INITIAL STRUCTURAL STABILITY ASSESSMENT

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Bremo Power Station CCR Surface Impoundment: West Ash Pond

Submitted To: Bremo Power Station
1038 Bremo Bluff Road
Bremo Bluff, VA 23022

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

April 2018 **Project No. 15-20347**

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1.0 CERTIFICATION

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

On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Virginia that this document has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances, at the same time, and in the same locale. It is my professional opinion that the document was prepared consistent with the requirements in §257.73(d) of the United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," published in the Federal Register on April 17, 2015, with an effective date of October 19, 2015 [40 CFR §257.73(d)], as well as with the requirements in §257.100 resulting from the EPA's "Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Extension of Compliance Deadlines for Certain Inactive Surface Impoundments; Response to Partial Vacatur" published in the Federal Register on August 5, 2016 with an effective date of October 4, 2016 (40 CFR §257.100).

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

Daniel McGrath	Associate and Senior Consultant
Print Name	Title
Daniel McGrath	4/13/18
Signature	Date

2.0 INTRODUCTION

This Initial Structural Stability Assessment was prepared for the Bremo Power Station's (Station) inactive Coal Combustion Residuals (CCR) surface impoundment, the West Ash Pond (WAP). 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 Fluvanna County at 1038 Bremo Road, east of Route 15 (James Madison Highway) and north of the James River. The Station includes an inactive CCR surface impoundment, the WAP, as defined by the Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule and Direct Final Rule (40 CFR §257; the CCR rule). All elevations noted in this report are in feet relative to the North American Vertical Datum of 1988 (NAVD-88).

3.0 STRUCTURAL STABILITY

3.1 Foundation and Abutments

The Station lies on an alluvial terrace in a geologically stable area with no active (Holocene) faults, karst (limestone, dolomite, or marble) potential, or other geologic conditions of concern. The WAP was constructed on the natural, alluvial soils, generally consisting of clayey silts and locally exposed underlying gravel channels or residual materials. The WAP embankments were constructed of mostly alluvial soils excavated from within the footprint of the pond. Material properties within the WAP abutments were interpreted based on subsurface data and site reconnaissance taken from previous Golder investigations, analyses, and reports included in Golder's March 2017 Virginia Department of Conservation and Recreation (DCR) Impounding Structure Geotechnical Design Report Supporting Documents (Golder 2017), and are presented in Table 1 below.

Table 1: Summary of Geotechnical Strength Properties

Material	Total Unit Weight (pound per cubic foot, pcf)	Strength Properties		
		Peak φ' (°)	Cohesion (pound per square foot, psf)	Su (ton per square foot, tsf)
Dike Fill Soils	125	> 214 ft-msl: 31 < 214 ft-msl: 28	50	1.5
Alluvium	115	28	50	depth < 75 ft-bgs: 1.0 depth > 75 ft-bgs: 1.75

3.2 Slope Protection

The WAP dike slopes are approximately 2 horizontal to 1 vertical (2H:1V), except for a short segment on the southeast, which is slightly steeper. The vegetation on the dike is maintained to prevent brush, trees, clumping of weeds, etc. that would concentrate flow and lead to the development of erosion rills.

No significant indications of instability or erosion issues with the WAP dikes were noted during Golder's initial geotechnical investigation in March 2015. In August 2017, following the excavation of CCR from the WAP, small tension cracks developed parallel to the embankment in at least three locations. These identified cracks have been evaluated by a licensed professional engineer and marked for continued observation. No failures have resulted from the cracking, and their condition is observed and documented during the weekly inspections.

3.3 Compaction of Dikes

The following tables summarize the primary geotechnical laboratory results and basic cone penetrometer testing (CPT)-based interpretations (Table 2), and secondary laboratory data (Table 3) from the WAP dike laboratory soil tests and CPTs completed during the 2015 geotechnical exploration program.

Table 2: Summary of Primary Geotechnical Testing Data for the WAP Dike Soil Fills

Property	Number of Tests	Minimum	Maximum	Average	Median
Depth Range *(ft)*	-	9.5	34.5	22.3	22.9
Water Content *(%)*	6	22	26	24	23
Gravel (> 4.75 millimeters) *(%)*	2	0	0	0	0
Sand *(%)*	2	11	32	21	21
Fines (< 0.075 millimeters) *(%)*	4	59	90	75	75
Specific Gravity	1	2.72	2.72	2.72	2.72
Liquid Limit (LL) *(%)*	5	28	41	34	35
Plastic Limit (PL) *(%)*	5	19	25	22	23
Plasticity Index (PI)	5	8	17	11	11
Non-Plastic Results	0	0 of 5			

Table 3: Summary of Secondary Geotechnical Data for the WAP Dike Soil Fills

Property		Number of Points	Minimum	Maximum	Average	Median
Drilling	Standard Penetration Test (SPT) N *(blows per foot, bpf)*	17	4	25	11	9
CPT Based	*Peak φ' (°)*	1213	26.0	47.5	34.8	34.3
	Su *(tsf)*		0.4	4.7	1.7	1.7
	SPT N_{60} *(bpf)*		3	23	10	10
	Normalized CPT Tip Resistance *(Qtn)*		5.8	520.0	58.3	33.1

Embankment fills in the WAP dikes generally consist of low-plasticity fines (CL and ML) with increasing amounts of sand with fines (SM and SC). The WAP dikes were generally observed to contain well compacted materials. The structural integrity and water levels within the WAP embankment fills showed good compaction and behavior in line with the visual observations of good performance.

3.4 Spillways

The WAP's primary spillway, an intake tower and 42-inch diameter corrugated metal pipe, regulated the WAP pool elevation prior to closure activities. The intake tower, in the southeast corner of the impoundment area at approximately 30 feet in height, is constructed of concrete and regulated by wooden baffles (stop logs). Water formerly exited the outlet tower structure through the 42-inch diameter pipe, which extends under the WAP dike to a manhole and ultimately through a permitted outfall. In mid-2016, the WAP was dewatered for closure activities and water has not overtopped the stop logs since that time.

As shown in the April 2018 Inflow Design Flood Control System Plan for the WAP, the structure has adequate capacity to store the flow from the 1,000-year storm event. The analysis of the spillway capacity is included in the April 2018 Inflow Design Flood Control System Plan for the WAP. Accumulated surface water within the WAP is routed to the Centralized Source Water Treatment System for treatment prior to discharge.

3.5 Hydraulic Structures

The primary spillway passes under the dike of the WAP. The primary spillway is a 42-inch diameter pipe connected to a concrete riser structure that is anchored within the footprint of the pond. There is no record or knowledge of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris associated with the primary spillway. In accordance with 40 CFR §257.83, the hydraulic structure will be monitored and inspected periodically for clogging, leaks, erosion around the pipe, movements, or other issues.

3.6 Inundation of Slopes

The WAP dike is located approximately 280 feet north of the James River. The elevation of the toe of the dike is approximately elevation 216 and the top of the dike is elevation 234. The mapped 100-year flood Zone AE elevation is approximately 230 feet, so significant inundation of the exterior slopes of the WAP can be expected during a 100-year flood event in the James River. Golder's evaluation of slope stability under rapid drawdown conditions after a 100-year flood event shows the embankments exhibit satisfactory factors of safety. For more details on the rapid drawdown analysis, please refer to the Rapid Drawdown Methodology Package (Appendix A).

