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Project Contact Information

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Site Statistics

SITE ADDRESS:	TBD, LUNENBURG COUNTY, VA
SITE LAT/LONG:	36.887696 / -78.141171
EXISTING USE:	AGRICULTURAL
PROPOSED USE:	ELECTRICAL SUBSTATION
SITE AREA:	213.45 AC
PARKING REQUIRED:	N/A (UNMANNED FACILITY)
PARKING PROVIDED:	
HANDICAP REQUIRED/PROVIDED:	N/A (UNMANNED FACILITY)
TOTAL IMPERVIOUS/% TOTAL:	15.98 AC/61%
TOTAL PERVIOUS/% TOTAL:	10.27 AC/39%
TOTAL DISTURBED AREA:	26.25 AC

ZONING:	A-1: AGRICULTURE
TAX MAP/GPIN NO.:	059-0A-0-18A 059-01-0-2 059-03-0-6

PROJECT DESCRIPTION:
THIS PROJECT IS FOR THE PROPOSED CONSTRUCTION OF DOMINION ENERGY 'S NEW 500/230KV SUBSTATION IN LUNENBURG COUNTY, VA.

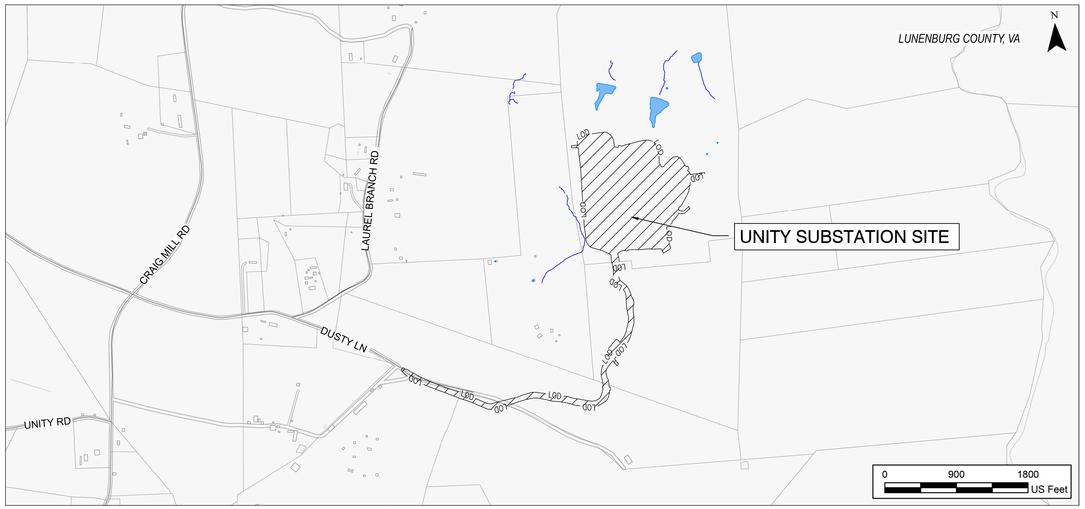
THIS PLAN SET IS THE SITE PLAN FOR THE NEW SUBSTATION, TO BE KNOWN AS UNITY SUBSTATION.

RESPONSIBLE LAND DISTURBER

THE DEWBERRY ENGINEERS INC. SEALING ENGINEER SHALL BE THE RESPONSIBLE LAND DISTURBER (RLD) FOR THIS PROJECT FOR APPROVAL PURPOSES ONLY. ONCE THE PROJECT HAS BEEN AWARDED, THE CONTRACTOR SHALL PROVIDE AN RLD AS NOTED ON PLAN SHEET 1707908-C-201.

IMPORTANT GRADING NOTE

ALL EXISTING AND PROPOSED GRADES SHOWN ON THE SITE PLAN ARE DIRT GRADES.



Unity Substation

Lunenburg County, VA

SITE PLAN
Permit Submission

REVISIONS		
REV	DATE	DESCRIPTION

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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

COVER SHEET

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-101		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-101.dwg		
APPROVED BY	KAS	8/18/23			

DOMINION SITE PREPARATION PERFORMANCE SPECIFICATIONS

PREFACE
It is the intent of these specifications to have a completely prepared site for the construction of an electrical facility at the completion of the "work" as indicated on the drawings, specifications, or other documents provided.

The regulations of all local, state, or federal governmental bodies having jurisdiction over the working areas shall be observed at all times.

Any specifications or instructions appearing on the drawings shall have precedence over the written specifications which appear herein. In the event that a discrepancy or omission has occurred, Dominion shall be consulted for resolutions.

All "work" shall be performed in a manner consistent with the best practices of the trades involved.

All "work" shall be performed within the limits of the property / rights-of-way shown on the drawings. The contractor will recognize and abide by all terms and conditions of permits, easements, and agreements relating to the project.

CLEARING AND GRUBBING
Limits for clearing and/or grubbing shall be as defined on the drawings.

Clearing shall consist of removal and disposal of brush, downed timber, logs, standing trees and snags, other growth and any items that would interfere with construction operations.

Grubbing shall consist of removal and disposal of stumps, buried logs, roots greater than ½" diameter, and any other organic material below the ground surface. All cleared areas will be grubbed unless otherwise noted.

Disposal of cleared/grubbed material by burning shall only be used when written approval is obtained from local authorities and Dominion. Otherwise, disposal shall be outside the limits of Dominion controlled land.

TOPSOIL
All topsoil and surface soils containing organic material shall be removed from the grubbed area. Topsoil shall be stockpiled for future use in approved locations unless otherwise shown on the drawings.

Topsoil shall not be used as, or mixed with, fill material in the construction of earth embankments unless otherwise shown on the drawings.

Topsoil material used as a surface dressing shall be reasonably free of cinders, debris, and stones. Unsuitable and excess topsoil material shall be disposed offsite.

EARTHWORK
Excavation:
Excavation shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown on the drawings.

Soft, unstable, or otherwise unsatisfactory materials encountered at the required grades shall be removed as directed and replaced with approved, properly compacted material.

Common excavation shall include all material which can be removed by common earth excavation equipment, other than solid rock or boulders and detached pieces of rock, each exceeding 2 cubic yards in volume.

Rock excavation shall be material which requires the use of pneumatic hammers and/or explosives for removal.

Site Preparation:
If earthwork operations are performed during wet seasons, contractor shall avoid operating equipment on saturated soils. Any wet subgrade areas which receive compacted fill shall be drained and allowed to dry.

The exposed subgrades of the building pad and roadbeds shall be proofrolled to detect unsuitable soil conditions. Proofrolling shall be done after a suitable period of dry weather to avoid degrading the subgrade. Proofrolling shall be performed with a heavily loaded dump truck or with similar approved construction equipment. Soft materials encountered shall be completely excavated and replaced with approved fill materials.

Benching:
Benching shall consist of a series of horizontal cuts beginning at the toe of the existing sloped surface and continuing at each vertical intersection of the previous cut. satisfactory material removed during this operation shall be re-compacted along with the new embankment material as generally specified, except moisture content shall be maintained within 10 percent of the optimum.

Benching shall be required for all fill embankments placed on existing slopes as follows:
Slopes steeper than 4:1 but not steeper than 1 ½ :1, the bench shall be at least 6 ft. in width.

Embankment:
Embankment work shall consist of the placement and compaction of fill material above the natural ground or other surface in conformance with the drawings.

Materials:
Approved soils used in compacted fills shall be free of debris and fibrous organic material. Frozen material will not be permitted in the fill. Satisfactory materials shall comprise those classified in accordance with the unified soil system, ASTM D-2487 as GW, GP, SW, SP, SM, and SC. These materials shall possess a maximum dry density of 100 #/cu.ft. or greater referenced to ASTM D-698 standard proctor. Soils shall have a liquid limit less than 40 percent and a plasticity index less than 15.

Other materials, when approved by engineering, may be permitted in fill areas.

Unsatisfactory soils include those classified as PT, OH OR OL, CH, MH, CL, and ML, as referenced to ASTM D-2487.

THESE MATERIAL SPECIFICATIONS ARE DOMINION STANDARDS. SATISFACTORY AND UNSATISFACTORY MATERIAL USE SHOULD BE VERIFIED AGAINST SITE-SPECIFIC GEOTECHNICAL ENGINEERING REPORT AND RECOMMENDATIONS. REFER TO THE GEOTECHNICAL REPORT AND ITS ADDENDUMS FOR FINAL DETERMINATIONS.

Compaction:
Compaction equipment shall consist of vibratory or tamping rollers, sheepsfoot roller, pnuematic-tired rollers, three-wheel power rollers, walk behind vibratory rollers, vibratory plate or other approved equipment well suited to the soil being compacted.

Approved fill material shall be placed in uniform horizontal lifts of approximately 8" depth (loose measurement), except for road materials above subgrade elevation and the upper 12" of building pads which require 6" lifts. Where walk behind rollers and vibratory plate compactors are used, the lift thickness shall not exceed 4".

Generally, fills shall be compacted to at least 95 percent of the standard proctor maximum dry density (ASTM D-698), with moisture content ranging between less than 3 percent up to the optimum as determined by the proctor density test. The upper 12" of roadbeds and control enclosure building pads require 98 percent compaction referenced to ASTM D-698, with moisture content maintained within 2 percent of the optimum.

Each successive lift will be placed on firm approved subgrade or compacted fill. Where previous lifts are found to be unacceptable, the area will be scarified, aerated or moistened, re-compacted or removed, and replaced as required.

Drainage:
The fill surface shall be adequately maintained during construction. The surface shall be sloped to achieve sufficient drainage, and to prevent water from ponding on the fill. If precipitation is expected while fill construction is temporarily halted, the surface shall be rolled with rubber-tired or steel-drummed equipment to improve surface runoff. For placement during or after difficult weather conditions, wet or frozen material shall be removed.

Finished Grade Tolerances:
The top of earthwork for substation pad and roadway travel areas shall be within 0.10 ft. above or below the theoretical grade.

Earth Slopes:
Excavated slopes steeper than 3:1 shall be rough graded in a manner to provide horizontal ridges and grooves having an average deviation no greater than 0.75 ft. from the theoretical line of the typical cross section.

Excavated slopes 3:1 or flatter shall be uniformly finished and shall not deviate from the theoretical plane surface by more than 0.50 ft.

Embankment slopes steeper than 3:1 shall be rough graded in a manner to provide horizontal ridges and grooves not more than 0.50 ft. from the theoretical line of the typical cross section.

Embankment slopes 3:1 or flatter shall be uniformly finished and shall not deviate from the theoretical plane surface by more than 0.50 ft.

Rock Slopes:
Shall not deviate from a plane surface by more than 2.0 ft. and shall not deviate from their theoretical location by more than 2.0 ft. Measured along any line perpendicular to the theoretical slope line.

MATERIALS/INSTALLATION
VDOT:
Items referenced to the Virginia Department of Transportation shown on the drawings shall conform to the requirements of their latest standards and specifications.

Manufacturers' Items:
Items referenced to specific manufacturers or brand names shall be subject to any recommendations or limitations pertaining to their installation or use.

Requests for substitutions must be approved by engineering. Sufficient information regarding requests must be received by engineering 10 days in advance of approval.

GENERAL NOTES

GENERAL

1. The "Miss Utility Law" requires the contractor to call (1-800-552-7001) at least 3 working days in advance of the planned work to allow time for marking, that the marks be respected and protected, and that excavation be completed carefully.
2. The site work for this project shall meet or exceed the project specifications.
3. Contractor shall be responsible for site security and job safety. Construction work and materials shall comply with local regulations, Commonwealth of Virginia regulations and codes, and O.S.H.A. Standards.
4. Areas disturbed during construction and not restored with impervious surfaces (buildings, pavement, walks, gravel, etc.) shall follow detail provided by Virginia Erosion and Sediment Control Handbook for site specific seeding mixtures in accordance with standard & specification 3.32 unless otherwise stated in project specifications.
5. Contractor shall immediately report any discrepancies between existing conditions and contract documents to the owner and engineer.
6. Upon award of contract, contractor shall make necessary construction notifications and apply for and obtain necessary permits, pay fees, and post bonds associated with the work indicated on the drawings, in the specifications, and in the contract documents. Do not close or obstruct roadways, sidewalks and fire hydrants without appropriate permits.
7. Contractor shall be responsible for all relocations, (unless otherwise noted on plans) including but not limited to, all utilities, storm drainage, signs, traffic signals & poles, etc. As required. All work shall be in accordance with governing authorities requirements and project specifications and shall be approved by such. All cost shall be included in base bid.
8. Traffic signage shall conform to the Manual for Uniform Traffic Control Devices.
9. Areas outside the limits of proposed work disturbed by the contractor's operation shall be restored by the contractor to their original condition at the contractor's expense.
10. In the event that suspected contaminated soil, groundwater, and other media are encountered during excavation and construction activities based on visual, olfactory (smell), or other evidence, the contractor shall stop work in the vicinity of the suspect material to avoid further spreading of the material, and shall notify the engineer immediately so that the appropriate testing and subsequent action can be taken.
11. Contractor shall prevent dust, sediment, and debris from exiting the site and shall be responsible for cleanup, repairs and corrective action if such occurs.
12. Damage resulting from construction loads shall be repaired by the contractor at no additional cost to owner.
13. Contractor shall control stormwater runoff during construction to prevent adverse impacts to on site and off site areas, and shall be responsible to repair resulting damages, if any, at no cost to owner.
14. All contractor laydown areas shall be located within the limits of disturbance line as shown on this plan.
15. A properly zoned/permitted site containing horizontal and vertical control points (benchmarks) and substation control grid baselines will be furnished by Dominion.
16. Contractor shall notify the Dominion Project Engineer through Dominion's Construction Coordinator a minimum of 1 (one) week prior to completion of site grading and prior to installation of any fencing and below grade work to allow Dominion to perform in-place soil resistivity testing.
17. Field inspection service may be furnished by Dominion for its use in ensuring compliance with the plans and specifications. The contractor shall be fully responsible for compliance with the technical requirements of the project in all respects. The lack of inspection service at any time by Dominion will not constitute a waiver of this responsibility. Dominion reserves the right to determine compliance with specifications of the "work" being performed or performed at all times.

DEMOLITION

1. Contractor shall remove and dispose of existing manmade surface features (if present) within the limit of work including pavements, slabs, curbing, fences, utility poles, signs, etc. unless indicated otherwise on the drawings. Civil site plan does not include demolition of substation electrical components/equipment. See electrical plans, by others, for all electrical demolition.
2. Contractor shall dispose of demolition debris in accordance with applicable federal, state and local regulations, ordinances and statutes.

EXISTING CONDITIONS

1. Topography: Elevations based on NAVD 88 datum. Horizontal control is Virginia State Plane Coordinates, Zone 4502, NAD 83. Contour interval is one (1) foot. Survey prepared by Dewberry Engineers.
2. Geotechnical engineering report prepared by Schnabel Engineering and dated December 1, 2022.
3. Wetlands and USCOE streams are present onsite, delineation performed by C2 Environmental.
4. This project is located within FEMA zone "X" as shown on FEMA firm map number 51111C0175B, effective July 20, 2009.

GRADING

1. All cut or fill slopes shall be 3:1 or flatter unless otherwise noted. All grades shown within substation are "soil" grades.
2. Existing grade contours shown at one (1) foot intervals.
3. Proposed grade contours shown at one (1) foot intervals unless otherwise noted.
4. If any existing structures to remain are damaged during construction it shall be the contractor's responsibility to repair and/or replace the existing structure as necessary to return it to existing conditions or better.
5. Contractor shall assure positive drainage on all natural and graveled areas.
6. All unsurfaced areas disturbed by grading operation shall receive 6 inches of topsoil (except pad area). Contractor shall stabilize disturbed areas in accordance with governing specifications until a healthy stand of vegetation is obtained.
7. Contractor shall notify the Dominion project engineer through Dominion's construction coordinator a minimum of one (1) week prior to completion of site grading and prior to installation of any fencing and below grade work to allow Dominion to perform in-place soil resistivity testing.

DRAINAGE

1. Prior to start of construction, contractor shall verify existing ground elevations adjacent to drainage outlets to assure proper transitions between existing and proposed facilities.
2. Prior to job completion, ditches shall be cleaned out to remove all silt and debris build-up.
3. Set drainage ditches in accordance with elevations on the grading and drainage plans. Contractor is responsible for positive drainage.

LAYOUT AND MATERIALS

1. Dimensions are from the face of curb, face of building, face of wall and center line of pavement markings, unless otherwise noted.
2. Any property monumentation disturbed during construction shall be set or reset by a professional licensed surveyor paid by the contractor at no expense to the owner.
3. Prior to start of construction, contractor shall verify existing improvements to assure proper transitions between existing and proposed facilities.
4 Existing structures within construction limits are to be abandoned, removed or relocated as necessary. All costs shall be included in base bid.
5. Symbols and legends of project features are graphic representations and are not necessarily scaled to their actual dimensions or locations on the drawings. The contractor shall refer to the detail sheet dimensions, manufacturer's literature, shop drawings and field measurements of supplied products for layout of the project features.
6. Contractor shall not rely solely on electronic versions of plans, specifications and data files that are obtained from the designers, but shall verify location of project features in accordance with the paper copies of the plans and specifications that are supplied as part of the contract documents.

UTILITIES

1. The locations, size and types of existing utilities are shown as an approximate representation only. The owner or its representative(s) have not independently verified this information as shown on the plans. The utility information shown does not guarantee the actual existence, serviceability, or other data concerning the utilities, nor does it guarantee against the possibility that additional utilities may be present that are not shown on the plans. Prior to ordering materials and beginning construction, the contractor shall verify and determine the exact locations, sizes and elevations of the points of connections to existing utilities and shall confirm that there are no interferences with existing utilities and the proposed utility routes, including routes within public rights of way.
2. The contractor must call "Miss Utility" (1-800-552-7001) at least 72 hours before excavation to request field location of utilities.
3. Where an existing utility is found to conflict with the proposed work, or existing conditions differ from those shown such that the work cannot be completed as intended, the location, elevation, and size of the utility shall be accurately determined without delay by the contractor, and the information furnished in writing to the owner's representative(s) for the resolution of the conflict. Contractor's failure to notify prior to performing additional work releases owner from obligations for additional payments which otherwise may be warranted to resolve the conflict.
4. The location, size, depth, and specifications for construction of proposed private utility services shall be installed according to the requirements provided by, and approved by, Dominion.
5. All fill material is to be in place and compacted before installation of proposed utilities.
6. Lines underground shall be installed, inspected and approved prior to backfilling.
7. Contractor is responsible for all necessary inspections and/or certifications required by codes and/or utility service companies.
8. Contractors shall notify operators who maintain underground utility lines in the area of proposed excavation or blasting at least two working days, but not more than ten working days prior to commencement of excavation or demolition.

SITE STONE MAINTENANCE

1. The uniform 4 inch covering of VDOT No. 57 stone coarse aggregate site stone covering the substation fenced area (excluding equipment access road areas) must remain loose and non-compacted.
2. Local areas where the stone becomes embedded into the subgrade must be immediately repaired by having the stone removed, subbase re-graded, and an application of new or cleaned coarse aggregate.
3. The stone must always allow water to pass through for grounding protections and environmental water quality integrity.

REVISIONS		
REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
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8/18/23
PROFESSIONAL ENGINEER

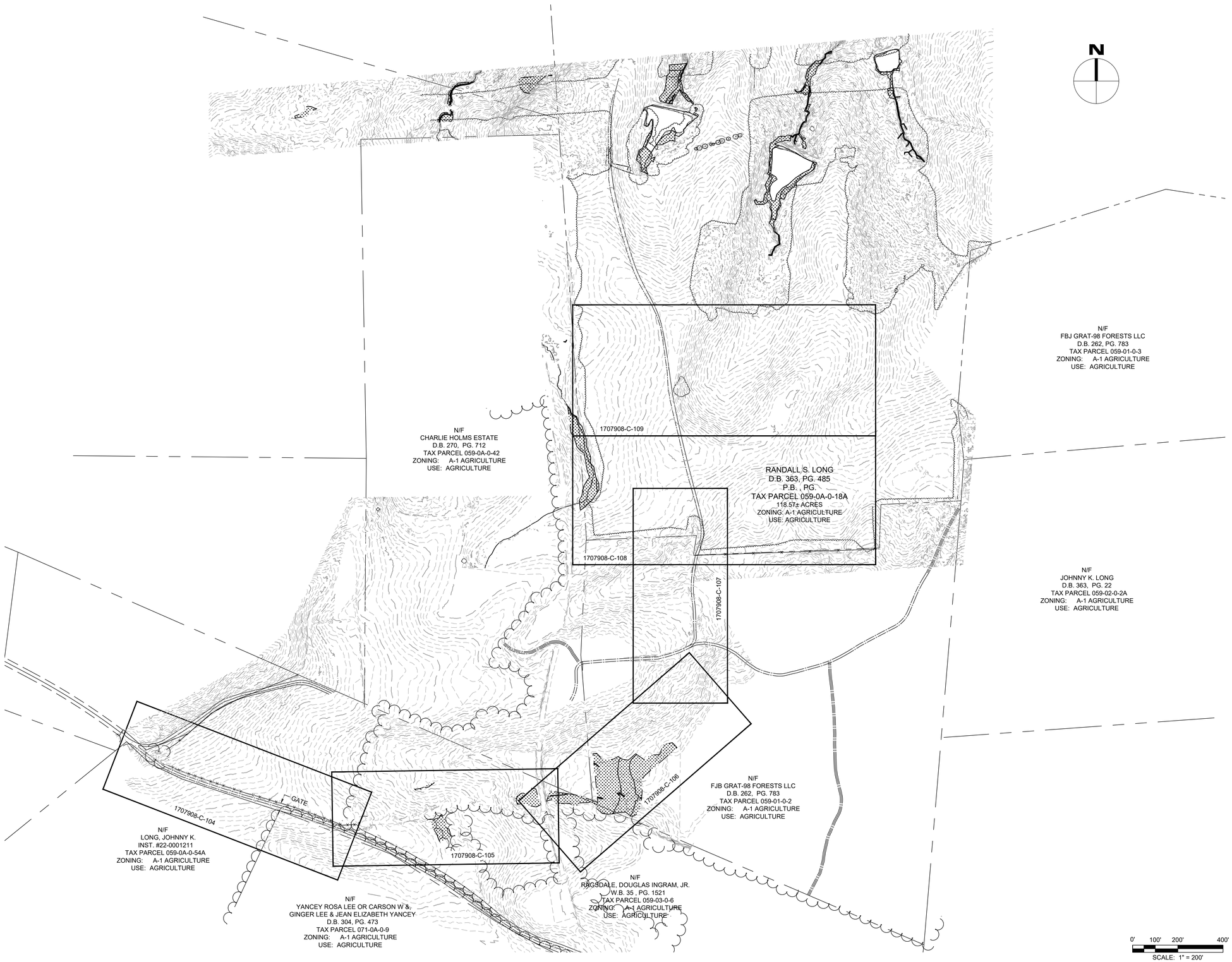
DEWBERRY PROJECT NO.: 50157950

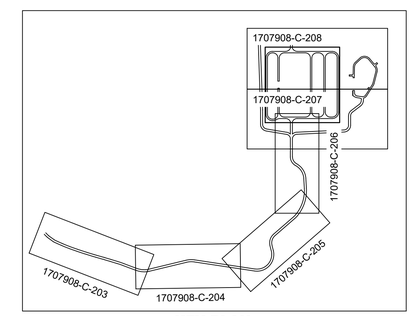
Dominion Energy

DOMINON SPECIFICATIONS & GENERAL NOTES

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-102		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-102.dwg		
APPROVED BY	KAS	8/18/23			





KEY PLAN

REVISIONS		
REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

EXISTING CONDITIONS

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-103
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-103.dwg
APPROVED BY		KAS	8/18/23		

EROSION & SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION
This project includes construction of a new Dominion Energy substation. The project also includes construction of a new stormwater management retention pond and retention forebay east of the substation, and a proposed access road south of the substation. The disturbed area is 26.25 AC.

EXISTING SITE CONDITIONS
The existing site is on an undeveloped grassy field.

ADJACENT AREAS
The project area is located east of Laurel Branch Road and to the northeast of Dusty Lane in Lunenburg County, Virginia. The site is bordered by wooded areas to the east and south, a residential property to the west, and an existing Dominion transmission easement to the north. The existing road beginning at Dusty Lane will be utilized for site access along with approximately 1000 LF of new 20' roadbed.

OFFSITE AREAS
Existing access across up to 4 parcels. Source of imported fill (if necessary) will be at the discretion of the contractor, not the engineer. Contractor shall only perform offsite activities that are covered under a separate VSMP permit.

SOILS
The soils on site are: Appling sandy loam, 2 to 7 percent slopes, moderately eroded (H.S.G. B); Appling sandy loam, 7 to 15 percent slopes, moderately eroded (H.S.G. B); Cecil sandy loam, 2 to 7 percent slopes, eroded (H.S.G. B).

CRITICAL AREAS
ESC measures shall be provided adjacent to wetlands and streams.

EROSION AND SEDIMENT CONTROL MEASURES
Construction Entrance (VESCH Std. & Spec. 3.02):
A stabilized stone pad with a filter fabric underliner located at points of vehicular ingress and egress on a construction site. The purpose is to reduce the amount of mud transported onto paved public roads by motor vehicles or runoff. Installed wherever traffic will be leaving a construction site and move directly onto a public road or other paved area.

Silt Fence (VESCH Std. & Spec. 3.05):
A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched. Silt fence is installed to intercept and detain small amounts of sediment from disturbed areas during construction in order to prevent sediment from leaving the site and to decrease the velocity of sheet flows and low-to-moderate channel flows.

Inlet Protection (VESCH Std. & Spec. 3.07):
A sediment filter or excavated impounding area around a storm drain drop inlet or curb inlet to prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area.

Culvert Inlet Protection (VESCH Std. & Spec. 3.08):
Prevents sediment from entering a culvert and associated drainage system prior to permanent stabilization of disturbed project area.

Diversion Ditch (VESCH Std. & Spec. 3.12):
A channel constructed across a slope with a supporting earthen ridge on the lower side. the purpose is to reduce slope length and to intercept and divert stormwater runoff to stabilized outlets at non-erosive velocities.

Temporary Sediment Trap (VESCH Std. & Spec. 3.13);
A temporary ponding area formed by constructing an earthen embankment with a stone outlet. he purpose is to detain sediment-laden runoff from small disturbed areas long enough to allow the majority of the sediment to settle out.

Temporary Sediment Basin (VESCH Std. & Spec. 3.14);
A temporary barrier or dam with a controlled stormwater release structure formed by constructing an embankment of compacted soil across a drainageway. The purpose is to detain sediment-laden runoff from disturbed areas in "wet" and "dry" storage long enough for the majority of the sediment to settle out.

Rock Check Dam (VESCH Std. & Spec. 3.20);
Small temporary stone dams constructed across a swale or drainage ditch. to reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or ditch.

Temporary Seeding (VESCH Std. & Spec. 3.31):
The establishment of a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing annual plants. Temporary seeding reduces erosion and sedimentation by stabilizing disturbed areas that will not be brought to final grade for a period of more than 14 days. Temporary seeding reduces damage from sediment and runoff to downstream or off-site areas, and to provide protection to bare soils exposed during construction until permanent vegetation or other erosion control measures can be established. For use where exposed soil surfaces are not to be fine-graded for periods of longer than 14 days. Such areas include denuded areas, soil stockpiles, dikes, dams, sides of sediment basins, temporary roadbanks, etc. A permanent vegetative cover shall be applied to areas that will be left dormant for a period of more than one (1) year.

Permanent Seeding (VESCH Std. & Spec. 3.32):
The establishment of a perennial vegetative cover on disturbed areas by planting seed. Permanent seeding reduces erosion and decreases sediment yield from disturbed areas. Permanent seeding stabilizes disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant material. Permanent seeding also improves wildlife habitat and enhances natural beauty. For use in disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil. For use where rough-graded areas will not be brought to final grade for one (1) year or more.

Mulching (VESCH Std. & Spec. 3.35):
Application of plant residues or other suitable materials to the soil surface. Mulching prevents erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow. Mulching fosters the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold. For use in areas which have been permanently seeded. Mulching should occur immediately following seeding. Areas that cannot be seeded because of the season should be mulched with an organic mulch.

Tree Protection (VESCH Std. & Spec. 3.38):
Protects desirable trees from mechanical and other injury during land disturbing and construction activity.

Dust Control (VESCH Std. & Spec. 3.39):
Reducing surface and air movement of dust during land disturbing, demolition and construction activities. The purpose is to prevent surface and air movement of dust from exposed soil surfaces and reduce the presence of airborne substances which may present health hazards, traffic safety problems or harm animal or plant life.

TEMPORARY AND PERMANENT STABILIZATION
During construction: apply temporary and/or permanent seeding as grading operations are completed in areas not to receive pavement or other impervious surfaces.

Post construction: apply topsoil, permanent seeding per specifications and soil amendments (as necessary) to all disturbed surfaces not receiving pavement or other impervious surface.

Temporary seeding shall be applied within seven days to denuded areas that may not be at final grade, but will remain dormant for longer than 14 days and less than one year. This includes, but is not limited to, stockpiles and borrow areas.

Permanent seeding shall be applied and a perennial vegetative covering shall be established on disturbed areas within seven days of being brought to final grade on areas not otherwise protected. Selection of the seed mixture shall depend on the time of year it is to be applied.

Mulching shall be applied to all permanent seeding immediately upon completion of seed application. Mulch liberally during the mid-summer and winter seasons.

See Virginia Erosion and Sediment Control Technical Bulletin No. 4, Nutrient Management for Development Sites, for updated seed mixtures and schedules as well as updated liming, mulching, and fertilizing requirements. See Virginia Erosion and Sediment Control Handbook Std. and Spec. 3.35 for mulching specifications.

STORMWATER RUNOFF CONSIDERATIONS
A Construction General Permit (CGP) for the discharge of stormwater from construction activities is required for projects disturbing 1 acre or greater. Visit the Virginia Stormwater Management Program Permitting website for more information.

Water quantity requirements have been met by utilizing a Level 2 Wet Pond and decreasing the area going to outfall points. The wet pond is located on the south side of the pad.

Water quality requirement of 27.71 lbs/yr of phosphorous removal will be met with the combination of the Level 2 Wet Pond and the purchase of 6.28 lbs/yr of off-site nutrient credits.

CALCULATIONS
See pertinent detail sheets included in this plan set.

SOIL STOCKPILES AND BORROW AREAS
All soil stockpiles shall have silt fence installed on all sides. Stockpiles shall be temporary/permanently seeded depending on time frame for reuse or removal of soil material. All on-site borrow areas (if necessary) shall be delineated on the plan by contractor. Appropriate erosion and sediment control features (ex. silt fence, sediment traps/basins) shall be installed depending on locations and field conditions.

EROSION & SEDIMENT CONTROL MAINTENANCE

In general, the project area shall be checked during or immediately following installation of ESC controls, and at least once in every five days. Within 48 hours after any runoff producing storm event and at the completion of the project to ensure that all erosion and sediment control devices are in working order. Erosion control devices shall be maintained according to the following schedule:

1. Construction Entrance
The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto public right-of-way. This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand and repair and/or cleanout of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked outside the project area will not be permitted under any circumstances.

2. Silt Fence
Sediment deposits shall be removed when deposits reach approximately one-half the height of the barrier.
Fabric shall be replaced if it has decomposed or become ineffective.

3. Inlet Protection
The structure shall be inspected after each rain and repairs made as needed. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design depth of the trap. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.

4. Culvert Inlet Protection
The structure shall be inspected after each rain and repairs made as needed. Aggregate shall be replaced or cleaned when inspection reveals that clogged voids are causing ponding problems which interfere with on-site construction. Sediment shall be removed and the impoundment restored to its original dimensions when sediment has accumulated to one-half the design depth. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems. Temporary structures shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

5. Diversion Ditch
Before final stabilization, the diversion should be inspected after every rainfall and at least once every two weeks. Sediment shall be removed from the channel and repairs made as necessary. Seeded areas which fail to establish a vegetative cover shall be reseeded as necessary.

6. Rock Check Dam
Check dams should be checked for sediment accumulation after each runoff-producing storm event. Sediment should be removed when it reaches one half of the original height of the measure. Regular inspections should be made to insure that the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam should be corrected immediately.

7. Seeding
The seeded areas shall be checked regularly to ensure that a good stand is maintained. Areas should be fertilized and re-seeded as needed.

8. Level Spreader
The level spreader shall be inspected after every rainfall and repairs made, if required. Level spreader lip must remain at 0% slope. The contractor should avoid the placement of any material on and prevent construction traffic across the structure. If the level spreader is damaged by construction traffic, it shall be repaired immediately.

9. Sediment Trap
Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design volume of the wet storage. Sediment removal from the basin shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems. Filter stone shall be regularly checked to ensure that filtration performance is maintained. Stone choked with sediment shall be removed and cleaned or replaced. The structure should be checked regularly to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The height of the stone outlet should be checked to ensure that the center is at least 1 foot below the top of the embankment.

10. Sediment Basin
The basin embankment should be checked regularly to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The emergency spillway should be checked regularly to ensure that its lining is well established and erosion-resistant. The basin should be checked after each runoff-producing rainfall for sediment cleanout. When the sediment reaches the clean-out level, it shall be removed and properly disposed of.

The contractor shall be responsible for providing an employee who will be responsible in charge of the Erosion and Sediment Control Plan and requirements for the project that is certified by the Virginia Department of Environmental Quality (DEQ) as a Responsible Land Disturber (RLD). The name of the contractor's RLD and copy of his current certification shall be provided to the owner, engineer ,and ESC inspector prior to performing any land disturbing activity.

The contractor shall be responsible for preventing surface and air movement of dust from exposed soils which may present health hazards, traffic safety problems, or harm animal or plant life.

The contractor will maintain a log of inspections, maintenance performed, and repairs made for the inspection by the owner and plan approving authority.

No erosion and sediment control measures shall be removed without approval of the engineer or ESC inspector for the project. Sediment shall be placed in approved location.

PLANT PROTECTION

1. Trees and vegetation adjacent to the actual work area or borrow area are to be protected with temporary fencing (construction safety fence for vegetation) to preserve existing items indicated to remain and to prevent damage to property.

2. Underground utilities shall be located so that construction will not damage or destroy the plants to remain. Utility trenching shall not be located closer than 1'-0" for each 1" in diameter up to a maximum of 20'-0" for trees to remain.

3. The parking of vehicles and storage of any construction equipment or materials shall not occur under the drip line of trees to be protected.

EROSION & SEDIMENT CONTROL SEQUENCE

1. Upon implementation and installation of the following areas: trailer, parking, lay down, porta-potty, wheel wash, concrete washout, mason's area, fuel and material storage containers, solid waste containers, etc., immediately denote them on the Stormwater Pollution Prevention Plan (SWPPP) and note any changes in location as they occur throughout the construction process. In addition, note in the SWPPP all areas where fill is imported from or soil is exported to.

2. Contractor may complete construction-related activities concurrently only if all preceding ESC measures have been completely installed.

3. The actual schedule for implementing ESC measures will be determined by project construction progress.

4. No ESC measure(s) shall be removed without approval of the engineer or ESC inspector for the project.

5. Additional ESC measures may be required due to site conditions at time of construction activity. Contractor shall provide any additional ESC measures as needed to control sediment run-off at no additional cost to owner.

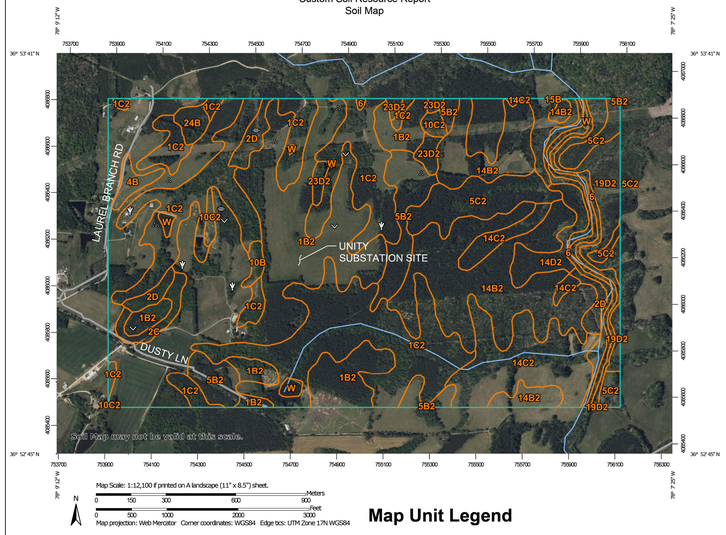
6. Contractor may locate stockpiles for topsoil, suitable fill, and debris within limits of construction. Contractor shall surround stock pile with silt fence, temporary/permanently seed and maintain the stockpile per the VESCH.

7. Contractor shall perform construction sequencing such that earth materials are exposed for the least amount of time before they are covered, seeded or otherwise stabilized to prevent erosion.

PHASE I
1. Install construction entrance, silt fence, tree protection, and inlet protection. Clear only those areas needed to install ESC measures.
2. Install diversion dikes, ditches, sediment basin, and sediment traps prior to land disturbance.

PHASE II
1. Clear trees and brush.
2. Perform demolition as noted on plan sheets.
3. Begin rough grading the site.
4. Install culverts and CIP.
5. Install check dams as ditches/channels are installed.
6. After installation of proposed storm drainage structures, install inlet protection.
7. Temporarily seed and mulch, throughout construction, within 7 days denuded areas that will be inactive for 14 days or more.
8. Permanently stabilize areas to be vegetated (6" topsoil and seed) as they are brought to final grade.
9. Prepare substation pad for gravel and install gravel.
10. Install electrical equipment and security fence.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lunenburg County, Virginia
Survey Area Data: Version 15, Aug 31, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 25, 2022—May 20, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1B2	Appling sandy loam, 2 to 7 percent slopes, moderately eroded	221.2	30.4%
1C2	Appling sandy loam, 7 to 15 percent slopes, moderately eroded	167.2	23.0%
2C	Ashlar loamy coarse sand, 7 to 15 percent slopes	5.8	0.8%
2D	Ashlar loamy coarse sand, 15 to 25 percent slopes	12.7	1.8%
4B	Caroline sandy loam, 1 to 7 percent slopes	4.5	0.6%
5B2	Cecil sandy loam, 2 to 7 percent slopes, eroded	32.6	4.5%
5C2	Cecil sandy loam, 7 to 15 percent slopes, eroded	33.5	4.6%
6	Chewacla, Toccoa, and Augusta loams, frequently flooded	17.0	2.3%
10B	Helena sandy loam, 1 to 6 percent slopes	2.6	0.4%
10C2	Helena sandy loam, 6 to 10 percent slopes, eroded	4.4	0.6%
14B2	Madison sandy loam, 2 to 7 percent slopes, eroded	101.7	14.0%
14C2	Madison sandy loam, 7 to 15 percent slopes, eroded	67.0	9.2%
14D2	Madison sandy loam, 15 to 30 percent slopes, eroded	12.0	1.6%
15B	Masada fine sandy loam, 2 to 7 percent slopes	0.0	0.0%
19D2	Pacolet sandy loam, 15 to 30 percent slopes, eroded	22.1	3.0%
23D2	Wedowee sandy loam, 15 to 30 percent slopes, eroded	7.3	1.0%
24B	Worsham loam, 0 to 4 percent slopes	4.3	0.6%
W	Water	11.0	1.5%
Totals for Area of Interest		**726.9**	**100.0%**

REVISIONS

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COMMONWEALTH OF VIRGINIA
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8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

ESC NARRATIVE I

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-201
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-201.dwg
APPROVED BY		KAS	8/18/23		

MINIMUM STANDARDS (9VAC25-840-40)

A VESCP must be consistent with the following criteria, techniques and methods:

1. Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.
2. During construction of the project, soil stock piles and borrow areas shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as borrow areas and soil intentionally transported from the project site.
3. A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.
4. Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.
5. Stabilization measures shall be applied to earthen structures such as dams, dikes and diversions immediately after installation.
6. Sediment traps and sediment basins shall be designed and constructed based upon the total drainage area to be served by the trap or basin.
   a. The minimum storage capacity of a sediment trap shall be 134 cubic yards per acre of drainage area and the trap shall only control drainage areas less than three acres.
   b. Surface runoff from disturbed areas that is comprised of flow from drainage areas greater than or equal to three acres shall be controlled by a sediment basin. The minimum storage capacity of a sediment basin shall be 134 cubic yards per acre of drainage area. The outfall system shall, at a minimum, maintain the structural integrity of the basin during a 25-year storm of 24-hour duration. Runoff coefficients used in runoff calculations shall correspond to a bare earth condition or those conditions expected to exist while the sediment basin is utilized.
7. Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.
8. Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.
9. Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.
10. All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.
11. Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.
12. When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction. Nonerodible material shall be used for the construction of causeways and cofferdams. Earthen fill may be used for these structures if armored by nonerodible cover materials.
13. When a live watercourse must be crossed by construction vehicles more than twice in any six-month period, a temporary vehicular stream crossing constructed of nonerodible material shall be provided.
14. All applicable federal, state and local requirements pertaining to working in or crossing live watercourses shall be met.
15. The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse is completed.
16. Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:
    a. No more than 500 linear feet of trench may be opened at one time.
    b. Excavated material shall be placed on the uphill side of trenches.
    c. Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.
    d. Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.
    e. Restabilization shall be accomplished in accordance with this chapter.
    f. Applicable safety requirements shall be complied with.
17. Where construction vehicle access routes intersect paved or public roads, provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface. Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual development lots as well as to larger land-disturbing activities.
18. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the VESCP authority. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.
19. Properties and waterways downstream from development sites shall be protected from sediment deposition, erosion and damage due to increases in volume, velocity and peak flow rate of stormwater runoff for the stated frequency storm of 24-hour duration in accordance with the following standards and criteria. Stream restoration and relocation projects that incorporate natural channel design concepts are not man-made channels and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels:
    a. Concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system. For those sites where runoff is discharged into a pipe or pipe system, downstream stability analyses at the outfall of the pipe or pipe system shall be performed.
    b. Adequacy of all channels and pipes shall be verified in the following manner:

       (1) The applicant shall demonstrate that the total drainage area to the point of analysis within the channel is one hundred times greater than the contributing drainage area of the project in question; or

       (2a) Natural channels shall be analyzed by the use of a two-year storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks.

       (2b) All previously constructed man-made channels shall be analyzed by the use of a 10-year storm to verify that stormwater will not overtop its banks and by the use of a two-year storm to demonstrate that stormwater will not cause erosion of channel bed or banks; and

       (2c) Pipes and storm sewer systems shall be analyzed by the use of a 10-year storm to verify that stormwater will be contained within the pipe or system.
    c. If existing natural receiving channels or previously constructed man-made channels or pipes are not adequate, the applicant shall:

       (1) Improve the channels to a condition where a 10-year storm will not overtop the banks and a two-year storm will not cause erosion to the channel, the bed, or the banks; or

       (2) Improve the pipe or pipe system to a condition where the 10-year storm is contained within the appurtenances;

       (3) Develop a site design that will not cause the pre-development peak runoff rate from a two-year storm to increase when runoff outfalls into a natural channel or will not cause the pre-development peak runoff rate from a 10-year storm to increase when runoff outfalls into a man-made channel; or

       (4) Provide a combination of channel improvement, stormwater detention or other measures which is satisfactory to the VESCP authority to prevent downstream erosion.
    d. The applicant shall provide evidence of permission to make the improvements.
    e. All hydrologic analyses shall be based on the existing watershed characteristics and the ultimate development condition of the subject project.
    f. If the applicant chooses an option that includes stormwater detention, he shall obtain approval from the VESCP of a plan for maintenance of the detention facilities. The plan shall set forth the maintenance requirements of the facility and the person responsible for performing the maintenance.
    g. Outfall from a detention facility shall be discharged to a receiving channel, and energy dissipators shall be placed at the outfall of all detention facilities as necessary to provide a stabilized transition from the facility to the receiving channel.
    h. All on-site channels must be verified to be adequate.
    i. Increased volumes of sheet flows that may cause erosion or sedimentation on adjacent property shall be diverted to a stable outlet, adequate channel, pipe or pipe system, or to a detention facility.
    j. In applying these stormwater management criteria, individual lots or parcels in a residential, commercial or industrial development shall not be considered to be separate development projects. Instead, the development, as a whole, shall be considered to be a single development project. Hydrologic parameters that reflect the ultimate development condition shall be used in all engineering calculations.
    k. All measures used to protect properties and waterways shall be employed in a manner which minimizes impacts on the physical, chemical and biological integrity of rivers, streams and other waters of the state.
    l. Any plan approved prior to July 1, 2014, that provides for stormwater management that addresses any flow rate capacity and velocity requirements for natural or man-made channels shall satisfy the flow rate capacity and velocity requirements for natural or man-made channels if the practices are designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm; and (iii) reduce the allowable peak flow rate resulting from the 1.5, 2, and 10-year, 24-hour storms to a level that is less than or equal to the peak flow rate from the site assuming it was in a good forested condition, achieved through multiplication of the forested peak flow rate by a reduction factor that is equal to the runoff volume from the site when it was in a good forested condition divided by the runoff volume from the site in its proposed condition, and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels as defined in any regulations promulgated pursuant to § 62.1-44.15:54 or 62.1-44.15:65 of the Act.

EROSION & SEDIMENT CONTROL NOTES

ES-1: Unless otherwise indicated, all vegetative and structural erosion and sediment control practices will be constructed and maintained according to minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook and Virginia Regulations (9VAC25-840).

ES-2: The plan approving authority must be notified one week prior to the pre-construction conference, one week prior to the commencement of land disturbing activity, and one week prior to final inspection.

ES-3: All erosion and sediment control measures are to be placed prior to or as the first step in clearing.

ES-4: A copy of the approved erosion and sediment control plan shall be maintained on the site at all times.

ES-5: Prior to commencing land disturbing activities in areas other than indicated on these plans (including, but not limited to, off-site borrow or waste areas), the contractor shall submit a supplementary erosion control plan to the owner for review and approval by the plan approving authority.

ES-6: The contractor is responsible for installation of any additional erosion control measures necessary to prevent erosion and sedimentation as determined by the plan approving authority.

ES-7: All disturbed areas are to drain to approved sediment control measures at all times during land disturbing activities and during site development until final stabilization is achieved.

ES-8: During dewatering operations, water shall be pumped into an approved filtering device.

ES-9: The contractor shall inspect all erosion control measures periodically after each runoff-producing rainfall event. Any necessary repairs or cleanup to maintain the effectiveness of the erosion control devices shall be made immediately.

