

CCR Rule Report: Initial Structural Stability Assessment

Ash Pond 2
Basin Electric Power Cooperative
Leland Olds Station
Stanton, North Dakota

AECOM Project No 60565307
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1. Introduction

This Coal Combustion Residual (CCR) Rule Report documents that that Ash Pond 2 at the Basin Electric Power Cooperative (BEPC) Leland Olds Station meets the initial structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(e) of the HAZARDOUS AND SOLID WASTE MANAGEMENT SYSTEM; DISPOSAL OF COAL COMBUSTION RESIDUALS FROM ELECTRIC UTILITIES [RIN-2050-AE81; FRL-9149-4] (EPA Final CCR Rule).

Ash Pond 2 is an existing CCR surface impoundment as defined by §257.53 of the EPA Final CCR Rule. In October 2015, BEPC determined that the impoundment met the criteria for an inactive surface impoundment as defined in §257.100 of the EPA Final CCR Rule, and the 'Notification of Intent to Initiate Closure of CCR Surface Impoundment' for Ash Pond 2 was completed on December 15, 2015, in accordance with §257.100 of the EPA Final CCR Rule.

Since that time, §257.100 of the CCR Rule has been vacated, and the compliance deadlines for inactive surface impoundments have been extended. Specifically, CCR impoundments that were initially classified with the 'Inactive' status and seeking closure under §257.100 now must have the initial structural stability assessment completed by April 17, 2018. The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment meets the requirements of 40 CFR §257.73.

The owner or operator must prepare a structural stability assessment every five years.

2. Structural Stability Assessment [§257.73(d)(1)(i) through (viii)]

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)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, and operation of Ash Pond 2 is consistent with good engineering practices. The results of the structural stability assessment are discussed in the following sections, and the design, construction, operation, and maintenance of Ash Pond 2 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 has been 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 on the north embankment of the adjacent Pond 3, which was determined to have similar soil properties but less favorable embankment stability conditions due to steeper side slopes and a smaller crest width. The stability of the embankments for Ash Pond 2 were determined by engineering review to have stability factors equal to or greater than those for Pond 3, which were satisfactory.

The west, south and east perimeters of Ash Pond 2 are effectively incised. Failure of embankments along the west, south, and east perimeter of Ash Pond 2 were determined to not plausibly result in an uncontrolled release of the impoundment due to the toe of the slope for the downstream embankment being higher than the Ash Pond 2 surcharge water level. Failure of the northern embankment along Ash Pond 2 would result in discharge only to Pond 3 and would not result in an uncontrolled release from the impoundment. Further discussion of these considerations and the stability review are contained in AECOM's Reconstitution of the CCR Surface Impoundment Design Subsurface and Geotechnical Engineering Analysis dated April 2018.

Ash Pond 2 is effectively incised on three sides and has an earthen internal divider dike on its fourth. Therefore, Ash Pond 2 does not have abutments. Based on the results of previous soil borings, the subsurface profile beneath the CCR impoundment generally consists of granular fill soils at the surface underlain by native granular or cohesive soil deposits. The relative density of the granular fill soils was typically in the medium dense to extremely dense range. Slope stability analyses as determined by inspection exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation based on analyses performed for Pond 3. 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 this evaluation, stable foundations were designed and constructed at Ash Pond 2, and operational and maintenance procedures are appropriate to maintain the stable conditions. Therefore, Ash Pond 2 meets the requirements presented in §257.73(d)(1)(i).

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

CCR unit has been 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 Ash Pond 2. No evidence of significant areas of erosion or wave action was observed. The interior slopes are protected with vegetation, articulated concrete block, and/or riprap, and the exterior slopes are protected with vegetation. The articulated concrete block and/or riprap on the interior slopes protect the embankment soils from surface erosion or wave action. Operational and maintenance procedures to repair the vegetation, articulated concrete block, or riprap as needed are appropriate to protect against surface erosion or wave action. The presence of articulated concrete block and riprap below the water surface serves to protect the interior slopes from adverse effects of sudden drawdown. Therefore, Ash Pond 2 meets the requirements in §257.73(d)(1)(ii).