4.0 CONCLUSIONS

Based upon a review of available information and the additional analyses performed for this and other assessments, areas of the WAP dikes require regrading to ensure global stability. The WAP will be closed by removal of CCR materials. Following the removal of CCR, the remaining existing perimeter dikes will be regraded to improve stability.

It is Golder's opinion that the surface impoundment design, construction, operations, and maintenance procedures are consistent with good engineering practices, and meets the requirements of 40 CFR 257.73(d).

APPENDIX A

Rapid Drawdown Methodology Package

Date:	April 2018	**Made by:**	G. Martin
Project No.:	15-20347	**Checked by:**	L. Jin
Subject:	Rapid Drawdown Methodology Package	**Reviewed by:**	G. Hebeler
Project Title:	**BREMO POWER STATION – WEST ASH POND**		

1.0 INTRODUCTION

This document describes the methodology Golder used to evaluate the stability of West Ash Pond (WAP) dike slopes under rapid drawdown conditions at Dominion Energy's Bremo Power Station.

Rapid drawdown takes place when free water outside a slope draws down quickly such that the pore pressure in the slope does not have sufficient time to dissipate. The water level drop removes a stabilizing force outside the slope and reduces the stability factor of safety from steady-state conditions.

2.0 METHODOLOGY AND ASSUMPTIONS

Golder used the design procedures and criteria described in the Engineer Manual (EM) 1110-2-1902 from the United States Army Corps of Engineers (USACE, 2003) to evaluate stability under rapid drawdown conditions. For the conditions considered in this package, the USACE lists a minimum target factor of safety of 1.1. Thus, a minimum target factor of safety of 1.1 was adopted for this analysis.

Additionally, the following has been assumed for this analysis:

- The slope is subject to an elevated water level long enough to become saturated
- Drawdown from the elevated water level is rapid
- No drainage occurs out of the slope when the water level drops

USACE lists two methods for performing rapid drawdown analysis but identifies one as the recommended method. Golder used the recommended method for analysis which was developed by Lowe and Karafiath (1959) and later modified by Wright and Duncan (1987) and by Duncan, Wright, and Wong (1990). These procedures are described in whole in the book *Soil Strength and Slope Stability* (Duncan et al. 2014). Golder used the computer program SLIDE's built-in rapid drawdown tool which includes the reference method (Rockscience 2018).

Factors of safety were calculated using the general limit equilibrium (GLE) method developed by Morgenstern and Price (Abramson et al. 2002). The factor of safety is calculated by dividing the resisting forces by the driving forces along the critical slip surface.

The rapid drawdown method differs from steady-state stability analyses in the application of material strengths. The rapid drawdown method uses two strength envelopes.

The first strength envelope represents the isotropic consolidation condition where the stress ratio is one (Kc = 1) and is determined from isotropically consolidated-undrained triaxial shear tests by plotting the undrained shear strength (τ_{ff}) versus the effective stress on the failure plane at consolidation (σ'_{fc}). The slope and intercept of the shear strength envelope are $\psi_{Kc=1}$ and $d_{Kc=1}$ as shown below in Figure 1.

The second strength envelope used in rapid drawdown analysis represents the effective shear strength at on the maximum effective principal stress ratio (Kc = $K_{failure}$ = K_f). The slope and intercept of the strength envelope are the defined by the effective friction angle (ϕ') and the effective cohesion (c') determined from isotropically consolidated-undrained triaxial shear tests as shown in Figure 2.

