DOMINION ENERGY

PERIODIC INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

POSSUM POINT POWER STATION INACTIVE CCR SURFACE IMPOUNDMENT: POND E

APRIL 2023

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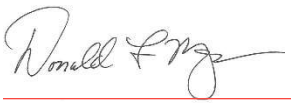
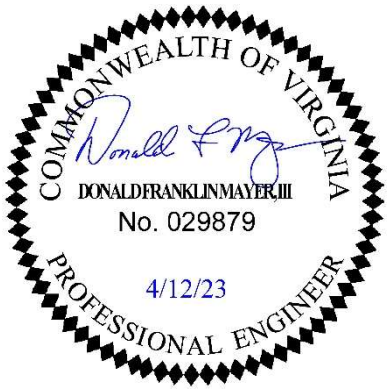
1 CERTIFICATION

This periodic Inflow Design Flood Control System Plan for the Possum Point Power Station's Pond E was prepared by WSP USA Inc. (WSP; formerly d/b/a Golder Associates USA Inc.). The document and Certification/Statement of Professional Opinion are based on and limited to information that WSP has relied on from Dominion Energy and others, but not independently verified, as well as work products previously 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 §257.82 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 §257.82), 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.

Donald Mayer, PE	Vice President
Print Name	Title
	4/12/2023
Signature	Date



2 INTRODUCTION

This periodic Inflow Design Flood Control System (PIDFCS) Plan was prepared for the Possum Point Power Station's (Station) existing Coal Combustion Residuals (CCR) inactive surface impoundment known as Pond E. This PIDFCS Plan was prepared in accordance with 40 CFR Part §257, Subpart D and is consistent with the requirements of 40 CFR §257.82. Pond E had all its CCR removed as well as an over excavation of additional soil in 2019 and currently serves as a stormwater management pond for the Station. Water that enters Pond E is currently pumped to an active CCR unit (Pond D) and managed at that facility.

The Station, owned and operated by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion Energy), is in Prince William County at 19000 Possum Point Road, east of Route 1 (Jefferson Davis Highway), and bounded to the south and east by Quantico Creek and the Potomac River. The Station includes an existing 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). Pond E has historically been regulated as an impounding structure by the Virginia Department of Conservation and Recreation (DCR), with Inventory Number 153021.

Dominion Energy performed closure by removal activities in Pond E by removing the stored CCR and over-excavating soil pursuant to its solid waste permit closure plan (SWP 617) and subsequently breaching the impoundment structure. The Virginia Department of Environmental Quality (DEQ) verified removal activities in August 2019. The Pond remains subject to the CCR Rule requirements due to observed groundwater impacts that prevent full closure of the unit under the rule even though the Pond no longer impounds CCR materials.

3 PURPOSE

This PIDFCS plan is prepared pursuant to 40 CFR §257.82(c) of the CCR Rule [40 CFR §257.82(c)]. The initial IDFCS plan was completed in April 2018 and is required to be reviewed every five (5) years pursuant to 40 CFR §257.82(c)(4). Pond E remains subject to the CCR Rule requirements, including this PIDFCS plan update, even though all CCR materials have been removed.

4 PERIODIC INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

As required by §257.82(c)(1), this PIDFCS plan includes documentation of how the inflow design flood control system for Pond E has been designed, constructed, operated, and maintained to:

- Adequately manage flow into Pond E during and following the peak discharge of the inflow design flood [40 CFR §257.82(a)(1)];
- Adequately manage flow from Pond E to collect and control the peak discharge resulting from the inflow design flood [40 CFR §257.82(a)(2)]; and
- Adequately handle discharge from Pond E in accordance with the surface water requirements under 40 CFR §257.3-3 [40 CFR §257.82(b)].

4.1 HAZARD POTENTIAL CLASSIFICATION

As indicated in WSP's Periodic Hazard Potential Classification Assessment (WSP, 2023), Pond E is assigned a "Low" hazard potential rating per 40 CFR §257.73.

4.2 INFLOW DESIGN FLOOD

In accordance with 40 CFR §257.82(a)(3)(ii), a CCR impoundment with a low hazard potential must collect and control the peak discharge resulting from a 100-year flood. Per National Oceanic and Atmospheric Administration (NOAA) Atlas-14, the 100-year, 24-hour precipitation depth is 8.3 inches in Dumfries, Virginia. Evaluation of the Pond E inflow design flood control system during the 100-year, 24-hour storm event is provided in Appendix A.

