



Midwest Generation, LLC

Joliet 29 Generating Station

2023 Hazard Potential Classification Assessment for Ash Pond 2



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TABLE OF CONTENTS

Table of Contentsi

1.0 Purpose & Scope.....1

1.1 Purpose..... 1

1.2 Scope..... 1

2.0 Inputs.....2

3.0 Assumptions.....4

4.0 Methodology4

5.0 Assessment4

5.1 Summary of 2022 Hazard Potential Classification Assessment..... 4

5.2 Summary of Initial Federal Hazard Potential Classification Assessment..... 5

5.3 Changes in Bases for Initial Federal Hazard Potential Classification..... 6

5.3.1 Changes in Ash Pond Operations & Embankment Geometry.....6

5.3.2 Changes in Site Topography6

5.3.3 Changes in Downstream Property Developments.....7

5.3.4 Changes in USBR Depth-Velocity Flood Danger Levels.....7

5.4 2023 Hazard Potential Classification Assessment 7

6.0 Conclusions8

7.0 Certification9

8.0 References10

Appendix A: 2016 Federal Hazard Potential Classification Assessment for Ash Pond 2

1.0 PURPOSE & SCOPE

1.1 PURPOSE

Ash Pond 2 at Midwest Generation, LLC's (MWG) Joliet 29 Generating Station ("Joliet 29" or the "Station") is an existing coal combustion residual (CCR) surface impoundment that is 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 845.440(a)(1), MWG must conduct and complete an annual hazard potential classification assessment that documents the hazard potential classification for Ash Pond 2 in accordance with the hazard potential classifications defined in 35 Ill. Adm. Code 845.120.

This report documents the 2023 hazard potential classification assessment conducted and completed in accordance with the Illinois CCR Rule by Sargent & Lundy (S&L) on behalf of MWG for Ash Pond 2 at Joliet 29. This report:

- Lists the inputs and assumptions used in the 2023 hazard potential classification assessment,
- Lists and compares the definitions for the hazard potential classifications for CCR surface impoundments promulgated by the Illinois CCR Rule and by the U.S. Environmental Protection Agency's regulations for CCR surface impoundments,
- Discusses the methodology used to conduct the 2023 hazard potential classification assessment,
- Provides the 2023 hazard potential classifications for Ash Pond 2 in accordance with 35 Ill. Adm. Code 845.440(a)(1).

1.2 SCOPE

In addition to being regulated under the Illinois CCR Rule, Joliet 29's Ash Pond 2 is 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, Ash Pond 2 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 2023 hazard potential classification assessment is strictly limited to demonstrating compliance with the Illinois CCR Rule. Pursuant to 40 CFR 257.73(f)(3), the next hazard potential classification assessment for demonstrating compliance with the Federal CCR Rule will be completed in 2026, five years after the last federal assessment was completed (2021).

2.0 INPUTS

Hazard Potential Classifications

The Illinois CCR Rule (Ref. 1, § 845.120) defines “hazard potential classification” as “the possible adverse incremental consequences that result from the release of water or stored contents due to failure of the diked CCR surface impoundment or mis-operation of the diked CCR surface impoundment or its appurtenances.” The Illinois CCR Rule (Ref. 1, § 845.440(a)(1)) requires a CCR surface impoundment be designated as either a Class 1 CCR surface impoundment or a Class 2 CCR surface impoundment. Per 35 Ill. Adm. Code 845.120, the two Illinois hazard potential classifications are defined as follows:

- *Class 1 CCR surface impoundment* means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.
- *Class 2 CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.

The Federal CCR Rule (Ref. 2, § 257.53) has the same definition for “hazard potential classification” as the Illinois CCR Rule. However, the Federal CCR Rule has three hazard potential classifications instead of the two designations promulgated by the Illinois CCR Rule. Per 40 CFR 257.53, the three federal hazard potential classifications are defined as follows:

- *High hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.
- *Low hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner’s property.
- *Significant hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.