REVISIONS		
REV	DATE	DESCRIPTION

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DEWBERRY PROJECT NO.: 50157950

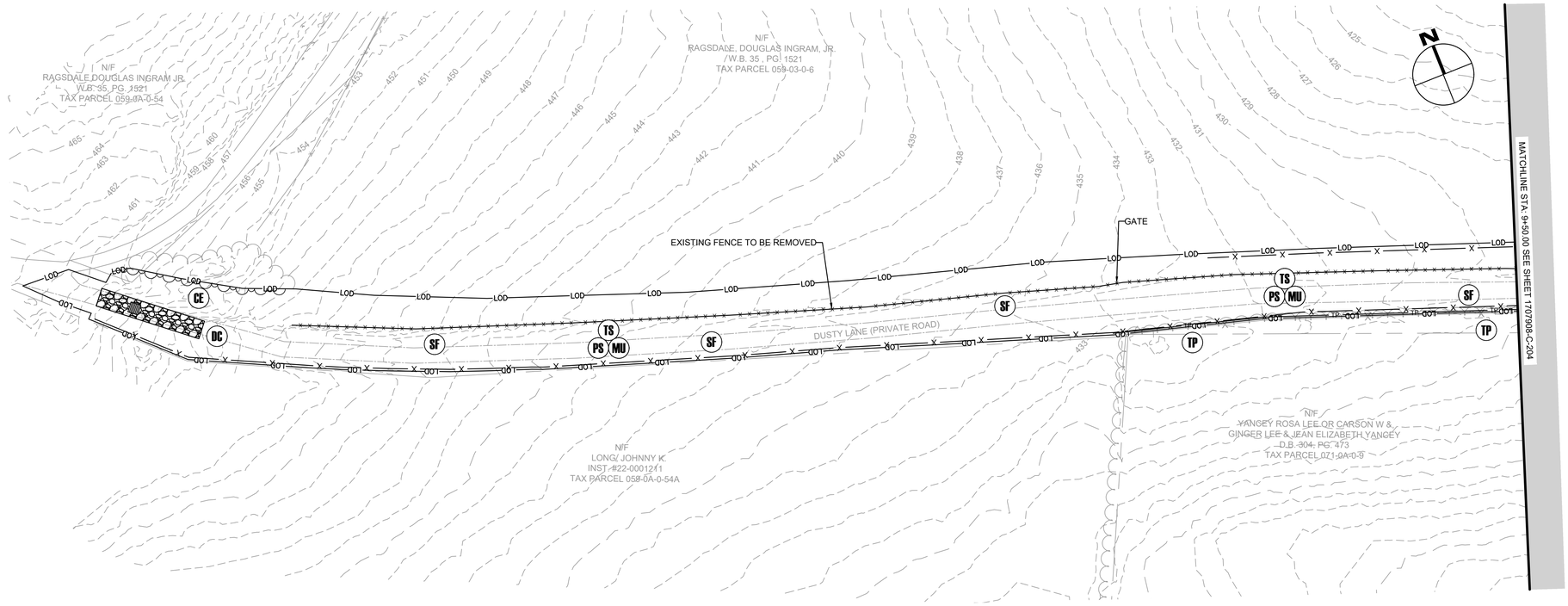
Dominion Energy

ESC NARRATIVE II

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

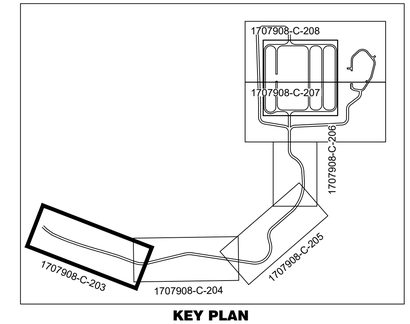
OPERATIONAL REGION			B/M No.	SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-202
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-202.dwg
APPROVED BY		KAS	8/18/23		



EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	SPEC*
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SILT FENCE W/ WIRE SUPPORT	3.05
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER



KEY PLAN

0' 20' 40' 80'
SCALE: 1" = 40'

REVISIONS

REV	DATE	DESCRIPTION

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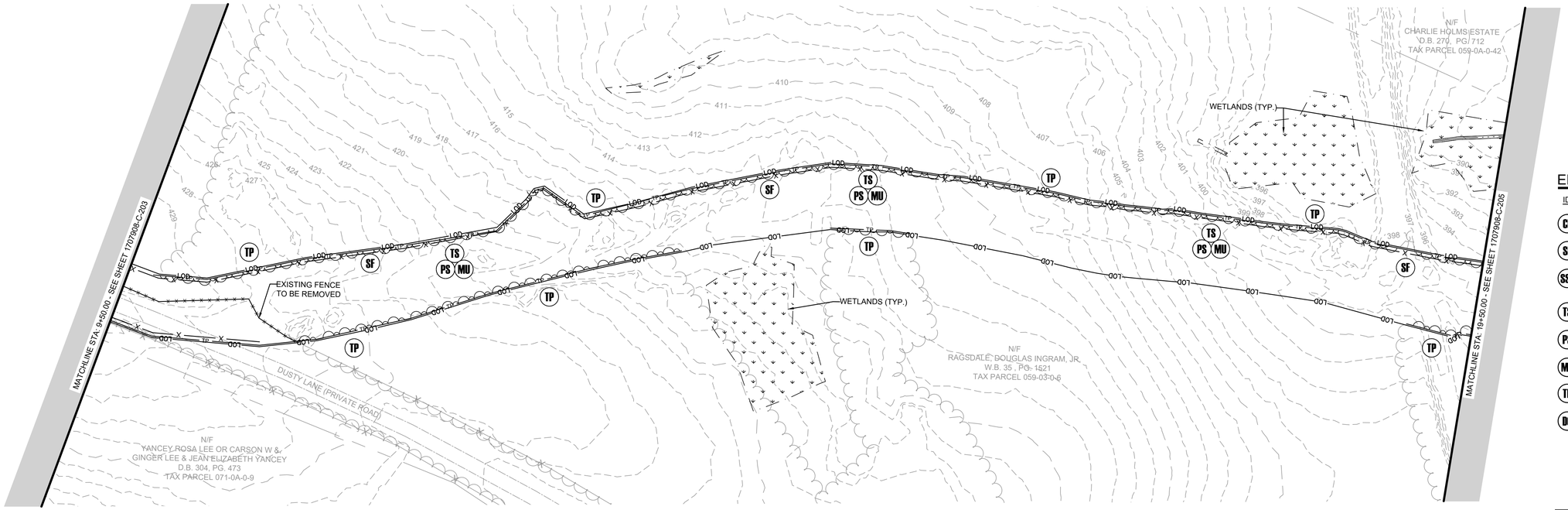
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

ESC PHASE 1 AND DEMOLITION
ACCESS ROAD STA. 0+00.00-9+50.00

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-203		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING:		
APPROVED BY	KAS	8/18/23	1707908-C-203.dwg		

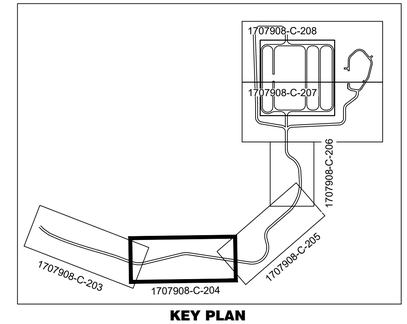


N

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	SPEC*
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SILT FENCE W/ WIRE SUPPORT	3.05
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER



KEY PLAN

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

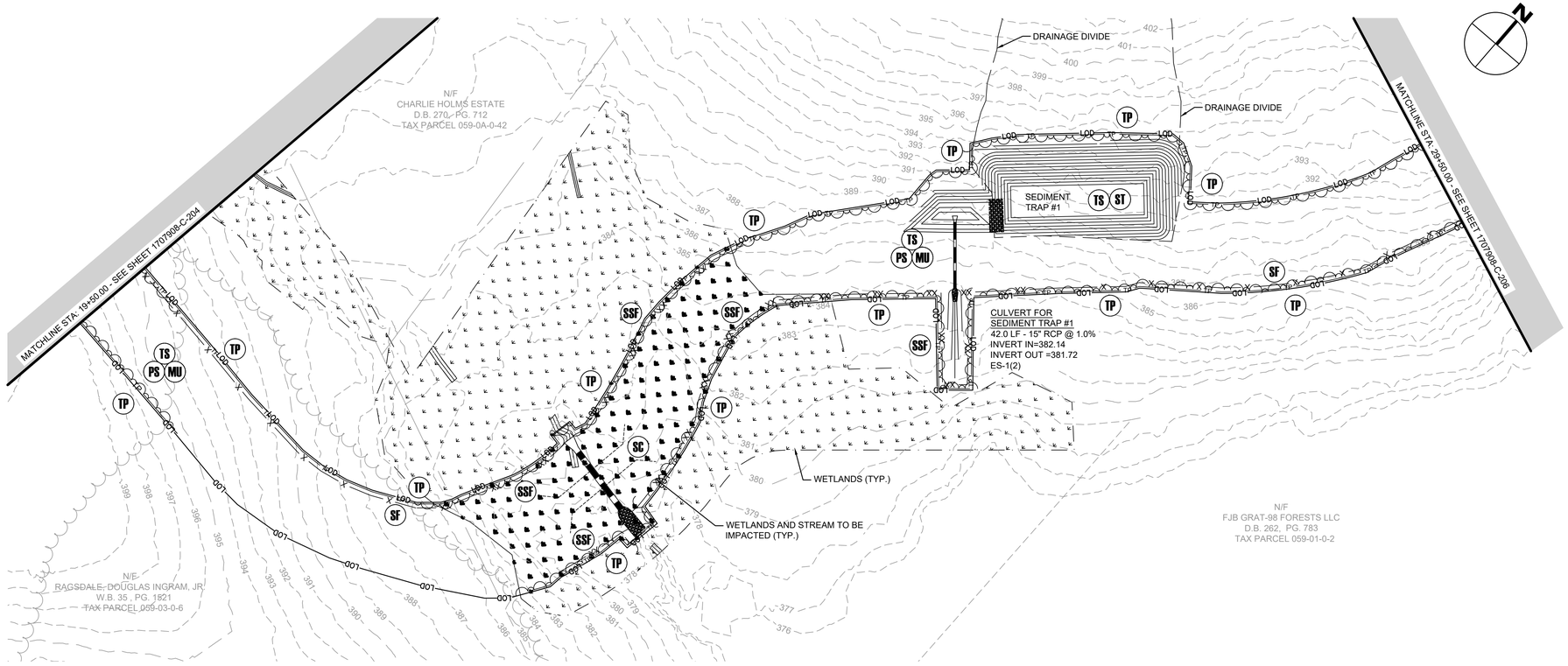
ESC PHASE 1 AND DEMOLITION ACCESS ROAD STA. 9+50.00-19+50.00

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

0' 20' 40' 80'
SCALE: 1" = 40'

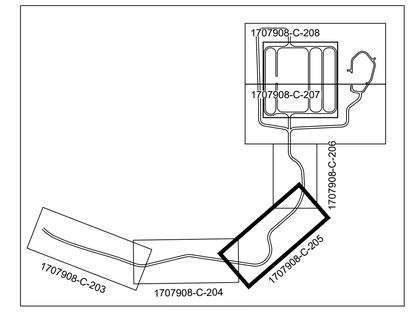
OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-204		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING:		
APPROVED BY	KAS	8/18/23	1707908-C-204.dwg		



EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	SPEC*
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SILT FENCE W/ WIRE SUPPORT	3.05
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
SC		VEHICULAR STREAM CROSSING	3.24
	LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER



KEY PLAN

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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Glen Allen, VA 23060; (p) 804.290.7957

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KEITH A. SCHOLTEN
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8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

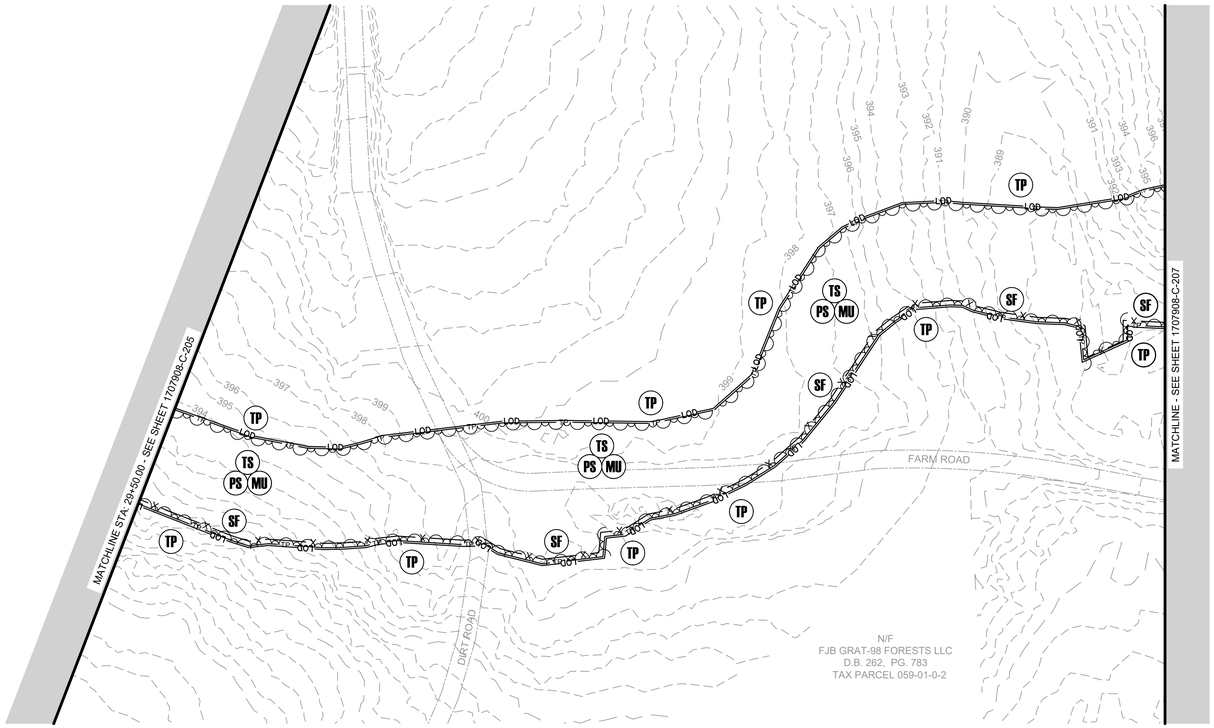
ESC PHASE 1 AND DEMOLITION
ACCESS ROAD STA. 19+50.00-29+50.00

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

0' 20' 40' 80'
SCALE: 1" = 40'

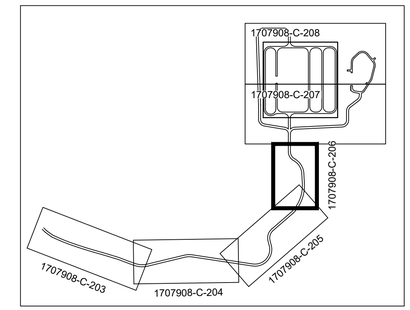
OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-205		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-205.dwg		
APPROVED BY	KAS	8/18/23			



EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	SPEC*
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SILT FENCE W/ WIRE SUPPORT	3.05
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER



KEY PLAN

0' 20' 40' 80'

SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

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8/18/23
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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

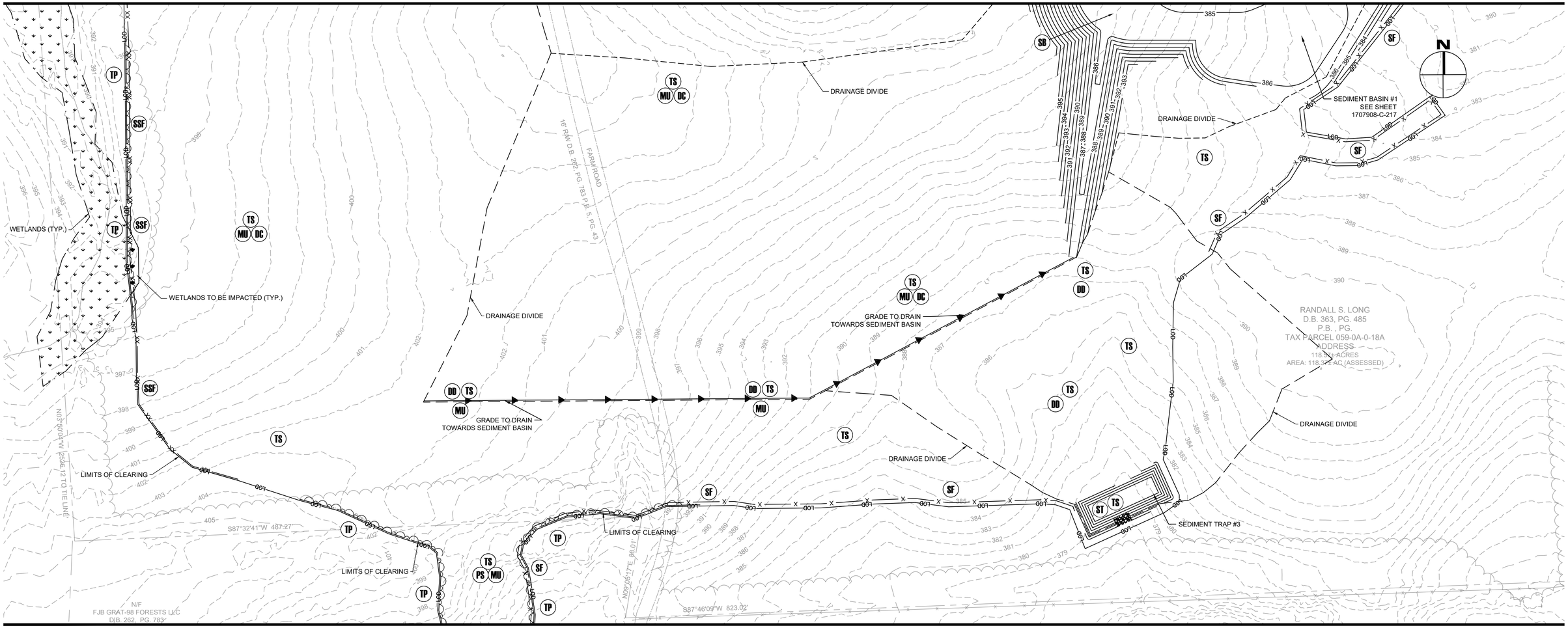
ESC PHASE 1 AND DEMOLITION
ACCESS ROAD STA. 29+50.00-38+50.00

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-206		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-206.dwg		
APPROVED BY	KAS	8/18/23			

MATCHLINE - SEE SHEET 1707908-C-208



MATCHLINE - SEE SHEET 1707908-C-206

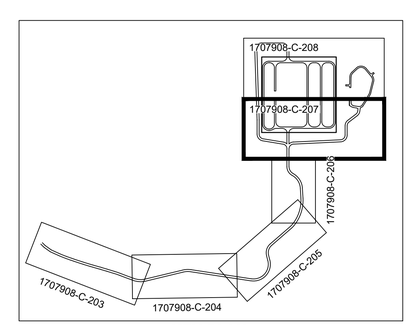
EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
BM	BM	BLANKET MATTING	3.36
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER



KEY PLAN

0' 20' 40' 80'
SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

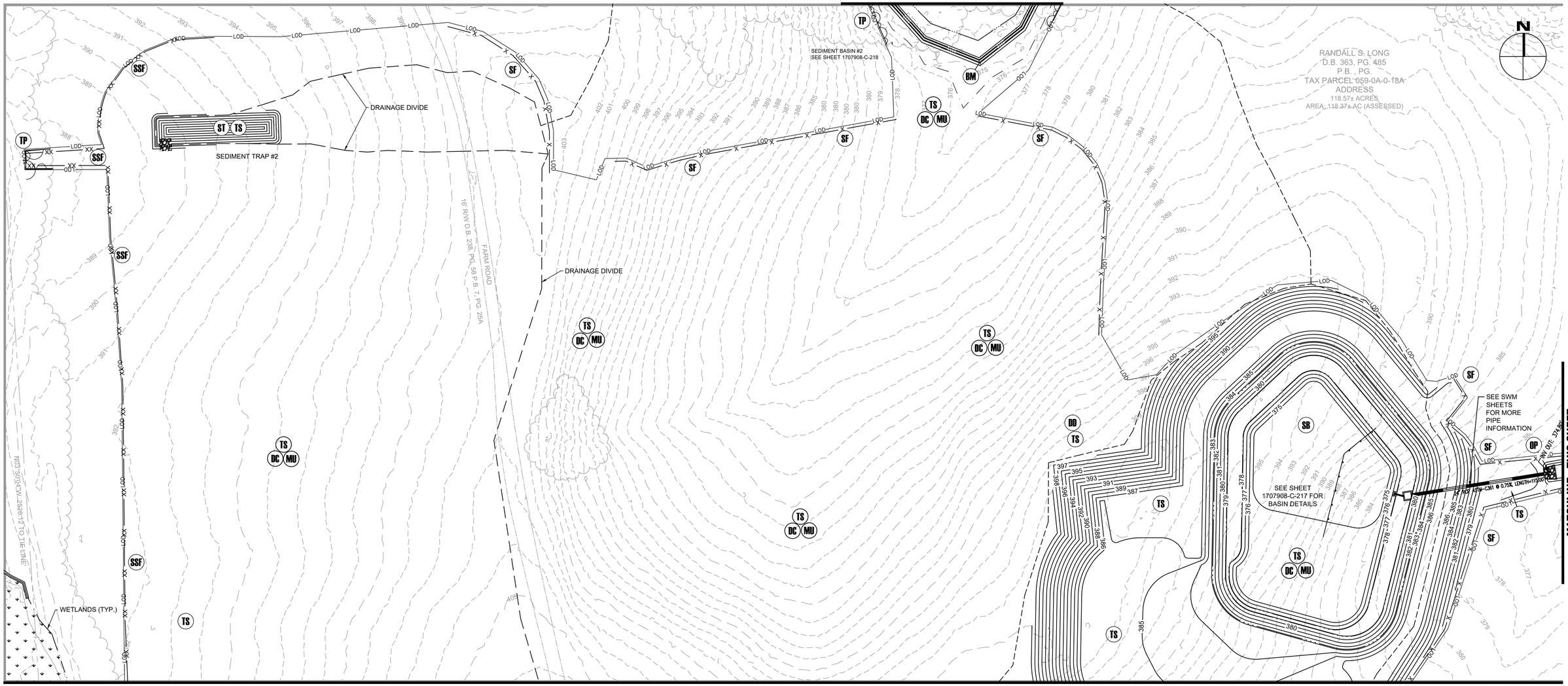
Dominion Energy

PHASE 1 ESC AND DEMOLITION PLAN 1

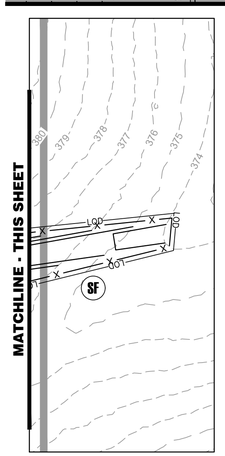
UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

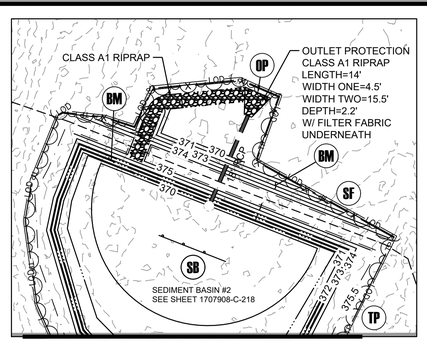
OPERATIONAL REGION			B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-207	
DESIGNER		MFR	8/18/23			
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-207.dwg	
APPROVED BY		KAS	8/18/23			

MATCHLINE - THIS SHEET



MATCHLINE - SEE SHEET 1707908-C-207





MATCHLINE - THIS SHEET

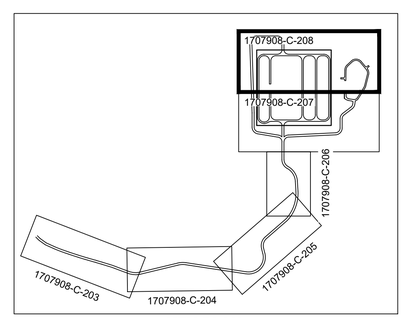
EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
BM	BM	BLANKET MATTING	3.36
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER



KEY PLAN

0' 20' 40' 80'
SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

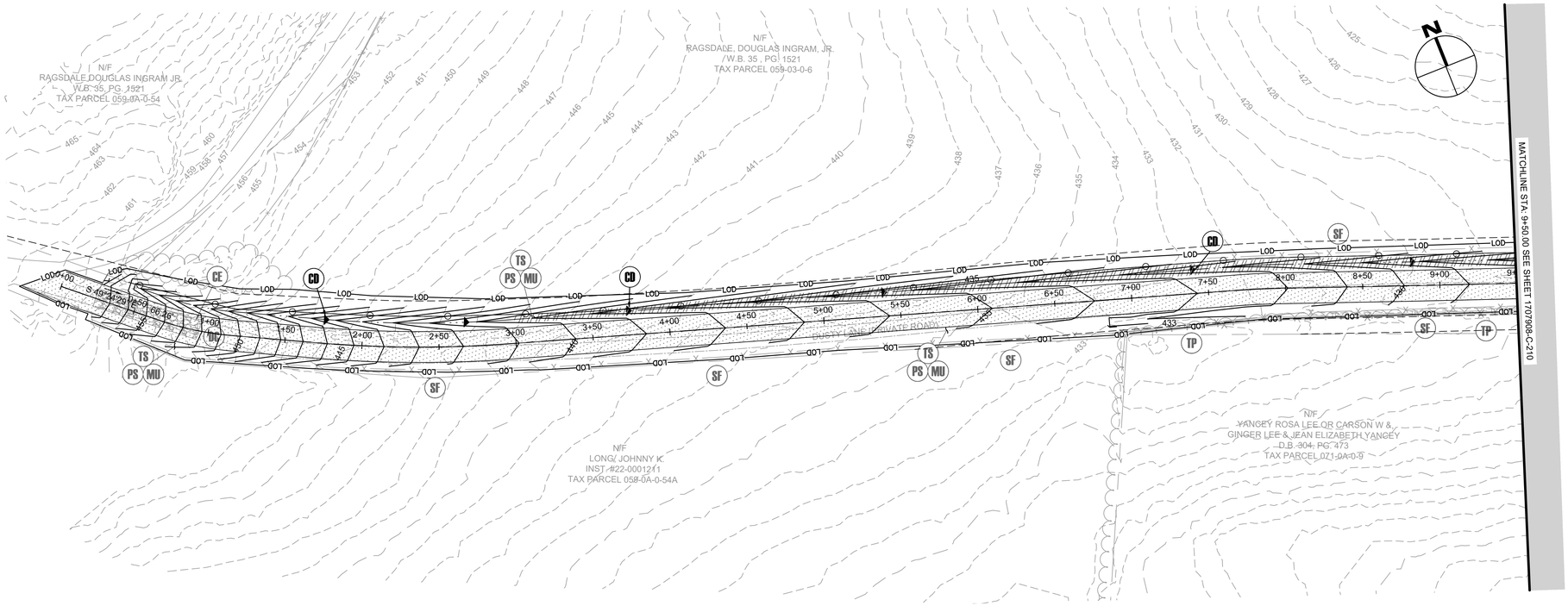
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

PHASE 1 ESC AND DEMOLITION PLAN 2

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET:	1707908-C-208
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	
APPROVED BY	KAS	8/18/23		1707908-C-208.dwg

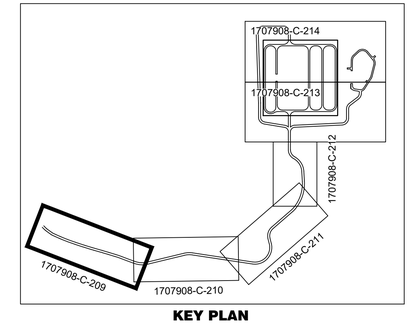


DITCH LINING LEGEND

EC-2 TY 2

EC-3-TY1

SOURCE: VDOT DRAINAGE MANUAL SECTION 7.4.6



KEY PLAN

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER

0' 20' 40' 80'

SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

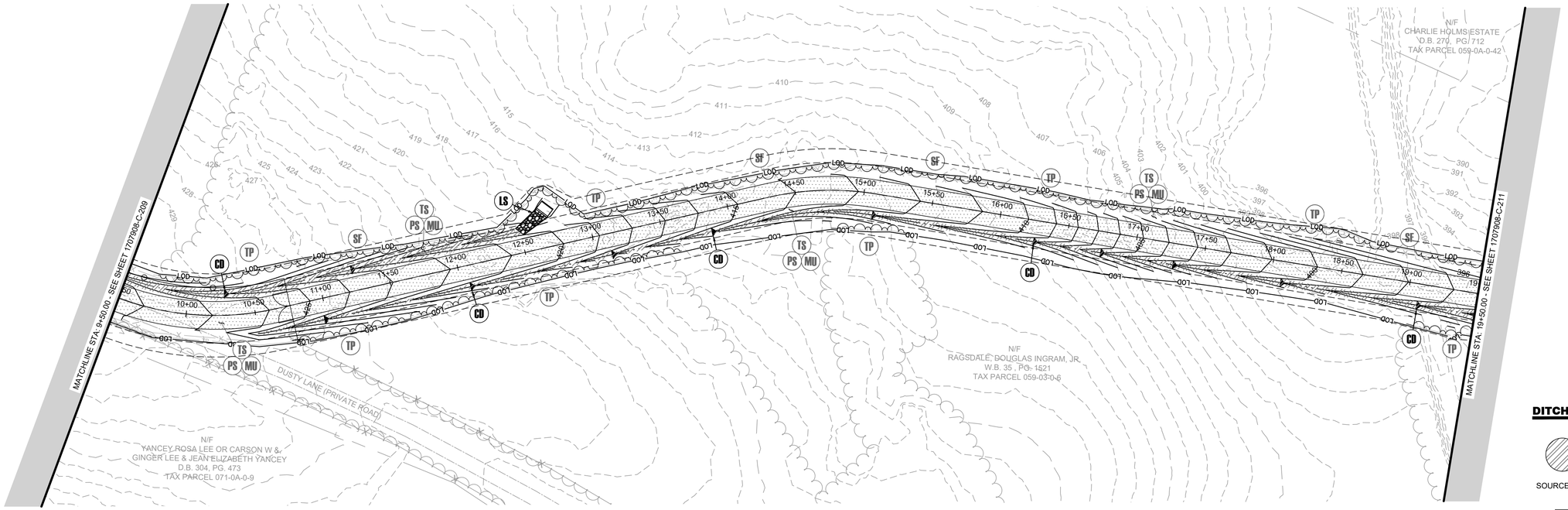
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

ESC PHASE 2 ACCESS ROAD
STA. 0+00.00-9+50.00

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-209		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING:		
APPROVED BY	KAS	8/18/23	1707908-C-209.dwg		



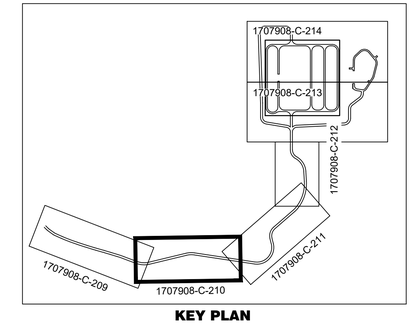
N

DITCH LINING LEGEND

EC-2 TY 2

EC-3-TY1

SOURCE: VDOT DRAINAGE MANUAL SECTION 7.4.6



KEY PLAN

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER

0' 20' 40' 80'

SCALE: 1" = 40'

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

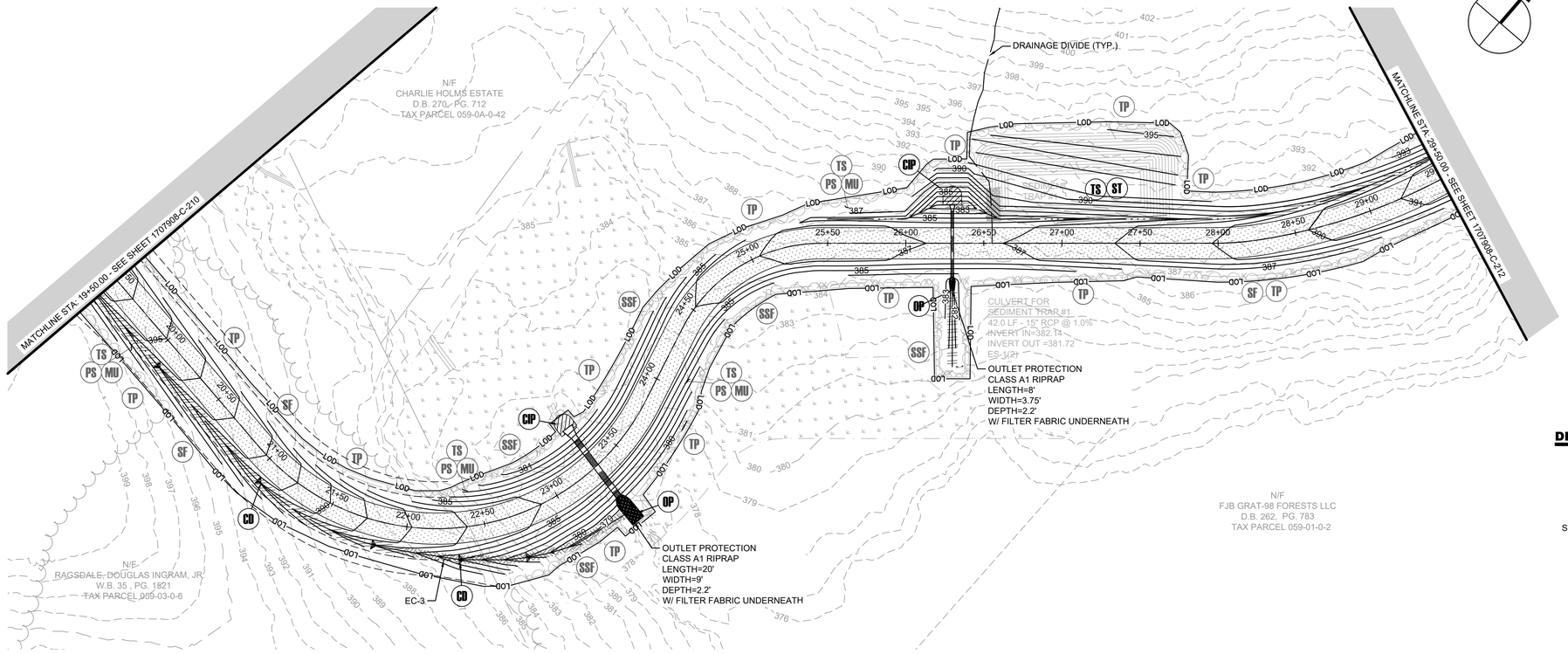
Dominion Energy

ESC PHASE 2 ACCESS ROAD
STA. 9+50.00-19+50.00

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE
PROJECT	NAME	DATE	SHEET:	1707908-C-210
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	
APPROVED BY	KAS	8/18/23		1707908-C-210.dwg

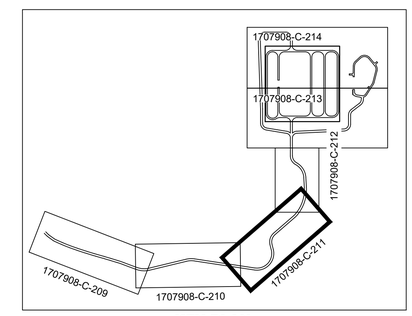


DITCH LINING LEGEND

EC-2 TY 2

EC-3-TY1

SOURCE: VDOT DRAINAGE MANUAL SECTION 7.4.6



KEY PLAN

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER

0' 20' 40' 80'

SCALE: 1" = 40'

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

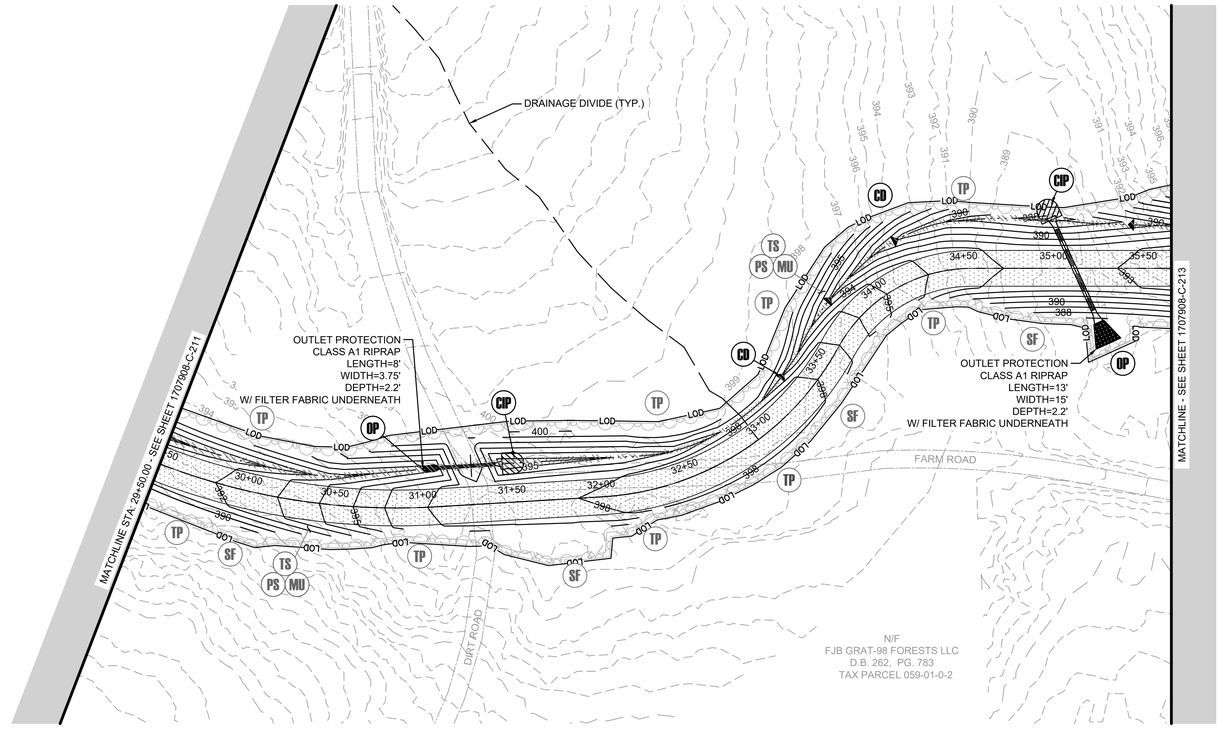
Dominion Energy

ESC PHASE 2 ACCESS ROAD
STA. 19+50.00-29+50.00

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-211		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-211.dwg		
APPROVED BY	KAS	8/18/23			



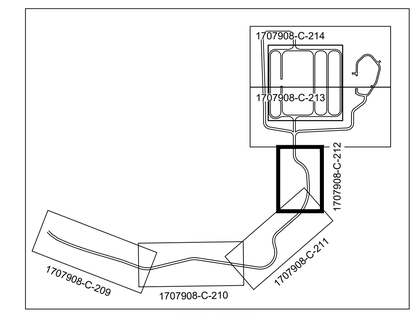
N

DITCH LINING LEGEND

EC-2 TY 2

EC-3-TY1

SOURCE: VDOT DRAINAGE MANUAL SECTION 7.4.6



KEY PLAN

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD LOD	LIMITS OF DISTURBANCE	

* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER

0' 20' 40' 80'

SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

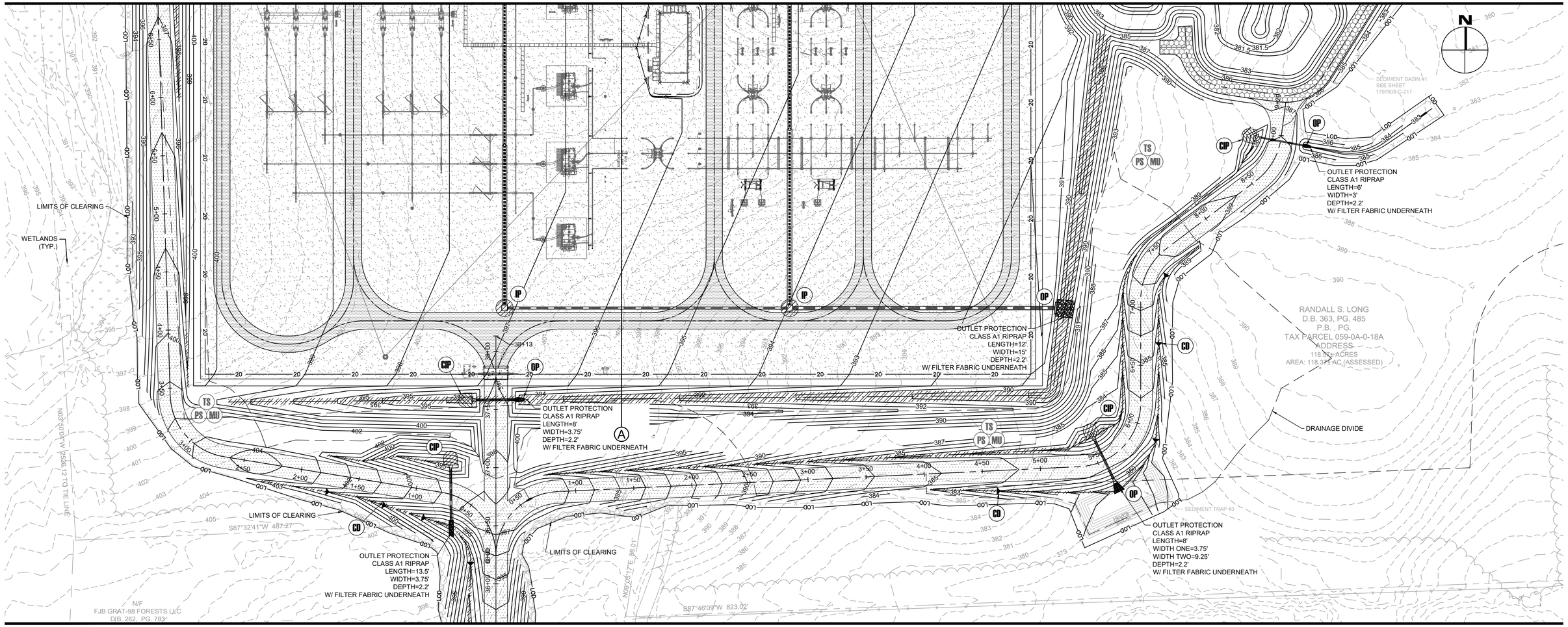
Dominion Energy

ESC PHASE 2 ACCESS ROAD
STA. 29+50.00-38+50.00

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-212		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-212.dwg		
APPROVED BY	KAS	8/18/23			

MATCHLINE - SEE SHEET 1707908-C-214



MATCHLINE - SEE SHEET 1707908-C-212

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD LOD	LIMITS OF DISTURBANCE	

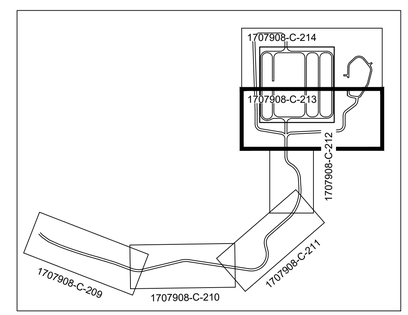
* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER

DITCH LINING LEGEND

EC-2 TY 2

EC-3-TY1

SOURCE: VDOT DRAINAGE MANUAL SECTION 7.4.6



KEY PLAN

0' 20' 40' 80'

SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
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DEWBERRY PROJECT NO.: 50157950

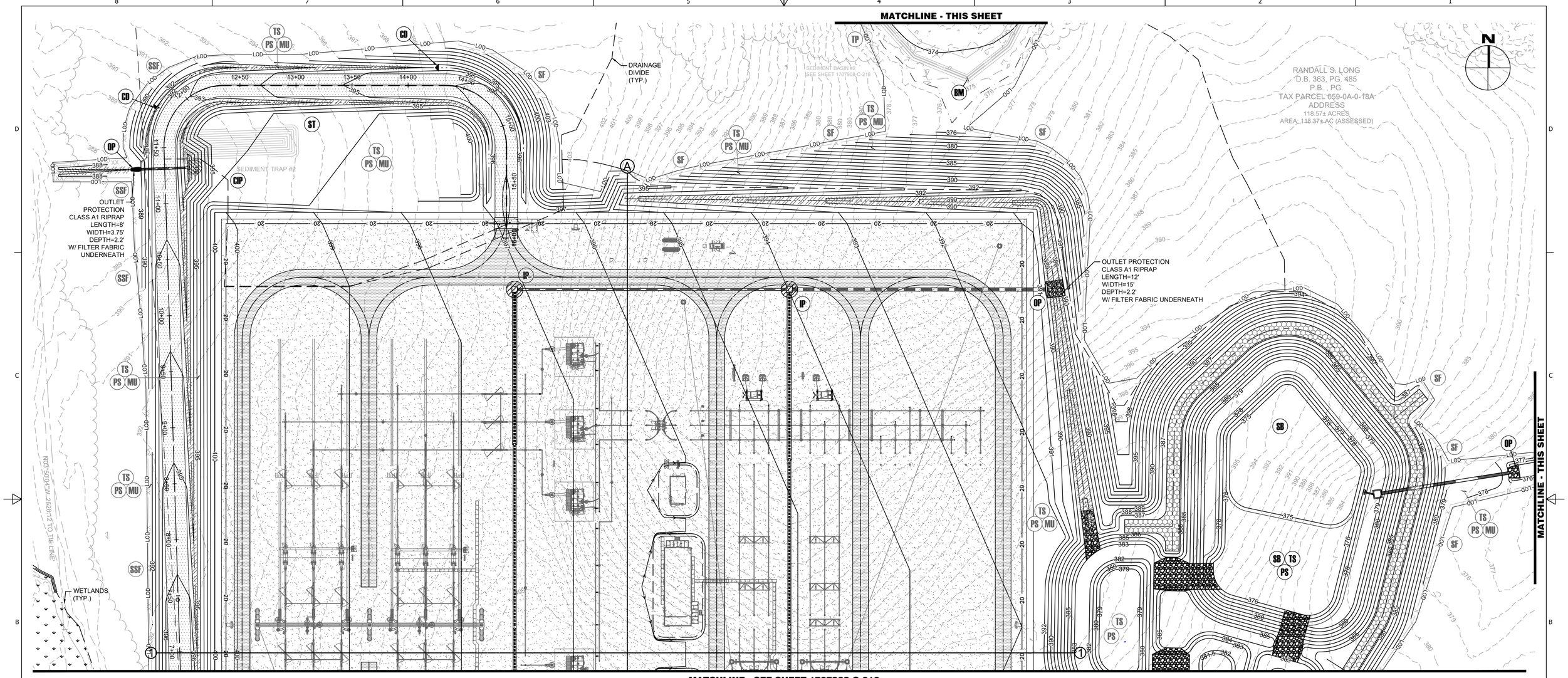
Dominion Energy

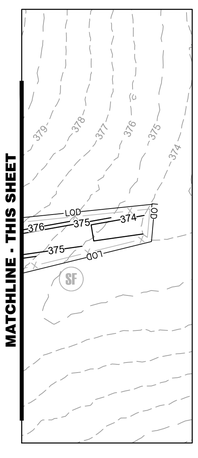
PHASE 2 ESC PLAN 1

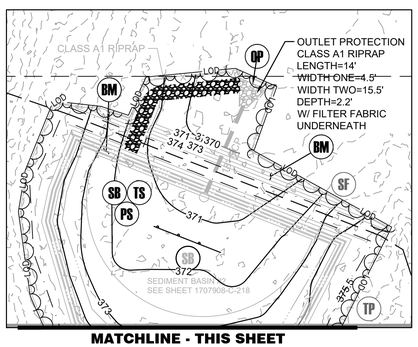
UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET:	1707908-C-213	
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING:		
APPROVED BY	KAS	8/18/23	1707908-C-213.dwg		







MATCHLINE - THIS SHEET

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
SAF		SAFETY FENCE	3.01
CE		CONSTRUCTION ENTRANCE	3.02
SF	X	SILT FENCE	3.05
SSF	XX	SUPER SILT FENCE	N/A
IP		INLET PROTECTION	3.07
CIP		CULVERT INLET PROTECTION	3.08
DD		DIVERSION DIKE	3.09
ST	ST	SEDIMENT TRAP	3.13
SB	SB	SEDIMENT BASIN	3.14

