INITIAL STRUCTURAL STABILITY ASSESSMENT

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# INITIAL STRUCTURAL STABILITY ASSESSMENT

## Chesapeake Energy Center CCR Surface Impoundment: Bottom Ash Pond

Dominion Energy℠

**Submitted To:** Chesapeake Energy Center
2701 Vepco Street
Chesapeake, VA 23323

**Submitted By:** Golder Associates Inc.
2108 W. Laburnum Avenue, Suite 200
Richmond, VA 23227

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**Project No. 13-00193**

Golder Associates

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## Tables

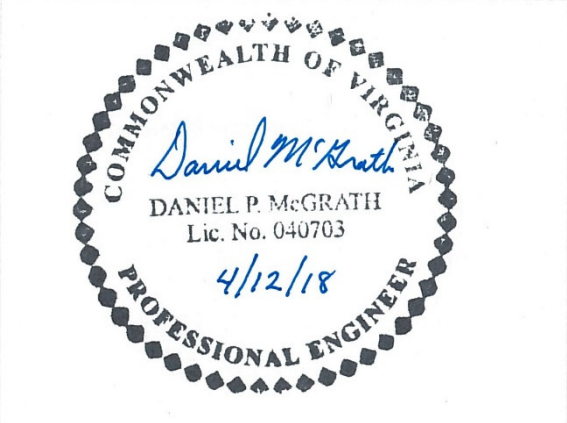
## 1.0 CERTIFICATION

This Initial Structural Stability Assessment for the Chesapeake Energy Center's Bottom Ash Pond was prepared by Golder Associates Inc. (Golder). The document and Certification/Statement of Professional Opinion are based on and limited to information that Golder has relied on from Dominion Energy and others, but not independently verified, as well as work products produced by Golder.

On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Virginia that this document 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 document was prepared consistent with the requirements in §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 §257.73), as well as with the requirements in §257.100 resulting from the EPA's "Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Extension of Compliance Deadlines for Certain Inactive Surface Impoundments; Response to Partial Vacatur" published in the Federal Register on August 5, 2016 with an effective date of October 4, 2016 (40 CFR §257.100).

The use of the word "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.

| Daniel McGrath | Associate and Senior Consultant |
|---|---|
| Print Name | Title |
| Daniel McGrath | 4/12/18 |
| Signature | Date |



# 2.0 INTRODUCTION

This Initial Structural Stability Assessment was prepared for the Chesapeake Energy Center's (CEC) existing Coal Combustion Residuals (CCR) inactive surface impoundment known as the Bottom Ash Pond (BAP). This Initial Structural Stability Assessment was prepared in accordance with 40 CFR Part §257, Subpart D and is consistent with the requirements of 40 CFR §257.73(d) and 40 CFR §257.100(e)(3)(v).

The CEC, owned and operated by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion), is located in the City of Chesapeake, Virginia, at 2701 Vepco Street. The CEC includes an existing, inactive CCR surface impoundment, the BAP, as defined by the Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule and Direct Final Rule (40 CFR §257; the CCR rule).

# 3.0 STRUCTURAL STABILITY

## 3.1 Foundation and Abutments

The BAP lies in a geologically stable area with no active (Holocene) faults, karst (limestone, dolomite, or marble) potential, or other geologic conditions of concern. The BAP embankments were originally constructed as part of a larger sluiced ash impoundment in the early 1950's. Prior to site improvements, the site was low-lying tidal back swamp or marsh area subject to regular tidal influences. Subsurface site investigations by Golder and others show the site is underlain by recent coarse-grained and fine-grained alluvium deposits of silty sand ranging from approximately 8 to 16 feet thick [to approximate elevation -7 feet above mean sea level (ft-msl)]. Under the alluvium layers is generally considered the Norfolk formation of coarse-grained and fine-grained clayey sands, which extend to depths greater than elevation -30 feet.

Material properties of the embankment soils and underlying strata are presented in Table 1 below.

