GREDELL Engineering Resources, Inc.

ENVIRONMENTAL ENGINEERING LAND - AIR - WATER

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

August 30, 2018

Ms. Kim Dickerson
Associated Electric Cooperative, Inc.
Thomas Hill Energy Center – Power Division
5693 Highway F
Clifton Hill, Missouri 65244-9778

Re: Pond 001, Cell 4 Professional Engineering Annual Inspection of CCR Impoundment

Dear Ms. Dickerson:

GREDELL Engineering Resources, Inc. (Gredell Engineering) conducted the annual inspection by a qualified professional engineer of Pond 001, Cell 4 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., and Bruce Dawson, P.E., Principal Geotechnical Engineer with Gredell Engineering, conducted an inspection of Pond 001, Cell 4 (Cell 4) between August 15 and 30, 2018. 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 4 Professional Engineering Annual Inspection of CCR Impoundment dated August 31, 2017 by Gredell Engineering,
- Initial Periodic Structural Stability Assessment Pond 001 - Cell 004 dated 17 October 2016 by Haley & Aldrich of Cleveland, Ohio (Haley & Aldrich),
- Initial Safety Factor Assessment Pond 001 - Cell 004 dated 17 October 2016 by Haley & Aldrich,
- Inflow Design Flood Control System Plan Pond 001 - Cell 004 dated 16 October 2016 by Haley & Aldrich,
- Site Plan Drawing Y6, Revision 2 dated December 1, 1978 by Burns & McDonnell of Kansas City, Missouri, and
- weekly inspection reports for 2017 and 2018 provided by AECI THEC.

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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 4 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.*

The reinforced concrete principal spillway inlet structure of Cell 4 appeared to be intact, stable, and properly aligned. Direct observation of the principal spillway discharge pipe will require confined space entry protocols and was not attempted during this inspection. The discharge end of the spillway is a reinforced concrete headwall with a concrete armored flume immediately downstream. These structures displayed no signs of concrete spalling or cracking that would impair structural integrity, there was no visible exposed reinforcing steel, and the structures appeared to be in correct vertical and horizontal alignment. The emergency spillway crosses the berm and top-of-berm roadway just east of the principal spillway and was observed to be in good condition.

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, slumping, bulging or other geometric indications of adverse embankment or embankment foundation performance. These observations are consistent with our annual inspection report dated August, 31 2017.

(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 4.

(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 4. The water level in Cell 4 was approximately elevation 700.1 feet, NAVD 88. CCR was submerged and no indication of CCR depth could be determined.

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

Based on analysis of the original Cell 4 embankment construction drawings dated December 1978 by Burns & McDonnell of Kansas City, Missouri, the total impoundment volume of Cell 4 to the emergency spillway elevation of 703 feet is approximately 110 acre-feet.

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

Based on analysis of the original Cell 4 embankment construction drawings dated December 1978 by Burns & McDonnell of Kansas City, Missouri, the total impoundment volume of Cell 4 to elevation 700.1 feet is approximately 79 acre-feet. CCR was submerged and no indication of CCR volume could be determined. Based on sedimentation rates observed at immediately upstream Cell 3, CCR volume in Cell 4 is expected to be minimal.

(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 4 structures, nor any observed existing conditions disrupting or having the potential to disrupt the operation and safety of Cell 4 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.*

None observed.

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.

GENERAL COMMENTS and RECOMMENDATIONS

AECI THEC routinely notes seepage along the south approximate 1/3 of the east embankment, and along the east approximate 1/4 of the south embankment in the weekly inspection reports. Some standing water was observed along the south approximate 1/3 of the east embankment during this inspection. The water was shallow, clear, and appeared static, and there was no evidence of erosion or soil piping. Weekly monitoring should continue to evaluate seepage conditions in this area.

A minor crack was observed in the concrete armored flume immediately downstream of the reinforced concrete discharge structure. The crack was located on the north side slope of the flume, parallel to the flow, and about one foot above the water surface at the time of our observations. At the time of our

observations the crack did not compromise the effectiveness of the channel armor. The concrete flume should be monitored during weekly inspections.

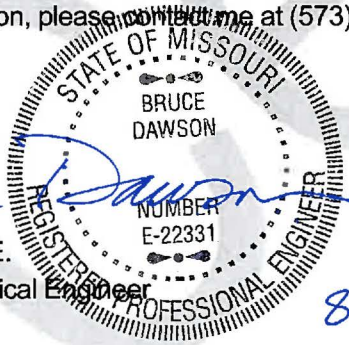
The downstream face of the embankment steepens in the vicinity of the southeast corner of Cell 4. Mowing in this area is typically performed using a boom-mounted mowing attachment. While there's currently no evidence to suggest the embankment should be flattened for safety or stability reasons, flattening the embankment in this area could facilitate more convenient mowing. It is noted that the available area to flatten the slope beyond the toe of the embankment at this location is limited by the proximity of the adjacent haul road. Detailed study would be required to evaluate the practicality of flattening the slopes by extending the toe of the embankment.

Trees and brush within about 15 feet (or more) of the south toe of the embankment had been cleared since the last annual inspection and native plants have established ground cover in the cleared area. A small seepage area was observed about 250 feet north of the discharge structure and just below the toe of the southwest embankment in this cleared area, but there was no evidence of erosion or soil piping. We recommend monitoring the seepage area and the adjacent embankment during routine weekly inspections.

Cell 4 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 a staff gauge, placarding or inscribing the "top of box" elevation at the principal spillway discharge structure, or similar devices.

This concludes the 2018 annual inspection by a qualified professional engineer of Pond 001, Cell 4 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,



Bruce Dawson, P.E.
Principal Geotechnical Engineer

8/30/18

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