both Basin A and Basin B of the MFPS ([2], [3], [15], [16]).

3.2 Review of Initial HPC

Geosyntec performed a review of the Initial HPC ([2], [3], [15], [16]), in terms of technical approach, input parameters, assessment of the results, and applicable requirements of the CCR Rule [1]. No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed.

3.3 Summary of Site Changes Affecting Initial HPC

Geosyntec did not identify any changes at the site that may affect the HPC. No new structures, infrastructure, frequently occupied facilities/areas, or waterways were present in the probable breach area indicated in the Initial EmAP [4]. Additionally, no significant changes to the topography in the probable breach were identified.

3.4 Periodic HPC

Geosyntec recommends retaining the "Significant" hazard potential classification for the MFPS, per §257.73(A)(2), based on the lack of site changes potentially affecting the Initial HPC occurring since the initial HPC was developed, as described in **Section 3.3**, and the lack of significant review comments, as described in **Section 3.2**. Updates to the Initial HPC reports ([2], [3], [15], [16]) are not recommended at this time.

SECTION 4

EMERGENCY ACTION PLAN - §257.73(a)(3)

4.1 Overview of Initial EmAP

The Initial EmAP was prepared by Stantec in 2017 [4], following the requirements of §257.73(a)(3). The Initial EmAP included the following information:

- A statement of purpose,
- Site maps showing the location of the MFPS,
- Communication procedures for various response levels,
- A notification flowchart,
- A process decision tree,
- Contact information and roles/responsibilities for MPP personnel,
- Contact information and roles/responsibilities for both local and state emergency responders,
- A summary of dam safety events and response levels,
- Recommended actions for dam-safety related conditions,
- Tables describing how to procure emergency supplies and equipment,
- A description of the MFPS, and
- A map of the expected breach area.

4.2 Review of Initial EmAP

Geosyntec performed a review of the Initial EmAP [4] in terms of approach, being up-to-date, and completeness. The review included the following tasks:

- Reviewing of appropriateness of event triggers for emergency response,
- Reviewing data in the EmAP for consistency with the HPC,

- Reviewing listed emergency management agencies for appropriateness based on the location of the CPRP, and

- Reviewing the contents vs. the applicable CCR Rule requirements [1].

During the review inconsistencies were observed in the technical information about the MFPS and its basins, including the technical and statistical information in Section 6 and Table 6-1 of the EmAP, relative to the information included within the Initial SSA, SFA, and IDF.

4.3 Summary of Site Changes Affecting the Initial EmAP

Several changes at the site were that occurred after development of the Initial EmAP were identified. These changes required an update to the Initial EmAP [4] are described below:

- Changes in onsite staff with the responsibility of managing the MFPS and other CCR surface impoundments at MPP have occurred.

- Contact information for local and state emergency management agencies and sources for equipment and emergency response materials may be outdated.

4.4 Periodic EmAP

The EmAP was updated with updated position titles and personnel contact information. The Periodic EmAP for MFPC is provided in **Attachment C**.

SECTION 5

HISTORY OF CONSTRUCTION REPORT - §257.73(c)

5.1 Overview of Initial HoC

The Initial History of Construction report (Initial HoC) was prepared by AECOM in 2016 [5], following the requirements of §257.73(c), and included information on the MFPS at MPP. The Initial HoC included the following information for each CCR surface impoundment:

- The name and address of the owner/operator,
- Location maps,
- Statements of purpose,
- The names and size of the surrounding watershed,
- A description of the foundation and abutment materials,
- A description of the embankment materials,
- Approximate dates and stages of construction,
- Available design and engineering drawings,
- A summary of instrumentation,
- A statement that area-capacity curves are not available,
- Information on spillway structures,
- A statement that the original construction specifications for MFPS are not available,
- Construction specifications for MFPS modifications,
- Inspection and surveillance plans,
- Information on operational and maintenance procedures, and
- A statement that historical structural instability had not occurred at any of the CCR surface impoundments.

5.2 Summary of Site Affecting the Initial HoC

A couple material changes at the site occurred after development of the initial HoC report were identified.

- The CCR unit name changed from Basin A and Basin B to the Miami Fort Pond System.
- The area-capacity curves and spillway design calculations were revised for the MFPS and prepared as part of the updated periodic Inflow Design Flood Control System Plan, as described in **Section 8.4**.

A letter documenting these changes to the HoC report is provided in **Attachment D**.

SECTION 6

STRUCTURAL STABILITY ASSESSMENT - §257.73(d)

6.1 Overview of Initial SSA

The Initial Structural Stability Assessment (Initial SSA) was prepared by AECOM in 2016 ([6], [7], [8], [9]), following the requirements of §257.73(d)(1), and included the following evaluations:

- Stability of embankment foundations, embankment abutments, slope protection, embankment compaction, and slope vegetation,
- Spillway stability including capacity, structural stability and integrity; and
- Downstream slope stability under sudden drawdown conditions for a downstream water body.

The Initial SSA concluded that the MFPS met all structural stability requirements for §257.73(d)(1)(i)-(vii).

The Initial SSA referenced the results of the Initial Structural Factor Assessment (Initial SFA) ([6], [7], [8], [9]) to demonstrate stability of the stability of foundations and abutments (§257.73(d)(1)(i)) and sufficiency of dike compaction (§257.73(d)(1)(iii)) portions of the SSA criteria. This included stating that slope stability analyses for slip surfaces passing through the foundation met or exceeded the criteria listed in §257.73(e)(1), for the stability of foundations and abutments. For the sufficiency of dike compaction, this included stating that slope stability analyses for slip surfaces passing through the dike also met or exceeded the §257.73(e)(1) criteria.

Additionally, the Initial SSA included a sudden drawdown slope stability analysis to evaluate the effect of a drawdown event in the adjacent Ohio River from the 100-year flood pool (El. 505 ft) to an empty-pool condition, as required by §257.73(3)(1)(vii) for CCR units where the downstream slopes are inundated by an adjacent water body. The minimum acceptable factor of safety for this loading condition was assumed to be 1.3 based on US Army Corps of Engineers guidance [34].

6.2 Review of Initial SSA

Geosyntec performed a review of the Initial SSA ([6], [7] [8], [9]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing photographs collected in 2015 and used to demonstrate compliance with §257.73(d)(1)(i)-(vii).

- Reviewing geotechnical calculations used to demonstrate the stability of foundations, per §257.73(d)(1)(i) sufficiency of embankment compaction, per §257.73(d)(1)(iii), and sudden drawdown stability, per §257.73(d)(1)(vii), in terms of supporting geotechnical investigation and testing data, input parameters, analysis methodology, selection of critical cross-sections, and loading conditions.

- Completeness and technical approach of closed-circuit television (CCTV) inspections used to evaluate the stability of hydraulic structures, per §257.73(d)(1)(vi).

No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed.

6.3 Summary of Site Changes Affecting Initial SSA

A number of changes at the site that occurred after development of the Initial SSA were identified. These changes will require updates to the Initial SSA. Each change and the recommended updates to the Initial SSA ([6], [7] [8], [9]).

- Initial SSA utilized the results of the Initial Inflow Design Flood Control System Plan (IDF) to demonstrate compliance with the adequacy of spillway design and management (§257.73(d)(1)(v)(A)-(B)). The Initial IDF was subsequently updated to develop a Periodic IDF, based on site changes, as discussed in **Section 8**.

  The Initial SSA utilized the slope stability analysis results of the Initial (SFA) as part of the compliance demonstration for the stability of foundations and abutments (§257.73(d)(1)(i)) and sufficiency of dike compaction (§257.73(d)(1)(iii)) as discussed in **Section 6.1**. The Initial SSA also utilized sudden drawdown slope stability analyses performed using the same cross-sections and input data as the Initial SFA to demonstrate compliance with downstream slope inundation/stability (§257.73(d)(1)(vii). The Initial SFA slope stability analyses, including the sudden drawdown analyses, were subsequently updated to develop a Periodic SFA, based on site changes, as discussed in **Section 7.**

6.1 Periodic SSA

The Periodic SFA (**Section 7**) indicates that foundations and abutments are stable and dike compaction is sufficient for expected ranges in loading conditions, as slope stability factors of safety were found to meet or exceed the requirements of §257.73(e)(1), including for static maximums storage pool conditions and post-earthquake (i.e., liquefaction) loading conditions considering seismically-induced strength loss in the foundation soils and sudden drawdown conditions in the adjacent Ohio River. Therefore, the requirements of §257.73(d)(1)(i), §257.73(d)(1)(iii), and (§257.73(d)(1)(vii) are met for the Periodic SSA.

The Periodic IDF (**Section 8**) indicates that spillways are adequately designed and constructed to adequately manage flow during the 1,000-year flood, as the spillways can adequately manage flow during peak discharge from the 1,000-year storm event without overtopping of the embankments. Therefore, the requirements of §257.73(d)(1)(v)(A)-(B) are met for the Periodic SSA.

Periodic inspection and certification of the hydraulic structures per 257.73(d)(1)(vi) was not included in the scope of this certification report.

SECTION 7

SAFETY FACTOR ASSESSMENT - §257.73(e)(1)

7.1 Overview of Initial SFA

The Initial Safety Factor Assessment (Initial SFA) was prepared by AECOM in 2016 ([6], [7], [10], [11]), following the requirements of §257.73(e)(1). The Initial SFA included the following information:

- A geotechnical investigation program with in-situ and laboratory testing;
- An assessment of the potential for liquefaction in the embankment and foundation soils;
- The development of two slope stability cross-sections for limit equilibrium stability analysis utilizing GeoStudio SLOPE/W software; and
- The analysis of both cross-sections for maximum storage pool, maximum surcharge pool, and seismic loading conditions.
- Liquefaction loading conditions were not evaluated as liquefaction-susceptible soil layers were not identified in the either the embankments or foundation soils.

The Initial SFA concluded that the MFPS met all safety factor requirements, per §257.73(e), as all calculated safety factors were equal to or higher than the minimum required values.

7.2 Review of Initial SFA

Geosyntec performed a review of the Initial SFA ([6], [7], [10], [11]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing geotechnical calculations used to demonstrate the acceptable safety factors, per §257.73(e)(1), in terms of:
  - Completeness and adequacy of supporting geotechnical investigation and testing data;
  - Completeness and approach of liquefaction triggering assessments; and
  - Input parameters, analysis methodology, selection of critical cross-sections, and loading conditions utilized for slope stability analyses.

  - Phreatic conditions based on piezometric data collected between January 1, 2015 and May 5, 2021, as discussed in **Section 2.3**.

No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed.

7.3 Summary of Site Changes Affecting the Initial SFA

Several changes that occurred after development of the Initial SFA ([6], [10], [7], [11]) were identified and . These changes required updates to the Initial SFA and are described below:

- Groundwater levels in piezometers were approximately 13 feet higher than levels assumed for slope stability analyses within the Initial IDF (see **Section 2.3**).

- The Periodic (IDF) (**Section 8**) found that the peak and normal pool elevation within the MFPS changed slightly for Basin A and Basin B (see **Table 4**), thereby resulting in differing levels of water loading on the embankment dikes than were considered in the Initial SFA.

7.4 Periodic SFA

Geosyntec revised existing slope stability analyses associated with the Initial SFA ([6], [7], [10], [11]) to account for observed higher piezometric levels, as described in **Section 2.3.** In addition, the normal pool and surcharge pool levels in these models were updated based on the Periodic IDF results as described in **Sections 8.2** and **8.3**. This included revising the slope stability analyses evaluating sudden drawdown conditions in the adjacent Ohio River that were utilized as part of the Initial SSA (**Section 6**). The following approach and input data were used to revise the analyses:

- The update of piezometric levels was applicable to two of the cross-sections at Basin B i.e., cross-sections (1) and (3), out of seven cross-sections analyzed by Initial SFA for both Basin A and basin B. Additionally, the maximum storage pool and maximum surcharge pool levels were updated in these models based on the updated IDF results.

- The Initial SFA utilized the GeoStudio 2007 software package [35]. This software package is no longer supported by GeoStudio, and licensing was unavailable to update the Initial SFA analyses within GeoStudio 2007. Therefore, the analysis was updated to utilize GeoStudio 2012 software [36], for which licensing was available.

- The Initial SFA utilized a finite-element seepage analysis to estimate pore pressures for the slope stability analysis. This finite-element seepage analysis was removed and piezometric conditions were represented with a piezometric line. The location of the piezometric line was based on observed upper end piezometric data collected since 2015.

- Water levels within the Basin B were assumed to be El. 499.1 for the maximum storage pool, seismic, liquefaction (i.e., post-earthquake), and sudden drawdown loading conditions, and El. 500.5 for maximum surcharge pool, in order to be consistent with the Periodic IDF.

- All other input data and settings from the Initial SFA were utilized, including, but not limited to, subsurface stratigraphy and soil strengths, ground surface geometry, slip surface search routines and methods, input data for the seismic analyses, and Ohio River pool levels.

Factors of safety from the Periodic SFA and Initial SFA, including factors for safety for loading conditions required by the Initial and Periodic SSA, are summarized in **Table 3**. The factors of safety confirm that the CPRP meets the requirements of §257.73(e)(1). Slope stability analyses associated with the Periodic SFA are provided in **Attachment E**.

Table 4 – Factors of Safety from Periodic SFA

	Structural Stability Assessment (§257.73(d)) and Safety Factor Assessment (§257.73(e))				Structural Stability Assessment (§257.73(d))	
Cross-Section	**Maximum Storage Pool §257.73(e)(1)(i) Minimum Required = 1.50**	**Maximum Surcharge Pool[1] §257.73(e)(1)(ii) Minimum Required = 1.40**	**Seismic §257.73(e)(1)(iii) Minimum Required = 1.00**	**Dike Liquefaction §257.73(e)(1)(iv) Minimum Required = 1.20**	**Foundation Liquefaction §257.73(d)(1)(i) Minimum Required = 1.20**	**Downstream Slope Sudden Drawdown (§257.73(d)(1)(iv) Minimum Required = 1.1**
1[2]	2.34	2.31	1.50	N/A	N/A	1.78
2[1]	2.29	2.29	1.58	N/A	1.88	1.90
3[2]	2.03	2.03	1.42	N/A	1.90	1.90
4[1]	2.07	N/A	1.54	N/A	2.06	N/A
5[1]	1.94	N/A	1.78	N/A	N/A	N/A
6[1]	2.09	2.09	1.88	N/A	N/A	N/A
7[1]	1.63*	1.63*	1.18*	N/A	1.33*	1.20*

Notes:
[1]Denotes cross-section where results from the Initial SFA are presented due to no observed changes.
[2]Denotes cross-section where changes are occurred, and results are presented from the updated Periodic SFA.
*Indicates critical cross-section (i.e., lowest calculated factor of safety out of the seven cross-sections analyzed)
N/A – Loading condition is not applicable.

SECTION 8

INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN - §257.82

8.1 Overview of Initial IDF

The Initial Inflow Design Flood Control System Plan (Initial IDF) was prepared by AECOM in 2016 ([6], [7], [12], [13]), following the requirements of §257.82. The Initial IDF included the following information:

- A hydraulic and hydrologic analysis, performed for the 1,000-year design flood event because of the hazard potential classification of "significant", which corresponded to 7.81 inches of rainfall over a 24-hour period.

- The Initial IDF utilized a HydroCAD Version 10 model to evaluate spillway flows and pool level increases during the design flood, with a SWSE of 501.5 ft and 499.4 ft at Basin A and Basin B, respectively.

The Initial IDF concluded that the MFPS met the requirements of §257.82, as the peak water surface estimated by the HydroCAD model was El. 502.6 ft and 500.0 ft at Basin A and Basin B, respectively. The minimum embankment crest elevations at Basin A and Basin B were indicated as 507.0 ft and 506.0 ft, respectively; therefore, overtopping was not expected. The Initial IDF also evaluated the potential for discharge from the CCR unit and determined that discharge in violation of the existing NPDES for the MFPS was not expected, as all discharge from the MFPS during both normal and inflow design flood conditions was expected to be routed through the existing spillway and NPDES-permitted outfall into the Ohio River.

8.2 Review of Initial IDF

Geosyntec performed a review of the Initial IDF [6], [7], [12], [13]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing the return interval used vs. the hazard potential classification.

- Reviewing the rainfall depth and distribution for appropriateness.

- Performing a high-level review of the inputs to the hydrological modeling.

- Reviewing the hydrologic model parameters for spillway parameters, starting pool elevation, and storage vs. the reference data.

- Reviewing the overall Initial IDF vs. the applicable requirements of the CCR Rule

One review comment was identified during review of the Initial IDF. The comment is described below:

- The pipe hydraulically connecting Basin A to Basin B was modeled as a 48-in diameter pipe; however, the pipe was slip lined with 40-in diameter HDPE as described in the Initial IDF.

8.3 Summary of Site Changes Affecting the Initial IDF

Changes at the site that occurred after development of the Initial IDF was identified. These changes required updates to the Initial IDF and are described below is described below:

- Approximately 14,000 CY and 2,000 CY of CCR were placed above the SWSE utilized for the Initial IDF certification in Basin A and Basin B, respectively, thereby altering the stage-storage curves for the impoundments relative to the Initial IDF.

8.4 Periodic IDF

Electronic HydroCAD model files associated with the Initial IDF were not available; therefore, Geosyntec recreated the HydroCAD model based on the HydroCAD output report provided in the Initial IDF [6], [7]. The recreated model was checked against values reported in the Initial IDF; peak discharge rates and peak water surface elevations (PWSE) for Basin A and Basin B matched exactly.

Geosyntec revised the recreated HydroCAD model described above to account for the additional CCR placement and changes in site conditions as described in **Sections 8.2** and **8.3.** The following approach and input data were used for the revised analyses:

- Updated stage-storage curve for Basin A and Basin B based on the 2021 site survey [31].
    - Revised stage-volume curves for Basin A and Basin B were prepared based on measuring the storage volume of the basins at every two-foot increment of depth from 500 ft in Basin A and 498 ft in Basin B to an elevation of 510 ft. This analysis identified an overall increase of 1,124 CY (0.7 ac-ft) of storage volume at Basin A from 2016 to 2021 and an overall decrease of 1,862 CY (1.2 ac-ft) of storage volume at Basin B from 2016 to 2021, relative to the SWSE used in the Initial IDF. See **Attachment F** for updated stage-volume (i.e., area-capacity) curves for comparison with the initial IDF stage-volume curves.

Drainage Area Characteristics

- Based on the 2021 site survey [31], the drainage area for Basin A was delineated into 11.2 acres of water surface area with a curve number (CN) of 98 and 21.3 acres of CCR surface with a CN of 93 (urban industrial, 72% impervious, HSG D). This update changed the composite CN from 98 to 95. The total drainage area remained the same.

- Based on the 2021 site survey [31],the drainage area for Basin B was delineated into 15.9 acres of water surface area with a curve number (CN) of 98 and 5.1 acres of CCR surface with a CN of 93 (urban industrial, 72% impervious, HSG D). This update changed the composite CN from 98 to 97. The total drainage area remained the same.

- The time of concentration (ToC) was updated from "Lake or Reservoir" to "Direct Entry". This update changed the ToC from 1.4 minutes for the Basin A and Basin B drainage areas to 6.0 minutes for the Basin A and Basin B drainage areas in accordance with the TR-20 recommended minimum time of concentration for direct entry of rainfall [37]

- The Starting Water Surface Elevation (SWSE) of Basin A was updated from 501.5 ft to 501.3 ft and the SWSE of Pond B was updated from 499.4 to 499.1 ft. to reflect the 2021 site survey [31].

- Updated pipes
    - 48-inch culvert connecting Basin A to Basin B
        - The length was updated from 100 LF to 90 LF (estimated) per 2021 survey [31].
        - The inlet invert was updated from 499.47 to 499.27 per 2021 site survey.
        - The outlet invert was updated from 498.69 to 498.46 per 2021 site survey.
        - The diameter and material were updated from 48" CMP to 40" HDPE per 2021 site survey and the Initial IDF [31].
        - The Manning's n value was updated from 0.013 to 0.010, corresponding to a closed conduit PVC pipe with smooth interior.
        - The entrance configuration was updated from "CMP, projecting, no headwall" to "CPP, projecting, no headwall" based on material identified in the 2021 site survey [31]. This change did not affect the entrance energy loss coefficient (K_e).
    - 42-inch culvert outlet from Basin B
        - The length was updated from 700 ft to 600 ft and inlet invert elevation from 470.0 to 469. 2 ft based on Drawing 7-3661-S23 [7].

- Updated spillways and/or outlet features

  - Updated the outlet structure configuration for Basin A
    - The broad-crested rectangular weir invert elevation was updated from 507.0 ft to 506.5 ft to reflect the 2021 site survey [31].
  - Updated the outlet structure configuration for Basin B
    - The sharp-crested rectangular weir with a crest elevation of 498 ft, crest length of 4.7 ft and a rise of 4 ft was updated to a 36-inch diameter horizonal orifice with an invert elevation of 499.1 ft to represent the riser pipe. The top of riser pipe elevation was assumed to be 499.1 ft based on the surveyed normal pool elevation.
    - The broad-crested rectangular weir crest elevation was updated from 506.2 ft to 503.9 ft to reflect the 2021 site survey [31].
- Additional information
  - Basin A also has a riser structure noted as a 36-inch diameter HDPE morning glory spillway with a gate that drains to a 42-inch CMP. Based on site interviews conducted in 2021, the Basin A riser structure is not in use; therefore, it was not included in the model (i.e., the updated model is representative of the Basin A spillway being closed during the IDF).
  - In the 2016 analysis, areas outside of Basins A and B were included in the model and did not overtop the ponds' berms from outside the active ponds. Based on site observations in 2021, no significant changes in site conditions have occurred in the areas outside of Basins A and B; therefore, it was assumed that no inflows from areas outside of Basins A and B would occur and sub-catchments upstream of Basins A and B were removed from the updated analysis.
- All other input data and settings from the Initial IDF HydroCAD model were utilized, including, but not limited to software package and version, runoff method, analysis time span and analysis time step. Also, an Antecedent Moisture Condition (AMC) II was selected under rainfall settings in the HydroCAD model.

The results of the Updated IDF are summarized in **Table 4** and confirm that the MFPS meets the requirements of §257.82(a)-(b), as the peak water surface elevation in Basins A and B does not exceed the minimum perimeter dike crest elevations. Additionally, all discharge from the MFPS is routed through the existing spillway system to the NPDES-permitted outfall, during both normal and IDF conditions. Updated area-capacity curves and HydroCAD model output is provided in **Attachment F**.

Table 5 – Water Levels from Updated Periodic IDF

	Basin A			Basin B		
Analysis	**Starting WSE (ft)**	**Peak WSE (ft)**	**Min. Dike Crest Elevation (ft)**	**Starting WSE (ft)**	**Peak WSE (ft)**	**Min. Dike Crest Elevation (ft)**
Initial IDF	501.5	502.6	507.0	499.4	500.0	506.0
Updated Periodic IDF	501.3	502.3	506.5	499.1	500.5	503.9
Initial to Periodic Change[1]	-0.2	-0.3	-0.5	-0.3	+0.5	-2.1

Notes:
[1]Positive change indicates an increase relative to the Initial IDF; negative change indicates a decrease relative to the Initial IDF.

