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SURFACE IMPOUNDMENT CLOSURE PLAN

Bremo Power Station – West and East Ash Ponds
Permit #618

Submitted to:

Bremo Power Station
1038 Bremo Road
Bremo Bluff, VA 23022

Submitted by:

Golder Associates Inc.
2108 West Laburnum Ave, Suite 200,
Richmond, Virginia 23227
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Project # 152-0347
May 11, 2018
Revised September 2018
Revised August 2019

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1.0 PLAN CERTIFICATION

This Closure Plan for the Bremo Power Station's West Ash Pond (WAP) and East Ash Pond (EAP) 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 §257.102 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 §257.102), 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.

Ron DiFrancesco, P. E.
Printed Name of Professional Engineer

025260
Commonwealth of Virginia License No.

Signature and Date

2.0 INTRODUCTION

This Closure Plan (Plan) was prepared for the Bremo Power Station's (Station) inactive Coal Combustion Residuals (CCR) surface impoundments, the West Ash Pond (WAP) and East Ash Pond (EAP). This Closure Plan was prepared in accordance with 40 CFR Part §257, Subpart D and is consistent with the requirements of 40 CFR §257.102 for closure of CCR surface impoundments, 40 CFR §257.100(e)(6)(i), and Virginia Solid Waste Management Regulations 9 VAC20-81-800. The Station, owned and operated by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion), is located in Bremo Bluff, Virginia at 1038 Bremo Road, north of the James River.

The WAP and EAP are being closed as CCR surface impoundments under the CCR rule provisions at 40 CFR §257. The ponds will be closed by removal of CCR pursuant to 40 CFR §257.102(c). All elevations noted in this document, unless stated otherwise, are in feet relative to the North American Vertical Datum of 1988 (NAVD-88).

2.1 General Impoundment Information

2.1.1 West Ash Pond

The WAP is approximately 17 acres in size and was used as a water treatment pond to settle and manage low-volume wastewaters, including CCR. In 2014, the Station converted from a coal-fired power plant to a natural gas-fired power plant. No new CCR has been placed in the WAP after the conversion. The WAP contained approximately 327,000 cubic yards (CY) of CCR prior to the start of excavation activities.

The WAP is regulated under the following permits:

- Virginia Department of Environmental Quality (DEQ) Solid Waste Permit (SWP) No. 618
- Virginia DEQ Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA0004138
- DEQ VPDES Construction General Permit No. VAR10H875
- Virginia Department of Conservation and Recreation (DCR) Operation and Maintenance Certificate, Inventory No. 06511

2.1.2 East Ash Pond

The EAP is an approximately 26.5-acre impoundment that was used for the storage of CCR from the Bremo Power Station. The pond was placed into service in the 1930's and was capped with soil fill in the mid-1980's except for the eastern portion of the pond, which remained wet, allowing pass-through of drainage from the adjacent area to the north. The EAP contained approximately 1,800,000 cubic yards (CY) of CCR prior to the start of excavation activities.

The EAP is regulated under the following permits:

- Virginia DEQ SWP No. 618

- Virginia DEQ VPDES Permit No. VA0004138
- DEQ VPDES Construction General Permit No. VAR10H875
- Virginia DCR Operation and Maintenance Certificate, Inventory No. 00815

3.0 CLOSURE IMPLEMENTATION

3.1 Overview of Closure Approach

This plan provides for the closure of the WAP and EAP by removal of the CCR material. Closure is considered complete under SWP No. 618 when:

1. A Professional Engineer licensed in the Commonwealth of Virginia certifies all CCR has been removed from the units followed by an over-excavation of approximately 6 inches of soil.
2. The unit's downgradient groundwater monitoring wells do not exhibit levels in excess of a maximum contaminant limit (MCL) or established groundwater protection standard for any CCR Appendix IV constituent *after a minimum of ten sampling events have occurred after CCR material has been verified as removed by a professional engineer licensed in Virginia.*

At the time of writing, the CCR and over-excavation in the EAP and the majority of CCR in the WAP has been relocated to the North Ash Pond (NAP). Final CCR removal and over-excavation from the WAP will be disposed of in a designated off-site facility. After CCR removal, the WAP will be used to store water from the NAP throughout the NAP's closure by removal. After completing the NAP closure, and final over-excavation from the WAP, the WAP embankments will be removed, and the remaining former pond area will be re-graded and left as a grassy open area. The EAP embankments are being stabilized and the area will be repurposed as the East Pond, a stormwater retention basin. In addition, a discrete area of fugitive CCR identified and characterized along the southern portion of the EAP embankment was removed as part of the EAP closure.

During and after closure, the existing network of groundwater monitoring wells will be sampled and tested to determine the monitored constituent concentrations required in 40 CFR §257 Appendix IV.

4.0 CLOSURE TIMEFRAMES

Table 1 below outlines the estimated sequence of scheduled closure activities.

Table 1: Closure Schedule

Activity	Tentative Date
Completion of WAP CCR Removal	By December 2021
Completion of WAP Over-Excavation	By December 2024
Completion of WAP Closure Construction	By March 2025
Certification of WAP Construction Completion	By June 2025

Closure is considered complete when the elements of this Closure Plan specified above have been performed, as certified by a Professional Engineer licensed in the Commonwealth of Virginia. This

certification will be included as part of a closure certification report. In accordance with 40 CFR §257.102(h), Dominion will prepare a notification of closure of the CCR unit within 30 days of completion of closure, and place the notification in the operating record.

5.0 INVENTORY REMOVAL AND DISPOSAL

5.1 Waste Removal, Decontamination and Disposal

The protocol for closure by removal of materials within the EAP and WAP involves removing accumulated CCR such that no residual materials remain visible, followed by over-excavating the removal footprint by approximately 6 inches. Until March 5, 2019, removed CCR and CCR-mixed soil was consolidated in the NAP. Remaining CCR and CCR-mixed soil from the WAP will be taken to a disposal facility. To facilitate stormwater management, construction, and/or structural stabilization of embankments or excavations, closure by removal of areas within the WAP may be achieved in phases. Phased closures may be sequenced as necessary to support traffic patterns, stormwater controls, etc.

Material removal against embankments may involve excavation of the upstream embankment face to a near-vertical condition. Immediately after excavation and inspection of these areas for certification, fill soil will be placed and compacted against the embankment to re-establish stable slopes of no steeper than 2 horizontal to 1 vertical (2H:1V). For rock, existing concrete designated to remain, or other similar hard surfaces (e.g. pipes or foundation supports to remain), the surface will be cleaned to a visually clean condition through mechanical means such as pressure washing. The soils surrounding said hard areas will be removed to the 6-inch over-excavation criterion. Once pond removal activities are complete, the WAP will be graded to drain. Vegetative stabilization will be established to prevent erosion. The area will be maintained as a grassy open area. In the EAP, the pond subgrade is being shaped and modifications will be made to the existing outlet structure. Vegetative stabilization will be established to prevent erosion.

5.2 Sampling and Testing Program

After removal of the 6-inch over-excavation material, the area is visually inspected to verify the CCR and over-excavation has been achieved. The pond is further inspected by targeted soil cores for visual inspection to a depth of at least 6 inches at a frequency of at least one core per acre. The soil cores are dug by hand, using a hand auger or similar tool, and are a minimum of 6-inches deep.

Verification surveys of the pond closure is prepared by a Commonwealth of Virginia-licensed Land Surveyor and consists of a survey of the “visually clean” surface and a survey of the “over-excavation” surface to verify the minimum 6-inch removal. Certification of the closure by removal is provided by a Commonwealth of Virginia-licensed Professional Engineer.

Groundwater monitoring will be conducted in accordance with the approved Groundwater Monitoring Plan to meet the closure by removal standard set forth in 40 CFR 257.102(c) and the Virginia Solid Waste Management Regulations.

5.3 Other Areas

During the evaluation of the nature and extent of CCRs in and around the EAP, a thin area of residual CCR material was identified along a portion of the toe of the East Pond embankment. Additional permits from the Corps of Engineers and Fluvanna County were required to authorize removal of materials in this area, and Dominion obtained all necessary permits prior to performing removal activities in this area. The identified materials were removed to a visually clean condition and relocated to the NAP. Verification and documentation of the removal was provided by a Virginia-licensed Professional Engineer. After removal and verification, the vegetation in the area was restored with equivalent vegetation as per the applicable permits.

6.0 CLOSURE OF SUPPORT PONDS AND BASINS

There are no supporting ponds or basins associated with the WAP or EAP.

7.0 CLOSURE IMPLEMENTATION

7.1 Posting

One sign will be posted at the site entrance to each pond notifying all persons of the final closure and prohibition against further receipt of CCR. Unauthorized access to the site will be controlled by natural barriers or lockable gates across the access roads.

7.2 Certification

Upon completion of closure construction, a certification statement signed by a licensed Professional Engineer will be placed in the operating record and submitted to the DEQ along with the documentation from the Sampling and Testing Program. The certification statement shall read as follows:

> **I certify that closure has been completed in accordance with the Closure Plan dated [DATE] for solid waste permit number 618 issued to Dominion, with the exception of the following discrepancies: [To Be Determined]**
>
> **In addition, a sign(s) was (were) posted on [DATE] at the site entrance notifying all persons of the closing [and state other notification procedures if applicable] and barriers [indicate type] were installed at [location] to prevent new waste from being deposited.**
>
> **[Signature, date and stamp of Professional Engineer]**

7.3 Post-Closure Uses

No post-closure use of the WAP area is proposed. The EAP will be repurposed as the East Pond for stormwater retention.

8.0 COST ESTIMATE

The closure and post-removal cost estimate for the WAP and EAP is $17,112,065. This estimated amount covers the remaining excavation, inspection, testing, certification, monitoring, and maintenance as proposed in this Plan.

