

MWVG

Midwest Generation, LLC

Powerton Generating Station

2022 Structural Stability Assessment for Ash Surge Basin, Bypass Basin, & Former Ash Basin



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1.0 PURPOSE & SCOPE

1.1 PURPOSE

The Ash Surge Basin, Bypass Basin, and Former Ash Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station") are existing coal combustion residual (CCR) surface impoundments that are regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments." These regulations are codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and are also referred to herein as the "Illinois CCR Rule." Pursuant to 35 Ill. Adm. Code 845.450(a), MWG must conduct and complete an annual structural stability assessment that documents whether the design, construction, operation, and maintenance of the Ash Surge, Bypass, and Former Ash Basins are consistent with recognized and generally accepted engineering practices for the CCR surface impoundments' storage capacities.

This report documents the 2022 structural stability assessment conducted and completed in accordance with the Illinois CCR Rule by Sargent & Lundy (S&L) on behalf of MWG for the Ash Surge, Bypass, and Former Ash Basins at Powerton.

1.2 SCOPE

In addition to being regulated under the Illinois CCR Rule, Powerton's Ash Surge, Bypass, and Former Ash Basins are also regulated by the U.S. Environmental Protection Agency's (EPA) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," 40 CFR Part 257 Subpart D (Ref. 2), also referred to herein as the "Federal CCR Rule." Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the Ash Surge, Bypass, and Former Ash Basins will continue to be subject to both the Illinois and Federal CCR Rules until the U.S. EPA approves the Illinois EPA's CCR permit program; the Illinois EPA has yet to publish a timeline for submitting its proposed CCR permit program to the U.S. EPA for approval. However, the scope of this 2022 structural stability assessment is strictly limited to demonstrating compliance with the Illinois CCR Rule. Pursuant to 40 CFR 257.73(f)(3), the next structural stability assessment for demonstrating compliance with the Federal CCR Rule is not required until 2026, five years after the last periodic assessment was completed (2021).

2.0 ASSESSMENT

2.1 INPUTS & 2022 BASIN CONDITIONS

The findings documented in this 2022 structural stability assessment for the Ash Surge, Bypass, and Former Ash Basins are based on visual observations made by S&L during a site visit on September 22, 2022;

discussions with MWG personnel; historical and recent aerial images obtained from Google Earth Pro (Ref. 3); and the following documents:

- Initial federal structural stability assessment for the Ash Surge and Bypass Basins (Ref. 4),
- Annual inspection reports for the Ash Surge and Bypass Basins (Refs. 5 through 10),
- History of construction for the Ash Surge and Bypass Basins (Ref. 11),
- Initial federal structural stability assessment for the Former Ash Basin (Ref. 12),
- Annual inspection reports for the Former Ash Basin (Refs. 13 through 18), and
- History of construction for the Former Ash Basin (Ref. 19).

The initial federal structural stability assessment for the Ash Surge and Bypass Basins, which was completed in October 2016, is included in its entirety in Appendix A. The initial federal structural stability assessment for the Former Ash Basin, which was completed in April 2018, is included in its entirety in Appendix B.

In early October 2020, Powerton took the Bypass Basin out of service for routine cleaning. During a site visit in September 2021, it was noted that most of the CCR previously stored in the Bypass Basin had been removed and minimal surface water remained. During a subsequent site visit by S&L on September 22, 2022, it was noted that almost all of the CCR previously stored in the Bypass Basin had been removed and minimal surface water remained. MWG currently plans to retrofit the Bypass Basin with a new composite liner system and a new leachate collection and removal system (LCRS). A construction permit application for retrofitting the Bypass Basin was submitted to the Illinois EPA on July 15, 2022. Retrofit construction activities will commence at the basin upon receipt of a retrofit construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule.

Powerton continues to operate the Ash Surge Basin to manage the Station's ash dewatering bin effluent and various non-CCR wastestreams in accordance with 40 CFR 257.103(f)(1). Operating conditions at this basin have not changed since the basin's initial federal structural stability assessment was completed in 2016. MWG plans to either retrofit the Ash Surge Basin with a new composite liner system and a new LCRS or close and subsequently repurpose the basin as a new low volume waste basin.

Finally, the Former Ash Basin is regulated by the Illinois CCR Rule as an inactive CCR surface impoundment and, therefore, is not used by the Station to manage any of Powerton's wastestreams. However, the basin still collects stormwater from direct precipitation and run-off from adjacent areas. During the basin's most recent annual inspection in July 2022 (Ref. 18), the volume of water impounded in the basin was estimated to be 20 acre-feet.