4.3 INFLOW CONTROL

As required by §257.82(a)(1), a control system must be in place for Pond E that is designed, constructed, operated, and maintained to adequately manage flow into Pond E during and following the peak discharge of the inflow design flood.

Inflow to Pond E is primarily stormwater runoff from within the unit (50 acres) and approximately 53 acres from north of the pond. The total drainage area to the pond is approximately 103 acres. The majority of stormwater arrives through overland flow. The natural conveyance systems adequately manage run-on into Pond E during the inflow design flood.

4.4 OUTFLOW CONTROL

As required by §257.82(a)(2), an inflow design flood control system must be in place for Pond E that is designed, constructed, operated, and maintained to adequately manage flow from Pond E to collect and control the peak discharge resulting from the inflow design flood.

The pond currently does not discharge to the environment, and water within the pond is pumped to Pond D. Water within the pond would discharge over the embankment crest at approximately Elevation 14.0 feet above mean sea level (ft amsl). Pond E has approximately 41 acre-feet of available water storage volume at the embankment crest.

The Pond E stormwater system was modeled in the U.S. Army Corps of Engineers Hydrologic Engineering Center's Hydraulic Modeling System (HEC HMS), and the analysis is included in Appendix A. Pond E's inflow design flood control system is capable of adequately managing the inflow from the design flood event without overtopping the embankment.

4.5 SURFACE WATER REQUIREMENTS

As required by §257.82(b), a control system must be in place for Pond E that is designed, constructed, operated, and maintained to meet the requirements of § 257.3-3. Pond E is not currently permitted to discharge surface water into the environment. Surface water within the pond is periodically pumped to Pond D and managed in the active CCR unit.

Pond E is operated under a Local Land Disturbance Permit, Stormwater Management Plan, and Stormwater Pollution Prevention Plan (SWPPP). The site is routinely inspected and monitored by Dominion Energy personnel in accordance with the before mentioned plans to minimize potential surface water impacts.

5 CONCLUSIONS

Pond E is subject to a PIDFCS plan update (due every 5 years from the original assessment performed in April 2018). The pond remains subject to the CCR Rule requirements, even though it no longer impounds CCR materials, due to observed groundwater impacts that prevent full closure of the unit under the CCR Rule.

Based on known site conditions, information in this PIDFCS Plan, as well as work performed by WSP, it is WSP's opinion that the existing Pond E inflow design flood control system complies with the requirements of 40 CFR §257.82 of the CCR Rule for a low hazard potential impoundment.

REFERENCES

- Golder Associates. Inflow Design Flood Control System Plan, Possum Point Power Station Inactive CCR Surface Impoundment: Pond E. April 2018.
- National Oceanic and Atmospheric Administration's National Weather Service. NOAA Atlas 14 Point Precipitation Frequency Estimates: VA. Accessed February 3, 2023. Available online: https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=va
- WSP USA Inc. Periodic Hazard Potential Classification Assessment. Possum Point Power Station Inactive CCR Surface Impoundment: Pond E. April 2023.

APPENDIX

A Pond E Inflow Design Flood Analysis

CALCULATIONS

Date	April 2023	**Made by:**	HNE
Reference No.	21466315	**Checked by:**	BJP
Site Name	Dominion Energy - Possum Point Pond E Dumfries, Virginia	**Approved by:**	ELH

POSSUM POINT POWER STATION POND E INFLOW DESIGN FLOOD ANALYSIS

1.0 OBJECTIVES

The purpose of this evaluation is to determine the hydraulic performance of Pond E at the Possum Point Power Station, resulting from the 100-year, 24-hour design storm event. This evaluation is in support of the Inflow Design Flood Control System Plan and is based on a "Low" hazard potential classification as defined in §257.53 of the *CCR Rule*. Pond ABC has been closed by removal of Coal Combustion Residuals (CCR), and stormwater entering the pond is currently pumped into an active CCR impoundment at the Station (Pond D).

2.0 CALCULATIONS

2.1 Pond Storage Volume

Pond E storage volume was computed based on the topography of the pond following removal of CCR material and regrading of the pond, surveyed in 2021. The maximum available storage below the discharge point on the berm at elevation 14.0 feet above mean sea level (ft amsl) is approximately 41 acre-feet. Attachment 1 contains the stage-storage rating table for Pond E.