DOMINION ENERGY

BREMO POWER STATION

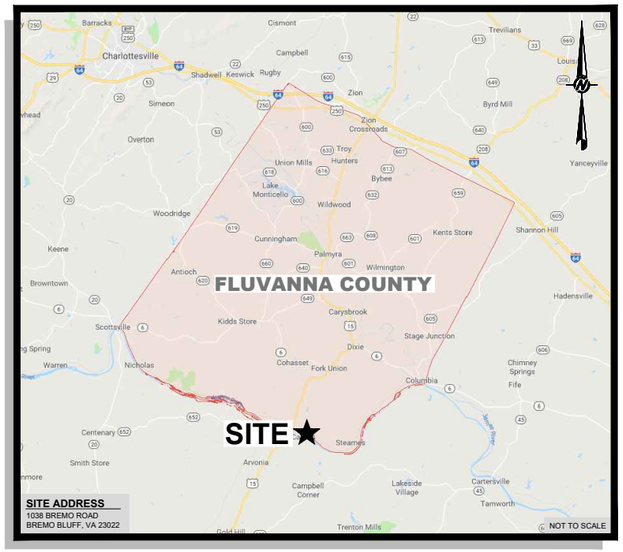
CLOSURE BY REMOVAL PLAN

WEST ASH POND & EAST ASH POND

SOLID WASTE PERMIT No. 618

FLUVANNA COUNTY, VIRGINIA

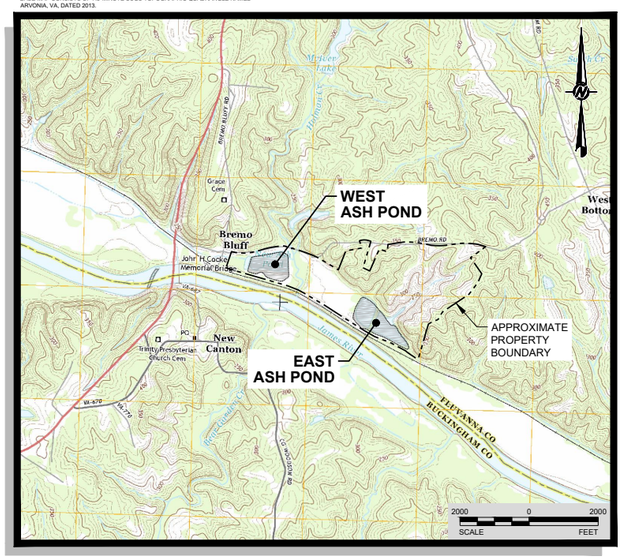
SEPTEMBER 2018



VICINITY MAP

DRAWING INDEX	
DRAWING No.	DRAWING TITLE
CBR-1	COVER SHEET
CBR-2	WEST ASH POND PRE-CLOSURE TOPOGRAPHY (APPROXIMATE BOTTOM OF POND)
CBR-3	WEST ASH POND CLOSURE BY REMOVAL PLAN
CBR-4	WEST ASH POND CONCEPTUAL FINAL GRADING PLAN
CBR-5	WEST ASH POND CROSS-SECTIONS
CBR-6	EAST ASH POND PRE-CLOSURE TOPOGRAPHY (APPROXIMATE BOTTOM OF POND)
CBR-7	EAST ASH POND CLOSURE BY REMOVAL PLAN
CBR-8	EAST ASH POND CONCEPTUAL FINAL GRADING PLAN
CBR-9	EAST ASH POND CROSS-SECTIONS

MAP SOURCE
BASE MAP CONSISTS OF 7.5-MINUTE USGS TOPOGRAPHIC QUADRANGLE NAMED ARVONIA, VA, DATED 2013.



SITE LOCATION MAP

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL

COMMONWEALTH OF VIRGINIA
JAMES R. DIFRANCESCO
LICENSED
PROFESSIONAL ENGINEER
9-19-18

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PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
COVER SHEET

PROJECT NO.
15-20347

REV. 1

1 of 9

DRAWING
CBR-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

PREPARED BY:

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Dominion Energy℠

DOMINION ENERGY
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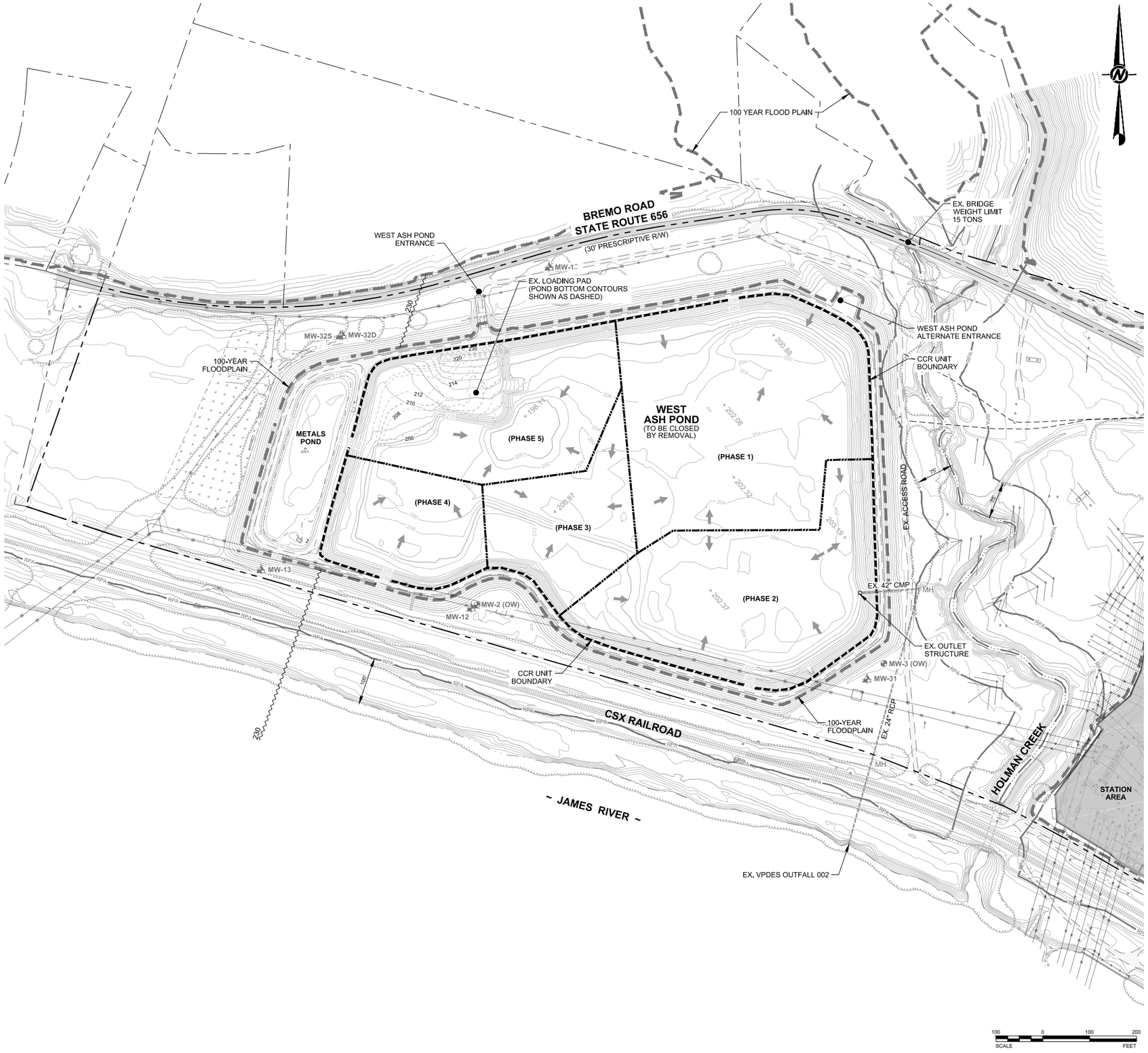

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- CCR UNIT BOUNDARY
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS)
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- WETLANDS
- CREEK/STREAM CENTERLINE
- LIMITS OF RIPARIAN PROTECTION AREA (PER FLUVANNA COUNTY ORDINANCE)
- APPROXIMATE EDGE OF SURFACE WATER
- LIMITS OF 100-YR FLOOD PLAIN
- BASE FLOOD ELEVATION (100-YEAR, SEE NOTE 4)
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD UTILITY LINE
- EXISTING MONITORING WELL LOCATION AND IDENTIFICATION (CCR RULE)
- EXISTING OBSERVATION WELL LOCATION AND IDENTIFICATION
- EXISTING MANHOLE
- EXISTING SURFACE WATER FLOW DIRECTION

GENERAL NOTES

1. EXISTING CONDITIONS COMPILED FROM:
   a. AERIAL TOPOGRAPHIC SURVEY PREPARED BY McKENZIE SNYDER, INC., DATE OF AERIAL PHOTO: 1/16/15 [CONTROL PREPARED BY H&B SURVEYING & MAPPING (H&B)]
   b. BOUNDARY SURVEY PREPARED BY H&B SURVEYING AND MAPPING, LLC DATED 04/27/15.
   c. EXISTING TOPOGRAPHY WITHIN THE LIMITS OF THE WEST ASH POND BASED ON FIELD SURVEY BY H&B SURVEYING AND MAPPING DATED 07/06/17. TOPO REPRESENTS THE BOTTOM OF POND.
2. SITE DATUM: NAD83 / NAVD88
3. WETLAND DELINEATION BY DOMINION ENVIRONMENTAL SERVICES ON 01/30/15 & 02/05/15 AND BY GOLDER ASSOCIATES ON 03/16/15 & 03/25/15. WATERS OF THE U.S. CONFIRMED BY THE USACE DURING JUNE 4, 2015 SITE VISIT.
4. 100 YEAR FLOOD PLAIN DELINEATION BASED ON FLOOD ELEVATION DATA REPRESENTED ON FEMA FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 51065C0260C, EFFECTIVE DATE: 05/16/2008.
5. THE MAJORITY OF WATER AND ASH HAS BEEN REMOVED FROM THE WEST ASH POND, AND ONLY MANAGED CONTACT STORMWATER IS PRESENT.

