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# CCR Rule Report: Initial Structural Stability Assessment

## For

## Basin A

## At Miami Fort Power Station

# 1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that Basin A at the Miami Fort Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). Basin A is located near North Bend, Ohio in Hamilton County, approximately 0.2 miles west of the Miami Fort Power Station. Basin A serves as a wet impoundment basin for CCR produced by the Miami Fort Power Station.

Basin A 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 Basin A is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). 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 Basin A were found to be consistent with recognized and generally accepted good engineering practices.

### **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. Basin A is a ring dike structure and does not have abutments.

The foundation consists of very soft to very stiff alluvial clays, overlying very soft to very stiff alluvial silts and clays, which in turn overlies medium dense to dense sand and gravel. 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 Basin A at Miami Fort Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of cyclic softening in the foundation, and were found to satisfy the criteria in §257.73(e)(1)(iv) applicable to dikes. A review of operational and maintenance procedures 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, Basin A was designed and constructed with stable foundations. Operational and maintenance procedures are in place to address any issues related to the stability of foundations; therefore, Basin A 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, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at Basin A. No evidence of significant areas of erosion or wave action was observed. The interior slopes are protected with vegetation and stacked CCRs, and the exterior slopes are protected with vegetation and concrete riprap. Operational and

maintenance procedures are in place to repair the vegetation, stacked CCRs, and concrete riprap as needed to protect against surface erosion or wave action. Sudden drawdown of the pool in Basin A is not expected to occur due to the configuration of the outfall structures; therefore, slope protection to protect against the adverse effects of sudden drawdown is not required. Therefore, Basin A 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 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 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 very stiff material, which is indicative of 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 Basin A at Miami Fort Power Station* (October 2016); therefore, the original design and construction of Basin A included sufficient density and dike compaction. Operational and maintenance procedures are in place to identify and mitigate deficiencies in order to maintain sufficient compaction of the dikes to withstand the range of loading conditions. Therefore, Basin A meets the requirements in §257.73(d)(1)(iii).

### **2.4 Vegetated Slopes (§257.73(d)(1)(iv))<sup>1</sup>**

*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, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the exterior and interior slopes is adequate as no substantial bare or overgrown areas were observed. Stacked CCRs on the interior slopes and concrete riprap on the exterior slopes is present in some areas, which is used as an alternate form of slope protection, and is adequate as significant areas of erosion or wave action not observed. Therefore, the original design and construction of Basin A included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance procedures are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, Basin A meets the requirements in §257.73(d)(1)(iv).

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<sup>1</sup> 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 primary spillway was evaluated using design drawings, operational and maintenance procedures, 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 1,000-year flood event for the significant hazard potential Basin A. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2). A secondary spillway is also present at Basin A, but it is not activated during the 1,000-year flood event and is therefore not considered in the evaluation of §257.73(d)(1)(v)(B).

The primary spillway is constructed of high-density polyethylene (HDPE) pipe sliplined into a corrugated metal pipe (CMP), which are non-erodible materials designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm 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 Basin A at Miami Fort Power Station* (October 2016). Operational and maintenance procedures are in place to repair any issues with the spillway and remove debris or other obstructions from the spillway, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway. Therefore, Basin A 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 are present at Basin A: the primary spillway and an inactive secondary spillway. Both structures are constructed of HDPE and CMP pipes. The stability and structural integrity of both spillways, which pass through the dikes of Basin A, were evaluated using design drawings, operational and maintenance procedures, closed-circuit television (CCTV) pipe inspections, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of Basin A.

The CCTV pipe inspection of both spillways covered their complete length and found the pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structures. Therefore, Basin A meets the requirements in §257.73(d)(1)(vi).

## 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 slopes of Basin A was evaluated by comparing the location of Basin A relative to adjacent water bodies using published Federal Emergency Management Agency Flood Insurance Rate Maps, aerial imagery, and conditions observed in the field by AECOM.

Based on this evaluation, the Ohio River is adjacent to the southern downstream slopes of Basin A. No other downstream rivers, streams, or lakes are adjacent to the downstream slopes of Basin A. A sudden drawdown slope stability analysis was performed at a cross-section identified as critical for sudden drawdown slope stability. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition (El. 490 feet) to an empty pool condition, which thereby is an evaluation of both sudden drawdown and low pool conditions. The resulting factor of safety was found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from flood to normal pool, as factor of safety criteria for sudden drawdown slope stability is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, Basin A meets the requirements listed in §257.73(d)(1)(vii).

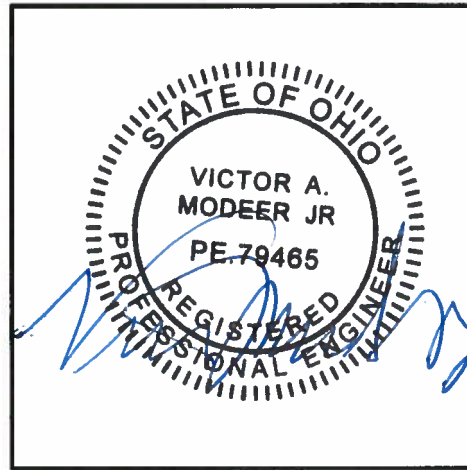
### 3 Certification Statement

**CCR Unit:** Miami Fort Power Station; Basin A

I, Victor A. Modeer, 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 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 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A. MODEER JR  
Printed Name

10/13/16  
Date



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