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Coal Combustion Residuals Unit Structural Stability Assessment

Richmond Power & Light
Whitewater Valley Station
Surface Impoundment
Wayne County, Indiana

GAI Project Number: C151119.07

April 2018

RICHMOND POWER & LIGHT

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Certification/Statement of Professional Opinion

This Structural Stability Assessment (Assessment) for the Whitewater Valley Power Station (Station) Surface Impoundment was prepared by GAI Consultants, Inc. (GAI). The Assessment may contain findings and determinations that are based on certain information that, other than for information GAI originally prepared, GAI has relied on but not independently verified. This Certification/Statement of Professional Opinion is therefore limited to the information available to GAI at the time the Assessment was written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the State of Indiana that the Assessment has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances, at the same time, and in the same locale. It is my professional opinion that the Assessment was prepared consistent with the requirements of § 257.73(d) of the United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," published in the Federal Register on April 17, 2015 with an effective date of October 19, 2015 (40 CFR 257 Subpart D), and meeting the provisions of the "Extension of Compliance Deadlines for Certain Inactive Surface Impoundments: Response to Partial Vacatur," effective October 4, 2016.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not be interpreted or construed as a guarantee, warranty or legal opinion.

GAI Consultants, Inc.

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Charles F. Straley, P.E.
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Date Apr 17, 2018

Acronyms

Assessment	Coal Combustion Residuals Structural Stability Assessment
CCR	Coal Combustion Residuals
CCR Rule	"Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments" 40 CFR 257 Subpart D (2015)
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
GAI	GAI Consultants, Inc.
IDFCSP	Inflow Design Flood Control System Plan
IN	Indiana
Impoundment	Surface Impoundment
RP&L	Richmond Power & Light
Station	Whitewater Valley Station
SWM	Stormwater Management

1.0 Introduction

The Whitewater Valley Power Station (Station) is owned by Richmond Power & Light (RP&L) and is located in Richmond, Indiana (IN). The station includes a Surface Impoundment (Impoundment), which is used for the long term storage of coal combustion residuals (CCR).

The Impoundment is located on RP&L property at the Whitewater Valley Power Station in Wayne County, Indiana (coordinates 39° 48' 12.9" North and 84° 53' 54.8" West). The Impoundment is located in the northwestern corner of the property.

The Impoundment is currently inactive and is regulated as an existing CCR surface impoundment under the United States Environmental Protection Agency's (EPA's) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments" [40 CFR 257 Subpart D] published in the Federal Register on April 17, 2015 with an effective date of October 19, 2015 (CCR Rule), and meeting the provisions of the "Extension of Compliance Deadlines for Certain Inactive Surface Impoundments: Response to Partial Vacatur," effective October 4, 2016.

2.0 Purpose

This Structural Stability Assessment (Assessment) is prepared pursuant to § 257.73(d) of the CCR Rule [40 CFR § 257.73(d)].

3.0 Structural Stability Assessment Requirements

In accordance with § 257.73(d)(1), a CCR surface impoundment owner or operator is required to conduct initial and periodic structural stability assessments to establish whether the CCR unit can safely store 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:

- Stable foundations and abutments;
- Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;
- [Embankments] mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;
- Vegetated slopes of [embankments] and surrounding areas not to exceed a height of six inches above the slope of the [embankment], except for slopes which have an alternate form or forms of slope protection;
- A single spillway or a combination of spillways designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the 1,000-year flood for a significant hazard potential CCR surface impoundment.
- Hydraulic structures underlying the base of the CCR unit or passing through the [embankment] 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; and
- 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.

4.0 Structural Stability Assessment

This Assessment is based on a review of material as noted, and on any additional analyses performed for this Assessment.

4.1 Stable Foundations and Abutments

The material underlying the Impoundment, comprising the embankment foundation, is discussed in the *History of Construction* (GAI Consultants, 2018b). The current configuration of the Impoundment is that it is filled with CCR material and generally graded to drain and not impound water. Thus, pooling of water within the Impoundment will be temporary. The critical sections for the stability analyses are located along the west embankment of the Impoundment due to their height and slope steepness. Under the maximum pool from the 1,000-year design storm event (GAI Consultants, 2018c), the critical sections are not adjacent to ponded water, and do not overtop.