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL

COMMONWEALTH OF VIRGINIA
JAMES R. DEFRANCESCO
LIC. NO. 042260
9-19-18
PROFESSIONAL ENGINEER

CLIENT
DOMINION ENERGY
BREMO POWER STATION
FLUVANNA COUNTY, VIRGINIA

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PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
WEST ASH POND
PRE-CLOSURE TOPOGRAPHY
(APPROXIMATE BOTTOM OF POND)

PROJECT NO.
15-20347

REV. 1

2 of 9

DRAWING
CBR-2

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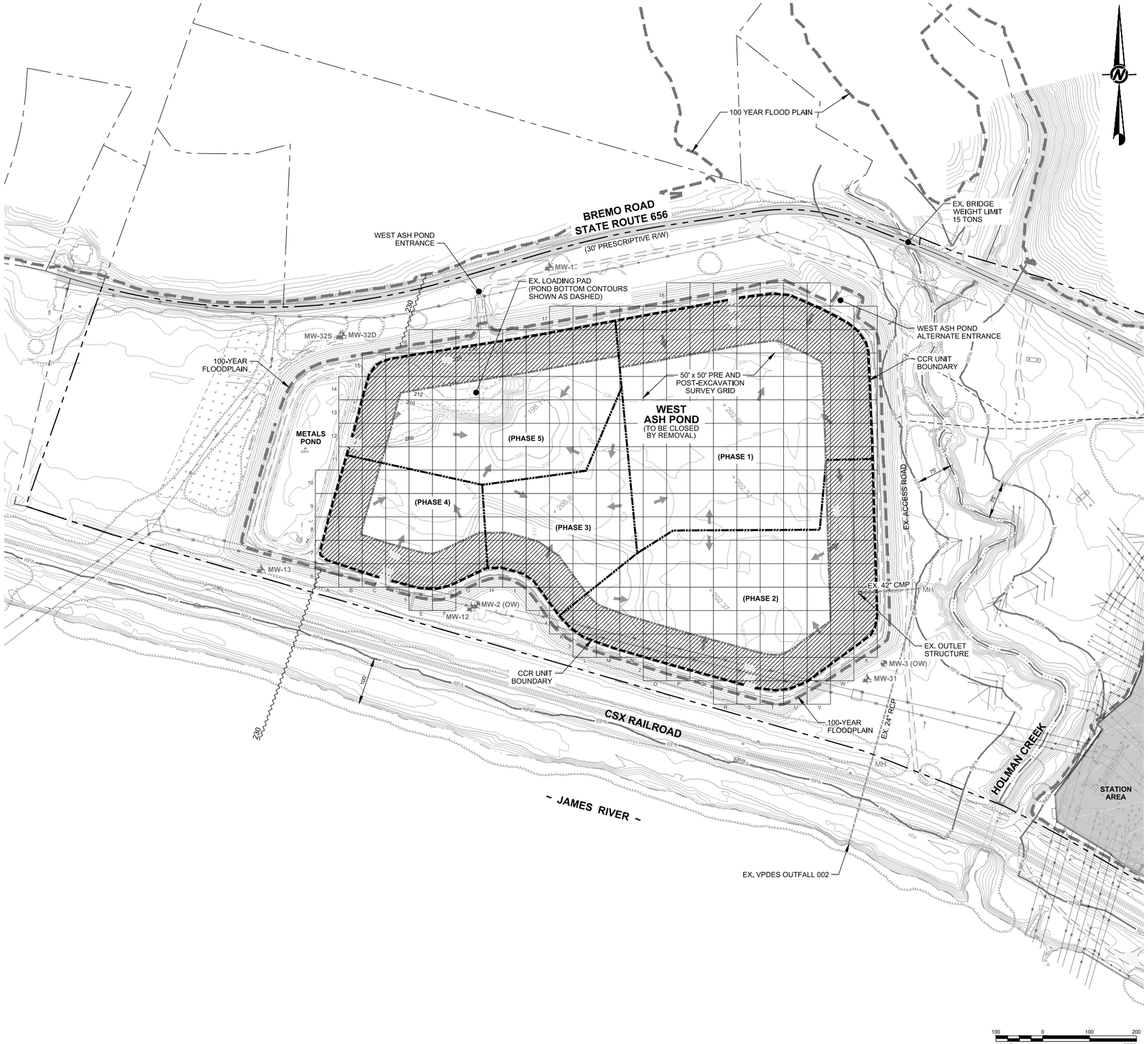

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- CCR UNIT BOUNDARY
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS)
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- WETLANDS
- CREEK/STREAM CENTERLINE
- LIMITS OF RIPARIAN PROTECTION AREA (PER FLUVANNA COUNTY ORDINANCE)
- APPROXIMATE EDGE OF SURFACE WATER
- LIMITS OF 100-YR FLOOD PLAIN
- BASE FLOOD ELEVATION (100-YEAR, SEE NOTE 4)
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD UTILITY LINE
- MW-1 — EXISTING MONITORING WELL LOCATION AND IDENTIFICATION (CCR RULE)
- MW-2 (OW) — EXISTING OBSERVATION WELL LOCATION AND IDENTIFICATION
- MH — EXISTING MANHOLE
- EXISTING SURFACE WATER FLOW DIRECTION
- APPROXIMATE CLEAN CLOSURE PHASE LIMITS (SUBJECT TO CHANGE BASED ON FIELD CONDITIONS DURING EXCAVATION AND MAY INCLUDE SUB-PHASES)
- DENOTES APPROXIMATE LIMITS OF CRITICAL AREAS SUBJECT TO BACKFILL FOR ACCESS AND SLOPE STABILITY

GENERAL NOTES

1. EXISTING CONDITIONS COMPILED FROM:
   a. AERIAL TOPOGRAPHIC SURVEY PREPARED BY McKENZIE SNYDER, INC., DATE OF AERIAL PHOTO: 1/16/15 [CONTROL PREPARED BY H&B SURVEYING & MAPPING (H&B)]
   b. BOUNDARY SURVEY PREPARED BY H&B SURVEYING AND MAPPING, LLC DATED 04/27/15.
   c. EXISTING TOPOGRAPHY WITHIN THE LIMITS OF THE WEST ASH POND BASED ON FIELD SURVEY BY H&B SURVEYING AND MAPPING DATED 07/06/17. TOPO REPRESENTS THE BOTTOM OF POND.
2. SITE DATUM: NAD83 / NAVD88
3. WETLAND DELINEATION BY DOMINION ENVIRONMENTAL SERVICES ON 01/30/15 & 02/05/15 AND BY GOLDER ASSOCIATES ON 03/16/15 & 03/25/15. WATERS OF THE U.S. CONFIRMED BY THE USACE DURING JUNE 4, 2015 SITE VISIT.
4. 100 YEAR FLOOD PLAIN DELINEATION BASED ON FLOOD ELEVATION DATA REPRESENTED ON FEMA FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 51065C0260C, EFFECTIVE DATE: 05/16/2008.

CLOSURE BY REMOVAL NOTES

1. TOPOGRAPHY SHOWN WITHIN LIMITS OF THE WEST ASH POND, REPRESENTS THE POND BOTTOM BASED ON FIELD SURVEY BY H&B SURVEYING AND MAPPING DATED 07/06/17.
2. PHASED CLOSURE OF THE WEST POND MAY BE SEQUENCED AS NECESSARY TO ADDRESS ISSUES RELATED TO ACCESS AND SLOPE STABILITY, AND TO MINIMIZE CONTACT STORMWATER AREAS. SUB-PHASES MAY BE REQUIRED FOR REGULATORY APPROVAL.
3. ANY AREA CERTIFIED AS ACHIEVING CLOSURE BY REMOVAL IS TO BE PROTECTED FROM CCR AND CONTACT STORMWATER, AND MAY BE FILLED AND/OR RESHAPED AS NEEDED PRIOR TO ACHIEVING FINAL GRADES.
4. ACCUMULATED CCR SHALL BE REMOVED FROM SURFACES WITHIN THE POND LIMITS SUCH THAT NO CCR REMAINS VISIBLE.
5. FOLLOWING VISUAL-CLEAN CONDITIONS, OVER-EXCAVATE THE REMOVAL FOOTPRINT BY AT LEAST SIX INCHES.
6. VISUAL INSPECTION AND TARGETED SUBGRADE VISUAL SAMPLING TO BE OVERSEEN BY OWNER'S ENGINEER REPRESENTATIVE. SAMPLING TO BE PERFORMED AT A FREQUENCY OF AT LEAST ONE TEST PER ACRE. TARGETED SAMPLING TO CONSIST OF HAND-DUG HOLES AT LEAST SIX INCHES DEEP.
7. EXCAVATION OF SLOPES STEEPER THAN 2:1 SHALL BE SEQUENCED SUCH THAT THE SLOPES CAN BE EXCAVATED, INSPECTED, AND BACKFILLED IN THE SHORTEST TIME POSSIBLE. BACKFILL SLOPES WITH CLEAN SOIL FILL AT NO STEEPER THAN 2:1.
8. EXCAVATED CCR AND SOIL-CCR MIXTURES SHALL BE CONSOLIDATED IN NORTH ASH POND OR TAKEN TO AN OFF-SITE DISPOSAL FACILITY AS DIRECTED BY DOMINION.

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL: COMMONWEALTH OF VIRGINIA — JAMES R. DEFRANCESCO — LIC. NO. 022560 — 9-14-18 — PROFESSIONAL ENGINEER

CLIENT
DOMINION ENERGY
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PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
WEST ASH POND
CLOSURE BY REMOVAL PLAN

PROJECT NO.
15-20347

REV. 1 — 3 of 9 — DRAWING CBR-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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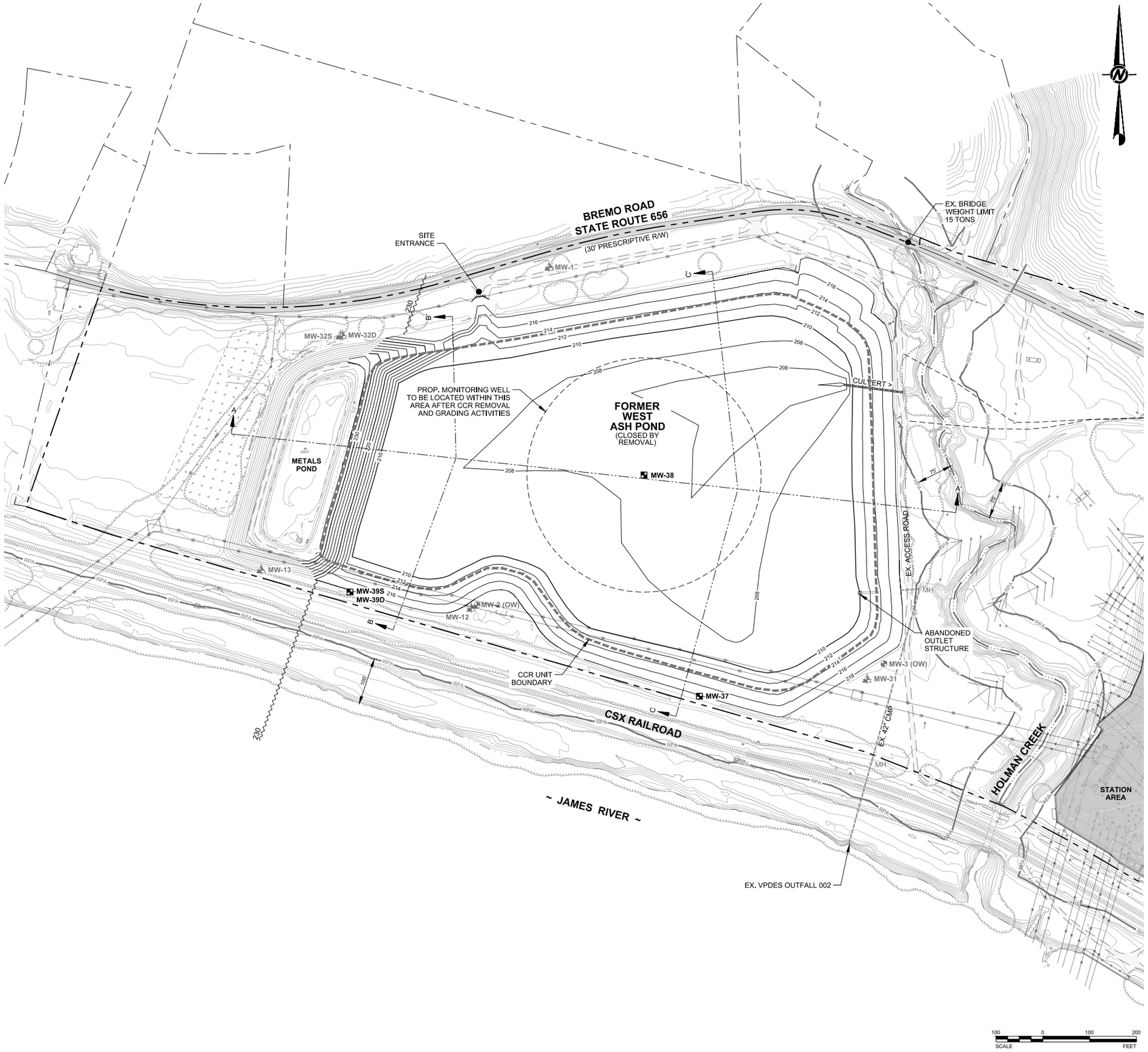