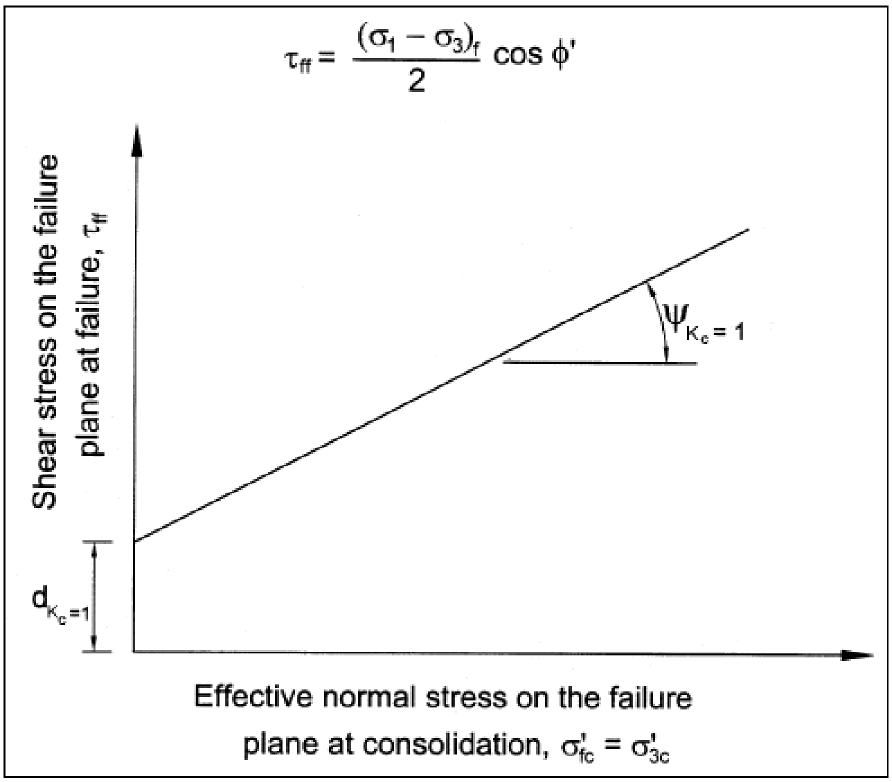


Figure 1. Estimation of Undrained Shear Strength Kc = 1

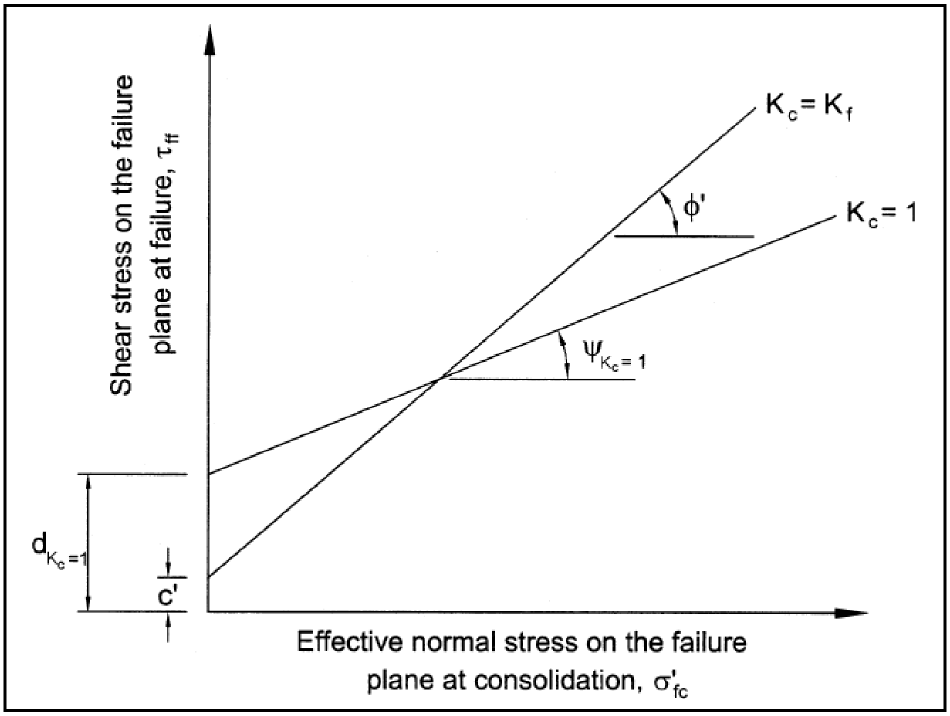


Figure 2. Shear Strength Envelopes for Rapid Drawdown Computations

3.0 SITE-SPECIFIC ANALYSIS

Based on the geotechnical exploration at the site, the East Ash Pond (EAP) and WAP dikes at Bremo Power Station are composed of alluvial soils excavated from the interior portions of the ponds. These materials are primarily described as a mix of fine sandy silt and sandy clay (ML and CL) and silty fine sand (SM) (Golder 2016).

3.1 Shear Strength of Embankment Fill

For the rapid drawdown analysis, results from isotropically consolidated undrained triaxial compression tests (CIU) are needed to develop the two strength envelopes described above. Two samples of EAP dike fill material and one sample of WAP dike fill material were subjected to such testing (summarized in the below table).

Table 1: Summary of Dike Sample Subject to CIU Testing

Sample ID	Sample Depth (ft)	Pond	USCS	Liquid Limit	Plasticity Index	Fines Content (%)
WB-01 UD-01	20.6 – 21.9	WAP	ML	36	11	90
GB-2 UD-01	8 – 10	EAP	CL	38	13	82
GB-3 UD-01	16 - 18	EAP	CL-ML	19	4	51

Data from the samples have been synthesized to estimate the shear strength envelopes of the dike under rapid drawdown conditions since the material for the dikes was obtained from the site and belongs to the same general soil unit. Table 2 lists the results of the triaxial tests and the calculated stresses.

Table 2: Summary of CIU Triaxial Results

Sample ID	σ'_{fc} (psi)	σ_{1f} (psi)	σ_{3f} (psi)	u_f (psi)	σ'_{1f} (psi)	σ'_{3f} (psi)	ϕ' (deg)	σ'_f (psi)	τ_{ff} (psi)
WB-1 UD-1	7.4	16.481	7.4	3.660	12.821	3.740	33.3	5.791	3.797
	14.8	31.806	14.8	6.592	25.214	8.208	30.6	12.384	7.320
	29.6	69.222	29.6	8.926	60.296	20.674	29.3	30.791	17.277
GB-2 UD-01	4.0	15.405	4.0	1.329	14.076	2.671	42.9	4.490	4.176
	8.0	19.835	8.0	3.840	15.995	4.160	36.0	6.603	4.790
	16.0	38.850	16.0	6.490	32.360	9.510	33.1	14.700	9.574
GB-3 UD-01	7.0	17.038	7.0	3.008	14.030	3.992	33.8	6.215	4.168
	15.0	28.801	15.0	5.984	22.817	9.016	25.7	12.925	6.218
	30.0	59.343	30.0	13.378	45.966	16.622	28.0	24.415	12.959

Strength envelopes were developed for the undrained ($K_c = 1$) condition and the effective strength condition ($K_c = K_f$) by fitting lines to the data as shown in Figure 3 and 4, respectively.

