Five-Year Periodic Inflow Design Flood Control System Plan

Fly Ash Reservoir II
Brilliant, Ohio

October 2026

Prepared For:

Cardinal Operating Company
306 County Road 7E
Brilliant, Ohio 43913

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1.0 Introduction

The Cardinal Power Plant (Plant) is located in Wells Township, Jefferson County, near the town of Brilliant in eastern Ohio. The Plant is owned by Buckeye Power, Inc. Cardinal Operating Company (Operator) operates the Plant. The Plant previously utilized the Fly Ash Reservoir II (FAR II) surface impoundment for storing coal combustion residuals (CCR). The FAR II is subject to the requirements of the United States Environmental Protection Agency's (USEPA) final CCR rule Title 40 Code of Federal Regulations (40 CFR) Part 257.82. The Initial Inflow Design Flood Control System Plan was completed and placed into the Plant's operating record on October 9, 2016. A periodic Inflow Design Flood Control System Plan is required every 5 years pursuant to 40 CFR 257.82(c)(4).

FAR II became operational in the 1980s and has been raised twice during its service life, the first raising performed in 1997, and the most recent raising being in 2013. Currently, FAD II has a design crest elevation of 983 feet, a maximum reservoir operating elevation of 974 feet, and a dam height of approximately 250 ft per. The 2013 raising of FAR II was completed using back-to-back mechanically stabilized earth (MSE) walls which were constructed over the then-existing crest placed during the 1997 dam raising, which was constructed using roller-compacted concrete (RCC). The MSE walls were constructed as back-to-back MSE walls over the RCC crest surface with installation of a vinyl sheet pile cut-off wall through the MSE backfill and RCC concrete (using a slurry trench excavation), which extends into the clay core of the dam. The emergency overflow spillway was raised using mass concrete to a minimum elevation of 975.5 as part of the second dam raising.

The Operator ceased sluicing fly ash into the impoundment in July 2021 and is nearing completion of closing FAR II, in accordance with the Closure Plan and the Permit to Install issued by the Ohio Environmental Protection Agency.

Federal Regulations

An owner or operator of an existing or new CCR surface impoundment or any lateral expansion must design, construct, operate, and maintain an inflow design flood control system for the CCR surface impoundment to:

(1) adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood;

(2) adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood. The inflow design flood is based on the hazard potential classification of the unit as required by 40 CFR 257.73. The inflow design floods for specific hazard potential classifications are as follows:

   i. The probable maximum flood for high hazard potential CCR surface impoundments,

   ii. The 1,000-year flood for significant hazard potential CCR surface impoundments,

   iii. The 100-year flood for low hazard potential CCR surface impoundments, or

   iv. The 25-year flood for incised CCR surface impoundments; and

(3) discharge from the CCR unit must be handled in accordance with the surface water requirements of 40 CFR 257.3-3.

2.0 Objective

This report was prepared by TRC Engineers, Inc. (TRC) to fulfill requirements for the periodic Inflow Design Flood Control System Plan documenting how the inflow design flood control system has been designed and constructed to meet the requirements of 40 CFR 257.82. This is the second 5-year periodic assessment as required per 40 CFR 257.82(c)(4), with the first plan prepared in October 2021.

To develop the periodic assessment TRC performed the following scope:

- Reviewed historical documents including:
    - Periodic Inflow Design Flood Control System Plan (TRC, 2021) (refer to Attachment A)
    - Inflow Design Flood Control Plan, September 2016, prepared by AEP Geotechnical Engineering Services
    - Components of the FAR II Dam Permit Modification Application (S&ME, 2012)
        - Appendix C: Hydrologic and Hydraulic Analysis
    - 2016-2025 Annual FAR II Annual Dam Inspection Reports
- Performed a site visit on August 14, 2025 to observe current conditions, and
- Developed a 5-year periodic Inflow Design Flood Control System Plan.

3.0 Design Storm

The FAR II is classified as a high hazard potential Dam (TRC, 2021); therefore, the FAR II must adequately manage peak discharges from the probable maximum flood (PMF). The FAR II dam was designed for a PMF event of 26.5 inches of precipitation for a 6-hour period based on Hydrometeorological Report 51 by the National Weather Service.