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- CCR UNIT BOUNDARY
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS) (FROM AERIAL SURVEY - SEE GENERAL NOTE 1a)
- CONCEPTUAL FINAL GRADE CONTOURS (2' INTERVALS)
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- WETLANDS
- CREEK/STREAM CENTERLINE
- LIMITS OF RIPARIAN PROTECTION AREA (PER FLUVANNA COUNTY ORDINANCE)
- APPROXIMATE EDGE OF SURFACE WATER
- BASE FLOOD ELEVATION (100-YEAR, SEE NOTE 4)
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD UTILITY LINE
- MW-1 — EXISTING MONITORING WELL LOCATION AND IDENTIFICATION (CCR RULE)
- MW-2 (OW) — EXISTING OBSERVATION WELL LOCATION AND IDENTIFICATION
- MW-38 — PROPOSED MONITORING WELL LOCATION AND IDENTIFICATION
- MH — EXISTING MANHOLE

GENERAL NOTES

1. EXISTING CONDITIONS COMPILED FROM:
   a. AERIAL TOPOGRAPHIC SURVEY PREPARED BY McKENZIE SNYDER, INC., DATE OF AERIAL PHOTO: 1/16/15 [CONTROL PREPARED BY H&B SURVEYING & MAPPING (H&B)]
   b. BOUNDARY SURVEY PREPARED BY H&B SURVEYING AND MAPPING, LLC DATED 04/27/15.
2. SITE DATUM: NAD83 / NAVD88
3. WETLAND DELINEATION BY DOMINION ENVIRONMENTAL SERVICES ON 01/30/15 & 02/05/15 AND BY GOLDER ASSOCIATES ON 03/16/15 & 03/25/15. WATERS OF THE U.S. CONFIRMED BY THE USACE DURING JUNE 4, 2015 SITE VISIT.
4. 100 YEAR FLOOD PLAIN DELINEATION BASED ON FLOOD ELEVATION DATA REPRESENTED ON FEMA FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 51065C0260C, EFFECTIVE DATE: 05/16/2008.

CONCEPTUAL FINAL GRADING NOTE

1. CONCEPTUAL FINAL GRADING IS SHOWN FOR REFERENCE ONLY AND IS SUBJECT TO CHANGE.

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL: COMMONWEALTH OF VIRGINIA — PROFESSIONAL ENGINEER — JAMES R. DEROSIERS — 9-19-18

CLIENT
DOMINION ENERGY
BREMO POWER STATION
FLUVANNA COUNTY, VIRGINIA

CONSULTANT
GOLDER ASSOCIATES INC.
2108 WEST LABURNUM AVENUE
SUITE 200
RICHMOND, VA 23227
(804) 358-7900
www.golder.com

PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
WEST ASH POND
CONCEPTUAL FINAL GRADING PLAN

PROJECT NO.
15-20347

REV. 1 | 4 of 9 | DRAWING CBR-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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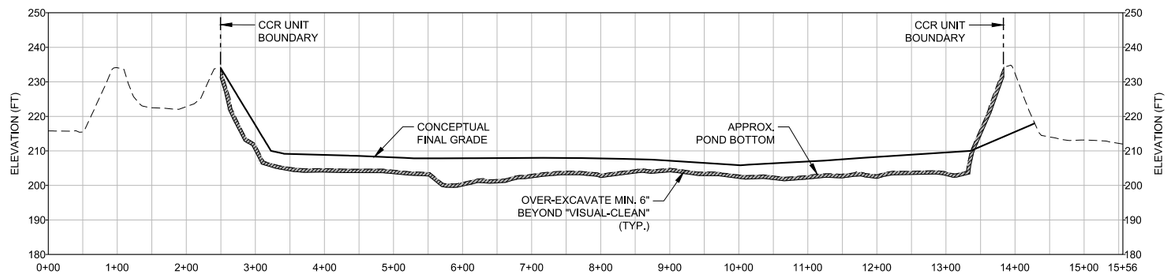
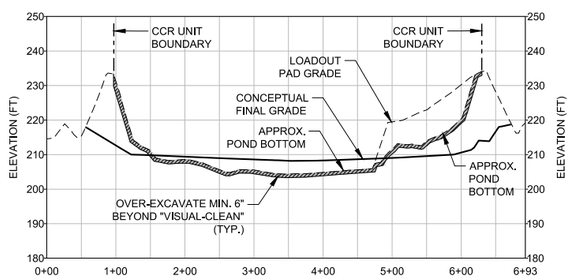


SECTION A - A'



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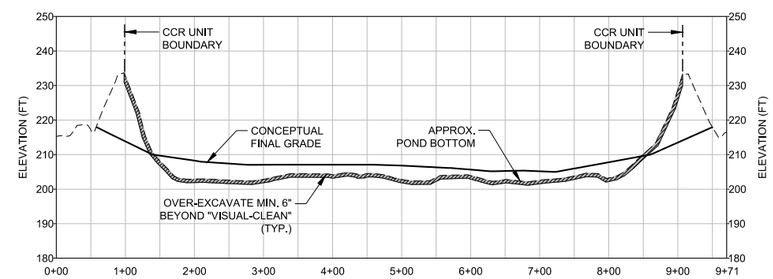

SECTION C - C'

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL

COMMONWEALTH OF VIRGINIA
JAMES R. DEROSSELLO
No. 070260
9-14-18
PROFESSIONAL ENGINEER

CLIENT
DOMINION ENERGY
BREMO POWER STATION
FLUVANNA COUNTY, VIRGINIA

CONSULTANT
GOLDER

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PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
WEST ASH POND
CROSS-SECTIONS

PROJECT NO.
15-20347

REV. 1

5 of 9

DRAWING
CBR-5

SCALE 100 0 100 200 FEET

SCALE 20 0 20 FEET

1 in

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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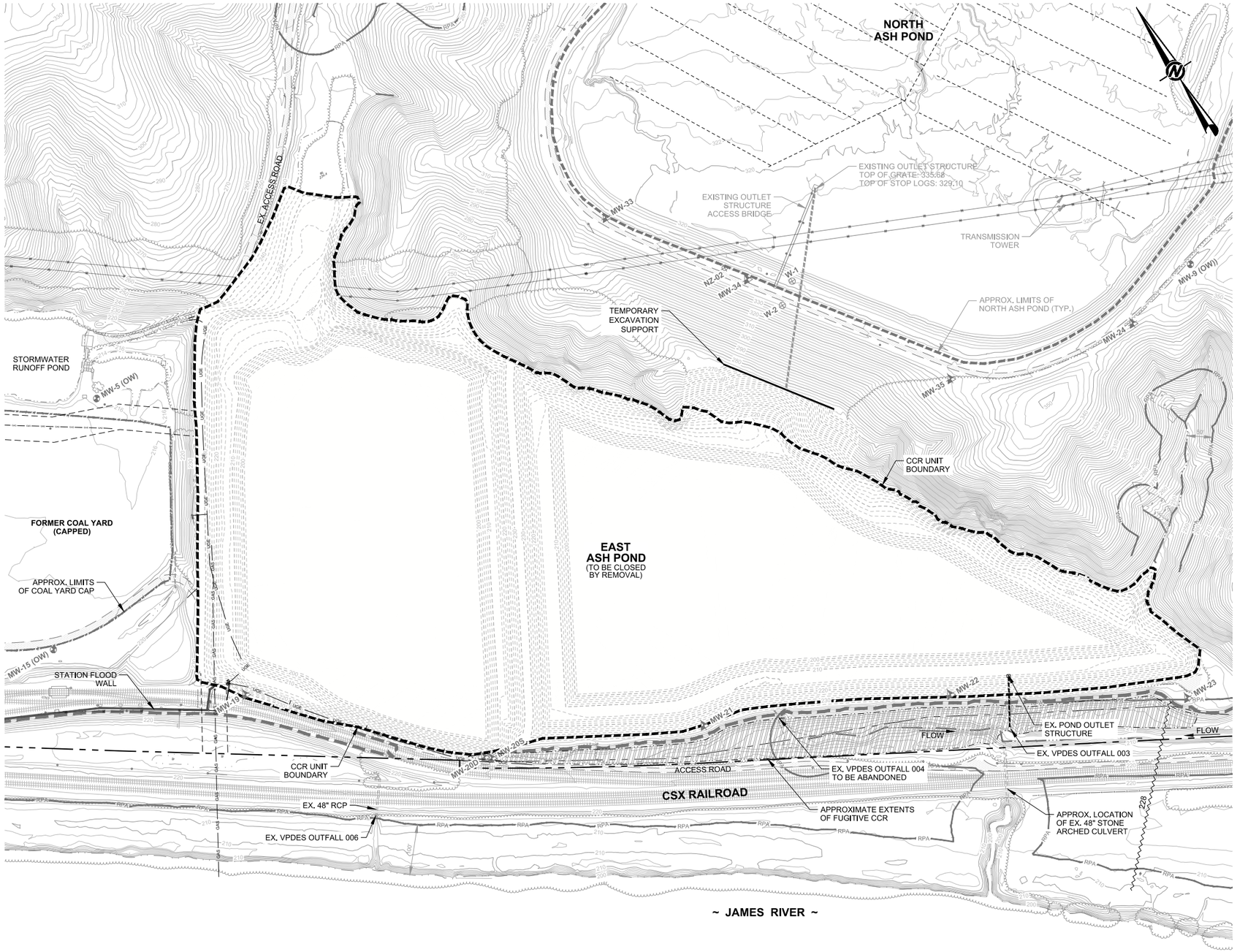