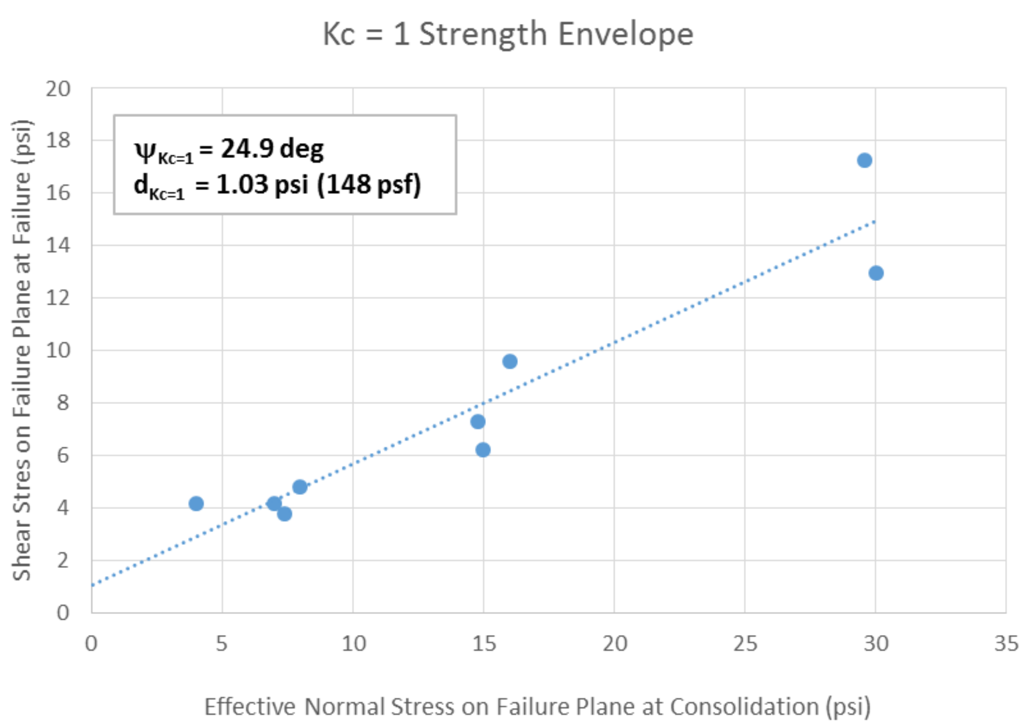


Figure 3. $K_c = 1$ Shear Strength Envelope for Rapid Drawdown Computations

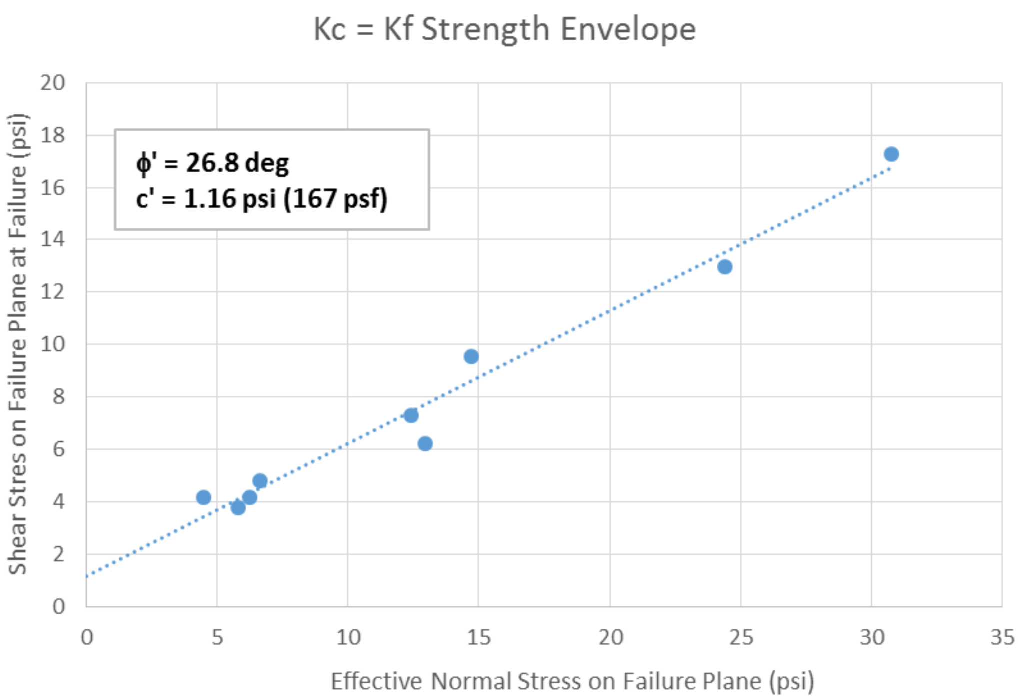


Figure 4. $K_c = K_f$ Shear Strength Envelope for Rapid Drawdown Computations

3.2 Water Levels

The initial (pre-drawdown) water level was set at 228.2 ft-msl which corresponds to the 100-yr flood event. Golder assumed that the rapid drawdown condition would occur until the water level reached the toe of the dike.

4.0 CONCLUSIONS

Using the process described above, Golder evaluated the stability of the WAP dikes under rapid drawdown conditions resulting from the site 100-year flood event. The table below presents the results of the analysis of the dikes surrounding the WAP. For all section analyzed, the calculated factors of safety meet or are in excess of those required. The detailed stability result figures are available in the pages following this text.

Table 1. Rapid Drawdown Analysis Results

Cross-Sections	Factor of Safety
A-A (East)	1.2
B-B (North)	1.3
B-B (South)	1.2
C-C (North)	1.3
C-C (South)	1.1

5.0 REFERENCES

Abramson, L.W., Lee, T.S., Sharma, S., and Boyce, G.M. (2002) Slope Stability and Stabilization Methods, 2nd Edition, John Wiley & Sons, Inc.

Duncan, J.M., Wright, S.G., and Brandon, T. L. (2014) Soil Strength and Slope Stability 2nd Ed., John Wiley & Sons, Inc., Hoboken, NJ.

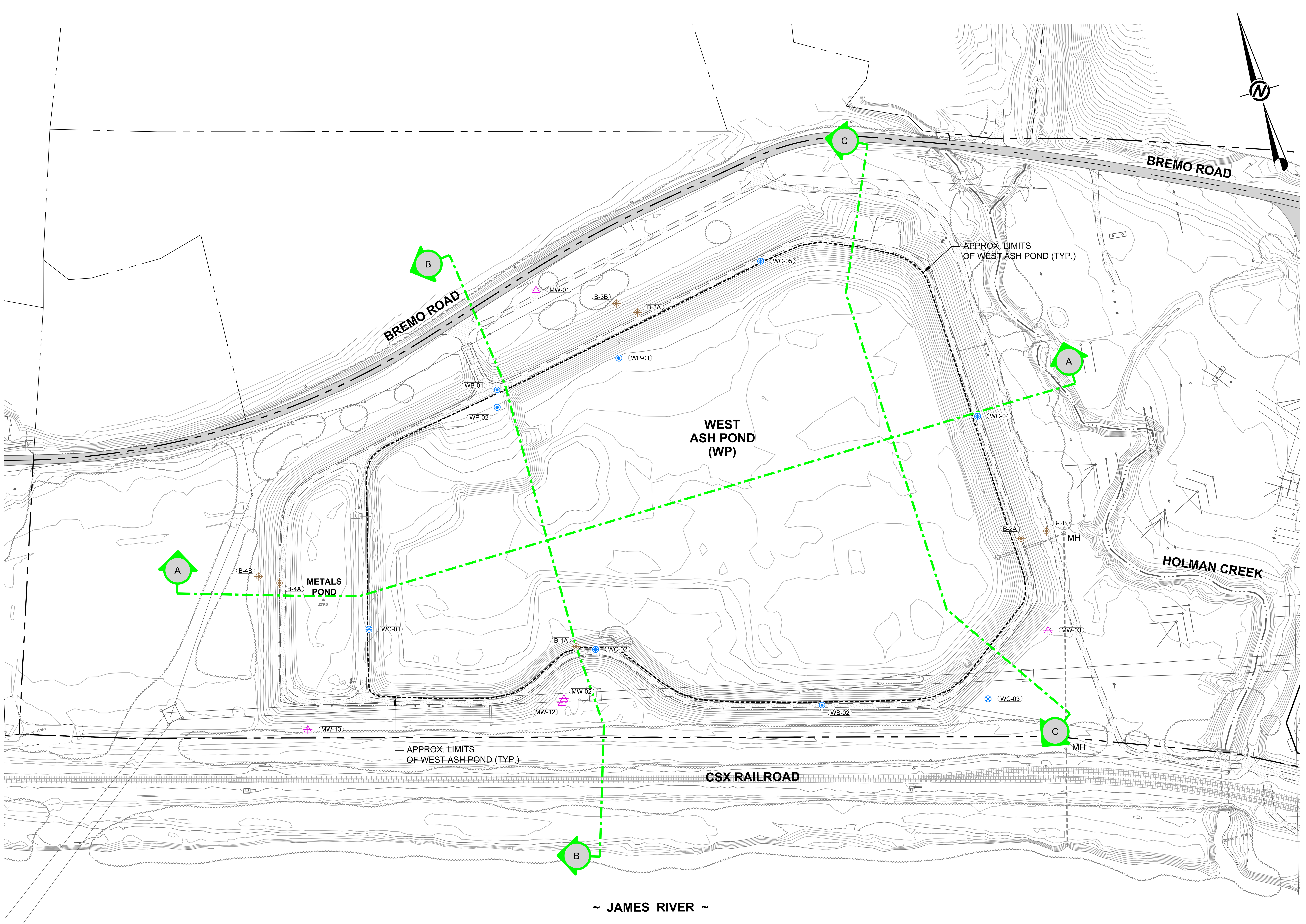
Duncan, J.M., Wright, S.G., and Wong, K.S. (1990) "Slope Stability During Rapid Drawdown," H. Bolton Seed Symposium, Vol. 2, University of California at Berkeley, pp. 253-272.

