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Zimmer Power Station
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Submitted by
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October 2016

CCR Rule Report: Initial Structural Stability Assessment

For

D Basin

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the D Basin at the Zimmer Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The D Basin is located near Moscow, Ohio in Clermont County, approximately 0.5 miles north of the Zimmer Power Station. The D Basin serves as a dewatering basin for CCR produced by the Zimmer Power Station.

The D Basin 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 D Basin 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 the D Basin 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, 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 foundations. The D Basin is a ring dike structure and does not have abutments.

The foundation consists of soft to stiff alluvial soil overlying medium dense to very dense alluvial soil. 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 D Basin at Zimmer 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 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 D Basin was designed and constructed with stable foundations. Any issues related to the stability of the foundation is addressed during operations and maintenance; therefore, the D Basin 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 D Basin. No evidence of significant areas of erosion or wave action were observed. Under normal operating conditions there is no free water present within the D Basin. The interior slopes are protected vegetation and a bottom ash protection layer. The exterior slopes are protected with vegetation. The bottom ash protection layer on the interior slopes isolates

the embankment soils from surface erosion, wave action, and acts as a free-draining material that is not susceptible to the adverse effects of sudden drawdown. Therefore, the D Basin 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, 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 dense to very dense 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 D Basin at Zimmer Power Station* (October 2016); therefore, the original design and construction of the D Basin included sufficient dike compaction. Deficiencies related to compaction of the dikes are identified and mitigated as part of operations and maintenance, in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, the D Basin 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, and vegetation where present on the interior slopes, is adequate as no substantial bare or overgrown areas were observed. Where vegetation is not present on the interior slopes, the bottom ash protection layer is used as an alternate form of slope protection, which is adequate as significant areas of erosion or wave action were not observed. Therefore, the original design and construction of the D Basin included adequate vegetation of the dikes and surrounding areas. Adequate information about operations and maintenance 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 D Basin 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 §257.73(d)(1)(v)(A) requirements are not applicable to the D Basin at the Zimmer Power Station because a spillway is not present. However, the §257.73(d)(1)(v)(B) requirement was evaluated to determine if the D Basin meets the requirements without a spillway system present, as discussed below.

The ability of the D Basin to adequately manage flow without a spillway system was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the D Basin can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2). The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for D Basin at Zimmer Power Station* (October 2016). Therefore, the D Basin meets the requirements in §257.73(d)(1)(v)(B), even though a spillway system is not present.

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.

Based on an evaluation of design drawings, information about operations and maintenance, and conditions observed in the field by AECOM, no hydraulic structures are present that underlie the base or pass through the dike of the D Basin. Therefore, the §257.73(d)(1)(vi) requirements are not applicable to the D Basin.

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 the D Basin was evaluated by comparing the location of the D Basin relative to adjacent water bodies using published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), aerial imagery, conditions observed in the field by AECOM, and sudden drawdown slope stability analyses.

Based on this evaluation, the Ohio River is adjacent to the western downstream slope of the D Basin. No other downstream water bodies are adjacent to the D Basin. The adjacent C and B Basins do not retain a pool that inundates the downstream slope of the D Basin during normal conditions.

A sudden drawdown slope stability analysis was performed at a cross-section considered critical for sudden drawdown slope stability analysis. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition, as found from the FEMA FIRM map, to an empty pool condition, thereby evaluating 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 normal to low pool, as factor of safety criteria for sudden drawdown slope stability analysis is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, the D Basin meets the requirements listed in §257.73(d)(1)(vii).

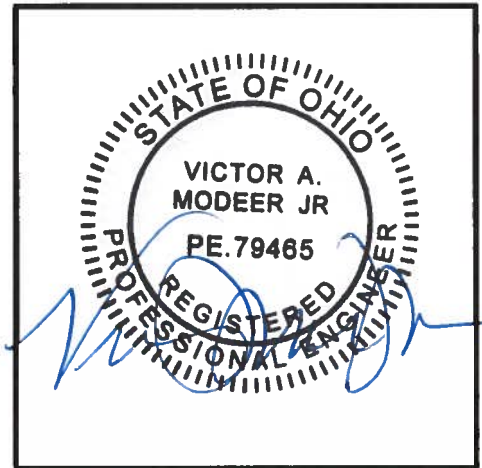
3 Certification Statement

CCR Unit: Zimmer Power Station; D Basin

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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