EROSION & SEDIMENT CONTROL LEGEND

ID	SYMBOL	NAME OF E&S MEASURE	*
CD		ROCK CHECK DAM	3.20
TS	TS	TEMPORARY SEEDING	3.31
PS	PS	PERMANENT SEEDING	3.32
MU	MU	MULCHING	3.35
BM	BM	BLANKET MATTING	3.36
TP	TP	TREE PROTECTION	3.38
DC	DC	DUST CONTROL	3.39
	LOD LOD	LIMITS OF DISTURBANCE	

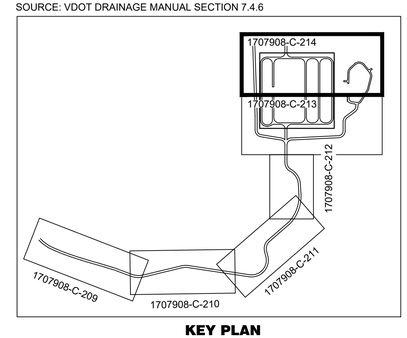
* VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK SPECIFICATION NUMBER

DITCH LINING LEGEND

EC-2 TY 2

EC-3-TY1

SOURCE: VDOT DRAINAGE MANUAL SECTION 7.4.6



KEY PLAN

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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

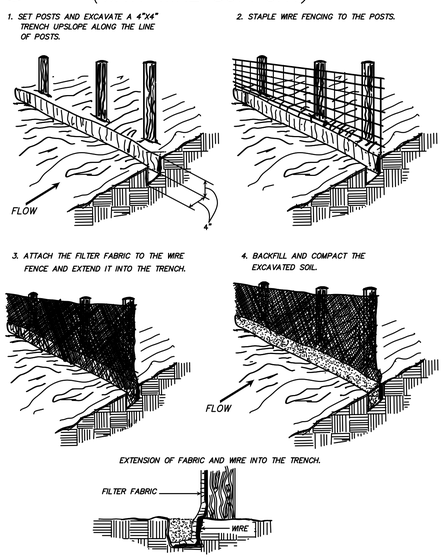
PHASE 2 ESC PLAN 2

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

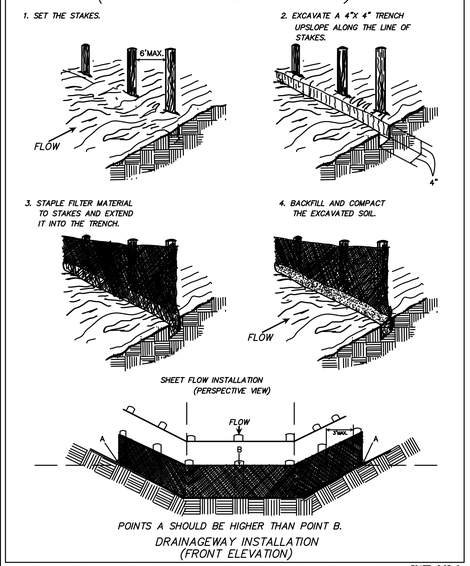
OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-214
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-214.dwg
APPROVED BY		KAS	8/18/23		

SSF CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)



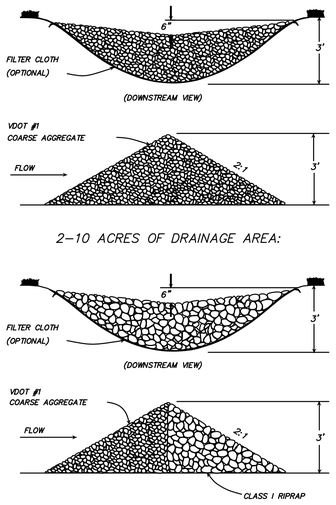
SOURCE: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood & Wyant PLATE 3.05-1

SF CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



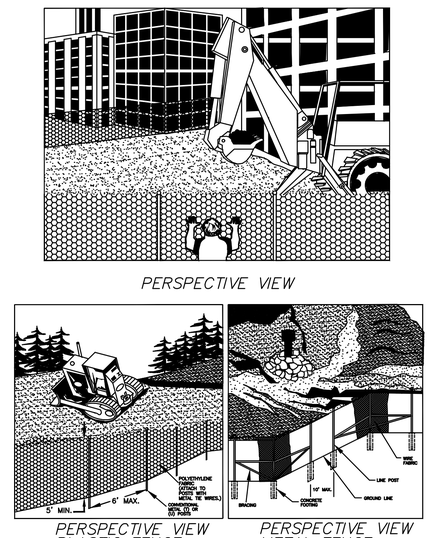
SOURCE: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control,VA. DSWC Sherwood and Wyant PLATE 3.05-2

CD ROCK CHECK DAM



SOURCE: VA. DSWC PLATE 3.20-1

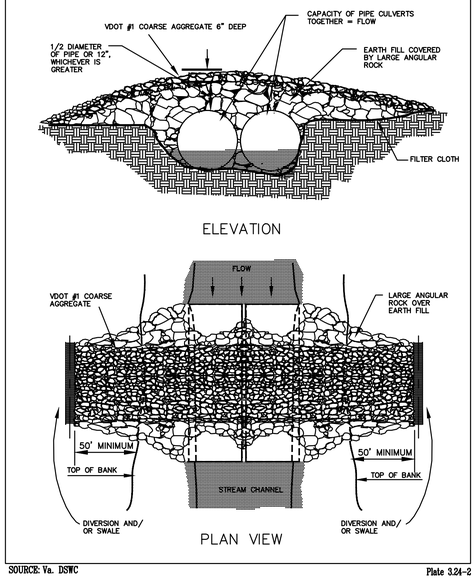
SAF SAFETY FENCE



SOURCE: CONWED PLASTICS
VDOT ROAD AND BRIDGE STANDARDS PLATE 3.1-1

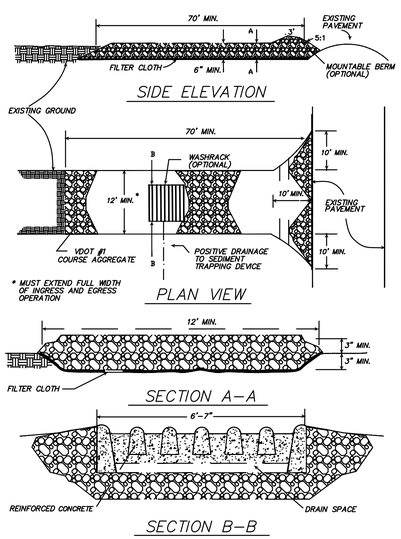
1992 3.24

SC TEMPORARY CULVERT CROSSING



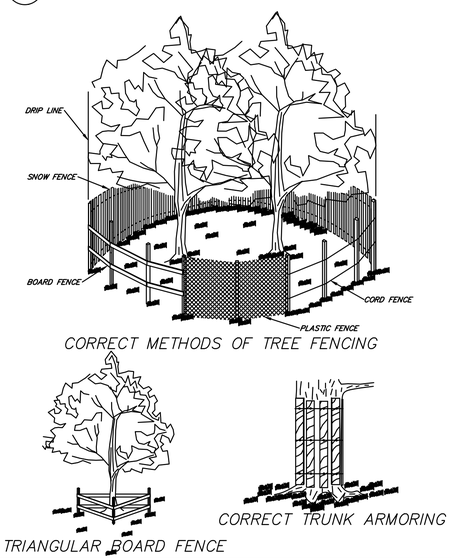
SOURCE: Va. DSWC Plate 3.24-2

CE STONE CONSTRUCTION ENTRANCE

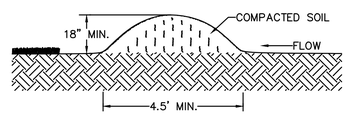


SOURCE: ADAPTED from 1983 Maryland Standards for Soil erosion and Sediment Control, and Va. DSWC Plate 3.02-1

TP TREE FENCING AND ARMORING

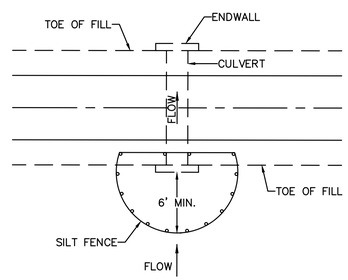


SOURCE: Va. DSWC Plate 3.38-2



DD TEMPORARY DIVERSION DIKE (3.09-1)

NO SCALE



CIP SILT FENCE CULVERT INLET PROTECTION (3.08-1)

NO SCALE

REVISIONS			Dewberry Engineers Inc. 4805 Lake Brook Drive, Suite 200 Glen Allen, VA. 23060; (p) 804.290.7957
REV	DATE	DESCRIPTION	COMMONWEALTH OF VIRGINIA KEITH A. SCHOLTEN Lic. No. 036569 8/18/23 PROFESSIONAL ENGINEER DEWBERRY PROJECT NO.: 50157950

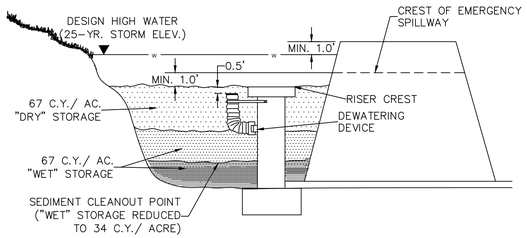
Dominion Energy

ESC DETAILS I

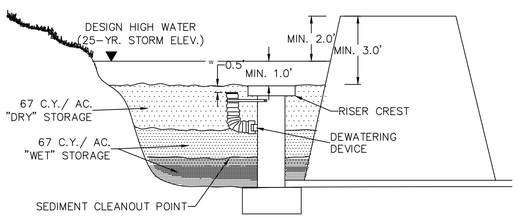
UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-215
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-215.dwg
APPROVED BY		KAS	8/18/23		



DESIGN ELEVATIONS WITH EMERGENCY SPILLWAY



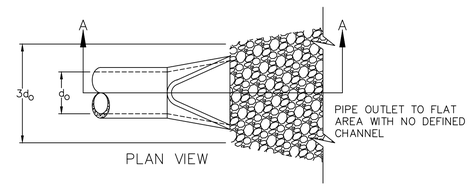
DESIGN ELEVATIONS WITHOUT EMERGENCY SPILLWAY
(RISER PASSES 25–YR. EVENT)

TEMPORARY SEDIMENT BASIN (3.14–2)

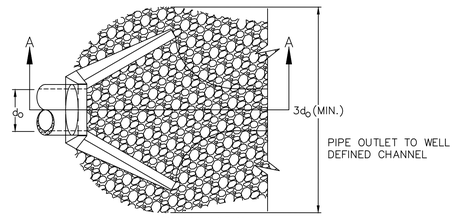
NO SCALE

(SB)

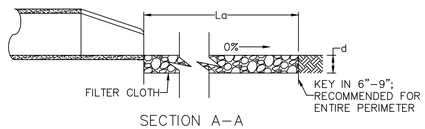
NOTE:
1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18–3 AND 3.18–4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAT 6 INCHES.



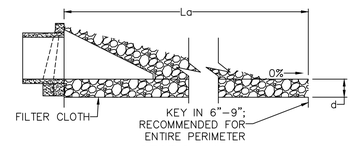
PLAN VIEW



PLAN VIEW



SECTION A–A

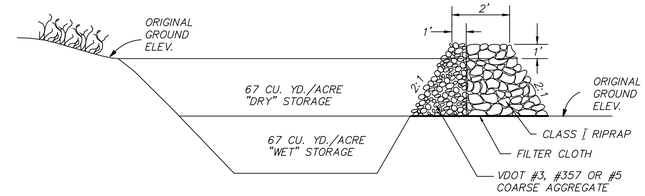


SECTION A–A

PIPE OUTLET CONDITIONS (3.18–1)

NO SCALE

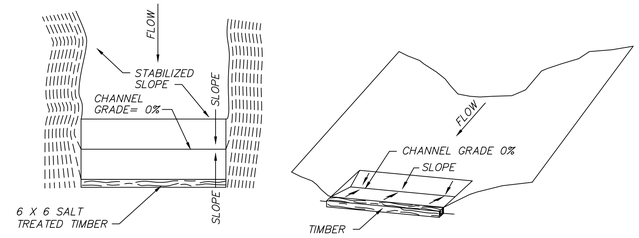
(OP)



(ST) TEMPORARY SEDIMENT TRAP (3.13–2)

NO SCALE

ST. NO.	MAX. AREA TO TRAP	VOLUME REQ'D	VOLUME PROVIDED	WET STORAGE	TOP OF EMBANK–MENT	WIDTH OF EMBANK–MENT	TOP OF RIP–RAP OUTLET	BOTTOM OF EXCAVA–TION	LENGTH OF OUTLET	LENGTH OF TRAP	WIDTH OF TRAP
1	2.8 AC.	381 CY	395CY @ 385.0	200 CY @ 383.4	386.0	6'	385.0	381.0	17'	85'	20'
2	1.0 AC.	134 CY	143CY @ 390.0	143 CY @ 388.7	391.0	6'	390.0	386.0	6	82'	2
3	1.4 AC.	188 CY	241CY @ 380.0	97 CY @ 378.1	381.0	6'	380.0	376.0	10'	60'	15'



PLAN VIEW

ISOMETRIC VIEW

NOTE:
LEVEL SPREADER DITCH MUST RECEIVE TEMPORARY SEEDING IMMEDIATELY AFTER INSTALLATION

LEVEL SPREADER DETAIL

NO SCALE

TABLE 3.32–D SITE SPECIFIC SEEDING MIXTURES FOR PIEDMONT AREA

SITE CONDITIONS	SEEDING MIXTURES	RATES PER ACRE	*SEASONAL NURSE CROP – DATES 2/16 TO 4/30	5/1 TO 8/15	8/16 TO 10/31	11/1 TO 2/15
HIGH MAINTENANCE LAWNS	TURF–TYPE TALL FESCUE OR KENTUCKY 31 FESCUE	200–250 LBS.				
MINIMUM CARE LAWN	KENTUCKY 31 FESCUE / TURF–TYPE TALL FESCUE > OR 95%–100%; IMPROVED PERENNIAL RYEGRASS 0%–5%; KENTUCKY BLUEGRASS 0%–5%	175–200 LBS.				
GENERAL SLOPE (3:1 OR LESS)	KENTUCKY 31 FESCUE 128 LBS.; RED TOP GRASS 2 LBS.; SEASONAL NURSE CROP * 20 LBS.	150 LBS.	ANNUAL RYE	FOXTAIL MILLET	ANNUAL RYE	WINTER RYE
LOW–MAINTENANCE SLOPE (STEEPER THAN 3:1)	KENTUCKY 31 FESCUE 108 LBS.; RED TOP GRASS 2 LBS.; SEASONAL NURSE CROP* 20 LBS.; CROWNVETCH** 20 LBS.	150 LBS.	ANNUAL RYE	FOXTAIL MILLET	ANNUAL RYE	WINTER RYE

* USE SEASONAL NURSE CROP IN ACCORDANCE WITH SEEDING DATES A STATED BELOW:
FEBRUARY 16th THROUGH APRIL.....ANNUAL RYE
MAY 1st THROUGH AUGUST 15th.....FOXTAIL MILLET
AUGUST 16th THROUGH OCTOBER.....ANNUAL RYE
NOVEMBER THROUGH FEBRUARY 15th.....WINTER RYE

** SUBSTITUTE SERICEA LESPEDEZA FOR CROWNVETCH EAST OF FARMVILLE, VA. (MAY THROUGH SEPTEMBER USE HULLED SERICEA, ALL OTHER PERIODS, USE UNHULLED SERICEA). IF FLATPEA IS USED IN LIEU OF CROWNVETCH, INCREASE RATE TO 30 LBS./ACRE. ALL LEGUME SEED MUST BE PROPERLY INOCULATED. WEEPING LOVEGRASS MAY BE ADDED TO ANY SLOPE OR LOW–MAINTENANCE MIX DURING WARMER SEEDING PERIODS; ADD 10–20 LBS./ACRE IN MIXES

MULCHING, Std. & Spec. 3.35

TABLE 3.35–A ORGANIC MULCH MATERIALS AND APPLICATION RATES

MULCHES:	RATES PER ACRE	RATES PER 1000 SQ. FT.	NOTES:
STRAW OR HAY	1½– 2 TONS (MINIMUM 2 TONS FOR WINTER COVER)	70–90 LBS.	FREE FROM WEEDS AND COARSE MATTER. MUST BE ANCHORED. SPREAD WITH MULCH BLOWER OR BY HAND.
FIBER MULCH	MINIMUM 1500 LBS.	35 LBS.	DO NOT USE AS MULCH FOR WINTER COVER OR DURING HOT, DRY PERIODS.* APPLY AS SLURRY.

*WHEN FIBER MULCH IS THE ONLY AVAILABLE MULCH DURING PERIODS WHEN STRAW SHOULD BE USED, APPLY AT A MINIMUM RATE OF 2000 LBS./AC. OR 45 LBS./1000 SQ. FT.

PERMANENT SEEDING, Std. & Spec. 3.32

Plant Selection
Refer to Table 3.32–D for Seeding Mixtures for the Piedmont Area.
Seedbed Preparation
1. Liming
In the Piedmont Region, apply 2 tons/acre pulverized agricultural grade limestone (90 lbs./1,000 sq, ft,).
2. Fertilizer
Shall be applied as 1000 lbs./acre of 10–20–10 (23 lbs./sq. ft.) or equivalent nutrients. Lime and Fertilizer shall be incorporated into the top 4–6 inches of the soil be discing or other means.
Seeding
1. Certified seed will be used for all permanent seeding whenever possible.
2. Legume seed should be inoculated with the inoculant appropriate to the species. Seed of the Lespedizas, the Clovers and the Crownvetch should be scarified to promote uniform germination.
3. Apply seed uniformly with a broadcast seeder, drill, culti–packer seeder, or hydroseeder on a firm, friable seedbed. Seeding depth should be 1/4 to 1/2 inch.
Mulching
All permanent seeding must be mulched immediately upon completion of seed application.
Irrigation
New seedings should be provided with adequate moisture.
Re–seeding
Inspect seeded areas for failure and make necessary repairs and re–seedings within the same season, if possible.

SEED		
APPLICATION DATES	SPECIES	APPLICATION RATES
SEPT. 1 – FEB. 15	50/50 MIX OF ANNUAL RYEGRASS (LOLIUM MULTI–FLORUM) & CEREAL (WINTER) RYE (SECALE CEREALE)	50–100 (lbs./acre)
FEB. 16 – APR. 30	ANNUAL RYEGRASS (LOLIUM MULTI–FLORUM)	60–100 (lbs./acre)
MAY 1 – AUG. 31	GERMAN MILLET	50 (lbs./acre)

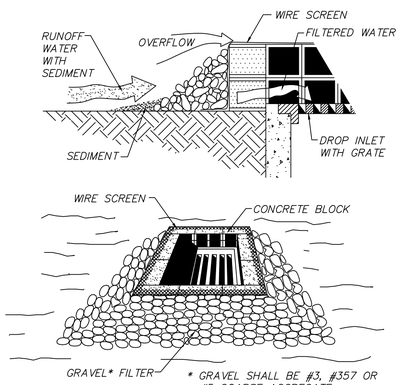
FERTILIZER & LIME

- APPLY 10–10–10 FERTILIZER AT A RATE OF 450 lbs./acre (OR 10 lbs./1,000 sq. ft.)
- APPLY PULVERIZED AGRICULTURAL LIMESTONE AT A RATE OF 2 TONS/ACRE (OR 90 LBS./1,000 SQ. FT.)

NOTE:
1.)A SOIL TEST IS NECESSARY TO DETERMINE THE ACTUAL AMOUNT OF LIME REQUIRED TO ADJUST THE SOIL pH OF SITE.
2.) INCORPORATE THE LIME AND FERTILIZER INTO THE TOP 4–6 INCHES OF THE SOIL BY DISKING OR BY OTHER MEANS.
3.) WHEN APPLYING SLOWLY AVAILABLE NITROGEN USE RATES AVAILABLE IN EROSION & SEDIMENT CONTROL TECHNICAL BULLETIN #4, 2003 NUTRIENT MANAGEMENT FOR DEVELOPMENT SITES AT:
http://ww.dcr.state.va.us/sw/e&s.htm#pubs

TEMPORARY SEEDING SPECIFICATIONS
QUICK REFERENCE FOR ALL REGIONS (TS)

TABLE 3.31–B
(REVISED JUNE 2003)



(IP) BLOCK & GRAVEL DROP INLET SEDIMENT FILTER (3.07–3)

NO SCALE

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA. 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

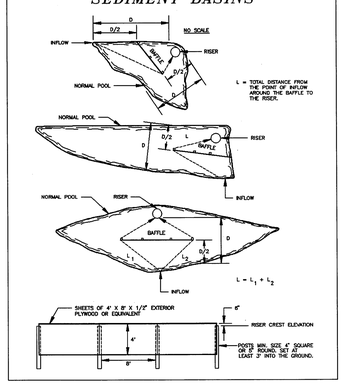
ESC DETAILS II

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-216
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	
APPROVED BY		KAS	8/18/23		1707908-C-216.dwg

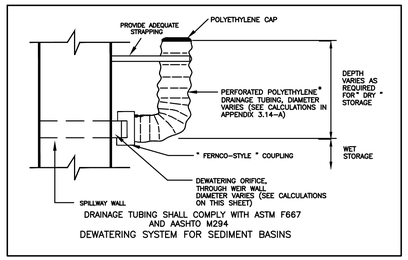
1992 3.14

EXAMPLE PLAN VIEWS OF BAFFLE LOCATIONS IN SEDIMENT BASINS



Source: USDA-SCS Plate 3.14-6

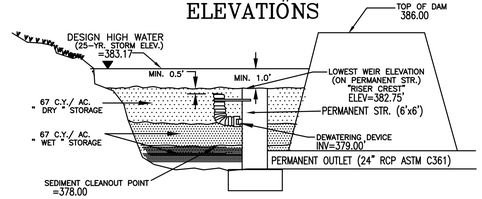
III - 94



DRAINAGE TUBING SHALL COMPLY WITH ASTM F667 AND AASHTO M294

DEWATERING SYSTEM FOR SEDIMENT BASINS

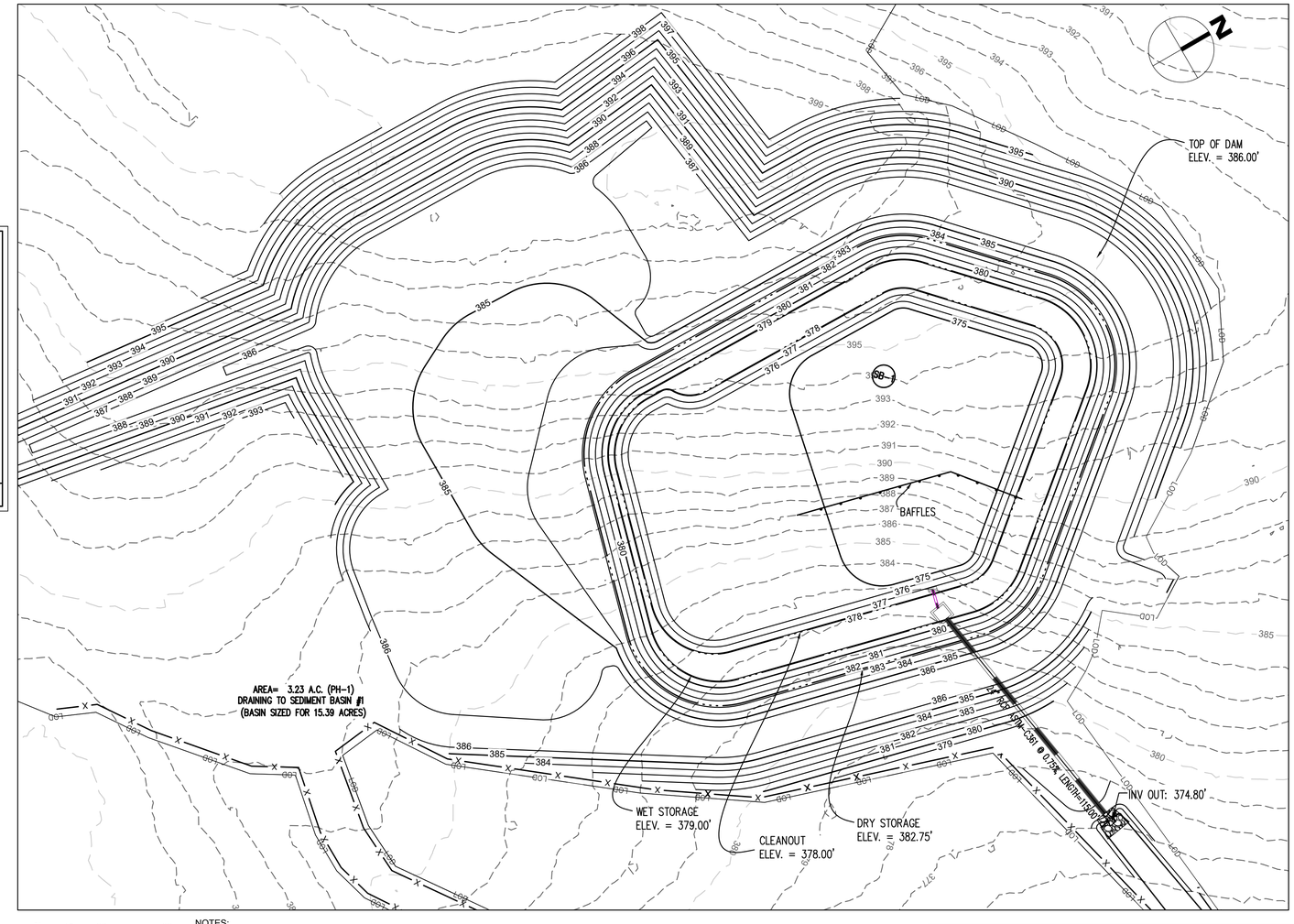
SEDIMENT BASIN #1 SCHEMATIC ELEVATIONS



DESIGN ELEVATIONS WITHOUT EMERGENCY SPILLWAY

(RISER PASSES 25-YR. ONSITE EVENT)

SEDIMENT BASIN 1 PLAN VIEW

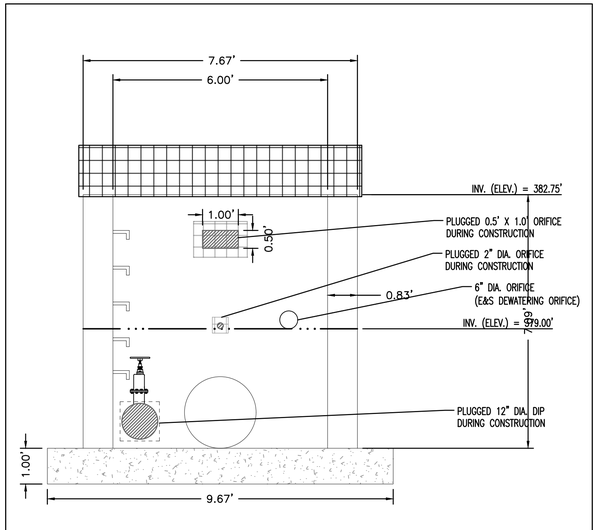


0' 15' 30' 60'

SCALE: 1" = 30'

SEDIMENT BASIN SUMMARY TABLE

SEDIMENT BASIN	DRAINAGE AREA (acres)	WET STORAGE: VOLUME REQUIRED (Cu. Yd.)	WET STORAGE: VOLUME PROVIDED (Cu. Yd.)	DRY STORAGE: VOLUME REQUIRED (Cu. Yd.)	DRY STORAGE: VOLUME PROVIDED (Cu. Yd.)	BOTTOM ELEVATION	RISER CREST ELEVATION	DEWATERING ORIFICE DIAMETER (Inches)	DEWATERING DEVICE ELEVATION	CLEAN OUT ELEVATION	DESIGN HIGH WATER ELEVATION	EMERGENCY SPILLWAY ELEVATION	TOP OF DAM ELEVATION (MINIMUM)	BAFFLE: MINIMUM FLOW LENGTH FOR 2.0 WIDTH RATIO	BAFFLE: BAFFLE REQUIRED (Yes / No)
1	15.39	1031.13	3130.62	1031.13	5707.15	375.00	382.75	6	379.00	378.00	383.17	N/A	386.00	200	Yes



RISER CONFIGURATION DURING CONSTRUCTION

ACTING AS A TEMPORARY SEDIMENT BASIN #1

NOT TO SCALE

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Wet Pond (IN)	Post-Development 25 year	25	6.244	12.150	84.10	(N/A)	(N/A)
Wet Pond (OUT)	Post-Development 25 year	25	3.604	12.450	19.87	383.17	3.264

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ac-ft)
379.00	0.000
380.00	0.707
381.00	1.461
382.00	2.261
383.00	3.110
384.00	4.009
385.00	5.234
386.00	6.807

NOTE: SEDIMENT BASIN WAS ROUTED USING PONDPACK FOR THE 25-YEAR FREQUENCY STORM UNDER DENUDED SOIL CONDITIONS (CN = 89). THIS CONFIRMED THE POND IS SIZED TO SUFFICIENTLY PASS THE 25-YEAR STORM WITH THE PROPOSED 24" RCP BARREL.

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser Top	Forward	Culvert - 24"	382.75	386.00
Orifice-Circular	Orifice - Circular	Forward	Culvert - 24"	379.00	386.00
Culvert-Circular	Culvert - 24"	Forward	TW	375.66	386.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

NOTES:

1. NOTIFY AND COORDINATE WITH ESC INSPECTOR AT THE START OF EMBANKMENT CONSTRUCTION. A GEOTECHNICAL ENGINEER SHOULD BE PRESENT DURING AND AFTER CONSTRUCTION TO MONITOR, REPORT AND VERIFY STABILITY AND COMPACTION OF DAM.
2. SEDIMENT BASIN CALCULATIONS ARE PROVIDED ON THIS SHEET.
3. ALL FILL EMBANKMENTS SHALL BE CONSTRUCTED PER REQUIREMENTS IN GEOTECH REPORT.
4. BLANKET AND MATTING IS REQUIRED WHEREVER THE SLOPE EXCEEDS 3:1. SEE EROSION AND SEDIMENT CONTROL SHEETS.

SEQUENCE OF CONSTRUCTION NARRATIVE

STEP 1: INSTALL E&S PERIMETER CONTROLS PRIOR TO CONSTRUCTION, INCLUDING TEMPORARY DE-WATERING DEVICES AND STORMWATER DIVERSIONS. UTILIZE SWM POND AS TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION. EXCAVATE / GRADE UNTIL THE APPROPRIATE ELEVATIONS AND DESIRED CONTOURS ARE ACHIEVED FOR THE BOTTOM AND SIDE SLOPES OF THE SEDIMENT BASIN. INSTALLATION OF THE PERMANENT OUTLET PIPE AND RISER STRUCTURE SHOULD BE INITIATED DURING THE CONSTRUCTION PHASE.

STEP 2: INSTALL THE PERMANENT OUTLET PIPE AND CONCRETE CRADLE, INCLUDING THE DOWNSTREAM RIPRAP APRON. INSTALL THE RISER TO THE INVERT ELEVATIONS AS SHOWN ON SHEET 1707908-C-616 .

STEP 3: CONSTRUCT THE EMBANKMENT IN 8 INCH LIFTS AND COMPACT THE LIFTS PER THE SPECIFICATIONS OUTLINED IN THE GEOTECH REPORT.

STEP 4: AFTER COMPLETION OF CONSTRUCTION OF THE SITE, STABILIZE THE ENTIRE DRAINAGE AREA.

STEP 5: THE PERMANENT FACILITY SHALL ONLY BE CONSTRUCTED AFTER THE CONTRIBUTING DRAINAGE AREA TO THE POND IS COMPLETELY STABILIZED.

STEP 6: TO CONVERT SEDIMENT BASIN TO A PERMANENT FACILITY, DEWATER AND DREDGE THE SEDIMENT BASIN AFTER THE SITE CONSTRUCTION IS COMPLETE TO REMOVE SEDIMENT AS NECESSARY. DISPOSE OF SEDIMENT AT A LEGAL DISPOSAL SITE.

STEP 7: EXCAVATE/ GRADE UNTIL THE APPROPRIATE FINAL ELEVATIONS AND DESIRED CONTOURS ARE ACHIEVED FOR THE BOTTOM AND SIDE SLOPES OF THE POND AS SHOWN ON SHEET 1707908-C-614. INCORPORATE THE CLAY LINER AND TOP SOIL AS PART OF THE FINAL GRADING. INSTALL THE ACCESS ROAD. INSTALL ANY INTERNAL BERMS IN 8 LIFTS AND COMPACT TO THE APPROPRIATE ELEVATION.

STEP 8: CONVERT THE SEDIMENT BASIN RISER STRUCTURE TO THE PERMANENT RISER STRUCTURE CONFIGURATION AS SHOWN ON SHEET 1707908-C-616.

STEP 9: ALL AREAS SHOULD BE PERMANENTLY STABILIZED BY HYDROSEEDING OR SEEDING AND MULCHING.

REVISIONS

REV	DATE	DESCRIPTION

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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SEDIMENT BASIN

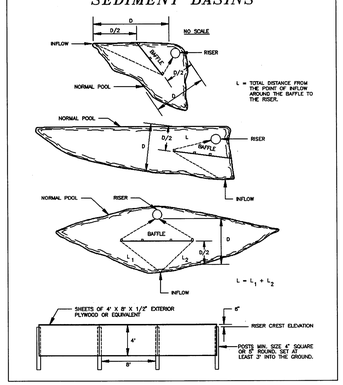
UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-217
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	
APPROVED BY		KAS	08/18/23		1707908-C-217.dwg

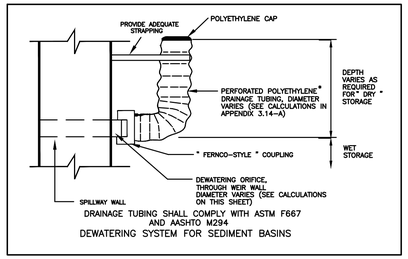
1992 3.14

EXAMPLE PLAN VIEWS OF BAFFLE LOCATIONS IN SEDIMENT BASINS

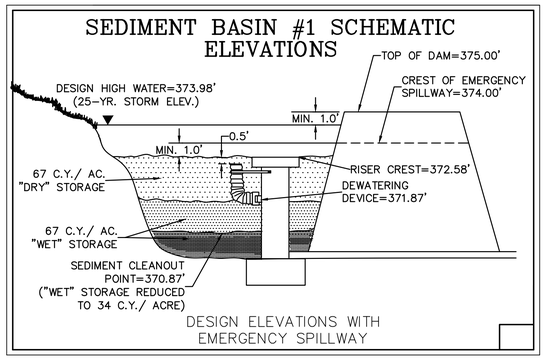


Source: USDA-SCS Plate 3.14-6

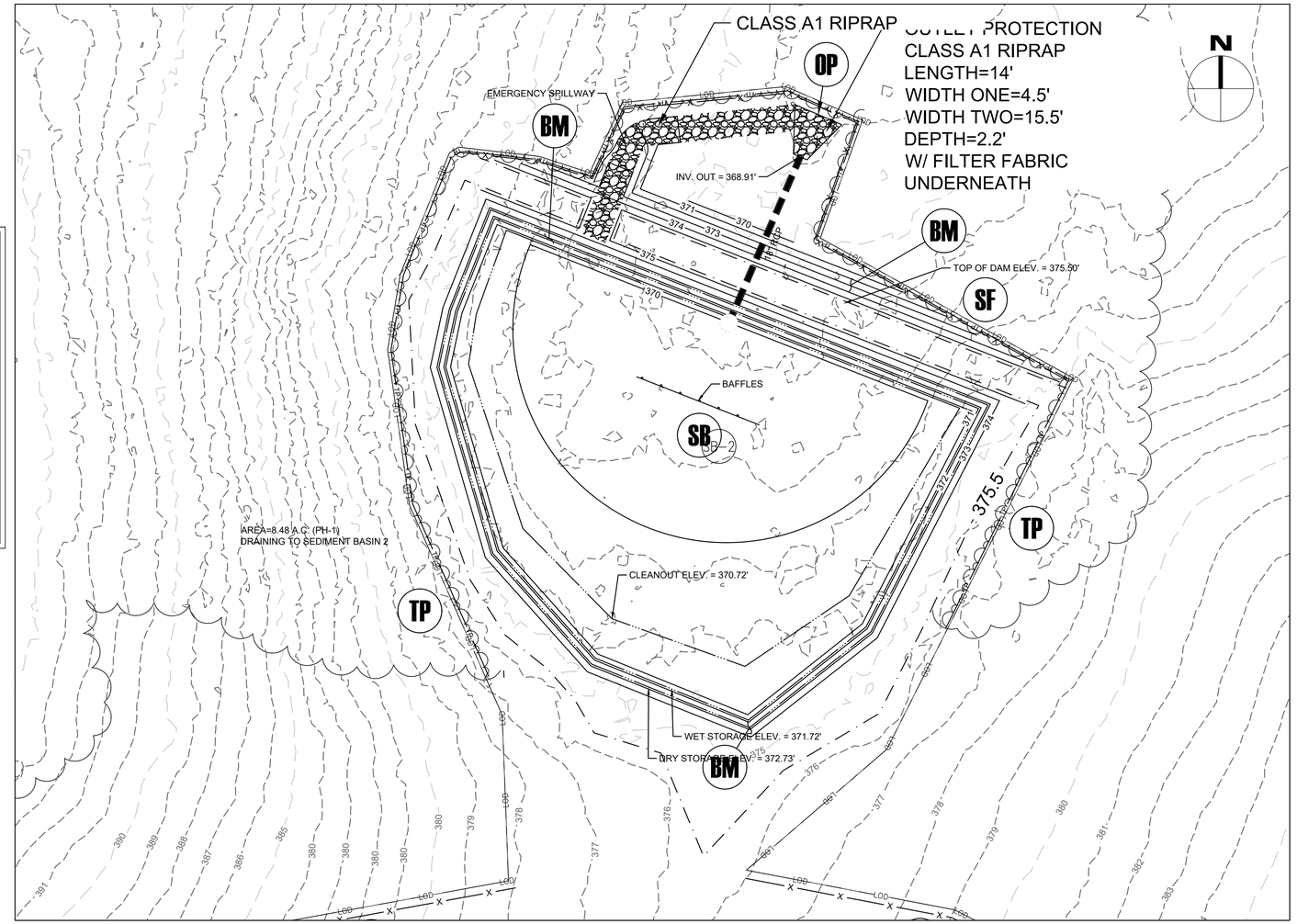
III - 94



DEWATERING SYSTEM FOR SEDIMENT BASINS



SEDIMENT BASIN 2 PLAN VIEW



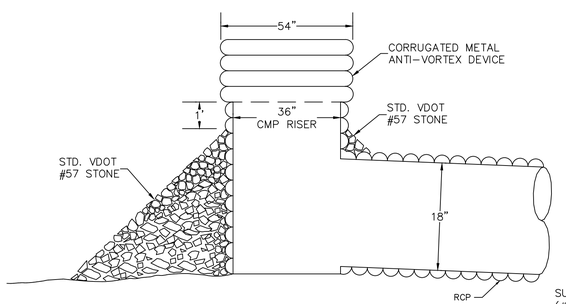
0' 10' 20' 40'
SCALE: 1" = 20'

SEDIMENT BASIN	DRAINAGE AREA (acres)	WET STORAGE VOLUME REQUIRED (Cu. Yd.)	WET STORAGE VOLUME PROVIDED (Cu. Yd.)	DRY STORAGE VOLUME REQUIRED (Cu. Yd.)	DRY STORAGE VOLUME PROVIDED (Cu. Yd.)	BOTTOM ELEVATION	RISER CREST ELEVATION	DEWATERING ORIFICE DIAMETER (Inches)	DEWATERING DEVICE ELEVATION	CLEAN OUT ELEVATION	DESIGN HIGH WATER ELEVATION	EMERGENCY SPILLWAY ELEVATION	TOP OF DAM ELEVATION (MINIMUM)	BAFFLE: MINIMUM FLOW LENGTH FOR 2.0 WIDTH RATIO	BAFFLE: BAFFLE REQUIRED (Yes / No)
2	8.48	568.16	779.59	568.16	573.12	369.35	372.73	3	371.72	370.72	374.13	374.50	375.50	165	YES

SEDIMENT BASIN SUMMARY TABLE

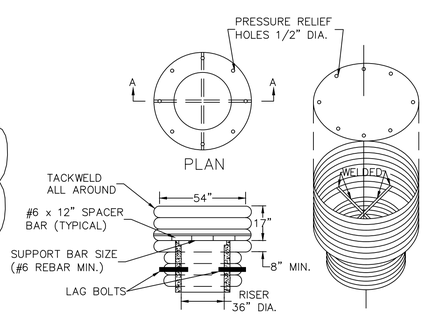
ELEV (ft)	VOLUME (acre-ft)	TOTAL VOLUME (acre-ft)	TOTAL VOLUME (cubic ft)	TOTAL VOLUME (cubic yds)
370.0	0.000	0.000	0	0.00
371.0	0.200	0.200	8,725	323.15
372.0	0.313	0.513	22,355	827.96
373.0	0.334	0.847	36,915	1367.22
374.0	0.356	1.204	52,430	1941.85
375.0	0.406	1.609	70,105	2596.48

ELEVATION - VOLUME



RISER AND BARREL DETAIL

NO SCALE



NOTES:

1. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER WITH LAG BOLTS AS SHOWN.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO THE TOP OF THE RISER.
3. TOP IS 16 GAGE CORRUGATED METAL OR 1/8" STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMITTED, IF THE ENDS OF THE CORRUGATIONS ARE LEFT FULLY OPEN WHEN THE TOP IS ATTACHED.
4. CYLINDER IS 16 GAGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8" STEEL PLATE.

ANTI-VORTEX DEVICE DETAIL

NO SCALE

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
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4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

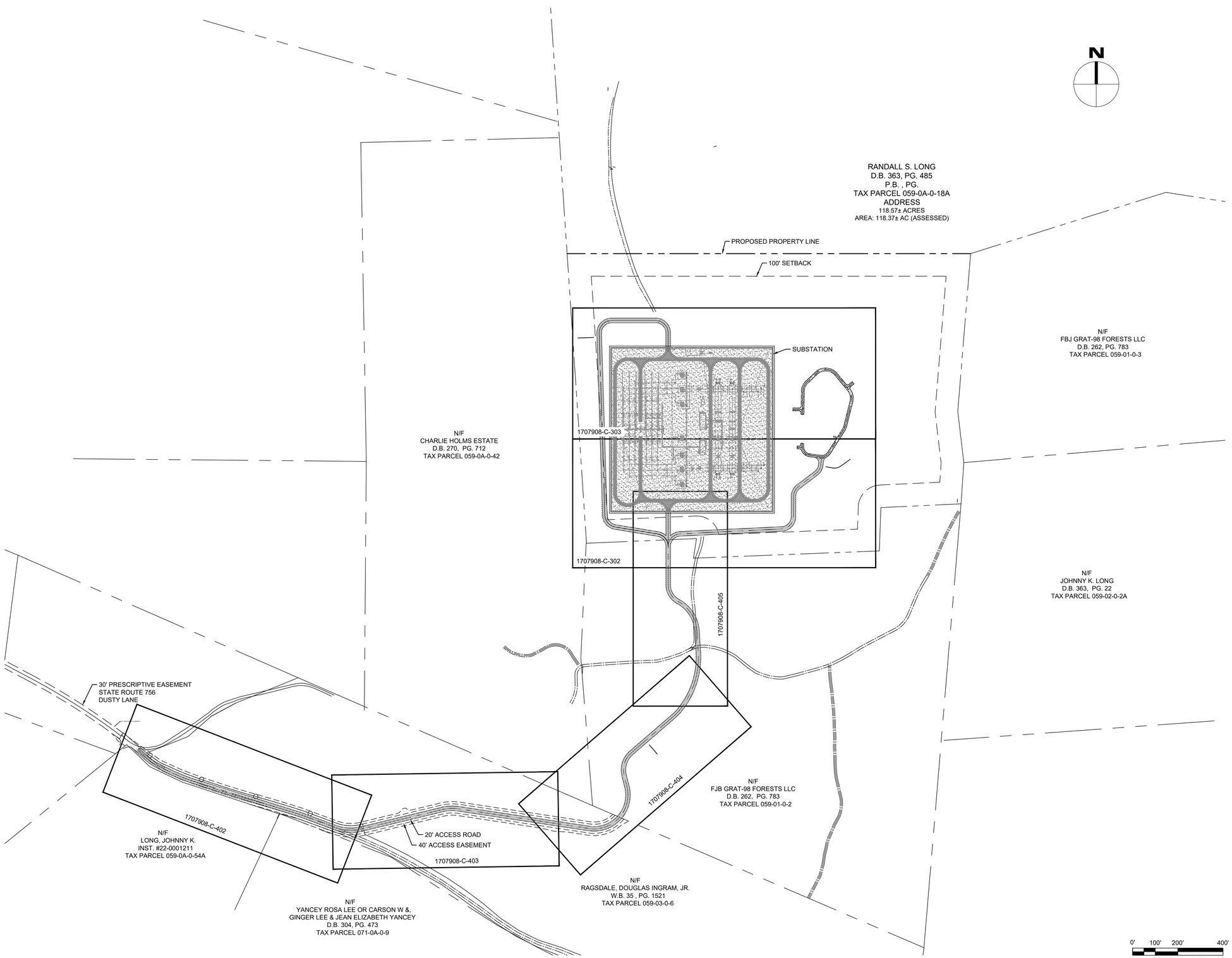
Dominion Energy

SEDIMENT BASIN 2

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE AS SHOWN
PROJECT 5017950		NAME	DATE	SHEET:	1707908-C-218
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-218.dwg
APPROVED BY		KAS	8/18/23		



GENERAL NOTES

1. NOT ALL SUBSTATION COMPONENTS SHOWN FOR CLARITY.
2. ELECTRICAL GENERAL ARRANGEMENT PLANS BY OTHERS; SHOWN ON CIVIL PLANS FOR INFORMATION ONLY.
3. PROPOSED PARCEL ACREAGE IS 41.29 ACRES.

