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Coal Combustion Residuals Inflow Design Flood Control System Plan

Virginia Electric and Power Company
Possum Point Power Station
Surface Impoundment D
Dumfries, Virginia

GAI Project Number: C150132.00

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Certification/Statement of Professional Opinion

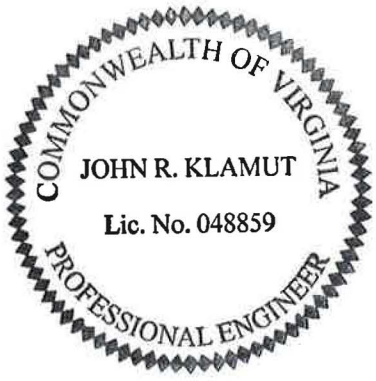
The Factor of Safety Assessment (Assessment) for the Possum Point Power Station Surface Impoundment D was prepared by GAI Consultants, Inc. (GAI). The Assessment was based on certain information that, other than for information GAI originally prepared, GAI has relied on but not independently verified. 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 Commonwealth of Virginia 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 section 257.73 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 Code of Federal Regulations (CFR) Subpart D).

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.

John R. Klamut, P.E.
Engineering Manager

Date: 10/13/2016



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Acronyms

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
Dominion	Virginia Electric and Power Company d/b/a Dominion
EPA	United States Environmental Protection Agency
GAI	GAI Consultants, Inc.
H&H	Hydrologic and Hydraulic
IDFCS	Inflow Design Flood Control System
Plan	CCR Unit Inflow Design Flood Control System Plan
PMF	Probable Maximum Flood
Station	Dominion Possum Point Power Station
VDEQ	Virginia Department of Environmental Quality
VPDES	Virginia Pollutant Discharge Elimination System
VPDES Permit	Virginia Pollutant Discharge Elimination System Permit No. VA0002071

1.0 Introduction

The Possum Point Power Station (Station) is owned by Virginia Electric and Power Company d/b/a Dominion Virginia Power (Dominion) and is located in Prince William County, Virginia. The Station includes the Surface Impoundment D, which is used for the long term storage of coal combustion residuals (CCR).

Surface Impoundment D is located on Dominion property at the Possum Point Power Station in Prince William County, Virginia (coordinates 38° 32' 05" North and 77° 16' 57" West).

Surface Impoundment D is regulated as an existing CCR surface impoundment under the Environmental Protection Agency'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). Surface Impoundment D is also regulated as a dam by the Virginia Department of Conservation and Recreation (DCR) and has an approved Operation and Maintenance Certificate with Inventory Number 15320.

2.0 Purpose

This Plan is prepared pursuant to the requirements in 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 (CCR Rule), § 257.82(c) [40 CFR § 257.82(c)].

3.0 Initial Inflow Design Flood Control System Plan

In accordance with § 257.73(a)(2), an initial Hazard Potential Classification was prepared for Surface Impoundment D under current conditions. Surface Impoundment D was determined to be a "significant hazard potential" CCR Impoundment (GAI, 2016b). As required by § 257.82(a)(3), the inflow design flood for a "significant" hazard potential CCR surface impoundment is the 1,000-year flood.

As required by § 257.82(c)(1), this Plan includes:

- Documentation of how the inflow design flood control system (IDFCS) has been designed, constructed, operated, and maintained to adequately manage flow into the Surface Impoundment D during and following the peak discharge of the inflow design flood [§257.82(a)(1)];
- Documentation of how the IDFCS has been designed, constructed, operated, and maintained to adequately manage flow from the Surface Impoundment D so as to collect and control the peak discharge resulting from the inflow design flood [§257.82(a)(2)]; and
- Documentation of how the IDFCS has been designed, constructed, operated, and maintained to adequately address the requirements of § 257.3-3 [§257.82(b)]

3.1 Site Configuration

Surface Impoundment D consists of an earthen embankment and stored CCR contained within the impoundment area. The embankment is approximately 1,700 feet long and 112 feet high. The crest elevation is 150 feet above mean sea level (MSL) and the toe is 36 feet above MSL (GAI, 2016c). The upstream embankment slopes are approximately 2.5H (horizontal) to 1V (vertical) (2.5H:1V) and the downstream embankment slopes are approximately 2.7H:1V with a stormwater control bench constructed approximately halfway down the downstream slopes (O'Brien & Gere, 2010).

The principal spillway includes a reinforced concrete riser located near the west abutment which discharges through a 30-inch-diameter, 320-foot-long pipe that runs below the embankment and into a concrete stilling basin located near the toe to the west. The flow then discharges via a 580-foot-long

concrete lined channel into Surface Impoundment E, which is located west of Surface Impoundment D (GAI, 2016c). Currently, water from Surface Impoundment D is being routed through a dewatering water treatment system prior to discharge to Outfall 503 and not through Surface ImpoundmentE.

The emergency spillway has a crest elevation of 144 ft. MSL and is located at the northwest corner of the site. Water discharging from the emergency spillway flows into a natural channel to the west and eventually outfalls into Quantico Creek (Golder, 2012). The drainage area for Surface Impoundment D is approximately 115 acres which includes the impoundment area (GAI, 2016a).