2.2 ASH SURGE & BYPASS BASINS

2.2.1 STABLE FOUNDATIONS & ABUTMENTS

(35 Ill. Adm. Code 845.450(a)(1))

The Ash Surge and Bypass Basins are comprised of earthen dikes on all sides and do not have any abutments. Detailed information on the soils supporting the Ash Surge and Bypass Basins' dikes is provided in the basins' initial federal structural stability assessment in Appendix A. Based on reviews of the basins' annual inspection reports (Refs. 5 through 10) and Google Earth aerial images (Ref. 3), there have been no significant modifications to Ash Surge and Bypass Basins' geometries since their initial federal structural stability assessment was completed. Therefore, the details of the soils supporting the Ash Surge and Bypass Basins' dikes and corresponding conclusions documented in the basins' initial federal structural stability assessment remain valid for this 2022 assessment (see Appendix A). Thus, the soils supporting the Ash Surge and Bypass Basins' dikes are considered to be stable for the maximum volume of CCR and CCR wastewater which can be impounded therein.

2.2.2 SLOPE PROTECTION

(35 Ill. Adm. Code 845.450(a)(2) & (4))

The upstream slopes of the Ash Surge and Bypass Basins are lined with high-density polyethylene (HDPE) geomembrane. A layer of gravel has also been installed on a second geomembrane liner around the perimeter of the Ash Surge Basin near the crests of the basin's upstream slopes. These forms of cover protect the upstream slopes of the basins' dikes against surface erosion, wave action, and adverse effects of sudden (rapid) drawdown.

Slope protection for the downstream slopes of the Ash Surge Basin consists of (1) the HDPE geomembrane liner of the Bypass Basin, (2) vegetative cover, or (3) a combination of rock and vegetative cover. Where present, the rock fill is generally along and near the crest of the given embankment. Similarly, the Bypass Basin's downstream slopes consist of either HDPE geomembrane liner of the Ash Surge Basin or vegetative cover. All three forms of cover protect the downstream slopes of the basins' dikes against surface erosion, wave action, and adverse effects of sudden (rapid) drawdown.

During S&L's September 2022 site visit, erosion was observed along the Ash Surge Basin's downstream slopes. However, the erosion observed does not suggest that the stability of the subject dikes has been compromised. Consistent with the Station's maintenance practices for Powerton's CCR surface impoundments, it is recommended that the Station place rock fill in any erosion areas and continue to monitor the performance of the protective cover.

Vegetation observed along the downstream slopes of the Ash Surge and Bypass Basin was typically less than 12-inches tall during S&L's walkdown in September 2022, and no woody vegetation was present. However, there were a few remote areas along the crest of the Bypass Basin where the vegetation was greater than 12-inches tall. In accordance with the Illinois CCR Rule (Ref. 1, §§ 845.430(b)(4) and 845.430(b)(5)), the Station should mow or otherwise cut the vegetation in these areas to reduce the height of the cover below the 12-inch threshold.

2.2.3 DIKE COMPACTION ***(35 Ill. Adm. Code 845.450(a)(3))***

As documented in the Ash Surge and Bypass Basins' initial federal and 2022 safety factor assessments (Refs. 4 and 20), the basins' dikes are sufficiently compacted to withstand the range of loading conditions in the CCR surface impoundments.

2.2.4 SPILLWAYS ***(35 Ill. Adm. Code 845.450(a)(5))***

The Ash Surge Basin has an emergency spillway structure located at the northeast corner of the basin. Similarly, the Bypass Basin has an emergency overflow riser pipe located at the northeast corner of the basin. However, as documented in the basins' 2022 inflow design flood control system plan (Ref. 20), both basins are capable of containing the design flood event (1,000-year, 24-hour storm) without discharging water from their respective emergency spillway structures. Moreover, during S&L's September 2022 site visit, it was noted that the Bypass Basin's emergency overflow riser pipe had been filled with concrete, thereby preventing any flow through the pipe. Therefore, the capacities of these spillways were not evaluated for this 2022 assessment.

2.2.5 EMBEDDED HYDRAULIC STRUCTURES ***(35 Ill. Adm. Code 845.450(a)(6))***

There are four pipes that underlie or pass through the Ash Surge Basin's dikes that convey wastewater to or from the Ash Surge and Bypass Basins. Meanwhile the Bypass Basin has three discharge pipes that pass through the basin's dikes. The locations of these pipes are shown on Figure 2 of the basins' initial federal structural stability assessment in Appendix A. As documented in the initial federal assessment, visual surveillance of the pipes passing through the Ash Surge and Bypass Basins' dikes was performed in May 2016. No significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that may negatively affect the basins were identified during the surveillance program.