HATCH LEGEND

- EQUIPMENT PATHWAY SEE DETAIL SHT. C-801
- ACCES ROADS SEE DETAIL SHT. C-801
- SUBSTATION GRAVEL PAD SEE DETAIL SHT. C-801
- DAM TOP ACCESS ROAD SEE DETAIL SHT. C-801

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

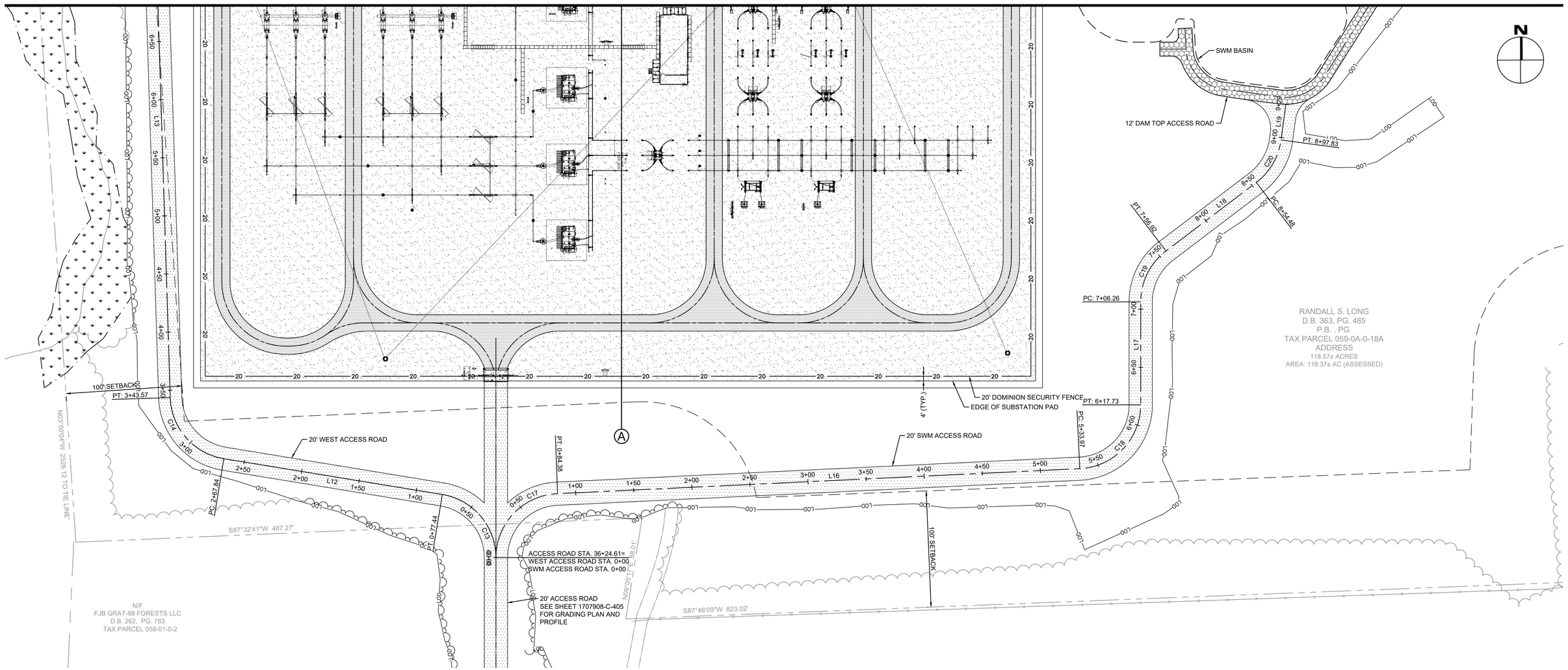
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

OVERALL SITE LAYOUT PLAN

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-301
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-301.dwg
APPROVED BY		KAS	8/18/23		



WEST ACCESS ROAD ALIGNMENT TABLE					
NUMBER	BEARING	LENGTH (FT)	RADIUS	START POINT	END POINT
C13	N 40°20'48" W	77.44'	55.03'	PC:-0+00.00 N:3482231.42 E:11587536.10	PT:0+77.44 N:3482285.69 E:11587490.00
C14	N 41°14'24" W	75.73'	55.00'	PC:2+67.84 N:3482316.50 E:11587302.12	PT:3+43.57 N:3482369.05 E:11587256.04
L12	N 80°41'13" W	190.39'		N:3482285.69 E:11587490.00	N:3482316.50 E:11587302.12
L13	N 1°47'36" W	805.61'		N:3482369.05 E:11587256.04	N:3483174.27 E:11587230.83

SWM ACCESS ROAD ALIGNMENT TABLE					
NUMBER	BEARING	LENGTH (FT)	RADIUS	START POINT	END POINT
C17	N 43°56'53" E	84.38'	55.00'	PC:0+00.00 N:3482231.42 E:11587536.10	PT:0+84.38 N:3482286.39 E:11587589.09
C18	N 43°37'41" E	83.76'	55.00'	PC:5+33.97 N:3482307.91 E:11588038.16	PT:6+17.73 N:3482362.85 E:11588090.53
C19	N 26°23'24" E	50.67'	55.00'	PC:7+06.26 N:3482451.37 E:11588090.53	PT:7+56.92 N:3482495.17 E:11588112.26
C20	N 30°12'11" E	43.34'	55.00'	PC:8+54.48 N:3482554.18 E:11588189.95	PT:8+97.83 N:3482590.68 E:11588211.19
L16	N 87°15'21" E	449.59'		N:3482286.39 E:11587589.09	N:3482307.91 E:11588038.16
L17	N 0°00'00" E	88.53'		N:3482362.85 E:11588090.53	N:3482451.37 E:11588090.53
L18	N 52°46'48" E	97.56'		N:3482495.17 E:11588112.26	N:3482554.18 E:11588189.95
L19	N 7°37'35" E	30.96'		N:3482590.68 E:11588211.19	N:3482621.36 E:11588215.30

GENERAL NOTES

1. NOT ALL SUBSTATION COMPONENTS SHOWN FOR CLARITY.
2. ELECTRICAL GENERAL ARRANGEMENT PLANS BY OTHERS; SHOWN ON CIVIL PLANS FOR INFORMATION ONLY.
3. LIMITS OF DISTURBANCE AND PROPOSED TREE LINE SHOWN SPACED FOR GRAPHICAL CLARITY. DO NOT CLEAR BEYOND LIMITS OF DISTURBANCE.
4. ALL GRADES SHOWN ARE SOIL GRADES AND PAVEMENT GRADES.
5. 20' HIGH SUBSTATION SECURITY FENCE:

   — 20 ——— 20 —

   SHOWN ON CIVIL PLANS FOR LOCATION ONLY. SEE CONFIDENTIAL FENCE PLANS (BY OTHERS) FOR DETAILED CONSTRUCTION PLANS.

HATCH LEGEND

- EQUIPMENT PATHWAY SEE DETAIL SHT. C-801
- ACCES ROADS SEE DETAIL SHT. C-801
- SUBSTATION GRAVEL PAD SEE DETAIL SHT. C-801
- DAM TOP ACCESS ROAD SEE DETAIL SHT. C-801

0' 20' 40' 80'
SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

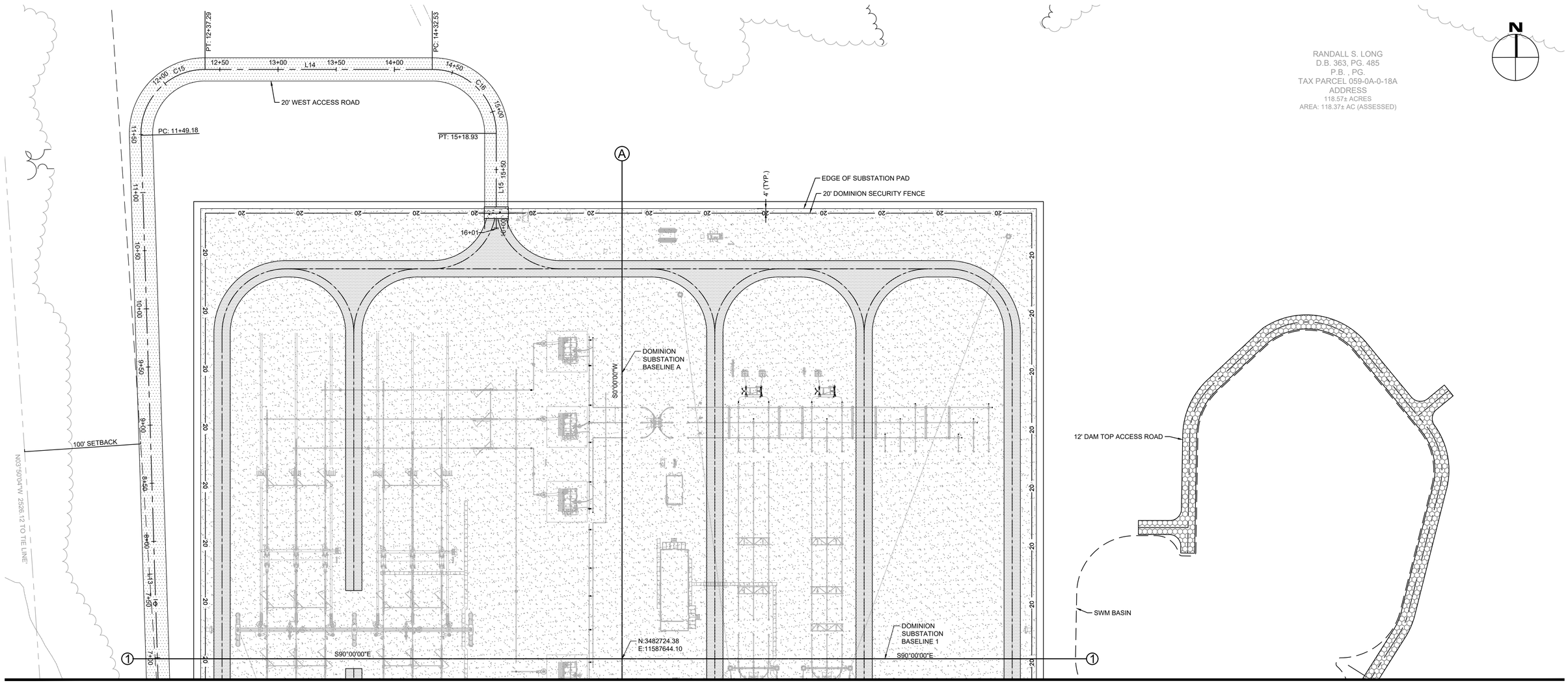
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SUBSTATION SITE LAYOUT PLAN 1

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.	SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET:	1707908-C-302
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	1707908-C-302.dwg
APPROVED BY	KAS	8/18/23		



MATCHLINE - SEE SHEET 1707908-C-302

WEST ACCESS ROAD ALIGNMENT TABLE					
NUMBER	BEARING	LENGTH (FT)	RADIUS	START POINT	END POINT
C15	N 44°06'12" E	88.12'	55.00'	PC:11+49.18 N:3483174.27 E:11587230.83	PT:12+37.29 N:3483230.99 E:11587285.81
C16	S 45°00'00" E	86.39'	55.00'	PC:14+32.53 N:3483230.99 E:11587481.05	PT:15+18.93 N:3483175.99 E:11587536.05
L13	N 1°47'36" W	805.61'		N:3482369.05 E:11587256.04	N:3483174.27 E:11587230.83
L14	N 90°00'00" E	195.24'		N:3483230.99 E:11587285.81	N:3483230.99 E:11587481.05
L15	S 0°00'00" W	82.04'		N:3483175.99 E:11587536.05	N:3483093.95 E:11587536.05

GENERAL NOTES

1. NOT ALL SUBSTATION COMPONENTS SHOWN FOR CLARITY.
2. ELECTRICAL GENERAL ARRANGEMENT PLANS BY OTHERS; SHOWN ON CIVIL PLANS FOR INFORMATION ONLY.
3. LIMITS OF DISTURBANCE AND PROPOSED TREE LINE SHOWN SPACED FOR GRAPHICAL CLARITY. DO NOT CLEAR BEYOND LIMITS OF DISTURBANCE.
4. ALL GRADES SHOWN ARE SOIL GRADES AND PAVEMENT GRADES.
5. 20' HIGH SUBSTATION SECURITY FENCE:

   20 ——— 20

   SHOWN ON CIVIL PLANS FOR LOCATION ONLY. SEE CONFIDENTIAL FENCE PLANS (BY OTHERS) FOR DETAILED CONSTRUCTION PLANS.

HATCH LEGEND

- EQUIPMENT PATHWAY SEE DETAIL SHT. C-801
- ACCES ROADS SEE DETAIL SHT. C-801
- SUBSTATION GRAVEL PAD SEE DETAIL SHT. C-801
- DAM TOP ACCESS ROAD SEE DETAIL SHT. C-801

0' 20' 40' 80'

SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA. 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

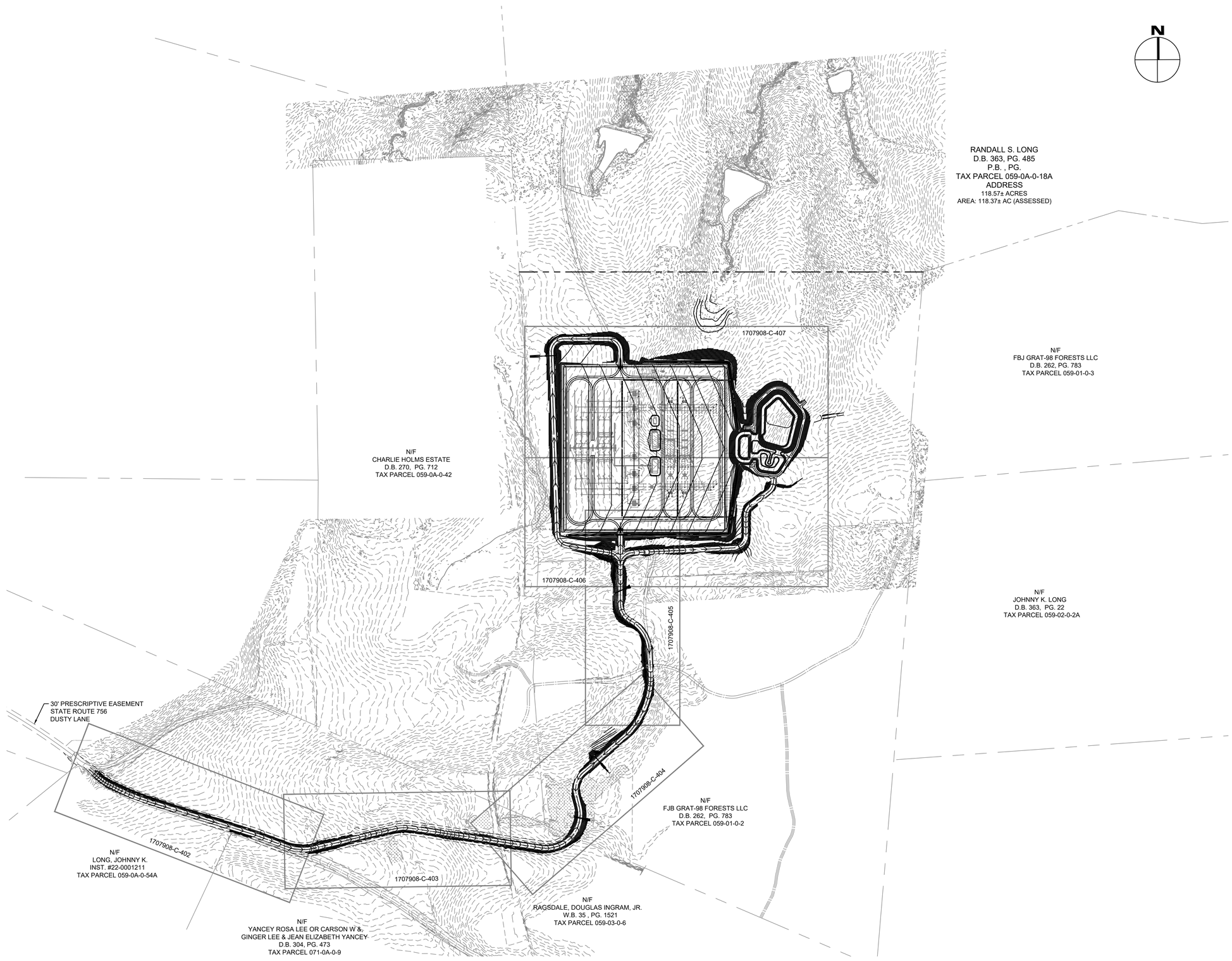
Dominion Energy

SUBSTATION SITE LAYOUT PLAN 2

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.	SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-303
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	
APPROVED BY		KAS	8/18/23		1707908-C-303.dwg



GENERAL NOTES

1. NOT ALL SUBSTATION COMPONENTS SHOWN FOR CLARITY.
2. ELECTRICAL GENERAL ARRANGEMENT PLANS BY OTHERS; SHOWN ON CIVIL PLANS FOR INFORMATION ONLY.
3. LIMITS OF DISTURBANCE AND PROPOSED TREE LINE SHOWN SPACED FOR GRAPHICAL CLARITY. DO NOT CLEAR BEYOND LIMITS OF DISTURBANCE.
4. ALL GRADES SHOWN ARE SOIL GRADES AND PAVEMENT GRADES.

0' 100' 200' 400'
SCALE: 1" = 200'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

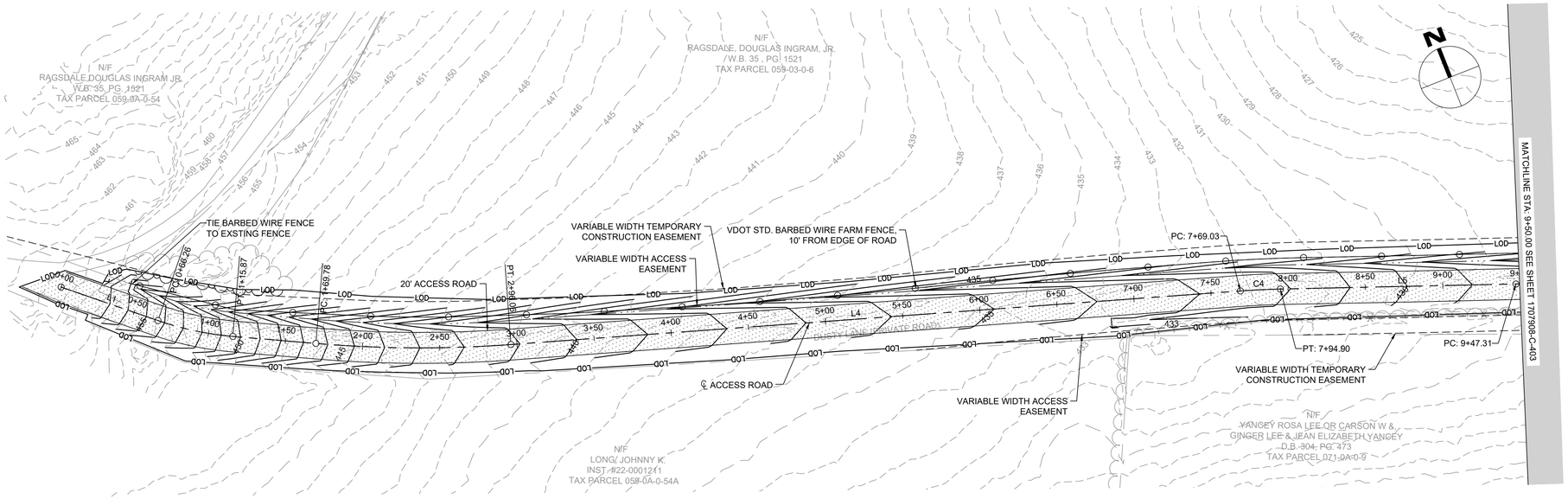
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

OVERALL GRADING AND DRAINAGE PLANS

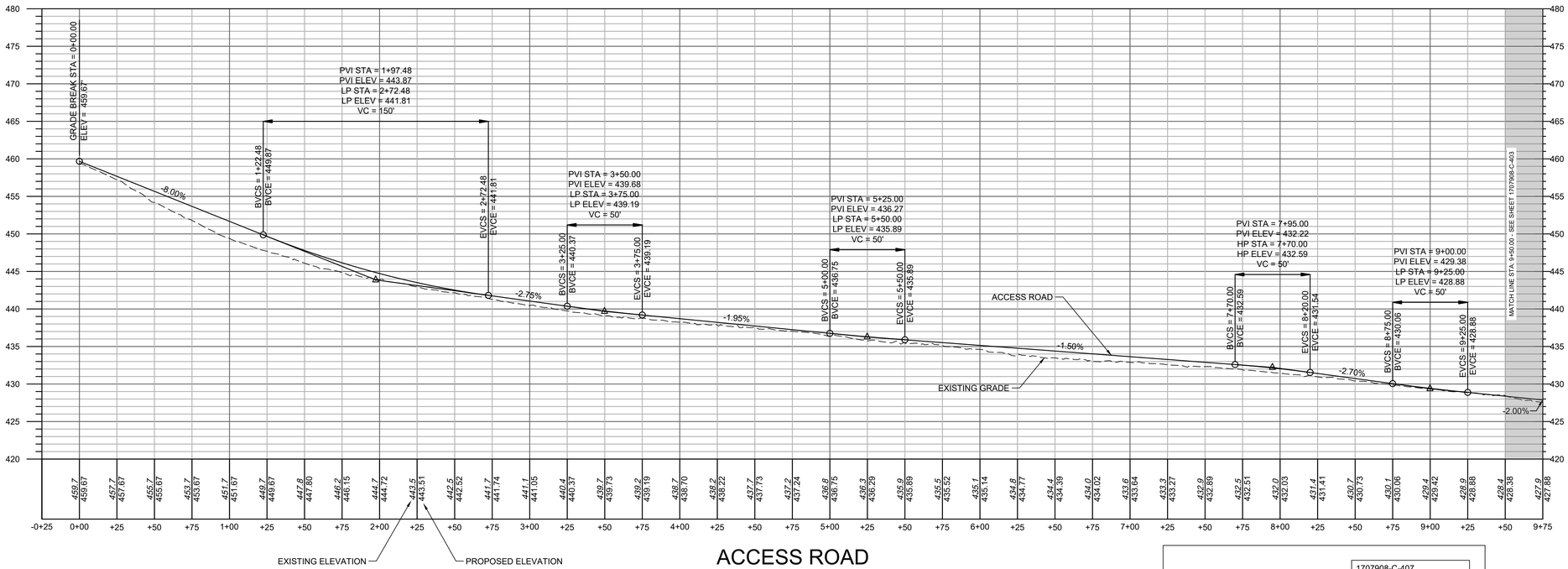
UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.	SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-401
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-401.dwg
APPROVED BY		KAS	8/18/23		



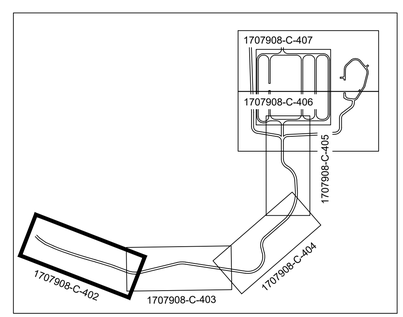
LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 320 — PROPOSED MAJOR CONTOUR
- 338 — PROPOSED MINOR CONTOUR
- PROPOSED STORM PIPE
- PERFORATED PIPE
- CHANNEL CENTERLINE
- ROAD CENTERLINE
- EXISTING TREELINE
- PROPOSED TREELINE
- PROPERTY LINE
- 20 — 20 — 20' HIGH SUBSTATION SECURITY FENCE
- ACCES ROADS SEE DETAIL SHT. C-801
- DAM TOP ACCESS ROAD SEE DETAIL SHT. C-801
- SUBSTATION GRAVEL PAD SEE DETAIL SHT. C-801
- EQUIPMENT PATHWAY SEE DETAIL SHT. C-801
- WETLANDS
- OUTLET PROTECTION



ACCESS ROAD

ACCESS ROAD ALIGNMENT TABLE					
NUMBER	BEARING	LENGTH (FT)	RADIUS	START POINT	END POINT
C4	S 71°10'53" E	25.88'	500.00'	PC:7+69.03 N:3481047.85 E:11585895.13	PT:7+94.90 N:3481039.50 E:11585919.62
L1	S 49°24'29" E	66.26'		N:3481330.11 E:11585186.69	N:3481287.00 E:11585237.00
L4	S 72°39'50" E	472.97'		N:3481188.78 E:11585443.65	N:3481047.85 E:11585895.13
L5	S 69°41'56" E	152.40'		N:3481039.50 E:11585919.62	N:3480986.62 E:11586062.56



KEY PLAN

0' 20' 40' 80'
HORIZONTAL SCALE: 1" = 40'

0' 4' 8' 16'
VERTICAL SCALE: 1" = 8'

REVISIONS		
REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
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8/18/23
PROFESSIONAL ENGINEER

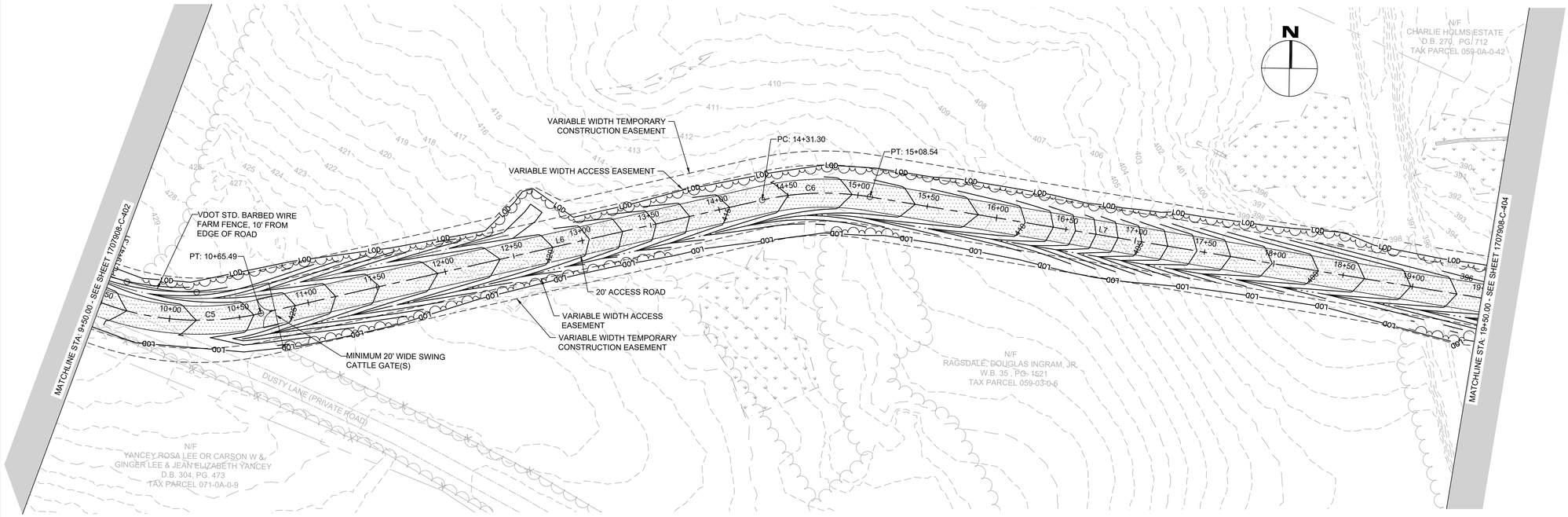
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

ACCESS ROAD PLAN & PROFILE
STA. 0+00.00-9+50.00

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE
PROJECT	NAME	DATE	SHEET:	1707908-C-402
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	1707908-C-402.dwg
APPROVED BY	KAS	8/18/23		



LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 320 PROPOSED MAJOR CONTOUR
- 338 PROPOSED MINOR CONTOUR
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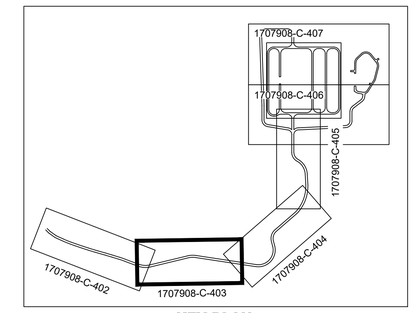
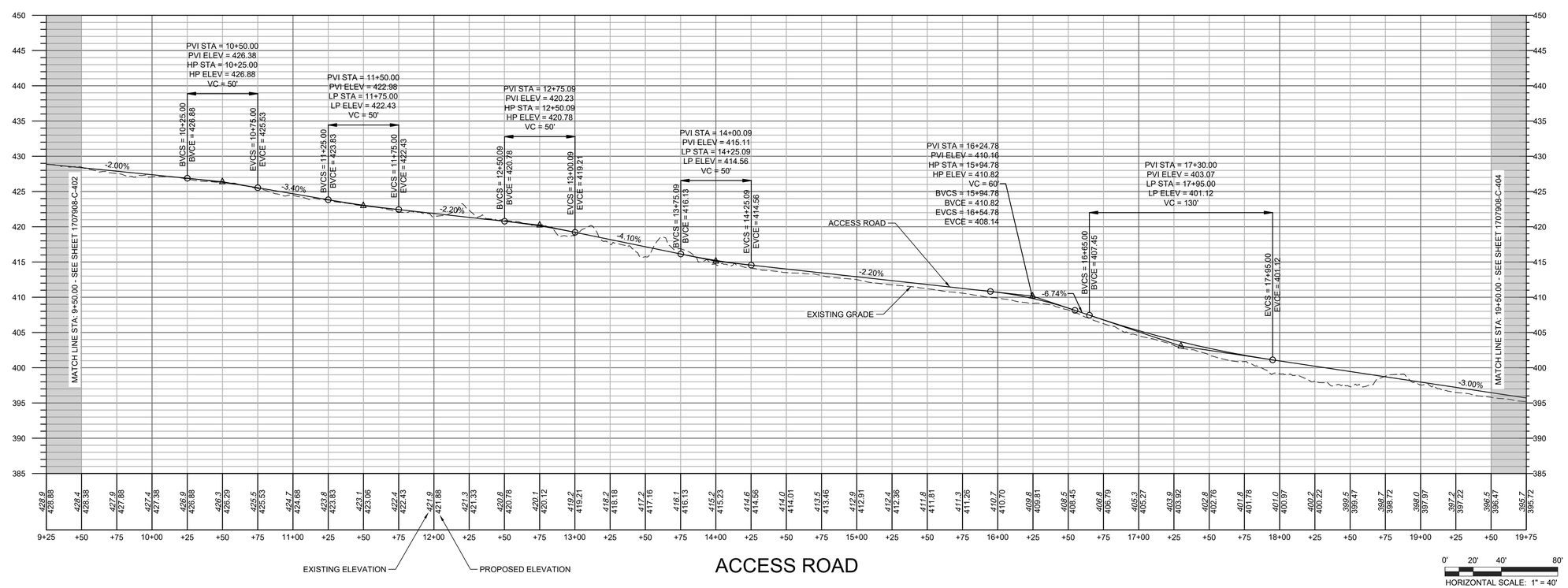


KEY PLAN



ACCESS ROAD

HORIZONTAL SCALE: 1" = 40'

VERTICAL SCALE: 1" = 8'

ACCESS ROAD ALIGNMENT TABLE

NUMBER	BEARING	LENGTH (FT)	RADIUS	START POINT	END POINT
C5	S 86°37'39" E	118.18'	200.00'	PC:9+47.31 N:3480986.62 E:11586062.56	PT:10+65.49 N:3480979.77 E:11586178.83
C6	N 87°30'28" E	77.24'	200.00'	PC:14+31.30 N:3481065.51 E:11586534.44	PT:15+08.54 N:3481068.85 E:11586611.13
L6	N 76°26'38" E	365.80'		N:3480979.77 E:11586178.83	N:3481065.51 E:11586534.44
L7	S 81°25'42" E	581.18'		N:3481068.85 E:11586611.13	N:3480982.23 E:11587185.82

REVISIONS

REV	DATE	DESCRIPTION

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8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

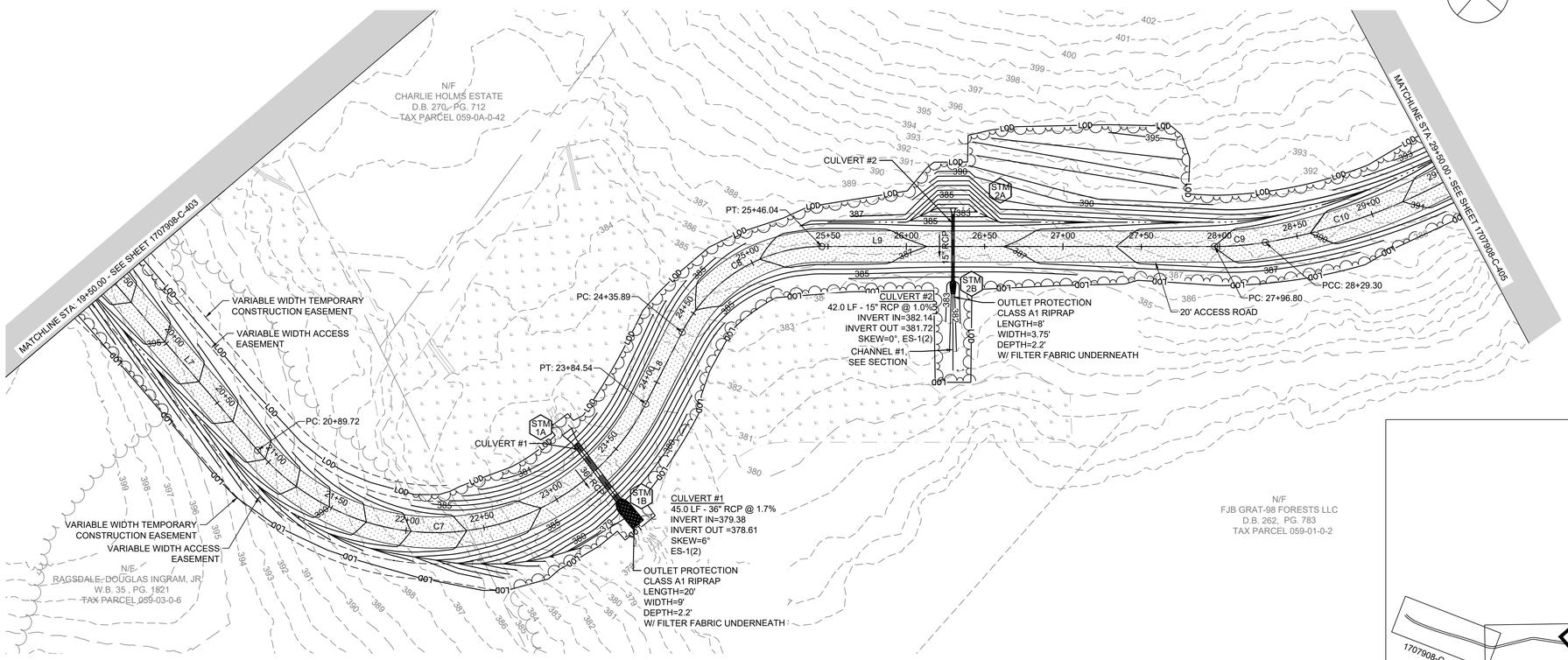
Dominion Energy

ACCESS ROAD PLAN & PROFILE
STA. 9+50.00-19+50.00

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-403		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING:		
APPROVED BY	KAS	8/18/23	1707908-C-403.dwg		



LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
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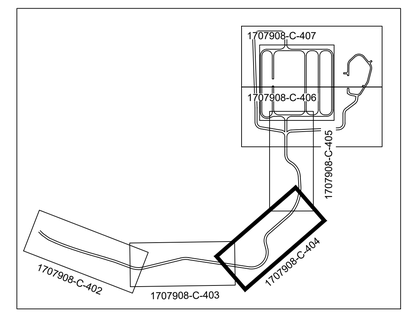
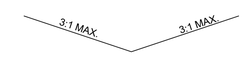


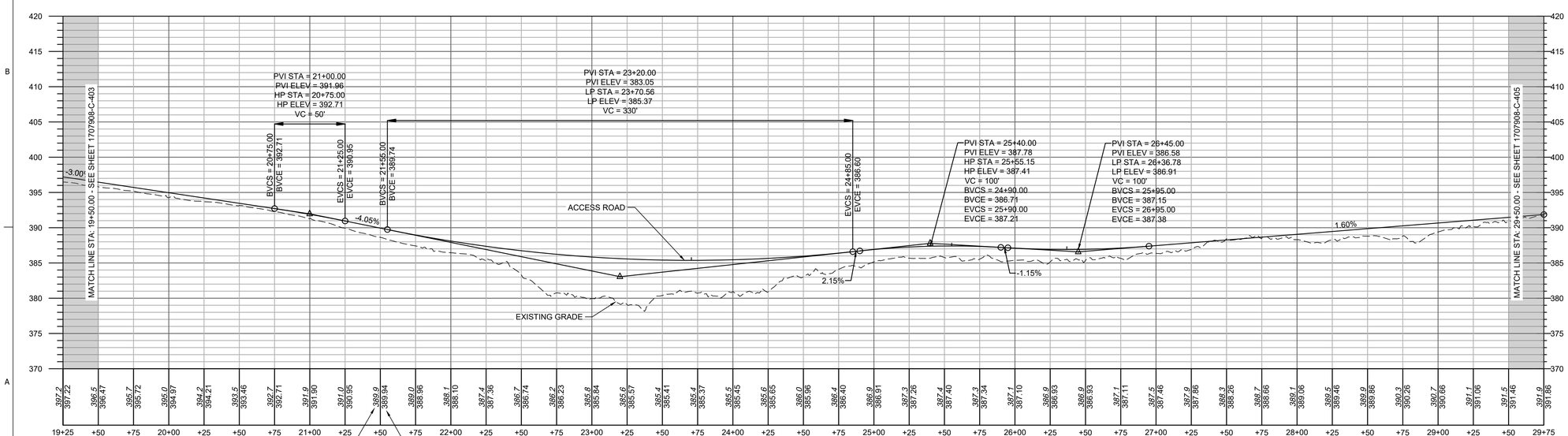
KEY PLAN



2-EC-2 TY 2 LINED CHANNEL
LONGITUNDINAL SLOPE=1% MIN.

CHANNEL 1 CROSS-SECTION

ACCESS ROAD ALIGNMENT TABLE					
NUMBER	BEARING	LENGTH (FT)	RADIUS	START POINT	END POINT
C7	N 42°15'55" E	294.82'	150.00'	PC:20+89.72 N:3480982.23 E:11587185.82	PT:23+84.54 N:3481166.95 E:11587353.69
C8	N 17°30'49" E	110.15'	100.00'	PC:24+35.89 N:3481216.77 E:11587341.23	PT:25+46.04 N:3481316.58 E:11587372.73
C9	N 44°24'46" E	32.50'	200.00'	PC:27+96.80 N:3481480.87 E:11587562.18	PT:28+29.30 N:3481504.06 E:11587584.90
C10	N 18°14'41" E	276.80'	368.61'	PC:28+29.30 N:3481504.06 E:11587584.90	PT:31+06.10 N:3481760.81 E:11587669.53
L7	S 81°25'42" E	581.18'		N:3481068.85 E:11586611.13	N:3480982.23 E:11587185.82
L8	N 14°02'28" W	51.35'		N:3481166.95 E:11587353.69	N:3481216.77 E:11587341.23
L9	N 49°04'05" E	250.76'		N:3481316.58 E:11587372.73	N:3481480.87 E:11587562.18



ACCESS ROAD

HORIZONTAL SCALE: 1" = 40'

VERTICAL SCALE: 1" = 8'

REVISIONS		
REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

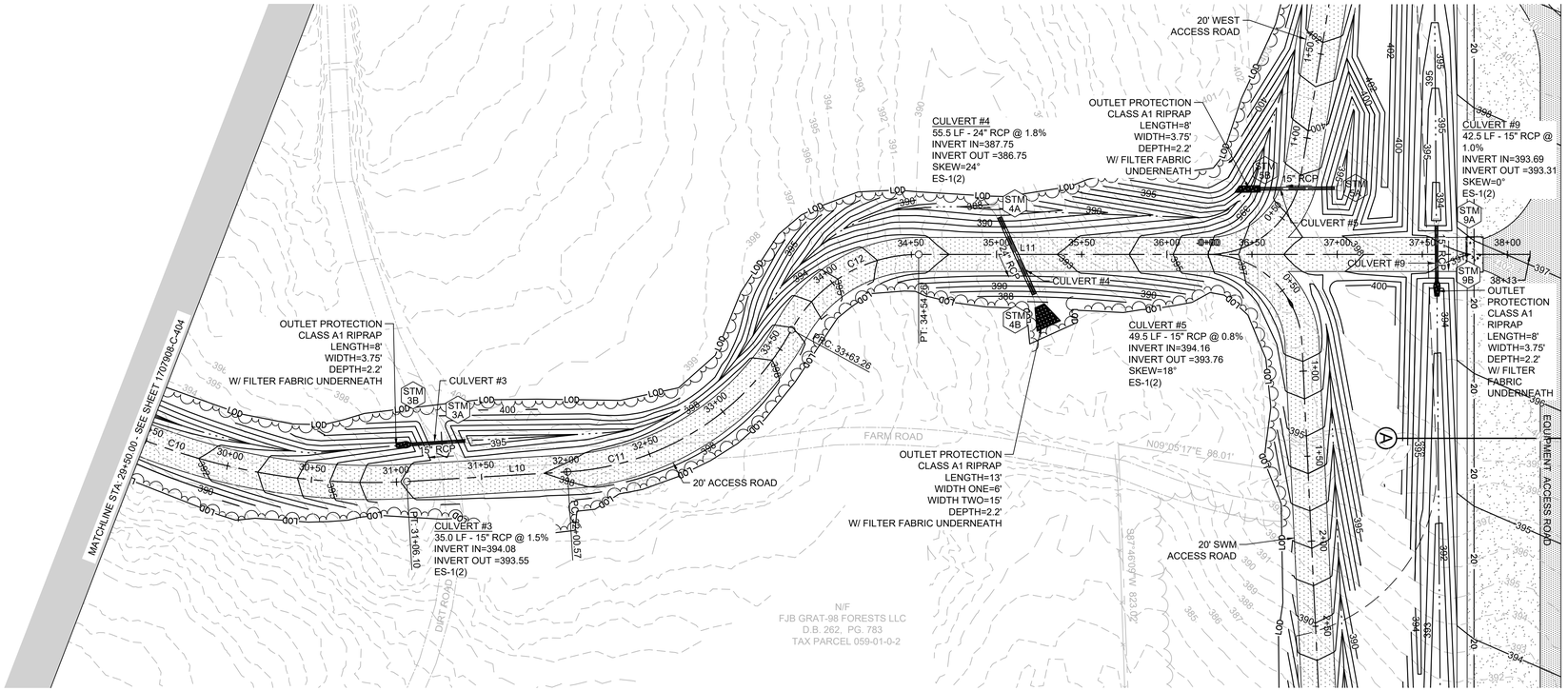
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

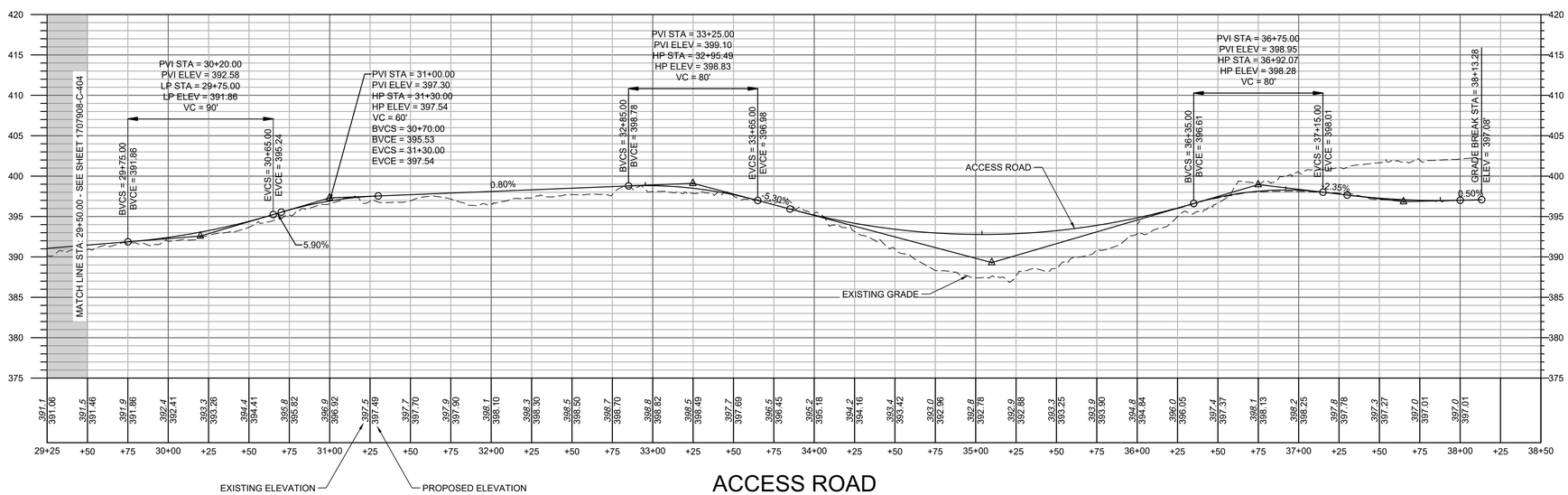
ACCESS ROAD PLAN & PROFILE
STA. 19+50.00-29+50.00

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-404		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-404.dwg		
APPROVED BY	KAS	8/18/23			



SEE SHEET 1707908-C-406 FOR SUBSTATION GRADING PLAN



ACCESS ROAD

HORIZONTAL SCALE: 1" = 40'

VERTICAL SCALE: 1" = 8'

LEGEND

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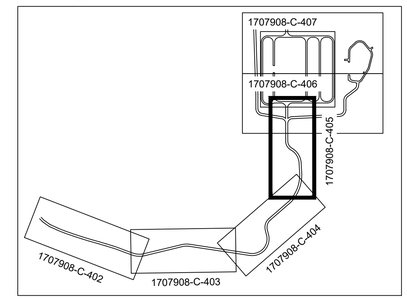

KEY PLAN

ACCESS ROAD ALIGNMENT TABLE

NUMBER	BEARING	LENGTH (FT)	RADIUS	START POINT	END POINT
C10	N 18°14'41" E	276.80'	368.61'	PC:28+29.30 N:3481504.06 E:11587584.90	PT:31+06.10 N:3481760.81 E:11587669.53
C11	N 32°23'46" W	162.69'	160.99'	PC:32+00.57 N:3481855.11 E:11587663.85	PT:33+63.26 N:3481986.70 E:11587580.35
C12	N 30°40'30" W	91.00'	85.00'	PC:33+63.26 N:3481986.70 E:11587580.35	PT:34+54.26 N:3482061.29 E:11587536.11
L10	N 3°26'48" W	94.47'		N:3481760.81 E:11587669.53	N:3481855.11 E:11587663.85
L11	N 0°00'15" W	359.02'		N:3482061.29 E:11587536.11	N:3482420.31 E:11587536.09

REVISIONS

REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
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8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

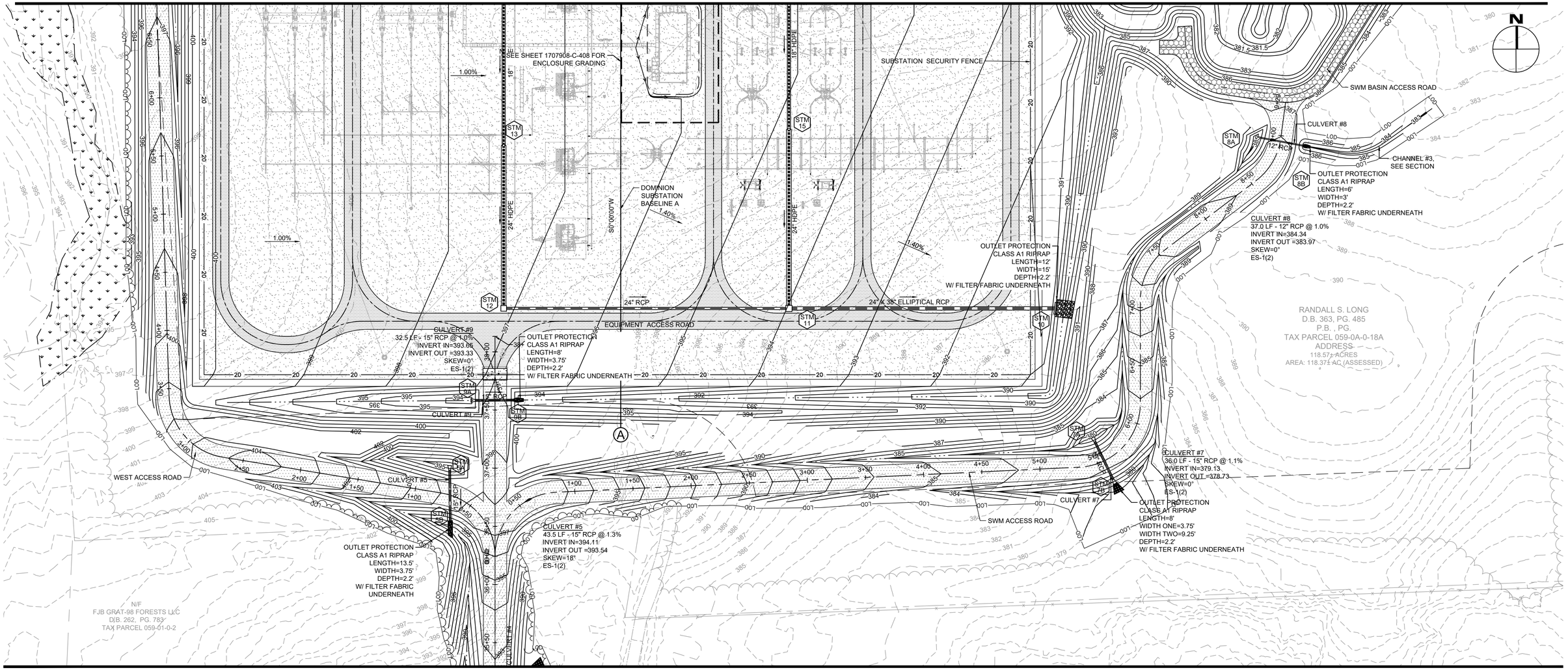
ACCESS ROAD PLAN & PROFILE
STA. 29+50.00-38+50.00

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE
PROJECT	NAME	DATE	SHEET:	1707908-C-405
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	
APPROVED BY	KAS	8/18/23		1707908-C-405.dwg

MATCHLINE - SEE SHEET 1707908-C-407



MATCHLINE - SEE SHEET 1707908-C-405

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 320 PROPOSED MAJOR CONTOUR
- 338 PROPOSED MINOR CONTOUR
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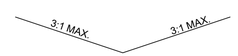
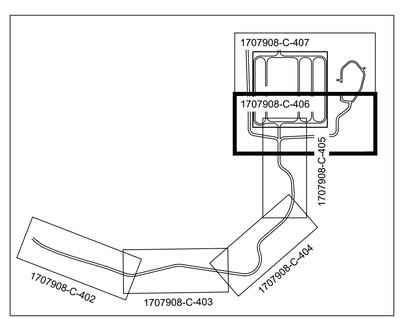


GRASSED LINED CHANNEL
LONGITUNDINAL SLOPE=1% MIN.