SECTION 9

CONCLUSIONS

The MFPS at MPP was evaluated relative to the USEPA CCR Rule periodic assessment requirements for:

- Hazard potential classification (§257.73(a)(2)),
- Emergency action plan development (§257.73(a)(3)),
- History of Construction reporting (§257.73(d)),
- Structural stability assessment (§257.73(d)), with the exception of §257.73(d)(1)(vi) that was not included in the scope of this report,
- Safety factor assessment (§257.73(e)), and
- Inflow design flood control system planning (§257.82).

Based on the evaluations presented herein, the referenced requirements are satisfied.

SECTION 10

CERTIFICATION STATEMENT

CCR Unit: Miami Fort Power Company LLC, Miami Fort Power Plant, Miami Fort Pond System

I, Panos Andonyadis, 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 2021 USEPA CCR Rule Periodic Certification Report, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the periodic assessment of the hazard potential classification, history of construction report, structural stability, emergency action plan, safety factors, and inflow design flood control system planning, dated October 2016, were conducted in accordance with the requirements of 40 CFR §257.73(a)(2), (a)(3), (c), (d), (e), and §257.82, with the exception of §257.73(d)(1)(vi)) that was not included in the scope of this certification.

Panos Andonyadis

October 11, 2021
Date

Exp. 11/30/2021

SECTION 11

REFERENCES

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[3] Stantec Consulting Services, Inc., "Initial Hazard Potential Classification Assessment, EPA Final CCR Rule, Basin B, Miami Fort Power Station, Hamilton County, Ohio," Fenton, MO, October 12, 2016.

[4] Stantec Consulting Services, Inc, "Dynegy Midwestern Generation, LLC, Miami fort Power Station, North Bend, Hamilton county, Ohio, Emergency Action Plan, Basin A (NID # OH01690), Basin B (NID # OH01691)," Fenton, MO, April 13, 2017.

[5] AECOM, "History of Construction, USEPA Final CCR Rule, Miami Fort Power Station, North Bend, Ohio," October 2016.

[6] AECOM, "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for Basin A at Miami Fort Power Station," St. Louis, MO, October 2016.

[7] AECOM, "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for Basin B at Miami Fort Power Station," St. Louis, MO, October 2016.

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[9] AECOM, "CCR Rule Report: Initial Structural Stability Assessment For Basin B At Miami Fort Power Station," St. Louis, MO, October 2016.

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[16] Stantec Consulting Services, Inc., "Documentation of Initial Hazard Potential Classification Assessment, Basin B, Miami fort Power Station, Hamilton County, Ohio," Fenton, MO, October 12, 2016.

[17] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Miami Fort Power Station, Basin A*, November 8, 2016.

[18] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Miami Fort Power Station, Basin A.*, January 18, 2017.

[19] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Miami Fort Power Station, Basin A*, February 7, 2018.

[20] S. Arends, *Annual Inspection by a Qualified Professional Engineer, 40 CFR §257.83(b), Miami Fort Power Station, Basin A*, January 15, 2019.

[21] J. Knutelski, *Annual Inspection by a Qualified Professional Engineer, 40 CFR 257.83(b), Miami Fort Power Station, Basin A*, January 8, 2020.

[22] J. Knutelski, *Annual Inspection by a Qualified Professional Engineer, 40 CFR §257.83(b), Miami Fort Power Station, Basin A*, January 6, 2021.

[23] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Miami Fort Power Station, Basin B*, November 8, 2016.

[24] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Miami Fort Power Station, Basin B*, January 18, 2017.

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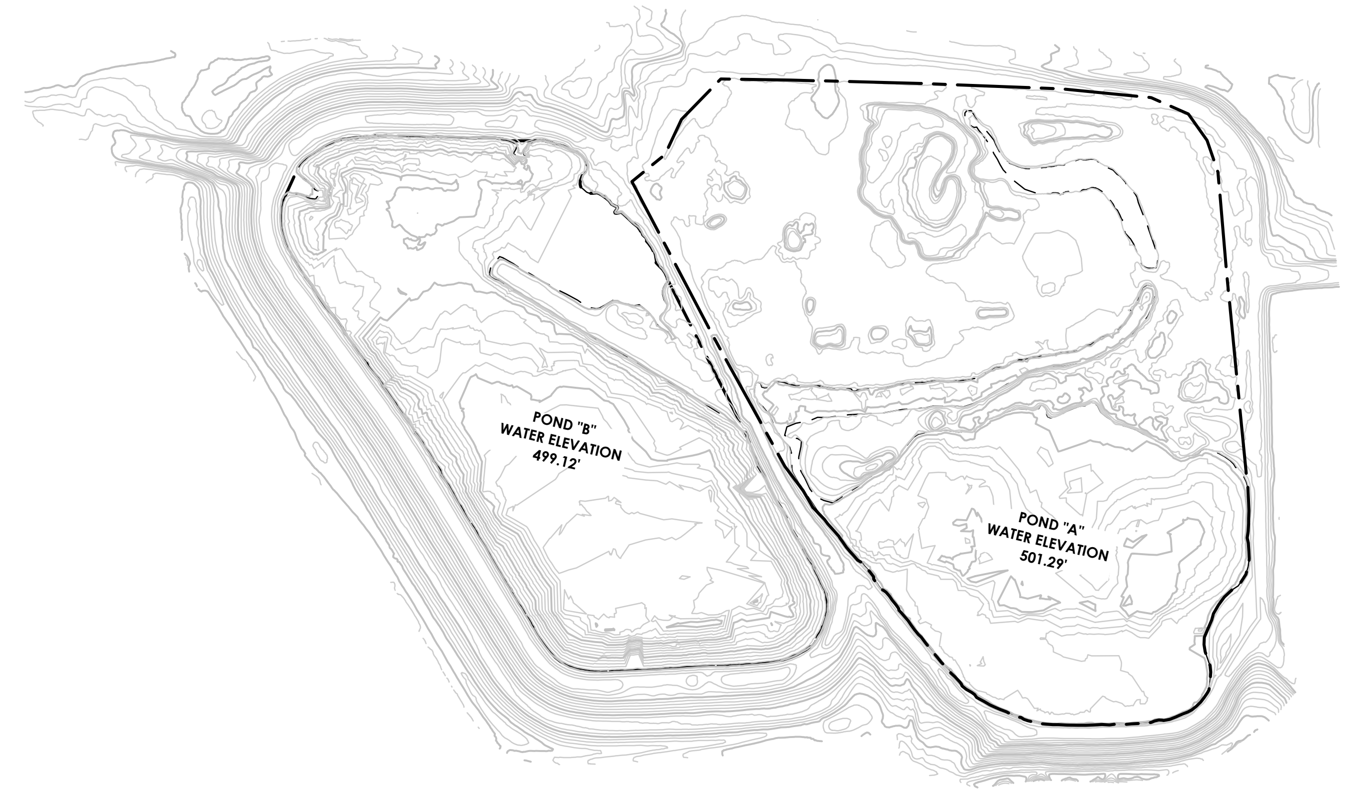
DRAWINGS

INITIAL AERIAL
10-2015 IMAGERY



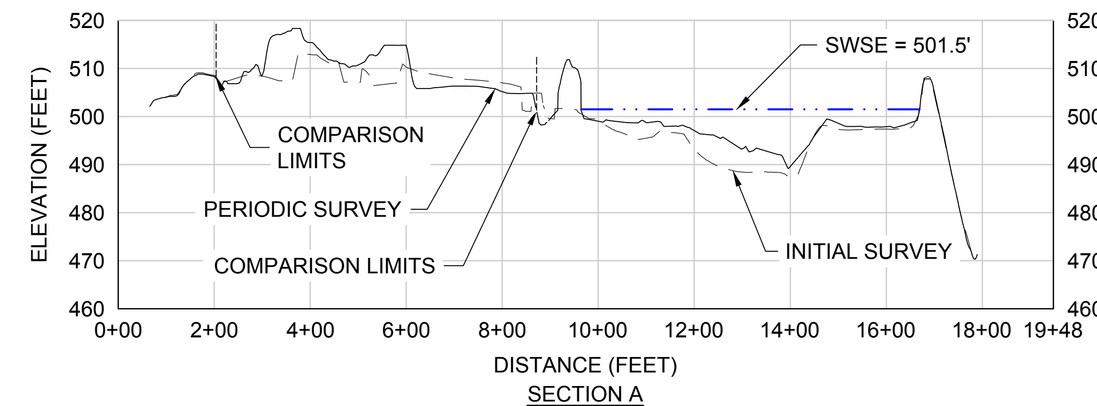
PERIODIC AERIAL
10-2020 IMAGERY

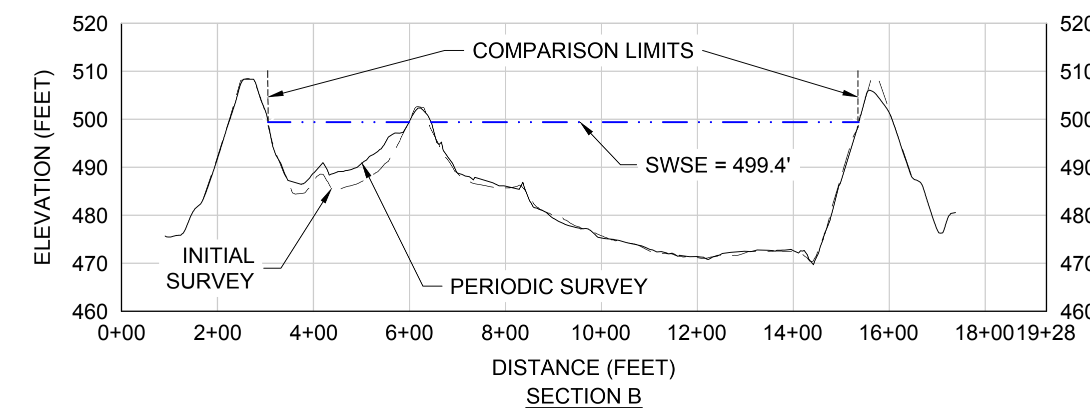
0 400

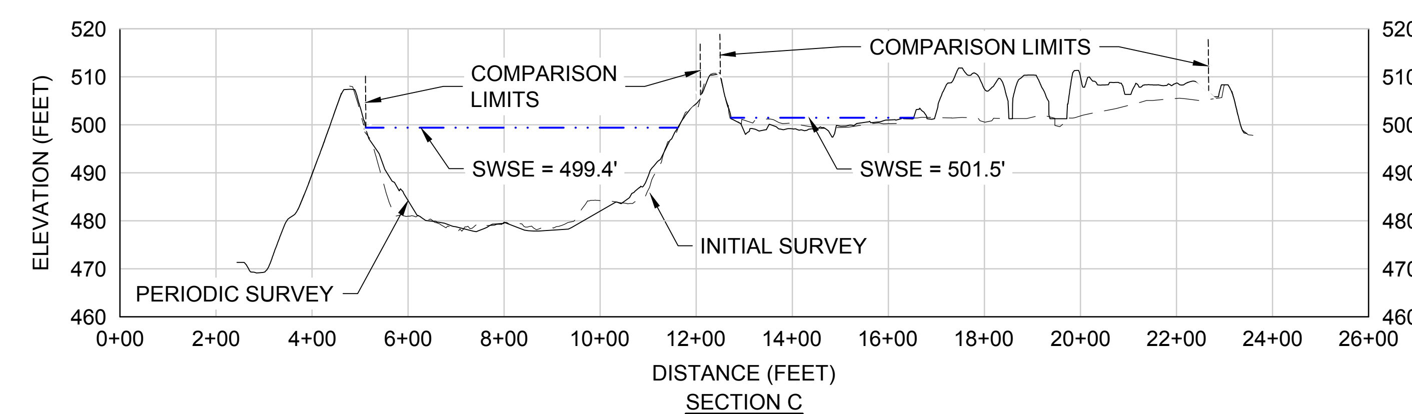
NOTES:

1. THE INITIAL SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "TOPOGRAPHIC SURVEY OF DUKE ASH PONDS AT MIAMI FORT STATION", PREPARED BY ESP ASSOCIATES, DATED AUGUST 20, 23-24, 2015.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "LUMINANT GENERATION COMPANY, LLC. MIAMI FORT POWER STATION, JULY 6-7 2020 TOPOGRAPHY", PREPARED BY INGENAE, DATED AUGUST 5, 2021.

INITIAL TO PERIODIC SURVEY IMAGERY COMPARISON MIAMI FORT POND SYSTEM MIAMI FORT POWER PLANT NORTH BEND, OHIO		
Geosyntec consultants		DRAWING 1
GLP8027.09	AUGUST 2021	







ISOPACH CONTOUR KEY		
COLOR	MIN ELEV	MAX ELEV
	-32	-10
	-10	-8
	-8	-6
	-6	-4
	-4	-2
	-2	0
	0	2
	2	4
	4	6
	6	8
	8	10
	10	12

NOTES:

1. THE INITIAL SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "TOPOGRAPHIC SURVEY OF DUKE ASH PONDS AT MIAMI FORT STATION", PREPARED BY ESP ASSOCIATES, DATED AUGUST 20, 23-24, 2015.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "LUMINANT GENERATION COMPANY, LLC. MIAMI FORT POWER STATION, JULY 6-7 2020 TOPOGRAPHY", PREPARED BY INGENAE, DATED AUGUST 5, 2021.
3. ALL SURVEY DATA WAS COLLECTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND NORTH AMERICAN DATUM OF 1983 (NAD83) FOR VERTICAL AND HORIZONTAL COORDINATES, RESPECTIVELY.
4. THE STARTING WATER SURFACE ELEVATION OF BASIN A IS EL. 501.5 AND FOR BASIN B IS EL. 499.4, AS NOTED IN THE REPORT TITLED "CCR CERTIFICATION REPORT INITIAL STRUCTURAL STABILITY ASSESSMENT, INITIAL SAFETY FACTOR ASSESSMENT, AND INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN FOR BASIN A AT MIAMI FORT POWER STATION", PREPARED BY AECOM, DATED OCTOBER 2016.

INITIAL TO PERIODIC SURVEY COMPARISON SUMMARY - BASIN A			
SURFACE IMPOUNDMENT	CUT	FILL	NET (CU. YD.)
ASH POND	32,234	63,967	31,733 (FILL)
ABOVE SWSE	28,060	42,193	14,133 (FILL)
BELOW SWSE	4,174	21,774	17,600 (FILL)

INITIAL TO PERIODIC SURVEY COMPARISON SUMMARY - BASIN B			
SURFACE IMPOUNDMENT	CUT	FILL	NET (CU. YD.)
ASH POND	7,459	35,153	27,694 (FILL)
ABOVE SWSE	2,379	4,108	1,729 (FILL)
BELOW SWSE	5,080	31,045	25,965 (FILL)

0 50
VERT: SCALE IN FEET

0 400
HORZ: SCALE IN FEET

SURVEY COMPARISON ISOPACH
MIAMI FORT POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Geosyntec consultants

DRAWING 2

GLP8027.09 | AUGUST 2021

INITIAL AERIAL
10-2015 IMAGERY

PERIODIC AERIAL
10-2020 IMAGERY

0 500
SCALE IN FEET

NOTES:

1. THE INITIAL IMAGERY WAS TAKEN FROM GOOGLE EARTH, IMAGE DATED OCTOBER 2015, DOWNLOADED 13 AUGUST 2021.
2. EXISTING AERIAL SHOWN IS FROM AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 7/6/2021.

INITIAL TO PERIODIC AERIAL IMAGERY COMPARISON
MIAMI FORT POND SYSTEM
MIAMI FORT POWER PLANT
NORTH BEND, OHIO

Geosyntec consultants

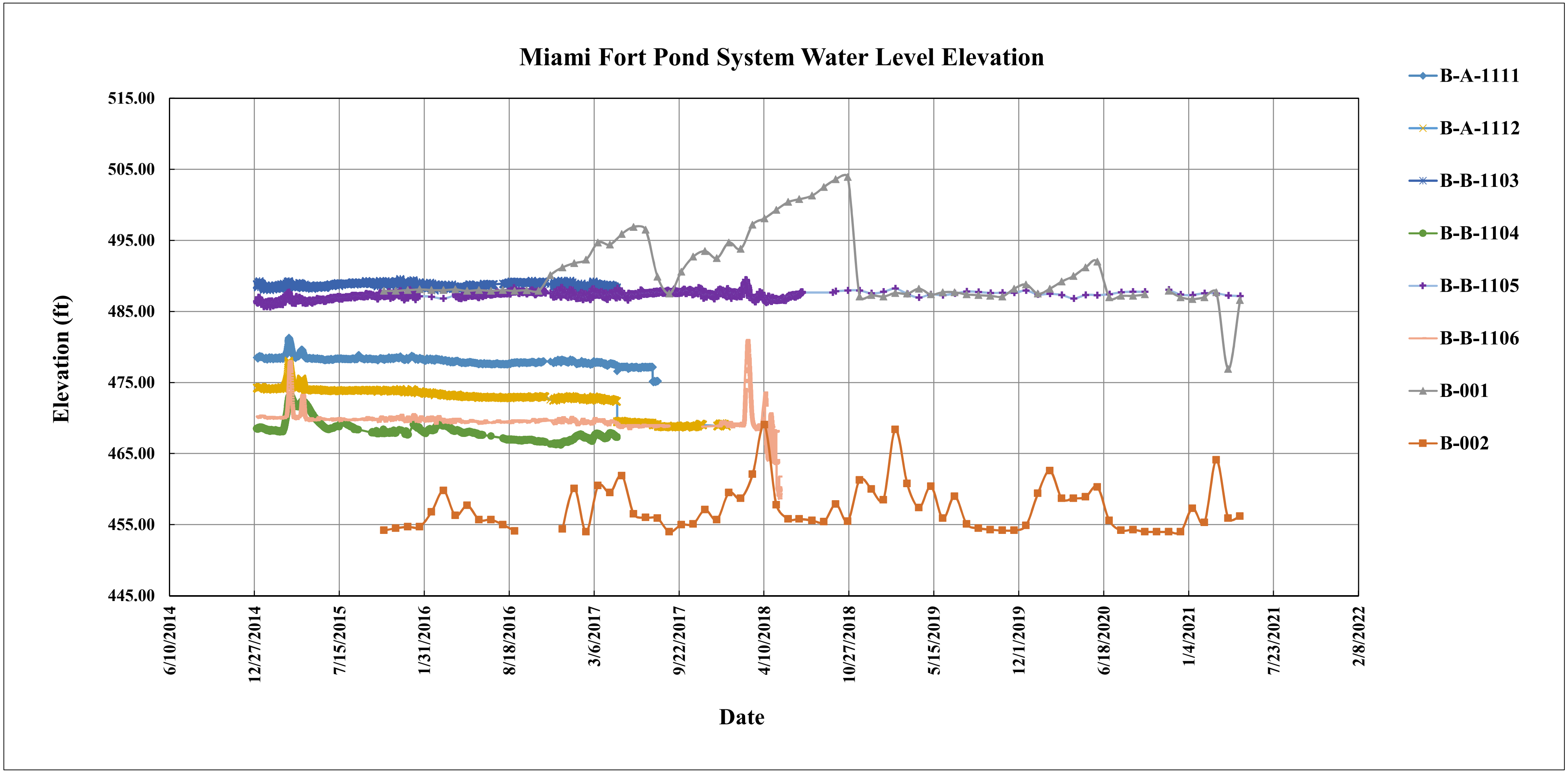
DRAWING 3

GLP8027.09 | AUGUST 2021

ATTACHMENTS

Attachment A

MFPS Piezometer Data Plots



NOTE:
Piezometer data was taken from the spreadsheet titled "2015-2021_MSF Pond Pizezometer Data", provided by the Miami Fort Power Plant.

PIEZOMETER DATA PERIODIC CERTIFICATION, MIAMI FORT POND SYSTEM MIAMI FORT POWER PLANT NORTH BEND, OHIO		
Geosyntec consultants		Figure A-1
GLP8027	8/20/2021	

Attachment B

MFPS Site Visit Photolog

GEOSYNTEC CONSULTANTS **Photographic Record**	
Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 01 **Date**: 06/03/2021 **Direction Facing:** SE **Comments:** Photo of the filled in portion of the former Basin A. Some vegetative growth, no trees. No erosion noted.	
Photo: 02 **Date:** 06/03/2021 **Direction Facing:** S **Comments:** Sluiced discharge along the northern side of former Basin A. Discharge channel and sluiced ash flow to the east.	

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 03	
Date: 06/03/2021	
Direction Facing: NE	
Comments: Outlet pipe from former Basin A to former Bain B. Outlet pipe is unobstructed.	

Photo: 04	
Date: 06/03/2021	
Direction Facing: E	
Comments: Discharge channel in Former Basin A. Phragmite and small tree growth observed along the internal separation dike within Former Basin A.	

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 05 **Date:** 06/03/2021 **Direction Facing:** SE **Comments:** Good vegetative cover and no signs of erosion along upstream side of the western dike for Former Basin A. No observed structural integrity issues along dike crest.	

Photo: 06 **Date:** 06/03/2021 **Direction Facing:** N **Comments:** Outlet structure from Former Basin A, in good condition, generally not operable.	

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 07

Date: 06/03/2021

Direction Facing: W

Comments: Downstream slope of the southern dike for Former Basin A. Good vegetative cover, no signs of erosion, no signs of instability along dike crest.

Photo: 08

Date: 06/03/2021

Direction Facing: W

Comments: Recycled concrete toe armoring along the downstream toe of the southern Former Basin A dike. No signs of rapid draw related damage. Good vegetative cover observed along the dike slope.

GEOSYNTEC CONSULTANTS
Photographic Record

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 09

Date: 06/03/2021

Direction Facing: W

Comments: Downstream slope of the northeastern corner of the Former Basin A dike. Good vegetative cover, no signs of erosion, no signs of instability along dike crest.

Photo: 10

Date: 06/03/2021

Direction Facing: W

Comments: Downstream slope of the eastern dike of the Former A Basin. Some poor vegetative cover observed. Geosyntec recommended area be vegetated as part of regular maintenance.

GEOSYNTEC CONSULTANTS
Photographic Record

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 11 **Date:** 06/03/2021 **Direction Facing:** NW **Comments:** Upstream slopes of the western and northern dikes for Former Basin B. Good vegetative cover and no signs of erosion of the dike slopes.	
Photo: 12 **Date:** 06/03/2021 **Direction Facing:** E **Comments:** Discharge pipe from Former Basin A to Former Basin B. The pipe is unobstructed and appears to be in good condition at the point of discharge.	

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 13

Date: 06/03/2021

Direction Facing: W

Comments: Discharge channel in Former Basin B. Some phragmite growth along the channel.

Photo: 14

Date: 06/03/2021

Direction Facing: NW

Comments: Internal diversion dike within Former Basin B. Some vegetative overgrowth and phragmite growth on the side slopes. No erosion or signs of instability along the crest.

GEOSYNTEC CONSULTANTS
Photographic Record

Geosyntec consultants

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 15

Date: 06/03/2021

Direction Facing: W

Comments: Upstream slopes of the western and southern dikes for Former Basin B. Good vegetative cover, no side slope erosion was observed, and the crest appears to be stable with no signs of slope instability.

Photo: 16

Date: 06/03/2021

Direction Facing: NW

Comments: Location of observed seepage in the downstream side of the southern dike for Former Basin B. Test pit was excavated and crushed piping for the internal toe drainage system was identified.

GEOSYNTEC CONSULTANTS
Photographic Record

Geosyntec consultants

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 17

Date: 06/03/2021

Direction Facing: E

Comments: Downstream side of southern dike for Former Basin B. Good vegetative cover, and no signs of damage from rapid drawdown.