No similar pipe surveillance programs have been performed since the initial video camera inspection in June 2016. However, no visual signs of distress at the dike surfaces that could be indicative of deterioration, failure, deformation, *etc.* (*e.g.*, soft spots caused by leaking water, distortions in dike alignment) were observed during the September 2022 site visit. Moreover, since the Bypass Basin has been taken out of service and had minimal surface water remaining in it as of the September 2022 site visit, the Bypass Basin's pipes that pass through or underlie the Ash Surge and Bypass Basins' dikes are not expected to convey water again until the basin has been retrofitted with a new composite liner system and a new LCRS. In addition and as previously mentioned, the discharge pipe from the Bypass Basin's emergency overflow riser pipe ("Pipe 2" on Figure 2 in Appendix A) has been filled with concrete, thereby preventing the flow of water. Therefore, it is recommended that the Station conduct a visual surveillance program to confirm the Bypass Basin's discharge pipes are in good, working condition and are free of significant material defects that could impact the pipes' integrities as part of the retrofit construction activities for the basin. It is also recommended that the Station conduct a similar visual surveillance program for the Ash Surge Basin's discharge pipes prior to retrofitting the basin or repurposing it as a new low volume waste basin.

2.2.6 LOW POOL & RAPID DRAWDOWN STABILITY

(35 Ill. Adm. Code 845.450(a)(7))

As documented in the Ash Surge and Bypass Basins' initial federal safety factor assessment (Ref. 4), the results of which were revalidated in the 2022 safety factor assessment (Ref. 20), the structural stabilities of the basins' downstream slopes are maintained during low pool conditions at each of the basins that are adjacent to the Ash Surge and Bypass Basins. These basins are:

- Metal Cleaning Basin,
- East Roof and Yard Runoff Basin,
- Limestone Basin, and
- Former Ash Basin.

The Ash Surge and Bypass Basins' initial federal safety factor assessment also concluded that the structural stabilities of the basins' downstream slopes are maintained during sudden (rapid) drawdown conditions at the East Roof and Yard Runoff Basin and the Former Ash Basin. Because the Metal Cleaning Basin is lined with an HDPE geomembrane, a sudden (rapid) drawdown condition was determined to not be an applicable loading condition for the basins since the Metal Cleaning Waste Basin's liner precludes the infiltration of water into the Ash Surge and Bypass Basin dikes. A sudden (rapid) drawdown condition was also not evaluated in the Limestone Basin since the basin is not used as a part of Station operations, only contains minimal surface water (if any) from direct precipitation, and does not have an outlet structure that could create a sudden (rapid) drawdown condition for the Ash Surge Basin's eastern dike.

Based on reviews of the Ash Surge and Bypass Basins' annual inspection reports (Refs. 5 through 10) and Google Earth aerial images (Ref. 3), there have been no significant modifications to the Metal Cleaning Basin, East Roof and Yard Runoff Basin, Limestone Basin, and Former Ash Basin since the Ash Surge and Bypass Basins' initial federal structural stability assessment was completed. Therefore, the conclusions documented therein regarding the stability of the basins' dikes during low pool and sudden (rapid) drawdown conditions (where applicable) at the identified basins remain valid for this 2022 assessment (see Appendix A).

2.3 FORMER ASH BASIN

2.3.1 STABLE FOUNDATIONS & ABUTMENTS

(35 Ill. Adm. Code 845.450(a)(1))

The Former Ash Basin is comprised of one earthen dike along its northern edge ("northern dike") and is effectively incised into the adjacent topography elsewhere. The basin does not have any abutments. Detailed information on the soils supporting the Former Ash Basin's dike is provided in the basin's initial federal structural stability assessment in Appendix B. Based on reviews of the basin's annual inspection reports (Refs. 13 through 18) and Google Earth aerial images (Ref. 3), there have been no significant modifications to the Former Ash Basin's geometry since its initial federal structural stability assessment was completed. Therefore, the details of the soils supporting the Former Ash Basin's northern dike and corresponding conclusions documented in the basin's initial federal structural stability assessment remain valid for this 2022 assessment (see Appendix A).