LEGEND

	DOMINION PROPERTY BOUNDARY
	ADJACENT PROPERTY BOUNDARY
	CCR UNIT BOUNDARY
200	EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS) (FROM AERIAL SURVEY - SEE GENERAL NOTE 1a)
200	APPROX. POND BOTTOM CONTOURS (2' INTERVALS) (SEE GENERAL NOTE 1c)
	EXISTING UNPAVED ROAD
	EXISTING RAILROAD
	WETLANDS
	CREEK/STREAM CENTERLINE
RPA	LIMITS OF RIPARIAN PROTECTION AREA (PER FLUVANNA COUNTY ORDINANCE)
	APPROXIMATE EDGE OF SURFACE WATER
	LIMITS OF 100-YR FLOOD PLAIN
228	BASE FLOOD ELEVATION (100-YEAR, SEE NOTE 4)
	EXISTING TREE LINE
	EXISTING FENCE
	EXISTING OVERHEAD UTILITY LINE
UGE	EXISTING UNDERGROUND ELECTRIC LINE
GAS	EXISTING UNDERGROUND GAS LINE
MW-22	EXISTING MONITORING WELL LOCATION AND IDENTIFICATION (CCR RULE)
MW-5 (OW)	EXISTING OBSERVATION WELL LOCATION AND IDENTIFICATION
NZ-02	EXISTING PIEZOMETER AND IDENTIFICATION
MH	EXISTING MANHOLE

GENERAL NOTES

1. EXISTING CONDITIONS COMPILED FROM:
   a. AERIAL TOPOGRAPHIC SURVEY PREPARED BY McKENZIE SNYDER, INC., DATE OF AERIAL PHOTO: 1/16/15 [CONTROL PREPARED BY H&B SURVEYING & MAPPING (H&B)]
   b. BOUNDARY SURVEY PREPARED BY H&B SURVEYING AND MAPPING, LLC DATED 04/27/15.
   c. TOPOGRAPHY WITHIN THE LIMITS OF THE EAST ASH POND BASED ON THE APPROXIMATE POND BOTTOM PER HISTORICAL INFORMATION.
2. SITE DATUM: NAD83 / NAVD88
3. WETLAND DELINEATION BY DOMINION ENVIRONMENTAL SERVICES ON 01/30/15 & 02/05/15 AND BY GOLDER ASSOCIATES ON 03/16/15 & 03/25/15. WATERS OF THE U.S. CONFIRMED BY THE USACE DURING JUNE 4, 2015 SITE VISIT.
4. 100 YEAR FLOOD PLAIN DELINEATION BASED ON FLOOD ELEVATION DATA REPRESENTED ON FEMA FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 51065C0260C, EFFECTIVE DATE: 05/16/2008.
5. THE MAJORITY OF WATER AND ASH HAS BEEN REMOVED FROM THE EAST ASH POND, AND ASH REMOVAL ACTIVITIES ARE ONGOING.

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL

COMMONWEALTH OF VIRGINIA
AARON THOMAS FRANCISCO
Lic. No. 0402060
9-14-18
PROFESSIONAL ENGINEER

CLIENT
DOMINION ENERGY
BREMO POWER STATION
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www.golder.com

PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
EAST ASH POND
PRE-CLOSURE TOPOGRAPHY
(APPROXIMATE BOTTOM OF POND)

PROJECT NO.
15-20347

REV. 1

6 of 9

DRAWING
CBR-6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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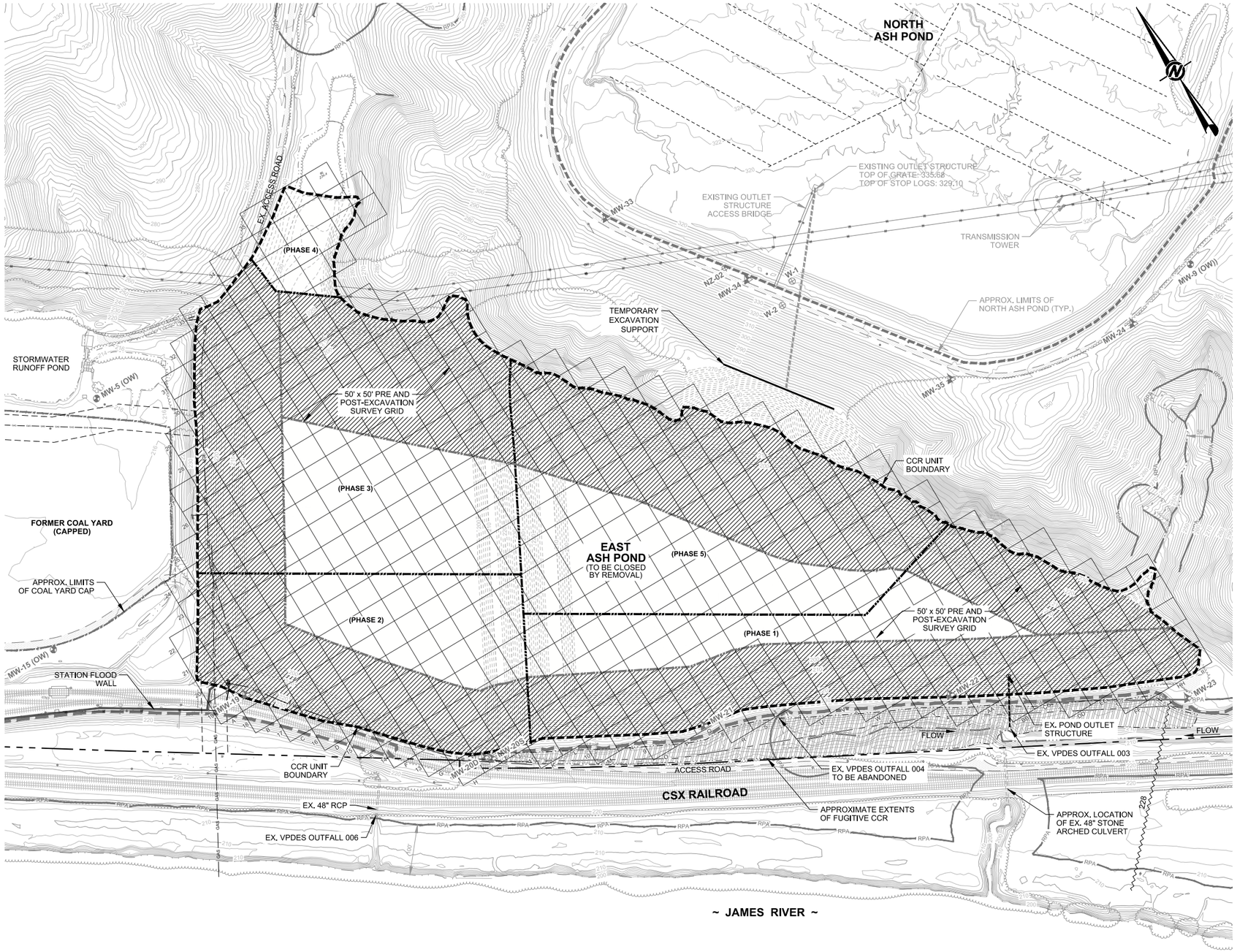

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- CCR UNIT BOUNDARY
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS) (FROM AERIAL SURVEY - SEE GENERAL NOTE 1a)
- APPROX. POND BOTTOM CONTOURS (2' INTERVALS) (SEE GENERAL NOTE 1c)
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- WETLANDS
- CREEK/STREAM CENTERLINE
- LIMITS OF RIPARIAN PROTECTION AREA (PER FLUVANNA COUNTY ORDINANCE)
- APPROXIMATE EDGE OF SURFACE WATER
- LIMITS OF 100-YR FLOOD PLAIN
- BASE FLOOD ELEVATION (100-YEAR, SEE NOTE 4)
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD UTILITY LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING UNDERGROUND GAS LINE
- MW-22 — EXISTING MONITORING WELL LOCATION AND IDENTIFICATION (CCR RULE)
- MW-5 (OW) — EXISTING OBSERVATION WELL LOCATION AND IDENTIFICATION
- NZ-02 — EXISTING PIEZOMETER AND IDENTIFICATION
- MH — EXISTING MANHOLE
- APPROXIMATE CLEAN CLOSURE PHASE LIMITS (SUBJECT TO CHANGE BASED ON FIELD CONDITIONS DURING EXCAVATION AND MAY INCLUDE SUB-PHASES)
- DENOTES APPROXIMATE LIMITS OF CRITICAL AREAS SUBJECT TO BACKFILL FOR ACCESS AND SLOPE STABILITY

GENERAL NOTES

1. EXISTING CONDITIONS COMPILED FROM:
   a. AERIAL TOPOGRAPHIC SURVEY PREPARED BY McKENZIE SNYDER, INC., DATE OF AERIAL PHOTO: 1/16/15 [CONTROL PREPARED BY H&B SURVEYING & MAPPING (H&B)]
   b. BOUNDARY SURVEY PREPARED BY H&B SURVEYING AND MAPPING, LLC DATED 04/27/15.
   c. TOPOGRAPHY WITHIN THE LIMITS OF THE EAST ASH POND BASED ON THE APPROXIMATE POND BOTTOM PER HISTORICAL INFORMATION.
2. SITE DATUM: NAD83 / NAVD88
3. WETLAND DELINEATION BY DOMINION ENVIRONMENTAL SERVICES ON 01/30/15 & 02/05/15 AND BY GOLDER ASSOCIATES ON 03/16/15 & 03/25/15. WATERS OF THE U.S. CONFIRMED BY THE USACE DURING JUNE 4, 2015 SITE VISIT.
4. 100 YEAR FLOOD PLAIN DELINEATION BASED ON FLOOD ELEVATION DATA REPRESENTED ON FEMA FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 51065C0260C, EFFECTIVE DATE: 05/16/2008.