CHANNEL 3 CROSS-SECTION



KEY PLAN

GENERAL NOTES

1. NOT ALL SUBSTATION COMPONENTS SHOWN FOR CLARITY.
2. ELECTRICAL GENERAL ARRANGEMENT PLANS BY OTHERS; SHOWN ON CIVIL PLANS FOR INFORMATION ONLY.
3. LIMITS OF DISTURBANCE AND PROPOSED TREE LINE SHOWN SPACED FOR GRAPHICAL CLARITY. DO NOT CLEAR BEYOND LIMITS OF DISTURBANCE.
4. 20' HIGH SUBSTATION SECURITY FENCE:
   20 — 20
   SHOWN ON CIVIL PLANS FOR LOCATION ONLY. SEE CONFIDENTIAL FENCE PLANS (BY OTHERS) FOR DETAILED CONSTRUCTION PLANS.
5. ALL GRADES SHOWN ARE SOIL GRADES AND PAVEMENT GRADES.

GRADING LEGEND

SP = GROUND ELEVATION
EP = EDGE OF PAVEMENT ELEVATION
FL = DITCH FLOWLINE ELEVATION

0' 20' 40' 80'
SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
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8/18/23
PROFESSIONAL ENGINEER

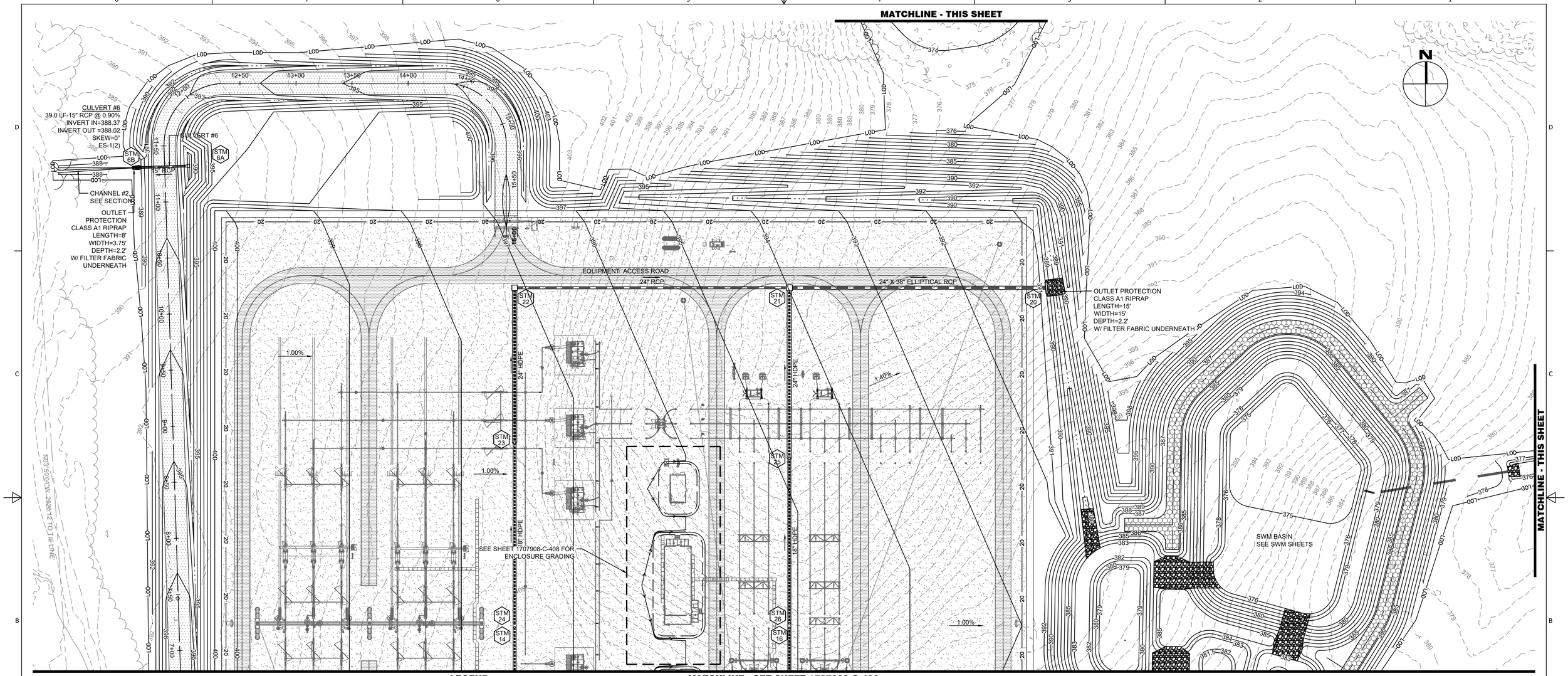
DEWBERRY PROJECT NO.: 50157950

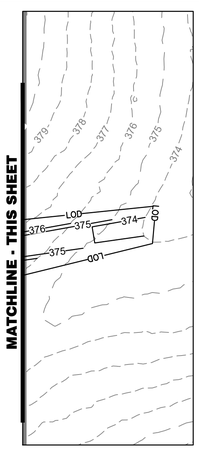
Dominion Energy

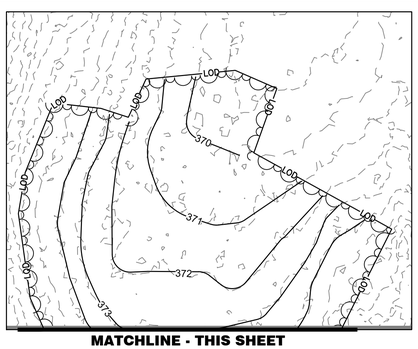
SUBSTATION GRADING AND DRAINAGE PLAN 1

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-406		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-406.dwg		
APPROVED BY	BRS	8/18/23			







LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 320 PROPOSED MAJOR CONTOUR
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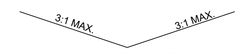
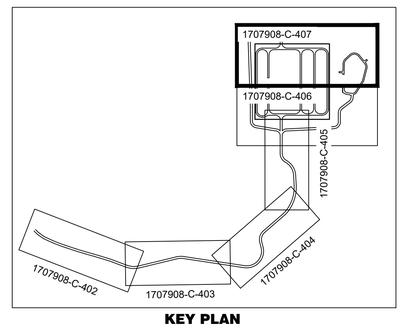


2-EC-2 TY 2 LINED CHANNEL
LONGITUNDINAL SLOPE=1% MIN.

CHANNEL 2 CROSS-SECTION



KEY PLAN

GENERAL NOTES

1. NOT ALL SUBSTATION COMPONENTS SHOWN FOR CLARITY.
2. ELECTRICAL GENERAL ARRANGEMENT PLANS BY OTHERS; SHOWN ON CIVIL PLANS FOR INFORMATION ONLY.
3. LIMITS OF DISTURBANCE AND PROPOSED TREE LINE SHOWN SPACED FOR GRAPHICAL CLARITY. DO NOT CLEAR BEYOND LIMITS OF DISTURBANCE.
4. 20' HIGH SUBSTATION SECURITY FENCE:

   20 20

   SHOWN ON CIVIL PLANS FOR LOCATION ONLY. SEE CONFIDENTIAL FENCE PLANS (BY OTHERS) FOR DETAILED CONSTRUCTION PLANS.
5. ALL GRADES SHOWN ARE SOIL GRADES AND PAVEMENT GRADES.

GRADING LEGEND

SP = GROUND ELEVATION
EP = EDGE OF PAVEMENT ELEVATION
FL = DITCH FLOWLINE ELEVATION

0' 20' 40' 80'
SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

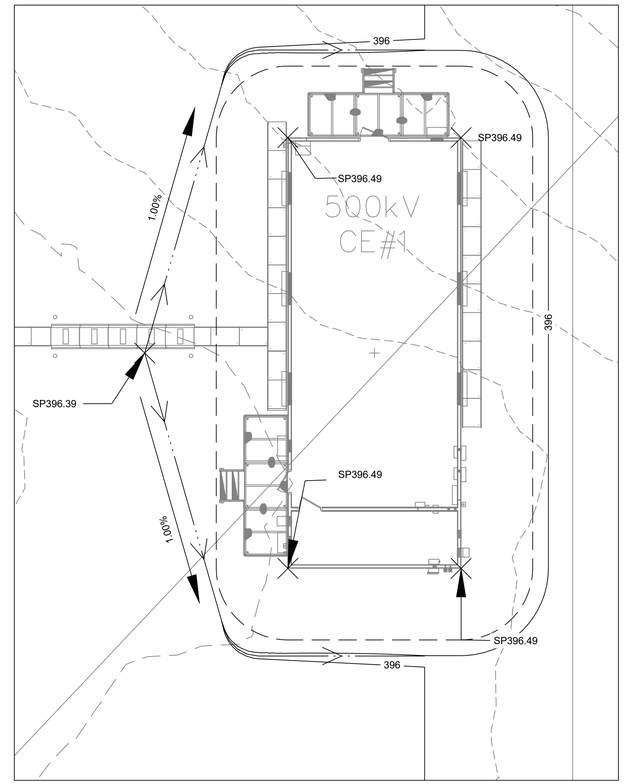
DEWBERRY PROJECT NO.: 50157950

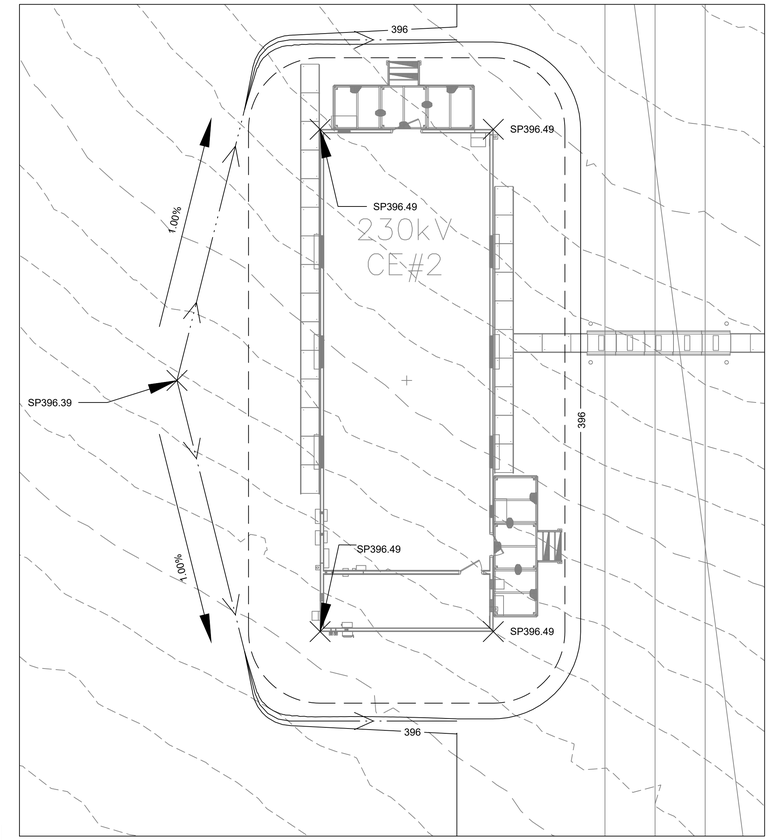
Dominion Energy

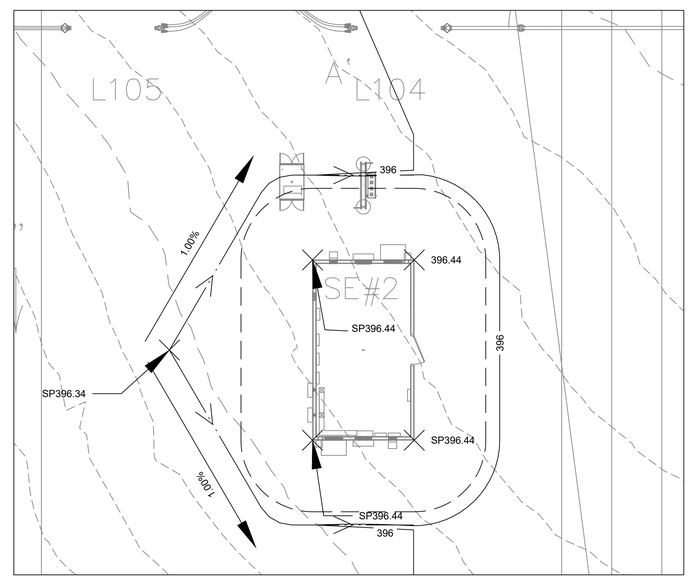
SUBSTATION GRADING AND DRAINAGE PLAN 2

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-407
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-407.dwg
APPROVED BY		KAS	8/18/23		







GENERAL NOTES

1. NOT ALL SUBSTATION COMPONENTS SHOWN FOR CLARITY.
2. ELECTRICAL GENERAL ARRANGEMENT PLANS BY OTHERS; SHOWN ON CIVIL PLANS FOR INFORMATION ONLY.

GRADING LEGEND

SP = GROUND ELEVATION
EP = EDGE OF PAVEMENT ELEVATION
FL = DITCH FLOWLINE ELEVATION

0' 5' 10' 20'
SCALE: 1" = 10'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

ENCLOSURES FINE GRADING PLAN

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.	SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-408
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-408.dwg
APPROVED BY		KAS	8/18/23		

CULVERTS #1, #2, #3, AND #4

LEGEND

DRAINAGE AREA
Tc PATH

0' 50' 100' 200'
SCALE: 1" = 100'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
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8/18/23
PROFESSIONAL ENGINEER

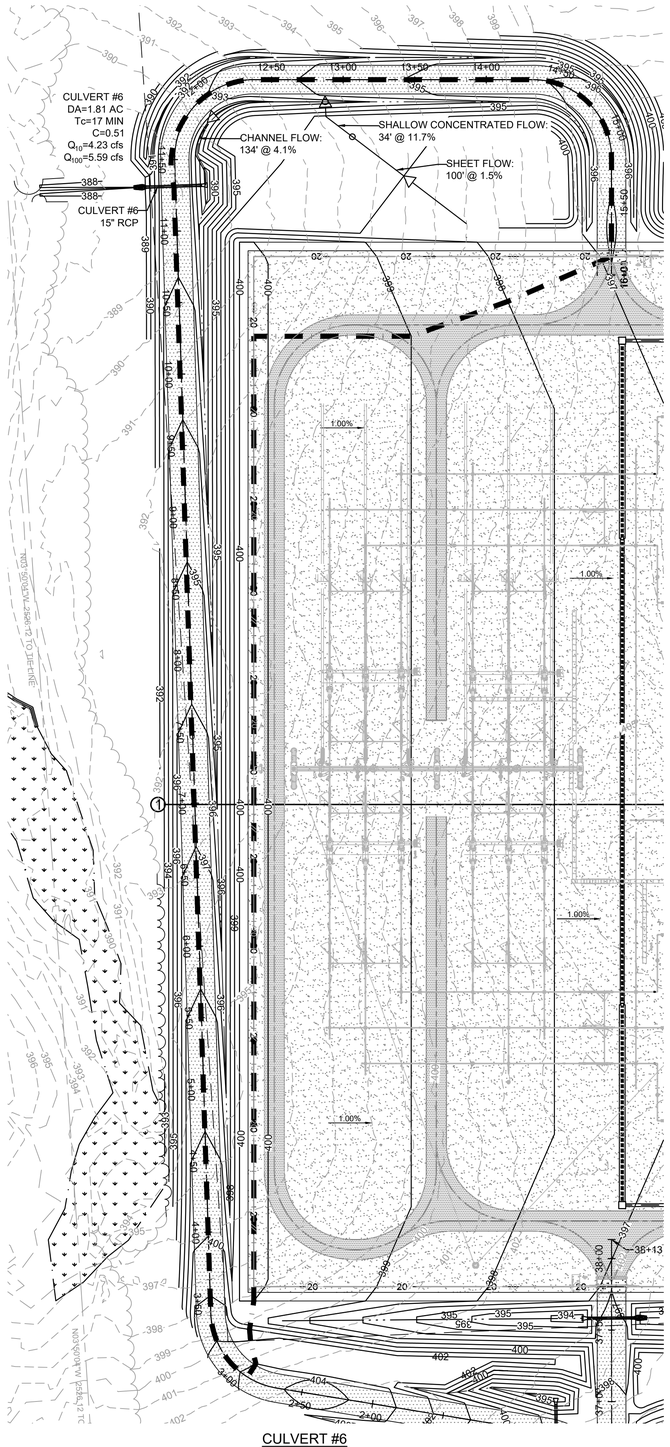
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

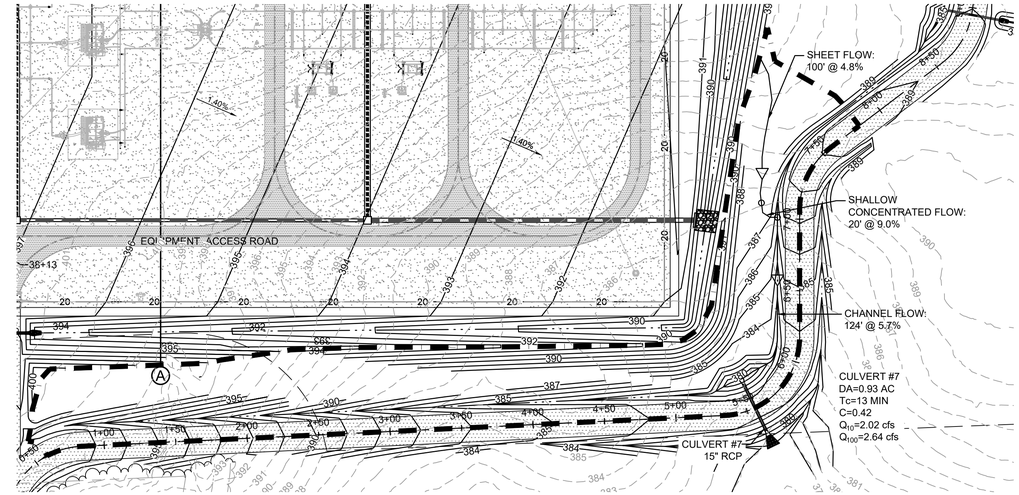
CULVERT DRAINAGE AREAS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

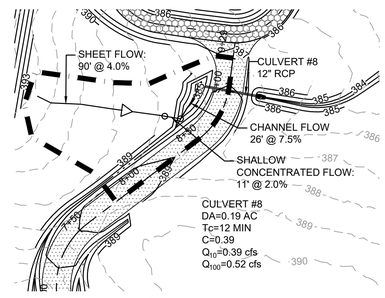
OPERATIONAL REGION			B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-409	
DESIGNER		MFR	8/18/23			
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-409.dwg	
APPROVED BY		KAS	8/18/23			



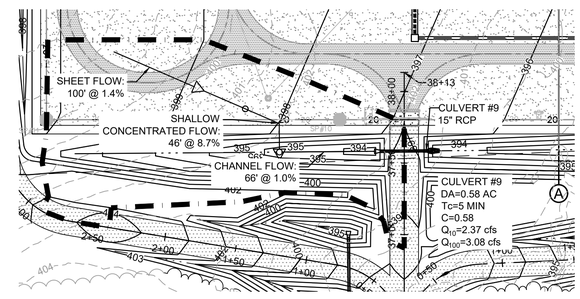
CULVERT #6



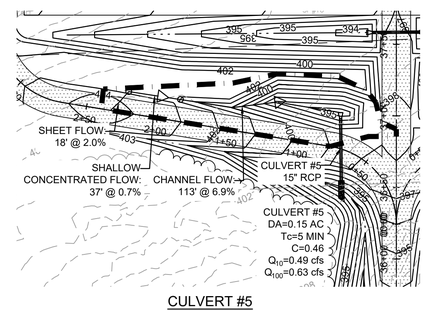
CULVERT #7



CULVERT #8



CULVERT #9



CULVERT #5

LEGEND

DRAINAGE AREA
Tc PATH

0' 25' 50' 100'
SCALE: 1" = 50'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

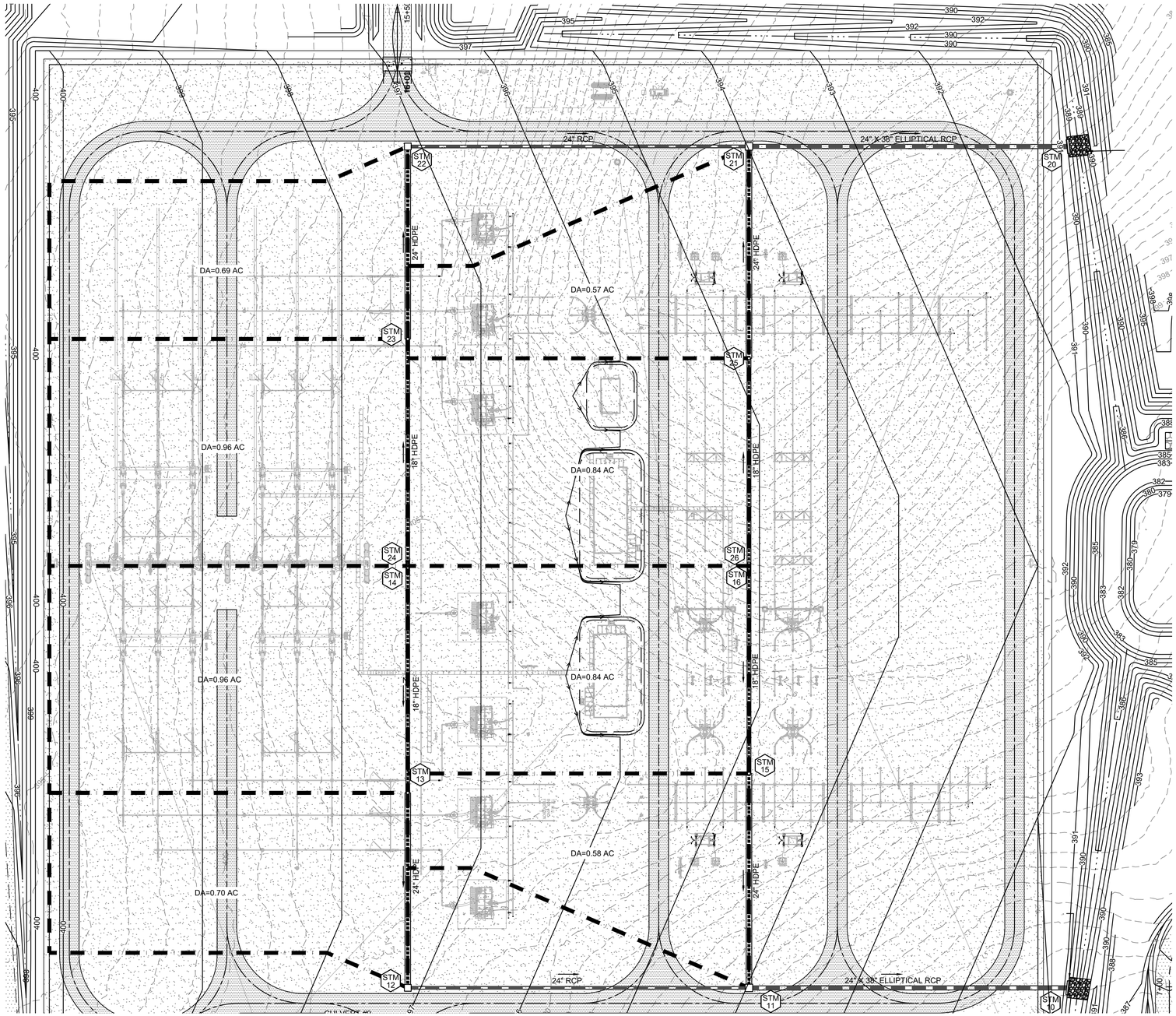
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

CULVERT DRAINAGE AREAS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-410		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-410.dwg		
APPROVED BY	KAS	8/18/23			



N

DRAINAGE AREAS*

STRUCTURE	AREA (AC)
11	0.00
12	0.00
13	0.70
14	0.96
15	0.58
16	0.84
21	0.00
22	0.00
23	0.69
24	0.96
25	0.57
26	0.84

* ALL SWITCHING STATION DRAINAGE AREAS ARE IMPERVIOUS AND USE A "C" VALUE OF 0.9 AND A "Tc" VALUE OF 5 MINUTES.

LEGEND

DRAINAGE AREA

0' 20' 40' 80'
SCALE: 1" = 40'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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COMMONWEALTH OF VIRGINIA
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8/18/23
PROFESSIONAL ENGINEER

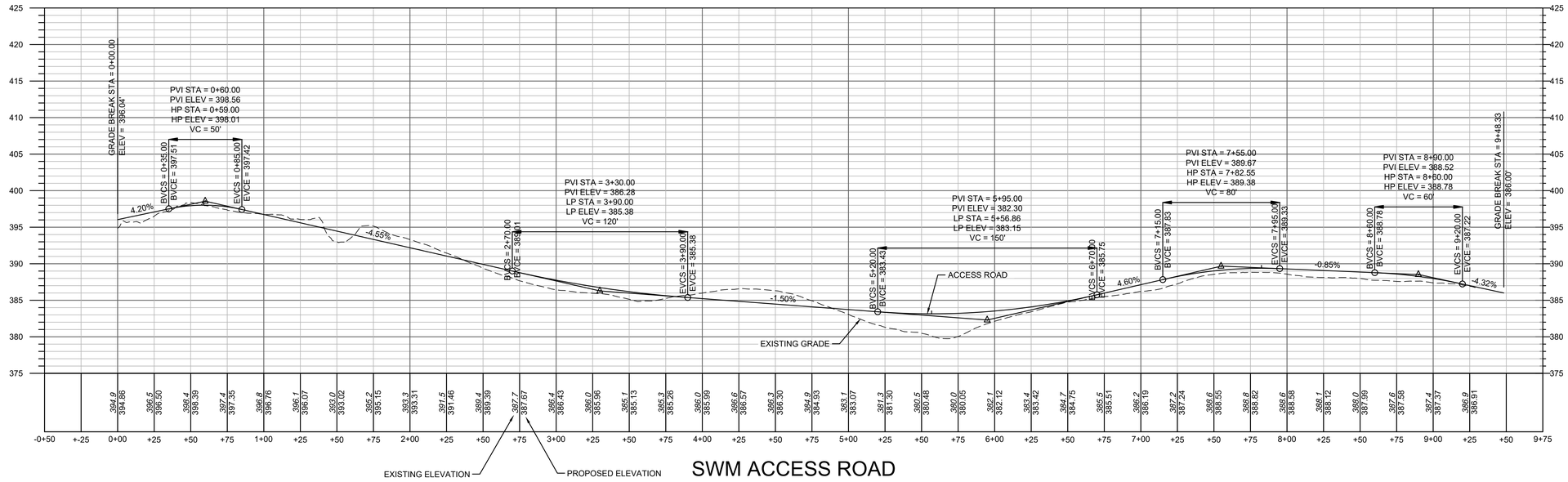
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SUBSTATION STORM SEWER DRAINAGE AREAS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-411		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-411.dwg		
APPROVED BY	KAS	8/18/23			



SWM ACCESS ROAD

0' 20' 40' 80'
HORIZONTAL SCALE: 1" = 40'

0' 4' 8' 16'
VERTICAL SCALE: 1" = 8'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
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Glen Allen, VA. 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

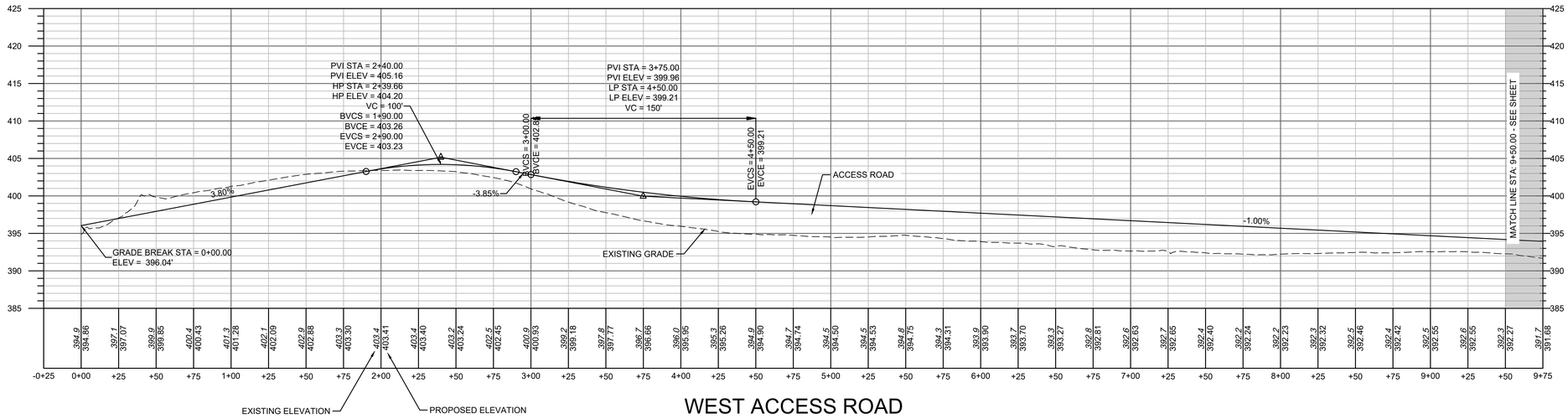
DEWBERRY PROJECT NO.: 50157950

Dominion Energy

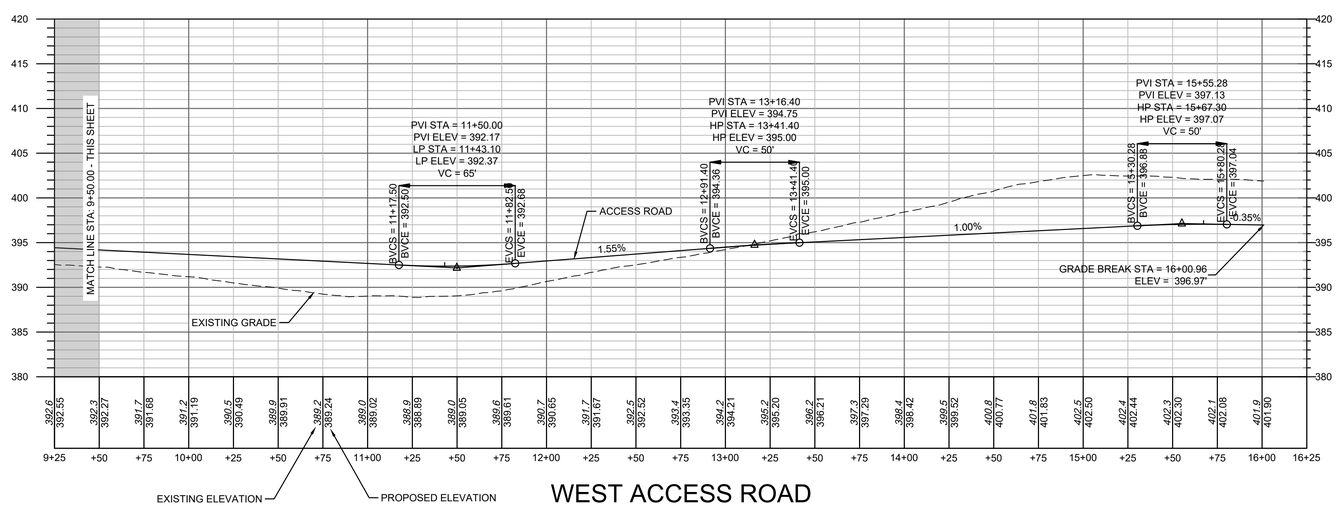
SWM ACCESS ROAD PROFILE

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE
PROJECT	NAME	DATE	SHEET:	1707908-C-501
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	1707908-C-501.dwg
APPROVED BY	KAS	8/18/23		



WEST ACCESS ROAD



WEST ACCESS ROAD

0' 20' 40' 80'
HORIZONTAL SCALE: 1" = 40'

0' 4' 8' 16'
VERTICAL SCALE: 1" = 8'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

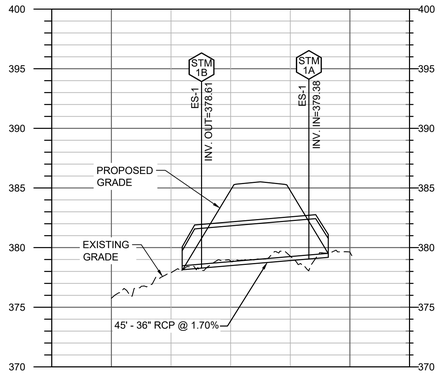
Dominion Energy

WEST ACCESS ROAD PROFILE

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT		NAME	DATE	SHEET:	1707908-C-502
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-502.dwg
APPROVED BY		KAS	8/18/23		

CULVERT 1



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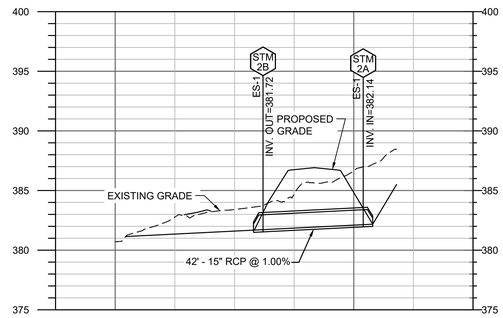

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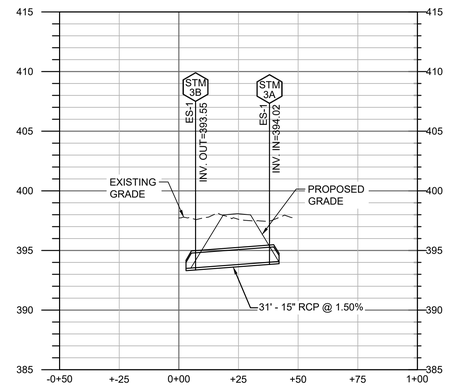
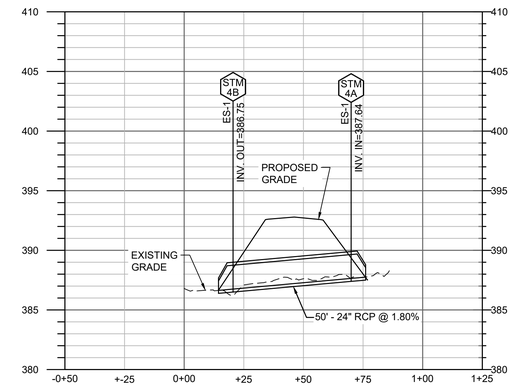
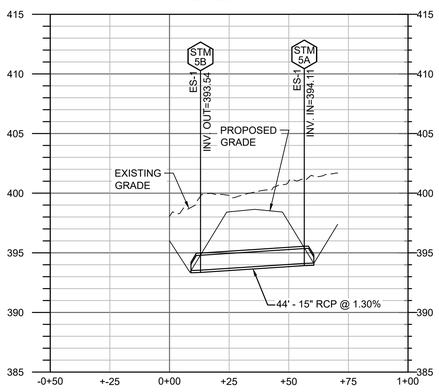


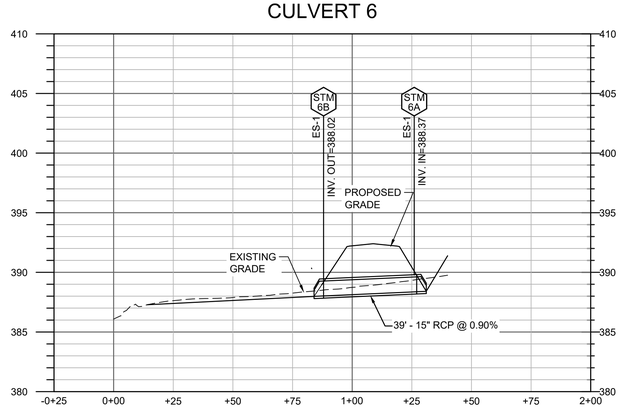
CULVERT 4



CULVERT 5



CULVERT 6



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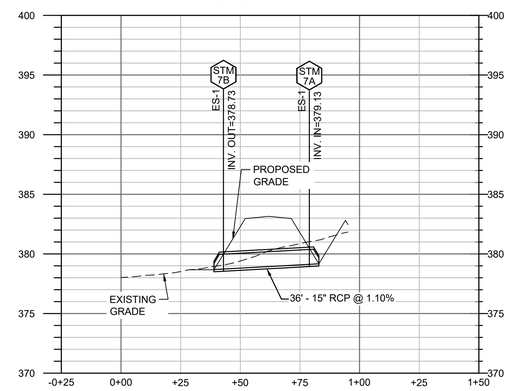
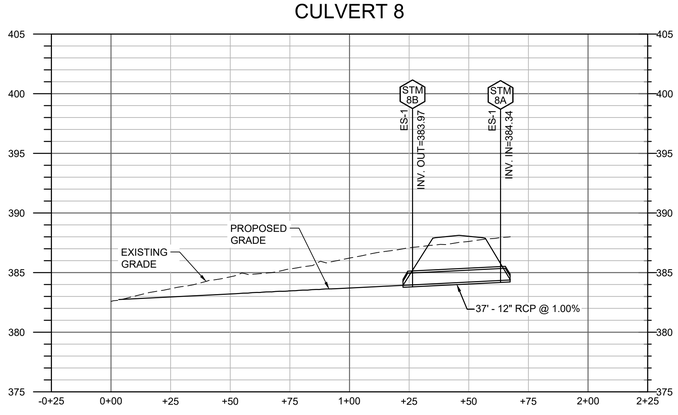
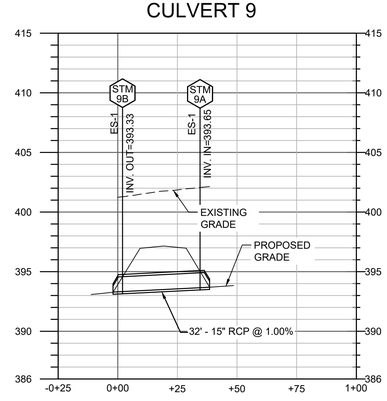


CULVERT 8



CULVERT 9



0' 15' 30' 60'
HORIZONTAL SCALE: 1" = 30'

0' 3' 6' 12'
VERTICAL SCALE: 1" = 6'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

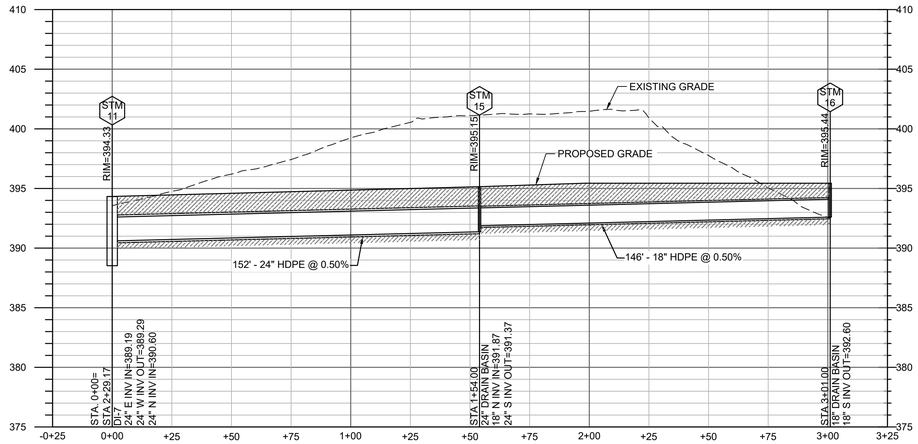
CULVERT PROFILES

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE
PROJECT	NAME	DATE	SHEET:	1707908-C-503
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	1707908-C-503.dwg
APPROVED BY	KAS	8/18/23		

STR 11 TO STR 16



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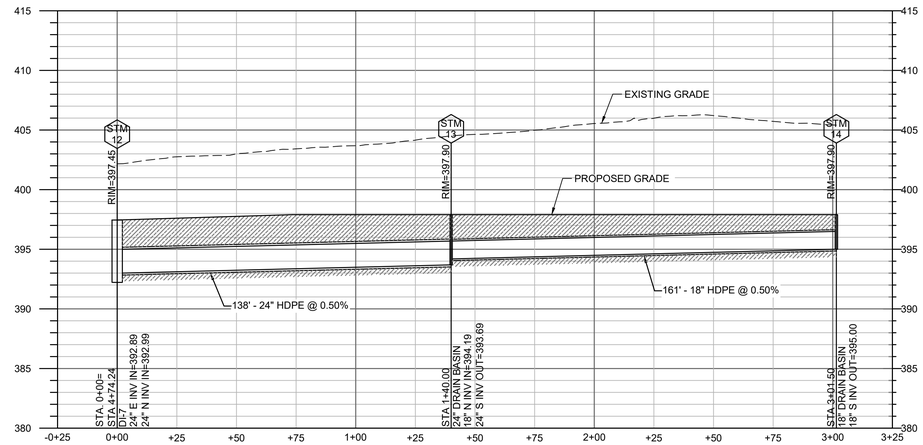
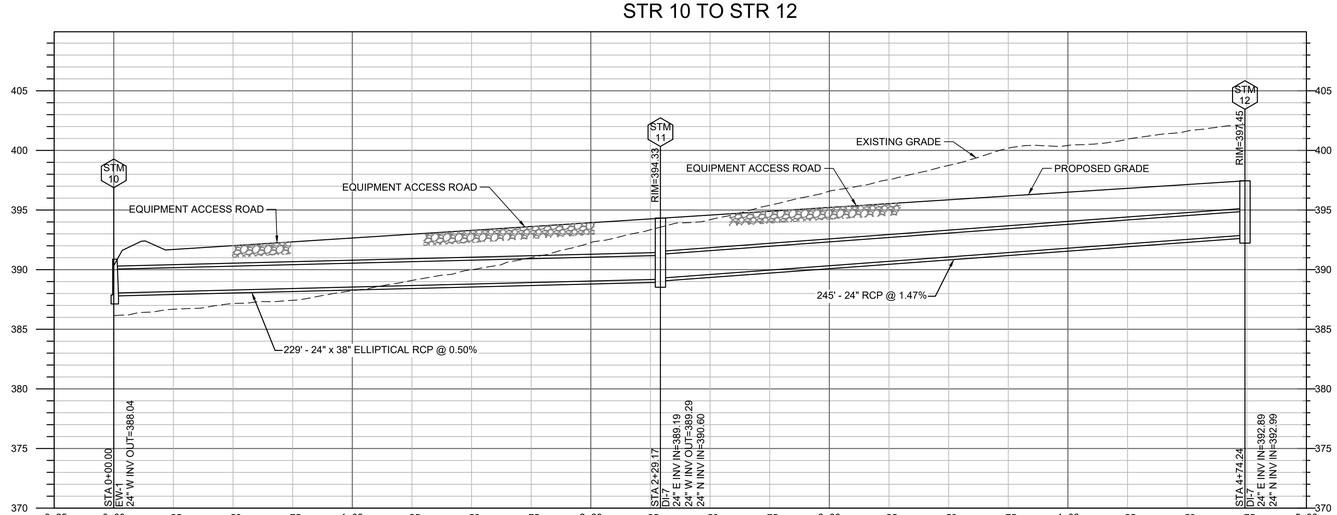


STR 10 TO STR 12



0' 15' 30' 60'
HORIZONTAL SCALE: 1" = 30'

0' 3' 6' 12'
VERTICAL SCALE: 1" = 6'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SUBSTATION INTERIOR
STORM SEWER PROFILES 1

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE
PROJECT	NAME	DATE	SHEET:	1707908-C-504
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	1707908-C-504.dwg
APPROVED BY	KAS	8/18/23		

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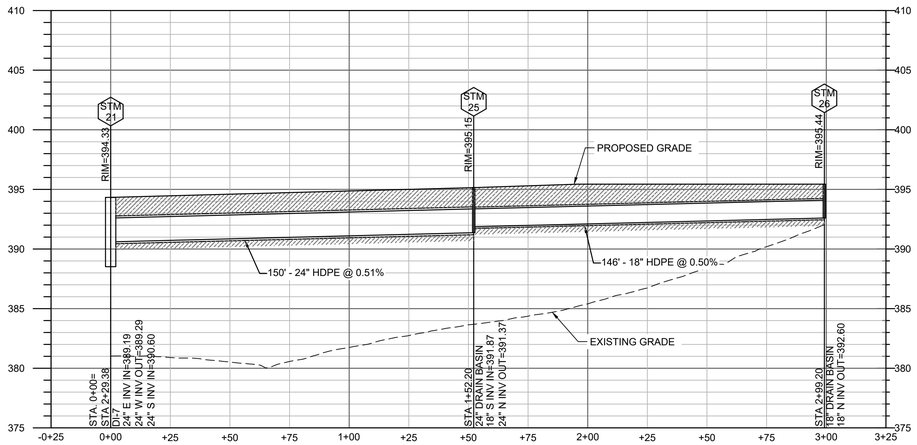

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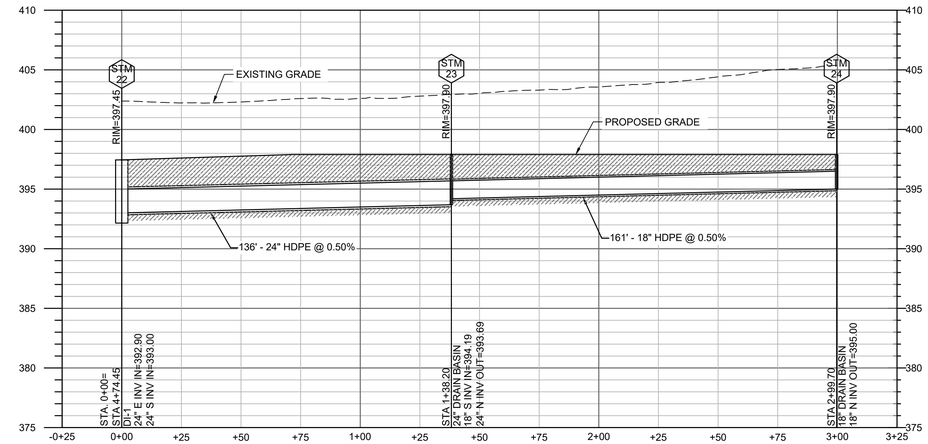

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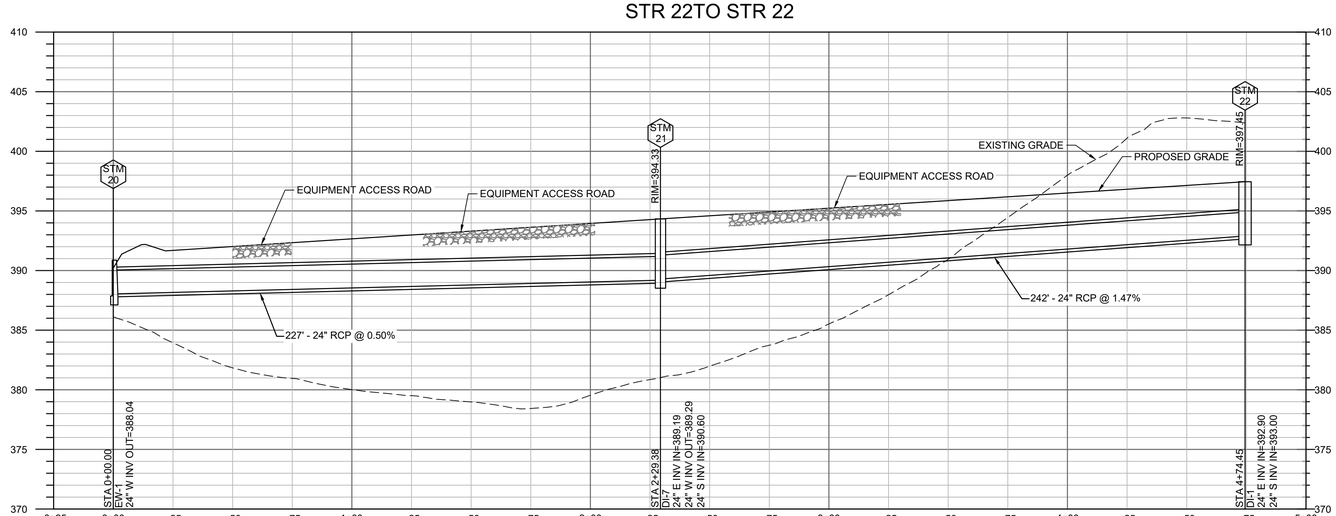

0' 15' 30' 60'
HORIZONTAL SCALE: 1" = 30'

0' 3' 6' 12'
VERTICAL SCALE: 1" = 6'

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
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COMMONWEALTH OF VIRGINIA
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Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SUBSTATION INTERIOR STORM SEWER PROFILES 2

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE
PROJECT	NAME	DATE	SHEET:	1707908-C-505
DESIGNER	MFR	8/18/23		
PROJECT ENGINEER	GA	8/18/23	DRAWING:	1707908-C-505.dwg
APPROVED BY	KAS	8/18/23		

STORMWATER MANAGEMENT & BMP NARRATIVE

PROJECT BACKGROUND & SUMMARY

Dominion Virginia Power ("Dominion") will be constructing an electrical utilitity substation in Lunenburg County, Virginia to meet growing power demand in the area and increase reliability. The proposed substation will be on a ___ ac parcel of land acquired by Dominion. The substation will be accessed by way of a proposed gravel access road connecting to Dusty Ln.