Photo: 18

Date: 06/03/2021

Direction Facing: NW

Comments: Downstream side of western dike for Former Basin B. Good vegetative cover, no signs of damage from rapid drawdown. Typical pump collection point for dike seepage shown.

GEOSYNTEC CONSULTANTS
Photographic Record

Site Owner: Miami Fort Power Company, LLC | **Project Number:** GLP8027

CCR Unit: Miami Fort Pond System | **Site:** Miami Fort Power Plant

Photo: 19

Date: 06/03/2021

Direction Facing: N

Comments: Downstream side of southern dike for Former Basin B. Good vegetative cover, no signs of damage from rapid drawdown.

Photo: 20

Date: 06/03/2021

Direction Facing: S

Comments: Emergency spillway along northern dike for Former Basin B. The spillway has never been active.

GEOSYNTEC CONSULTANTS
Photographic Record

Geosyntec consultants

Site Owner: Miami Fort Power Company, LLC	**Project Number:** GLP8027
CCR Unit: Miami Fort Pond System	**Site:** Miami Fort Power Plant

Photo: 21

Date: 06/03/2021

Direction Facing: W

Comments: Western dike for Former Basin B. Crest and side slopes in good condition with good vegetative cover, no sign instability or erosion.

Photo: 22

Date: 06/03/2021

Direction Facing: NW

Comments: Some rutting in poor vegetated areas observed along dike crest. Geosyntec recommended to be vegetated during regular maintenance.

Attachment C

Periodic Emergency Action Plan for Miami Fort Power Plant

Miami Fort Power Company LLC

MIAMI FORT POWER PLANT
NORTH BEND, HAMILTON COUNTY, OHIO

Emergency Action Plan (EAP)

40 CFR § 257.73(a)(3)
Coal Combustion Residual (CCR) Impoundments
& Related Facilities

Miami Fort Pond System
- Basin A (NID # OH01690)
- Basin B (NID # OH01691)

Revision Date: September 28, 2021

MIAMI FORT POWER PLANT
EMERGENCY ACTION PLAN
CCR IMPOUNDMENTS & RELATED FACILITIES

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MIAMI FORT POWER PLANT
EMERGENCY ACTION PLAN
CCR IMPOUNDMENTS & RELATED FACILITIES

1 STATEMENT OF PURPOSE

The Miami Fort Power Plant (Plant) is located near North Bend in Hamilton County, Ohio. The location is shown in Figure 1-1. The Plant is a coal-fired electricity producing power plant operated by Miami Fort Power Company, LLC, a subsidiary of Vistra Energy and operated by Luminant. This Emergency Action Plan (EAP) was prepared in accordance with 40 CFR **§** 257.73(a)(3) and covers the following Coal Combustion Residual (CCR) surface impoundments located at the site:

- Miami Fort Pond System

The locations of the CCR unit is shown in Figure 1-2. Section 6 of this EAP includes a description CCR unit.

The purpose of this Emergency Action Plan (EAP) is to:

1. Safeguard the lives, as well as to reduce property damage, of citizens living within potential downstream flood inundation areas of CCR impoundments and related facilities at the Miami Fort Power Plant.
2. Define the events or circumstances involving the CCR impoundments and related facilities at the Miami Fort Power Plant that represent atypical operating conditions that pose a safety hazard or emergency and how to identify those conditions.
3. Define responsible persons, their responsibilities, and notification procedures in the event of a safety emergency.
4. Provide contact information of emergency responders.
5. Identify emergency actions in the event of a potential or imminent failure of the impoundment.
6. Identify the downstream area that would be affected by failure of the impoundments.
7. Provide for effective facility surveillance, prompt notification to local Emergency Management Agencies, citizen warning and notification responses, and preparation should an emergency occur.

Information provided by Luminant was utilized and relied upon in preparation of this report.

Figure 1-1. Miami Fort Power Plant Location Map

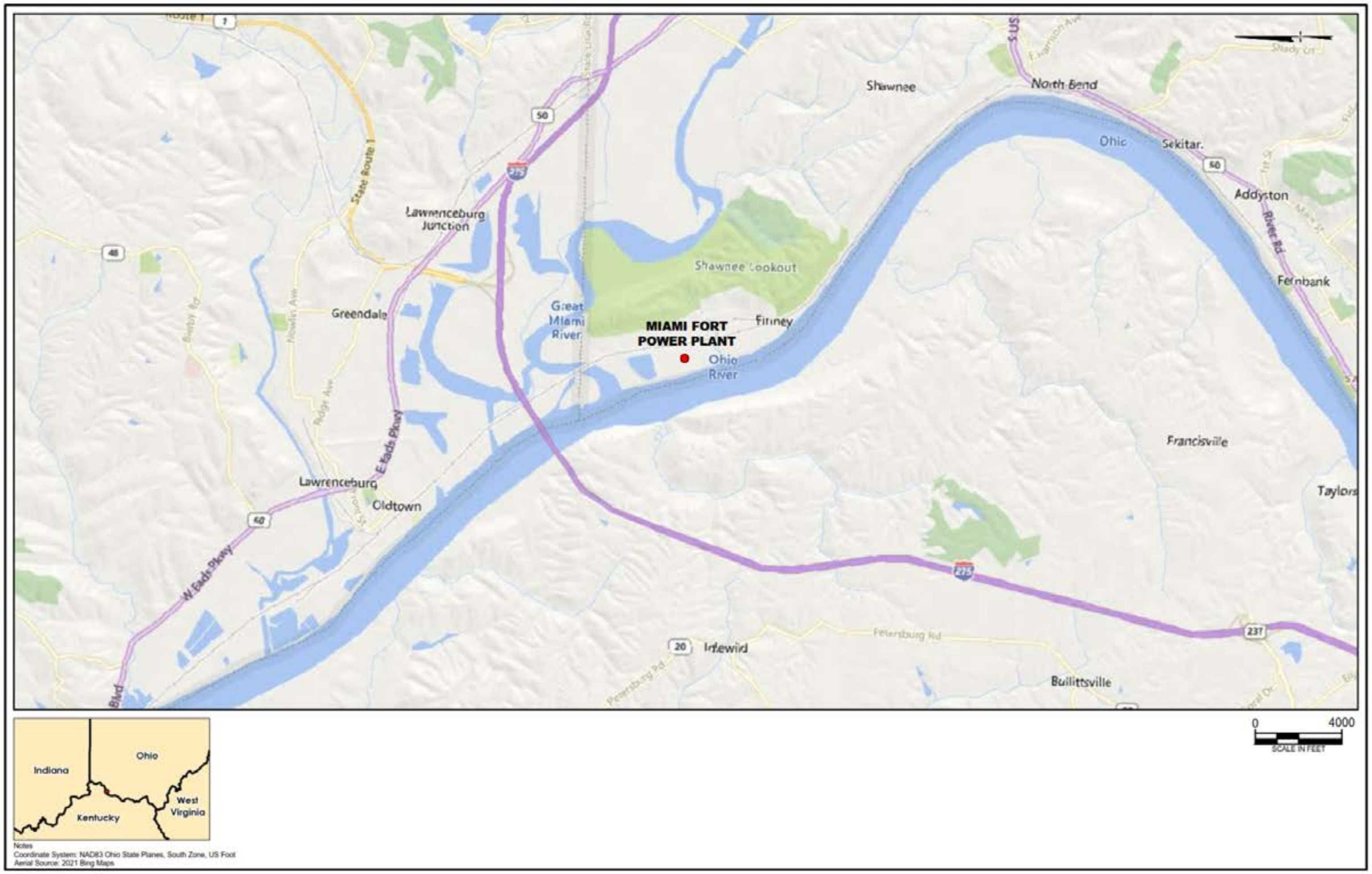


Figure 1-2. Miami Fort Power Plant CCR Impoundments & Related Facilities

2 COMMUNICATION

To facilitate understanding among everyone involved in implementing this EAP, four response levels are used to identify the condition of an impoundment. These are:

Response Levels:

- **Level 0:** Normal conditions and routine operations, including surveillance and initial investigation of unusual conditions and effects of storm events.
- **Level 1:** Potentially hazardous condition exists, requiring investigation and possible corrective action.
- **Level 2:** Potential failure situation is developing; possible mode of failure is being assessed; corrective measures are underway.
- **Level 3:** Failure is occurring or is imminent, public protective actions are required.

The 4-Step Incident Response Process is outlined in Figure 2-1. This should be used in conjunction with the Notification Flowchart (Figure 2-2) and EAP Decision Tree (Figure 2-3). Section 4 provides guidance tables for determining Response Levels and a table providing emergency actions to be taken given various situations. Table 2-1 lists contact information for the emergency responders.

Figure 2-1. Summary/Sequence of Tasks 4-Step Incident Response Process

Step 1: Detection, Evaluation, and Response Level Determination

Sequence of Tasks:

- Notify EAP Coordinator, Station Management (Plant Manager and Maintenance Manager), and Dam Safety Manager of unusual condition detected and confer on next steps needed.
- Conduct technical evaluation of conditions as needed.
- Determine Response Level based on evaluation. **(Table 4-1)**
- Reset Response Level as revised evaluations warrant.

Step 2: Notification

Sequence of Tasks:

- Notify authorities, designated personnel, and external response partners of change in Response Level, using the Notification Flowchart. **(Figure 2-2)**
- *Re-notify authorities, designated personnel, and external response partners as Response Level is changed.*

Step 3: Emergency Actions

Sequence of Tasks:

- Perform emergency actions with goal of saving the impoundment and minimizing impacts to life, property, and environment. **(Table 4-3)**
- Take continuous actions to include situation assessment, information sharing, remediation, and public safety advisories or warnings, as warranted.
- *Revise action plan as changes in conditions warrant.*

Step 4: Follow-up

Sequence of Tasks:

- Document conditions and decisions in the Emergency Incident Log.
- Notify authorities, designated personnel, and external response partners that condition is stabilized; limit incident termination declarations to conditions at the site.
- Conduct and document after-action review of incident and response.

Figure 2-2. Notification Flowchart

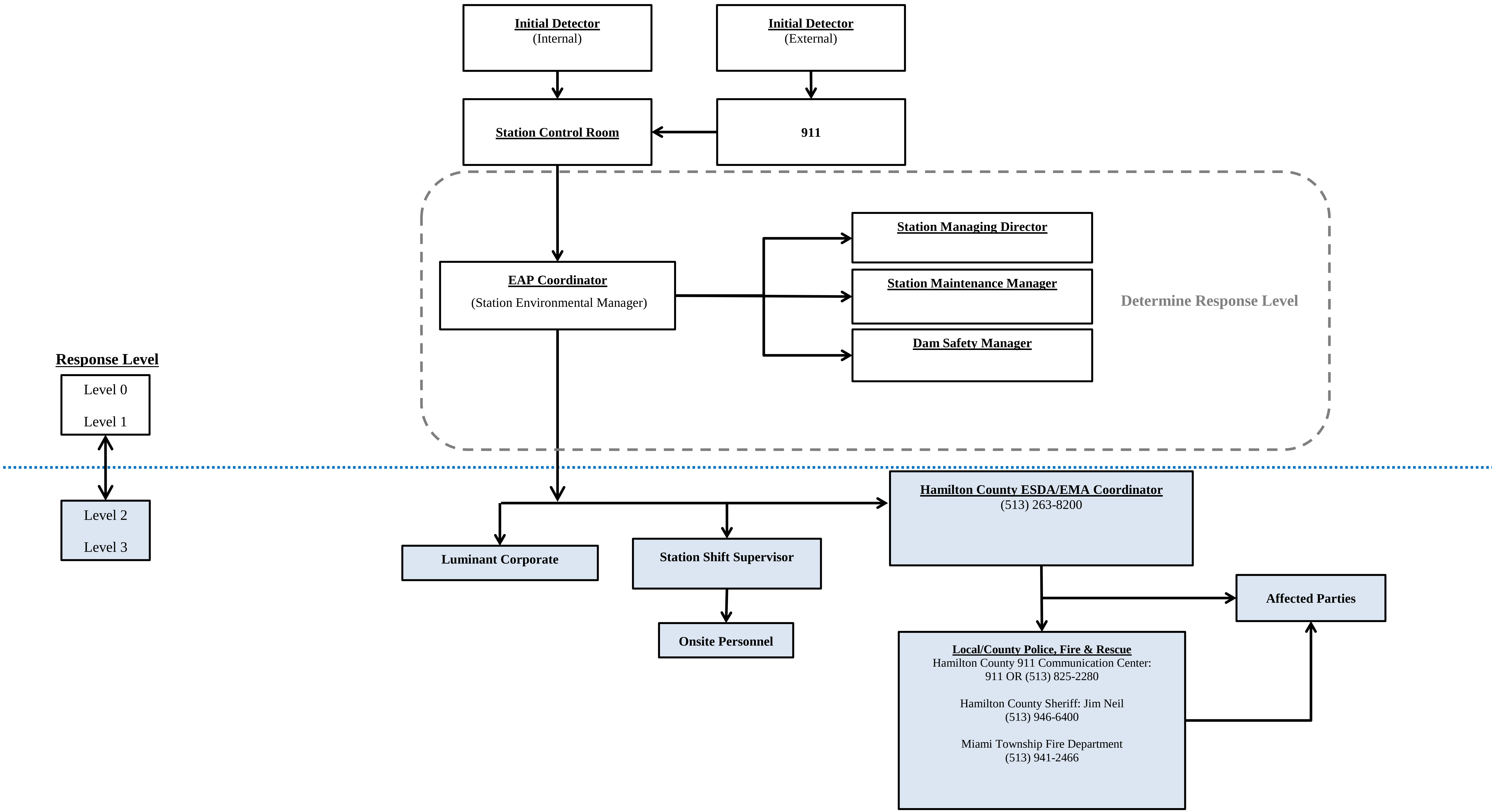


Figure 2-3. EAP Response Process Decision Tree

Note: At any given below, if failure is imminent or actively occurring **CALL 911 IMMEDIATELY** to notify emergency responders and then continue with process afterwards.

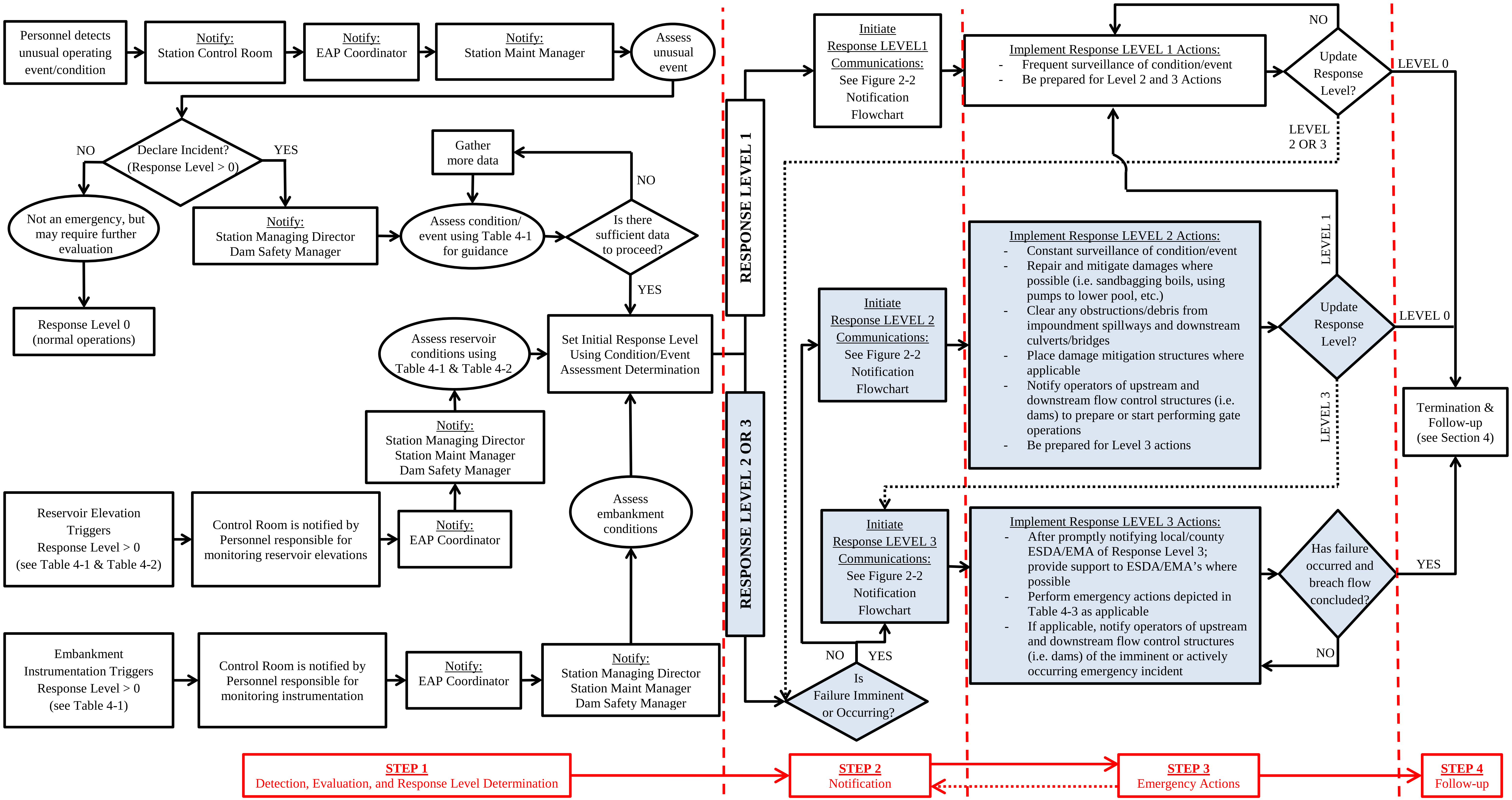


Table 2-1. EAP Emergency Responders

Position / Entity	Contact Information		
Internal Contacts			
Miami Fort Power Plant	**Contact**		
Managing Director			
Environmental Manager (EAP Coordinator)	Trevor Tallent	(513) 340-3956	
Maintenance Manager			
Control Room		(513) 467-4911	
Luminant Corporate Operations	**Contact**		
Dam Safety Manager	Jason Campbell	(618) 792-8488	
External Contacts			
Local/County ESDA/EMA, Police, & Fire	**Contact**	**Phone #**	**Alternate Phone #**
Hamilton County 911 Emergency Communications Center		911	(513) 825-2280
Hamilton County – ESDA/EMA	Hamilton County EMA	(513) 263-8200	
Hamilton County – Sheriff Department	Sheriff Jim Neil	(513) 946-6400	
Miami Township – Fire Department	Chief Steve Ober	(513) 941-2466	(513) 467-3727
State Emergency Management Agencies & Organizations	**Contact**	**Phone #**	**Alternate Phone #**
Ohio Department of Natural Resources - Wildlife		1(800) 945-3543	(614) 265-6314

3 EAP ROLES AND RESPONSIBILITIES

Table 3-1 provides a summary of the EAP roles during an emergency event.

Table 3-1. Summary of EAP Roles

Entity	Role Description
Luminant Emergency Response Team (ERT)	**ERT:** Luminant personnel responsible for EAP implementation, distribution, updates/maintenance, and training activities. The *ERT* is comprised of the following roles; 1. **Luminant Corporate:** Luminant corporate entity, committee, team, or position with relevant responsibility for a given generating Plant. 2. **Plant Management:** Personnel responsible for day-to-day operation and management of the Plant. 3. **Dam Safety Manager:** Personnel that is most knowledgeable about the design and technical operation of facilities at a given Plant. 4. **EAP Coordinator:** Personnel responsible for implementing the EAP and associated activities. **Emergency Event – EAP Responsibilities** 1. Respond to emergencies at the Plant. 2. Verify and assess emergency conditions. 3. Notify and coordinate as appropriate with participating emergency services disaster agencies or emergency management agencies (ESDA/EMA's), emergency responders, regulatory agencies, and all other entities involved or affected by this EAP. 4. Take corrective action at the Plant. 5. Declare termination of emergencies at the Plant.
Hamilton County ESDA/EMA	1. Receive Response Level reports from *Luminant Corporate* through *EAP Coordinator*. 2. Coordinate emergency response activities with local authorities: police, fire and rescue, etc. 3. Coordinate notification of public as necessary through established channels, which may include door-to-door contact. 4. Coordinate notification activities to affected parties within inundation areas. 5. Evaluate risk to areas beyond the inundation areas, communicate needs to *Luminant Corporate* and/or *EAP Coordinator*, and coordinate aid as appropriate. 6. Responsible for declaring termination of an emergency condition off-site upon receiving notification of an emergency status termination from *Luminant Corporate*. 7. If necessary, coordinate with *State ESDA/EMA*.
Cleves Police, Miami Township Fire, and Rescue	1. Receive alert status reports from the *ERT* or the *County ESDA/EMA*. 2. If necessary, notify affected parties and general public within inundation areas (see Section 7). 3. Render assistance to Hamilton County ESDA/EMA, as necessary. 4. Render assistance to *Luminant Corporate* and *Plant Management*, as necessary.
Hamilton County Police, Fire and Rescue, and Emergency Services	1. Receive alert status reports from the *ERT* or the *County ESDA/EMA*. 2. If necessary, notify affected parties within the inundation area. 3. Provide mutual aid to other affected areas, if requested and able.

4 EAP RESPONSE

The 4-Step Incident Response Process is shown in Figure 2-1. The Decision Tree shown in Figure 2-3 provides a flowchart for the various elements of the response process. Upon reaching Step 4 of the response process (termination and follow-up), the EAP Coordinator is responsible for notifying the ESDA/EMA's that the condition of the dam/impoundment has been stabilized. The purpose of this section is to provide specific information that can be used during a response. This information is provided in the following tables:

- Table 4-1 provides guidance for determining the response level.
- Table 4-2 provides impoundment pool level trigger elevations.
- Table 4-3 lists emergency actions to be taken depending on the situation.