CLOSURE BY REMOVAL NOTES

1. TOPOGRAPHY SHOWN WITHIN LIMITS OF THE EAST ASH POND REPRESENTS THE APPROXIMATE BOTTOM BASED ON HISTORIC DRAWINGS AND FIELD INFORMATION. FOR REFERENCE ONLY.
2. PHASED CLOSURE OF EAST ASH POND MAY BE SEQUENCED AS NECESSARY TO SUPPORT CONSTRUCTION AND MAY INCLUDE SUB-PHASES FOR REGULATORY APPROVAL TO SUPPORT ACCESS, SLOPE STABILITY, AND MINIMIZE CONTACT STORMWATER AREAS.
3. ANY AREA CERTIFIED AS ACHIEVING CLOSURE BY REMOVAL IS TO BE PROTECTED FROM CCR AND CONTACT STORMWATER, AND MAY BE FILLED AND/OR RESHAPED PRIOR TO ACHIEVING FINAL GRADES.
4. ACCUMULATED CCR SHALL BE REMOVED FROM SURFACES WITHIN THE POND LIMITS SUCH THAT NO CCR REMAINS VISIBLE.
5. FOLLOWING VISUAL-CLEAN CONDITIONS, OVER-EXCAVATE THE REMOVAL FOOTPRINT BY AT LEAST SIX INCHES.
6. VISUAL INSPECTION AND TARGETED SUBGRADE VISUAL SAMPLING TO BE OVERSEEN BY OWNER'S ENGINEER REPRESENTATIVE. SAMPLING TO BE PERFORMED AT A FREQUENCY OF AT LEAST ONE TEST PER ACRE. TARGETED SAMPLING TO CONSIST OF HAND-DUG HOLES AT LEAST SIX INCHES DEEP.
7. EXCAVATION OF SLOPES STEEPER THAN 2:1 SHALL BE SEQUENCED SUCH THAT THE SLOPES CAN BE EXCAVATED, INSPECTED, AND BACKFILLED IN THE SHORTEST TIME POSSIBLE. BACKFILL SLOPES WITH CLEAN SOIL FILL AT NO STEEPER THAN 2:1.
8. EXCAVATED CCR AND SOIL-CCR MIXTURES SHALL BE CONSOLIDATED IN NORTH ASH POND OR TAKEN TO AN OFF-SITE DISPOSAL FACILITY AS DIRECTED BY DOMINION.

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL: COMMONWEALTH OF VIRGINIA — AMIR E. TORKAMESCO — LICENSE NO. 0402020560 — 9-14-18 — PROFESSIONAL ENGINEER

CLIENT
DOMINION ENERGY
BREMO POWER STATION
FLUVANNA COUNTY, VIRGINIA

CONSULTANT
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www.golder.com

PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
EAST ASH POND
CLOSURE BY REMOVAL PLAN

PROJECT NO.
15-20347

REV. 1 — 7 of 9 — DRAWING CBR-7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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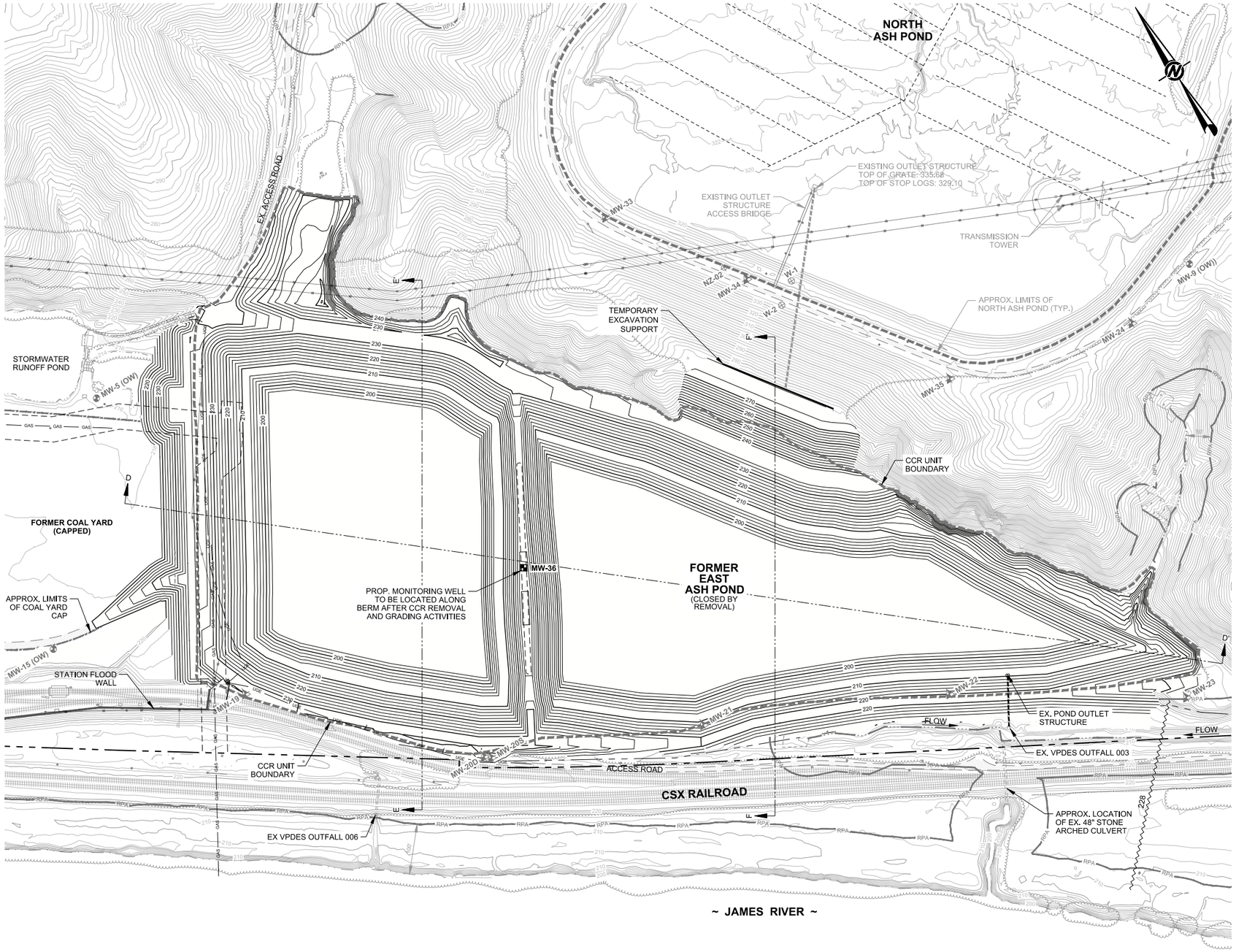

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- CCR UNIT BOUNDARY
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS) (FROM AERIAL SURVEY - SEE GENERAL NOTE 1a)
- CONCEPTUAL FINAL GRADE CONTOURS (2' INTERVALS)
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- WETLANDS
- CREEK/STREAM CENTERLINE
- LIMITS OF RIPARIAN PROTECTION AREA (PER FLUVANNA COUNTY ORDINANCE)
- APPROXIMATE EDGE OF SURFACE WATER
- BASE FLOOD ELEVATION (100-YEAR, SEE NOTE 4)
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD UTILITY LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING UNDERGROUND GAS LINE
- MW-22 — EXISTING MONITORING WELL LOCATION AND IDENTIFICATION (CCR RULE)
- MW-5 (OW) — EXISTING OBSERVATION WELL LOCATION AND IDENTIFICATION
- MW-36 — PROPOSED MONITORING WELL LOCATION AND IDENTIFICATION
- NZ-02 — EXISTING PIEZOMETER AND IDENTIFICATION
- MH — EXISTING MANHOLE

GENERAL NOTES

1. EXISTING CONDITIONS COMPILED FROM:
   a. AERIAL TOPOGRAPHIC SURVEY PREPARED BY McKENZIE SNYDER, INC., DATE OF AERIAL PHOTO: 1/16/15 [CONTROL PREPARED BY H&B SURVEYING & MAPPING (H&B)]
   b. BOUNDARY SURVEY PREPARED BY H&B SURVEYING AND MAPPING, LLC DATED 04/27/15.
2. SITE DATUM: NAD83 / NAVD88
3. WETLAND DELINEATION BY DOMINION ENVIRONMENTAL SERVICES ON 01/30/15 & 02/05/15 AND BY GOLDER ASSOCIATES ON 03/16/15 & 03/25/15. WATERS OF THE U.S. CONFIRMED BY THE USACE DURING JUNE 4, 2015 SITE VISIT.
4. 100 YEAR FLOOD PLAIN DELINEATION BASED ON FLOOD ELEVATION DATA REPRESENTED ON FEMA FLOOD INSURANCE RATE MAP (FIRM), MAP NUMBER 51065C0260C, EFFECTIVE DATE: 05/16/2008.