LIMITS OF DISTURBANCE & FLOW PATTERNS

The limits of disturbance for this project are 25.21 acres. The existing site has one main outfall point. The Pre-Development Drainage Map shows five drainage areas, but all five ultimately flow to the same point further downstream in Flat Rock Creek. The main outfall point is located within a swale on the east side of the property where the concentrated flow from the pond's outfall enters the existing natural channel. The drainage area that flows into the stream in the middle of the property consists of 2-15% slopes.

A Level 2 Wet Pond will be placed east of the substation pad, directly west of the stream The proposed SWM basin will capture 15.39 acres, while 4.19 acres within project limits will bypass the basin to reach the main outfall point as uncontrolled runoff. Stormwater coming from the substation pad will be directed through the pretreatment forebay by two grass-lined channels. From the forebay, the majority of the stormwater will flow through a wetland cell and then into the permanent pool. The basin outfalls through a riser structure with a 2" orifice, 1ft x 0.5ft orifice, 6ft x 6ft riser, and 24" RCP culvert. Adequate outfall energy balance is described further below, with calculations shown on this page.

HYDROLOGIC METHODS

Stormwater management design for the site has been developed in accordance with Virginia Stormwater Management Program Regulations Part II-B criteria, 9VAC25-870-62 through 9VAC25-870-92. Rainfall-frequency-depth values for 24-hr storm events for Lunenburg County were obtained from NOAA Atlas 14 Precipitation Frequency Data Server. Soil groups were obtained from the National Resources Conservation Service (NRCS) Web Soil Survey. Times of concentration, runoff curve numbers, and routing of the stormwater management basin were determined with the SCS method. The required phosphorous load reduction was calculated using the Virginia Runoff Reduction Method (VRRM). Time of concentration calculations use a maximum sheet flow length of 100', before conversion to another flow type, as required by TR-55 User Manual, January 2009.

NOTE - RUNOFF CURVE NUMBERS

Runoff curve numbers were determined based on soil type and land cover. All gravel stone, compacted and non-compacted, were considered impervious for water quality. A curve number of 98 was used for the impervious areas. For water quantity, a CN value of 85 for B Soils (89 for C Soils) was used for the non-compacted substation pad gravel. This CN value is referenced in Dominion's Technical Memo, "Non- Compacted Stone - Pervious versus Impervious Substation Engineering - SWM Guidance" dated October 9, 2014.

WATER QUANTITY

This project was analyzed for the 1-year and 10-year storm events to show compliance with VA DEQ IIB Stormwater Management Water Quantity Requirements. There are 5 outfalls on this project. See sheets 1707908-C-606and 1707908-C-607for the pre and post developed drainage area maps. There is 1 stormwater quantity control structure provided for the project (Wet Pond).

Outfall 1
Pre-development outfall 1 outfalls along the east side of the project site, into an unnamed tributary of Flat Rock Creek primarily as shallow concentrated/sheet flow. Post-development outfall 1 includes controlled runoff from Wet Pond #1 which is comprised of onsite runoff and some uncontrolled sheet flow.

Outfall 1 meets the allowable discharge for the 10-year flood protection event, with the post-development flow rate computed at the outfall being less than the pre-development flow rate.

The point of concentrated discharge corresponding to this outfall is isolated to a singular culvert discharging from SWM Facility 1. A two-inch circular orifice controls the flow for the 1-year event, and yields a peak discharge of (0.14 cfs). The post-development peak discharge has been reduced to be below the computed peak discharge in the forested condition (0.20 cfs). This flow rate is extremely small and it is not anticipated that it will adversely affect the downstream receiving channel (erosion or flooding).

The remaining portion of the drainage area to outfall 1 discharges as sheet flow over a length of approximately 600 ft. Per Virginia code section 9VAC25-870-66 D, this sheet flow has been analyzed and deemed to be non-erosive.

One- and ten-year discharges for outfall 1 are summarized below in table 1.

DA 1					
Return Event	$Q_{pre-dev}$	$Q_{forested}$	$Q_{post-pond}$	$Q_{post-uncont}$	$Q_{post-outfall}$
	CFS	CFS	CFS	CFS	CFS
1-year	0.43	0.20	0.14	0.43	0.51
10-year	7.75	--	2.49	5.43	5.58

Note: Post-development peak outflows are non-coincident.

100-YR STORM EVENT:
The basin has greater than 2 foot of freeboard for the 100-yr storm conditions: the 100-yr storm elevation is 383.57, while the top of dam elevation is 386.0'.
See 1707908-C-612 for basin routing calculations. See 1707908-C-614 for basin detail.

Outfall 2
Stormwater exits the property as a combination of sheet flow and shallow concentrated flow in both the pre-development and post development conditions and discharges into the unnamed tributary of Flat Rock Creek on the north-east side of the Substation.

Per the Code of Virginia, Section 9VAC25-870-66 D, the sheet flow for the 2 and 10 year events has decreased for the post-development conditions. The sheet flow has been analyzed and it was determined that it is non-erosive and that the receiving area is in good condition.

DA 2		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	2.30	1.18
10-year	11.88	6.41

Outfall 3
Stormwater exits the property as a combination of sheet flow and shallow concentrated flow in both the pre-development and post development conditions and discharges into the unnamed tributary of Flat Rock Creek on the west side of the Substation.

Per the Code of Virginia, Section 9VAC25-870-66 D, the sheet flow for the 2 and 10 year events has slightly increased for the post-development conditions. The sheet flow has been analyzed and it was determined that it is non-erosive and that the receiving area is in good condition.

DA 3		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	3.25	5.10
10-year	17.04	17.65

Outfall 4
Stormwater exits the property as a combination of sheet flow and shallow concentrated flow in both the pre-development and post development conditions and discharges into the unnamed tributary of Flat Rock Creek on the south side of the Substation.

Per the Code of Virginia, Section 9VAC25-870-66 D, the sheet flow for the 2 and 10 year events has slightly increased for the post-development conditions. The sheet flow has been analyzed and it was determined that it is non-erosive and that the receiving area is in good condition.

DA 4		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	1.70	2.71
10-year	9.37	9.69

Outfall 5
Stormwater exits the property as a combination of sheet flow and shallow concentrated flow in both the pre-development and post development conditions and discharges into the unnamed tributary of Flat Rock Creek on the north side of the Substation.

Per the Code of Virginia, Section 9VAC25-870-66 D, the sheet flow for the 2 and 10 year events has stayed the same for the post-development conditions. The sheet flow has been analyzed and it was determined that it is non-erosive and that the receiving area is in good condition.

DA 5		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	1.35	1.35
10-year	6.66	6.66

WATER QUALITY

As calculated by the Virginia Runoff Reduction Method Spreadsheet v3.0, the required phosphorous removal of 27.71 lb/yr will be addressed through a combination of the Level 2 Wet Pond and the purchase of off-site nutrient credits.

See Sheet 1707908-C-602 for water quality calculations. See Sheet 1707908-C-603 for VRRM land cover maps.

STORMWATER MANAGEMENT FOREBAY

A metered rod will be installed in the forebays to measure the depth of sediment. The rod should be placed within the flow path.

MAINTENANCE PLAN AND SCHEDULE

The purpose of this section is to present a general maintenance program for this facility. It should be noted that the maintenance tasks presented herein will not eliminate the possibility that a structural or subsurface deficiency may develop in the future, nor will they eliminate all potential for dam failure. However, they significantly reduce the risk of future problems and make it possible to catch potential problems early, before they can develop into serious threats to SWM facility. The owner is responsible for maintenance to the extent not maintained by the County.

1. EMBANKMENT

The purpose of the tasks described below is to maintain a thick, healthy grass cover over the embankment which is free from brush and trees. This type of cover will assist in the inspection of the dam.

A. The embankment should be mowed at least twice during the growing season with the last cutting occurring at the end of the growing season. The grass cover should not be cut to less than 4" in height.
B. The embankment should be limed, fertilized and seeded at least once every two years in the fall after the growing season. Consulting with the Virginia Tech Cooperative Extension Service or the local soil and water conservation district office is recommended to determine the precise lime and fertilizer requirements.
C. All erosion gullies and pathways noted during the growing season should be backfilled with topsoil, reseeded, and protected (e.g. mulched) until revegetated.
D. All bare areas and pathways on the embankment should be properly seeded and protected in order to eliminate the potential for erosion.
E. All animal burrows noted during mowing operations should be backfilled and compacted. Measures should be taken to eliminate the animals from the area.
F. Any vine cover or brush should be removed from the dam embankment, riser structure and downstream culvert outlet and outlet items (e.g. endwalls, wingwalls, etc.) at least twice per year. This will allow for proper inspection of the concrete in the spillway.

2. OUTLET STRUCTURE

A. The outlet structure should be kept clear of debris which could impede flow into the structure. Clearing in the spring and fall of each year is recommended. In addition, the structure should be inspected after significant storm events to check for possible damage, and to remove any significant debris accumulation.
B. Each year the concrete in the outlet structure and outlet culvert should be checked for cracks, spalling and broken or loose sections. At this time, any cracked or spalled areas should be cleaned and refilled with an appropriate patching concrete. Any broken or loose sections should be removed along with any loose debris underneath. Replacement concrete should match the existing contour of the concrete, and fill the void underneath. If any extensive spalling or fractured areas are noted they should be inspected by a qualified structural engineer prior to repair.
C. Each year the outlet structure and culvert should be inspected to determine if any water is entering the spillway through any joints or cracks. If any significant leakage is encountered it should be inspected by a qualified professional engineer. If recommended by the engineer, pressure grouting the cracks with an appropriate hydroactive joint or crack sealer should be performed.

3. PONDING AREA

A. The entire ponding area should be inspected annually for erosion or significant debris accumulation. Considerations should be given to stabilizing severely eroded areas with vegetative measures or other forms of shoreline revetment such as riprap. Significant debris build-up should be removed from the ponding area.

ADEQUATE OUTFALL CALCULATIONS

Unity Sub Station
Lunden County
Dewberry
Site-Civil Engineering

Outfall: 1 | Channel Type: **Natural** | Engineer: **KZ** | Checker: **EU**

STEP 1: Determine the Pre Developed, Forested, and Post Developed Conditions within the disturbed area and the offsite area draining to project BMPs.

Pre Developed Conditions		Forested Conditions		Post Developed Conditions		Offsite Conditions	
Weighted CN =	58.0	Weighted CN =	55.0	Weighted CN =	81.8	Weighted CN =	55.0
Area (ac) =	6.46	Area (ac) =	6.46	Area (ac) =	15.39	Area (ac) =	0.00
P (in.) =	2.73	P (in.) =	2.73	P (in.) =	2.73	P (in.) =	2.73

STEP 2: Determine the peak discharge for each area. The total predevelopment discharge combines offsite and pre developed conditions.

Pre Developed Discharge		Forested Conditions Discharge		Post Development Discharge		Offsite Conditions Discharge	
S	7.2	S	8.2	S	2.2	S	8.2
Ia	1.4	Ia	1.6	Ia	0.4	Ia	1.6
Q (in)	0.2 in	Q (in)	0.1 in	Q (in)	1.2 in	Q (in)	0.1 in
Volume	0.104 ac-ft	Volume	0.069 ac-ft	Volume	1.486 ac-ft	Volume	0.000 ac-ft

Total Forested Peak Discharge **0.20** cfs (From PondPack)

Total Predevelopment Discharge **0.43** cfs (From PondPack)

STEP 3: Calculate Adjusted CN value using Runoff Reduction provided in BMPs

BMP	Runoff Reduction
Weipond N/A	ft^3
	ft^3
	ft^3
	ft^3
	ft^3
Total =	**0** ft^3

Qpost without RR = 1.2
Qpost with RR = 1.2
Adjusted CN = 82

STEP 4: Calculate $Q_{allowable}$ using the energy balance equation. Only apply the improvement factor to the disturbed area.

Energy Balance Equation: $Q_{Developed} \leq IF \times (Q_{Pre\text{-}Developed} \times RV_{Pre\text{-}Developed}) / RV_{Developed}$
Improvement Factor 0.8

$Q_{allowable} \leq$ [Total Predevelopment Discharge (Offsite Volume + (Improvement Factor x Pre-Developed Volume) / (Post-Development Volume + Offsite Volume)]
$Q_{allowable}$ 0.02 cfs

STEP 5: Calculated Maximum Allowable Peak Discharge.

Maximum Allowable Peak Discharge = Maximum (Q_{forest} or $Q_{allowable}$)

Q_{forest} = Total Forest Peak Discharge x (Forest Volume + Offsite Volume)/(Post-Development Volume + Offsite Volume)
Q_{forest} 0.01 cfs

Maximum Allowable Peak Discharge ##### cfs

STEP 6: Ensure $Q_{post\text{-}developed}$ is less than the Maximum Allowable Peak Discharge

$Q_{post\text{-}developed}$ (from Pond Pack) **0.14** cfs

Channel is Inadequate

Dewberry

Adequate Outfall Flood Protection Summary

Outfall Number: 1 **Project:** Unity Substation

Outfall Type: Channel
Channel Type: Natural

Flood Protection - 10-year post < pre

Existing 10-yr Discharge (cfs)	Proposed 10-yr Discharge (cfs)
7.75	5.58

Is the outfall adequate? **YES**

Notes / Remarks:
The channel is adequate for flood protection because the post 10-year discharge is less than the pre 10-year discharge.

REVISIONS		
REV	DATE	DESCRIPTION

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Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SWM NARRATIVE

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-601		
DESIGNER	EU/KZ	08/18/23			
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING: 1707908-C-601.dwg		
APPROVED BY	KAS	08/18/23			

VRRM SPREADSHEET

DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0

☐ 2011 BMP Standards and Specifications ☒ 2013 Draft BMP Standards and Specifications

Project Name:	Unity Sub Station
Date:	7/14/2023
BMP Design Specifications List:	2013 Draft Stds & Specs

CLEAR ALL

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	9.69	0.00	0.00	9.69
Impervious Cover (acres)	0.00	15.52	0.00	0.00	15.52
					25.21

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	27.71

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary

Forest/Open Space Cover (acres)	0.00
Weighted Rv (forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	9.69
Weighted Rv (turf)	0.20
% Managed Turf	38%
Impervious Cover (acres)	15.52
Rv (impervious)	0.95
% Impervious	62%
Site Area (acres)	**25.21**
Site Rv	**0.66**

Treatment Volume and Nutrient Loads

Treatment Volume (acre-ft)	1.3902
Treatment Volume (cubic feet)	60,556
TP Load (lb/yr)	38.05
TN Load (lb/yr) (Informational Purposes Only)	272.18

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	12.62	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	12.62	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	2.75	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	2.75	0.00	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	60,556

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	28.60	0.00	0.00	0.00	0.00	28.60
TP LOAD REDUCTION ACHIEVED (lb/yr)	21.43	0.00	0.00	0.00	0.00	21.43
TP LOAD REMAINING (lb/yr)	7.17	0.00	0.00	0.00	0.00	7.17
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	81.74	0.00	0.00	0.00	0.00	81.74

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	38.05
TP LOAD REDUCTION REQUIRED (lb/yr)	27.71
TP LOAD REDUCTION ACHIEVED (lb/yr)	21.43
TP LOAD REMAINING (lb/yr):	16.62
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	**6.29**

SEE LETTER OF NUTRIENT CREDIT AVAILABILITY ON THIS SHEET FOR REMAINING REMOVAL

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	272.18
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	81.74
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	190.44

Drainage Area A

Drainage Area A Land Cover (acres)

CLEAR BMP AREAS

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	2.75	0.00	0.00	2.75	0.20
Impervious Cover (acres)	0.00	12.62	0.00	0.00	12.62	0.95
				Total	15.37	

Total Phosphorus Available for Removal in D.A. A (lb/yr)	28.60
Post Development Treatment Volume in D.A. A (ft^3)	45,518

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0	2.75	12.62	0	0	45,518	45,518	75	0.00	28.57	21.43	7.14	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
13. Wet Ponds (no RR)					
13.a. Wet Pond #1 (Spec #14)	30	0.00	0.00	0.00	0.00
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	20	0.00	0.00	0.00	0.00
13.c. Wet Pond #2 (Spec #14)	40	0.00	204.36	81.74	122.62
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	30	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	12.62	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	2.75	AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	27.71
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	28.60
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	21.43
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	21.43
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	7.17

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	81.74
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	81.74

LETTER OF NUTRIENT CREDIT AVAILABILITY

Porter Nutrient Bank

CREDIT AVAILABILITY & PRICING LETTER

RE: Nutrient Offset Availability & Pricing

Date: 18 August 2023

Project Reference: Lunenburg County Project
Address: 36°88'76.6"N 78°14'05.39"W
HUC: 03010204

Attention: Ms. Megan Langston,

This letter is to confirm the availability and price of authorized nonpoint nutrient offsets at the Porter Nutrient Bank project located in Lunenburg County, owned by Porters Farm, LLC ("the Bank"). The Bank has received operational status through the Chesapeake Bay Watershed Nutrient Exchange Program (Virginia Code 62.1-44.19:12 et seq.) of the Virginia Department of Environmental Quality. The Bank currently has 31.75 pounds of phosphorus offsets and 294.65 pounds of nitrogen offsets available for transfer in the approved service area in the Chowan River Basin River watershed. These offsets were certified pursuant to the Chesapeake Bay Nutrient Exchange Program by Virginia Department of Environmental Quality and the Virginia Department of Conservation and Recreation to be used as compensation for state or local permit water quality requirements. These offsets have been generated and are transferable according to 62.1-44.15:35 of the code of Virginia. The proposed terms are as follows:

- Purchase Request: 6.29 lbs/yr of phosphorus
- Price: $14,900 per pound or $93,721 for 6.29lbs
- Terms: The Bank shall transfer those credits to the project owner upon execution of a credit purchase agreement and payment of the purchase price. Terms are good for 30 days from date above.

If we can provide further assistance please do not hesitate to contact me at 434-953-8105 or todd@vcce.net.

Sincerely,

Todd Hochrein
Agent for
Porter Nutrient Bank

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

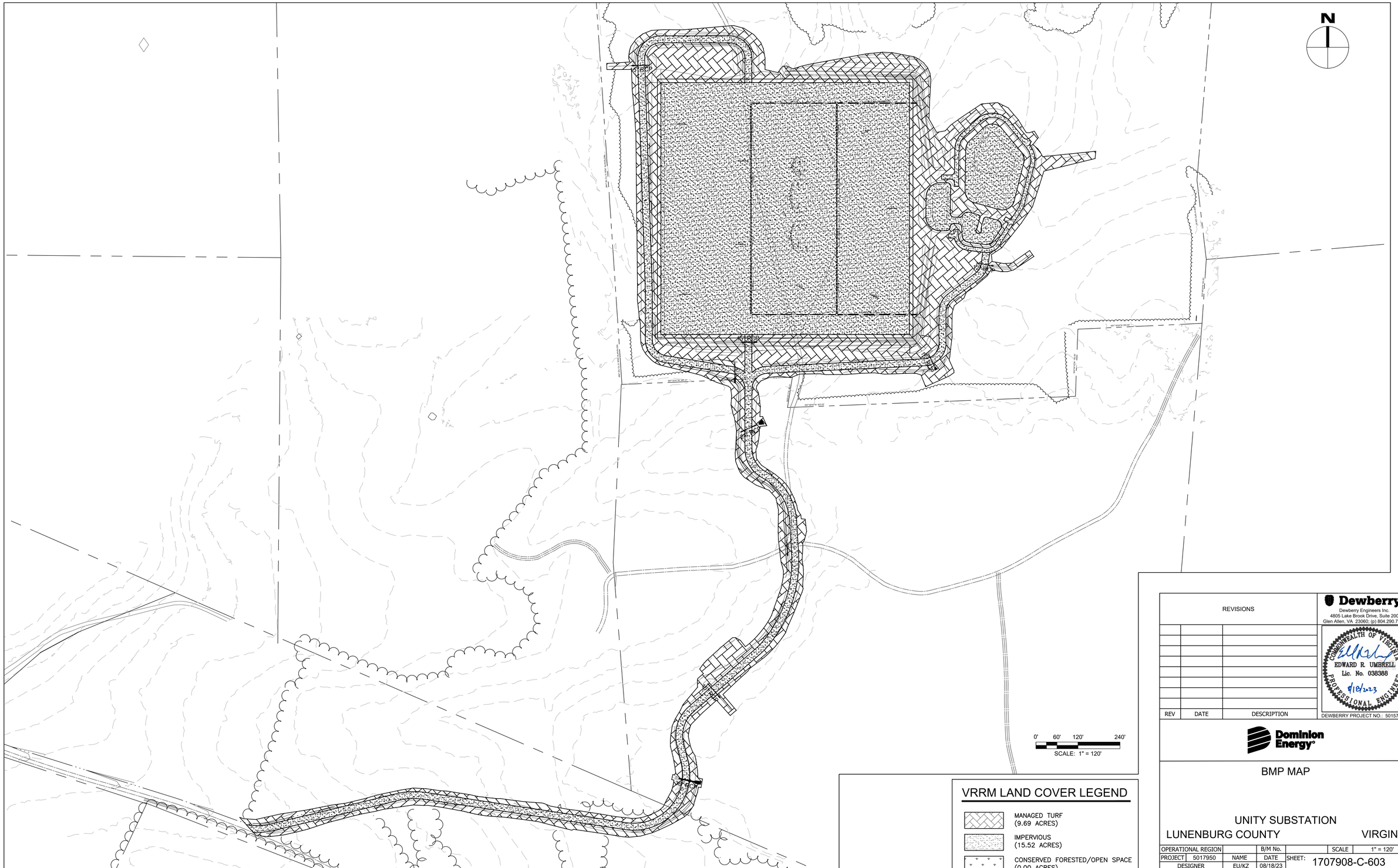
Dominion Energy

BMP COMPS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET:	1707908-C-602
DESIGNER	EU/KZ	08/18/23		
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING:	
APPROVED BY	KAS	08/18/23		1707908-C-602.dwg

VRRM LAND USE MAP



VRRM LAND COVER LEGEND

- MANAGED TURF (9.69 ACRES)
- IMPERVIOUS (15.52 ACRES)
- CONSERVED FORESTED/OPEN SPACE (0.00 ACRES)

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

BMP MAP

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	1" = 120'
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-603
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	1707908-C-603.dwg
APPROVED BY		KAS	08/18/23		

PRE DEVELOPMENT LAND USE MAP

PRE DEVELOPMENT LAND COVER LEGEND

FORESTED
(9.93 ACRES)

MEADOW
(36.87 ACRES)

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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COMMONWEALTH OF VIRGINIA
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Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

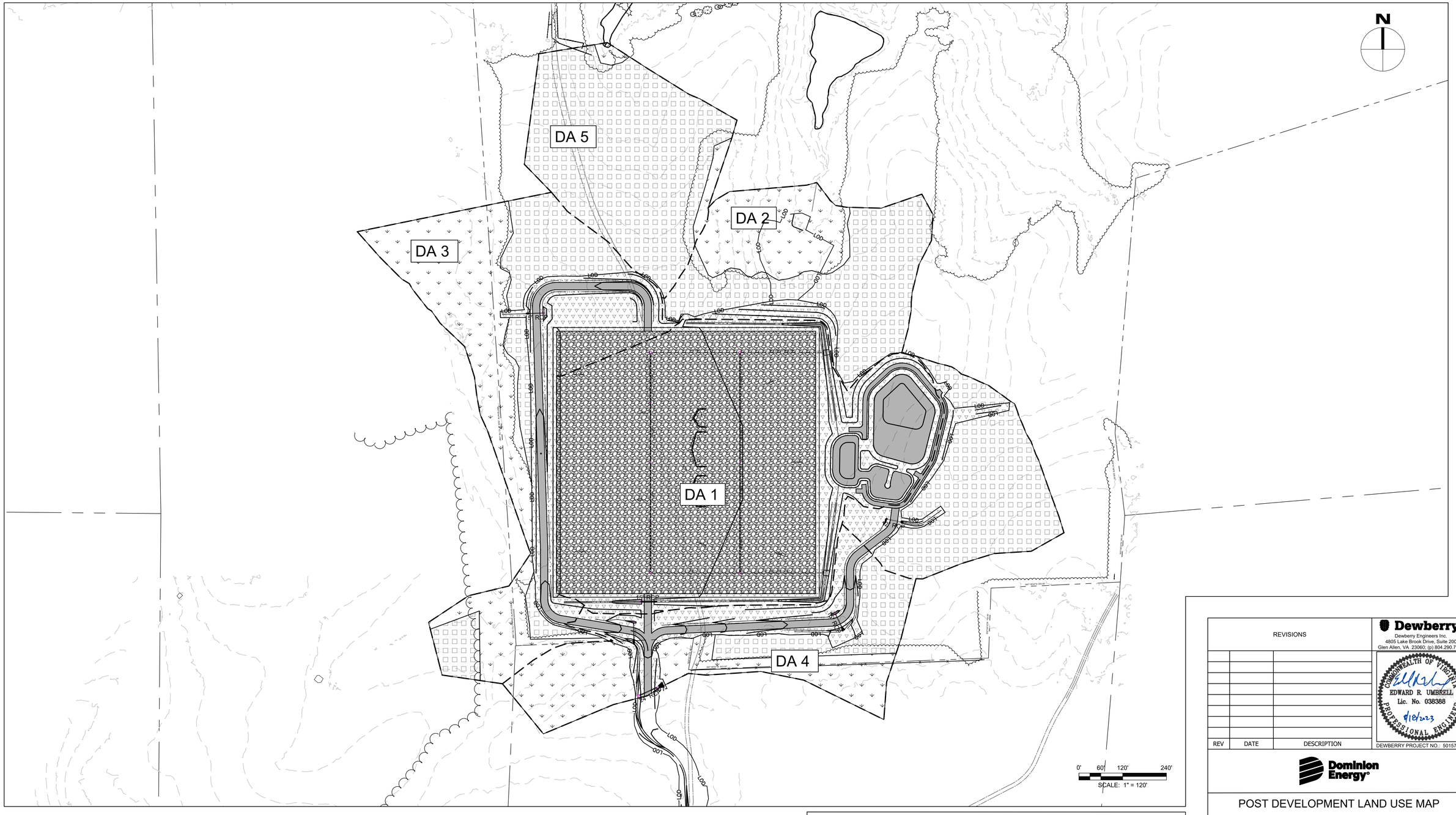
Dominion Energy

PRE DEVELOPMENT LAND USE MAP

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	1" = 120'
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-604
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	1707908-C-604.dwg
APPROVED BY		KAS	08/18/23		

POST DEVELOPMENT LAND USE MAP



POST DEVELOPMENT LAND COVER LEGEND

IMPERVIOUS (2.64 ACRES)	MEADOW (15.60 ACRES)
FORESTED (9.38 ACRES)	GRAVEL (11.74 ACRES)
MANAGED TURF (7.45 ACRES)	

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

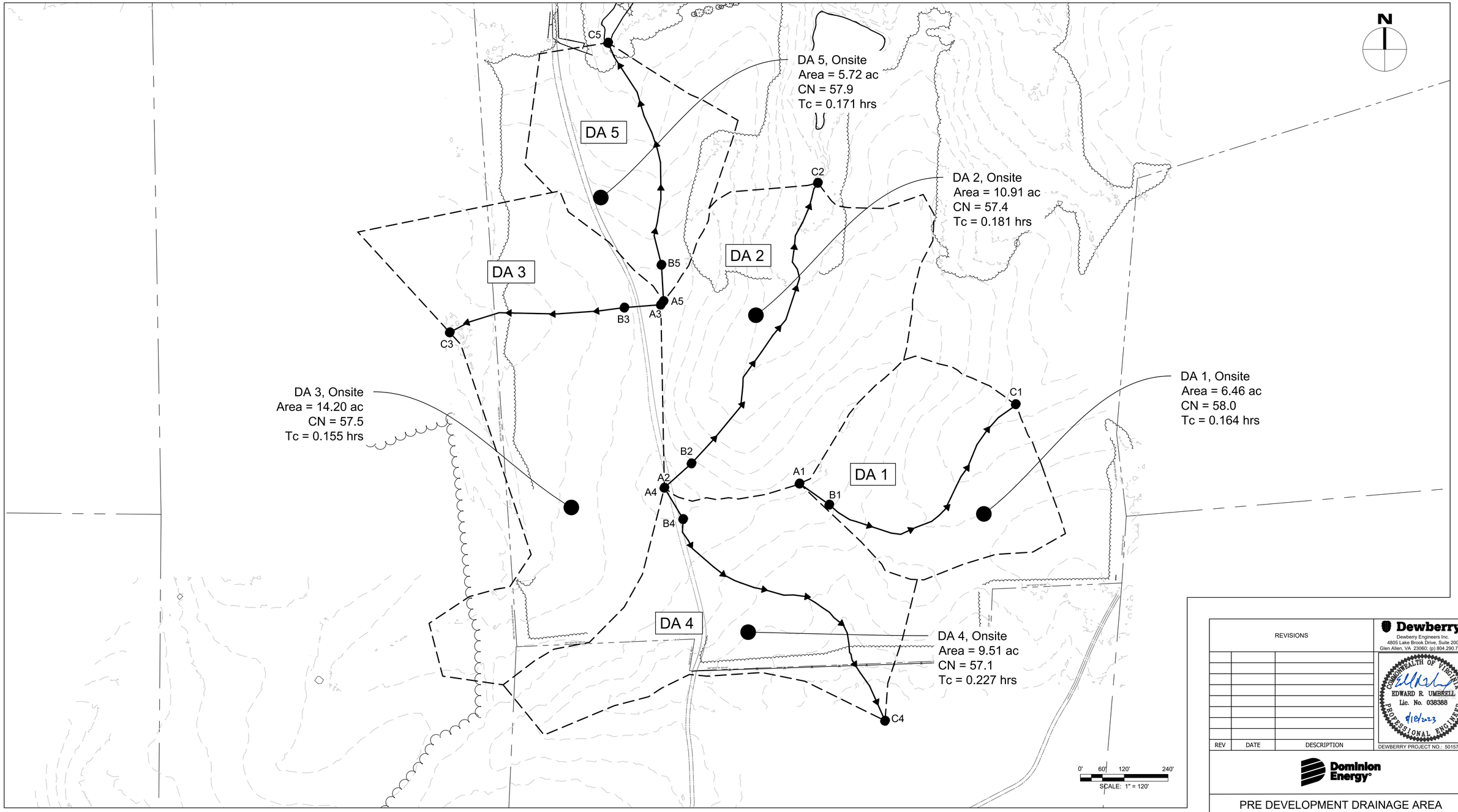
Dominion Energy

POST DEVELOPMENT LAND USE MAP

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	1" = 120'
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-605		
DESIGNER	EU/KZ	08/18/23			
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING:		
APPROVED BY	KAS	08/18/23	1707908-C-605.dwg		

PRE DEVELOPMENT DRAINAGE DIVIDE MAP



REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
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COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

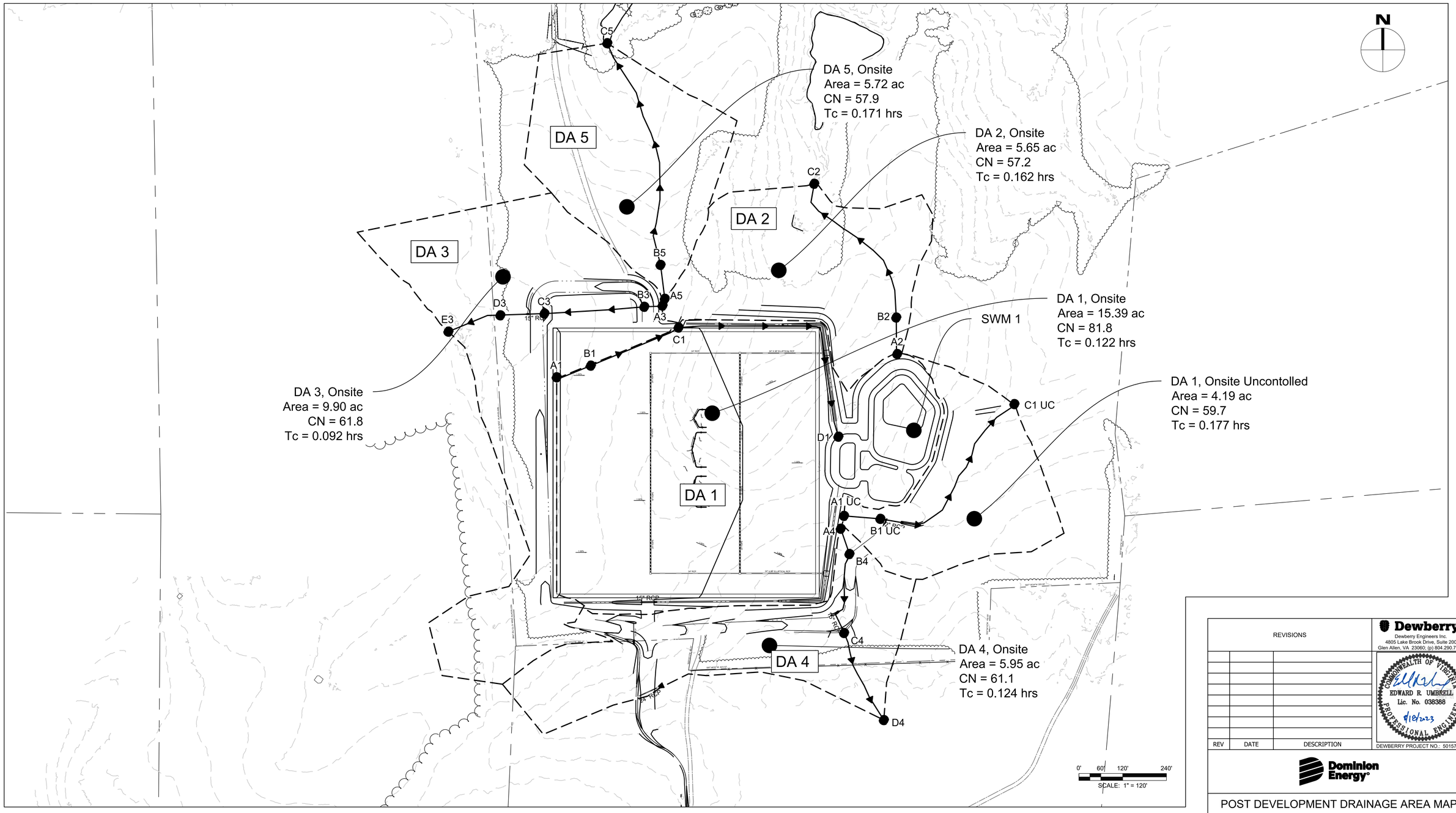
Dominion Energy

PRE DEVELOPMENT DRAINAGE AREA

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	1" = 120'
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-606
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	1707908-C-606.dwg
APPROVED BY		KAS	08/18/23		

POST DEVELOPMENT DRAINAGE DIVIDE MAP



REVISIONS		
REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

POST DEVELOPMENT DRAINAGE AREA MAP

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	1" = 120'
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-607
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	1707908-C-607.dwg
APPROVED BY		KAS	08/18/23		

DRAINAGE AREA 1

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 1, Onsite | Checked: EU | Date: 7/18/2023
Check one: [X] Present: [ ] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Meadow - Good Condition	58	6.46	374.5
[1]Use only one CN source per line	Totals →		6.46	374.5
			0.0101	sq. miles
CN (weighted) = total product / total area =	Use CN →		58.0	

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.11	0.24	0.76	2.13	3.62

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 1 – FORESTED

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 1, Onsite | Checked: EU | Date: 7/18/2023
Check one: [X] Present: [ ] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Woods - Good Condition	55	6.46	355.1
[1]Use only one CN source per line	Totals →		6.46	355.1
			0.0101	sq. miles
CN (weighted) = total product / total area =	Use CN →		55.0	

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.11	0.24	0.76	2.13	3.62

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 2

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 2, Onsite | Checked: EU | Date: 7/18/2023
Check one: [X] Present: [ ] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Forested - Good Condition	55	2.04	112.0
B	Meadow - Good Condition	58	8.88	514.9
[1]Use only one CN source per line	Totals →		10.91	626.9
			0.0171	sq. miles
CN (weighted) = total product / total area =	Use CN →		57.4	

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.10	0.22	0.73	2.08	3.55

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 3

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 3, Onsite | Checked: EU | Date: 7/18/2023
Check one: [X] Present: [ ] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Forested - Good Condition	55	4.34	238.6
B	Meadow - Good Condition	58	9.35	542.3
C	Forested - Good Condition	70	0.29	20.3
C	Meadow - Good Condition	71	0.23	16.0
[1]Use only one CN source per line	Totals →		14.20	817.2
			0.0222	sq. miles
CN (weighted) = total product / total area =	Use CN →		57.5	

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.10	0.23	0.73	2.09	3.57

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 4

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 4, Onsite | Checked: EU | Date: 7/18/2023
Check one: [X] Present: [ ] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Forested - Good Condition	55	3.00	165.1
B	Meadow - Good Condition	58	6.50	377.3
[1]Use only one CN source per line	Totals →		9.51	542.4
			0.0149	sq. miles
CN (weighted) = total product / total area =	Use CN →		57.1	

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.09	0.22	0.71	2.04	3.51

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 5

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 5, Onsite | Checked: EU | Date: 7/18/2023
Check one: [X] Present: [ ] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Forested - Good Condition	55	0.27	14.6
B	Meadow - Good Condition	58	5.46	316.5
[1]Use only one CN source per line	Totals →		5.72	331.1
			0.0089	sq. miles
CN (weighted) = total product / total area =	Use CN →		57.9	

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.11	0.24	0.75	2.12	3.60

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

REVISIONS		
REV	DATE	DESCRIPTION

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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

PRE DEVELOPMENT CN COMPS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET:	1707908-C-608
DESIGNER	EU/KZ	08/18/23		
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING:	
APPROVED BY	KAS	08/18/23		1707908-C-608.dwg

DRAINAGE AREA 1

Unity Sub Station - Drainage Area 1 Onsite - Existing Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Predeveloped Conditions

Sheet flow		A1 - B1
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.06
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.103
Shallow concentrated flow		**B1 - C1**
Surface description		Unpaved
Flow length, L	(ft)	709
Watercourse slope, s	(ft/ft)	0.04
Average velocity, V	(fps)	3.2
Tt = L/(3600*V)	(hr)	0.061
Watershed time of concentration, Tc	(hrs)	**0.164**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.098**

DRAINAGE AREA 2

Unity Sub Station - Drainage Area 2 Onsite - Existing Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Predeveloped Conditions

Sheet flow		A1 - B1
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.06
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.107
Shallow concentrated flow		**B1 - C1**
Surface description		Unpaved
Flow length, L	(ft)	883
Watercourse slope, s	(ft/ft)	0.04
Average velocity, V	(fps)	3.3
Tt = L/(3600*V)	(hr)	0.074
Watershed time of concentration, Tc	(hrs)	**0.181**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.109**

DRAINAGE AREA 3

Unity Sub Station - Drainage Area 3 Onsite - Existing Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Postdeveloped Conditions

Sheet flow		A - B
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.05
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.116
Shallow concentrated flow		**B - C**
Surface description		Unpaved
Flow length, L	(ft)	490
Watercourse slope, s	(ft/ft)	0.05
Average velocity, V	(fps)	3.5
Tt = L/(3600*V)	(hr)	0.039
Watershed time of concentration, Tc	(hrs)	**0.155**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.093**

DRAINAGE AREA 4

Unity Sub Station - Drainage Area 4 Onsite - Existing Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Predeveloped Conditions

Sheet flow		A1 - B1
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.02
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.161
Shallow concentrated flow		**B1 - C1**
Surface description		Unpaved
Flow length, L	(ft)	855
Watercourse slope, s	(ft/ft)	0.05
Average velocity, V	(fps)	3.6
Tt = L/(3600*V)	(hr)	0.066
Watershed time of concentration, Tc	(hrs)	**0.227**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.136**

DRAINAGE AREA 5

Unity Sub Station - Drainage Area 5 Onsite - Existing Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Postdeveloped Conditions

Sheet flow		A - B
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.04
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.122
Shallow concentrated flow		**B - C**
Surface description		Unpaved
Flow length, L	(ft)	646
Watercourse slope, s	(ft/ft)	0.05
Average velocity, V	(fps)	3.6
Tt = L/(3600*V)	(hr)	0.049
Watershed time of concentration, Tc	(hrs)	**0.171**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.103**

REVISIONS

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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

PRE DEVELOPMENT TC COMPS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-609	
DESIGNER		EU/KZ	08/18/23			
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	1707908-C-609.dwg	
APPROVED BY		KAS	08/18/23			

DRAINAGE AREA 1

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 1, Onsite Treated | Checked: EU | Date: 7/18/2023
Check one: [ ] Present: [X] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Open Space - Good Condition	61	2.77	168.7
B	Gravel	85	11.28	958.6
--	Impervious	98	0.22	21.9
--	Water	98	1.12	109.6
	Totals →		15.39	1258.9
			0.0240	sq. miles

[1]Use only one CN source per line

CN (weighted) = total product / total area = Use CN → **81.8**

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.92	1.28	2.36	4.50	6.50

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 1 – UNCONTROLLED

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 1, Onsite Uncontrolled | Checked: EU | Date: 7/18/2023
Check one: [ ] Present: [X] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Meadow	58	3.42	198.4
B	Open Space - Good Condition	61	0.64	39.1
--	Impervious	98	0.13	12.7
	Totals →		4.19	250.3
			0.0066	sq. miles

[1]Use only one CN source per line

CN (weighted) = total product / total area = Use CN → **59.7**

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.92	1.28	2.36	4.50	6.50

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 2

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 2, Onsite Treated | Checked: EU | Date: 7/18/2023
Check one: [ ] Present: [X] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Woods - Good Condition	55	2.04	112.0
B	Open Space - Good Condition	61	0.45	27.7
B	Meadow	58	3.16	183.3
	Totals →		5.65	323.0
			0.0088	sq. miles

[1]Use only one CN source per line

CN (weighted) = total product / total area = Use CN → **57.2**

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.10	0.22	0.72	2.05	3.52

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 3

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 3, Onsite Treated | Checked: EU | Date: 7/18/2023
Check one: [ ] Present: [X] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Woods - Good Condition	55	4.1093	226.0
B	Meadow	58	2.11	122.6
B	Open Space - Good Condition	61	2.07	126.3
B	Gravel	85	0.46	38.9
C	Woods - Good Condition	70	0.30	20.9
B	Meadow	71	0.23	16.0
--	Impervious	98	0.62	60.8
	Totals →		9.90	611.5
			0.0155	sq. miles

[1]Use only one CN source per line

CN (weighted) = total product / total area = Use CN → **61.8**

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.18	0.35	0.96	2.48	4.07

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 4

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 4, Onsite Treated | Checked: EU | Date: 7/18/2023
Check one: [ ] Present: [X] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Woods - Good Condition	55	2.6687	146.8
B	Open Space - Good Condition	61	1.50	91.7
B	Meadow	58	1.23	71.4
--	Impervious	98	0.54	53.3
	Totals →		5.95	363.1
			0.0093	sq. miles