2.3.2 SLOPE PROTECTION

(35 Ill. Adm. Code 845.450(a)(2) & (4))

Slope protection for the upstream slopes of the Former Ash Basin consists of vegetation which protects the basin's interior slopes from surface erosion, wave action, and the adverse effects of sudden (rapid) drawdown. Similarly, the downstream slopes of the basin's northern dike are vegetated which offers protection from surface erosion. However, given the lack of necessary information due to the construction age of the basin, an assessment of the downstream slopes' stability against wave action or after sudden (rapid) drawdown could not be performed.

During the September 2022 site visit, vegetation greater than 12 inches was observed along portions of the pond's interior slopes and the northern dike's downstream slopes. Very dense, woody vegetation was also prevalent within the basin and along its slopes due to how long the basin has been inactive.

2.3.3 DIKE COMPACTION

(35 Ill. Adm. Code 845.450(a)(3))

As documented in the Former Ash Basin's initial and 2022 federal safety factor assessments (Refs. 12 and 20), an engineering analysis to calculate the safety factors for the basin's northern dike could not be performed given the lack of necessary information due to the construction age of the basin. Therefore, an assessment of the compacted density of the basin's northern dike could not be performed.

2.3.4 SPILLWAYS

(35 Ill. Adm. Code 845.450(a)(5))

The Former Ash Basin does not have spillways. As documented in the basin's 2022 inflow design flood control system plan (Ref. 21), the basin is capable of containing the design flood event (1,000-year, 24-hour storm) without a spillway.

2.3.5 EMBEDDED HYDRAULIC STRUCTURES

(35 Ill. Adm. Code 845.450(a)(6))

No hydraulic structures are known to underlie the base of the Former Ash Basin or pass through the basin's northern dike.

2.3.6 LOW POOL & RAPID DRAWDOWN STABILITY

(35 Ill. Adm. Code 845.450(a)(7))

As previously stated, an engineering analysis to calculate the safety factors for the Former Ash Basin's northern dike could not be performed given the lack of necessary information due to the construction age of the basin. Therefore, an assessment to determine whether the basin's northern dike remains stable during low pool and sudden (rapid) drawdown conditions could not be performed.

3.0 RECOMMENDED CORRECTIVE MEASURES

(35 Ill. Adm. Code 845.450(b)(1))

Based on the findings documented in this 2022 structural stability assessment, the following corrective measures are recommended for the Ash Surge and Bypass Basins:

- Mow or otherwise cut vegetation that is greater than 12-inches tall along the Bypass Basin's crest,
- Place rock fill in areas along the Ash Surge Basin's downstream slopes where erosion is present and continue monitoring performance,
- Conduct a visual surveillance program to verify that the Bypass Basin's discharge pipes are in good, working condition and are free of significant material defects that could compromise the pipes' integrities during retrofit construction activities for the Bypass Basin, and
- Conduct a visual surveillance program to verify that the Ash Surge Basin's discharge pipes are in good, working condition and are free of significant material defects that could compromise the pipes' integrities prior to retrofitting the basin or repurposing it as a new low volume waste basin.

Given the lack of necessary information due to the construction age of the Former Ash Basin, a full structural stability assessment meeting the requirements of 35 Ill. Adm. Code 845.450(a) could not be performed. Consequently, it is recommended that the Station continue with its plans to close the Former Ash Basin in accordance with the closure criteria promulgated by the Illinois CCR Rule.

4.0 CERTIFICATION

I certify that:

- This structural stability assessment was prepared by me or under my direct supervision.
- The work was conducted in accordance with the requirements of 35 Ill. Adm. Code 845.450.
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin

Date: October 14, 2022

Seal:



5.0 REFERENCES

1. Illinois Pollution Control Board. "Standards for Disposal of Coal Combustion Residuals in CCR Surface Impoundments." 35 Ill. Adm. Code 845. Accessed October 13, 2022.
2. U.S. Environmental Protection Agency. "Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments." 40 CFR Part 257 Subpart D. <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-257/subpart-D>. Accessed October 13, 2022.
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21. Sargent & Lundy. "2022 Inflow Design Flood Control System Plan for Ash Surge Basin, Bypass Basin, & Former Ash Basin." S&L Project No. A12661.148. October 2022.

**APPENDIX A: 2016 FEDERAL STRUCTURAL STABILITY
ASSESSMENT FOR ASH SURGE & BYPASS BASINS**



**APPENDIX B: 2018 FEDERAL STRUCTURAL STABILITY
ASSESSMENT FOR FORMER ASH BASIN**