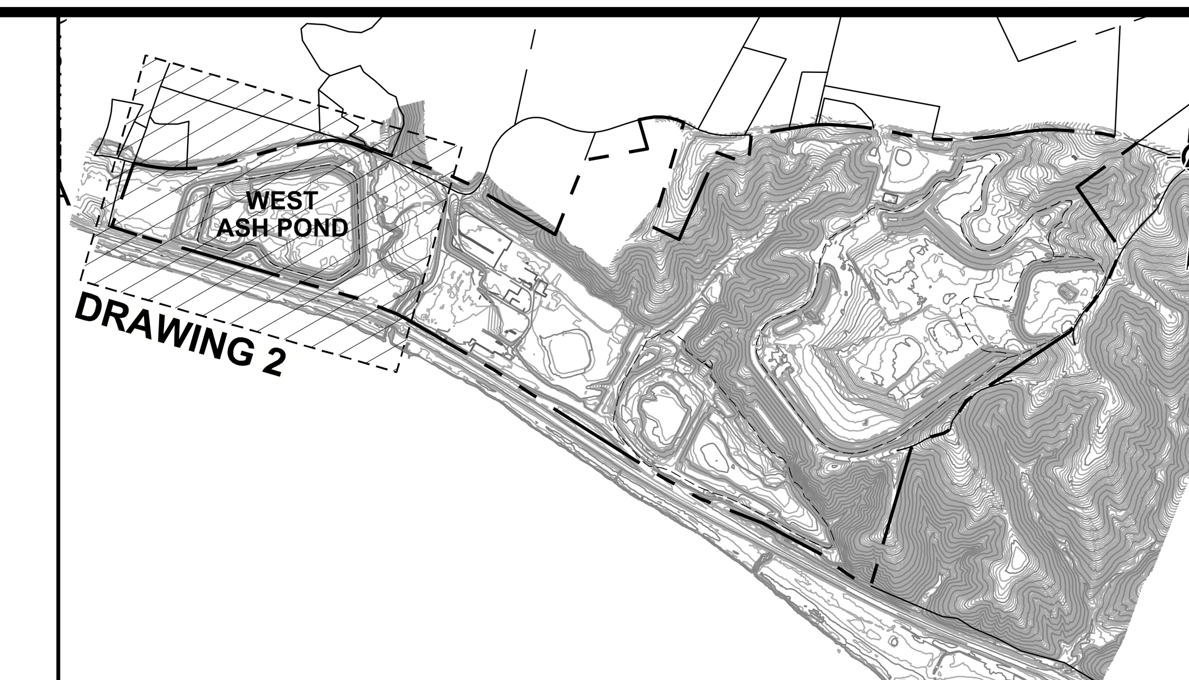
Lowe, J., and Karafiath, L. (1959). “Stability of earth dams upon drawdown,” Proceedings, First PanAmerican Conference on Soil Mechanics and Foundation Engineering, Mexico City, Vol. 2, pp. 537–552.

Rockscience (2018) SLIDE version 7.031 (64-bit)

U.S. Army Corps of Engineers (2003) Engineering and Design - Slope Stability, Engineer Manual EM 1110-2-1902, Department of the U.S. Army, Office of the Chief Engineer, Washington, D.C.

Wright, S. G., and Duncan, J. M. (1987). An Examination of Slope Stability Computation Procedures for Sudden Drawdown, Miscellaneous Paper GL-87-25, Geotechnical Laboratory, U. S. Army Waterways Experiment Station, Vicksburg, MI, Sept.





SITE KEY

NOT TO SCALE

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF EXISTING ASH PONDS
- 300 EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS)
- 220 DESIGN SURFACE CONTOURS (2' INTERVALS)
- EXISTING PAVED ROAD
- EXISTING RAILROAD
- CREEK CENTERLINE
- EXISTING FENCE
- Obscure Area — DENOTES AREAS OF TOPOGRAPHY THAT DO NOT MEET MINIMUM ACCURACY STANDARDS FOR AERIAL SURVEYING
- GES MONITORING WELL (2013)
- HALEY AND ALDRICH BORING (2015)
- GOLDER BORING
- GOLDER PIEZOMETER
- GOLDER CONE PENETRATION TEST (CPT)
- GOLDER PROBE HOLE
- GOLDER HAND AUGER
- SLOPE STABILITY SECTIONS
- SLOPE STABILITY DRAWING LOCATIONS - SEE APPENDIX D

REFERENCES

1. TOPOGRAPHY DERIVED FROM THE MONTHLY EXCAVATION SURVEY PREPARED BY H&B SURVEYING AND MAPPING LLC., COLLECTED ON JANUARY 31, 2018.

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SCALE FEET

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
1	01/04/17	ADDED 2016 TOPO; UPDATED DESIGN GRADES, NOTATION, SECTION LOCATIONS	-	SEP	JGM	GLH

PROJECT

DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE

INACTIVE POND DEMONSTRATION GEOTECHNICAL PLAN (WEST POND)

Golder Associates

PROJECT No.		15-20347
DESIGN	LJ	03/05/2018
CADD	RMS	03/05/2018
CHECK	JGM	03/05/2018
REVIEW	GLH	03/05/2018

FILE No. 1520347AD00-02 INACTIVE POND DEMON
SCALE AS SHOWN

1

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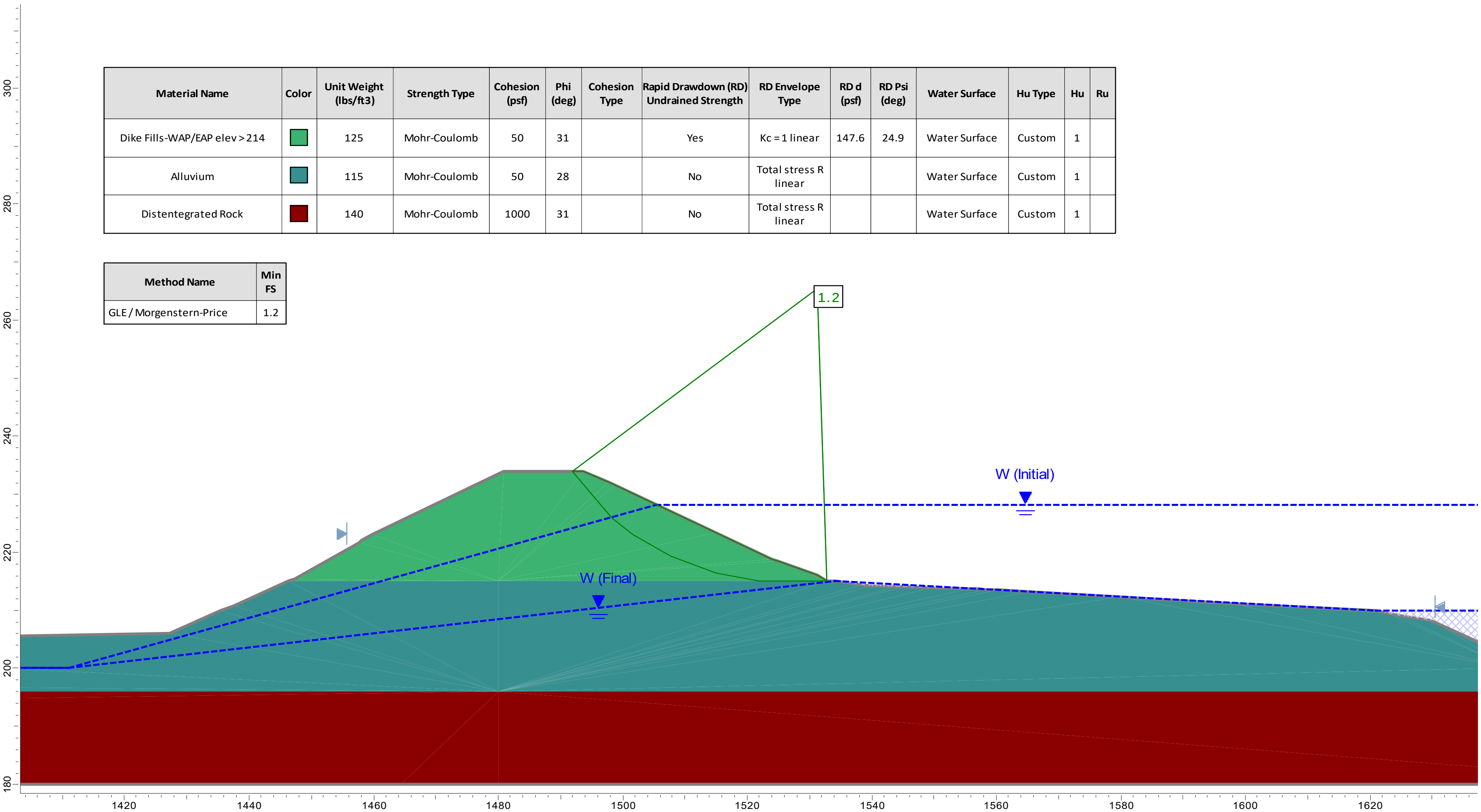
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Rapid Drawdown (RD) Undrained Strength	RD Envelope Type	RD d (psf)	RD Psi (deg)	Water Surface	Hu Type	Hu	Ru
Dike Fills-WAP/EAP elev>214		125	Mohr-Coulomb	50	31		Yes	Kc=1 linear	147.6	24.9	Water Surface	Custom	1	
Alluvium		115	Mohr-Coulomb	50	28		No	Total stress R linear			Water Surface	Custom	1	
Distentegrated Rock		140	Mohr-Coulomb	1000	31		No	Total stress R linear			Water Surface	Custom	1	