Per the preceding sets of definitions for the federal and Illinois hazard potential classifications, a high hazard potential CCR surface impoundment per the Federal CCR Rule is the same as a Class 1 CCR surface impoundment per the Illinois CCR Rule. Similarly, a CCR surface impoundment that is classified as a low or significant hazard potential per the Federal CCR Rule is considered to be a Class 2 CCR surface impoundment per the Illinois CCR Rule.

A CCR surface impoundment’s hazard potential classification is not a reflection of the probability of a hypothetical failure event associated with the surface impoundment. Hazard potential classifications are not contingent upon a CCR surface impoundment’s structural stability; they only classify the potential impacts

should a hypothetical failure occur. For example, a well-maintained CCR surface impoundment with appropriate factors of safety may be classified as a Class 1 hazard potential solely because a loss of human life would be probable if a hypothetical failure event did occur. Instead, the structural integrity of a CCR surface impoundment and its potential for failure are evaluated and documented in the structural stability and safety factor assessments prepared pursuant to 35 Ill. Adm. Code 845.450 (Ref. 3) and 35 Ill. Adm. Code 845.460 (Ref. 4), respectively.

Site Topography

Topographic data for Ash Pond 2 and the surrounding areas was obtained from an aerial survey performed by Aero-Metric, Inc. in 2008 (Ref. 6).

Impacted Areas

Areas impacted by a hypothetical failure at Ash Pond 2 were obtained from the pond's initial federal hazard potential classification assessment (Ref. 5), the dike breach analysis conducted in 2016 for the pond's southern dike (Ref. 7), and the dike breach inundation map included in Ash Pond 2's Emergency Action Plan (Ref. 8). The inputs, assumptions, and methodology utilized to identify areas impacted by failures at each of the pond's dikes were evaluated to determine whether any updates to these analyses were warranted.

Appendix A provides the initial federal hazard potential classification assessment conducted by Geosyntec Consultants in 2016 for Ash Pond 2.

Aerial Images

Historical and recent aerial images of the Station and surrounding areas were obtained from Google Earth Pro (Ref. 9).

Property Boundaries

Boundaries for the Station's property and adjacent properties were obtained from the geographic information system (GIS) for Will County, Illinois (Ref. 10).

100-Year Floodway & Floodplain

Delineations for the floodway and floodplain for the 1% annual chance flood ("100-year flood") at and downstream from the Joliet 29 site were obtained from the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) for the subject area (Ref. 11).

Ash Pond Conditions

The operating and physical conditions for Ash Pond 2 were based on discussions with MWG personnel and on the annual inspection reports prepared for the CCR surface impoundment in accordance with 40 CFR 257.83(b) and 35 Ill. Adm. Code 845.540(b) (Refs. 13 through 19).

3.0 ASSUMPTIONS

There are no assumptions in this document that require verification.

4.0 METHODOLOGY

As documented in last year's hazard potential classification assessment, the 2022 hazard potential classification assigned to Ash Pond 2 was based on the initial federal hazard potential classification assigned in 2016 pursuant to the Federal CCR Rule after it was determined that the bases for the initial federal hazard potential classification was still valid. Accordingly, the bases for Ash Pond 2's initial federal hazard potential classification as documented within the pond's initial federal hazard potential classification assessment were re-evaluated to determine if any changes have occurred since the initial assessment was completed. Identified changes were then evaluated to determine if the pond's 2022 hazard potential classification warrants an adjustment. Where no changes were noted for a given input, or where identified changes were determined to have no impact to the results and conclusions of the initial federal hazard potential classification assessment, the previous evaluation of that input was considered to still be valid for this 2023 assessment.

In instances where changes to one or more factors used as the bases for the initial hazard potential classification were identified (e.g., downstream development that was not present in 2016), hypothetical dike breaches were considered at the CCR surface impoundment to evaluate the impacts that a release of CCR and CCR wastewater would have on the identified factor(s). These hypothetical dike breaches were evaluated regardless of potential causes and/or apparent dike stability. When evaluating a hypothetical dike breach at Ash Pond 2, the solid waste materials in the CCR surface impoundment were conservatively considered as an equivalent volume of liquid, and the CCR surface impoundment was assumed to be entirely filled with liquid.