Table 4-1. Guidance for Determining the Response Level

Event	Situation	Response Level
Spillway flow (see Table 4-2 for relevant elevations)	Primary spillway flow is not causing active erosion and impoundment water surface elevation is below auxiliary spillway crest elevation (if equipped).	Level 0
	Impoundment water surface elevation is at or above auxiliary spillway crest elevation (if equipped). No active erosion caused by spillway flow.	Level 1
	Spillway flow actively causing minor erosion that is not threatening the control section or dam/impoundment stability.	Level 2
	Spillway flow that could result in flooding of people downstream if the reservoir level continues to rise.	Level 2
	Abnormal operation of the spillway system due to blockage or damage that could lead to flooding.	Level 2
	Spillway flow actively eroding the soil around the spillway that is threatening the control section (e.g. undermining) or dam/impoundment stability.	Level 3
	Spillway flow that is flooding people downstream.	Level 3
Embankment overtopping (see Table 4-2 for relevant elevations)	Impoundment water surface elevation at or below typical normal pool fluctuation elevation.	Level 0
	Impoundment water surface elevation above typical high pool fluctuation elevation.	Level 1
	Impoundment water surface elevation within 2 feet of the embankment crest elevation	Level 2
	Impoundment water surface elevation at or above embankment crest elevation.	Level 3
Seepage	New seepage areas in or near the dam/impoundment with clear flow.	Level 1
	New seepage areas with cloudy discharge or increasing flow rate.	Level 2
	Heavy seepage with active erosion, muddy flow, and/or sand boils.	Level 3
Sinkholes	Observation of new sinkhole in impoundment area or on embankment.	Level 2
	Rapidly enlarging sinkhole and/or whirlpool in the impoundment.	Level 3
Embankment cracking	New cracks in the embankment greater than ¼ inch wide without seepage.	Level 1
	Any crack in the embankment with seepage.	Level 2
	Enlarging cracks with muddy seepage.	Level 3

Table 4-1. Guidance for Determining the Response Level

Event	Situation	Response Level
Embankment movement	Visual signs of movement/slippage of the embankment slope.	Level 1
	Detectable active movement/slippage of the embankment slope or other related effects (tension cracking, bulges/heaves, etc.) that could threaten the integrity of the embankment.	Level 2
	Sudden or rapidly proceeding slides of the embankment slopes.	Level 3
Embankment Monitoring Equipment (piezometers, inclinometers, surface displacement mounts, etc.)	Instrumentation readings beyond historic normal.	Level 1
	Instrumentation readings indicate the embankment is susceptible to failure.	Level 2
	Instrumentation readings indicate embankment is at threshold of failure or is currently failing.	Level 3
Earthquake or other event	Measurable earthquake felt or reported on or within 100 miles of the impoundment.	Level 1
	Earthquake or other event resulting in visible damage to the impoundment or appurtenances.	Level 2
	Earthquake or other event resulting in uncontrolled release of water or materials from the impoundment.	Level 3
Security threat	Verified bomb threat or other physical threat that, if carried out, could result in damage to the impoundment.	Level 2
	Detonated bomb or other physical damage that has resulted in damage to the impoundment or appurtenances.	Level 3
Sabotage/ vandalism	Damage to impoundment or appurtenance with no impact to the functioning of the impoundment.	Level 1
	Modification to the impoundment or appurtenances that could adversely impact the functioning of the impoundment. This would include unauthorized operation of spillway facilities.	Level 2
	Damage to impoundment or appurtenances that has resulted in seepage flow.	Level 2
	Damage to impoundment or appurtenances that has resulted in uncontrolled water release.	Level 3

Table 4-2. Impoundment Trigger Elevations

Impoundment	Embankment Crest Elevation	Auxiliary Spillway Crest Elevation	Normal Pool Fluctuation	
			Typical	High
Basin A	507.5 ft.	Not Applicable	501.4 ft.	502.5 ft.
Basin B	507.7 ft.	Not Applicable	499.4 ft.	502.7 ft.

Notes:
*Elevation estimated from 2014 Topographic survey prepared by ESP Associates, P.A. – September 2014

Table 4-3. Step 3: Emergency Actions

Condition	Description of Condition	Action to be Taken
High Water Level/ Large Spillway Release	See Table 4-1 and Table 4-2 for elevations and triggering water levels associated with the impoundments and spillways covered by this EAP.	1. Assess cause of increased reservoir stage, especially during fair weather conditions. 2. Determine Response Level. 3. Make proper notifications as outlined in the Figure 2-2 Notification Flowchart. 4. Perform additional tasks as determined through consultation with the ERT. 5. Make notifications if condition worsens such that downstream flooding is imminent. **Response Level 0**: require enhanced surveillance 3 times per day **Response Level 1**: contact internal chain of command and external response partners as necessary; inspect impoundment minimum 1 time per hour **Response Level 2**: contact internal chain of command; notify ESDA/EMA's and notify external response partners. ESDA/EMA's notify affected parties. **Response Level 3**: contact internal chain of command; notify ESDA/EMA's and notify external response partners. ESDA/EMA's notify affected parties of emergency incident.
Seepage	Localized new seepage or boil(s) observed along downstream face / toe of earthen embankment with muddy discharge and increasing but controllable discharge of water.	1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection notes. 2. Determine Response Level. 3. Make proper notifications as outlined in the Figure 2-2 Notification Flowchart. 4. ERT (with Dam Safety Manager as lead) to determine mitigation actions. The following actions may apply: a) Place a ring of sand bags with a weir at the top towards the natural drainage path to monitor flow rate. If boil becomes too large to sand bag, place a blanket filter over the area using non-woven filter fabric and pea gravel. Attempt to contain flow in such a manner (without performing any excavations) that flow rates can be measured. Stockpile gravel and sand fill for later use, if necessary. b) Inspect the embankment and collect piezometer, water level and seepage flow data daily unless otherwise instructed by the Dam Safety Manager. Record any changes of conditions. Carefully observe embankment for signs of depressions, seepage, sinkholes, cracking or movement. c) Maintain continuous monitoring of feature. Record measured flow rate and any changes of condition, including presence or absence of muddy discharge. 5. Make notifications as outlined in the lower portion of the Notification Flowchart (Figure 2-2) if condition worsens such that failure is imminent.

Table 4-3. Step 3: Emergency Actions

Condition	Description of Condition	Action to be Taken
Sabotage and Miscellaneous Other Issues	Criminal action with significant damage to embankment or structures where significant repairs are required and the integrity of the facility is compromised—condition appears stable with time.	1. Contact law enforcement authorities and restrict all access (except emergency responders) to impoundment. Restrict traffic on embankment crest to essential emergency operations only. 2. Determine Response Level. 3. Make internal notifications as outlined in the upper portion of the Notification Flowchart (Figure 2-2). 4. In conjunction with the Dam Safety Manager, assess extent of damage and visually inspect entire embankment and ancillary structures for additional less obvious damage. Based on inspection results, confirm if extent of damage to various components of the impoundment warrants a revised Response Level and additional notifications. 5. Perform additional tasks as directed by the ERT. 6. Make notifications if conditions worsen.
Embankment Deformation	**Cracks:** New longitudinal (along the embankment) or transverse (across the embankment) cracks more than 6 inches deep or more than 3 inches wide or increasing with time. New concave cracks on or near the embankment crest associated with slope movement.	1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection notes. 2. Restrict traffic on embankment crest to essential emergency operations only. 3. Determine Response Level. 4. Make notifications as outlined in the Figure 2-2 Notification Flowchart. 5. ERT (with Dam Safety Manager as lead) to determine mitigation actions. The following actions may apply: a) Place buttress fill against base of slope immediately below surface feature. Stock pile additional fill. b) Place sand bags as necessary around crack area to divert any storm water runoff from flowing into crack(s). 6. As directed by the Dam Safety Manager, additional inspection and monitoring of the dam may be required. Items may include; inspect the dam on a schedule determined by the engineers; collect piezometer and water level data; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. 7. Make notifications as outlined in the Figure 2-2 Notification Flowchart if conditions worsen such that failure is imminent.
	Slides / Erosion: Deep slide / erosion (greater than 2 feet deep) on the embankment that may also extend beyond the embankment toe but does not encroach onto the embankment crest and appears stable with time.	1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection report. 2. Restrict traffic on embankment crest to essential emergency operations only. 3. Determine the Response Level. 4. Make notifications as outlined in the Figure 2-2 Notification Flowchart. 5. ERT (with Dam Safety Manager as lead) to determine mitigation actions. Additional actions may include the following items. a) Place sand bags as necessary around slide area to divert any storm water runoff from flowing into slide(s). b) Increase inspections of the dam; collect piezometer and water level data; and record any changes of condition. During inspections, carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. 6. Make notifications as outlined in the Figure 2-2 Notification Flowchart if conditions worsen such that failure is imminent.

Table 4-3. Step 3: Emergency Actions

Condition	Description of Condition	Action to be Taken
Embankment Deformation (cont.)	**Sinkholes:** Small depression observed on the embankment or within 50 feet of the embankment toe that is less than 5 feet deep and 30 feet wide or which is increasing with time.	1. Slowly open drain gates to lower pool elevation. 2. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection notes. 3. Restrict traffic on embankment crest to essential emergency operations only. 4. Determine Response Level. 5. Make notifications as outlined in the Figure 2-2 Notification Flowchart. 6. ERT (with Dam Safety Manager as lead) to determine mitigation actions. Additional actions may include the following items: a) Backfill the depression with relatively clean earth fill (free of organic materials) generally even with surrounding grade and slightly mounded (6 to 12 inches higher) in the center in order to shed storm water away from the depression. Stock pile additional fill. b) Increase inspections of the dam; collect piezometer and water level data daily unless otherwise instructed by Dam Safety Manager; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. 7. Make notifications as outlined in the Figure 2-2 Notification Flowchart if conditions worsen such that failure is imminent.
Gate Malfunction or Failure	Sluice gate damaged structurally (sabotage, debris, etc.) with uncontrolled release of water at a constant volume. Condition appears stable.	1. Close any other gates, if open. 2. Determine Response Level. 3. Make notifications as outlined in the Figure 2-2 Notification Flowchart. 4. Obtain instructions from the Dam Safety Manager to determine if there are other methods to stop or slow down the flow of water. 5. If conditions worsen such that failure is imminent, make notifications as outlined in the lower portion of the Figure 2-2 Notification Flowchart.

5 PREPAREDNESS

The intent of this section is to provide information that will be utilized during a response. Established emergency supplies and locations, suppliers, and equipment are provided in Table 5-1. Supplier contact information is listed in Table 5-2.

A coordination meeting shall be conducted annually between representatives of Miami Fort Power Company LLC and local emergency responders. This meeting may be in the form of a face-to-face meeting, tabletop exercise, or additional training regarding the EAP.

Table 5-1. Emergency Supplies and Equipment

Item	On-site (Yes/No/Occasionally)	Remarks
Flashlights Generator Extension Cords Fire extinguishers Floodlights	Yes	Typically at Miami Fort Power Plant Maintenance Facility, contact Shift Supervisor for location(s).
Backhoe	No	Contact Bucher Excavating, Utter Construction (see Table 5-2) and/or other nearby large equipment rental providers for additional large equipment as necessary.
Dozer	Yes	One CAT D5 and one CAT D8. Contact Shift Supervisor for location(s).
Large Equipment (Rental – including excavating equipment, pumps, lighting)	Yes	One 300 Hyundai Short Stick Track Hoe Excavator, one 821E Case Wheel Rubber Tire Front End Loader, one GMC ½ ton site pick-up, one New Holland LS-185 Skid Steer, one Smooth Drum Roller, two Industrial Vacuum Trucks. Contact Shift Supervisor for availability and location(s). Contact Bucher Excavating, Utter Construction (see Table 5-2) and/or other nearby large equipment rental providers for additional large equipment as necessary.
Dump Truck	Yes	One Mack Quint Axle Dump Truck, one Volvo Quint Axle Dump Truck, one International Quint Axle Dump Truck. Contact Shift Supervisor for location(s).
Pump and Hoses	Yes	Three Portable Water Pumps. Contact Shift Supervisor for availability and location(s). Contact Allied Technical Services or Sunbelt Rentals for high capacity portable pumps (see Table 5-2).
Sandbags and Sand	Yes	Soil stockpiled on-site. Contact Shift Supervisor for location(s). Contact Dayton Bag & Burlap or Max Katz Bag Company, Inc for additional sandbags (see Table 5-2).
Fill (Stone, aggregate, sand)	Yes	Medium sized aggregate available on-site. Contact Shift Supervisor for location(s). Contact listed suppliers in Table 5-2 for gravel, sand, and riprap fill as necessary.
Concrete/grout	No	Contact Cannon U-Cart Concrete and/or Hilltop Ready Mix for concrete/grout (see Table 5-2).
Geotextile Filter Fabric	Yes	Contact Shift Supervisor for location(s).
Plastic Sheeting	Yes	Contact Shift Supervisor for location(s).
Rope	Yes	Contact Shift Supervisor for location(s). Should be maintained in close proximity to any features that might require immediate access.
Personal Flotation Devices	Yes	Contact Shift Supervisor for location(s).

Table 5-2. Supplier Addresses

Supply/Rental Item(s)	Supplier Contact Information	Distance from Site (miles)	Address
Backhoe, Large Equipment (Rental – including excavating equipment, pumps, lighting)	**Bucher Excavating** (513) 353-3700	5.6	3707 Hayes McKinney Road North Bend, OH 45052
	Utter Construction (513) 876-8616	63.7	1302 OH-133 Bethel, OH 45106
Pump and Hoses	**Allied Technical Services** (513) 793-0499	33.5	3460 Mustafa Drive Cincinnati, OH 45241
	Sunbelt Rentals (859) 283-5544	26.5	4631 Spring Grove Avenue Cincinnati, OH 45232
Fill (Stone, aggregate, sand)	**Martin Marietta Aggregates** (513) 492-5638	5.4	10905 US-50 North Bend, OH 45052
	Watson Gravel, Inc. (513) 863-0070	6.8	10569 Suspension Bridge Road Harrison, OH 45030
Sandbags and Sand	**Dayton Bag & Burlap** (937) 253-1726	69.0	322 Davis Avenue Dayton, OH 45403
	Max Katz Bag Company, Inc. (317) 635-9561	99.6	235 S La Salle Street Indianapolis, IN 46201
Concrete/grout	**Ernst Concrete** (513) 402-5001	10.7	7340 Dry Fork Rd Harrison OH 45030
	Hilltop Ready Mix (513) 621-4995	19.8	511 W Water Street Cincinnati, OH 45202

6 FACILITY/IMPOUNDMENT DESCRIPTION

The impoundments included in this EAP are described as follows and illustrated in Figure 1-2. Table 6-1 contains additional geometric details for each impoundment.

The Miami Fort Power Plant is located within Miami Township of Hamilton County, Ohio. The facility is located in the southwest corner of Ohio about 3,500 feet east of the confluence of the Ohio River and the Great Miami River. The facility is bounded to the south by the Ohio River and to the west by the Great Miami River approximately 1 mile upstream of the Interstate-275 bridge over the Ohio River and 2.25 miles upstream of Lawrenceburg, Indiana, the nearest downstream city.

The Miami Fort Pond System is a single, multi-cell system that comprises of two basins referred to as Basin A and Basin B. These Basins operate in series and are hydraulically connected by a 40-inch HDPE pipe that runs through a shared separator dike.

Basin A is located west of the Miami Fort Power Plant power plant, approximately 1,250 feet from the power house and 1,500 feet east of the confluence of the Ohio River and the Great Miami River. The Ohio River flows east to west and bounds the impoundment to the south. Basin A is situated directly to the east of Basin B, separated by a shared dike.

Basin A is a diked impoundment that was originally constructed prior to 1959 as a settling pond for CCR with an embankment elevation of 500 feet. A 1976 soil investigation showed the embankment to be primarily comprised of compacted silty clay. Basin B was added to the west between 1979 and 1982 and the embankments of the basins were raised to an approximate elevation of 510 feet. Basin A has a contributing drainage area of approximately 32.5 acres. The water capacity of Basin A is approximately 174 acre-feet with about 23 acre-feet of stored water at normal pool elevation (El. 501.3 feet). The lowest crest elevation of the impoundment is at elevation 506.5 feet located on the northeast side of the perimeter. The crest is 51.5 feet above the normal pool elevation of the Ohio River (El. 455 feet). The western crest of Basin A is at an elevation of approximately 510 feet.

Basin A contains "stabilized" material deposited in designated portions of the impoundment (stabilization is achieved by filling, heavy equipment traffic and natural vegetation growth). As a result, approximately 11.2 acres of the 32.5 acres of the impoundment is open water contained by the dike. Water is able to pass between Basin A and Basin B through a 48-inch diameter corrugated metal pipe (CMP) slip-lined with a 40-inch diameter high density polyethylene (HDPE) pipe. Basin A has a 36-inch diameter spillway riser that drains to a 42-inch CMP; flow through the outlet is controlled by a gate structure and is currently not in use.

Basin B was constructed as a settling pond for CCR. The basin has a contributing drainage area of approximately 21 acres. The water capacity of Basin B is approximately 239 acre-feet. The lowest crest elevation of the impoundment is 503.9 feet located on the southeast side of the perimeter. The crest is 48.9 feet above the normal pool elevation of the Ohio River (El. 455 feet). The eastern crest of Basin B is at an elevation of approximately 510 feet.

Basin B’s standpipe acts as the principal spillway structure as Basin B has a lower normal pool level than Basin A (according to 2021 survey drawings which show a normal pool elevation within Basin B of 499.1 feet and a normal pool elevation within Basin A of 501.3 feet). Basin B’s principal spillway is a 36-inch diameter spillway riser draining to a 42-inch CMP discharging to a shared outlet pipe with Basin A to the Ohio River. The crest of Basin B’s standpipe was assumed to be at normal pool elevation (499.1 feet).

Table 6-1. Plant Impoundment Characteristics

Feature/Parameter	Basin A	Basin B
Maximum Embankment Height	50 ft.	50 ft.
Length of Dam	4,500 ft.	4,000 ft.
Crest Width	15-20 ft.	15-20 ft.
Crest Elevation	506.5 ft.	503.9 ft.
Reservoir Area at Top of Dam	26 acres	20 acres
Storage Capacity at Top of Dam	91.4 acre-ft.	124 acre-ft.
Primary Spillway Type	40” HDPE Pipe between Basin A and Basin B	36” Morning Glory Spillway draining to 42” CMP (
Primary Spillway Crest Elevation	501.3 ft. (Assumed based on Normal Pool)	499.1 ft. (Assumed based on Normal Pool)
Storage Capacity at Primary Spillway Elevation	23 acre-ft. (Normal Storage)	Approximately 45 acre-ft.
Reservoir Area at Normal Water Surface Elevation	9.5 acres	15.2 acres
Auxiliary Spillway Type	Not Applicable	Not Applicable
Auxiliary Spillway Crest Elevation	Not Applicable	Not Applicable

Notes:

- Survey Data obtained from (Luminant, Luminant Generation Company, LLC., Miami Fort Power Station, prepared by IngenAE, August 2021)
- 2.5-Feet Resolution LiDAR DEM - Downloaded from http://ogrip.oit.ohio.gov/ (January, 2016)
- Elevations are in reference to Mean Sea Level (MSL), NAVD88.

7 BREACH INUNDATION MAPS AND POTENTIAL IMPACTS

Inundation maps for Basin A and Basin B potential breach scenarios are provided in this section. It is the Hamilton County ESDA/EMA's responsibility to keep a current list of affected parties/properties to contact in the case of emergencies that result in Response Level 2 or 3. This list should encompass all properties within and adjacent to the probable inundation extents shown in the provided maps.

The methodology used to identify probable inundation extents for potential breach scenarios varied as a function of the impoundment size, location, surrounding topography, and surrounding structures/facilities/waterbodies.

A 2-dimensional (2-D) dam breach analysis was performed for Basin A to determine possible inundation limits for the "Sunny Day", 100-Year, and Probable Maximum Flood (PMF) event scenarios. The breach analysis included stormwater runoff calculations, reservoir pool routing and breach failure, and 2-D hydraulic routing of the floodwave over land and into the Ohio River.

The inundation limits were mapped using the modeled maximum water surface elevations (WSE) and a combination of digital elevation data from the topographic survey prepared by ESP Associates, P.A. – September, 2014 and DEM data downloaded from the Ohio OGRIP website.

A visual analysis was performed for Basin B to determine possible inundation limits for a breach scenario. The inundation limits were mapped using a combination of digital elevation data from the topographic survey prepared by ESP Associates, P.A. – September, 2014 and DEM data downloaded from the Ohio OGRIP website.

Approximate inundation areas are illustrated in Figure 7-1 and Figure 7-2.

Figure 7-1. Basin A Inundation Map

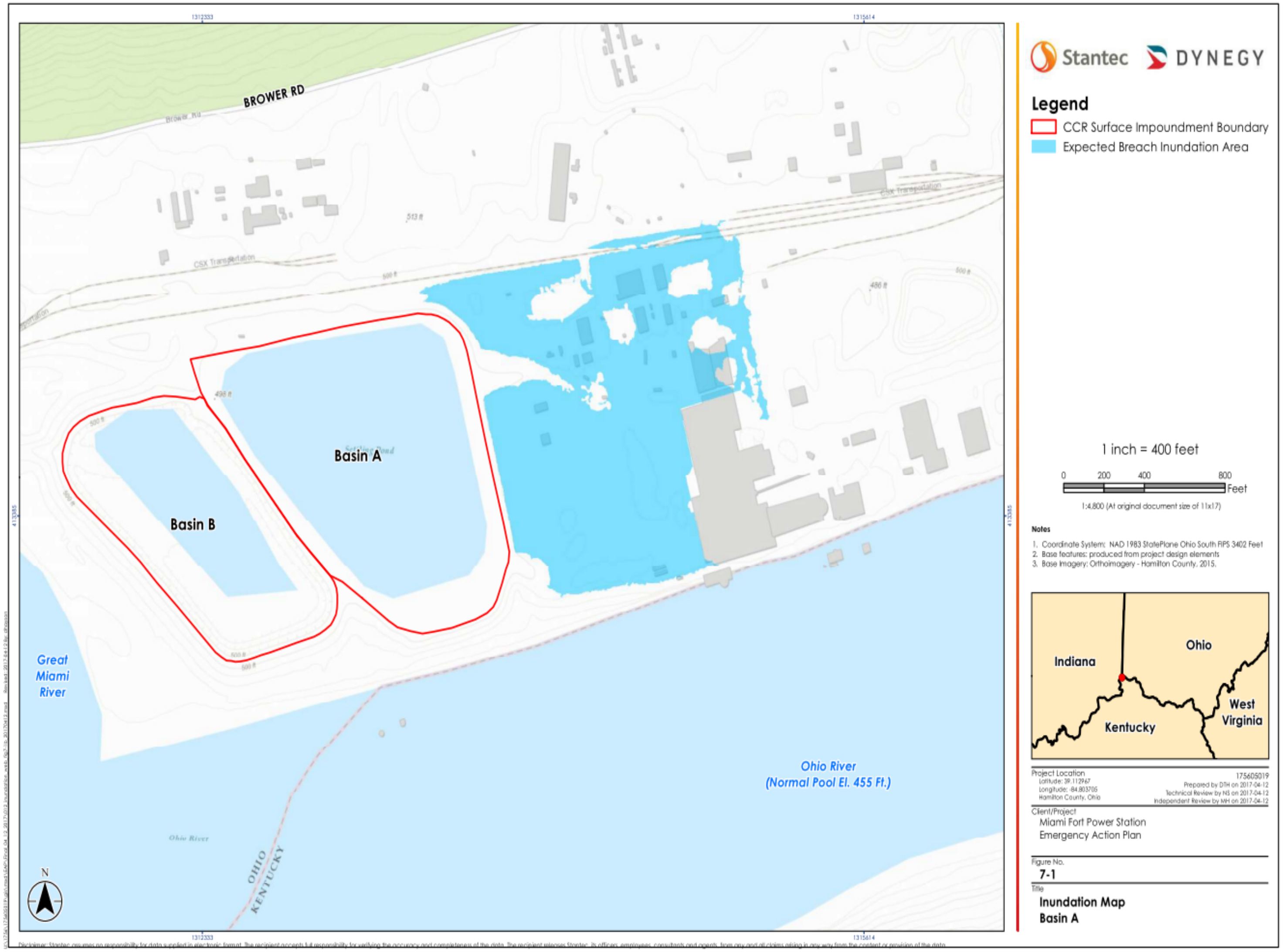
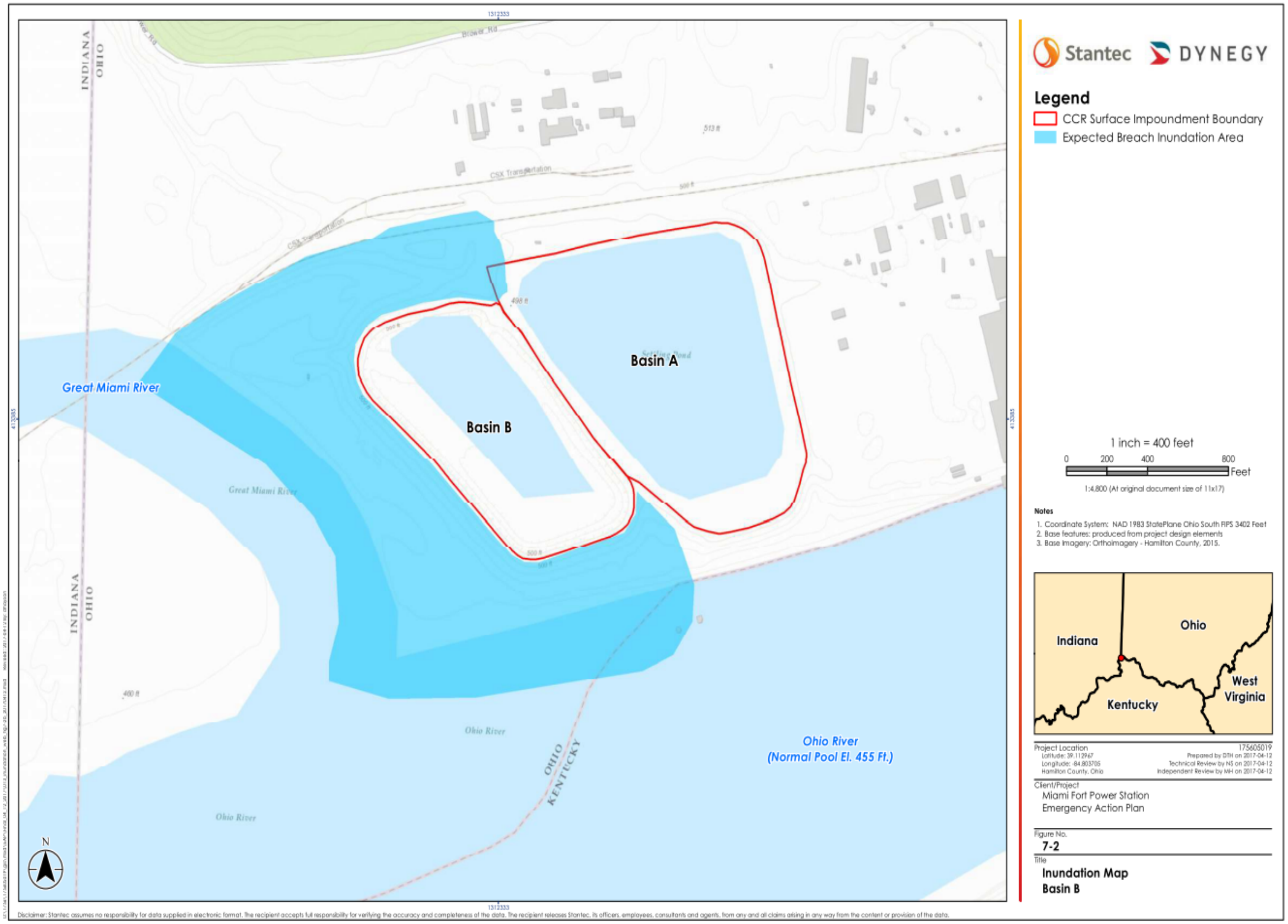