4.0 Inflow Design Flood Control System

4.1 Inflow Management

The FAR II dam acts as the primary inflow control by impounding the drainage area and regulating outflow through the service spillway. At the maximum design pool elevation, 974 feet National Geodetic Vertical Datum 1929 (NGVD 29), the impoundment has a surface area of approximately 161 acres. There is sufficient storage above the operating pool elevations to manage discharge though the service spillway during storm events up to the 24-hour, 50-year storm event without activating the emergency spillway.

4.2 Outflow Management

The FAR II has two designed outlets: the service spillway and the emergency spillway. The service spillway allows management of the operating pool elevation and allows discharge from the FAR II. The inlet to the service spillway is a rectangular weir with stoplogs that can be added or removed to control water elevations in FAR II. The rectangular weir connects to a sloping concrete shaft on the upstream dam face which discharges into a 54-inch diameter pre-stressed concrete cylinder pipe. The concrete pipe transitions to a steel pipe where it daylights on the downstream face of the dam. Discharge from the service spillway occurs at an energy dissipator into Blockhouse Run.

The emergency spillway is an open channel spillway provided to manage flood events. The spillway has been designed to pass the PMF without overtopping the dam.

4.3 Hydraulic Evaluation

FAR II was designed and constructed with a service spillway and an emergency spillway to control outflow. As previously mentioned, closure activities related to FAR II are nearing completion. The closure activities included modifications to the dam involving the reduction of the impounded water level to below the final cover grades, grading the fly ash coal combustion byproduct, installing the final cover system, and modifying the service spillway to lower the normal operating pool level to approximately 920 feet NGVD as outlined in the Dam Modification Application submitted to the Ohio Department of Natural Resources (prepared by TRC, revision date May 2021). Under the current conditions (e.g., completion FAR II closure), the top of dam elevation is 983.0 feet (NGVD 29), and the maximum operating pool elevation is 974 feet NGVD 29. During the PMF, the estimated peak impounded water elevation is 977.1 feet NGVD 29. The existing configuration provides 5.9 ft of freeboard during the PMF. A summary of the hydraulic analysis of FAR II during the PMF is presented below:

Parameter	Current Conditions*
Contributing Drainage Area	1,352 acres
Weighted Runoff Curve Number, East Watershed	71
Weighted Runoff Curve Number, West Watershed	71
Design Peak Inflow, Probable Maximum Flood	13,190 cubic feet per second (cfs)
Peak Discharge from Probable Maximum Flood	913 cfs
Top of Dam Elevation	983 feet NGVD 29
Pool Elevation, assuming probable maximum flood	977.1 feet NGVD 29

*Taken from Dam Modification Application (prepared by TRC, dated May 2021)

4.3 Discharge

Discharge from FAR II is regulated in accordance with an NPDES permit issued by the Ohio Environmental Protection Agency. The permit grants the Plant permission to discharge from the facility to Blockhouse Run in accordance with effluent limitations, monitoring requirements, and other conditions. The NPDES permit is issued in accordance with the provisions of the Federal Clean Water Act. Therefore, by complying with the NPDES permit, the discharge from FAR II is also being handled in accordance with the applicable surface water requirements.

5.0 Site Visit

TRC performed a site visit on August 14, 2025, as part of the annual dike and dam inspection for the facility. Based on the observations made during the site visit, the conditions modeled in the Initial Inflow Design Flood Control Plan (AEP, 2016) accurately reflect the conditions of the FAR II that govern the analyses of the impact of the PMP. Ther outlet features for the FAR II appeared in good working order and functioning as designed.

The FAR II dam has a deformation review completed every 28 days which includes inclinometer and monument surveys of the dam to monitor potential deformation. TRC has been coordinating the 28-day

dam deformation surveys since March 2024. Based on the latest set of data (28-Day Dam Deformation Survey dated August 21, 2026), the deformations observed by the survey monuments and inclinometers appear to be within expected ranges and tolerances of an earthen dam of a similar size and age given consideration to the dewatering activities that occurred as a part of the FAR II capping project.