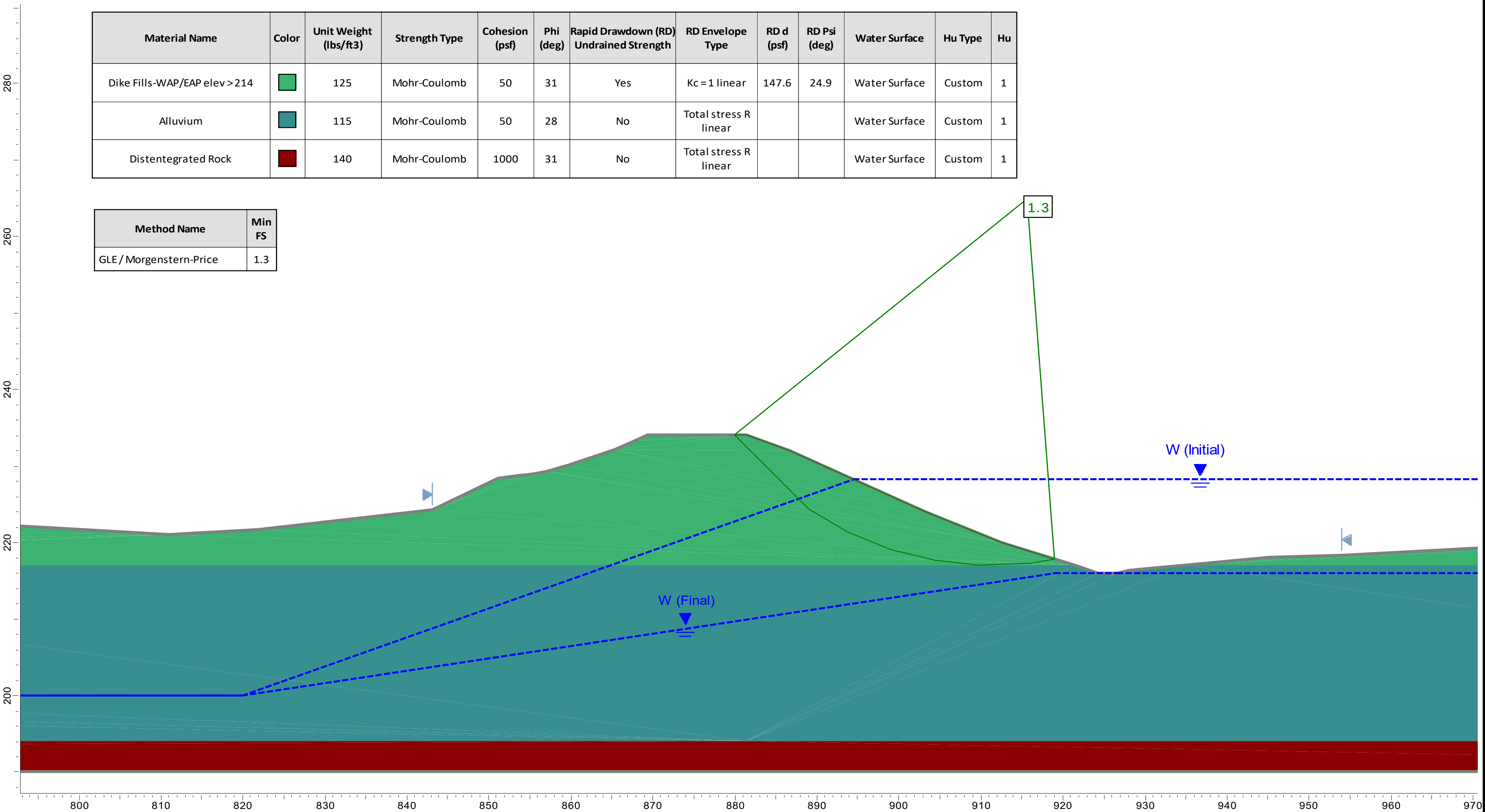
Method Name	Min FS
GLE / Morgenstern-Price	1.2



Golder Associates	SCALE: AS SHOWN	PROJECT	Bremo West Pond - Inactive Pond Demonstration
	DATE: Mar 2018	TITLE	Section A-A (East) Rapid Drawdown
	MADE BY: LJ		
	CAD: -		
FILE: STABILITY	CHECK: JGM	CLIENT: Dominion Energy	FIGURE: 2(d)
PROJECT No. 1520347 / REV. 0	REVIEW: GLH		

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Envelope Type	RD d (psf)	RD Psi (deg)	Water Surface	Hu Type	Hu
Dike Fills-WAP/EAP elev > 214		125	Mohr-Coulomb	50	31	Yes	Kc = 1 linear	147.6	24.9	Water Surface	Custom	1
Alluvium		115	Mohr-Coulomb	50	28	No	Total stress R linear			Water Surface	Custom	1
Distentegrated Rock		140	Mohr-Coulomb	1000	31	No	Total stress R linear			Water Surface	Custom	1