3.2 Flow Into Surface Impoundment D

As required by § 257.82(a)(1), a control system must be in place for Surface Impoundment D that is designed, constructed, operated, and maintained to flow into the impoundment for the Inflow Design Flood (1,000-year flood). Per the 1986 Design Report illustrated in Attachment A, Surface Impoundment D was designed pursuant to Regulation No. 9, Section 4.01(b) of the State Water Control Board of Virginia. This regulation required impounding structures over 100 feet in height to safely pass the appropriate spillway design flood. In this case, the Probable Maximum Flood (PMF) was used as the spillway design flood (Virginia Power, 1986a). The design PMF used in the original design was 28.2-inches of precipitation with a duration of 48 hours. The precipitation data defining the current 1000-year flood event is 15.2-inches of precipitation with a duration of 48-hours. Thus, utilizing the original design PMF in lieu of the 1,000-year flood, for the purposes of this Plan, provides a more conservative approach to demonstrating adequacy set forth by § 257.82.

As illustrated by Table 1 below, given the current operating water elevation of 106-feet (GAI, 2016c) the existing storage volume of Surface Impoundment D can adequately contain the PMF within the limits of the impoundment.

The PMF was calculated to have a volume of 310 Acre-Feet (Virginia Power, 1986a).

Table 1. -
Summary of Adequate Storage Volume Demonstration. -

Elevation (MSL)	Surface Area (AC)	Storage Volume (AC FT)	Cumulative Storage Volume (AC FT)
106	33.6	0	0
108	36.0	70	70
110	37.7	74	143
112	39.2	77	220
114	40.7	80	300
116	41.8	83	383
118	42.9	85	467
120	44.0	87	554
130	49.5	98	1021
140	59.2	116	1559
148	67.7	134	2069

3.3 Flow From Surface Impoundment D

As required by § 257.82(a)(2), an IDFCS must be in place for Surface Impoundment D that is designed, constructed, operated, and maintained to control flow from the impoundment for the Inflow Design Flood (1,000-year flood). The principal and emergency spillways comprise the IDFCS for the existing Surface Impoundment D, as shown on the as-built drawings (Virginia Power, 1986b).

The principal spillway consists of a reinforced concrete intake tower connected to a 30-inch reinforced concrete pipe (RCP). This outlet structure utilizes a series of manually operated valves from elevation 116 to 142 feet that can be used to control water elevation (Virginia Power, 2014). When reaching the maximum design elevation, water enters the tower through a 5-foot-wide intake weir with a crest elevation of 142 feet. Water from the principal spillway pipe is conveyed to the adjacent Surface Impoundment 'E' (Golder, 2012). The emergency spillway crest is a 120-foot-wide earthen spillway sized to safely convey the full PMF storm event while maintaining a minimum freeboard of two feet. The emergency spillway crest elevation is 144 feet. Water discharging from the emergency spillway flows into a natural channel to the west and eventually outfalls into Quantico Creek (Golder, 2012).

In this Plan, management of the inflow design flood is defined as having the capacity to convey the peak discharge resulting from the flood. Per the 1986 Final Design Report Hydrologic and Hydraulic (H&H) analysis, Surface Impoundment D was designed pursuant to Regulation No. 9, Section 4.01(b) of the State Water Control Board of Virginia. This regulation required impounding structures over 100 feet in height to safely pass the appropriate spillway design flood (Virginia Power, 1986a). In this case the PMF was used as the spillway design flood (Virginia Power, 1986a). The design PMF used in the original design was 28.2 inches of precipitation with a duration of 48 hours. The precipitation data defining the current 1000-year flood event is 15.2 inches of precipitation with a duration of 48 hours. Thus, utilizing the original design PMF in lieu of the 1,000-year flood, for the purposes of this plan, provides a more conservative approach to demonstrating adequacy set forth by § 257.82.

Table 2. -
Summary of Adequate Conveyance of PMF. -

Storm Event	Peak Inflow CFS)	Peak Outflow (CFS)	Max Water Elevation	Max Capacity of Combined Spillways (CFS)
Original Design PMF	1950	1367	146.7	3124

Surface Impoundment D was modeled for its performance during the PMF. The original design report contains the calculations and results of the modeling (Virginia Power, 1986a). The analysis was conducted assuming that the antecedent water level in Surface Impoundment D is set at its maximum design elevation (El. 142). A summary of the calculations is shown above in Table 2. The calculations demonstrate that the impoundment has been designed, constructed, and maintained to adequately pass the original design PMF while maintaining at least two feet of freeboard.

3.4 Surface Water Requirements

As required by § 257.82(b), a control system must be in place for Surface Impoundment D that is designed, constructed, operated, and maintained to meet the requirements of § 257.3-3. Accordingly, discharges from Surface Impoundment D are limited and monitored in accordance with the requirements in VPDES Permit VA0002071.

4.0 Conclusion

It is GAI's opinion that the existing Surface Impoundment D Inflow Design Flood Control System is in compliance with the requirements in § 257.82 of the CCR Rule for a significant hazard impoundment.

5.0 References

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