When evaluating the downstream impacts from a hypothetical dike breach at Ash Pond 2, the primary consideration examined was whether a loss of human life is probable under the given hypothetical failure scenario. Loss of human life is the critical aspect of the Class 1 hazard potential classification. If a loss of human life is unlikely to occur, then Ash Pond 2 was not considered to be a Class 1 hazard potential and was instead classified as a Class 2 hazard potential.

5.0 ASSESSMENT

5.1 SUMMARY OF 2022 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

The previous hazard potential classification assessment for Ash Pond 2 was completed on October 14, 2022. Ultimately, the 2022 hazard potential classification for Ash Pond 2 was based on the initial federal

hazard potential classification that was assigned to the pond in 2016 after it was determined that the bases for the initial federal hazard potential classification were still valid. Per the initial federal hazard potential classification assessment for Ash Pond 2, the pond was classified as a significant hazard potential CCR surface impoundment pursuant to 40 CFR 257.53. Based on the comparison between the Federal and Illinois CCR Rules' definitions for hazard potential classifications in Section 2.0, a significant hazard potential CCR surface impoundment under the Federal CCR Rule is the equivalent of a Class 2 CCR surface impoundment under the Illinois CCR Rule. Therefore, Ash Pond 2 was classified as a Class 2 CCR surface impoundment in the 2022 hazard potential classification assessment.

5.2 SUMMARY OF INITIAL FEDERAL HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

The initial federal hazard potential classification assessment for Ash Pond 2 was completed in October 2016 and is included in its entirety in Appendix A. This assessment evaluated the potential consequences of hypothetical dike failures for the pond. A quantitative dike breach analysis was also conducted for the pond's southern dike which was determined to pose the most risk to human life due its height, its proximity to occupied buildings, and the adjacent topography sloping towards occupied buildings and the Des Plaines River. The 2016 dike breach analysis also assumed that Ash Pond 2 was at capacity at the time of the hypothetical failure.

Per Figures 2 and 3 in Appendix A, the 2016 dike breach analysis concluded that the flood released through a hypothetical breach in Ash Pond 2's southern dike could impact six Station buildings, of which three are considered to be occupied building and the remaining three are considered to be unoccupied buildings. The 2016 dike breach analysis also concluded that the combination of the estimated flood velocity and depth at each occupied building is within the U.S. Department of the Interior, Bureau of Reclamation's (USBR) "Low Danger Zone" (see Figure 4 in Appendix A). In its "Downstream Hazard Classification Guidelines" (Ref. 12), the USBR states that if the depth-velocity combination of a hazard (*e.g.*, flood) for a given area plots within the "Low Danger Zone," "the number of lives-in-jeopardy associated with possible downstream hazards is assumed to be zero." In other words, floods plotting within the USBR's "Low Danger Zone" are unlikely to cause a probable loss of human life. Therefore, the initial federal hazard potential classification assessment concluded that a failure of Ash Pond 2's southern dike would not result in a probable loss of human life.

Although a hypothetical failure at Ash Pond 2 was determined to not cause a probable loss of human life, it was also determined that wastewater released from such a breach would flow into the Station's Intake Canal, thereby impacting the Des Plaines River. Therefore, Ash Pond 2 was classified as a significant hazard potential CCR surface impoundment.

5.3 CHANGES IN BASES FOR INITIAL FEDERAL HAZARD POTENTIAL CLASSIFICATION

Because the 2022 hazard potential classification assigned to Ash Pond 2 is based on the analysis performed in 2016 pursuant to the Federal CCR Rule, this 2023 assessment re-evaluates the bases for the pond's initial federal hazard potential classification to determine if any changes have occurred since the initial assessment was completed that warrant adjusting the pond's 2022 hazard potential classification.