Figure 7-2. Basin B Inundation Map



Attachment D

Periodic History of Construction Report Update Letter

Geosyntec consultants

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October 2021

Miami Fort Power Company, LLC
11080 Brower Road
North Bend, Ohio 45052

Subject: Periodic History of Construction Report Update Letter
USEPA Final CCR Rule, 40 CFR §257.73(c)
Miami Fort Power Plant
North Bend, Ohio

At the request of Miami Fort Power Company LLC (MFPC), Geosyntec Consultants (Geosyntec) has prepared this Letter to documents updates to the Initial History of Construction (HoC) report for the Miami Fort Power Plant (MIA), also known as the Miami Fort Power Station. The Initial HoC report was prepared by AECOM in October of 2016 [1] in accordance with 40 Code of Federal Regulations (CFR) §257.73(c) of the United States Environmental Protection Agency (USEPA) Coal Combustion Residuals Rule, known as the CCR Rule [2].

BACKGROUND

The CCR Rule required that, by October 17, 2016, Initial HoC reports to be compiled for existing CCR surface impoundments with: (1) a height of five feet or more and a storage volume of 20 acre-feet or more, or (2) a height of 20 feet or more. The Initial HoC report was required to contain, to the extent feasible, the information specified in 40 CFR §257.73(c)(1)(i)-(xii). The Initial HoC report for MIA, which included the existing CCR surface impoundment, the Miami Fort Pond System (MFPS), was prepared and subsequently posted to MFPC's CCR Website prior to October 17, 2016.

The CCR Rule requires that Initial HoC to be updated if there is a significant change to any information complied in the Initial HoC report, as listed below:

§ 257.73(c)(2): If there is a significant change to any information complied under paragraph (c)(1) of this section, the owner or operator of the CCR unit must update the relevant information and place it in the facility's operating record as required by § 257.105(f)(9).

MFPC retained Geosyntec to review the Initial HoC report, review reasonably and readily available information for the MFPS generated since the Initial HoC report was prepared, and perform a site visit to MIA to evaluate if significant changes may have occurred since the Initial HoC report was prepared. This Letter contains the results of Geosyntec's evaluation and documents significant changes that have occurred at the MFPS and MIA, as they pertain the requirements of §257.73(c)(1)(i)-(xii)

UPDATES TO HISTORY OF CONSTRUCTION REPORT

Geosyntec's evaluation for the MIA MFPS determined that no known significant changes requiring updates to the information in the Initial HoC report pertaining to §257.73(c)(1)(ii)-(vii) and (x)-(xii) of the CCR Rule had occurred since the Initial HoC report was developed.

However, Geosyntec's evaluation determined that significant changes at the MIA MFPS pertaining to §257.73(c)(1)(i) and (viii)-(ix) of the CCR Rule had occurred since the Initial HoC report had been developed. Each change and the subsequent updates to the Initial HoC report is described within this section.

§ 257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

The MFPS consists of two basins, Basin A and Basin B, that operate in series and are hydraulically connected by a 40-inch HDPE pipe that runs through a shared separator dike. In the Initial HoC, each basin was identified as unique CCR units; however, the MFPS is a single, multi-cell system for purposes of the CCR Rule and is referred to as such in CCR compliance documents.

Name of CCR unit: Miami Fort Pond System

§ 257.73(c)(1)(viii): A description of the type, purpose, and location of existing instrumentation.

Several piezometers have stopped working since 2016 and are no longer being utilized for monitoring purposes. These piezometers include:

- B-A-1111, B-A-1112, B-B-1103, B-B-1104, and B-B-1106.

§ 257.73(c)(1)(ix): Area-capacity curves for the CCR unit.

Updated area-capacity curves were prepared for the MFPS in 2021. These curves are provided in **Figures 1** and **2**.

Figure 1 – Area-Capacity Curve for Basin A

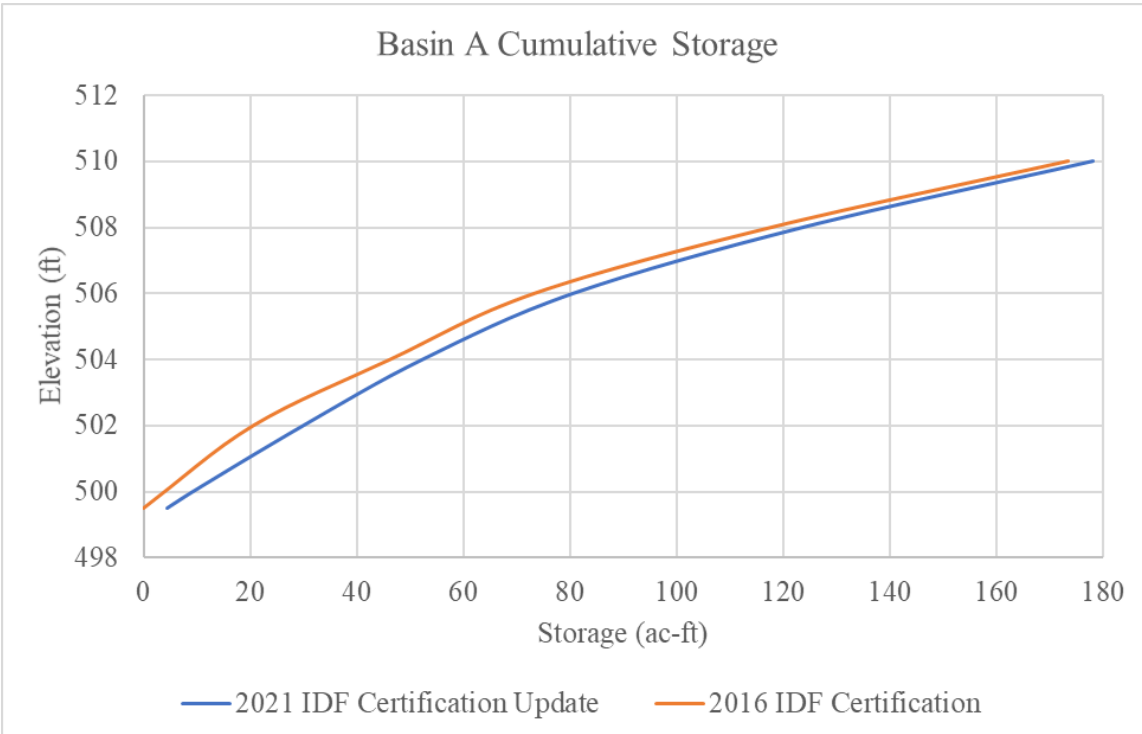
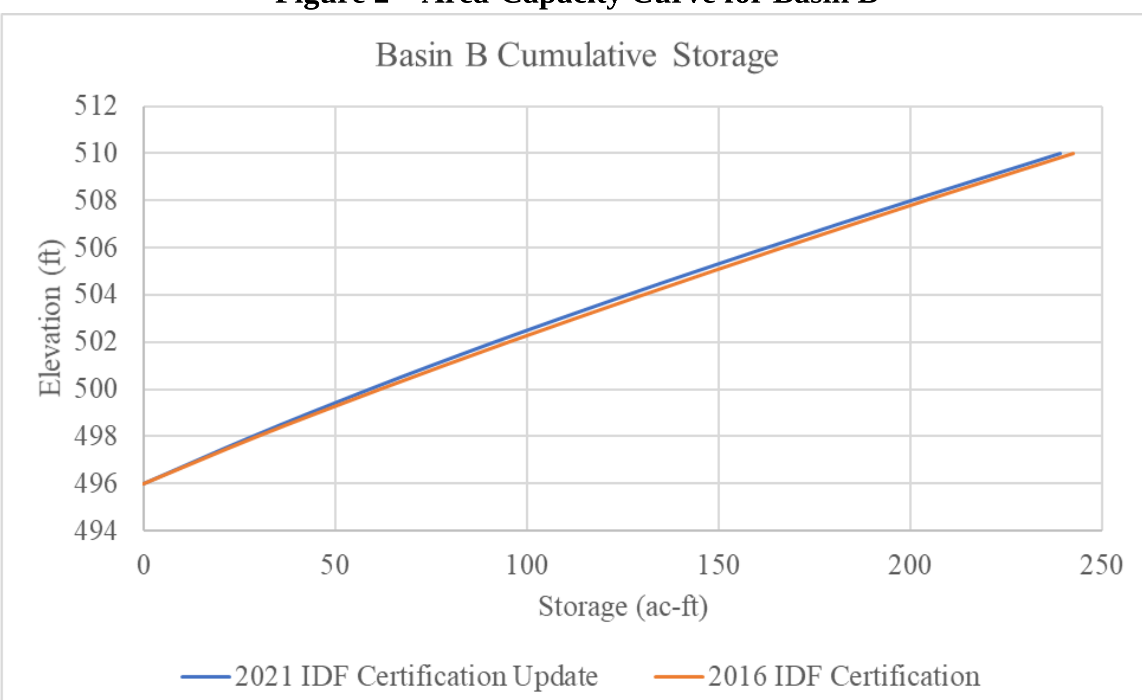


Figure 2 – Area-Capacity Curve for Basin B



§ 257.73(c)(1)(x): A description of each spillway and diversion design features and capacities and calculations used in their determination.

Updated discharge capacity calculations for the existing spillways were prepared in 2021 using HydroCAD 10 modeling software. The calculations indicate that the MFPS has sufficient storage capacity and will not overtop the embankments during the Probable Maximum Precipitation (PMP), 24-hour, storm event. The results of the calculations are provided in **Table 1**.

Table 1 – Results of Updated Discharge Capacity Calculations

	Pond A	Pond B
Approximate Berm Minimum Elevation[1], ft	506.5	503.9
Approximate Emergency Spillway Elevation[1], ft	Not Applicable	Not Applicable
Starting Water Surface Elevation[1] (SWSE), ft	501.3	499.1
Peak Water Surface Elevation[1] (PWSE), ft	502.3	500.5
Time to Peak, hr	12.8	16.6
Surface Area[2], ac	11.0	16.3
Storage[3], ac-ft	11.0	21.4

Notes:
[1]Elevations are based on the NAVD88 datum
[2]Surface Area is defined as the water surface area at the PWSE
[3]Storage is defined as the volume between the SWSE and PWSE

CLOSING

This letter has been prepared to document Geosyntec's evaluation of changes that have occurred at the MFPS at the MIA since the Initial HoC was developed, based on reasonably and readily available information provided by MFPC, observed by Geosyntec during the site visit, or generated by Geosyntec as part of subsequent calculations.

Sincerely,

Panos Andonyadis, P.E.
Senior Engineer

John Seymour, P.E.
Senior Principal

REFERENCES

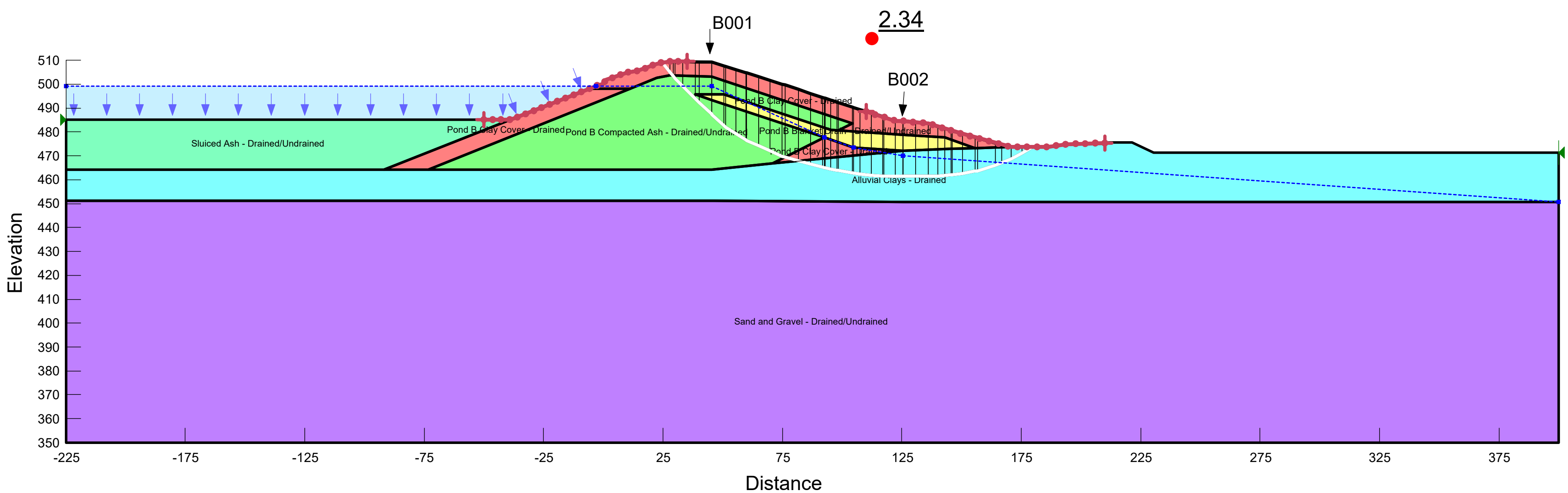
[1] AECOM, "History of Construction, USEPA 40 CFR § 257.73(c), Miami Fort Power Station, North Bend, Ohio," October 2016.

[2] United Stated Environmental Protection Agency, "40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, 2015," 2015.

Attachment E

Periodic Structural Stability and Safety Factor Assessment Analyses

Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 1 (Ash Basin B, North side)
Static Long Term (Drained Strengths)



Material Properties

Name: Sluiced Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Alluvial Clays - Drained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 150 psf Phi': 29 ° Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Piezometric Line: 1
Name: Pond B Clay Cover - Drained Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1

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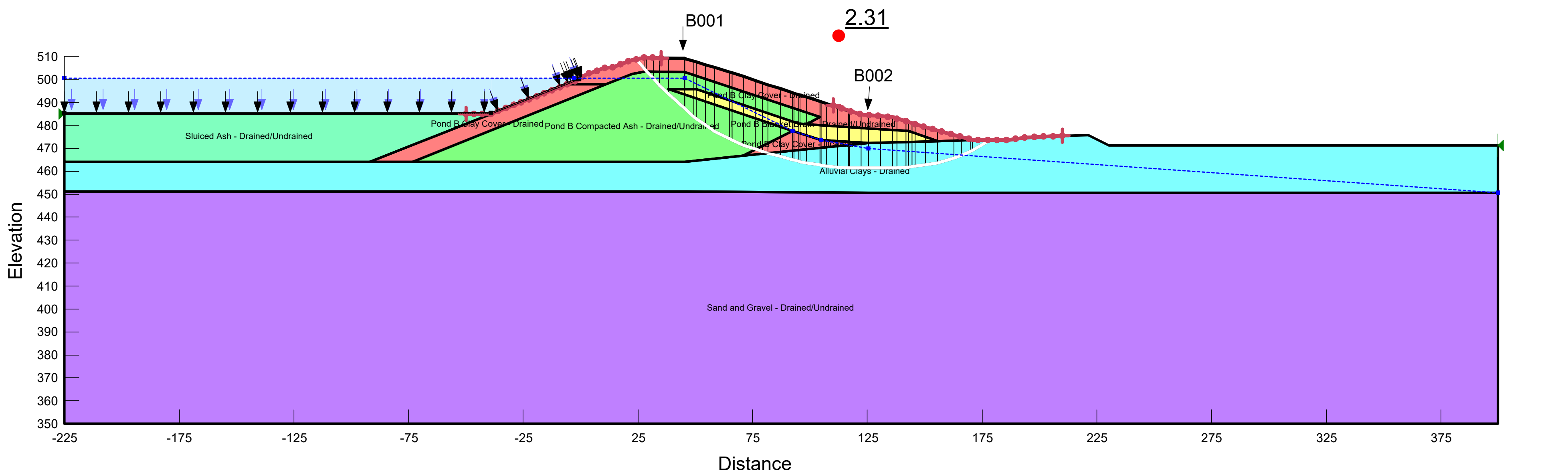
Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 1 (Ash Basin B, North side)
Static Surcharge Pool (Drained Strengths)



Material Properties

Name: Sluiced Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Alluvial Clays - Drained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 150 psf Phi': 29 ° Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Piezometric Line: 1
Name: Pond B Clay Cover - Drained Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1

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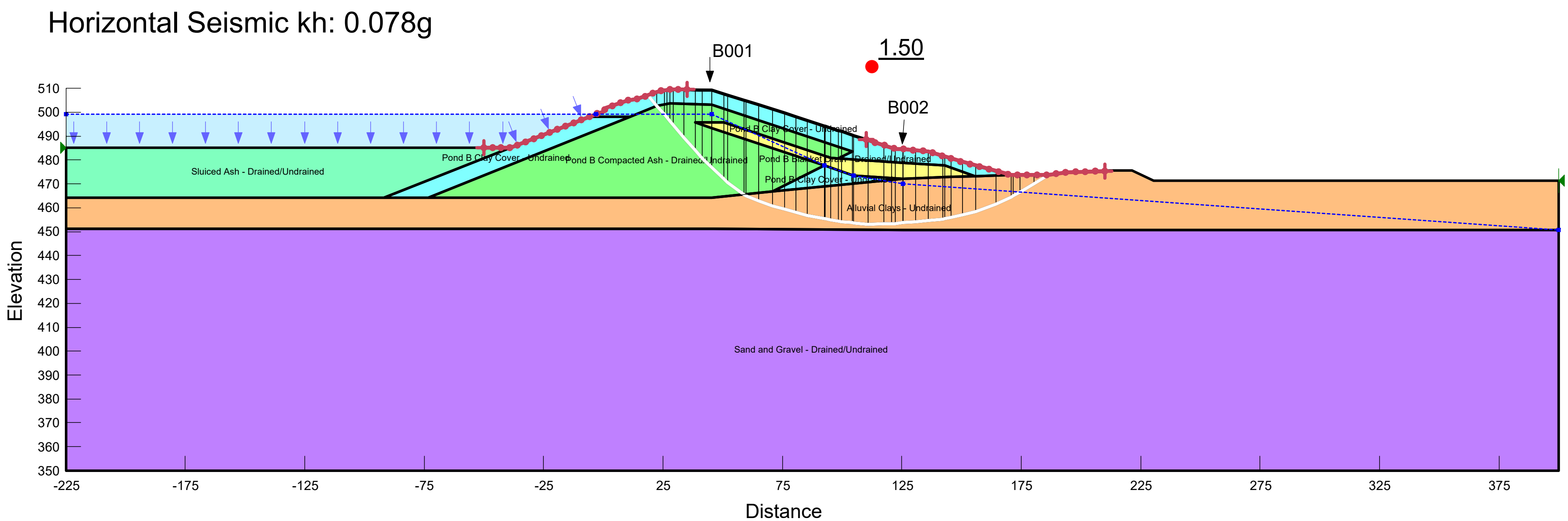
Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 1 (Ash Basin B, North side)
Pseudo Static (Peak Undrained Strengths)



Material Properties

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Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Piezometric Line: 1
Name: Alluvial Clays - Undrained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 400 psf Phi': 18 ° Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Pond B Clay Cover - Undrained Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 600 psf Phi': 17 ° Piezometric Line: 1

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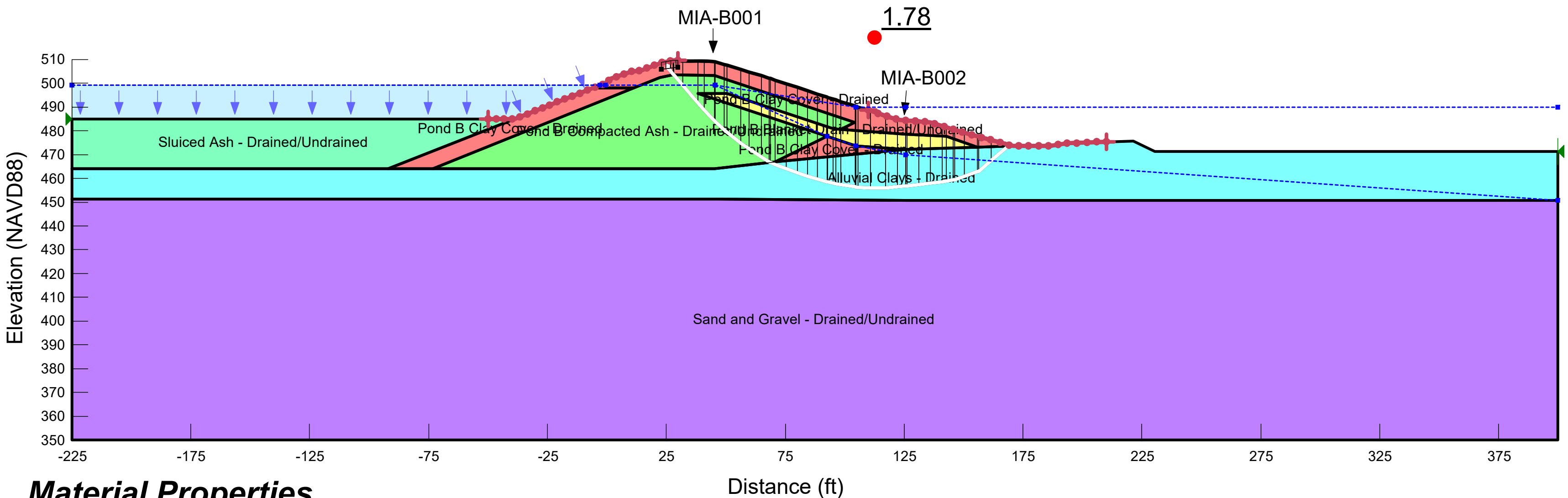
Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 1 (Ash Basin B, North side)
Rapid Drawdown Condition (Drained Strengths)

