

GREDELL Engineering Resources, Inc.

ENVIRONMENTAL ENGINEERING

LAND - AIR - WATER

Offices in Jefferson City, Kansas City Metro and Springfield, Missouri

August 30, 2019

Mr. Ryan Bennett
Associated Electric Cooperative, Inc.
Thomas Hill Energy Center – Power Division
5693 Highway F
Clifton Hill, Missouri 65244-9778

Re: Pond 001, Cell 2 Professional Engineering Annual Inspection of CCR Impoundment

Dear Mr. Bennett:

GREDELL Engineering Resources, Inc. (Gredell Engineering) conducted the annual inspection by a qualified professional engineer of Pond 001, Cell 2 at Associated Electric Cooperative's (AECI) Thomas Hill Energy Center (THEC), as required by 40 CFR 257.83 (b) to ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. This letter is the inspection report required by 40 CFR 257.83 (b) (2). Zachary Troesser, P.E., Geotechnical Engineer, with Gredell Engineering, conducted an inspection of Pond 001, Cell 2 (Cell 2) between August 23 and 30, 2019. The inspection consists of a review of available information, on-site observation of the facility, and preparation of this report.

REVIEW OF AVAILABLE INFORMATION

Per 40 CFR 257.83 (b) (1), this inspection included:

- (i) *A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (e.g., CCR unit design and construction information required by §§ 257.73(c)(1) and 257.74(c)(1), previous periodic structural stability assessments required under §§ 257.73(d) and 257.74(d), the results of inspections by a qualified person, and results of previous annual inspections).*

Gredell Engineering reviewed the following documents as part of this inspection:

- Pond 001, Cell 2 Professional Engineering Annual Inspection of CCR Impoundment dated August 30, 2018 by Gredell Engineering,
- Initial Periodic Structural Stability Assessment Pond 001 - Cell 002 dated 17 October 2016 by Haley & Aldrich of Cleveland, Ohio (Haley & Aldrich),
- Compliance Assistance for Clean Closure of Pond 001, Cell 2 West dated April 2018 by Gredell Engineering,
- Construction Modification Report for Ash Pond 001 Cell 2 East Basin dated October 2015 by Gredell Engineering,
- Construction Modification Report for Ash Pond 001 Cell 2 West Basin dated October 2015 by Gredell Engineering,
- Cell 2 - 2013/2014 Ash Pond 001 CCP Removal Project Construction Documents dated May 2013 by Gredell Engineering, and
- weekly inspection reports for 2018 and 2019 provided by AECI THEC.

ON-SITE OBSERVATIONS

Per 40 CFR 257.83 (b) (1), this inspection included:

- (ii) *A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit and appurtenant structures;*

There were no visually discernible signs of distress or malfunction of Cell 2 or its appurtenant structures at the time of this inspection.

- (iii) *A visual inspection of any hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation.*

Cell 2 was divided into two basins in 2015; the basins are referred to as the east basin and west basin. The reinforced concrete inlet structure in the east basin appeared to be intact, stable, and properly aligned. There were no signs of concrete spalling or cracking that would impair structural integrity, there was no visible exposed reinforcing steel, and the structure appeared to be in correct vertical alignment. The water elevation in the inactive east basin was about 1-inch above the inlet structure weir elevation and minor discharge was observed. The discharge end of the principal spillway pipe was submerged and could not be observed. Direct observation of the principal spillway discharge pipe will require confined space entry protocols and was not attempted during this inspection. The separation berm between the east and west basins acts as an emergency spillway with a crest elevation of 721 feet.

The primary discharge pipe for the west basin is a 15 inch corrugated metal pipe. The pipe is in excellent condition. The water elevation in the inactive west basin was approximately 7.5-feet below the invert of the primary outlet pipe and no discharge was observed. The separation berm between the east and west basins acts as an emergency spillway with a crest elevation of 721 feet.