5.3.1 CHANGES IN ASH POND OPERATIONS & EMBANKMENT GEOMETRY

Ash Pond 2 was originally designed to manage CCR and miscellaneous non-CCR wastestreams from the Station. Following the conversion of Joliet 29's coal-fired units to natural gas, the pond was no longer used to manage CCR wastestreams and was eventually taken out of service. In accordance with the Station's ash pond maintenance practices, the Station then began dewatering and removing CCR from the pond. As documented in the pond's annual inspection reports since 2019 (Refs. 16 through 19), minimal CCR remains in Ash Pond 2. During a site visit in September 2023, no CCR and only a few feet of stormwater were visually observed in Ash Pond 2. In April 2021, MWG filed a notice of intent to close Ash Pond 2 in accordance with the Federal CCR Rule's closure criteria (Ref. 2, § 257.102). Closure construction activities will commence at the pond upon receipt of a closure construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule.

As previously mentioned in Section 5.1, Ash Pond 2's 2016 federal hazard potential classification assessment examined hypothetical breach scenarios assuming the pond was at capacity; therefore, the assumed operating condition used for the initial assessment is conservative for the pond's current operating condition. Therefore, there is no basis to reevaluate the surface water elevation used to conduct the initial hazard potential classification assessment for Ash Pond 2.

Based on reviews of the annual inspection reports (Refs. 13 through 19) and Google Earth aerial images (Ref. 9), there have been no significant modifications to Ash Pond 2 (mass excavations, major embankment modifications, *etc.*) since the initial federal hazard potential classification assessment was completed in 2016. Therefore, there is no basis to reevaluate the embankment geometry for this 2023 assessment.

5.3.2 CHANGES IN SITE TOPOGRAPHY

Based on reviews of the annual inspection reports (Refs. 13 through 19) and Google Earth aerial images (Ref. 9), there have been no significant modifications to the ground surfaces (mass excavations, mass fill placement, *etc.*) adjacent to Ash Pond 2 or within the dike breach impact areas since the initial federal hazard potential classification assessment was completed in 2016. Therefore, the topographic data collected for the site in 2008 (Ref. 6) remains valid for use in this 2023 assessment.

5.3.3 CHANGES IN DOWNSTREAM PROPERTY DEVELOPMENTS

Based on reviews of Google Earth aerial images (Ref. 9) and the Will County, Illinois GIS (Ref. 10), no new buildings or transport corridors (roads, rail lines, *etc.*) have been constructed in the past seven years within the dike breach impact areas identified in the initial federal hazard potential classification assessment. Thus, there is no basis to reevaluate the potential impacts to the areas downstream of Ash Pond 2 for this 2023 assessment.

5.3.4 CHANGES IN USBR DEPTH-VELOCITY FLOOD DANGER LEVELS

The USBR has not updated the depth-velocity flood danger level relationships presented in its “Downstream Hazard Classification Guidelines” (Ref. 12) since the initial federal hazard potential classification assessment for Ash Pond 2 was completed in 2016. Therefore, there is no basis to reevaluate the danger levels assigned to the occupied buildings identified within the inundation area downstream of Ash Pond 2’s southern dike following a hypothetical breach.

5.4 2023 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

Other than the change in the operational status of Ash Pond 2, there have been no significant modifications to Ash Pond 2; no significant modifications to the topography adjacent to and downstream of the CCR surface impoundment; and no significant buildings or transport corridors that have been constructed in the areas downstream of the CCR surface impoundments that would be impacted by a hypothetical dike breach. There have also been no changes to the USBR’s depth-velocity flood danger level relationships, which were used in the 2016 federal hazard potential classification assessment. Moreover, the Federal Energy Regulatory Commission’s *Engineering Guidelines for the Evaluation of Hydropower Projects* (Ref. 20), which references FEMA’s *Federal Guidelines for Dam Safety* (Ref. 19), states that “the consequences of failure are not expected to cause a probable loss of human life when incremental effects on downstream structures are approximately two feet or less.” FEMA’s *Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures* (Ref. 22) also states that an incremental rise in flood depth of two feet or less caused by a dike breach is not considered to be a concern to human life. These two federal guidelines further support the conclusion that the loss of human life at the three occupied buildings is not probable given the initial breach analysis results show the estimated flood depths at these buildings are less than two feet. Therefore, the initial federal hazard potential classification assessment completed in 2016 for this CCR surface impoundment remains valid. In addition, the 2016 dike breach analysis for Ash Pond 2’s southern dike still represents the worst-case failure scenario amongst the pond’s three dikes.