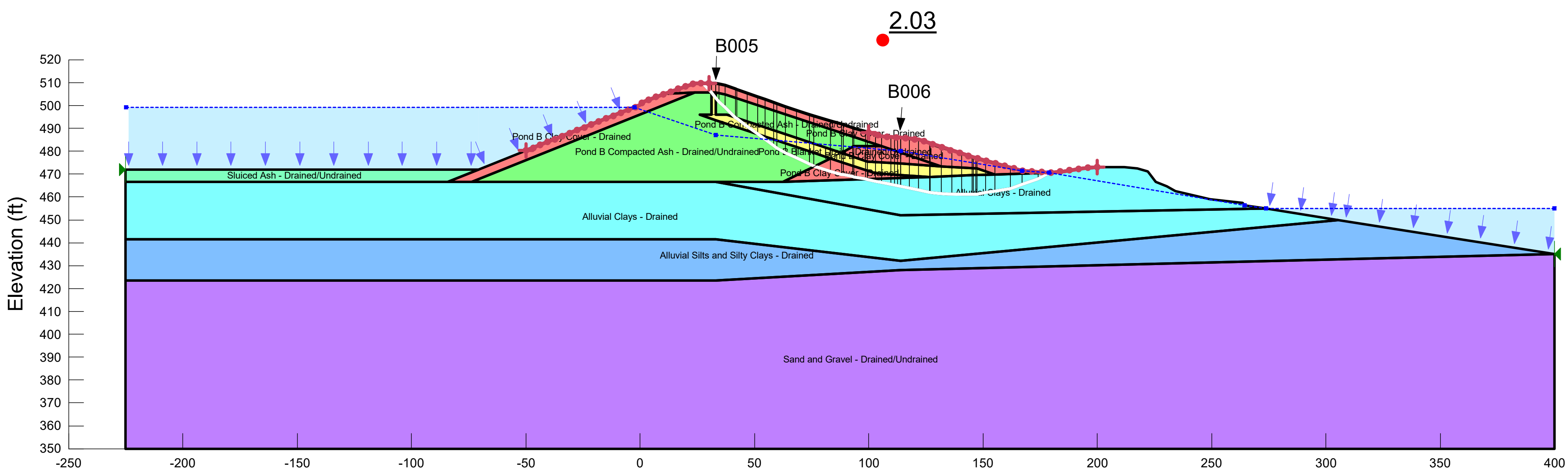


Material Properties

Name: Sluiced Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Alluvial Clays - Drained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 150 psf Phi': 29 ° Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Piezometric Line: 1
Name: Pond B Clay Cover - Drained Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1

\\STLOUISMO-01\Data\Company\Projects_post_2014\GLP8027_CCR_ReCert\500_Technical\508_MIA\508d_Full_Cert_Rpt\MFPS Report\Revised SFA\Reruns_2021\Section 1\Sec 1 Pond B_RDD_PK_23092021.gsz

Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 3 (Ash Basin B, South side)
Static Long Term (Drained Strengths)

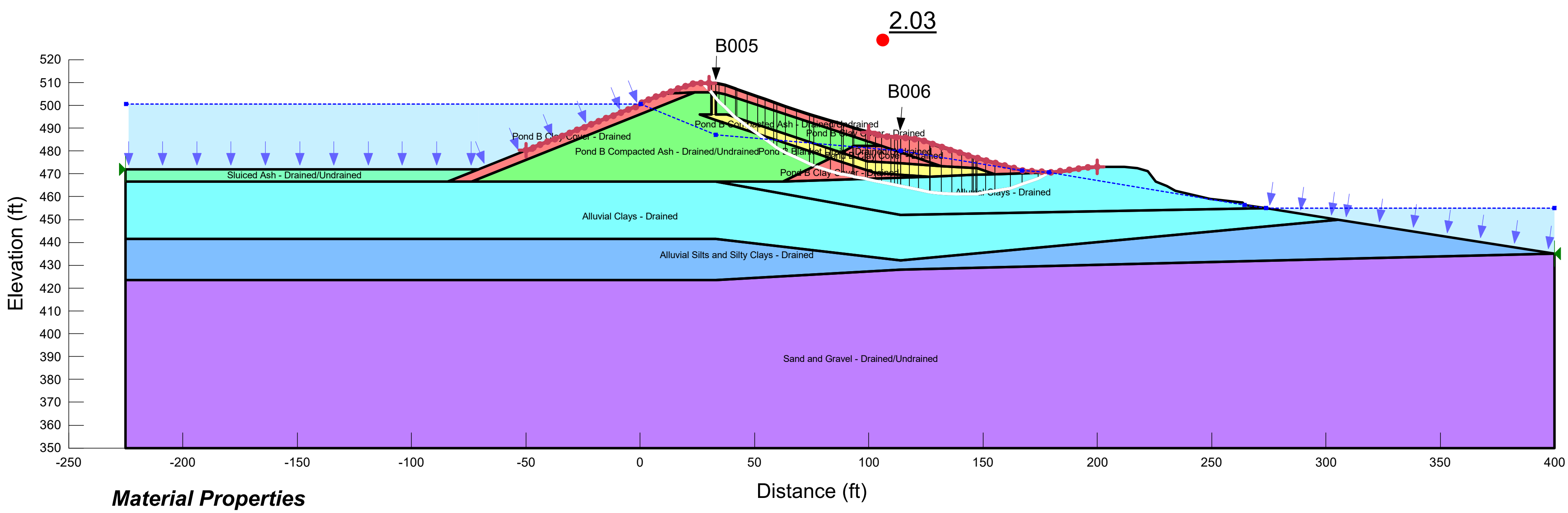


Material Properties

Name: Sluiced Ash - Drained/Undrained   Model: Mohr-Coulomb   Unit Weight: 95 pcf   Cohesion': 0 psf   Phi': 28 °   Piezometric Line: 1
Name: Alluvial Clays - Drained   Model: Mohr-Coulomb   Unit Weight: 126 pcf   Cohesion': 150 psf   Phi': 29 °   Piezometric Line: 1
Name: Alluvial Silts and Silty Clays - Drained   Model: Mohr-Coulomb   Unit Weight: 126 pcf   Cohesion': 200 psf   Phi': 28 °   Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained   Model: Mohr-Coulomb   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 31 °   Piezometric Line: 1
Name: Pond B Clay Cover - Drained   Model: Mohr-Coulomb   Unit Weight: 130 pcf   Cohesion': 200 psf   Phi': 26 °   Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained   Model: Mohr-Coulomb   Unit Weight: 110 pcf   Cohesion': 0 psf   Phi': 33 °   Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained   Model: Mohr-Coulomb   Unit Weight: 115 pcf   Cohesion': 0 psf   Phi': 32 °   Piezometric Line: 1

\\STLOUISMO-01\Data\Company\Projects_post_2014\GLP8027_CCR_ReCert\500_Technical\508_MIA\508d_Full_Cert_Rpt\MFPS Report\Revised SFA\Reruns_2021\Section 3\ Section 3_Rev3_09242021_PK.gsz

Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 3 (Ash Basin B, South side)
Static Surcharge Pool (Drained Strengths)



Material Properties

Name: Sluiced Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Alluvial Clays - Drained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 150 psf Phi': 29 ° Piezometric Line: 1
Name: Alluvial Silts and Silty Clays - Drained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Piezometric Line: 1
Name: Pond B Clay Cover - Drained Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1

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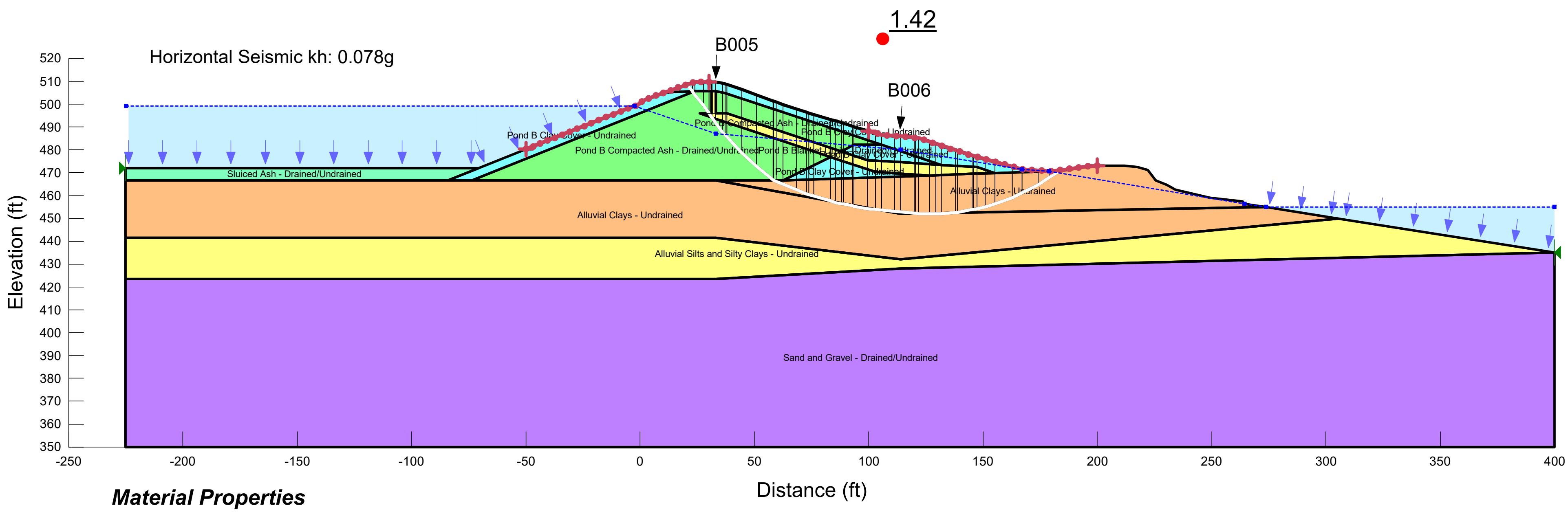
Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 3 (Ash Basin B, South side)
Pseudo Static (Peak Undrained Strengths)



Material Properties

Name: Sluiced Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Piezometric Line: 1
Name: Alluvial Clays - Undrained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 400 psf Phi': 18 ° Piezometric Line: 1
Name: Alluvial Silts and Silty Clays - Undrained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 525 psf Phi': 17 ° Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Pond B Clay Cover - Undrained Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 600 psf Phi': 17 ° Piezometric Line: 1

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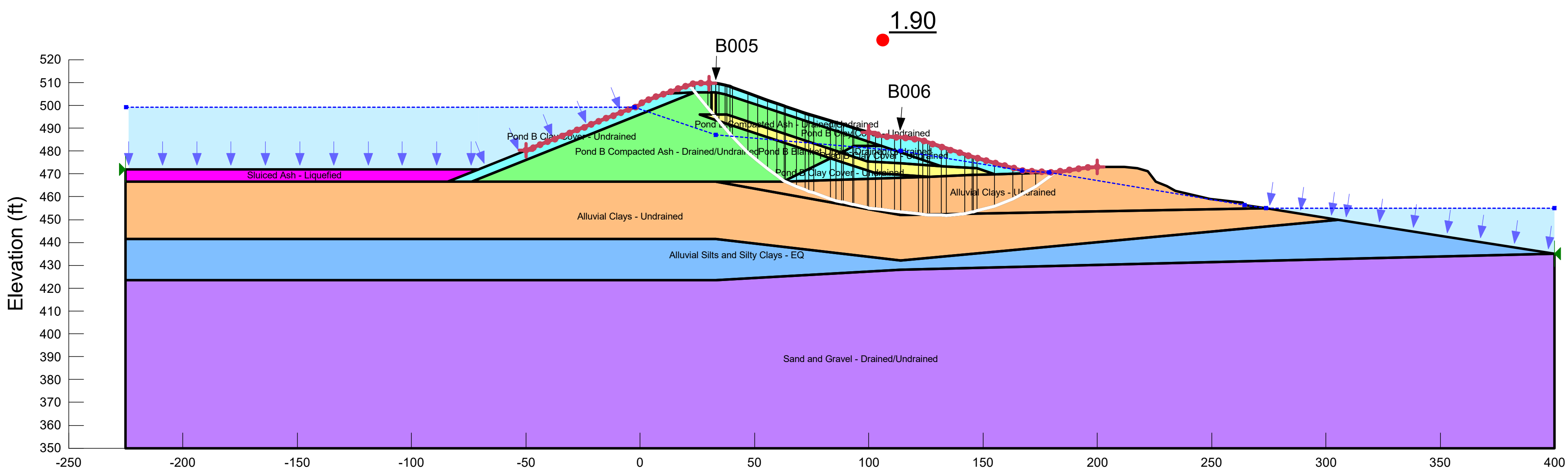
Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 3 (Ash Basin B, South side)
Post Liquefaction (Peak Undrained Strengths, Softened Silts, Liquefied Sluiced Ash)



Material Properties

Name: Sand and Gravel - Drained/Undrained   Model: Mohr-Coulomb   Unit Weight: 120 pcf   Cohesion': 0 psf   Phi': 31 °   Piezometric Line: 1
Name: Alluvial Clays - Undrained   Model: Mohr-Coulomb   Unit Weight: 126 pcf   Cohesion': 400 psf   Phi': 18 °   Piezometric Line: 1
Name: Alluvial Silts and Silty Clays - EQ   Model: Mohr-Coulomb   Unit Weight: 126 pcf   Cohesion': 420 psf   Phi': 13.6 °   Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained   Model: Mohr-Coulomb   Unit Weight: 110 pcf   Cohesion': 0 psf   Phi': 33 °   Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained   Model: Mohr-Coulomb   Unit Weight: 115 pcf   Cohesion': 0 psf   Phi': 32 °   Piezometric Line: 1
Name: Pond B Clay Cover - Undrained   Model: Mohr-Coulomb   Unit Weight: 130 pcf   Cohesion': 600 psf   Phi': 17 °   Piezometric Line: 1
Name: Sluiced Ash - Liquefied   Model: S=f(overburden)   Unit Weight: 95 pcf   Tau/Sigma Ratio: 0.06   Minimum Strength: 0 psf   Piezometric Line: 1

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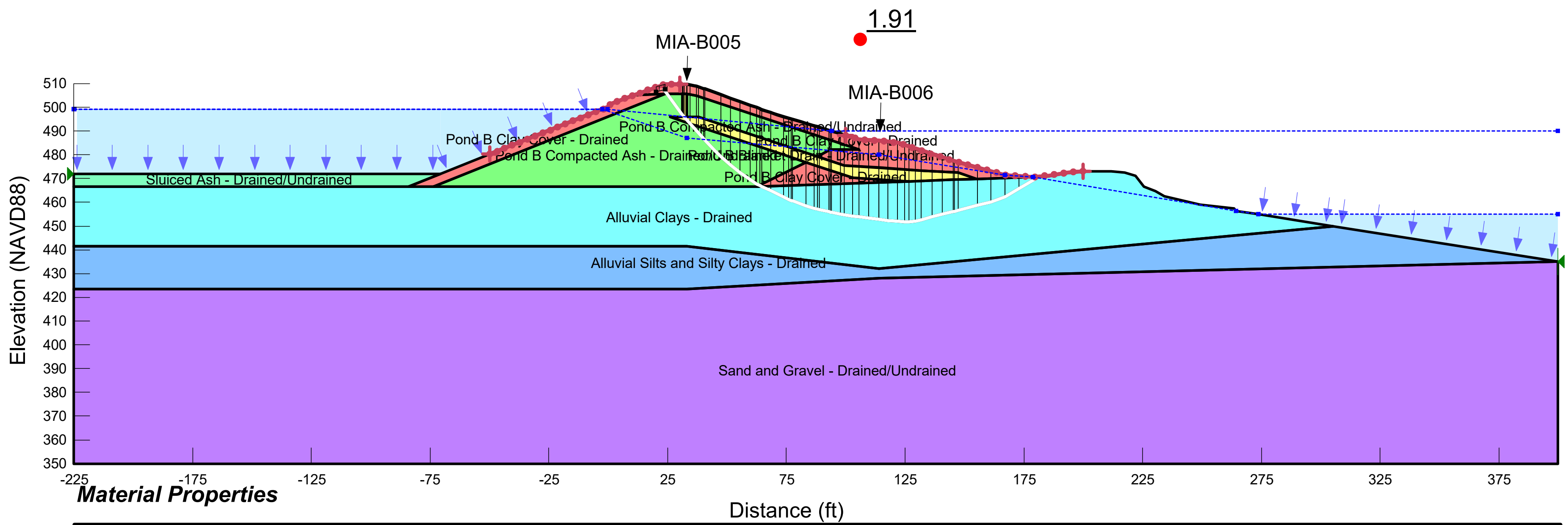
Miami Fort Power Plant
Project Location: North Bend, OH
Cross Section 3 (Ash Basin B, South side)
Rapid Drawdown Condition (Drained Strengths)



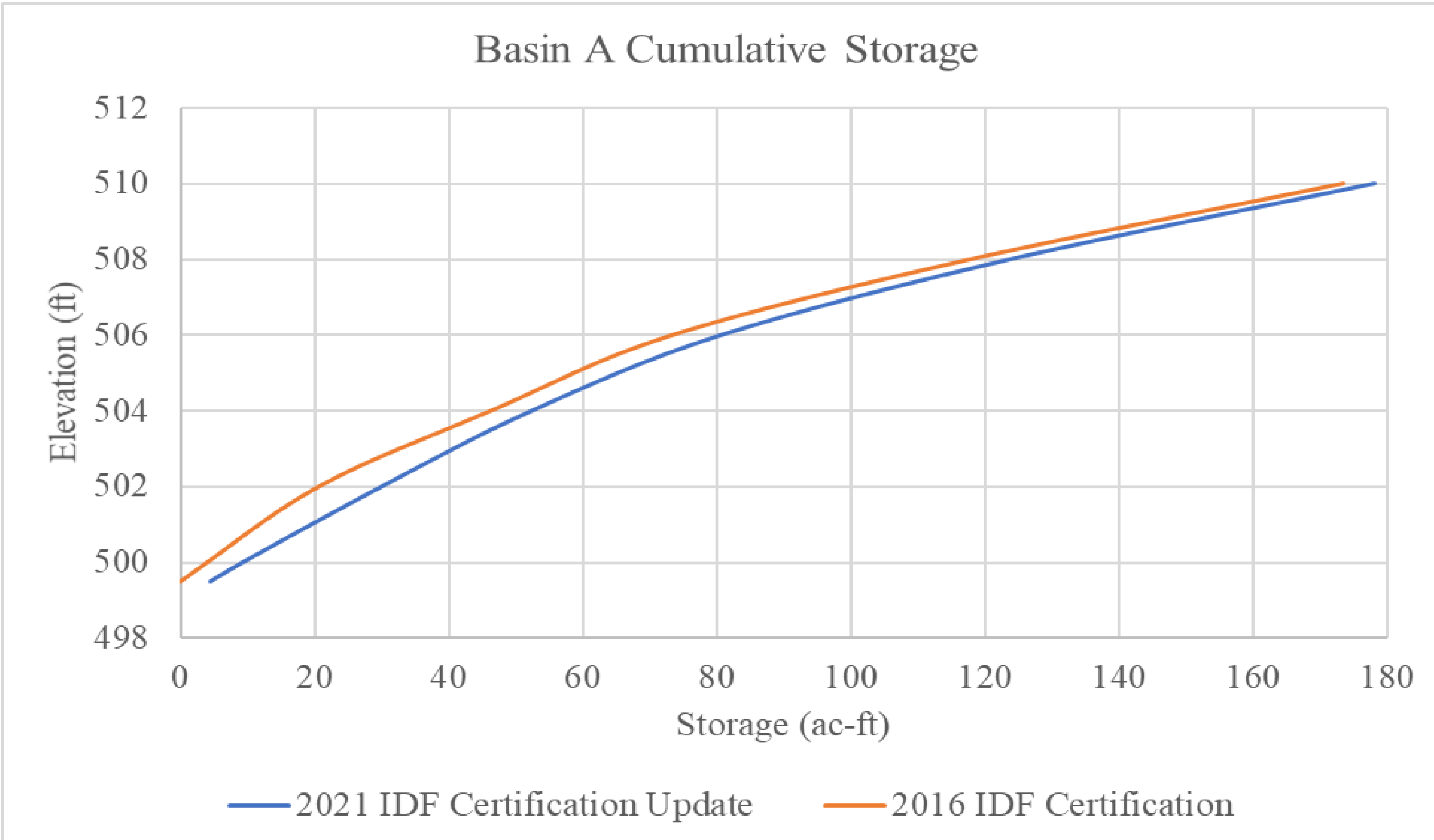
Material Properties

Name: Sluiced Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Alluvial Clays - Drained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 150 psf Phi': 29 ° Piezometric Line: 1
Name: Alluvial Silts and Silty Clays - Drained Model: Mohr-Coulomb Unit Weight: 126 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Piezometric Line: 1
Name: Pond B Clay Cover - Drained Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Pond B Compacted Ash - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 33 ° Piezometric Line: 1
Name: Pond B Blanket Drain - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1

