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October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

East Ash Pond

At Joppa Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the East Ash Pond at the Electric Energy, Inc. (EEI) Joppa Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d), except as noted herein. The East Ash Pond is located near Joppa, Illinois in Massac County, approximately 0.1 miles northeast of the Joppa Power Station. The East Ash Pond serves as the wet impoundment basin for CCRs produced by the Joppa Power Station.

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

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

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(1)

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

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of the East Ash Pond is consistent with recognized and generally accepted good engineering practices. The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of the Joppa East Ash Pond were found to be consistent with recognized and generally accepted good engineering practices, and meet the standards in §257.73(d)(1)(i)-(vii), except as noted herein.

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

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

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

The foundation consists of medium stiff to stiff clay overlying medium dense to dense sand, which indicates stable foundations. Ash placed before 1973 was identified below the compacted embankment of the dike and above the naturally occurring foundation materials near the southeast corner of the East Ash Pond embankment; however this condition was modified by installing a Deep Soil Mixed (DSM), wet soil cement mixed method, zone in 2016. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for East Ash Pond at Joppa Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of liquefaction in the foundation and were found to satisfy the criteria in §257.73(e)(1)(iv) applicable to dikes. A review of information about operations and maintenance as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, the East Ash Pond was designed and constructed with stable foundations. Any issues related to the stability of the foundation are addressed during operations and maintenance; therefore, the East Ash Pond meets the requirements in §257.73(d)(1)(i).

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

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

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

Based on this evaluation, adequate slope protection was designed and constructed at the East Ash Pond. No evidence of significant areas of erosion or wave action was observed. The exterior dike slopes are covered with crushed stone and vegetation for slope protection. EEL regularly maintains the slopes, including repairing observed surface erosion and addressing areas of poor vegetation growth, as required. As the exterior slopes are not adjacent to a downstream water body, they are not susceptible to wave action or sudden drawdown. AECOM observed the vegetation to be adequately protecting against surface erosion.

The interior dike slopes have a 1.5H:1V orientation and are covered with vegetation, stacked CCRs, and some limited areas of crushed stone. Sudden drawdown conditions are not expected to occur due to the characteristics of the outfall structure at the East Ash Pond. EEL regularly maintains the interior slopes, including repairing observed surface erosion and addressing areas of poor vegetation growth, as required. AECOM observed the vegetation to be adequately protecting against surface erosion and wave action. Therefore, the East Ash Pond meets the requirements in §257.73(d)(1)(ii).

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

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

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

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

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

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

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

Based on this evaluation, the vegetation on the exterior slopes is adequate as no substantial bare or overgrown areas were observed. The exterior slopes were vegetated or covered with crushed stone and the interior slopes were covered with vegetation, crushed stone, or mechanically-stacked CCR which are alternate forms of slope protection. Therefore, the original design and construction of the East Ash Pond included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance practices are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, the East Ash Pond meets the requirements in §257.73(d)(1)(iv).

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

2.5 Spillways (§257.73(d)(1)(v))

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

(A) All spillways must be either:

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

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

- (1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or*
- (2) 1000-year flood for a significant hazard potential CCR surface impoundment; or*
- (3) 100-year flood for a low hazard potential CCR surface impoundment.*

The spillways were evaluated using design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the probable maximum flood event for the high hazard potential East Ash Pond.

Two spillway structures are present at the East Ash Pond, including a ductile iron pipe and high-density polyethylene (HDPE) spillway pipe and a reinforced concrete pipe (RCP) spillway. The ductile iron, HDPE, and reinforced concrete are non-erodible materials designed to carry sustained flows. The capacity of the spillways was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillways can adequately manage flow during peak discharge resulting from the probable maximum flood event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for East Ash Pond at Joppa Power Station* (October 2016). Therefore, the East Ash Pond meets the requirements in §257.73(d)(1)(v).

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

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

Two hydraulic structures pass through the dike of the East Ash Pond: the south-sub-basin 26-inch diameter HDPE spillway pipe and the north sub-basin 48-inch RCP spillway pipe. The stability and structural integrity of both pipes were evaluated using design drawings, information about operations and maintenance, inspections, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike or underlie the base of the East Ash Pond.

Closed circuit television (CCTV) inspections of both pipes were attempted in 2016. The 48-inch RCP was successfully visually inspected and noted to contain 12-inches of cemented CCR materials. However, the pipe was free of significant deterioration, deformation, distortion, and bedding deficiencies that may negatively affect the operation of the hydraulic structure. The presence of the cemented CCR materials was accounted for in the hydrologic and hydraulic analyses discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for East Ash Pond at Joppa Power Station* (October 2016), and were not found sufficient enough to negatively affect the operation of the hydraulic structure. The inspection of the HDPE spillway pipe could not be fully completed due to access issues that prevented an inspection of the entire pipe. However, the evaluation of design drawings, operational and maintenance procedures, and conditions observed in the field did not identify any issues with the HDPE spillway pipe.

Based on this evaluation, all East Ash Pond hydraulic structures cannot be certified to meet the requirements of §257.73(d)(1)(vi) because a complete CCTV inspection of the 26-inch HDPE pipe has not yet been performed, thus, precluding completion of the evaluation of the stability and structural integrity of that pipe. In accordance

with §257.73(d)(2), AECOM recommends that a CCTV pipe inspection of the 26-inch HDPE pipe be completed as soon as feasible and that this assessment be updated once the inspection is completed.

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

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

The structural stability of the downstream slope of the East Ash Pond was evaluated by comparing the location of the East Pond relative to published flood maps for the area. The East Ash Pond is located outside of the 100-year flood zone shown on the FEMA Federal Insurance Rate Map (FIRM) map for Massac County, Illinois and the village of Joppa, Illinois. Therefore, adjacent water bodies that could potentially inundate the downstream slopes of the East Ash Pond are not present. Based on this evaluation, the requirements in §257.73(d)(1)(vii) are not applicable to the East Ash Pond, as inundation of the downstream slopes is not expected to occur during 100-year or lesser flood conditions.

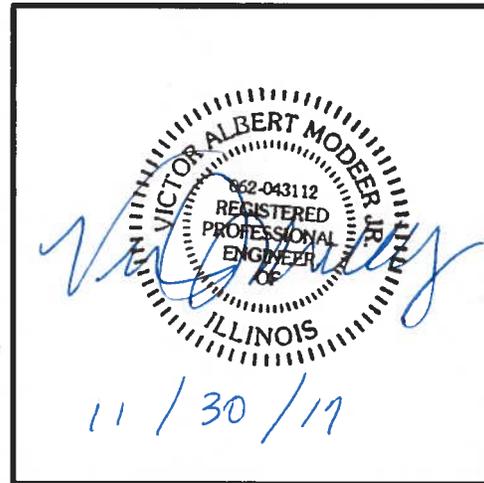
3 Certification Statement

CCR Unit: Electric Energy, Inc.; Joppa Power Station; East Ash Pond

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 14, 2016 was conducted in accordance with the requirements of 40 CFR §257.73.

Victor A. Modeer
Printed Name

10/14/16
Date



About AECOM

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