CONCEPTUAL FINAL GRADING NOTE

1. CONCEPTUAL FINAL GRADING IS SHOWN FOR REFERENCE ONLY AND IS SUBJECT TO CHANGE.

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL: COMMONWEALTH OF VIRGINIA — AMELIA DEL CONCHESCO — LICENSED PROFESSIONAL ENGINEER — 9-14-18

CLIENT
DOMINION ENERGY
BREMO POWER STATION
FLUVANNA COUNTY, VIRGINIA

CONSULTANT
GOLDER ASSOCIATES INC.
2108 WEST LABURNUM AVENUE
SUITE 200
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www.golder.com

PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
EAST ASH POND
CONCEPTUAL FINAL GRADING PLAN

PROJECT NO.
15-20347

REV. 1 — 8 of 9 — DRAWING CBR-8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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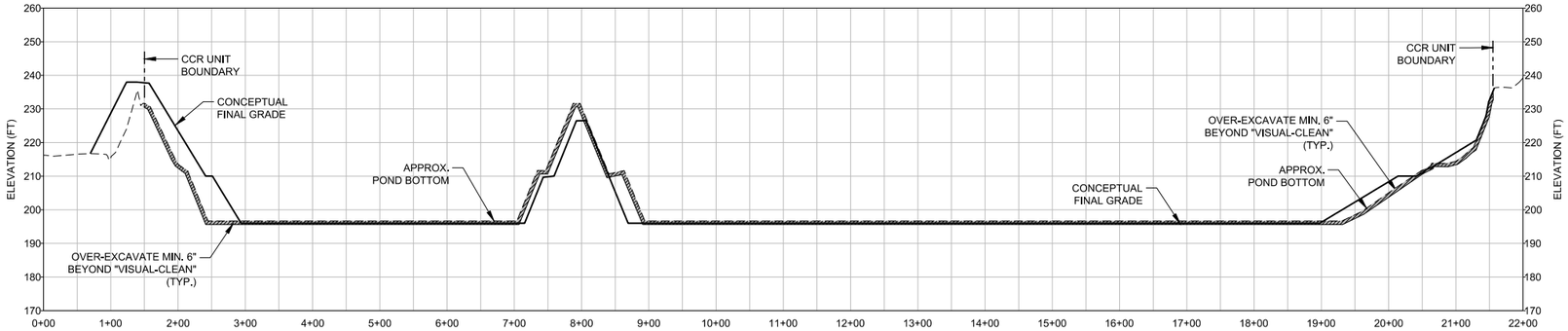

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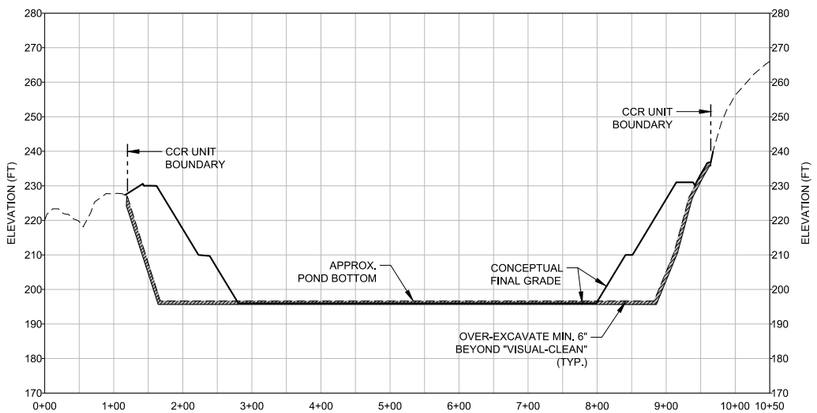
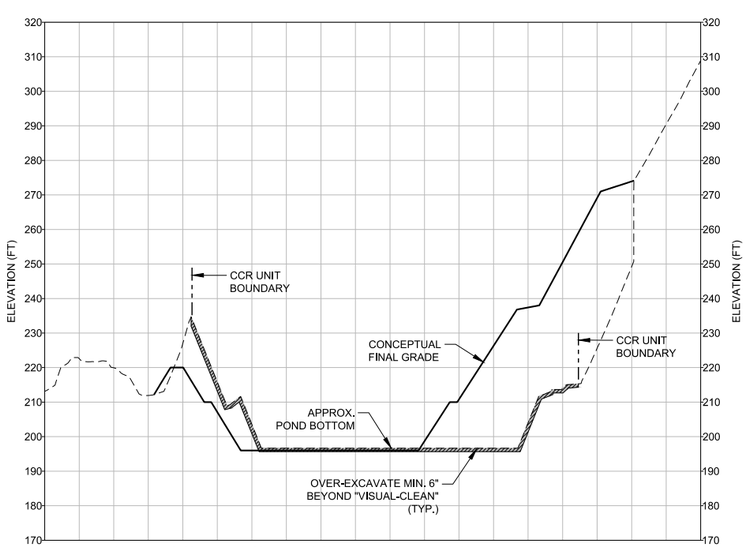


SECTION E - E'



SECTION F - F'

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
1	09/14/18	RESPONSE TO DEQ TR COMMENTS	JRD	BPG	DPM	JRD
0	05/07/18	ISSUED FOR PERMIT	JRD	BPG	DPM	JRD

SEAL

COMMONWEALTH OF VIRGINIA
AMBER DIRONESCO
LICENSE NO. 070260
9-14-18
PROFESSIONAL ENGINEER

CLIENT
DOMINION ENERGY
BREMO POWER STATION
FLUVANNA COUNTY, VIRGINIA

CONSULTANT
GOLDER ASSOCIATES INC.
2108 WEST LABURNUM AVENUE
SUITE 200
RICHMOND, VA 23227
(804) 358-7900
www.golder.com

GOLDER

PROJECT
CLOSURE BY REMOVAL PLAN
WEST ASH POND & EAST ASH POND
SOLID WASTE PERMIT No. 618

TITLE
EAST ASH POND
CROSS-SECTIONS

PROJECT NO.
15-20347

REV. 1

9 of 9

DRAWING
CBR-9

SCALE 100 0 100 200 FEET

SCALE 20 0 20 FEET

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

Path: G:\Plan Production Data Files\Drawing Data Files\15-20347QA\H - EAP and WAP Closure by Removal\Active Drawings\1520347QA_H09-09.dwg

Solid Waste Disposal Facility
Cost Estimate Form

Facility Name:	Bremo Power Station CCR Impoundments			Permit No. SWP	618
Address:	1038 Bremo Road				
City:	Bremo Bluff	State:	VA	Zip:	23022
FA Holder:	Dominion Energy Virginia				
Estimate Prepared By:	Golder Associates Inc.				

Indicate the plan versions for which this cost estimate was prepared, identifying the following information for each plan:

Closure Plan				**Post-Closure Care Plan**			
Title:	Surface Impoundment Closure Plan			Title:	n/a		
Plan Date:	September 2018	Approved:	June 2019	Plan Date:		Approved:	
Consultant:	Golder Associates Inc.			Consultant:			
Corrective Action Plan				**Corrective Action Monitoring Plan**			
Title:	n/a			Title:	n/a		
Plan Date:		Approved:		Plan Date:		Approved:	
Consultant:				Consultant:			

Cost Estimate Summary	
Total Closure Cost:	$6,769,565
Total Post-Closure Cost:	$10,342,500
Total Corrective Action Cost:	$0
TOTAL:	**$17,112,065**

References

Please indicate references used to develop this cost estimate: Unit costs were developed from closure construction bid estimates for Dominion's CCR impoundment facilities, estimates of soil prices in the coastal Virginia area, and other landfill closure bid packages in the consultant's local area.

Certification by Preparer:

This is to certify that the cost estimates pertaining to the engineering features and monitoring requirements of this solid waste management facility have been prepared by me and are representative of the design specified in the facility's approved Closure, Post-Closure and Corrective Action Plans. The estimate is based on the cost of hiring a third party and does not incorporate any salvage value that may be realized by the sale of wastes, facility structures, or equipment, land or other facility assets at the time of partial or final closure. In my professional judgment, the cost estimates are a true, correct, and complete representation of the financial liabilities for closure, post-closure care, and corrective action of the facility and comply with the requirements of 9 VAC 20-70 and all other DEQ rules and statutes of the Commonwealth of Virginia.

Name:	Ron DiFrancesco, P.E.	Signature:	
Title:	Principal and Practice Leader	Date:	7-31-19

Acknowledgement by Owner/Operator :

Name:	Robert W. Sauer	Signature:	Robert W. Sauer
Title:	Vice President System Operations	Date:	8/2/19

Bremo Power Station East Ash Pond Closure Estimate Worksheet

Excavation Components

				Calculation or Conversion	
I.	**Cover Removal**				
a.	Quantity of cover removal	0	yd3		
b.	Total cover removal unit cost	$0.00	/yd3		
	Total Cover Removal Cost			a x b	***$0***
II.	**Dewatering/Water Treatment/Testing Analysis**				
a.	Duration of dewatering/treatment/testing	0	months		
b.	Total dewatering/treatment/testing unit cost	$0.00	/month		
	Total Dewatering/Treatment/Testing Cost			a x b	***$0***
III.	**CCR Removal/Disposal**				
a.	Quantity of CCR removal	0	yd3		
b.	Total CCR removal unit cost	$0.00	/yd3		
c.	Total CCR off-site disposal unit cost	$0.00	/ton		
	Total CCR Removal/Disposal Cost			a x (b + c)	***$0***
IV.	**Overexcavation Removal/Disposal**				
a.	Quantity of overexcavation removal	0	yd3		
b.	Total overexcavation removal unit cost	$0.00	/yd3		
c.	Total overexcavation off-site disposal unit cost	$0.00	/ton		
	Total Overexcavation Cost			a x (b + (1.2c))	***$0***

Excavation Component Subtotal (I + II + III + IV): $0

Stabilization Components

V.	**Slope & Fill**				
a.	Quantity of soil needed	80,000	yd3		
b.	Total soil unit cost	$25.00	/yd3		
	Total Slope Backfill Cost			a x b	***$2,000,000***
VI.	**Vegetative Cover**				
a.	Area to be vegetated	27	acres		
b.	Vegetative cover unit cost	$3,250	/acre		
	Total Vegetative Cover Cost			a x b	***$87,750***
VII.	**Erosion/Sediment Control**				
a.	Duration of erosion/sediment control maintenance	6	months		
b.	Erosion/sediment control maintenance unit cost	$5,000.00	/month		
	Total Silt Fence Removal and Disposal Cost			a x b	***$30,000***

Stabilization Component Subtotal (V + VI + VII): $2,117,750

Miscellaneous Components

VIII. Groundwater Monitoring Well Installation

a.	Quantity of wells needed	1		
b.	Well installation unit cost	$50,000.00	/well	
	Total Groundwater Monitoring Well Installation Cost		a x b	***$50,000***

IX. Site Security

Gate or Barrier

a.	Number of gates required	1		
b.	Gate unit cost	$1,500.00	/gate	
c.	*Subtotal gate cost*		a x b	***$1,500***

Closed Sign

d.	Number of signs required	1		
e.	Sign unit cost	$1,250.00	/sign	
f.	*Subtotal sign cost*		d x e	***$1,250***
	Total site security cost		c + f	***$2,750***

X. Mobilization / Demobilization

a.	Cost for mobilization/demobilization	$265,000		
	Total mobilization/demobilization cost		TCC x 0.10	***$265,000***

Miscellaneous Component Subtotal (VIII + IX + X): $317,750

Closure Cost Subtotal (CCS):	(I + … + X)	$2,435,500
Contingency (10%):	CCS x 0.10	$243,550
Engineering & Documentation:		
Construction QA/QC		$200,000
Construction Engineering/Surveying/Permitting		$60,000
Total Engineering & Documentation Costs		***$260,000***
Total Closure Cost (TCC):	CCS + Contingency + Engineering	**$2,939,050**