2.2 Outlet Design Capacity

Currently, no surface water is permitted to discharge from Pond E. Water within the pond is intermittently pumped to Pond D. This analysis assumes that the starting water level in Pond E is at the top of the southern basin within the pond (Elevation 5.0 ft amsl), which was the approximate water surface elevation during the 2021 survey.

2.3 Storm Routing Calculations

The Pond E stormwater system analysis was performed using the US Army Corps of Engineers Hydrologic Engineering Center's Hydraulic Modeling System (HEC-HMS) software package (Ref 1). The drainage area to the pond is approximately 53 acres from north of the pond, and 50 acres from direct precipitation into the pond.

Design Storm

Per §257.82(a)(3)(ii), the impoundment is required to adequately manage flow resulting from the 24-hour, 100-year storm event. The 100-year, 24-hour storm event precipitation depth was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation Frequency Data Server (PFDS, Ref 2) for Dumfries, Virginia, and amounts to 8.3 inches. The design storm is distributed in time as an SCS Type II synthetic distribution.

HMS Model Input

Figure 1 illustrates the connectivity of the stormwater elements and the data inputs as modeled in HEC-HMS. The predominant soil types in the area are Hydrologic Soil Group (HSG) 'B' soils. The acreage, curve number (CN), and lag time for each sub-basin area are provided in the attached worksheet.

The time of concentration for each basin was estimated using the TR-55 time of concentration method (NRCS, ref #3), which divides the longest hydraulic flow path into sheet flow, shallow concentrated flow, and open channel flow, and considers a minimum time of concentration of 6 minutes. The lag time was estimated as 60% of the time of concentration. The maximum length of sheet flow was assumed to be 100 feet.

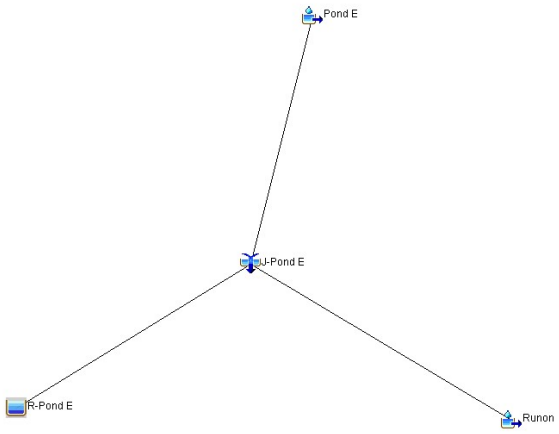


Figure 1: Pond E HEC HMS Model Routing

HMS Model Output

The following table summarizes the results of the HEC-HMS analysis, using a starting water surface elevation of 5.0 ft amsl. Note that the computed high water (Max Hw) elevations are at the top of the berm (Elevation 14.0 ft amsl), but not expected to overtop the berm. The inflow volume and pool elevation are shown in Attachment 1.

Table 1: Pond E HEC-HMS Results

Q_{in} (CFS)	V_{in} (acre-ft)	Max Hw (Ft El*)
674.8	40.8	14.0

3.0 CONCLUSIONS

Based on the calculations presented herein, Pond E at the Possum Point Power Station can accept and store the 100-year, 24-hour storm event without discharging to the environment.

4.0 REFERENCES

1) USACE (United States Army Corps of Engineers). 2020. HEC-HMS Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) [computer software]. Version 4.10. September 2020.

2) Precipitation Frequency Data Server (NOAA Atlas 14). https://hdsc.nws.noaa.gov/hdsc/pfds/

3) NRCS. 2010. National Engineering Handbook. Part 630 Hydrology, Chapter 15 Time of Concentration.

5.0 ATTACHMENTS

1) Possum Point Pond E H&H Calculations

ATTACHMENT 1

Possum Point Pond E H&H Calculations

Pond E Stage Storage	
Contour Elevation (ft)	**Volume (Acre-ft)**
5.0	-
6.0	2.53
7.0	5.20
8.0	8.01
9.0	11.08
10.0	14.55
11.0	18.79
12.0	24.34
13.0	31.78
14.0	41.17

Notes:
1. Pond E stage-storage is evaluated for storage above El. 5 feet, which is the approximate water level measured in the pond during the 2021 as-built survey.