[1]Use only one CN source per line

CN (weighted) = total product / total area = Use CN → **61.1**

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.17	0.33	0.92	2.41	3.99

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

DRAINAGE AREA 5

Worksheet 2: Runoff curve number and runoff

Project: Unity Substation | By: KAZ | Date: 7/18/2023
Location: Drainage Area 5, Onsite | Checked: EU | Date: 7/18/2023
Check one: [ ] Present: [X] Developed:

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	AREA (Acres)	Product of CN x Area
B	Woods - Good Condition	55	0.2652	14.6
B	Open Space - Good Condition	61	0.01	0.6
B	Meadow	58	5.44	315.8
	Totals →		5.72	331.0
			0.0089	sq. miles

[1]Use only one CN source per line

CN (weighted) = total product / total area = Use CN → **57.9**

2. Runoff

	Storm #1	Storm #2	Storm #3	Storm #4	Storm #5
Frequency ..... Yr	1	2	10	100	500
Rainfall, P (24-hour) . In.	2.4	2.89	4.2	6.58	8.69
Runoff, Q..... In.	0.11	0.24	0.75	2.12	3.61

(Use P and CN with table 2-1, Figure 2-1, or equations 2-3 and 2-4)

REVISIONS

REV	DATE	DESCRIPTION

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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

POST DEVELOPMENT CN COMPS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-610
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	
APPROVED BY		KAS	08/18/23		1707908-C-610.dwg

DRAINAGE AREA 1 – CONTROLLED

Unity Sub Station - Drainage Area 1 Onsite Controlled - Proposed Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Postdeveloped Conditions

Sheet flow		A - B
Surface description		Smooth Surfaces (Gravel)
Manning's roughness coeff., n		0.025
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.010
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.051
Shallow concentrated flow		**B - C**
Surface description		Paved
Flow length, L	(ft)	263
Watercourse slope, s	(ft/ft)	0.02
Average velocity, V	(fps)	2.7
Tt = L/(3600*V)	(hr)	0.027
Pipe flow		**C - D**
Pipe Diameter	(in)	
Channel Data		
bottom width	(ft)	4
side slope	z:1	3
depth	(ft)	1
Cross sectional flow area, a		7.000
Wetted perimeter, Pw		10.325
Hydraulic radius, r = a/Pw		0.678
Channel slope, s		0.0130
Manning's roughness coeff., n		0.030
V =(1.49*r^2/3*s^1/2)/n; Compute V		4.375
Flow length, L	(ft)	690.8
Tt = L/(3600*V); Compute Tt	(hr)	0.044
Watershed time of concentration, Tc	(hrs)	**0.122**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.073**

DRAINAGE AREA 1 – UNCONTROLLED

Unity Sub Station - Drainage Area 1 Onsite Uncontrolled - Proposed Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Postdeveloped Conditions

Sheet flow		A1 - B1
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.040
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.122
Shallow concentrated flow		**B1 - C1**
Surface description		Unpaved
Flow length, L	(ft)	543
Watercourse slope, s	(ft/ft)	0.03
Average velocity, V	(fps)	2.7
Tt = L/(3600*V)	(hr)	0.055
Watershed time of concentration, Tc	(hrs)	**0.177**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.106**

DRAINAGE AREA 2

Unity Sub Station - Drainage Area 2 Onsite - Proposed Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Predeveloped Conditions

Sheet flow		A1 - B1
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.04
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.128
Shallow concentrated flow		**B1 - C1**
Surface description		Unpaved
Flow length, L	(ft)	470
Watercourse slope, s	(ft/ft)	0.06
Average velocity, V	(fps)	3.9
Tt = L/(3600*V)	(hr)	0.034
Watershed time of concentration, Tc	(hrs)	**0.162**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.097**

DRAINAGE AREA 3

Unity Sub Station - Drainage Area 3 Onsite - Proposed Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Postdeveloped Conditions

Sheet flow		A - B
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	50
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.140
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.042
Shallow concentrated flow		**B - C**
Surface description		Unpaved
Flow length, L	(ft)	274
Watercourse slope, s	(ft/ft)	0.03
Average velocity, V	(fps)	2.6
Tt = L/(3600*V)	(hr)	0.030
Pipe flow/Channel flow		**C - D**
Pipe Diameter	(in)	
Channel Data		
bottom width	(ft)	0.1
side slope	z:1	2.5
depth	(ft)	0.96
Cross sectional flow area, a		2.400
Wetted perimeter, Pw		5.270
Hydraulic radius, r = a/Pw		0.455
Channel slope, s		0.0129
Manning's roughness coeff., n		0.030
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.343
Flow length, L	(ft)	116
Tt = L/(3600*V); Compute Tt	(hr)	0.010
Shallow concentrated flow		**D-E**
Surface description		Unpaved
Flow length, L	(ft)	156
Watercourse slope, s	(ft/ft)	0.07
Average velocity, V	(fps)	4.4
Tt = L/(3600*V)	(hr)	0.010
Watershed time of concentration, Tc	(hrs)	**0.092**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.055**

DRAINAGE AREA 4

Unity Sub Station - Drainage Area 4 Onsite - Proposed Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Postdeveloped Conditions

Sheet flow		A - B
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	76.91
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.052
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.089
Pipe flow/Channel flow		**B-C**
Pipe Diameter	(in)	
Channel Data		
bottom width	(ft)	0.1
side slope	z:1	3
depth	(ft)	0.51
Cross sectional flow area, a		0.831
Wetted perimeter, Pw		3.326
Hydraulic radius, r = a/Pw		0.250
Channel slope, s		0.0405
Manning's roughness coeff., n		0.030
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.965
Flow length, L	(ft)	222.42
Tt = L/(3600*V); Compute Tt	(hr)	0.016
Shallow concentrated flow		**C-D**
Surface description		Unpaved
Flow length, L	(ft)	277
Watercourse slope, s	(ft/ft)	0.06
Average velocity, V	(fps)	4.1
Tt = L/(3600*V)	(hr)	0.019
Watershed time of concentration, Tc	(hrs)	**0.124**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.074**

DRAINAGE AREA 5

Unity Sub Station - Drainage Area 5 Onsite - Proposed Conditions

Worksheet 3: Time of Concentration (Tc) or Travel Time (Tt)
Time of Concentration Computations for Postdeveloped Conditions

Sheet flow		A - B
Surface description		Short Grass Prarie
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.31
Land slope, s	(ft/ft)	0.040
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.122
Shallow concentrated flow		**B - C**
Surface description		Unpaved
Flow length, L	(ft)	646
Watercourse slope, s	(ft/ft)	0.05
Average velocity, V	(fps)	3.6
Tt = L/(3600*V)	(hr)	0.049
Watershed time of concentration, Tc	(hrs)	**0.171**
Lag Tc, Tlag = (0.6*Tc)	(hrs)	**0.103**

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

POST DEVELOPMENT TC COMPS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-611
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	1707908-C-611.dwg
APPROVED BY		KAS	08/18/23		

ROUTING RESULTS SUMMARY

DA 1					
Return Event	$Q_{pre\text{-}dev}$	$Q_{forested}$	$Q_{post\text{-}pond}$	$Q_{post\text{-}uncont}$	$Q_{post\text{-}outfall}$
	CFS	CFS	CFS	CFS	CFS
1-year	0.43	0.20	0.14	0.43	0.51
10-year	7.75	--	2.49	5.43	5.58

NOTE: POST-DEVELOPMENT PEAK OUTFLOWS ARE NON-COINCIDENT.

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Drainage Area 1	Pre-Development 1 year	1	0.104	12.350	0.43
Drainage Area 1	Post-Development 1 year	1	1.491	12.150	21.71
Drainage Area 1	Forested	1	0.070	12.550	0.20
Drainage Area 1	Pre-Development 2 year	2	0.206	12.200	1.59
Drainage Area 1	Post-Development 2 year	2	2.076	12.150	30.14
Drainage Area 1	Pre-Development 10 year	10	0.647	12.150	7.75
Drainage Area 1	Post-Development 10 year	10	3.998	12.150	56.54
Drainage Area 1	Pre-Development 100 year	100	1.733	12.150	23.27
Drainage Area 1	Post-Development 100 year	100	7.674	12.150	105.90
DA 1B: Uncontrolled	Post-Development 1 year	1	0.082	12.250	0.43
DA 1B: Uncontrolled	Post-Development 2 year	2	0.155	12.200	1.33
DA 1B: Uncontrolled	Post-Development 10 year	10	0.459	12.150	5.43
DA 1B: Uncontrolled	Post-Development 100 year	100	1.191	12.150	15.55

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Pre-Development 1 year	1	0.104	12.350	0.43
O-1	Post-Development 1 year	1	0.210	12.250	0.51
O-1	Forested	1	0.070	12.550	0.20
O-1	Pre-Development 2 year	2	0.206	12.200	1.59
O-1	Post-Development 2 year	2	0.463	12.200	1.44
O-1	Pre-Development 10 year	10	0.647	12.150	7.75
O-1	Post-Development 10 year	10	2.413	12.150	5.58
O-1	Pre-Development 100 year	100	1.733	12.150	23.27
O-1	Post-Development 100 year	100	6.467	12.250	49.17

ELEVATION–VOLUME TABLE

STAGE VS. STORAGE USING CONIC METHOD

PROJECT: Unity Substation Wet Pond
ENGINEER / DATE: KZ 7/18/2023
Main Cell

ELEVATION (FEET)	AREA (SQ FEET)	AREA (ACRES)	INCREMENTAL VOLUME (ACRE-FEET)	TOTAL VOLUME (ACRE-FEET)	
375	10189.5	0.2339	0	0.000	
376	19805.1	0.4547	0.3382	0.338	
377	21486.1	0.4933	0.4738	0.812	
378	23225.5	0.5332	0.5131	1.325	
378.5	24118.6	0.5537	0.2717	1.597	
378.5	28865.7	0.6627	0.0000	1.597	
379	29830.8	0.6848	0.3369	1.934	84232.189 Normal Pool = 379 ft
380	31803.4	0.7301	0.7073	2.641	
381	33832.6	0.7767	0.7533	3.394	
382	35918.3	0.8246	0.8005	4.195	
383	38060.5	0.8737	0.8490	5.044	
384	40788.8	0.9364	0.9049	5.949	
385	42983.4	0.9868	0.9615	6.910	
386	45569.6	1.0461	1.0163	7.927	

STAGE VS. STORAGE USING CONIC METHOD

PROJECT: Unity Substation Wet Pond
ENGINEER / DATE: KZ 7/18/2023
Forebay

ELEVATION (FEET)	AREA (SQ FEET)	AREA (ACRES)	INCREMENTAL VOLUME (ACRE-FEET)	TOTAL VOLUME (ACRE-FEET)	
379	3153.0	0.0724	0	0.000	
380	3910.8	0.0898	0.0809	0.081	
381	4732.9	0.1087	0.0991	0.180	
382	5619.3	0.1290	0.1187	0.299	
382.5	6086.6	0.1397	0.0672	0.366	
382.5	8257.4	0.1896	0.0000	0.366	
383	9161.3	0.2103	0.0999	0.466	20288.497 Normal Pool = 383 ft
384	10649.4	0.2445	0.2272	0.693	
385	11781.5	0.2705	0.2574	0.950	
386	13546.5	0.3110	0.2905	1.241	Top of Dam = 386 ft

STAGE VS. STORAGE USING CONIC METHOD

PROJECT: Unity Substation Wet Pond
ENGINEER / DATE: KZ 7/18/2023
Wetland Cell

ELEVATION (FEET)	AREA (SQ FEET)	AREA (ACRES)	INCREMENTAL VOLUME (ACRE-FEET)	TOTAL VOLUME (ACRE-FEET)	
381.5	1831.1	0.0420	0	0.000	
382	2755.4	0.0633	0.0261	0.026	
382.5	5332.2	0.1224	0.0456	0.072	
382.5	6771.9	0.1555	0.0000	0.072	
383	7754.7	0.1780	0.0833	0.155	6754.4566 Normal Pool = 383 ft
384	9271.2	0.2128	0.1952	0.350	
385	10645.9	0.2444	0.2284	0.579	
386	12048.2	0.2766	0.2603	0.839	Top of Dam = 386 ft

STAGE VS. STORAGE USING CONIC METHOD

PROJECT: Unity Substation Wet Pond
ENGINEER / DATE: KZ 7/18/2023
Total Volume

ELEVATION (FEET)	AREA (SQ FEET)	AREA (ACRES)	INCREMENTAL VOLUME (ACRE-FEET)	TOTAL VOLUME (ACRE-FEET)	
375	10189.50	0.234	0.000	0.000	
376	19805.05	0.455	0.338	0.338	
377	21486.10	0.493	0.474	0.812	
378	23225.45	0.533	0.513	1.325	
378.5	24118.59	0.554	0.272	1.597	
378.5	28865.65	0.663	0.000	1.597	
379	32983.71	0.757	0.337	1.934	
380	35714.16	0.820	0.788	2.722	
381	38565.42	0.885	0.852	3.574	
382	41537.53	0.954	0.919	4.494	
382.5	47337.06	1.087	0.913	4.632	
382.5	50947.55	1.170	0.801	4.632	
383	54976.55	1.262	1.032	5.665	
384	60709.37	1.394	1.327	6.992	
385	65410.73	1.502	1.447	8.439	
386	71164.34	1.634	1.567	10.006	435875 Top of Dam = 386 ft

ELEVATION–DISCHARGE TABLE

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
379.00	0.00	(N/A)	0.00
379.50	0.07	(N/A)	0.00
380.00	0.10	(N/A)	0.00
380.50	0.12	(N/A)	0.00
381.00	0.14	(N/A)	0.00
381.25	0.15	(N/A)	0.00
381.50	0.76	(N/A)	0.00
382.00	1.88	(N/A)	0.00
382.50	2.60	(N/A)	0.00
382.75	2.89	(N/A)	0.00
383.00	12.16	(N/A)	0.00
383.50	37.37	(N/A)	0.00
384.00	39.38	(N/A)	0.00
384.50	40.84	(N/A)	0.00
385.00	42.17	(N/A)	0.00
385.50	43.45	(N/A)	0.00
386.00	44.68	(N/A)	0.00

OUTLET STRUCTURE INPUT DATA

Requested Pond Water Surface Elevations

Minimum (Headwater)	379.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	386.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - Square	Forward	Culvert - 24"	381.25	386.00
Inlet Box	Riser Top	Forward	Culvert - 24"	382.75	386.00
Orifice-Circular	Orifice - Circular	Forward	Culvert - 24"	379.00	386.00
Culvert-Circular	Culvert - 24"	Forward	TW	375.66	386.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - Circular
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	379.00 ft
Orifice Diameter	2.0 in
Orifice Coefficient	0.600

Structure ID: Culvert - 24"
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	24.0 in
Length	115.00 ft
Length (Computed Barrel)	115.00 ft
Slope (Computed)	0.007 ft/ft

Outlet Control Data

Manning's n	0.013
Ke	0.500
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data

Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.156
T2 ratio (HW/D)	1.303
Slope Correction Factor	-0.500

Structure ID: Riser Top
Structure Type: Inlet Box

Number of Openings	1
Elevation	382.75 ft
Orifice Area	36.0 ft²
Orifice Coefficient	0.600
Weir Length	24.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	True
Orifice H to crest	False

Structure ID: Orifice - Square
Structure Type: Orifice-Area

Number of Openings	1
Elevation	381.25 ft
Orifice Area	0.5 ft²
Top Elevation	381.75 ft
Datum Elevation	381.50 ft
Orifice Coefficient	0.600

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

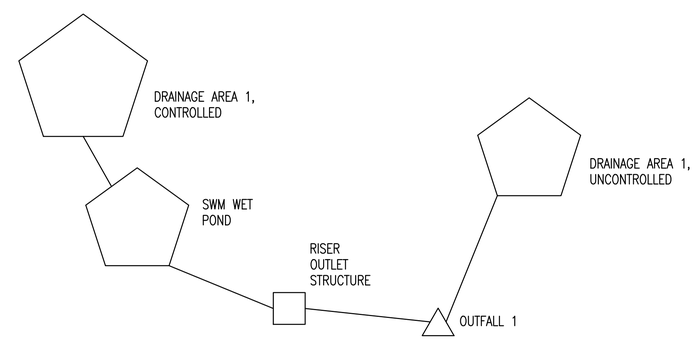
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	377.97 ft	T1 Flow	15.55 ft³/s
T2 Elevation	378.27 ft	T2 Flow	17.77 ft³/s

MODEL SCHEMATIC



LEVEL POOL ROUTING

Subsection: Level Pool Pond Routing Summary
Label: Wet Pond (IN)
Scenario: Post-Development 1 year
Return Event: 1 years
Storm Event: 1 Year

Infiltration			
Infiltration Method (Computed)	No Infiltration		
Initial Conditions			
Elevation (Water Surface, Initial)	379.00 ft		
Volume (Initial)	0.000 ac-ft		
Flow (Initial Outlet)	0.00 ft³/s		
Flow (Initial Infiltration)	0.00 ft³/s		
Flow (Initial, Total)	0.00 ft³/s		
Time Increment	0.050 hours		
Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	21.71 ft³/s	Time to Peak (Flow, In)	12.150 hours
Flow (Peak Outlet)	0.14 ft³/s	Time to Peak (Flow, Outlet)	24.000 hours
Elevation (Water Surface, Peak)	380.87 ft		
Volume (Peak)	1.363 ac-ft		
Mass Balance (ac-ft)			
Volume (Initial)	0.000 ac-ft		
Volume (Total Inflow)	1.491 ac-ft		
Volume (Total Infiltration)	0.000 ac-ft		
Volume (Total Outlet Outflow)	0.128 ac-ft		
Volume (Retained)	1.362 ac-ft		
Volume (Unrouted)	-0.001 ac-ft		
Error (Mass Balance)	0.0 %		

Subsection: Level Pool Pond Routing Summary
Label: Wet Pond (IN)
Scenario: Post-Development 10 year
Return Event: 10 years
Storm Event: 10 Year

Infiltration			
Infiltration Method (Computed)	No Infiltration		
Initial Conditions			
Elevation (Water Surface, Initial)	379.00 ft		
Volume (Initial)	0.000 ac-ft		
Flow (Initial Outlet)	0.00 ft³/s		
Flow (Initial Infiltration)	0.00 ft³/s		
Flow (Initial, Total)	0.00 ft³/s		
Time Increment	0.050 hours		
Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	56.54 ft³/s	Time to Peak (Flow, In)	12.150 hours
Flow (Peak Outlet)	2.49 ft³/s	Time to Peak (Flow, Outlet)	14.600 hours
Elevation (Water Surface, Peak)	382.42 ft		
Volume (Peak)	2.619 ac-ft		
Mass Balance (ac-ft)			
Volume (Initial)	0.000 ac-ft		
Volume (Total Inflow)	3.998 ac-ft		
Volume (Total Infiltration)	0.000 ac-ft		
Volume (Total Outlet Outflow)	1.954 ac-ft		
Volume (Retained)	2.039 ac-ft		
Volume (Unrouted)	-0.005 ac-ft		
Error (Mass Balance)	0.1 %		

Subsection: Level Pool Pond Routing Summary
Label: Wet Pond (IN)
Scenario: Post-Development 2 year
Return Event: 2 years
Storm Event: 2 Year

Infiltration			
Infiltration Method (Computed)	No Infiltration		
Initial Conditions			
Elevation (Water Surface, Initial)	379.00 ft		
Volume (Initial)	0.000 ac-ft		
Flow (Initial Outlet)	0.00 ft³/s		
Flow (Initial Infiltration)	0.00 ft³/s		
Flow (Initial, Total)	0.00 ft³/s		
Time Increment	0.050 hours		
Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	30.14 ft³/s	Time to Peak (Flow, In)	12.150 hours
Flow (Peak Outlet)	0.49 ft³/s	Time to Peak (Flow, Outlet)	23.450 hours
Elevation (Water Surface, Peak)	381.39 ft		
Volume (Peak)	1.770 ac-ft		
Mass Balance (ac-ft)			
Volume (Initial)	0.000 ac-ft		
Volume (Total Inflow)	2.076 ac-ft		
Volume (Total Infiltration)	0.000 ac-ft		
Volume (Total Outlet Outflow)	0.308 ac-ft		
Volume (Retained)	1.766 ac-ft		
Volume (Unrouted)	-0.002 ac-ft		
Error (Mass Balance)	0.1 %		

Subsection: Level Pool Pond Routing Summary
Label: Wet Pond (IN)
Scenario: Post-Development 100 year
Return Event: 100 years
Storm Event: 100 Year

Infiltration			
Infiltration Method (Computed)	No Infiltration		
Initial Conditions			
Elevation (Water Surface, Initial)	379.00 ft		
Volume (Initial)	0.000 ac-ft		
Flow (Initial Outlet)	0.00 ft³/s		
Flow (Initial Infiltration)	0.00 ft³/s		
Flow (Initial, Total)	0.00 ft³/s		
Time Increment	0.050 hours		
Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	105.90 ft³/s	Time to Peak (Flow, In)	12.150 hours
Flow (Peak Outlet)	37.64 ft³/s	Time to Peak (Flow, Outlet)	12.350 hours
Elevation (Water Surface, Peak)	383.57 ft		
Volume (Peak)	3.620 ac-ft		
Mass Balance (ac-ft)			
Volume (Initial)	0.000 ac-ft		
Volume (Total Inflow)	7.674 ac-ft		
Volume (Total Infiltration)	0.000 ac-ft		
Volume (Total Outlet Outflow)	5.276 ac-ft		
Volume (Retained)	2.389 ac-ft		
Volume (Unrouted)	-0.009 ac-ft		
Error (Mass Balance)	0.1 %		

REVISIONS

REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
4/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

ROUTING COMPS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.	SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-612
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	
APPROVED BY		KAS	08/18/23		1707908-C-612.dwg

DRAINAGE AREA 2

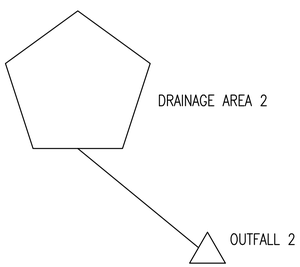
DA 2		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	2.30	1.18
10-year	11.88	6.41

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DA2	Pre-Development 2 year	2	0.330	12.200	2.30
DA2	Post-Development 2 year	2	0.167	12.200	1.18
DA2	Post-Development 10 year	10	0.540	12.150	6.41
DA2	Pre-Development 10 year	10	1.059	12.150	11.88

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-2	Pre-Development 2 year	2	0.330	12.200	2.30
O-2	Post-Development 2 year	2	0.167	12.200	1.18
O-2	Post-Development 10 year	10	0.540	12.150	6.41
O-2	Pre-Development 10 year	10	1.059	12.150	11.88



DRAINAGE AREA 3

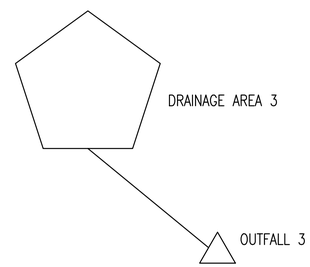
DA 3		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	3.25	5.10
10-year	17.04	17.65

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DA3	Post-Development 2 year	2	0.432	12.150	5.10
DA3	Pre-Development 2 year	2	0.434	12.200	3.25
DA3	Pre-Development 10 year	10	1.387	12.150	17.04
DA3	Post-Development 10 year	10	1.207	12.100	17.65

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-3	Post-Development 2 year	2	0.432	12.150	5.10
O-3	Pre-Development 2 year	2	0.434	12.200	3.25
O-3	Pre-Development 10 year	10	1.387	12.150	17.04
O-3	Post-Development 10 year	10	1.207	12.100	17.65



DRAINAGE AREA 4

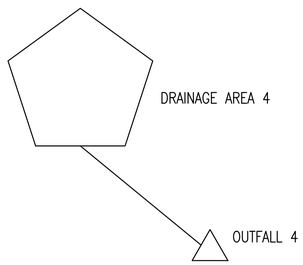
DA 4		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	1.70	2.71
10-year	9.37	9.69

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DA4	Pre-Development 2 year	2	0.277	12.250	1.70
DA4	Post-Development 2 year	2	0.245	12.150	2.71
DA4	Pre-Development 10 year	10	0.902	12.200	9.37
DA4	Post-Development 10 year	10	0.700	12.150	9.69

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-4	Pre-Development 2 year	2	0.277	12.250	1.70
O-4	Post-Development 2 year	2	0.245	12.150	2.71
O-4	Pre-Development 10 year	10	0.902	12.200	9.37
O-4	Post-Development 10 year	10	0.700	12.150	9.69



DRAINAGE AREA 5

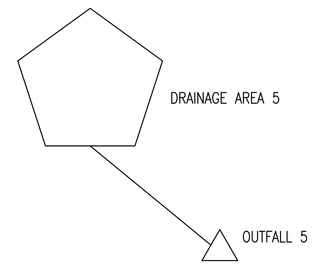
DA 5		
Return Event	$Q_{pre-dev}$	$Q_{post-dev}$
--	CFS	CFS
2-year	1.35	1.35
10-year	6.66	6.66

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DA5	Post-Development 2 year	2	0.180	12.200	1.35
DA5	Pre-Development 2 year	2	0.180	12.200	1.35
DA5	Pre-Development 10 year	10	0.569	12.150	6.66
DA5	Post-Development 10 year	10	0.569	12.150	6.66

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-5	Post-Development 2 year	2	0.180	12.200	1.35
O-5	Pre-Development 2 year	2	0.180	12.200	1.35
O-5	Pre-Development 10 year	10	0.569	12.150	6.66
O-5	Post-Development 10 year	10	0.569	12.150	6.66



REVISIONS

REV	DATE	DESCRIPTION

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Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

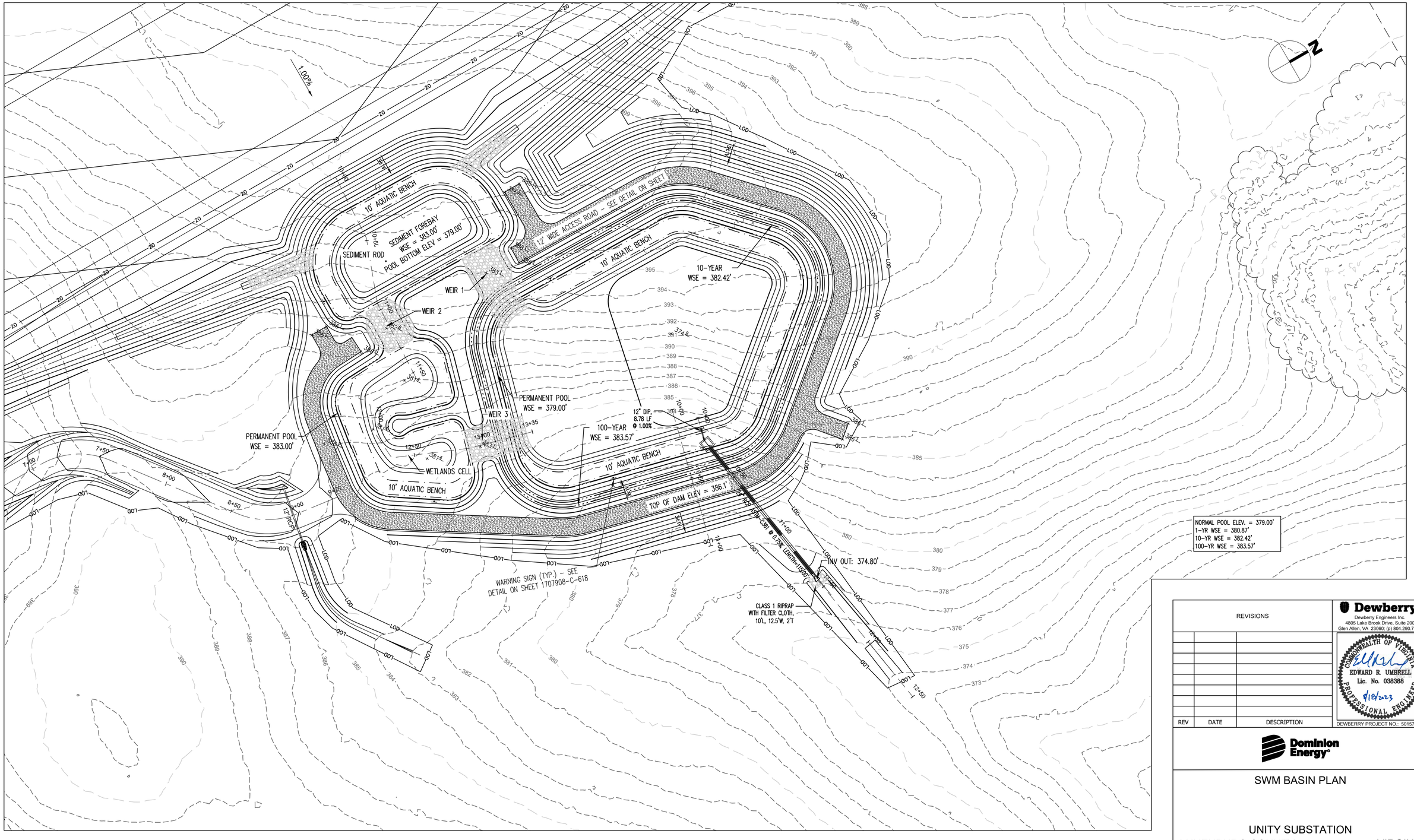
ROUTING COMPS

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.	SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-613
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	
APPROVED BY		KAS	08/18/23		1707908-C-613.dwg

SWM 1 - LVL 2 WET POND PLAN VIEW



NOTE:

1. ALL FILL EMBANKMENTS SHALL BE CONSTRUCTED TO THE 2013 APPENDIX A: EARTHEN EMBANKMENT SPEC PROVIDED BY DEQ
2. REFER BACK TO SEDIMENT BASIN ON 1707908-C-217 FOR CONVERSION SEQUENCE

0' 15' 30' 60'
SCALE: 1" = 30'

REVISIONS		
REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

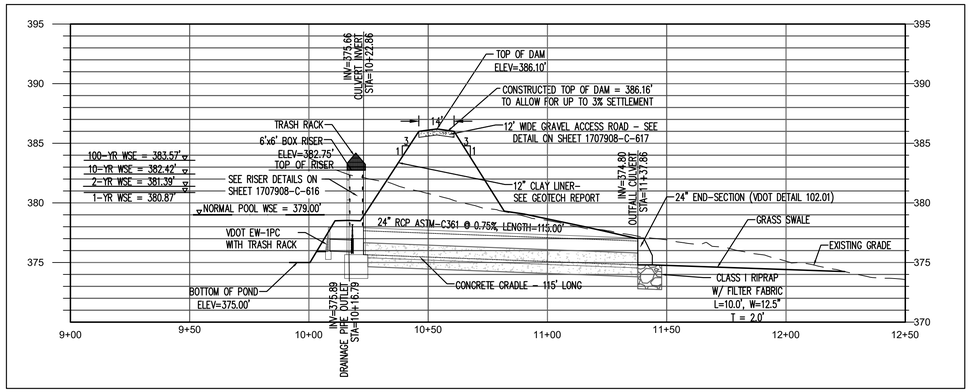
SWM BASIN PLAN

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

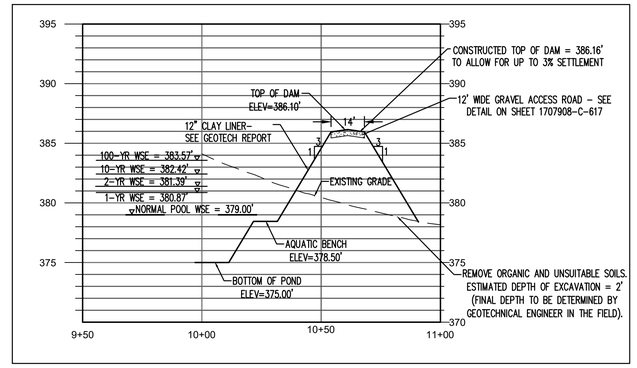
OPERATIONAL REGION		B/M No.		SCALE	1" = 30'
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-614
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	
APPROVED BY		KAS	08/18/23		1707908-C-614.dwg

SWM 1 - LVL 2 WET POND PROFILE VIEWS



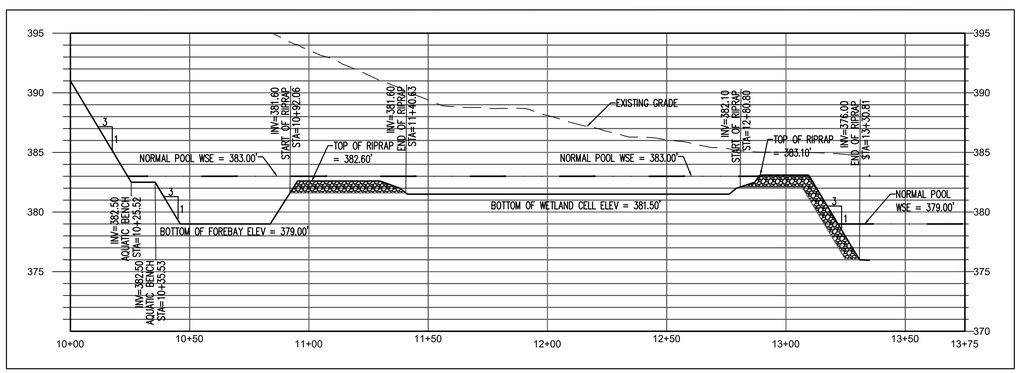
PRINCIPAL SPILLWAY PROFILE

SCALE: 1" = 30' HORIZONTAL
1" = 6' VERTICAL



DAM EMBANKMENT SPILLWAY PROFILE

SCALE: 1" = 30' HORIZONTAL
1" = 6' VERTICAL



FOREBAY MICROPOOL PROFILE

SCALE: 1" = 30' HORIZONTAL
1" = 6' VERTICAL

SWM 1 RIP-RAP COMPUTATIONS

STRUCTURE	DIA. (IN.)	5*S (FT.) L REQ.	L PROV. (FT.)	5*S(FT.) W REQ.	W PROV. (FT.)	100 YEAR Q (CFS)*	VELOCITY (FPS)	RIP RAP	MIN. "T" (FT.)
STM 1	24	10	10	10	12.5	29.96	9.5	CLASS I	2

*FULL FLOW CAPACITY FOR 21" RCP AT 0.80% SLOPE
NOTE: COMPUTATIONS FOR RIP RAP BASED ON VDOT EC-1. VELOCITY IS FOR 100 YEAR STORM EVENT.

SWM 1 SUMMARY

WET POND (LEVEL 2)							
DRAINAGE AREA	TOP OF DAM	DESIGN 10-YR WSE	DESIGN 100-YR WSE	FREEBOARD (100-YR)	TREATMENT REQUIRED	TREATMENT PROVIDED	PRE-TREATMENT METHOD
(AC)	(FT)	(FT)	(FT)	(FT)	(CF)	(CF)	
15.39	386.00	382.42	383.57	2.43	68277	111275	FOREBAY

OUTLET STRUCTURE - SWM 1						
STRUCTURE TYPE	TOP OF RISER	RISER DIMENSIONS	LOW FLOW ORIFICE INV	LOW FLOW ORIFICE SIZE	MID ORIFICE INV	MID ORIFICE SIZE
	(FT)	(FT)	(FT)	(IN)	(FT)	(SF)
BUILT-IN	382.75	6 X 6	379.00	2	381.25	0.5

SWM1 DISCHARGES:
1- YEAR = 0.14 CFS
10- YEAR = 2.49 CFS
100- YEAR = 37.64 CFS

SWM 1 WATER SURFACE ELEVATIONS:
1- YEAR = 380.87 FT
10- YEAR = 382.42 FT
100- YEAR = 383.57 FT

VERTICAL SCALE 0' 3' 6' 12'
SCALE: 1" = 6'

HORIZONTAL SCALE 0' 15' 30' 60'
SCALE: 1" = 30'

REVISIONS

REV	DATE	DESCRIPTION

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8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

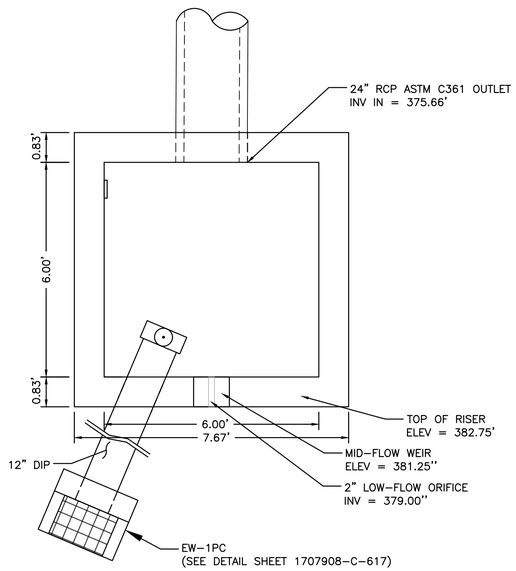
Dominion Energy

SWM BASIN PROFILES

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

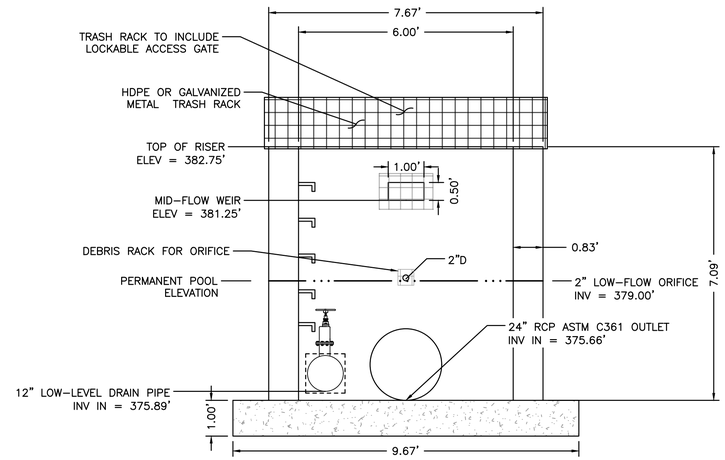
OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-615		
DESIGNER	EU/KZ	08/18/23			
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING: 1707908-C-615.dwg		
APPROVED BY	KAS	08/18/23			

SWM 1 - RISER SCHEMATIC



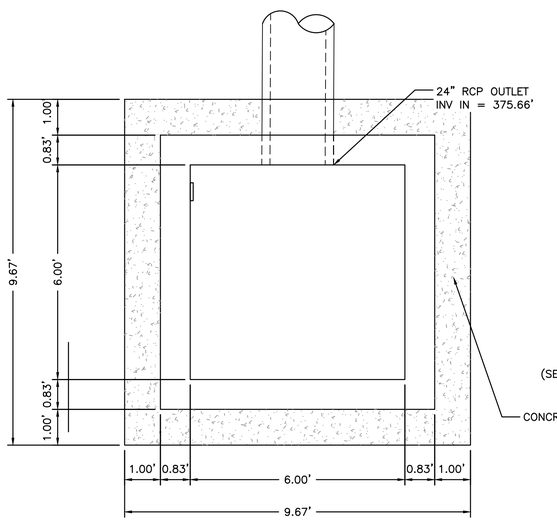
TOP PLAN

N.T.S.



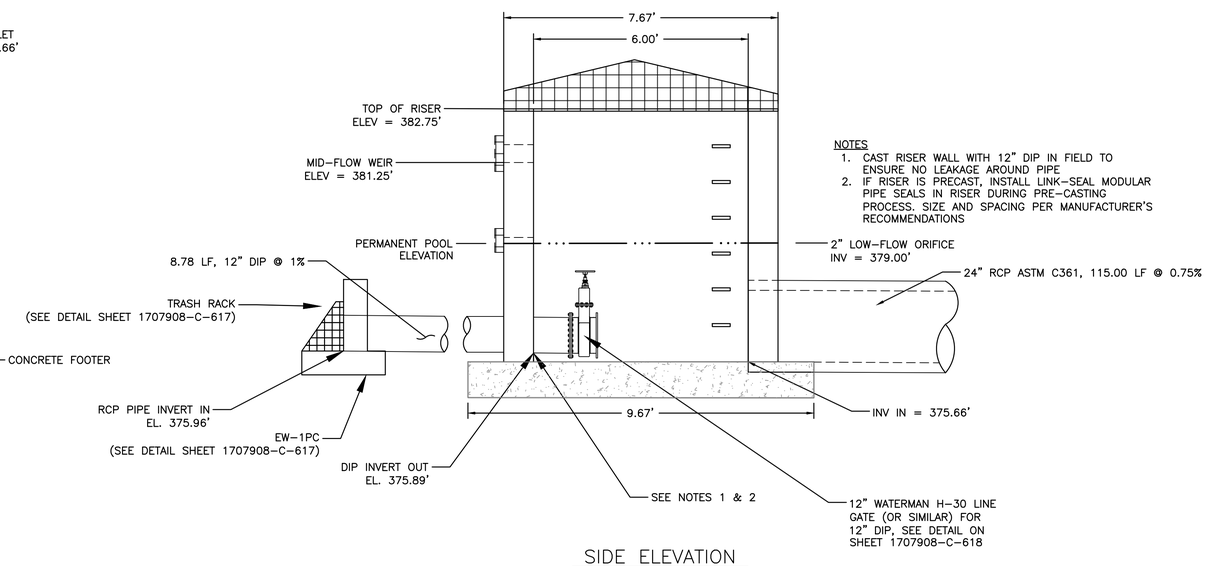
FRONT ELEVATION

N.T.S.



FOUNDATION PLAN

N.T.S.



SIDE ELEVATION

N.T.S.

NOTES

1. CAST RISER WALL WITH 12" DIP IN FIELD TO ENSURE NO LEAKAGE AROUND PIPE
2. IF RISER IS PRECAST, INSTALL LINK-SEAL MODULAR PIPE SEALS IN RISER DURING PRE-CASTING PROCESS. SIZE AND SPACING PER MANUFACTURER'S RECOMMENDATIONS

NORMAL POOL ELEV. = 379.00'
1-YR WSE = 380.87'
10-YR WSE = 382.42'
100-YR WSE = 383.57'

THIS SHEET IS FOR INFORMATION ONLY!!

INFORMATION SHOWN ON THIS SHEET IS FOR HYDRAULIC INFORMATION ONLY AND IS NOT TO BE USED FOR CONSTRUCTION, ONLY HYDRAULIC DIMENSIONS ARE SHOWN.

SEE SHEET 1707908-C-618 FOR BUOYANCY COMPUTATIONS.

REVISIONS		
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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SWM RISER DETAILS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-616
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	1707908-C-616.dwg
APPROVED BY		KAS	08/18/23		

VDOT CULVERT OUTLET PROTECTION DETAIL
EC-1 – 113.01
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/113_01.pdf

VDOT STORMWATER MANAGEMENT (SWM)
CONCRETE CRADLE DETAILS
SWM-DR – 114.06
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/114_06.pdf

VDOT PRECAST ENDWALL FOR PIPE CULVERTS DETAIL
EW-1 – 101.02
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/101_02.pdf

VDOT STANDARD STEP DETAIL
ST-1 – 106.09
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/106_09.pdf

VDOT STORMWATER MANAGEMENT
TRASH RACK FOR SWM DRAINAGE STRUCTURES DETAIL
SWM-DR – 114.08
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/114_08.pdf

VDOT FLARED END SECTION
CONCRETE PIPE CULVERTS DETAIL
ES-1 – 102.01
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/102_01.pdf

VDOT STORMWATER MANAGEMENT (SWM)
DEBRIS RACK DETAILS
SWM-DR – 114.05
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/114_05.pdf

References to specific VDOT Road and Bridge Standards are shown. VDOT no longer allows the insertion of Road and Bridge Standard Drawings in plan assemblies. Contractor shall use specified VDOT Road and Bridge Standards as referenced.

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
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DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SWM DETAILS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-617		
DESIGNER	EU/KZ	08/18/23			
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING: 1707908-C-617.dwg		
APPROVED BY	KAS	08/18/23			

RED TOP

H-30 LINE GATE

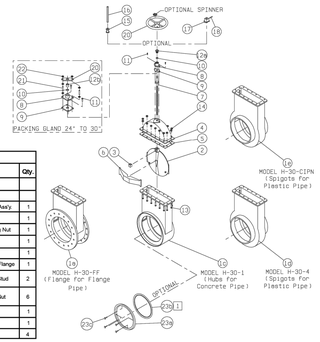
- Iron seats (bronze seats optional)
- Each gate is hydrostatically tested
- 60 feet maximum seating (face) pressure
- 10 feet maximum unseating (back) pressure
- Non-rising stainless steel stems, double leads
- Bronze packing gland nut and lift nut
- Handwheel standard, 2" square operating nut optional
- NEW! Grease fitting on packing gland for continued ease of actuation

H-30-1 Hub End

USES:
The Red Top Line Gate is designed for installation in pipe lines to eliminate the use of capped stands or standpipes. It is of heavy construction engineered to withstand constant usage over long periods of time.

FEATURES:
The gate is constructed of cast iron with a non-rising stainless steel screw which has also proven popular in the Waterman Pressure Gate. A screw with the standard Waterman double lead "Acme" type threads is offered.A handwheel is furnished.

The packing gland is made of cast iron with a bronze packing nut which eliminates "freezing" due to rust. A single wrench is required to adjust it.



PARTS LIST					
No.	Name	Qty.	No.	Name	Qty.
1	Body	1	13	Bonnet Bolt	
2	Cover	1	14	Hex Nut	
3	Screw Nut	1	15	Stem Coupling Ass'y	1
4	Bonnet	1	16	Extension Stub	1
5	Bonnet Gasket	1	17	2" Sq. Operating Nut	1
6	Arch	1	18	Pin	1
7	Screw w/Collar	1	19	Handwheel	1
8	Packing Gland Body	1	20	Pack. Retainer Flange	1
9	Packing Gland Gasket	1	21	Packing Gland Stud	2
10	Packing Gland Packing	2	22	Packing Gland Nut	6
11	Packing Gland Bolt	2	23a	Bronze Seat	1
12a	Packing Gland Nut	1	23b	O-Ring	1
12b	Packing Gland Sleeve	1	23c	Seat Screws	4

1

H-30 LINE GATES

H-30-1 Line Gate (Hub End) for use with concrete pipe.

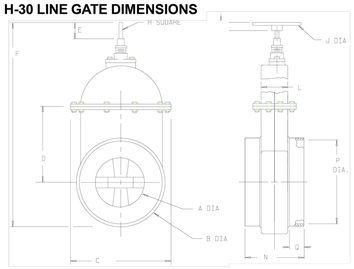
H-30-4 Line Gate for use with PIP size plastic pipe. Use two part epoxy to bond pipe to spigot.