6.0 Conclusions

The FAR II meets the requirements of 40 CFR 257.82 of adequately controlling the inflows and outflows of peak discharge for the following reasons:

- FAR II can adequately receive and store inflows for the PMF.
- The service spillway and emergency spillway were designed and constructed to collect and control peak outflow associated with the PMF in a controlled manner.
- The discharge from FAR II is permitted under an NPDES permit which was issued in accordance with the provisions of the Federal Clean Water Act.

This plan has been completed in compliance with the requirements set forth in 40 CFR 257.82. This document will be placed in the Plant's CCR operating record, and posted to the publicly accessible CCR website, and government notifications will be provided.

A periodic inflow design flood control system plan must be prepared every 5 years from the completion date of this Plan. The next Plan update is required by October 2031.

The Plan must be amended whenever the periodic review period is reached, or if changes in site conditions occur that will substantially affect the current written Plan.

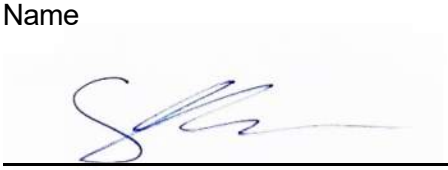
7.0 Limitations

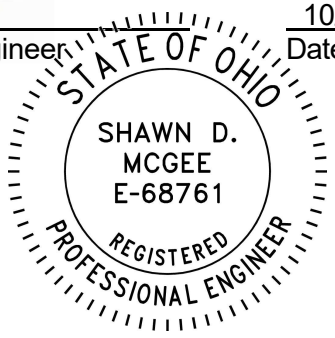
The observations, assessment, and recommendations presented in this Report are based on our limited scope of work reviewing relevant historic reports (including annual inspections reports), the conditions at the time of the August 14, 2025, site visit for the TRC 2025 Annual Inspection Report, the design information available at the time of this investigation and only apply to the Cardinal FAR II Dam. This work has been performed in accordance with our authorized scope of work and is based on the level of effort and investigative techniques using that degree of care and skill ordinarily exercised under similar conditions by reputable members of the profession practicing in the same or similar locality at the time of service. No other warranties, expressed or implied, are made or intended by this Report. These services were intended to provide an indication of the current, observable conditions of the dam at the time of the visual observations on the date indicated in this Report. Such a limited visual review does not account for other non-visible, hidden, subsurface or material condition analyses, and the professional services rendered are not guaranteed to be a representation by TRC of inaccessible and unobservable site conditions or actual conditions subsequent to the date of TRC's site visit. Therefore, the evaluations, conclusions, recommendations and opinions provided in this Report are subject to change as a result of future natural or manmade processes and as a result of an additional comprehensive, intrusive investigation and engineering analyses beyond TRC's visual observations. TRC is not responsible for any conclusions or opinions drawn by others from the data included herein, nor are the recommendations specifically presented in this Report intended for use or reliance as construction specifications.

8.0 Certification

I, the undersigned Ohio Professional Engineer, hereby certify that I am familiar with the technical requirements of 40 CFR 257 Subpart D. I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of 40 CFR 257.82(c).

For the purpose of this document, “certify” and “certification” shall be interpreted and construed to be a “statement of professional opinion.” The certification is understood and intended to be an expression of my professional opinion as a Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.

Shawn D. McGee, P.E.	PE.68761
Name	Engineer License Number
	10/06/2026
Signature of Professional Engineer	Date



9.0 References

American Electric Power Service Corporation (AEP). 2016. Inflow Design Flood Control Plan – CFR 257.82: Fly Ash Reservoir II – Cardinal Plant, Brilliant, Ohio. Geotechnical Engineering Services. October 2016.

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TRC Engineers, Inc., 2021. Five-Year Periodic Inflow Design Flood Control System Plan. Fly Ash Reservoir II, Brilliant, OH. October 2021.

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TRC Engineers, Inc., 2026. 28-Day Dam Deformation Survey: Cardinal Plant Fly Ash Dam. June 3, 2026.