

GREDELL Engineering Resources, Inc.

ENVIRONMENTAL ENGINEERING

LAND - AIR - WATER

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

August 3, 2022

Ms. Sarah White
Associated Electric Cooperative, Inc.
PO Box 754
Springfield MO 65801

RE: Pond 001, Cell 4 Professional Engineering Annual Inspection of CCR Impoundment
AECI PO No. TH-103736

Dear Ms. White:

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 engineering standards. Bruce Dawson, P.E., Gredell Engineering, accompanied by Ben Gutz, AECI, conducted an on-site inspection of Pond 001, Cell 4 (Cell 4) July 18, 2022. The following is the inspection report required by 40 CFR 257.83 (b) (2).

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:

- Weekly inspection reports for 2021 and 2022 provided by AECI THEC,
- Report on Periodic Structural Stability Assessment, Pond 001 – Cell 004, Thomas Hill Energy Center, Clifton Hill, Missouri by Haley & Aldrich, Inc., Cleveland, Ohio, dated 15 October 2021, reference File No. 128064-022, and
- Pond 001, Cell 4 Professional Engineering Annual Inspection of CCR Impoundment, dated August 28, 2020 by Gredell Engineering,

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 visible signs of distress or malfunction of Cell 4 or its appurtenant structures at the time of this inspection. The embankment and surrounding areas were closely mowed, which provided good conditions for visual inspection.

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- (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. The inlet was receiving discharge at the time of these observations and this discharge volume obscured observation of the upstream, inlet end of the principal spillway pipe. Direct observation of the principal spillway discharge pipe will require remote controlled inline camera inspection or confined space entry protocols and was not attempted during this inspection. The discharge end of the principal spillway pipe terminates at a reinforced concrete headwall and flow continues through a reinforced concrete flume with parallel sidewalls that extends immediately downstream. A small area on the natural bank just outside the north sidewall of this flume has been armored with grout, and the grout has a crack running parallel to the channel. The crack is well above normal flow elevations in the flume and has not exhibited any discernible movement or deterioration for at least five years. 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 functional vertical and horizontal alignment. The emergency spillway crosses the berm and top-of-berm roadway just east of the principal spillway, is armored with 8 to 12-inch rip rap on the upstream and downstream slopes and approximately 1-inch clean crushed limestone across the embankment crest, 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;*

There were no obvious visible changes to the impounding structure since Gredell Engineering's prior annual inspection in 2020. 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.

- (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 700.0 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.

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- (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 700.0 feet is approximately 77 acre-feet. CCR was submerged and no indication of CCR volume could be determined. Based on sedimentation rates that have occurred at Cell 3 immediately upstream, 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.*

At the time of this inspection, there were no discernible changes which have affected the stability or operation of the Cell 4 embankments.

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 this inspection.

GENERAL COMMENTS and RECOMMENDATIONS

Previous annual inspections have noted seepage in the open channel along the south side of Cell 4. This open channel has been cleared of cattails and other vegetation, regraded, and lined with a fabric formed liner system. There were limited occurrences of standing water in the lined open channel, and no apparent standing water immediately adjacent to the channel. An apparent seepage area at the toe of the westerly embankment has been cited in most previous annual inspection reports. This inspection noted limited apparent seepage pooling in this area as well. The pooled areas were very small; the pooled 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 these areas.

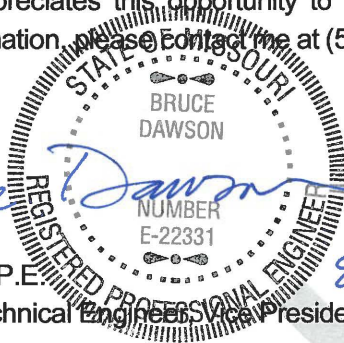
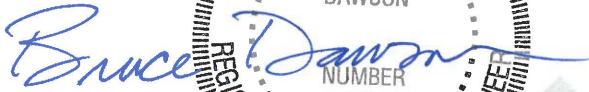
A small area on the natural bank just outside the north sidewall of this flume has been armored with grout, and the grout has a crack running parallel to the channel. The crack is well above normal flow elevations in the flume and has not exhibited any discernible movement or deterioration for at least five years. However, we recommend continuing to monitor the grout during weekly inspections.

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The downstream face of the embankment steepens in the vicinity of the southwest corner of Cell 4. We understand mowing in this area has typically been 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 lined open channel and haul road beyond to the south. Detailed study would be required to evaluate the practicality of flattening the slopes by extending the toe of the embankment.

This concludes the 2022 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, Vice President

C: Thomas R. Gredell, P.E., President
Mikel C. Carlson, R.G., Principal Geologist, Vice President
Ben Gutz, AECI