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CCR Rule Report: Initial Structural Stability Assessment

For

GMF Pond

At Coffeen Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Gypsum Management Facility (GMF) Pond at the Illinois Power Generating Company Coffeen Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The GMF Pond is located near Coffeen, Illinois in Montgomery County, approximately 0.6 miles north of the Coffeen Power Station. The GMF Pond serves as the primary wet impoundment basin for gypsum produced by the wet scrubber system at the Coffeen Power Station.

The GMF 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 GMF Pond 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 GMF Pond 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. The GMF Pond is a ring dike structure and does not have abutments.

The foundation consists of medium stiff to stiff soil, overlying soft to very soft soil, which in turn overlies very stiff to hard glacial till. Slope stability analyses exceed the criteria listed in §257.73(e)(1)(i) through (iii) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for GMF Pond at Coffeen Power Station* (October 2016). Additional slope stability analyses were performed to evaluate the effects of liquefaction and cyclic softening in the foundation, and were found to satisfy the criteria listed 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, the GMF Pond 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, the GMF 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, operational and maintenance procedures, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at the GMF Pond. No evidence of significant areas of erosion or wave action was observed. The interior slopes are protected with a geomembrane liner that underlies the entire GMF Pond and extends up the interior slopes, and the exterior

slopes are protected with vegetation. The geomembrane liner on the interior slopes isolates the embankment soils from surface erosion or wave action. Operational and maintenance procedures to repair the vegetation (exterior slopes) and liner (interior slopes) as needed are appropriate to protect against surface erosion or wave action. Given the presence of a liner that serves to prevent saturation of the dike's soils below the normal pool, sudden drawdown, as well as the corresponding adverse effects, is not applicable to the GMF Pond. Therefore, the GMF 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 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 stiff material, which is indicative of mechanically compacted dikes. As discussed in the *CCR Rule Report: Initial Safety Factor Assessment for GMF Pond at Coffeen Power Station* (2016), slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. Therefore, the original design and construction of the GMF Pond included sufficient 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, the GMF 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, operational and maintenance procedures, 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. Exposed geomembrane liners on the interior slopes are used as an alternate form of slope protection, which is adequate as significant tears or defects were not observed. Therefore, the original design and construction of the GMF Pond 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, the GMF 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 spillway system 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 probable maximum flood (PMF) inflow design flood (IDF) event for the high hazard potential GMF Pond. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The spillway system at the GMF Pond includes a geomembrane-lined transfer channel and a high-density polyethylene low-flow pipe. Both the lined channel and the low-flow pipe are constructed from non-erodible materials that are designed to carry sustained flows. The capacity of the spillway system was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway system can adequately manage flow during peak discharge resulting from the PMF IDF 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 GMF Pond at Coffeen Power Station* (October 2016). Operational and maintenance procedures are in place to repair any tears in the spillway liner and remove debris or other obstructions from the transfer channel and low-flow pipe, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the spillway system. Therefore, the GMF 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.

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

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

Based on this evaluation, water bodies adjacent to the downstream slopes of the GMF Pond are not present. The nearest downstream water body is the GMF Recycle Pond, which is approximately 500 lateral feet beyond the

downstream slopes of the GMF Pond. The GMF Recycle Pond is a CCR unit, rather than a river, stream, or lake. Coffeen Lake is also located in the vicinity of the GMF Pond, but the GMF Pond is outside of the flood zone shown on the FEMA FIRM. Therefore, adjacent water bodies that can inundate the downstream slopes of the GMF Pond are not present.

Based on this evaluation, the requirements in §257.73(d)(1)(vii) are not applicable to the GMF Pond, as inundation of the downstream slopes is not expected to occur.

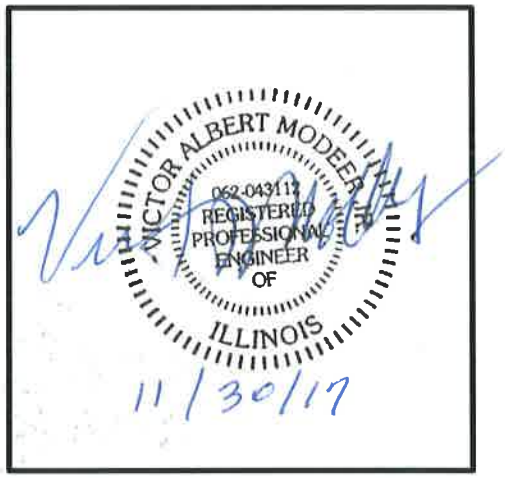
3 Certification Statement

CCR Unit: Illinois Power Generating Company; Coffeen Power Station; GMF 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 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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