Since pooling within the Impoundment will be temporary, and the topographic configuration of the Impoundment precludes pooling near the critical section, the calculated static factors of safety for the long-term, maximum storage pool loading condition and maximum surcharge pool loading condition are equivalent to that under existing conditions. GAI's analyses of the embankment stability (GAI Consultants, 2018a) show the calculated static factor of safety under existing conditions is greater than the minimum of 1.50 and 1.40, respectively, required by the CCR Rule.

The calculated factor of safety against sliding under a seismic event exceeded the minimum of 1.00 stated in the CCR Rule (GAI Consultants, 2018a).

The Impoundment embankments are generally composed of sandy lean clay. In order for liquefaction to occur, the embankment material would need to be saturated. The long term groundwater level is located below the base of the embankment; therefore, the embankment material should not be subject to liquefaction. In addition, GAI performed a liquefaction analysis to determine if the soils in the embankment are susceptible to liquefaction. The calculated liquefaction safety factors exceeded the minimum of 1.20 stated in the CCR Rule.

A visual inspection of the Impoundment was performed on April 11, 2017 as part of the annual inspection. During the inspection, GAI personnel did not identify any signs of distress in the abutment areas, where the embankment material interfaces with existing ground.

4.2 Slope Protection

The external and internal embankment slopes of the Impoundment are vegetated to protect against erosion. A visual inspection of the Impoundment was performed on April 11, 2017 as part of the annual inspection. During the inspection, GAI personnel did not identify any signs of distress in the embankments. Subsequent site visits have observed similar conditions.

4.3 Embankment Compaction

Per the CCR rule, "EPA recognizes that it would be highly difficult for owners or operators of older units to certify with any certainty that the unit's construction meets the specific numeric compaction criteria found in the ASTM standards." The subsurface exploration program (GAI Consultants, August 2016) completed through the embankment materials indicated that the density of embankment soils generally increased with depth. Correlations of Standard Penetration Test resistance obtained during drilling to density of in-place material indicate that the estimated relative density of the embankment ranges from 75 percent near the crest of the embankment to 100 percent at increasing depths. From this observation and the results of the stability analyses (GAI Consultants, 2018a), it is our opinion that the embankment is stable.

4.4 Vegetated Slopes

On April 11, 2017, GAI performed a visual inspection of Whitewater Valley Surface Impoundment. As part of this inspection, GAI evaluated the vegetation on the slopes of the Impoundment embankment. GAI recommended trees be removed and vegetation be trimmed; this has subsequently been completed. The vegetated slopes currently allows for visual observation of the Impoundment and embankments.

4.5 Spillway Capacity and Underlying Hydraulic Structures

The Impoundment is divided into two areas: the main body of the Impoundment, and a Stormwater Management (SWM) pond adjacent to and considered part of the Impoundment. The SWM pond is separated from the Impoundment by an internal embankment. Flow through and from the Impoundment is controlled within each of these areas.

Gravel drains within the internal embankment convey water from the Impoundment to the SWM Pond while high flows will overflow the embankment into the SWM Pond. A spillway conveys runoff from the SWM Pond to Station Pond P4. All spillways and conveyances appeared in good condition during the Annual Inspection.

The Inflow Design Flood Control System Plan (IDFCSP) (GAI Consultants, 2018c) contains routing calculations as part of a hydraulic capacity assessment, and demonstrates that the gravel drains and spillways adequately manage the peak discharge from the 1,000-year flood.

It is GAI's opinion that the spillway and conveyance system in the Impoundment are stable.

4.6 Adjacent Water Bodies

There are no adjacent water bodies to the Impoundment which would subject the Impoundment embankment to inundation.

5.0 Corrective Measures

Based on a review of available material and the analyses performed for this Assessment, at this time no deficiencies were detected in the structural stability analysis of the Impoundment and no corrective measures are required.

6.0 Conclusion

It is GAI's opinion, based on a review of available material and analyses performed for this Assessment, that the Impoundment's design, construction, and operations and maintenance procedures are consistent with good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded and meet the requirements of 40 CFR 257.73(d).

7.0 References

GAI Consultants. 2018a. *Factor of Safety Assessment*. April 2018.

GAI Consultants. *Geotechnical Summary Report*. August 2016.

GAI Consultants. *Groundwater Characterization Report.* June 2016, Revised September 2016.

GAI Consultants. 2018b. *History of Construction*. April 2018.

GAI Consultants. 2018c. *Inflow Design Flood Control System Plan*. April 2018.