Possum Point Pond E H and H Calculations

Client: Dominion
Project: Possum Pond E CCR Inflow Design
Project Number: 21466315

Date:	3/9/23
By:	HNE
Chkd:	BJP
Apprvd:	ELH

Design Storm **100 -Year Reccurence Interval**

Storm Duration (hours)	2-Year Depth (inches)	100 -Year Depth (inches)	Storm Distribution
24	3.1	8.3	II

Subbasin ID	Subbasin Area (ft^2)	Subbasin Area (acres)	Subbasin Area (sq mile)	CN = 98 Pond Area (acres)	CN = 58 Grass (acres)	CN = 82 Bare Soil (acres)	CN = 85 Gravel (Acres)	CN = 55 Forest (Acres)	Composite SCS Curve No.	$S = \frac{1000}{CN} - 10$	Unit Runoff Q (in)	Runoff Volume (ac-ft)	Runoff Volume (ft^3)
Pond E	2,196,964	50.44	0.0788	10.27		37.91	2.25		CN = 85	1.76	6.53	27.45	1,195,886
Runon	2,311,865	53.07	0.0829		7.81			45.27	CN = 55	8.18	3.01	13.32	580,277
		0.00	0.0000										
		0.00	0.0000										
Total:	4,508,829	103.51	0.16									40.78	1,776,162

Possum Point Pond E H and H Calculations

Client: Dominion
Project: Possum Pond E CCR Inflow Design
Project Number: 21466315

					Flow Segment 1						Flow Segment 2					
Subbasin ID	Subbasin Area (sq mile)	Composite Curve Number	Total Lag (0.6*Tc) (min)	Total Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Travel Time (min)
Pond E	0.0788	85	3.6	6.0												
Runon	0.0829	55	7.7	12.9	Sheet	100	0.030	E	Short Grass	8.4	Shallow	965	0.050	U	Unpaved	4.5

Notes:
(1) Refer to Attachment A for Roughness Condition descriptions and Tc Coeffiecients.

Possum Point Pond E H and H Calculations

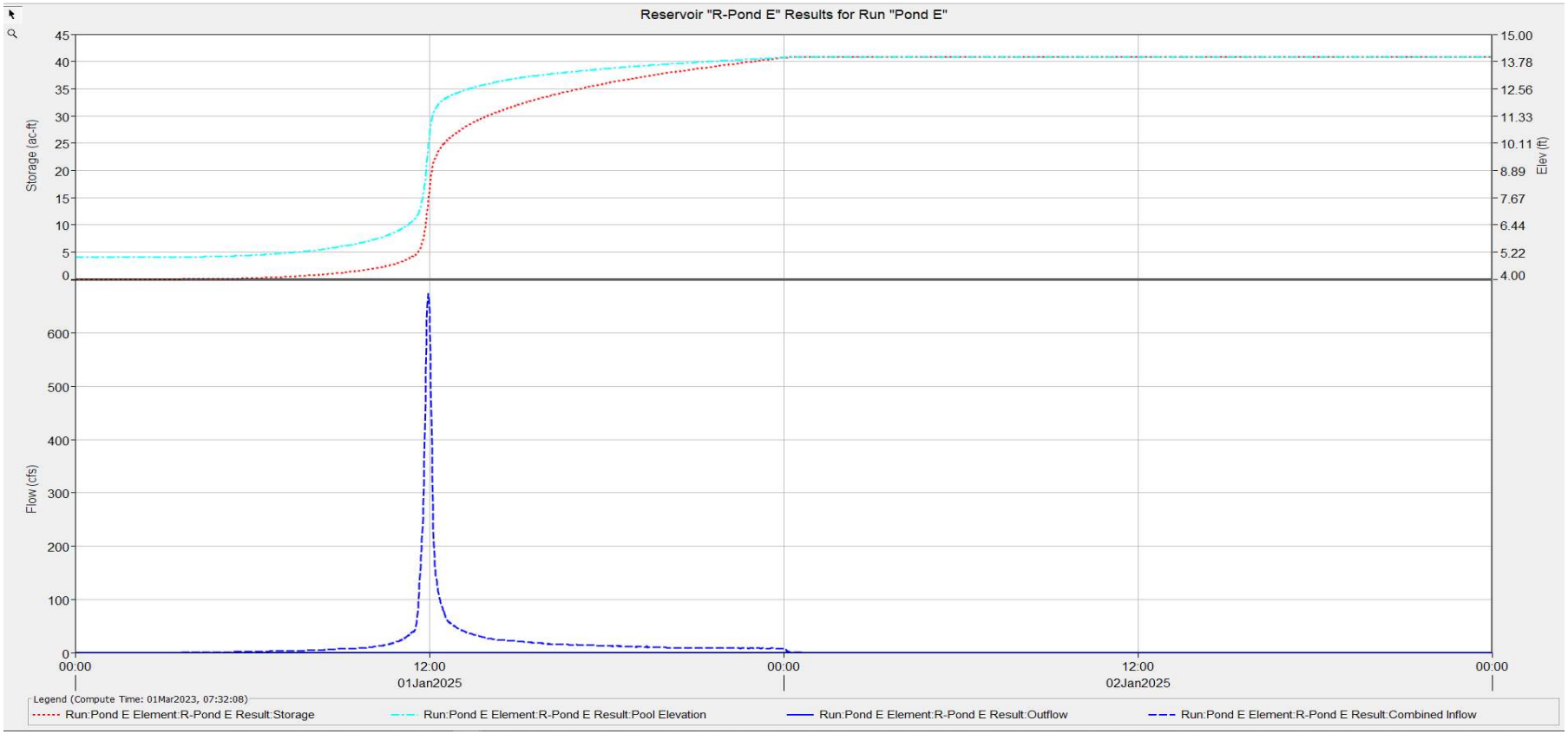
Client: Dominion
Project: Possum Pond E CCR Inflow Design
Project Number: 21466315

