



# INITIAL STRUCTURAL STABILITY ASSESSMENT

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## INITIAL STRUCTURAL STABILITY ASSESSMENT

Possum Point Power Station CCR Surface Impoundment: Pond E



**Submitted To:** Possum Point Power Station  
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## 1.0 CERTIFICATION

This Structural Stability Assessment for the Possum Point Power Station's Pond E 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).

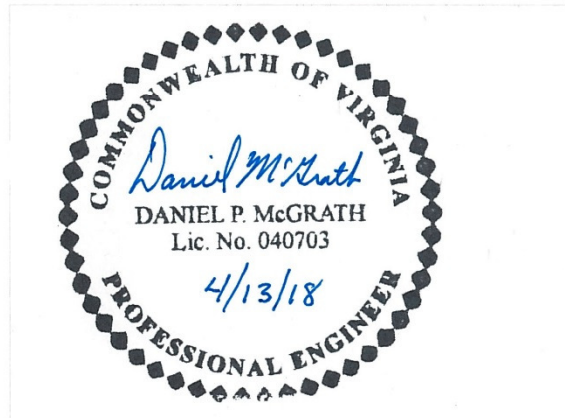
The use of the word "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion, and is not and shall not be interpreted or construed as a guarantee, warranty, or legal opinion.

Daniel McGrath  
Print Name

Associate and Senior Consultant  
Title

*Daniel McGrath*  
Signature

4/13/18  
Date



## 2.0 INTRODUCTION

This Initial Structural Stability Assessment was prepared for the Possum Point Power Station's (Station) Coal Combustion Residuals (CCR) inactive surface impoundment Pond E. 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 Station, owned and operated by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion), is located in Prince William County, Virginia, at 19000 Possum Point Road. The Station includes an inactive CCR surface impoundment, Pond E, 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 Station lies in a geologically stable area with no active (Holocene) faults, karst (limestone, dolomite, or marble) potential, or other geologic conditions of concern. The Pond was constructed as an embankment across a drainage feature in the rising natural hillside. The natural soils in the hillside area are typical alluvial Coastal Plain soils consisting of sandy loams developed from feldspathic sediments in the Coastal Plain terraces and stratified marine sediments. The predominant soil groups are the Dumfries series and Quantico series, which are well-draining. Prior to site improvements, parts of the site were marshy areas as indicated on historical maps from the United States Geological Service (USGS). Construction drawings for the embankments call for the removal of soft soils under the planned embankments and replacement with suitable soil materials.

Subsurface site investigations by Golder and others show the site is underlain by typical alluvial fine-grained and coarse-grained Coastal Plain soils, which is consistent with the site's proximity to Quantico Creek and the Potomac River. Material properties for the various strata were interpreted based on subsurface data and site reconnaissance taken from previous Dominion investigations, analyses, and reports included in Dominion's 1985 "Ash Pond 'E' Boring Logs and Laboratory Test Data" performed by the Law Engineering Testing Company, and are presented in Table 1 below. Additional information on the geotechnical exploration and sources of material properties is presented in the report titled Safety Factor Assessment – Pond E (Golder 2018).

**Table 1: Selected Material Properties for Pond E Embankment Analysis**

Material	Drained Strength		Undrained Strength		Unit Weight (pcf)
	$\phi'$ (degrees)	$c'$ (psf)	$\phi$ (degrees)	$c$ (psf)	
Dike Fill	29	100	14	290	120
Fine Grained / Organic Alluvium	24	0	12.4	400	100
Coarse Grained Alluvium	30	0	N/A	N/A	120
Fine Grained Terrace Deposits	28	75	12.4	400	120
Coarse Grained Terrace Deposits	34	0	N/A	N/A	125
Cretaceous Sediments	40	0	0	3000	130

### 3.2 Embankment Stability Analysis

Golder’s 2018 assessment of the Pond E embankment stability (Safety Factor Assessment – Pond E) indicates the computed factors of safety (FS) for two areas of the embankment (sections B-B’ and E-E’) are less than the required FS in Sections § 257.73(e)(i) and (ii) of the EPA Rule:

**Table 2. Slope Stability Assessment Results**

Analysis Case	Normal Storage Pool	Max. Surcharge Pool
Rule Section	§ 257.73(e)(i)	§ 257.73(e)(ii)
Target Factor of Safety	1.5	1.4
Cross-Sections	Factor of Safety	
A-A’	1.8	1.8
<b>B-B’</b>	<b>1.3</b>	<b>1.2</b>
C-C’	1.5	1.5
D-D’	1.6	1.6
<b>E-E’</b>	<b>1.3</b>	<b>1.3</b>

Corrective measures for the Pond E embankment stability are already in place, and include the following actions:

- Prohibition of vehicle traffic on the embankment crest;
- Removal by pumping of stormwater as needed to prevent accumulation of water against the embankment;
- Weekly inspections by qualified personnel and annual professional engineer inspections; and,
- Plans for embankment height reduction and embankment opening during pond closure.

### 3.3 Slope Protection

The Pond E dike was built with exterior slopes of 2 horizontal to 1 vertical (2H:1V) and interior slopes of 1.5H:1V. The exterior slope has a good stand of existing, well-maintained grass to protect from erosion.

Interior slopes have been excavated to remove CCR materials and were backfilled with clean soil fill to reestablish a minimum 2:1 slope and enhance the existing calculated factor of safety prior to final closure.

Protection from interior wave action is not required, as the pond does not contain a permanent pool of water. On the exterior, the embankment does not meet the high water level of Quantico Creek, nor is it within the mapped 100-year flood elevation, so no provisions for wave action or flooding are required.

Golder also considered the impacts of rapid drawdown of slopes as described in § 257.73(d)(vii) of the USEPA CCR Rule. The mapped (FIRM zone AE) 100-year flood level in the Quantico Creek is elevation 8 ft-msl. The toe areas of the downstream slopes are generally at elevation 6 ft-msl or higher; thus the dikes around Pond E are not expected to be significantly impacted by rapid drawdown. Therefore, additional rapid drawdown analyses are not necessary.

### **3.4 Compaction of Dikes**

In addition to a review of previous exploration work by others, Golder completed one round of Cone Penetrometer Testing (CPT) in late 2017. A total of 7 soundings were made through and near the Pond E dike to assess the material strength in the dike and below. Soundings were made to depths up to 101 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. Borrow source information is limited, but the original design drawings show a borrow area within the planned footprint of the pond, suggesting that at least some of the embankment material was excavated from onsite soils. Additional information and CPT sounding logs are included in Attachment 1 – Material Properties Package of the April 2018 Safety Factor Assessment for Pond E.

### **3.5 Spillways**

Pond E receives stormwater runoff from the adjacent upland areas and from rainfall directly into the pond. The primary outlet structure is a 6-ft by 6-ft square riser, fitted with stoplogs, that discharges through a 72-inch corrugated metal pipe (CMP) into an unnamed tributary of Quantico Creek. There currently is no auxiliary spillway. There are no flow or inlet control devices on this pipe. As shown in the April 2018 Inflow Design Flood Control System Plan for Pond E, 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 Pond E.

### **3.6 Hydraulic Structures**

The principal spillway passes through the western dike of the pond, discharging into Quantico Creek, and there are no other known structures passing through or underlying the base of the pond. 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 Pond E surface impoundment design, construction, operations, and maintenance procedures are consistent with good engineering practices and meets the requirements of 40 CFR 257.73(d) except as noted in Section 3.2.

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