Based on the preceding observations, the significant hazard potential classification assigned to Ash Pond 2 in 2016 pursuant to the Federal CCR Rule and the bases for this assignment remain valid for this 2023 assessment. A loss of human life is unlikely to result from a hypothetical failure at this CCR surface

impoundment, but potential offsite environmental damage could occur to the Des Plaines River. As discussed in Section 2.0, a CCR surface impoundment classified as a significant hazard potential per the Federal CCR Rule is considered to be an Illinois Class 2 CCR surface impoundment. Therefore, Ash Pond 2 remains classified as a Class 2 CCR surface impoundment pursuant to 35 Ill. Adm. Code 845.440(a)(1). However, this is not a reflection of the potential for the impoundment to fail. The 2023 annual safety factor assessment conducted pursuant to 35 Ill. Adm. Code 845.460 (Ref. 4) shows that Ash Pond 2 is stable under design operating conditions. Moreover, no visual signs of distress that could be indicative of dike instability were observed during the September 14, 2023, condition assessment performed by S&L in support of the pond's 2023 annual structural stability assessment under 35 Ill. Adm. Code 845.450 (Ref. 3).

6.0 CONCLUSIONS

This assessment re-evaluated the factors and design inputs used as the bases for the initial federal hazard potential classification assessment completed in 2016 pursuant to the Federal CCR Rule for Joliet 29's Ash Pond 2. It was determined that no significant operational or physical changes to the CCR surface impoundment and no new downstream developments within the dike breach inundation areas have occurred within the last seven years that would necessitate changing the pond's initial federal hazard potential classification. Therefore, because the 2022 Illinois hazard potential classification for Ash Pond 2 was based on its 2016 federal hazard potential classification, the 2022 Illinois hazard potential classification assigned to Ash Pond 2 and the bases for this assignment remain valid for 2023.

Table 6-1 presents the 2023 hazard potential classifications assigned to Ash Pond 2 at Joliet 29 in accordance with 35 Ill. Adm. Code 845.440(a)(1).

Table 6-1 – 2023 Illinois Hazard Potential Classifications for Ash Pond 2 at the Joliet 29 Generating Station

CCR Surface Impoundment	2023 Illinois Hazard Potential Classification
Ash Pond 2	Class 2

However, as noted above, the 2023 hazard potential classification for Ash Pond 2 does not reflect the probability of a hypothetical failure event associated with the pond and is not contingent upon the pond's structural stability. Indeed, the 2023 annual safety factor assessment conducted pursuant to 35 Ill. Adm. Code 845.460 (Ref. 4) shows Ash Pond 2 is structurally stable under design operating conditions. Moreover, no visual signs of distress that could be indicative of dike instability were observed during S&L's September 14, 2023, condition assessment performed in support of the pond's 2023 annual structural stability assessment under 35 Ill. Adm. Code 845.450 (Ref. 3).

7.0 CERTIFICATION

I certify that:

- This hazard potential classification assessment was prepared by me or under my direct supervision.
- The work was conducted in accordance with the requirements of 35 Ill. Adm. Code 845.440.
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin

Date: October 13, 2023

Seal:



8.0 REFERENCES

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**APPENDIX A: 2016 FEDERAL HAZARD POTENTIAL
CLASSIFICATION ASSESSMENT FOR ASH POND 2**