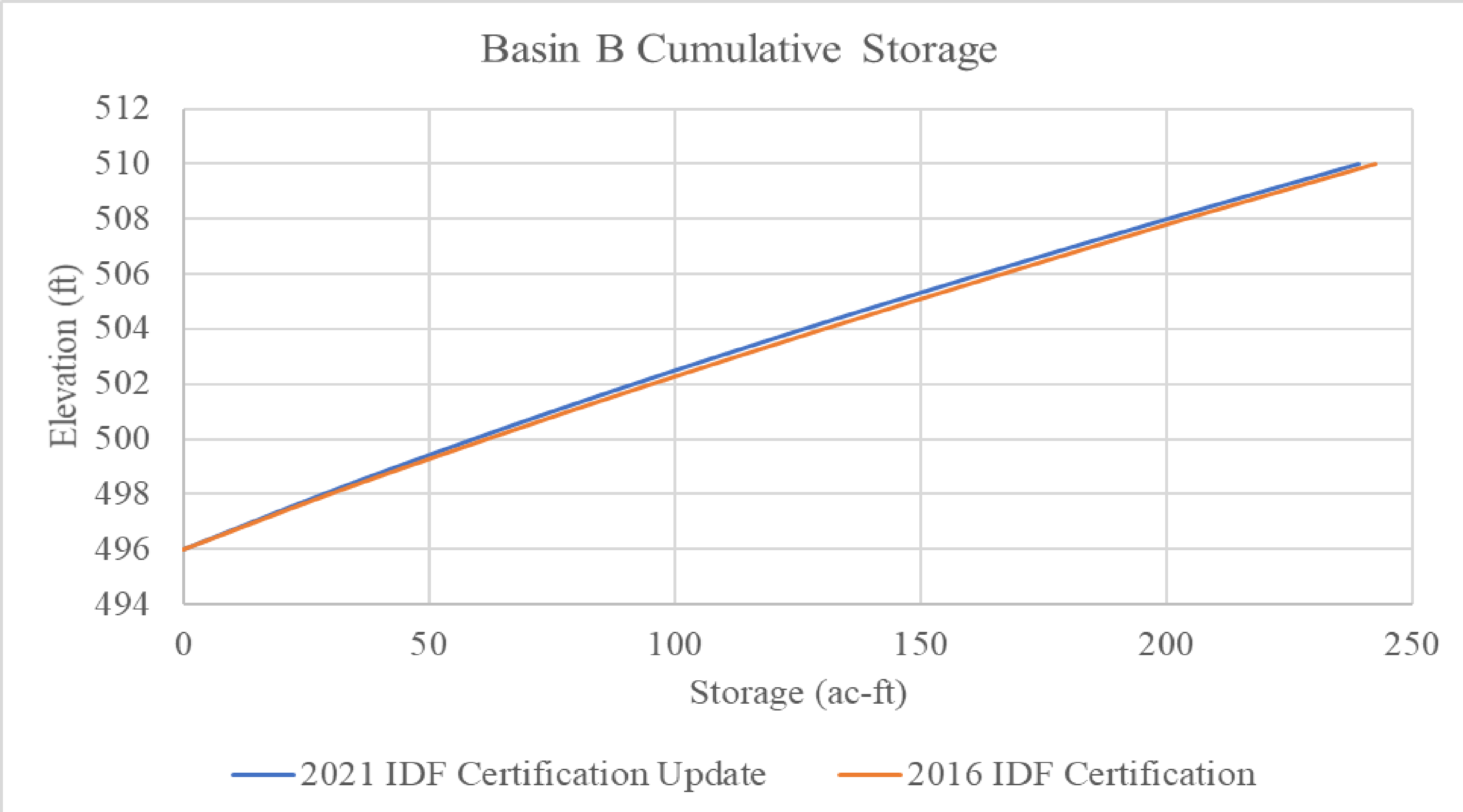
\\STLOUISMO-01\Data\Company\Projects_post_2014\GLP8027_CCR_ReCert\500_Technical\508_MIA\508d_Full_Cert_Rpt\MFPS Report\Revised SFA\Reruns_2021\Section 3\ Sec 3 Pond B SEEP_RDD_09242021_PK.gsz

Attachment F

Periodic Inflow Design Flood Control System Plan Analyses



BASIN A CUMULATIVE STORAGE PERIODIC CERTIFICATION MIAMI FORT POWER STATION NORTH BEND, OHIO		
Geosyntec consultants		Figure F-1
GLP8027	9/24/2021	

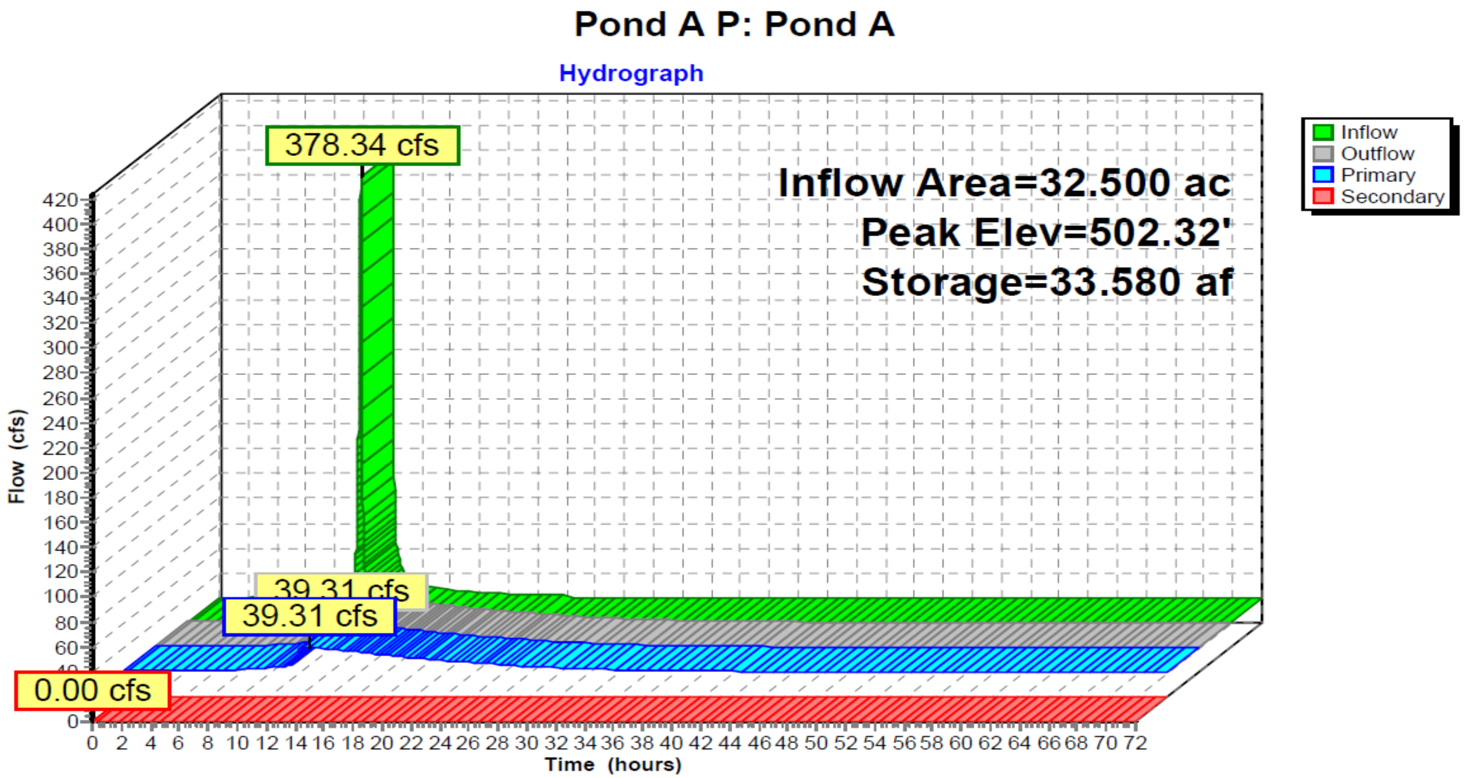


BASIN B CUMULATIVE STORAGE
PERIODIC CERTIFICATION
MIAMI FORT POWER STATION
NORTH BEND, OHIO

Geosyntec consultants

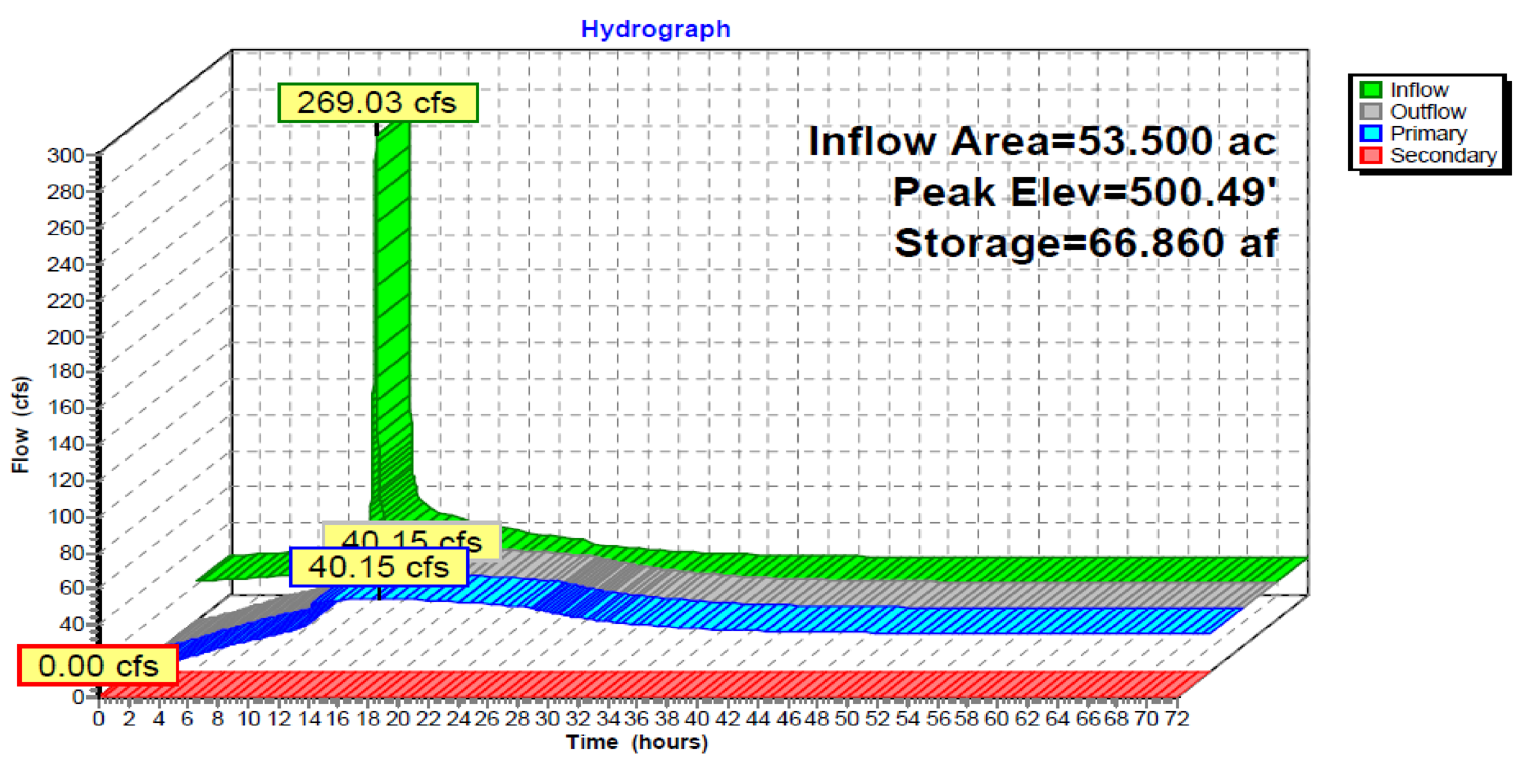
Figure F-2

GLP8027 | 9/24/2021

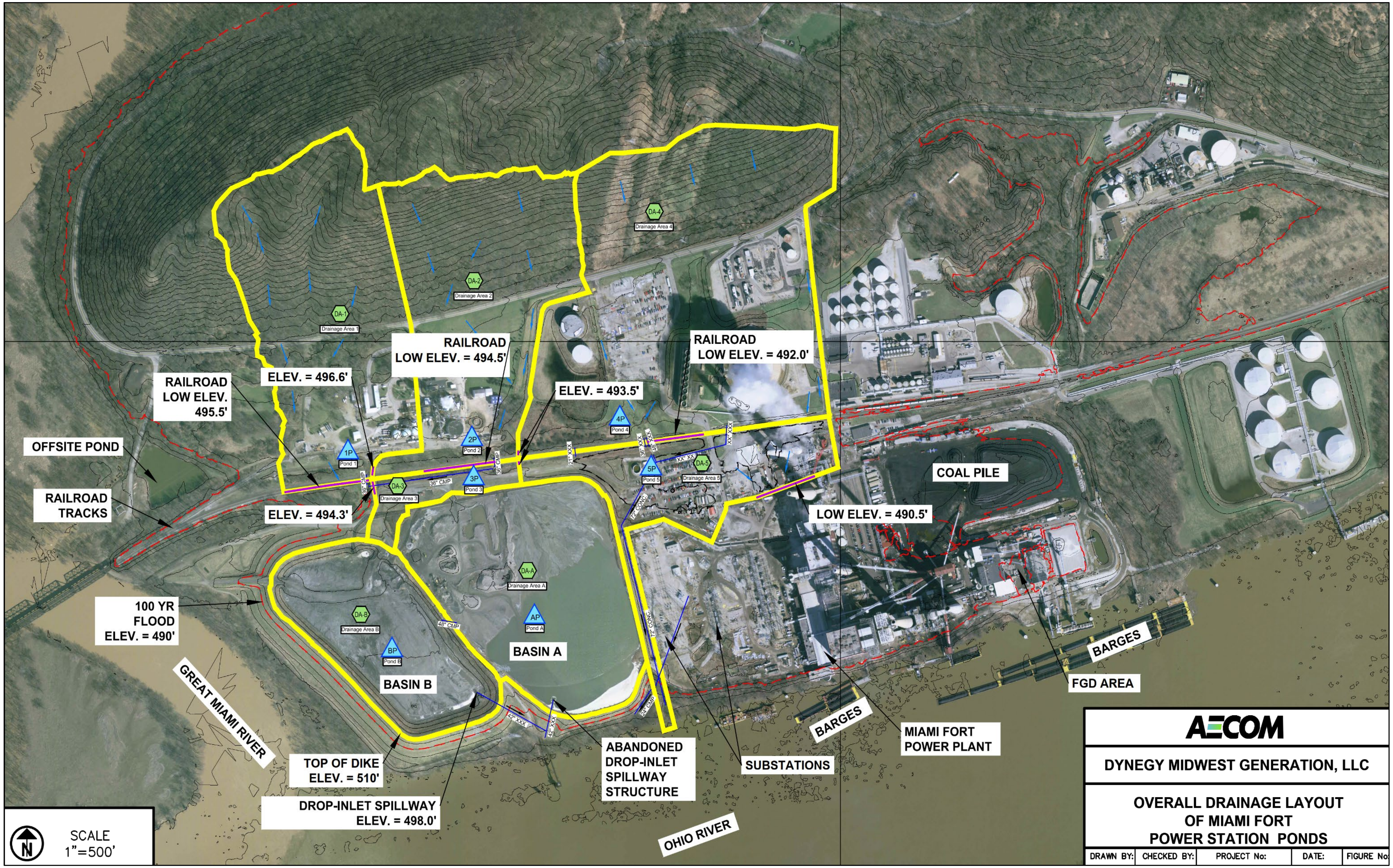


BASIN A IDF HYDROGRAPH PERIODIC CERTIFICATION MIAMI FORT POWER STATION NORTH BEND, OHIO		
Geosyntec consultants		Figure F-3
GLP8027	9/24/2021	

Pond B P: Pond B



BASIN B IDF HYDROGRAPH PERIODIC CERTIFICATION MIAMI FORT POWER STATION NORTH BEND, OHIO		
Geosyntec consultants		Figure F-4
GLP8027	9/24/2021	



Miami Fort Power Station
Pond System
Initial IDF Delineations

Geosyntec consultants

Figure F-5

GLP8027

September 2021

Figure based on AECOM Overall Drainage Layout of Miami Fort Power Station Ponds (from: *CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Constrol System Plan for Basin A at Miami Fort Power Station,* Oct. 2016)

NOT FOR CONSTRUCTION - NOT TO SCALE

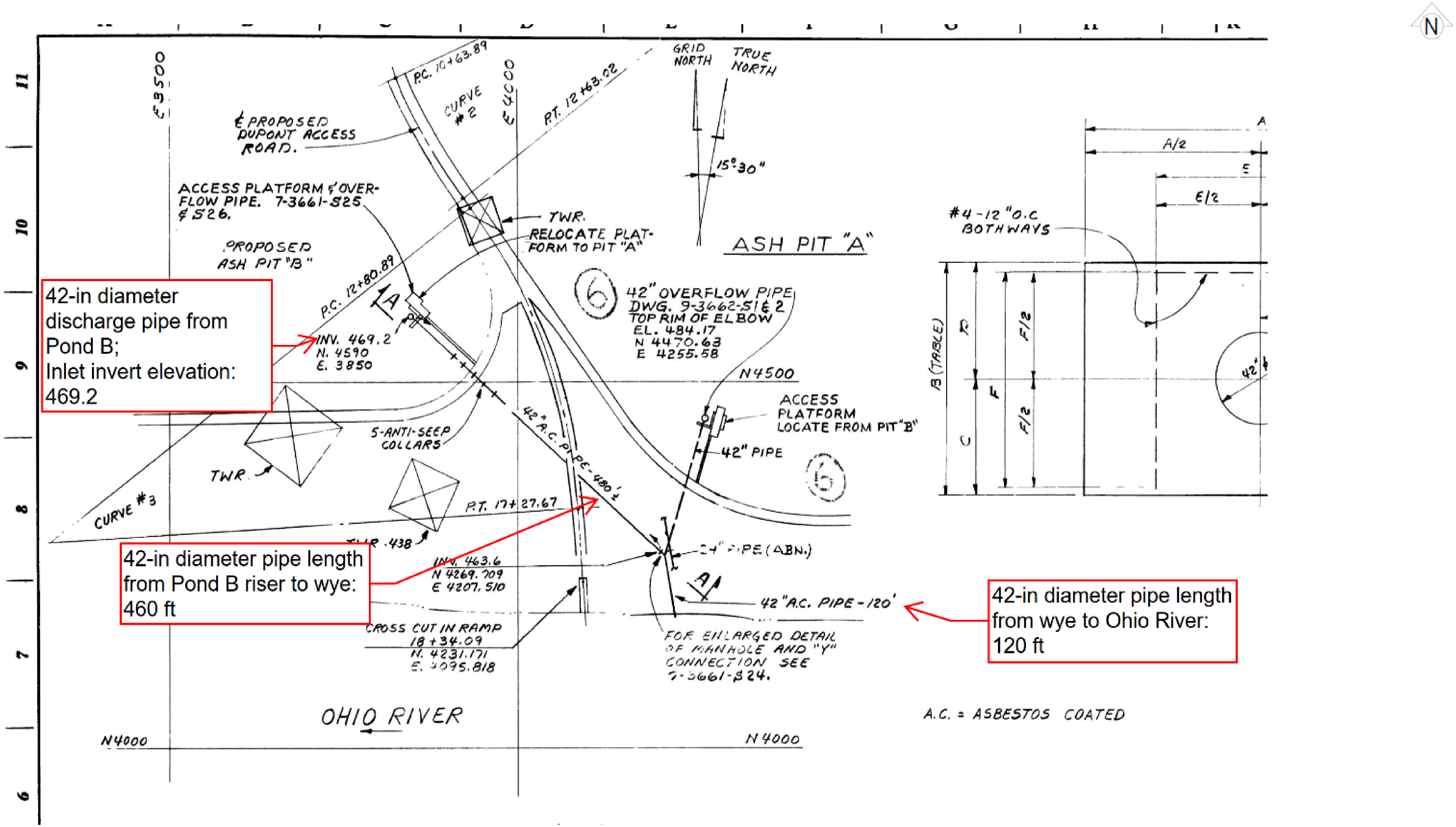


Figure based on Cincinnati Gas & Electric Company Dwg. No. 7-3661-S23 - *Ash Disposal Pit "B" Overflow Details - Sheet 1,* Septmber 12, 1979.