**Table 1: Summary of Geotechnical Strength Properties**

| Material | Total Unit Weight (pound per cubic foot, pcf) | Strength Properties | | |
|---|---|---|---|---|
| | | Peak φ' (°) | Cohesion (pound per square foot, psf) | Su (psf) |
| Dike Fill Soils- BAP | 125 | 26 | 100 | 1,500 |
| Ponded Fill | 100 | 28 | 0 | 700 |
| Fine-grained Alluvium | 115 | N/A | N/A | 500 |
| Upper Sand | 120 | 32 | 0 | N/A |
| Layered Clayey Sand | 120 | 28 | 100 | 0 |
| Silty Sand | 120 | 30 | 0 | N/A |
| Lower Sand | 120 | 34 | 0 | N/A |
| Lower Silty Sand | 120 | 34 | 0 | N/A |

## 3.2 Slope Protection

The BAP dike was built with interior slopes of 2 horizontal to 1 vertical (2H:1V) and 6H:1V, and the exterior slopes vary from 2H:1V to 2.5V:1V. The interior and exterior slopes are maintained and protected against

surface erosion by regular inspections and maintenance, as required, to prevent small erosion areas from developing into larger problem areas. The exterior slope has a good stand of existing vegetation that is mowed at least once per year to preclude the development of woody vegetation.

Protection from interior wave action is not required, as the pond normally does not contain a permanent pool of water. On the exterior, the embankment is bordered on the east by the Southern Branch of the Elizabeth River and on the south by wetland areas. The primary source of wave action in the river is from passing ship traffic, as the fetch length for wind-driven waves is relatively short. The river-facing embankment is adequately protected from wave action by a combination of stone riprap, sheet pile walls, and well-established vegetation.

The impacts of rapid drawdown of slopes facing the Elizabeth River as described in the §257.73(d)(vii) of the CCR Rule were considered. The mapped (FIRM Zone AE) 100-year flood level in the Elizabeth River is elevation 8 ft-msl, indicating a maximum rise of 1.6 meters (5.4 feet) above mean water levels. Thus, the dikes of the BAP are not expected to undergo rapid drawdown in excess of 5.4 feet. Impacts of such a drawdown event have been mitigated by armoring the toe of the dike slopes along the Elizabeth River. Therefore, additional rapid drawdown analyses are not necessary.

## 3.3 Compaction of Dikes

In addition to a review of previous exploration work by others, Golder completed two rounds of Cone Penetrometer Testing (CPT) during 2016 and 2017 geotechnical exploration programs. A total of 14 soundings were made through and near the BAP dikes to assess the material strength in the dike and below. Soundings were made to depths up to 100 feet below ground surface (bgs). The dike fill soil contains variations of fine-grained and coarse-grained soils and exhibit sufficient compaction and density to withstand the anticipated range of loading conditions. Additional information and CPT sounding logs are included in Attachment 1 – Material Properties Package of the April 2018 Safety Factor Assessment for the BAP.

## 3.4 Spillways

The BAP receives stormwater runoff from the adjacent landfill, where it enters the northeast corner of the pond. The principal spillway is a 30-inch diameter corrugated high density polyethylene (CHDPE) culvert pipe located in the western embankment. The CHDPE pipe has an invert elevation of 15.15 feet, and an outlet elevation of 14.15 feet. There are no flow or inlet control devices on this pipe. As shown in the April 2018 Inflow Design Flood Control System Plan for the BAP, the culvert has adequate capacity to pass the flow from the 1,000-year storm event as required for a “Significant” hazard classification rating. The analysis of the spillway capacity is included in the April 2018 Inflow Design Flood Control System Plan for the BAP.

## 3.5 Hydraulic Structures

The principal spillway passes through the western dike of the BAP into the adjacent sediment basin, and there are no other known structures passing through or underlying the base of the BAP. In accordance with 40 CFR §257.83, the pipe is monitored and inspected periodically for clogging, leaks, erosion around the pipe, movements, or other issues.

# 4.0 CONCLUSIONS

It is Golder's opinion, based upon a review of available information and the additional analyses performed for this and other assessments, that the BAP surface impoundment design, construction, operations, and maintenance procedures are consistent with good engineering practices for the volume of CCR and CCR wastewater that is impounded, and meets the requirements of 40 CFR 257.73(d).

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| Africa | + 27 11 254 4800 |
| Asia | + 852 2562 3658 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 56 2 2616 2000 |

solutions@golder.com
www.golder.com

**Golder Associates Inc.**
**2108 W. Laburnum Avenue, Suite 200**
**Richmond, VA 23227 USA**
**Tel: (804) 358-7900**
**Fax: (804) 358-2900**


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