Per 40 CFR 257.83 (b) (2), the following observations are noted:

- (i) *Any changes in geometry of the impounding structure since the previous annual inspection;*

The embankment crest and slopes were of uniform line and grade. There was no discernible sag of the crest, or bulging of the embankment face in the west basin. A minor slump was identified on the embankment face in the east basin. This condition was not identified during our prior annual inspection and vegetation was not established in the slump area, indicating the slump had formed recently. The downstream embankment was observed to be armored with a band of riprap near its toe and there were no discernible areas of distress.

- (ii) *The location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection;*

There is no instrumentation of Cell 2.

- (iii) *The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection;*

Gredell Engineering is not aware of any minimum and maximum water level and CCR records for Cell 2. Cell 2 was divided into an east and a west basin by construction of an earthen separation berm in October 2015. All CCR was removed from the east basin in 2015, and the east basin is now a stormwater management feature and does not receive CCR. The west basin was placed in inactive status in October 2015 and CCR has been substantially removed from the west basin. The water level in the east basin at the time of this inspection was approximately elevation 716.1 feet, NAVD 29. The water level in the west basin at the time of this inspection was approximately elevation 710.5 feet, NAVD 29.

- (iv) *The storage capacity of the impounding structure at the time of the inspection;*

The storage capacity of the east basin of Cell 2 is estimated to be 22 acre-feet at its principal spillway elevation, 716 feet. The storage capacity of the west basin of Cell 2 is estimated to be 45 acre-feet at its principal spillway elevation, 718 feet.

- (v) *The approximate volume of the impounded water and CCR at the time of the inspection;*

The impounded water volume in the east basin of Cell 2 at the time of this inspection is estimated at 22 acre-feet. The impounded water volume in the west basin of Cell 2 at the time of this inspection is estimated at 4 acre-feet.

- (vi) *Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures;*

There were no appearances of actual or potential structural weakness of the Cell 2 structures, nor any observed existing conditions disrupting or having the potential to disrupt the operation and safety of Cell 2 and its appurtenant structures.

- (vii) *Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.*

A minor slump on the face of the embankment was observed just above the water level. The slump presents a steep scarp and a relatively flat bench at the approximate water surface. The slumping may gradually increase in size and extend further into the embankment, ultimately reducing the embankment stability.

Per 40 CFR 257.83 (b) (5):

If a deficiency or release is identified during an inspection, the owner or operator must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

No visual evidence of a deficiency or release was identified during the course of this inspection.

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GENERAL COMMENTS and RECOMMENDATIONS

While the observed slump on the east basin embankment isn't considered an immediate threat to the embankment stability, we recommend repairing the slump and armoring the embankment along the waterline. We recommend armoring the dam embankment, beginning at the separation berm of the Cell 2 east and west basins and extending approximately 50 feet east of the outlet structure walkway, where the dam embankment slope softens to about 3:1. We recommend the armor consist of riprap. The toe of the armor should be a minimum of three feet below the observed water level, approximately 716 feet, and extend a minimum of three feet above the observed water level. Overall, the armored embankment should have a minimum 2:1 slope. Riprap may need to be placed deeper than three feet beneath the observed water surface to establish a minimum 2:1 armored embankment face.

Cell 2 currently has no instrumentation for determining water elevation. We recommend installing instrumentation to facilitate water elevation measurements during weekly, annual, and other inspections. The instrumentation may consist of installation of a staff gauge, placarding or inscribing the "top of box" elevation at the principal spillway discharge structure, or similar devices.

This concludes the 2019 annual inspection by a qualified professional engineer of Pond 001, Cell 2 at Associated Electric Cooperative's Thomas Hill Energy Center, as required by 40 CFR 257.83 (b). Gredell Engineering appreciates this opportunity to serve AECI THEC. If you have any questions or require additional information, please contact me at (573) 659-9078.

Sincerely,

Zachary Troesser, P.E.
Geotechnical Engineer



C: Thomas R. Gredell, P.E., President