Method Name	Min FS
GLE / Morgenstern-Price	1.3



Golder Associates

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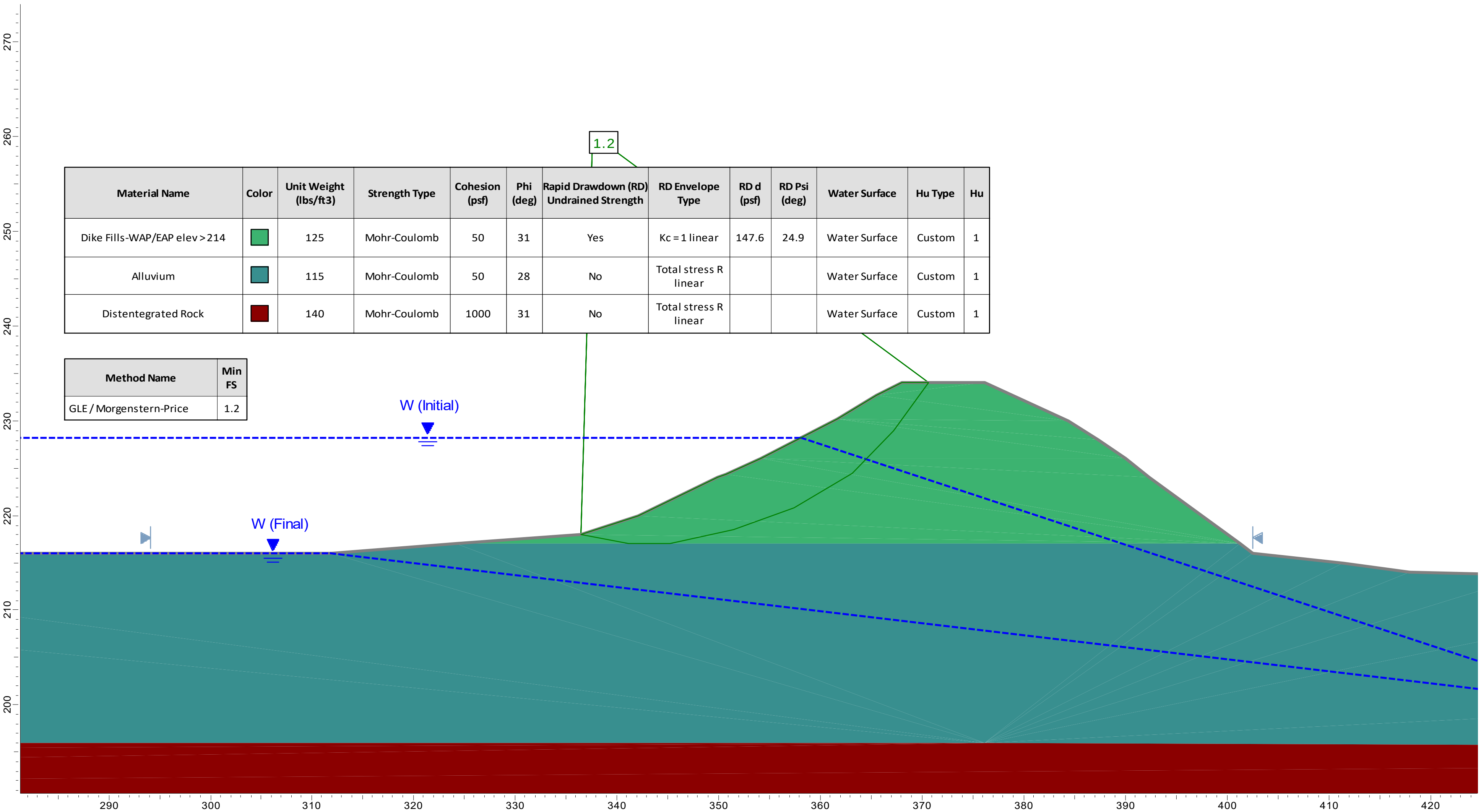
DATE	Mar 2018	TITLE	Section B-B (North) Rapid Drawdown
MADE BY	LJ		
CAD	-		
CHECK	JGM	CLIENT	Dominion Energy
REVIEW	GLH	FIGURE	3(d)

FILE STABILITY

PROJECT No. 1520347 REV. 0

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Envelope Type	RD d (psf)	RD Psi (deg)	Water Surface	Hu Type	Hu
Dike Fills-WAP/EAP elev>214		125	Mohr-Coulomb	50	31	Yes	Kc=1 linear	147.6	24.9	Water Surface	Custom	1
Alluvium		115	Mohr-Coulomb	50	28	No	Total stress R linear			Water Surface	Custom	1
Distentegrated Rock		140	Mohr-Coulomb	1000	31	No	Total stress R linear			Water Surface	Custom	1

Method Name	Min FS
GLE / Morgenstern-Price	1.2



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CAD	-
CHECK	JGM
REVIEW	GLH
FILE	STABILITY
PROJECT No.	1520347
REV.	0

PROJECT **Bremo West Pond - Inactive Pond Demonstration**

TITLE

Section B-B (South)
Rapid Drawdown

CLIENT **Dominion Energy**

FIGURE **4(d)**

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Envelope Type	RD d (psf)	RD Psi (deg)	Water Surface	Hu Type	Hu
Dike Fills-WAP/EAP elev > 214		125	Mohr-Coulomb	50	31	Yes	Kc = 1 linear	147.6	24.9	Water Surface	Custom	1
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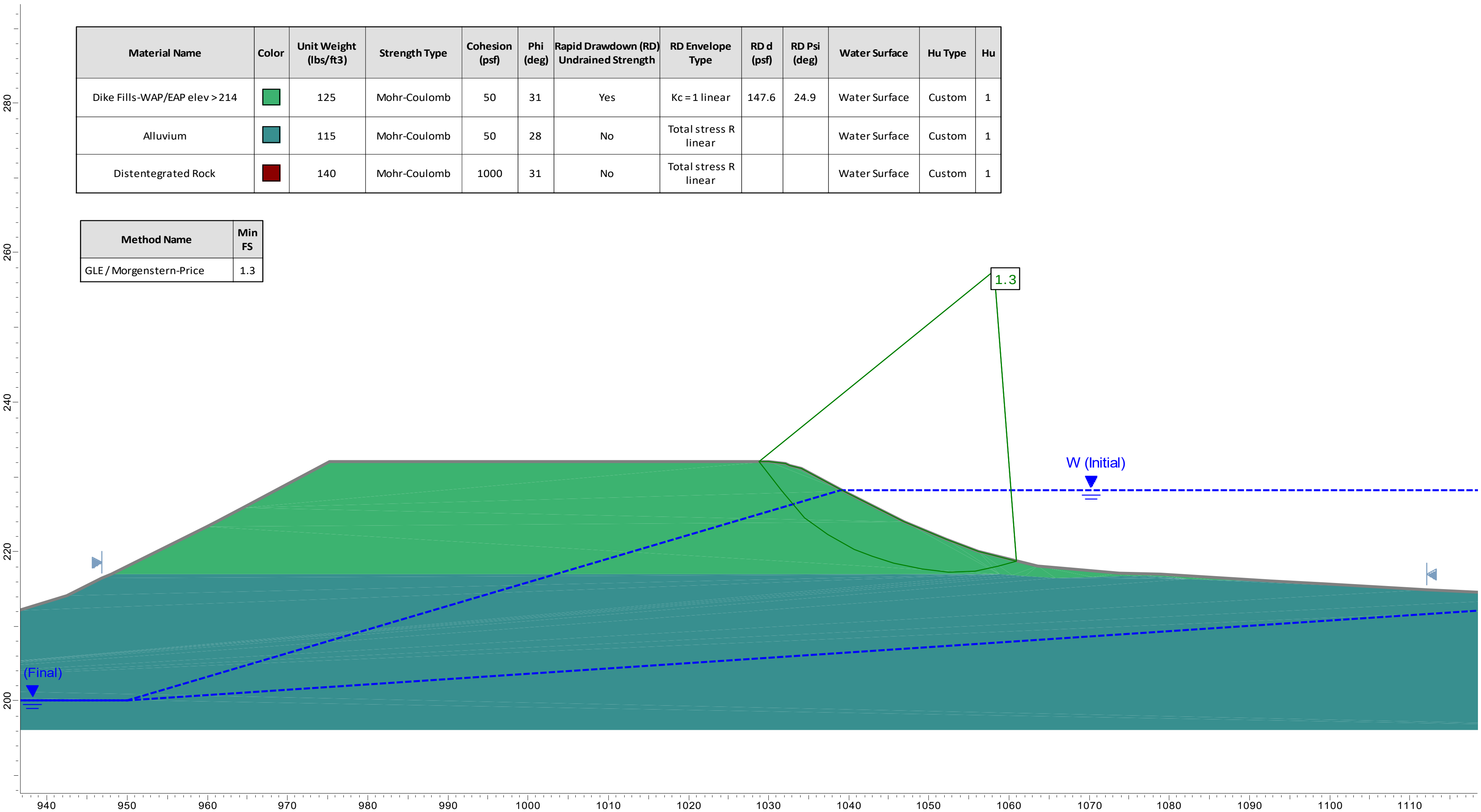
Method Name	Min FS
GLE / Morgenstern-Price	1.3