NOT FOR CONSTRUCTION - NOT TO SCALE

Miami Fort Power Station
Pond System
Discharge Pipe Drawings

Geosyntec consultants

GLP8027 | September 2021

Figure F-6

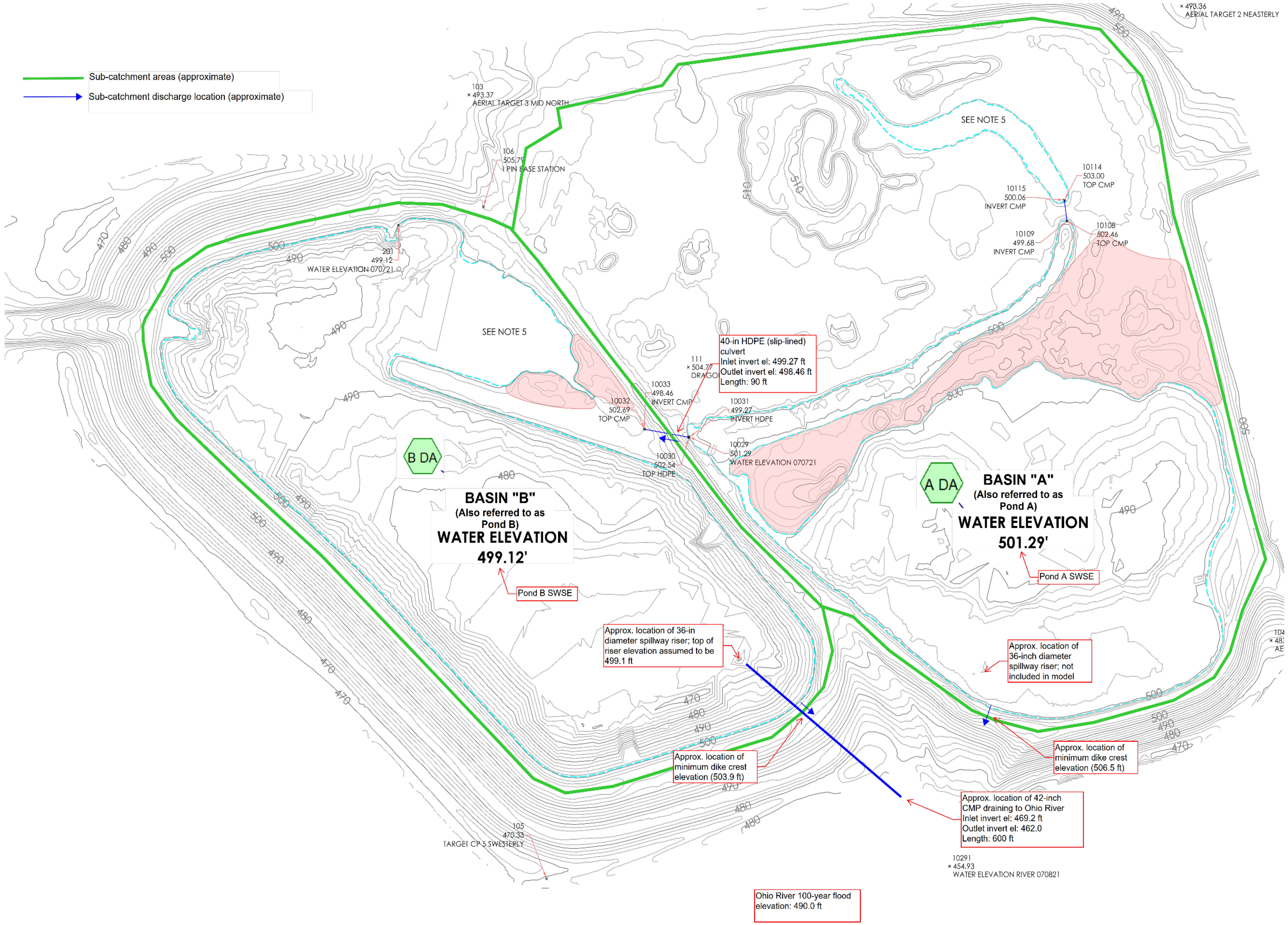


Figure based on IngenAE 2020 As-Built Drawings for Fly Ash Pond Closure

NOT FOR CONSTRUCTION - NOT TO SCALE

Miami Fort Power Station
Pond System
Hydrologic Workmap

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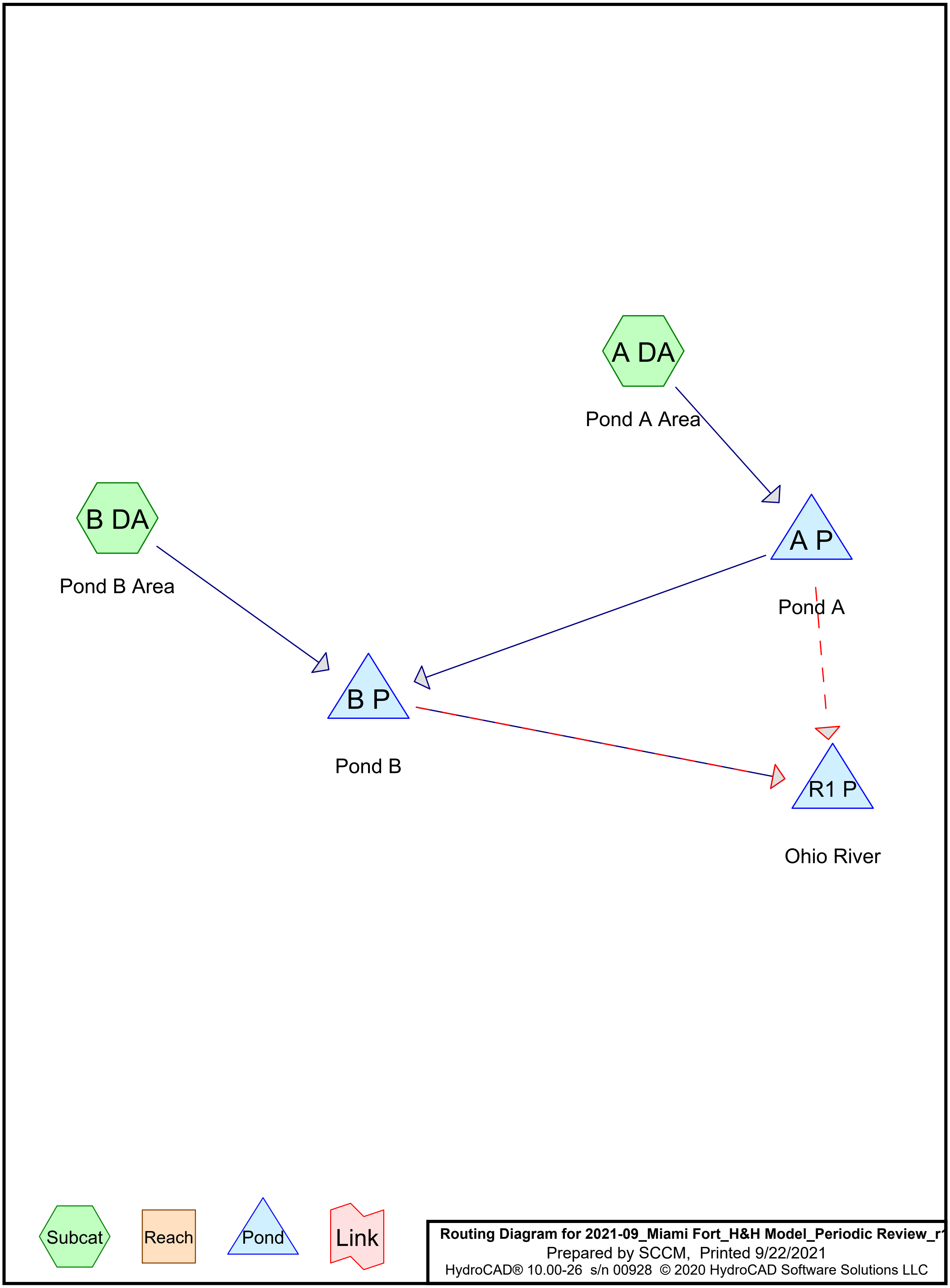
GLP8027 | September 2021

Figure F-7



Routing Diagram for 2021-09_Miami Fort_H&H Model_Periodic Review_r1
Prepared by SCCM, Printed 9/22/2021
HydroCAD® 10.00-26 s/n 00928 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
26.440	93	Urban industrial, 72% imp, HSG D (A DA, B DA)
27.060	98	Water Surface, HSG C (A DA, B DA)
53.500	**96**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
27.060	HSG C	A DA, B DA
26.440	HSG D	A DA, B DA
0.000	Other	
53.500		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	26.440	0.000	26.440	Urban industrial, 72% imp	A DA, B DA
0.000	0.000	27.060	0.000	0.000	27.060	Water Surface	A DA, B DA
0.000	**0.000**	**27.060**	**26.440**	**0.000**	**53.500**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	A P	499.27	498.46	90.0	0.0090	0.010	40.0	0.0	0.0
2	B P	469.20	462.00	600.0	0.0120	0.025	42.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A DA: Pond A Area Runoff Area=32.500 ac 81.65% Impervious Runoff Depth=7.21"
Tc=6.0 min CN=95 Runoff=358.34 cfs 19.533 af

Subcatchment B DA: Pond B Area Runoff Area=21.000 ac 93.15% Impervious Runoff Depth=7.45"
Tc=6.0 min CN=97 Runoff=233.51 cfs 13.039 af

Pond A P: Pond A Peak Elev=502.32' Storage=33.580 af Inflow=378.34 cfs 138.557 af
Primary=39.31 cfs 139.232 af Secondary=0.00 cfs 0.000 af Outflow=39.31 cfs 139.232 af

Pond B P: Pond B Peak Elev=500.49' Storage=66.860 af Inflow=269.03 cfs 158.818 af
Primary=40.15 cfs 147.264 af Secondary=0.00 cfs 0.000 af Outflow=40.15 cfs 147.264 af

Pond R1 P: Ohio River Peak Elev=490.00' Storage=275,146.522 af Inflow=40.15 cfs 147.264 af
Outflow=0.33 cfs 0.733 af

Total Runoff Area = 53.500 ac Runoff Volume = 32.571 af Average Runoff Depth = 7.31"
13.84% Pervious = 7.403 ac 86.16% Impervious = 46.097 ac

Summary for Subcatchment A DA: Pond A Area

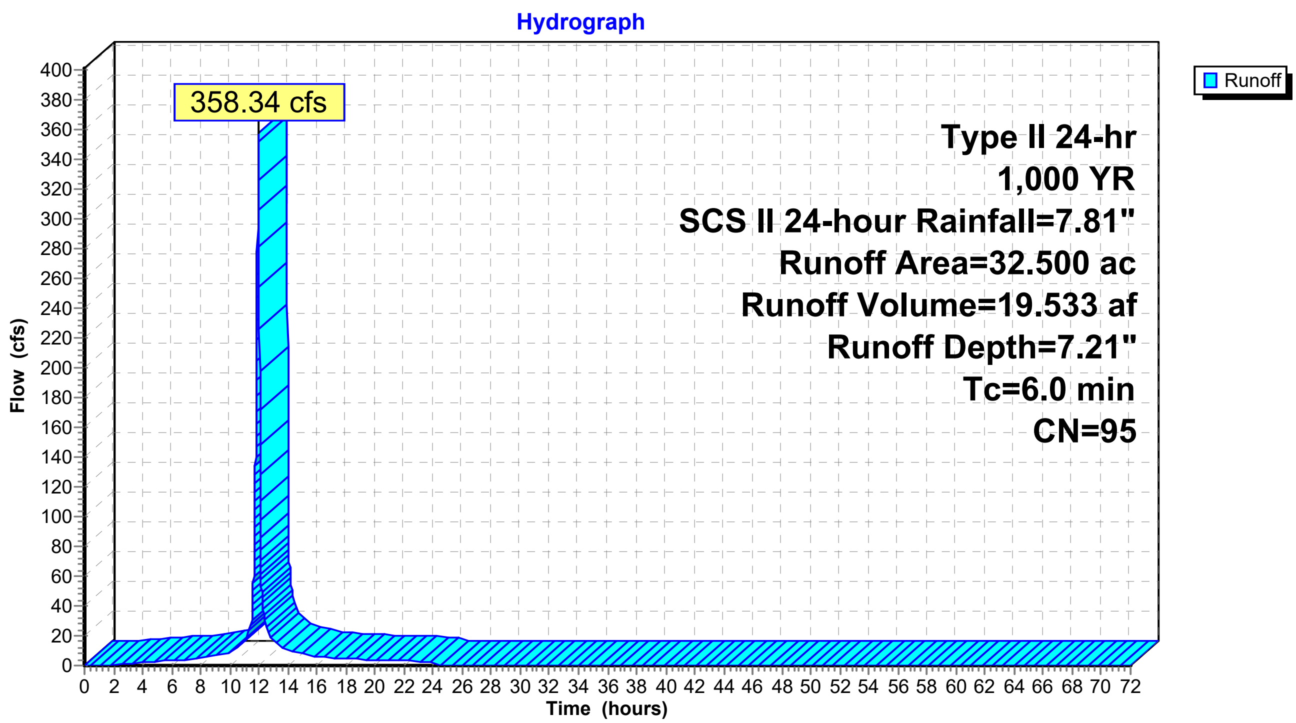
Runoff = 358.34 cfs @ 11.97 hrs, Volume= 19.533 af, Depth= 7.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1,000 YR, SCS II 24-hour Rainfall=7.81"

Area (ac)	CN	Description
11.200	98	Water Surface, HSG C
21.300	93	Urban industrial, 72% imp, HSG D
32.500	95	Weighted Average
5.964		18.35% Pervious Area
26.536		81.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A DA: Pond A Area



Summary for Subcatchment B DA: Pond B Area

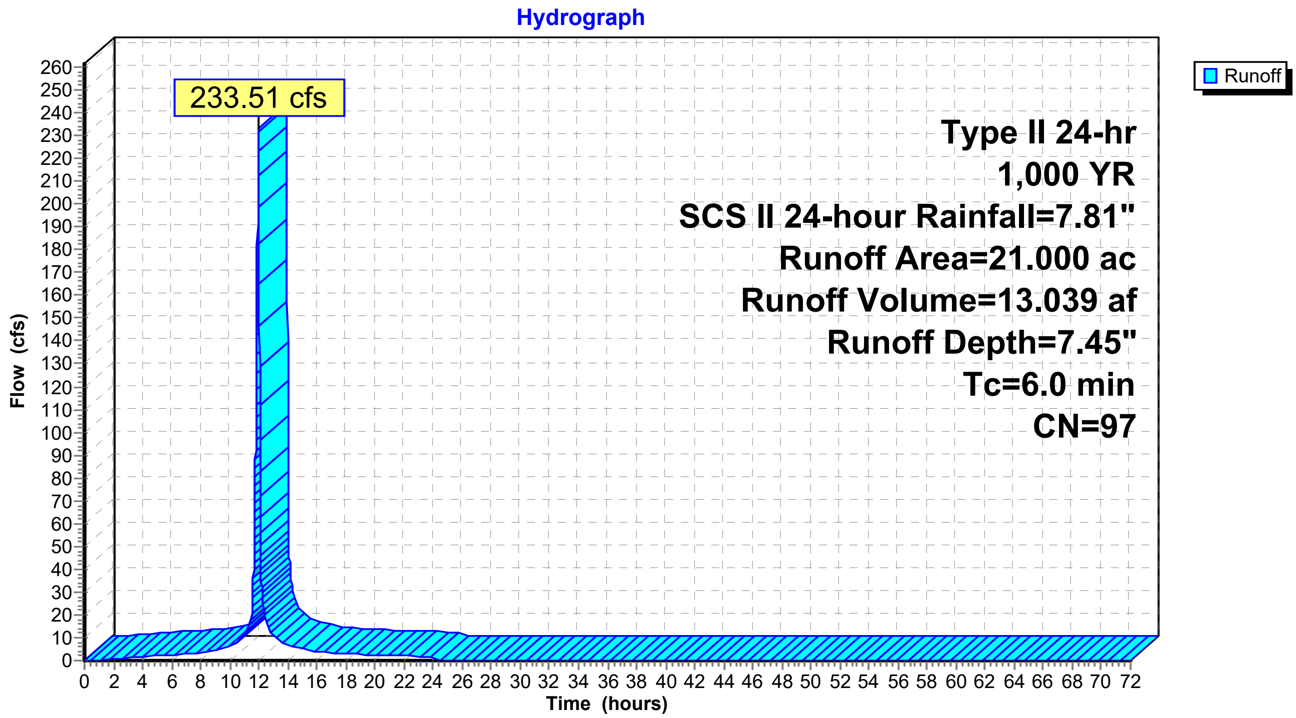
Runoff = 233.51 cfs @ 11.97 hrs, Volume= 13.039 af, Depth= 7.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1,000 YR, SCS II 24-hour Rainfall=7.81"

Area (ac)	CN	Description
15.860	98	Water Surface, HSG C
5.140	93	Urban industrial, 72% imp, HSG D
21.000	97	Weighted Average
1.439		6.85% Pervious Area
19.561		93.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B DA: Pond B Area



Summary for Pond A P: Pond A

Inflow Area = 32.500 ac, 81.65% Impervious, Inflow Depth > 51.16" for 1,000 YR, SCS II 24-hour event
Inflow = 378.34 cfs @ 11.97 hrs, Volume= 138.557 af, Incl. 20.00 cfs Base Flow
Outflow = 39.31 cfs @ 12.80 hrs, Volume= 139.232 af, Atten= 90%, Lag= 50.3 min
Primary = 39.31 cfs @ 12.80 hrs, Volume= 139.232 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 501.29' Surf.Area= 0.000 ac Storage= 22.612 af
Peak Elev= 502.32' @ 12.80 hrs Surf.Area= 0.000 ac Storage= 33.580 af (10.969 af above start)

Plug-Flow detention time= 737.1 min calculated for 116.597 af (84% of inflow)
Center-of-Mass det. time= 51.9 min (2,013.7 - 1,961.8)

Volume	Invert	Avail.Storage	Storage Description
#1	499.00'	178.129 af	**Custom Stage Data** Listed below

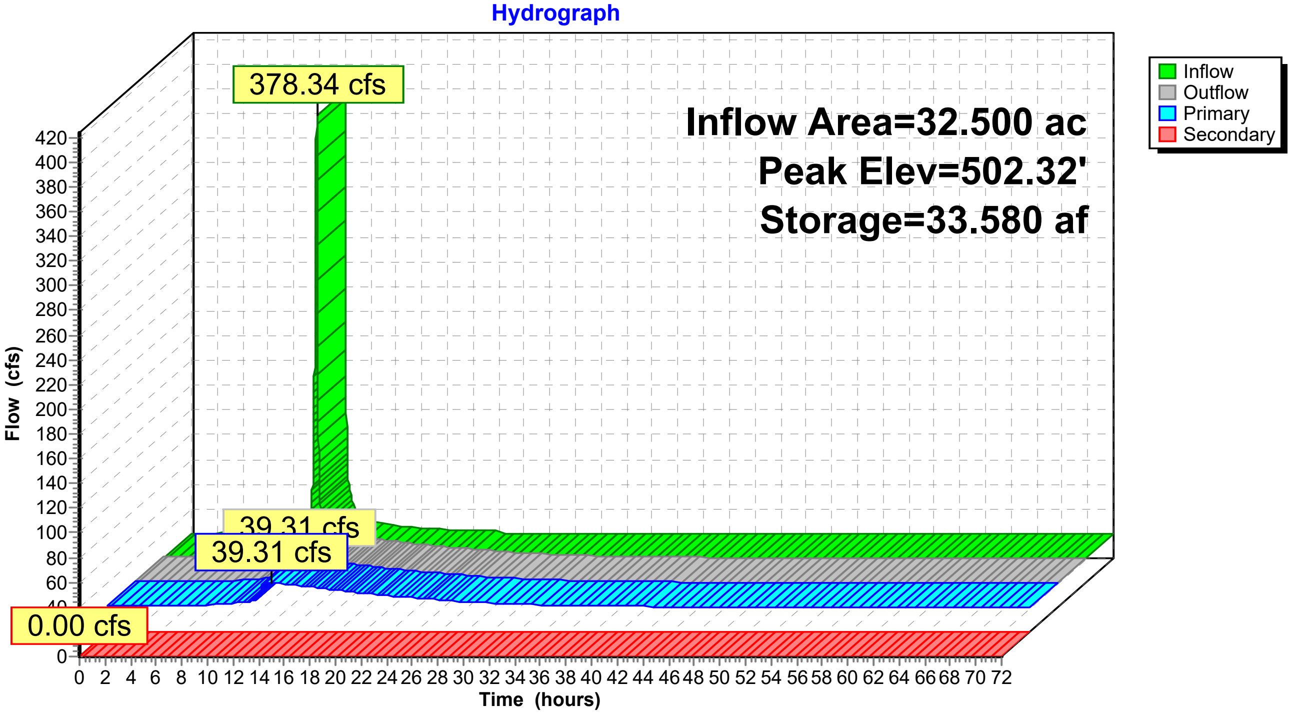
Elevation (feet)	Cum.Store (acre-feet)
499.00	0.000
499.50	4.448
500.00	9.231
502.00	29.976
504.00	52.341
506.00	80.645
508.00	123.790
510.00	178.129

Device	Routing	Invert	Outlet Devices
#1	Primary	499.27'	**40.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 499.27' / 498.46' S= 0.0090 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 8.73 sf
#2	Secondary	506.50'	**500.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=39.32 cfs @ 12.80 hrs HW=502.32' TW=500.39' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 39.32 cfs @ 4.70 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=501.29' TW=490.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond A P: Pond A



Summary for Pond B P: Pond B

Inflow Area = 53.500 ac, 86.16% Impervious, Inflow Depth > 35.62" for 1,000 YR, SCS II 24-hour event
Inflow = 269.03 cfs @ 11.97 hrs, Volume= 158.818 af, Incl. 1.10 cfs Base Flow
Outflow = 40.15 cfs @ 16.62 hrs, Volume= 147.264 af, Atten= 85%, Lag= 279.0 min
Primary = 40.15 cfs @ 16.62 hrs, Volume= 147.264 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 499.12' Surf.Area= 0.000 ac Storage= 45.416 af
Peak Elev= 500.49' @ 16.62 hrs Surf.Area= 0.000 ac Storage= 66.860 af (21.444 af above start)
Flood Elev= 509.64' Surf.Area= 0.000 ac Storage= 232.114 af (186.698 af above start)

Plug-Flow detention time= 1,552.2 min calculated for 101.839 af (64% of inflow)
Center-of-Mass det. time= 197.1 min (2,112.5 - 1,915.4)

Volume	Invert	Avail.Storage	Storage Description
#1	496.00'	239.130 af	**Custom Stage Data** Listed below

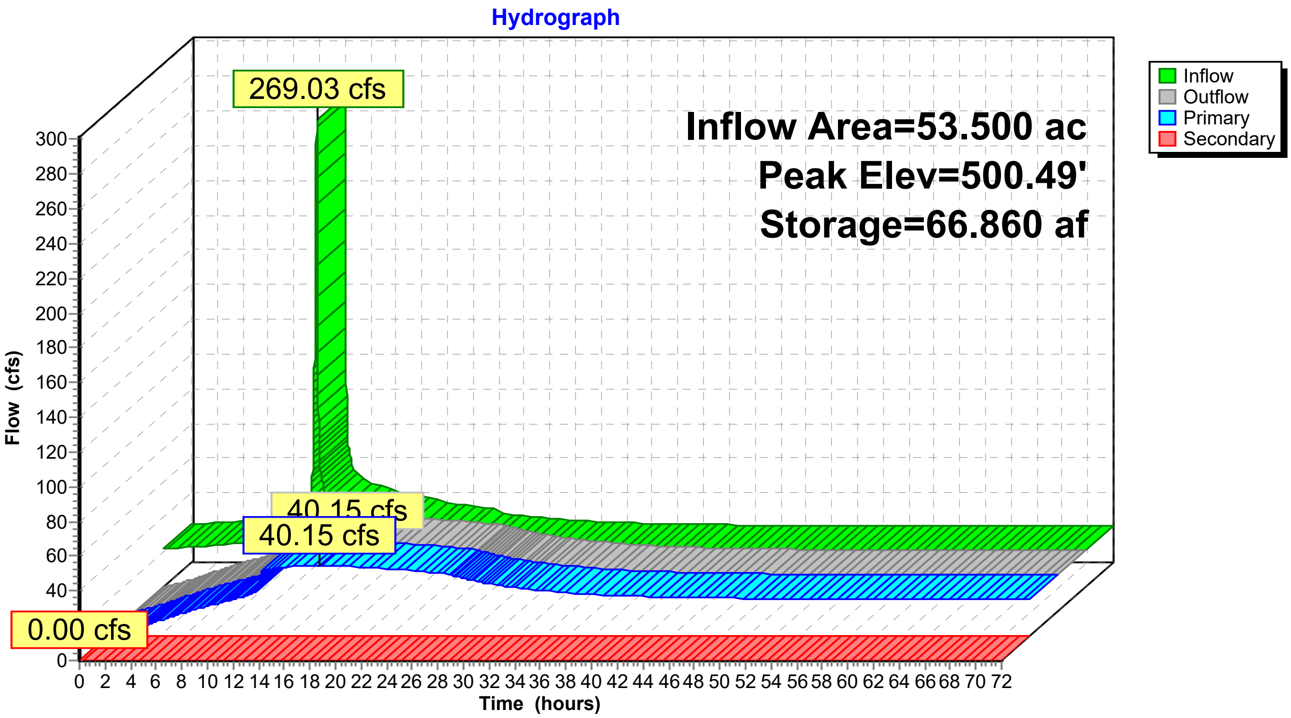
Elevation (feet)	Cum.Store (acre-feet)
496.00	0.000
498.00	28.330
500.00	58.840
502.00	91.450
504.00	126.060
506.00	162.400
508.00	200.150
510.00	239.130

Device	Routing	Invert	Outlet Devices
#1	Primary	469.20'	**42.0" Round Culvert** L= 600.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 469.20' / 462.00' S= 0.0120 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 9.62 sf
#2	Secondary	503.90'	**100.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Device 1	499.10'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=40.15 cfs @ 16.62 hrs HW=500.49' TW=490.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 40.15 cfs of 64.54 cfs potential flow)
  └─**3=Orifice/Grate** (Orifice Controls 40.15 cfs @ 5.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=499.12' TW=490.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B P: Pond B



Summary for Pond R1 P: Ohio River

Inflow Area = 53.500 ac, 86.16% Impervious, Inflow Depth > 33.03" for 1,000 YR, SCS II 24-hour event
Inflow = 40.15 cfs @ 16.62 hrs, Volume= 147.264 af
Outflow = 0.33 cfs @ 18.21 hrs, Volume= 0.733 af, Atten= 99%, Lag= 95.5 min
Primary = 0.33 cfs @ 18.21 hrs, Volume= 0.733 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 490.00' Surf.Area= 30,000.000 ac Storage= 275,000.000 af
Peak Elev= 490.00' @ 72.00 hrs Surf.Area= 30,002.442 ac Storage= 275,146.522 af (146.522 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 513.5 min (2,625.9 - 2,112.5)

Volume	Invert	Avail.Storage	Storage Description
#1	480.00'	600,000.000 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
480.00	25,000.000	0.000	0.000
500.00	35,000.000	600,000.000	600,000.000

Device	Routing	Invert	Outlet Devices
#1	Primary	490.00'	**250.0' long x 250.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.02 cfs @ 18.21 hrs HW=490.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.09 fps)

Pond R1 P: Ohio River