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

CCR unit has been 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 dikes over the range of expected loading conditions as defined within the section (§257.73).

Based on this evaluation, the relative density of the granular fill soils was typically in the medium dense to extremely dense range, which is indicative of mechanically compacted dikes. Therefore, the original design and construction of Ash Pond 2 included sufficient dike compaction. The operational and maintenance procedures at Ash Pond 2 are appropriate for maintaining compaction of the dikes, as evidenced by the conditions observed by AECOM. Therefore, Ash Pond 2 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 vegetated portions of the interior and exterior slopes is adequate, as no substantial bare or overgrown areas were observed. Articulated concrete block and/or riprap provide additional protection near and below the normal water level. Therefore, the original design and construction of Ash Pond 2 included adequate vegetation of the dikes and surrounding areas, with articulated concrete block and/or riprap constituting equivalence on portions of the interior slopes.

Operational and maintenance procedures are in place to regularly manage vegetation growth, including seeding any bare areas, as evidenced by the conditions observed by AECOM. As a result, these procedures are appropriate for maintaining vegetation. Therefore, Ash Pond 2 meets the requirements in §257.73(d)(1)(iv).

2.5 Spillways (§257.73(d)(1)(v)(A) and (B))

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.

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).

(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.*

Hydrologic and hydraulic analyses were completed to evaluate the storage capacity of Ash Pond 2 relative to inflow estimated for the 1,000-year flood event based on the significant hazard potential of Ash Pond 2.

Based on this evaluation, Ash Pond 2 is able to adequately manage the inflow during peak discharge conditions resulting from a 1,000-year flood event. Therefore, the spillway requirements in §257.73(d)(1)(v)(A) and (B) are not applicable to Ash Pond 2.

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

CCR unit has been 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.

The structural stability and integrity of the hydraulic structures were evaluated using design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM. A single 36-inch culvert passes through the northwestern exterior dike of Ash Pond 2 and drains storm water into Ash Pond 2 from a conveyance ditch on the west side of Ash Pond 2. The 36-inch culvert was observed to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris and appeared to be in good condition. Therefore, Ash Pond 2 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 Ash Pond 2 was evaluated by comparing the location of Ash Pond 2 relative to adjacent water bodies using published United States Geological Survey (USGS) topographic maps, water level readings for the Missouri River from USGS Gage 06340700, aerial imagery, recent site topographic data, and conditions observed in the field by AECOM.

Based on this evaluation, the water bodies adjacent to the downstream slopes of Ash Pond 2 include the Missouri River to the north, which is approximately 500 lateral feet beyond the downstream slopes of Ash Pond 2. The toe of the embankment for Ash Pond 2 in its northern portions is at elevation approximately 1678 feet (NGVD29). Since construction of the Garrison Dam upstream of Leland Olds Station and apparent operational changes made in late 1965, the highest gage reading for the Missouri River at the gage location is 1672.744 ft (NGVD29).

Therefore, inundation of the downstream slopes of Ash Pond 2 is not likely to occur. Additionally, the exterior dikes of Ash Pond 2 are not adjacent to the Missouri River, as the northern portion of Ash Pond 2 is a divider dike between Ash Pond 2 and Pond 3. Therefore, the northern dike of Pond 3 serves as the exterior dike for the nearest adjacent water body.

Based on this evaluation, the requirements listed in §257.73(d)(1)(vii) are not applicable to Ash Pond 2, as inundation of the downstream slopes is not expected to occur.

3. Certification Statement

CCR Unit: Basin Electric Power Cooperative; Leland Olds Station; Ash Pond 2

I, Aaron M Humphrey, being a Registered Professional Engineer in good standing in the State of North Dakota, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the Reconstitution of the CCR Surface Impoundment Design Subsurface and Geotechnical Engineering Analysis dated April 2018 was conducted in accordance with the requirements of 40 CFR §257.73.

Aaron Humphrey
Printed Name

April 13, 2018
Date