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CHECK	JGM
REVIEW	GLH
FILE	STABILITY
PROJECT No.	1520347
REV.	0

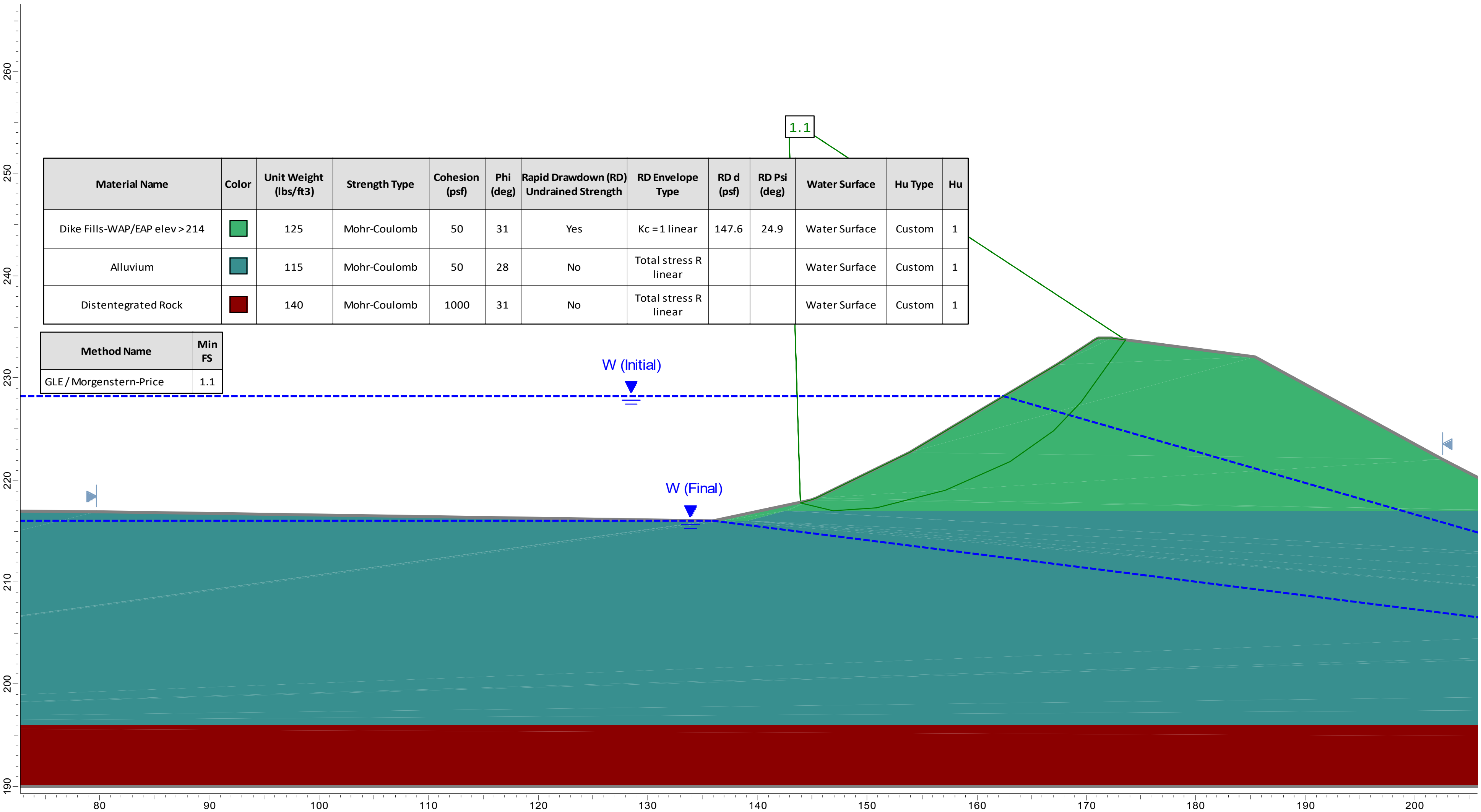
Golder Associates

PROJECT **Bremo West Pond - Inactive Pond Demonstration**

TITLE **Section C-C (North) Rapid Drawdown**

CLIENT **Dominion Energy**

FIGURE **5(d)**



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Envelope Type	RD d (psf)	RD Psi (deg)	Water Surface	Hu Type	Hu
Dike Fills-WAP/EAP elev>214		125	Mohr-Coulomb	50	31	Yes	Kc=1 linear	147.6	24.9	Water Surface	Custom	1
Alluvium		115	Mohr-Coulomb	50	28	No	Total stress R linear			Water Surface	Custom	1
Distentegrated Rock		140	Mohr-Coulomb	1000	31	No	Total stress R linear			Water Surface	Custom	1

Method Name	Min FS
GLE/Morgenstern-Price	1.1

SCALE	AS SHOWN	PROJECT	Bremo West Pond - Inactive Pond Demonstration
DATE	Mar 2018	TITLE	Section C-C (South) Rapid Drawdown
MADE BY	LJ		
CAD	-		
FILE	STABILITY	CHECK	JGM
PROJECT No.	1520347	REV.	0
REVIEW	GLH	CLIENT	Dominion Energy
FIGURE	6(d)		

Golder Associates

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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Golder Associates

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