Bremo Power Station East Ash Pond Post-Removal Estimate Worksheet

			Calculation or Conversion		
I. Groundwater Monitoring					
a. Total number of monitoring wells	10	wells			
b. Total number of sampling events/year	2	events/yr	a x b	20	samples/yr
c. Quantity of additional samples (e.g. QA/QC)	2	samples/event	b x c	4	samples/yr
d. Total samples per year			b + c	24	samples/yr
e. Analysis unit cost (Table 3.1 constituents)	$1,250.00	/sample			
f. *Total Analysis cost*			d x e	*$30,000.00*	/yr
g. GW Monitoring unit cost	$6,500.00	/event			
i. *Total sampling cost*			f + (g x b)	*$43,000.00*	/yr
j. Engineering fees & reports	$5,000	/yr			
Yearly Groundwater Monitoring Cost			i + j	***$48,000***	***/yr***
II. Area Maintenance & Repair					
a. Closure Area	27	acres			
Mowing & Fertilization					
b. Mowing frequency	2	visits/yr			
c. Mowing unit cost	$500.00	/acre/visit			
d. *Total mowing cost*			a x b x c	*$27,000*	/yr
e. Fertilizer frequency	1	visits/yr			
f. Fertilizer unit cost	$1,000.00	/acre/visit			
g. *Total fertilizer cost*			a x e x f	*$27,000*	/yr
Erosion & Repair					
h. Area to reseed/year			33% x a	9.0	acres
i. Reseeding unit cost	$1,200.00	/acre			
j. *Total reseeding cost*			h x i	*$10,800.00*	/yr
k. Area of erosion/year			10% x a	2.7	acres
l. Erosion repair unit cost	$2,500.00	/acre			
m. Mobilization/Demobilization	$500.00	/yr			
n. *Total cap erosion repair cost*			(k x l) + m	*$7,250*	/yr
Yearly Area Maintenance & Repair cost			d + g + j + n	***$72,050***	***/yr***
III. BMP Maintenance & Repair					
a. BMP cleanout frequency, 1 per	2	years	1 / a	0.50	event/yr
b. BMP cleanout unit cost	$75,000	/event			
c. Mobilization/Demobilization	$2,500	/event			
Yearly BMP Maintenance & Repair			a x (b + c)	***$38,750***	***/yr***
IV. General Inspections					
a. General Inspection unit cost	$2,000	/inspection			
b. Number of inspections per year	2				
Yearly General Inspection Cost			a x b	***$4,000***	***/yr***

V. Surface Water Monitoring

			Calculation or Conversion		
a.	Total number of monitoring locations	1	locations		
b.	Total number of sampling events/year	4	events/yr	a x b	4 samples/yr
c.	Quantity of additional samples (e.g. QA/QC)	0	samples/event	b x c	0 samples/yr
d.	Total samples per year			b + c	4 samples/yr
e.	Analysis unit cost	$1,250.00	/sample		
f.	*Total Analysis cost*			d x e	*$5,000.00* /yr
g.	Surface Water Monitoring unit cost	$2,500.00	/event		
i.	*Total sampling cost*			f + (g x b)	*$15,000.00* /yr
j.	Engineering fees & reports	$5,450	/yr		
	Yearly Surface Water Monitoring Cost			i + j	***$20,450 /yr***

Annual Post-Removal Care Cost (APRCC)			I + … + V	$183,250 /yr
Length of post-removal care (LPRC)	30	years		
Post-Removal Care Cost			(APRCC x LPRC)	$5,497,500
Total Post-Removal Care Cost				**$5,497,500**

Bremo Power Station West Ash Pond Closure Estimate Worksheet

Excavation Components

				Calculation or Conversion	
I.	**Cover Removal**				
a.	Quantity of cover removal	0	yd3		
b.	Total cover removal unit cost	$0.00	/yd3		
	Total Cover Removal Cost			a x b	***$0***
II.	**Dewatering/Water Treatment/Testing Analysis**				
a.	Duration of dewatering/treatment/testing	1	months		
b.	Total dewatering/treatment/testing unit cost	$2,000,000.00	/month		
	Total Dewatering/Treatment/Testing Cost			a x b	***$2,000,000***
III.	**CCR Removal/Disposal**				
a.	Quantity of CCR removal	0	yd3		
b.	Total CCR removal unit cost	$0.00	/yd3		
c.	Total CCR off-site disposal unit cost	$0.00	/ton		
	Total CCR Removal/Disposal Cost			a x (b + c)	***$0***
IV.	**Overexcavation Removal/Disposal**				
a.	Quantity of overexcavation removal	14,000	yd3		
b.	Total overexcavation removal unit cost	$20.00	/yd3		
c.	Total overexcavation off-site disposal unit cost	$100.00	/ton		
	Total Overexcavation Cost			a x (b + (1.2c))	***$282,400***

Excavation Component Subtotal (I + II + III + IV): $2,282,400

Stabilization Components

V.	**Slope & Fill**				
a.	Quantity of soil earthworks	80,000	yd3		
b.	Total soil earthworks unit cost	$6.50	/yd3		
	Total Slope Backfill Cost			a x b	***$520,000***
VI.	**Vegetative Cover**				
a.	Area to be vegetated	18	acres		
b.	Vegetative cover unit cost	$3,250	/acre		
	Total Vegetative Cover Cost			a x b	***$58,500***
VII.	**Erosion/Sediment Control**				
a.	Duration of erosion/sediment control maintenance	6	months		
b.	Erosion/sediment control maintenance unit cost	$5,000.00	/month		
	Total Silt Fence Removal and Disposal Cost			a x b	***$30,000***

Stabilization Component Subtotal (V + VI + VII): $608,500

Miscellaneous Components

VIII. Groundwater Monitoring Well Installation

a.	Quantity of wells needed	1		
b.	Well installation unit cost	$50,000.00	/well	
	Total Groundwater Monitoring Well Installation Cost		a x b	***$50,000***

IX. Site Security

Gate or Barrier

a.	Number of gates required	1		
b.	Gate unit cost	$1,500.00	/gate	
c.	*Subtotal gate cost*		a x b	***$1,500***

Closed Sign

d.	Number of signs required	1		
e.	Sign unit cost	$1,250.00	/sign	
f.	*Subtotal sign cost*		d x e	***$1,250***
	Total site security cost		c + f	***$2,750***

X. Mobilization / Demobilization

a.	Cost for mobilization/demobilization	$345,000		
	Total mobilization/demobilization cost		TCC x 0.10	***$345,000***

Miscellaneous Component Subtotal (VIII + IX + X): $397,750

Closure Cost Subtotal (CCS):	(I + … + X)	$3,288,650
Contingency (10%):	CCS x 0.10	$328,865
Engineering & Documentation:		
Construction QA/QC		$170,000
Construction Engineering/Surveying/Permitting		$43,000
Total Engineering & Documentation Costs		***$213,000***
Total Closure Cost (TCC):	CCS + Contingency + Engineering	**$3,830,515**

Bremo Power Station West Ash Pond Post-Removal Estimate Worksheet

			Calculation or Conversion		
I. Groundwater Monitoring					
a. Total number of monitoring wells	11	wells			
b. Total number of sampling events/year	2	events/yr	a x b	22	samples/yr
c. Quantity of additional samples (e.g. QA/QC)	2	samples/event	b x c	4	samples/yr
d. Total samples per year			b + c	26	samples/yr
e. Analysis unit cost (Table 3.1 constituents)	$1,250.00	/sample			
f. *Total Analysis cost*			d x e	*$32,500.00*	/yr
g. GW Monitoring unit cost	$7,250.00	/event			
i. *Total sampling cost*			f + (g x b)	*$47,000.00*	/yr
j. Engineering fees & reports	$5,000	/yr			
Yearly Groundwater Monitoring Cost			i + j	***$52,000***	***/yr***
II. Area Maintenance & Repair					
a. Closure Area	22	acres			
Mowing & Fertilization					
b. Mowing frequency	2	visits/yr			
c. Mowing unit cost	$500.00	/acre/visit			
d. *Total mowing cost*			a x b x c	*$22,000*	/yr
e. Fertilizer frequency	1	visits/yr			
f. Fertilizer unit cost	$1,000.00	/acre/visit			
g. *Total fertilizer cost*			a x e x f	*$22,000*	/yr
Erosion & Repair					
h. Area to reseed/year			33% x a	7.3	acres
i. Reseeding unit cost	$1,200.00	/acre			
j. *Total reseeding cost*			h x i	*$8,800.00*	/yr
k. Area of erosion/year			10% x a	2.2	acres
l. Erosion repair unit cost	$2,500.00	/acre			
m. Mobilization/Demobilization	$500.00	/yr			
n. *Total cap erosion repair cost*			(k x l) + m	*$6,000*	/yr
Yearly Area Maintenance & Repair cost			d + g + j + n	***$58,800***	***/yr***
III. BMP Maintenance & Repair					
a. BMP cleanout frequency, 1 per	2	years	1 / a	0.50	event/yr
b. BMP cleanout unit cost	$50,000	/event			
c. Mobilization/Demobilization	$2,500	/event			
Yearly BMP Maintenance & Repair			a x (b + c)	***$26,250***	***/yr***
IV. General Inspections					
a. General Inspection unit cost	$2,000	/inspection			
b. Number of inspections per year	2				
Yearly General Inspection Cost			a x b	***$4,000***	***/yr***

V. Surface Water Monitoring

			Calculation or Conversion		
a.	Total number of monitoring locations	1	locations		
b.	Total number of sampling events/year	4	events/yr	a x b	4 samples/yr
c.	Quantity of additional samples (e.g. QA/QC)	0	samples/event	b x c	0 samples/yr
d.	Total samples per year			b + c	4 samples/yr
e.	Analysis unit cost	$1,250.00	/sample		
f.	*Total Analysis cost*			d x e	*$5,000.00* /yr
g.	Surface Water Monitoring unit cost	$2,500.00	/event		
i.	*Total sampling cost*			f + (g x b)	*$15,000.00* /yr
j.	Engineering fees & reports	$5,450	/yr		
	Yearly Surface Water Monitoring Cost			i + j	***$20,450 /yr***

Annual Post-Removal Care Cost (APRCC)			I + … + V	$161,500 /yr
Length of post-removal care (LPRC)	30	years		
Post-Removal Care Cost			(APRCC x LPRC)	$4,845,000
Total Post-Removal Care Cost				**$4,845,000**

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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