Date:	3/9/23
By:	HNE
Chkd:	BJP
Apprvd:	ELH

HEC-HMS Basin Model:	East Pond
HEC-HMS Met. Model:	1000yr,24-hr
HEC-HMS Control Specs:	48 hour, 1 min

Hydrologic Element	Drainage Area (sq mile)	Peak Discharge (cfs)	Time of Peak	Total Volume (ac-ft)
Runon	0.083	215.9	01Jan2025, 12:02	13.3
Pond E	0.079	503.3	01Jan2025, 11:56	27.5
J-Pond E	0.162	674.8	01Jan2025, 11:58	40.8
R-Pond E	0.162	0	01Jan2025, 00:00	0

Pond E Storage Analysis



Attachment A
Time of Concentration and Mannings Flow Coefficients

TR-55 (1986)

Sheet Flow Travel time (SCS Upland Method)

$$T_t = \frac{0.007\ (n'\ L)^{0.8}}{(P_2)^{0.5}\ S^{0.4}}$$

Where: T_t = travel time (hr); n' = roughness coefficient; L = flow length (ft);

P_2 = 2-yr storm depth (inches); s = slope (ft/ft)

flow velocity = $L/(60T_t)$

Flow Type	Surface Type	roughness n	Surface Description	Short Description
Sheet/Overland Flow	A	0.011	Smooth surfaces (concrete, asphalt, gravel, bare soil)	Smooth
	B	0.05	Fallow (no residue)	Fallow
	C	0.06	Cultivated soils: Residue cover <= 20%	Cover<20%
	D	0.17	Cultivated soils: Residue cover > 20%	Cover>20%
	E	0.15	Grass: Short grass prairie	Short Grass
	F	0.24	Grass: Dense grasses	Dense Grass
	G	0.41	Grass: Bermuda grass	Bermuda Grass
	H	0.13	Range (natural)	Range
	I	0.40	Woods: Light underbrush	Light woods
	J	0.80	Woods: Heavy underbrush	Heavy Woods

Shallow Concentrated Flow Velocity (SCS Upland Method)

$v = mS^{0.5}$

Where: v = velocity (fps); m = roughness coeffient; S = slope (ft/ft)

Flow Type	Surface Type	Roughness m	Surface Description	Short Description
Shallow Conc. Flow	P	20.3282	Paved Surfaces	Paved
	U	16.1345	Unpaved Surfaces	Unpaved

Channel Flow Velocity (Mannings Velocity)

$v = 1.49/n\ Rh^{2/3}S^{1/2}$ Where: v = velocity (fps); n = roughness coeffient; Rh = Hydraulic Radius (ft), S = slope (ft/ft)

Lining Type	Mannings n for Depth	Mannings n for Velocity	Material	Maximum Velocity	Maximum Shear Stress
A	0.026	0.026	ACB	25	
C	0.024	0.022	CSP	50	
E	0.025	0.022	Earth-lined	3	
G	0.035	0.030	Grass-lined	5	
I	0.017	0.013	Ductile Iron	50	
P	0.012	0.009	Plastic	25	
R	0.040	0.035	Riprap	16	
T	0.035	0.030	Turf Reinf.	10	1.5
Z	0.060	0.005	Other	25	