H-30-CIPN Line Gate for use with either PIP or IPS size plastic pipe. Use regular PVC cement to bond pipe to plastic spigots. (Specify PIP or IPS)

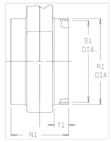
H-30-FF Line Gate with flanges drilled to match 25# standard flange or 125# standard flange (optional)

2

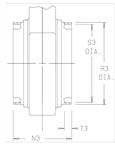
H-30 LINE GATE DIMENSIONS



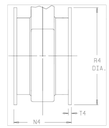
Type 1



Type 4 Frame



Type CIPN Frame



Flanged Frame

GATE DIMENSIONS IN INCHES

VALVE SIZE	A	B	C	D	E	F	H	J	K	L	N	P	Q
6	6	8½	11¼	8⅞	1¼	25	⅞	12	2½	6½			
8	7½	11½	12½	9¼	1¼	27½	⅞	12	2½	6½	6¼	11¼	1¼
10	10	14¼	14¼	12	1¼	31½	⅞	12	2½	6	6¼	13 9/16	1¼
12	12	17½	17 9/16	13½	1¼	36½	⅞	12	2½	7	7½	16⅞	1 7/16
14	13½	19½	19½	15¾	1¼	39½	⅞	12	2½	8¼	9½	18⅞	1¼
14 x 15	13½	20 7/16	19½	15¾	1¼	40½	⅞	12	2½	8¼	13½	19.00 [1] 19.75	3¼
16	16	21½	21½	18¼	1¼	45	⅞	14	3¼	8¼	9¼	21¼	1¼
16 x 18	16	24	21½	18¼	1¼	46½	⅞	14	3¼	8¼	13½	23.94 [1] 24.44	1.00 [1] 1.94
18	18	23½	23½	20¼	1¼	48½	⅞	14	3¼	8½	9¼	23	1 7/16
20	20	27½	26½	21	1¼	53½	⅞	14	3¼	10½	11½	27½	2
20 x 24	20	30½	26½	21	1¼	55½	⅞	14	3¼	10½	15½	29.00 [1]	3.97
24	24	32¾	32½	27¼	2¼	71½	1¼	18	3¼	12	13	31¼	2 3/16
30	30	43	40½	34¾	4½	87½	1½	24	2½	10¾	20½	41 7/16	4½

GATE DIMENSIONS IN INCHES

VALVE SIZE	TYPE 4 FRAME I.D. PLASTIC PIPE				TYPE CIPN FRAME O.D. IPS & PIP PIPE					FLANGED FRAME		
	N1	R1	S1	T1	N3	R3 [2]	S3 [3]	T3		N4	R4	T4
6	12½	5 7/16	5¼	3¼	11¼	6.45	6.16	2.50		8	11	¾
8	13	7 7/16	7¼	3½	12½	8.64	8.18	3.00		8½	13½	¾
10	13	9 7/16	9¼	3½	11¼	10.77	10.22	3.00		11½	16	¾
12	14½	11 7/16	11¼	3½	14½	12.78	12.27	3.00		12	19	1
14	16	13¼	13 9/16	3½						13	21	1¼
14 x 15	16	14¼	14 9/16	3½								
16	14½	15¼	15 9/16	3½						13	23½	1¼
16 x 18												
18	14½	17½	17¼	4½						14	25	1¼
20	16½	19½	19½	4½						15½	27½	1¼
20 x 24												
24										15½	32	1½
30										21½	38½	1½

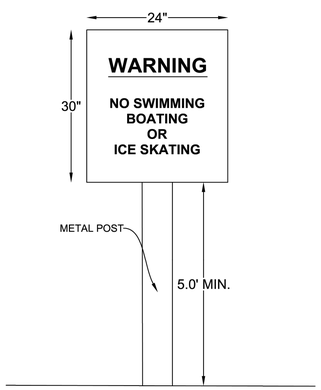
[1] Nominal dimensions for SRG (Shaffer Rubber Gasket) and pipe.
[2] Nominal dimensions for IPS plastic pipe.
[3] Nominal dimensions for 50 and 100 ft. PIP plastic pipe.

3

VDOT SOIL STABILZATION MAT
EC-3 - 113.03
https://www.virginiadot.org/business/resources/LocDes/VDOT2016_Road_and_Bridge_Standards/Section100/113_03.pdf

EXHIBIT 20

1. SIGNS SHALL BE FABRICATED AS SHOWN BELOW IN **REFLECTIVE ORANGE WITH BLACK VINYL LETTERING.**
2. SIGNS ARE 24 INCHES WIDE AND 30 INCHES HIGH, ON 0.08 ALUMINUM SIGN BLANKS.
3. SIGNS MAY BE BOLTED TO SWM FACILITY OR PLACED ON A METAL POST, WITH A MINIMUM DISTANCE OF FIVE FEET FROM THE BOTTOM OF THE SIGN TO THE GROUND.
4. POSTS SHALL BE GALVANIZED STEEL U CHANNEL (2 LBS/FT).

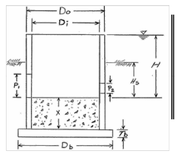


SIGNAGE FOR WET SWM/BMP FACILITIES

Adopted December 3, 2019 Exhibit 20 Effective February 3, 2020

RECTANGULAR RISER BUOYANCY COMPUTATIONS

PROJECT: **Unity Sub Station** ENGINEER / DATE: KZ/07/24/2023



Dimensions in Feet

Wo =	7.67	Lo =	7.67
Wi =	6.00	Li =	6.00
Bw =	9.67	Bl =	9.67
Tb =	1.00		
H =	7.09		
Hs =	2.84		
X=	0		

Terms not in Diagram	
Wo	Outside Width
Lo	Outside Length
Wi	Inside Width
Li	Inside Length
Bw	Base Width
Bl	Base Length

Weight of Water Displaced = 31835.16 pounds

Weight of Concrete = 40584.73 pounds

Weight of Soil on Footing = 3701.85 pounds

Factor of Safety = 1.39

want 1.25 FS

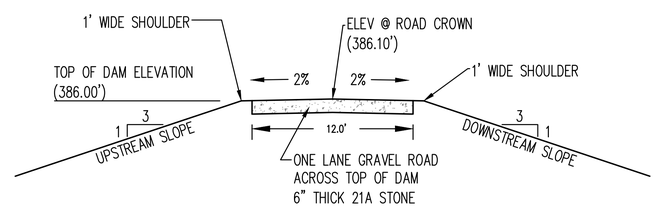
Volume of Concrete

Riser	254.9	CF
Drain Pipe	-0.7	CF
Culvert	-2.6	CF
Circular Orifice	-0.02	CF
Rect. Orifice	-0.42	CF
	19.3	CF
	270.56	CF
x	150	lb/CF
weight of concrete	40584.73	pounds

NOTE: This bouyancy computation assumes that once the water exceeds 7.09 feet in height (H) it will begin flowing over the riser and begin to oppose the buoyancy force. Thus the maximum buoyancy occurs at this height.

FORMULAS:
Weight of Water Displaced =(Lo*Wo*H+Bl*Bw*Tb)*62.4
Weight of Concrete =((Lo*Wo-Li*Wi)*H+Weir 2(L*H*Tw)+Weir 3(L*H*Tw)+(Bl*Bw*Tb)-Pl/4*D^2*Tw-Wc*Hc*Tc)*150
Weight of Soil on Footing =N/A
Factor of Safety =(Wt. Concrete) / Wt. Water Displaced

DAM TOP ACCESS ROAD DETAIL



References to specific VDOT Road and Bridge Standards are shown. VDOT no longer allows the insertion of Road and Bridge Standard Drawings in plan assemblies. Contractor shall use specified VDOT Road and Bridge Standards as referenced.

REVISIONS

REV	DATE	DESCRIPTION

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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SWM DETAILS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-618
DESIGNER		EU/KZ	08/18/23		
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:	
APPROVED BY		KAS	08/18/23		1707908-C-618.dwg

GENERAL NOTES:

1. ALL PLANT MATERIALS SHALL BE SPECIFIED TO BE EQUAL TO OR BETTER THAN THE STANDARDS FOR NURSERY STOCK, BY THE AMERICAN NURSERY AND LANDSCAPERS ASSOCIATION (ANLA).

2. TREES AND SHRUBS SHALL BE NURSERY GROWN, UNLESS OTHERWISE APPROVED, AND SHALL BE HEALTHY AND VIGOROUS PLANTS, FREE FROM DEFECTS, DECAY, DISFIGURING ROOTS, SUN-SCALD, INJURIES, ABRASIONS OF THE BARK, PLANT DISEASES, INSECT PEST EGGS, BORERS AND ALL FORMS OF INFESTATIONS OR OBJECTIONABLE DISFIGUREMENTS, AS DETERMINED BY THE DIRECTOR OF PUBLIC WORKS. PLANTS SHALL BE IN ACCORDANCE WITH THE CURRENT AMERICAN NURSERY AND LANDSCAPE ASSOCIATION AND CONFORM IN GENERAL TO REPRESENTATIVE SPECIES.

3. PLANT MEASUREMENTS: ALL PLANTS SHALL CONFORM TO THE MEASUREMENTS SPECIFIED IN THE PLANT SCHEDULE OF THE LANDSCAPE PLAN. ALL PLANT SIZES SPECIFIED IN THE PLANS SHALL GENERALLY BE THE MEDIAN FOR THE SIZE RANGES INDICATED IN THE ANLA STANDARDS AND, AT A MINIMUM, SHALL COMPLY WITH THE FOLLOWING.

A. CALIPER MEASUREMENTS SHALL BE TAKEN SIX (6) INCHES ABOVE GRADE FOR TREES UNDER FOUR (4) INCHES CALIPER, AND TWELVE (12) INCHES ABOVE GRADE FOR TREES FOUR (4) INCHES IN CALIPER AND OVER.

B. MINIMUM BRANCHING HEIGHT FOR ALL SHADE TREES SHALL BE SIX (6) FEET.

C. MINIMUM SIZE FOR PLANTING LARGE DECIDUOUS TREES SHALL BE TWO TO TWO AND ONE-HALF (2-2½) INCH CALIPER, TWELVE (12) FEET TO FOURTEEN (14) FEET IN HEIGHT.

D. MINIMUM SIZE FOR PLANTING ALL OTHER DECIDUOUS TREES SHALL BE ONE TO ONE AND ONE-HALF (1-1½) INCH CALIPER, SIX (6) FEET TO EIGHT (8) FEET IN HEIGHT.

4. PLANTS SHALL BE PROTECTED DURING DELIVERY TO PREVENT DESICCATION OF LEAVES.

5. INSOFAR AS IS PRACTICABLE, TREES AND SHRUBS SHALL BE PLANTED ON DAY OF DELIVERY. IF THIS IS NOT POSSIBLE, THE CONTRACTOR SHALL PROTECT UNPLANTED TREES BY KEEPING THEM IN SHADE, WELL PROTECTED WITH SOIL, MULCH OR OTHER ACCEPTABLE MATERIAL AND SHALL KEEP TREES WELL WATERED. TREES AND SHRUBS SHALL NOT REMAIN UNPLANTED FOR MORE THAN TWO (2) WEEKS.

6. ALL TREES AND SHRUBS SHALL BE PLANTED IN SUCH A MANNER AS TO ENSURE THEIR SURVIVAL. THIS SHALL INCLUDE THE PLANTING OF INTACT BALLS, PLANTING AT PROPER DEPTH, PROPERLY BACKFILLING AND WATERING, AND CONSTRUCTION OF A PLANTING SAUCER. ALL PLANTING AREAS SHALL CONTAIN SOILS SUITABLE FOR PLANTING. SOILS SHALL BE CLEAN AND FREE OF ALL CONSTRUCTION MATERIALS. (SEE PLANTING PROCEDURES FOR TREES AND PLANTING PROCEDURES FOR SHRUBS IN THE LATEST EDITION OF LANDSCAPE SPECIFICATION GUIDELINES FOR BALTIMORE, WASHINGTON METROPOLITAN AREA, PREPARED BY THE LANDSCAPE CONTRACTORS ASSOCIATION OF METROPOLITAN WASHINGTON AND AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS FOR ADEQUATE SPECIFICATIONS.)

7. ANY ROPE OR WIRE BINDING THE BALL SHALL BE CUT PRIOR TO THE CONCLUSION OF BACKFILLING OPERATIONS TO PREVENT GIRDLING OF THE TREE TRUNK.

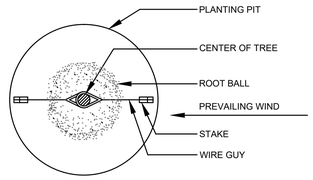
8. IF A NONBIODEGRADABLE MATERIAL IS USED AROUND THE BALL, IT SHALL BE COMPLETELY REMOVED PRIOR TO BACKFILLING.

9. ALL AREA WITHIN THE HIGH MARSH AND LOW MARSH LANDSCAPING SHALL BE COVERED BY COIR FIBER MATTING AND SECURED WITH LANDSCAPING BIODEGRADABLE (NON-METALLIC) STAPLES (MIN. 4"-6" STAPLES).

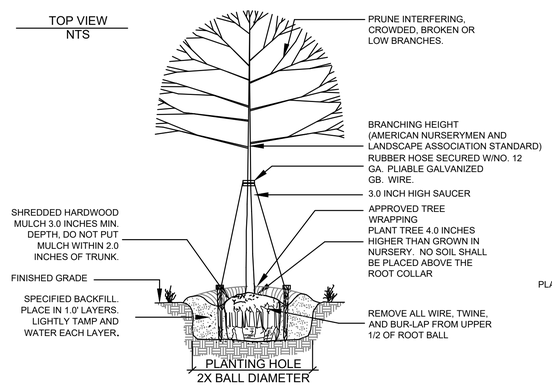
10. WHEN THE HIGH MARSH SEED MIX IS APPLIED, MIX WITH TEMPORARY SEED MIX TO HELP STABILIZE THE MIX UNTIL IT HAS HAD TIME TO GERMINATE (UNLESS THE MIX IS PRE-GERMINATED).

11. CONTRACTOR IS SOLELY RESPONSIBLE TO PROVIDE ONLY THE PLANTS SPECIFIED IN THIS PLAN SET. PLANT CULTIVARS SHALL NOT BE ACCEPTED WITHOUT PRIOR WRITTEN APPROVAL FROM PROJECT ENGINEER.

THIS SHEET IS FOR LANDSCAPE PURPOSES ONLY!!

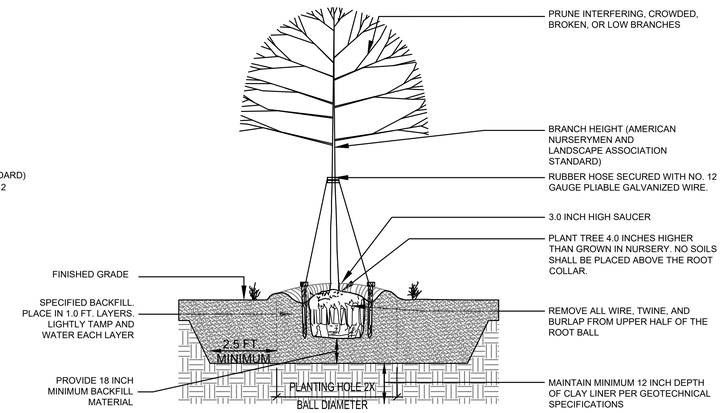


TOP VIEW
NTS



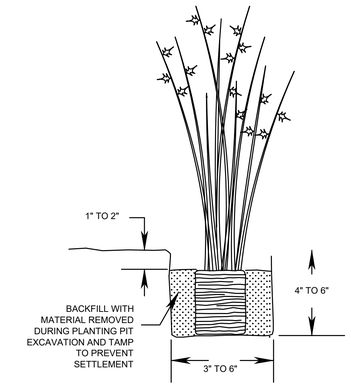
TYPICAL SHADE TREE PLANTING DETAIL

NOT TO SCALE



TYPICAL SHADE TREE PLANTING DETAIL - WETLAND BERMS

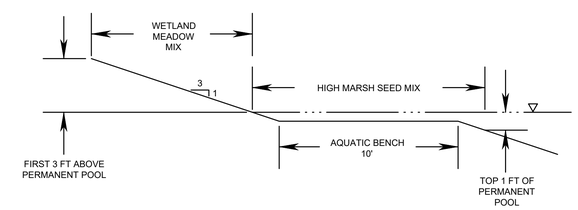
NOT TO SCALE



1) CUT LINEAR SLITS IN ORGANIC CONTAINER TO FACILITATE ROOT PENETRATION. IF CONTAINER IS NON-ORGANIC, REMOVE COMPLETELY.
2) CONTRACTOR TO UTILIZE BIODEGRADABLE STAPLE FOR PLUGS. WOODEN STAKES SHALL NOT BE USED.

TYPICAL HERBACEOUS PLUGS

NOT TO SCALE



CROSS SECTION - AQUATIC BENCH PLANTINGS

NOT TO SCALE

SEEDING NOTES:

A. GENERAL: THIS WORK SHALL CONSIST OF FURNISHING, TRANSPORTING, STOCKPILING, AND INSTALLING ALL HERBACEOUS PERMANENT AND TEMPORARY SEEDING.

B. ALL AREAS WILL BE SEEDED WITH THE SEED MIXES IN THE APPROPRIATE ZONES AS SPECIFIED IN THE SEEDING PLANS.

C. ALL SEED AND SEED VARIETIES SHALL BE FREE FROM STATE AND FEDERAL PROHIBITED NOXIOUS WEED SEEDS LISTED AS ALIEN INVASIVE SPECIES BY THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION NATURAL HERITAGE PROGRAM, THE US DEPARTMENT OF AGRICULTURE AND THE MID-ATLANTIC EXOTIC PEST PLANT COUNCIL.

D. DO NOT USE: LOLIUM PERENNES, PERENNIAL RYEGRASS, ERAGROSTIS CURVULA, WEEPING LOVEGRASS, OR LESPEDEZA STIPULACEA (OR L. CUNEATE), CHINESE LESPEDEZA.

E. STORAGE AND HANDLING: SEED STORAGE SHOULD FOLLOW THE JAMES RULE (JAMES HARRINGTON): RELATIVE HUMIDITY + TEMPERATURE IN DEGREES FAHRENHEIT, MUST BE EQUAL TO OR LESS THAN 100 DEGREES

F. ALL NATIVE SEED MIXES MUST BE OBTAINED FROM ERNST CONSERVATIONS SEEDS OF MEADVILLE, PA OR AN OWNER APPROVED ALTERNATE VENDOR. THE ERNMX-865 SEED MIX SHOULD BE APPLIED AT 60LBS PER ACRE. THE ERNMX-128 MIX SHOULD BE APPLIED AT 20LBS PER ACRE.

G. INSTALLATION

1. ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE SEEDED IN ACCORDANCE WITH THE PLANTING PLANS AND SCHEDULES. THE HERBACEOUS PERMANENT SEEDING IS SPECIFIED ON THE COMPOSITION AND PLANTING SCHEDULES IN THE CONTRACT DOCUMENTS. AREAS NOT DISTURBED, SHALL NOT BE SEEDED.
2. PRIOR TO SEEDING CONTRACTOR SHALL VERIFY THAT ALL AREAS TO BE SEEDED SHALL CONFORM TO THE FINISHED GRADES AS SPECIFIED ON THE PLANS. ALL GULLIES, WASHES OR DISTURBED AREAS THAT DEVELOP SUBSEQUENT TO FINAL DRESSING SHALL BE REPAIRED PRIOR TO SEEDING.
3. PERMANENT SEEDING SHALL BE DONE BETWEEN AUGUST 15 AND JUNE 15.
4. SEEDING SHALL BE ACCOMPLISHED BY USING A BROADCASTING OR USE OF A TRUAX TYPE SEED DRILL. ANY ALTERNATIVE SEEDING METHODS MUST BE APPROVED BY OWNER PRIOR TO SEEDING. BROADCAST SPREADERS MAY BE USED TO SOW COVER CROPS. SEED INSTALLED BY A BROADCAST SPREADER SHALL BE CAPABLE OF PLACING SEED AT THE SPECIFIED RATE.
5. IF SEED DRILLING IS USED, IT MUST BE WITH A TRUAX TYPE SEED DRILL INTENDED FOR NATIVE SEED MIXES. ALL SEEDING EQUIPMENT SHALL BE CALIBRATED BEFORE APPLICATION TO THE SATISFACTION OF OWNER SO THAT THE MATERIAL IS APPLIED ACCURATELY AND EVENLY TO AVOID MISSES AND OVERLAPS.
6. THE SPECIFIED HERBACEOUS PERMANENT SEED MIX SHALL BE INSTALLED WITH SPECIFIED COVER CROP AND SEEDED AT THE RATES SPECIFIED IN THE CONTRACT DOCUMENTS.
7. ALL SEED MIXES INSTALLED USING SEED DRILLS SHALL BE APPLIED ON TOP OF THE PREPARED AND/OR COMPOSTED SEEDING AREA IN TWO DIFFERENT DIRECTIONS.
8. FOLLOWING BROADCAST SEEDING, THE CONTRACTOR SHALL RAKE THE AREA TO MIX THE SEED MIX WITH THE TOP ONE INCH (1 INCH) OF PREPARED SOIL.
9. THE CONTRACTOR SHALL THEN COVER THE SEEDED AREAS WITH STRAW MULCH AT A RATE OF 2 TONS PER ACRE PRIOR TO INSTALLING MATTING.
10. COVER CROPS SHALL CONSIST OF THE FOLLOWING.

1. SEPT 1 - FEB 15: CEREAL RYE (SECALE CEREALE)
2. FEB 15 - MAY 1: OATS (AVENA SETIVA)
3. MAY 1 - SEPT 1: ANNUAL RYE (LOLIUM MULTIFLORUM)

ADDITIONAL NOTES - LOW MARSH PLUGS:

A. GENERAL:

1. THIS WORK SHALL CONSIST OF PROVIDING, INSTALLING, WATERING AND MAINTAINING COMMERCIALLY SUPPLIED HERBACEOUS PLANT MATERIAL AS SPECIFIED IN THE CONTRACT DOCUMENTS.

2. ALL PLANT MATERIAL WILL MEET THE SPECIFICATIONS AS DEFINED BY CONTRACT DOCUMENTS. UNLESS OTHERWISE SPECIFIED, THE MINIMUM SIZE FOR PLANT MATERIAL UNDER THIS SECTION SHALL CONSIST OF EITHER

a. 4-INCHES (2.2 INCHES WIDE, 4 INCHES DEEP, 10.07 CUBIC INCHES ROOT VOLUME, 32 PLANTS PER TRAY) OR
b. 5-INCHES (2 INCHES WIDE, 5 INCHES DEEP, 11.9 CUBIC INCHES ROOT VOLUME, 50 PLANTS PER TRAY)
c. NOTE THAT VERNALIZED PLUGS ARE PREFERRED FOR SPRING PLANTING AND IS A BEST PRACTICE WHICH HARDENS THE PLANTS USUALLY OVER WINTER SO THAT THEY WILL BE BETTER ADAPTED TO SITE CONDITIONS AND THEREFORE BE HARDIER AND SURVIVE BETTER.

3. SUBSTITUTIONS FOR ANY OTHER PLUG SIZE WILL REQUIRE WRITTEN APPROVAL OF THE OWNER PRIOR TO DELIVERY ON SITE.

4. PLANT MATERIALS SHALL BE NURSERY GROWN UNLESS OTHERWISE OWNER APPROVED AND SHALL BE HEALTHY AND VIGOROUS. PLANTS SHALL BE FREE FROM DEFECTS, DECAY, DISFIGURING ROOTS, SUN-SCALD, INJURIES, ABRASIONS, DISEASES, INSECT PESTS, AND FORMS OF INFESTATIONS OR OBJECTIONABLE DISFIGUREMENT AS DETERMINED BY THE OWNER.

B. DELIVERY, STORAGE AND HANDLING:

1. PLANTS SHALL BE PROTECTED DURING DELIVERY TO PREVENT DESICCATION OF LEAVES.
2. PLANTS SHOULD BE PLANTED ON DAY OF DELIVERY. IF THIS IS NOT POSSIBLE, THE CONTRACTOR SHALL PROTECT UNPLANTED PLANTS BY KEEPING THEM IN SHADE, WATERED AND PROTECTED.
3. PLANTS SHALL NOT REMAIN UNPLANTED FOR MORE THAN TWO WEEKS, SHOULD NOT SHOW SIGNS OF STRESS BEFORE PLANTING.
4. UNINSTALLED PLANTS WILL BE SUBJECT TO RE-INSPECTED AND MAY BE REJECTED IF THEY HAVE DETERIORATED.

C. INSTALLATION:

DRY CONDITIONS:

i. PLUGS SHALL BE INSTALLED AS DIRECTED IN THE CONTRACT DOCUMENTS.
ii. PLUGS WILL BE ANCHORED SO THAT THEY WILL NOT FLOAT WHEN THE POOL AREA BECOMES INUNDATED (BIO-DEGRADABLE STAPLES).
iii. IF POOL IS EMPTY, WATER THE PLUGS IMMEDIATELY AFTER PLANTING PER ABOVE.
iv. ADDITIONAL WATERING MAY BE REQUIRED IF THE POOL IS NOT TO BE FILLED WITHIN 48 HOURS OF PLANTING.
v. NOTIFY OWNER OF ALL WATERING EVENTS.
vi. SUPPLY, INSTALL AND MAINTAIN GOOSE FENCING AS NEEDED TO PROTECT PLANTS IN PONDED AREAS FROM DISTURBANCE FROM AQUATIC BIRDS.

WET CONDITIONS:

i. PLUGS INSTALLED IN WET CONDITIONS IN PERMANENT POOLS SHALL BE PLANTED AS PER THE PROJECT DOCUMENTS OR IN 12 INCHES OF WATER OR LESS AS DIRECTED BY THE OWNER.
ii. PLUGS INSTALLED IN WET CONDITIONS IN TEMPORARY POOLS SHALL BE INSTALLED AS DETAILED IN THE CONTRACT DOCUMENTS AND ANCHORED SO THAT THEY WILL NOT FLOAT AWAY WHILE INUNDATED (BIO-DEGRADABLE STAPLES).
iii. SUPPLY, INSTALL AND MAINTAIN GOOSE FENCING AS NEEDED TO PROTECT PLANTS FROM DISTURBANCE FROM AQUATIC BIRDS.

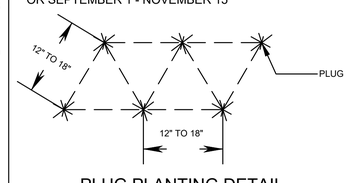
LOW MARSH PLUGS:

SCHEDULE

SCIENTIFIC NAME	COMMON NAME	SIZE
Carex stricta	TUSSOCK SEDGE	#SP 2 CONTAINER
Eupatorium purpureum	JOE PYE WEED	#SP 2 CONTAINER
Hibiscus moscheutos	MARSH HIBISCUS	#SP 2 CONTAINER
Juncus effusis	COMMON RUSH	#SP 2 CONTAINER
Peltandra virginica	ARROW ARUM	#SP 2 CONTAINER
Pontederia cordata	PICKEREL WEED	#SP 2 CONTAINER
Scripus tabernaemontani	SOFT STEM BULRUSH	#SP 2 CONTAINER

NOTES

1) TOTAL QUANTITY OF PLUGS TO BE PROVIDED = 1,322
2) ALL SPECIES LISTED TO BE EQUALLY REPRESENTED IN PLANTED INSTALLATION
3) PLANT PLUGS IN GROUPINGS OF 3-5 LIKE SPECIES 12-18-INCHES ON CENTER UNLESS PLANT SCHEDULE OR LANDSCAPE ARCHITECT DIRECTS OTHERWISE (SEE EXAMPLE DIAGRAM BELOW). PLUG SPACING MAY VARY WITH SPECIES. LIKE GROUPING SPECIES SHALL BE A MINIMUM OF 24-INCHES FROM EACH OTHER.
4) PLUG QUANTITIES MAY BE FIELD ADJUSTED WITH APPROVAL FROM THE LANDSCAPE ARCHITECT TO ALIGN WITH QUANTITIES AVAILABLE PER FLAT AT THE TIME OF PURCHASE.
5) PLUGS SHALL BE INSTALLED MARCH 15 - MAY 31 OR SEPTEMBER 1 - NOVEMBER 15



PLUG PLANTING DETAIL

NOT TO SCALE

REVISIONS		
REV	DATE	DESCRIPTION

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Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SWM LANDSCAPE DETAILS

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-619		
DESIGNER	EU/KZ	08/18/23			
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING: 1707908-C-619.dwg		
APPROVED BY	KAS	08/18/23			

LEGEND:

PROP. PLANT TAG- QUANTITY XXX / KEY XX

PLANT SCHEDULE					
KEY	QTY	BOTANICAL NAME	COMMON NAME	REMARKS	SIZE
SHADE TREES					
BN	9	*Betula nigra*	river birch	B&B/Multi-Stem	6-8'HT

THIS SHEET IS FOR LANDSCAPE PURPOSES ONLY!!

(FOR LANDSCAPE DETAILS SEE SHEET 1707908-C-619)

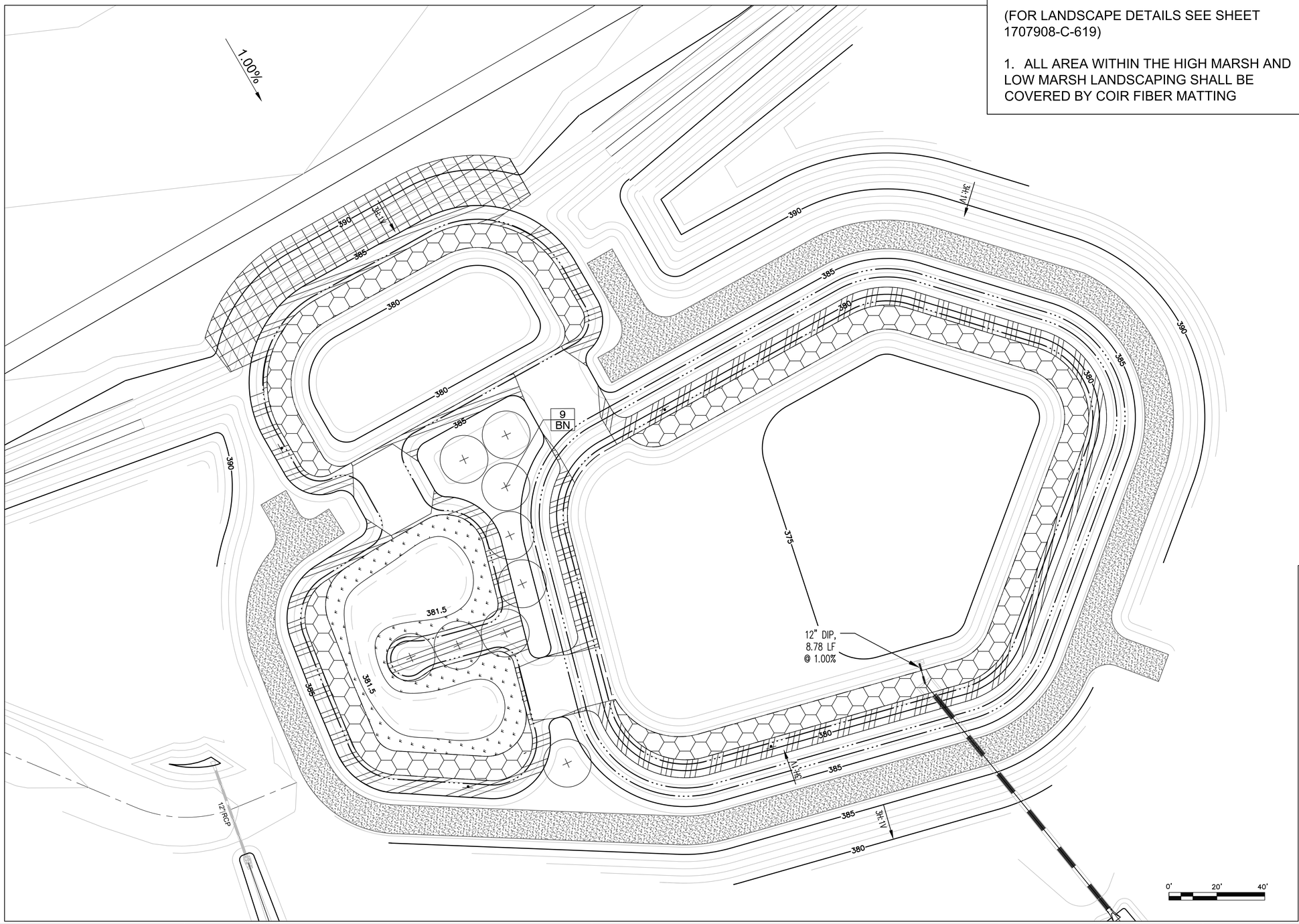
1. ALL AREA WITHIN THE HIGH MARSH AND LOW MARSH LANDSCAPING SHALL BE COVERED BY COIR FIBER MATTING

WETLAND MEADOW MIX (ERNMX-865)

HIGH MARSH SEED MIX (ERNMX-128)

LOW MARSH PLUGS

ES-3 SOIL STABILIZATION MAT



REVISIONS		
REV	DATE	DESCRIPTION

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COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

SWM LANDSCAPE PLAN

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	1" = 20'
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-620		
DESIGNER	EU/KZ	08/18/23			
PROJECT ENGINEER	EU/KZ	08/18/23	DRAWING:		
APPROVED BY	KAS	08/18/23	1707908-C-620.dwg		

(FOR LANDSCAPE DETAILS SEE SHEET 1707908-C-619)

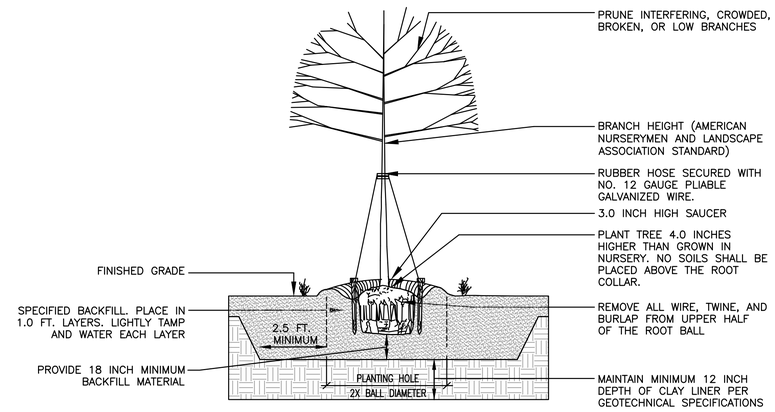
1. TOP SOIL SHALL MEET VDOT SPECIFICATIONS.
2. SEE GEOTECHNICAL RECOMMENDATIONS FOR CLAY LINER SPECIFICATIONS.
3. CLAY LINER SHALL BE UNDER ALL PERMANENT POOLS, INCLUDING WETLANDS AND SEDIMENT FOREBAYS.
4. CLAY LINER SHALL EXTEND 2' ABOVE THE 10-YEAR WATER SURFACE ELEVATION ON THE DAM EMBANKMENT.
5. 6" OF TOP SOIL SHALL BE USED UNDER ALL PERMANENT SEEDING.
6. 12" OF TOP SOIL SHALL BE USED UNDER ALL WETLANDS, LOW AND HIGH MARSH PLANTINGS.
7. RIPRAP FOR RIPRAP WEIRS SHALL BE PLACED ON AT LEAST 12" THICK CLAY LINER.
8. ALL OTHER AREAS OF THE DAM EMBANKMENT AND THE POND AREA SHALL HAVE 6" OF TOP SOIL (UNDER PERMANENT SEEDING).

12" THICK CLAY LINER

6" TOP SOIL & 12" CLAY LINER

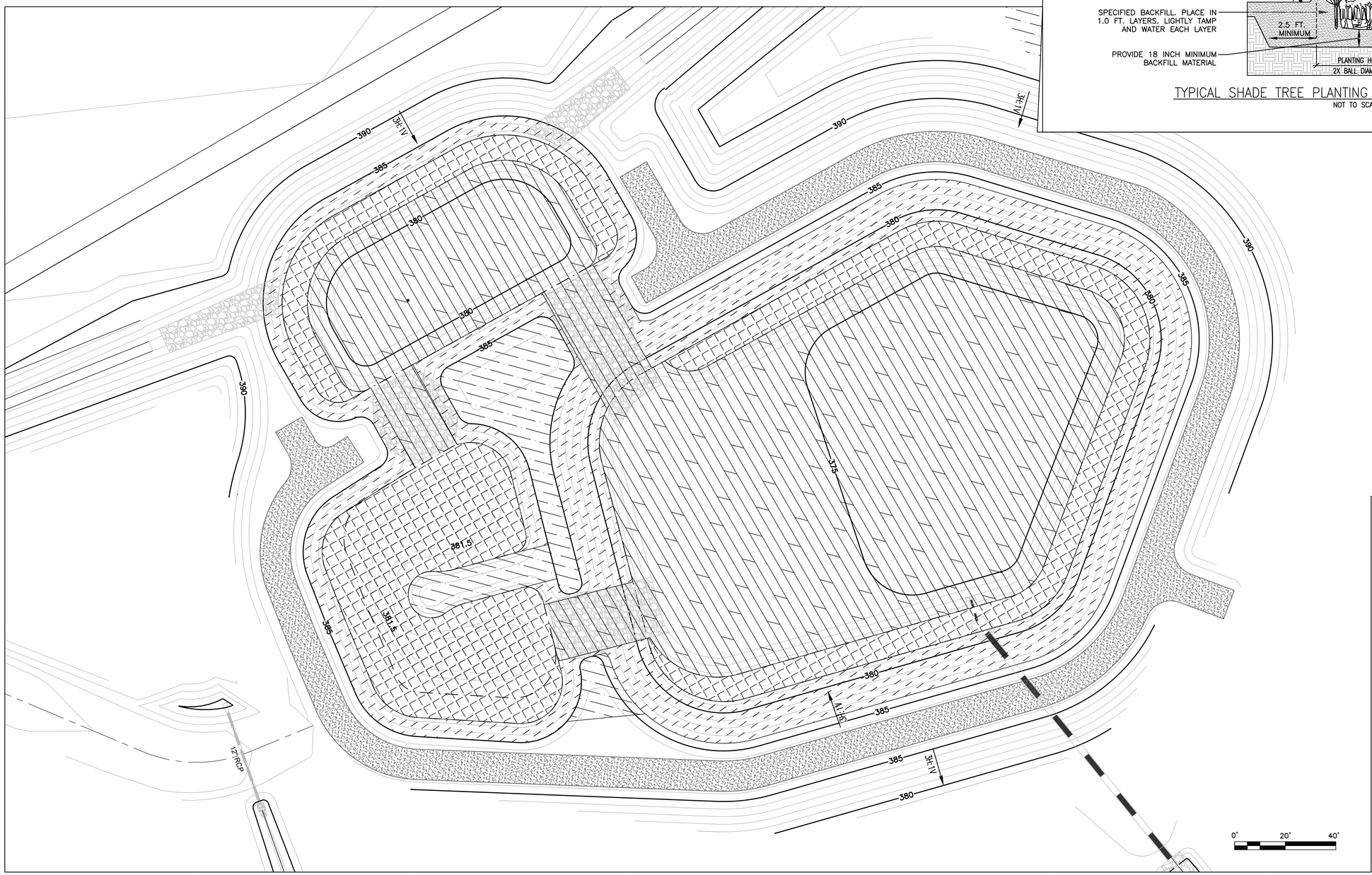
12" TOP SOIL & 12" CLAY LINER (UNDER WETLANDS & MARSH PLANTINGS)

42" TOP SOIL & 12" CLAY LINER (UNDER WETLAND BERMS)



TYPICAL SHADE TREE PLANTING DETAIL – WETLAND BERMS

NOT TO SCALE



THIS SHEET IS FOR LANDSCAPE PURPOSES ONLY!!

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry

Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
EDWARD R. UMBRELL
Lic. No. 038388
8/18/2023
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

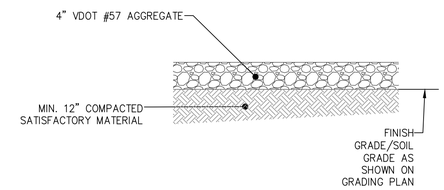
Dominion Energy

SWM TOP SOIL

UNITY SUBSTATION

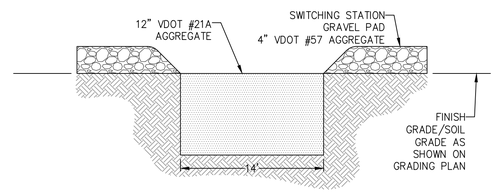
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION			B/M No.		SCALE	1" = 20'
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-621	
DESIGNER		EU/KZ	08/18/23			
PROJECT ENGINEER		EU/KZ	08/18/23	DRAWING:		
APPROVED BY		KAS	08/18/23	1707908-C-621.dwg		



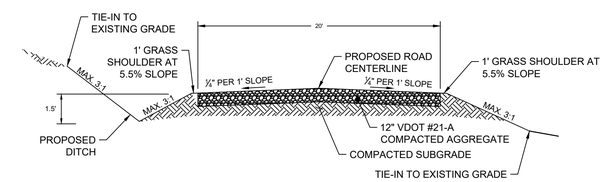
SUBSTATION GRAVEL PAD

N.T.S. Source: Dewberry



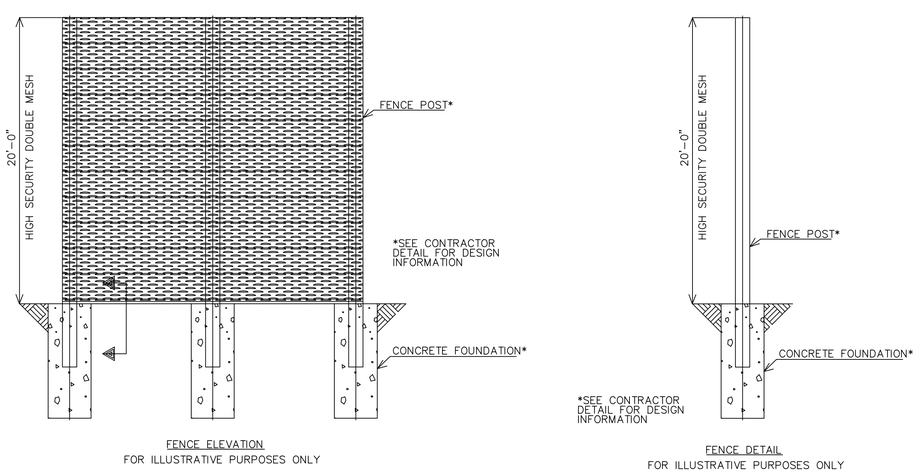
EQUIPMENT ACCESS ROAD

N.T.S. Source: Dewberry



ACCESS ROAD, WEST ACCESS ROAD & SWM ACCESS ROAD SECTION

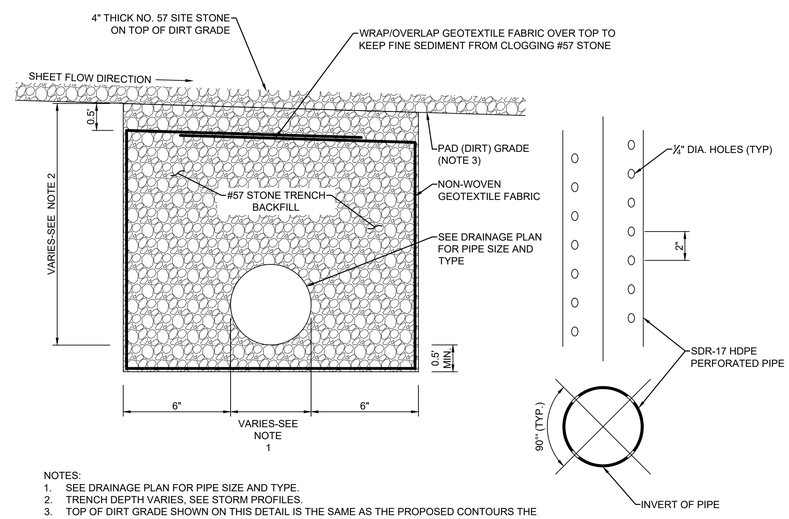
N.T.S. Source: Dewberry



NOTE:
1. SEE CONFIDENTIAL FENCE PLANS (BY OTHERS) FOR DETAILED FENCE CONSTRUCTION PLANS.

TYPICAL DOMINION SECURITY FENCE

N.T.S. Source: DOMINION



NOTES:
1. SEE DRAINAGE PLAN FOR PIPE SIZE AND TYPE.
2. TRENCH DEPTH VARIES, SEE STORM PROFILES.
3. TOP OF DIRT GRADE SHOWN ON THIS DETAIL IS THE SAME AS THE PROPOSED CONTOURS THE GRADING PLAN.

STONE TRENCH WITH PERFORATED PIPE

N.T.S. Source: Dewberry

REVISIONS		
REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

CONSTRUCTION DETAILS

UNITY SUBSTATION

LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT	5017950	NAME	DATE	SHEET:	1707908-C-801
DESIGNER		MFR	8/18/23		
PROJECT ENGINEER		GA	8/18/23	DRAWING:	1707908-C-801.dwg
APPROVED BY		KAS	8/18/23		

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Project UNITY SUBSTATION
ACCESS ROAD STA 23+31.5
CULVERT #1

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 27.55 AC.
Tc = 22 mins
i10= 4.03
i100=5.38
C=0.38

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 385.32 CL elev. 385.52
Skew ____ ˘ Cover ____ ft.
Inv. El. 379.38 So= 0.017 Inv. El. 378.61
Orig. Gr. Elev. ____ L= 45' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 42.19 CFS
Q 100 = 56.32 CFS
Q ____ = ____ CFS
Q ____ = ____ CFS
Q ____ = ____ CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
36" RCP	42.19	42.19	1.4	3.5	0.5	2.1	2.3	2.3	2.4	0.8	3.9					
36" RCP	56.32	56.32	2.2	5.5	0.5	2.4	2.7	2.7	3.8	0.80	5.7					

SUMMARY & RECOMMENDATIONS: NOTE: CULVERT IS COUNTERSUNK 6". THEREFORE, CALCULATIONS ARE BASED ON A 30" PIPE

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

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Rev. May 2016

Project UNITY SUBSTATION
ACCESS ROAD STA 26+16.8
CULVERT #2

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 3.49 AC.
Tc = 17 mins
i10= 4.58
i100=6.06
C=0.29

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 386.72 CL elev. 386.92
Skew ____ ˘ Cover ____ ft.
Inv. El. 382.14 So= 0.01 Inv. El. 381.72
Orig. Gr. Elev. ____ L= 42' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 4.64 CFS
Q 100 = 6.13 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
15" RCP	4.64	4.64	1.1	1.4	0.5	0.6	0.9	0.9	0.4	0.4	0.9					
15" RCP	6.13	6.13	1.3	1.6	0.5	0.9	1.1	1.1	0.8	0.4	1.5					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

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Project UNITY SUBSTATION
ACCESS ROAD STA 31+32
CULVERT #3

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 0.74 AC.
Tc = 14 mins
i10=5.16
i100=6.77
C=0.29

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 398.1 CL elev. 398.3
Skew ____ ˘ Cover ____ ft.
Inv. El. 394.02 So= 0.015 Inv. El. 393.55
Orig. Gr. Elev. ____ L= 31' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 1.11 CFS
Q 100 = 1.45 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
15" RCP	1.11	1.11	0.4	0.5	0.5	0.5	0.9	0.9	0	0.5	0.4					
15" RCP	1.45	1.45	0.5	0.6	0.5	0.5	0.9	0.9	0	0.5	0.4					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

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Project UNITY SUBSTATION
ACCESS ROAD STA 35+12
CULVERT #4

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 11.04 AC.
Tc = 22 mins
i10=4.03
i100=5.38
C=0.29

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 392.59 CL elev. 392.79
Skew ____ ˘ Cover ____ ft.
Inv. El. 387.64 So= 0.018 Inv. El. 386.75
Orig. Gr. Elev. ____ L= 49.5' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 12.90 CFS
Q 100 = 17.22 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
24" RCP	12.90	12.90	0.95	1.9	0.5	1.4	1.7	1.7	0.6	0.9	1.4					
24" RCP	17.22	17.22	1.2	2.4	0.5	1.5	1.8	1.8	1.0	0.9	1.9					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

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Project UNITY SUBSTATION
WEST ACCESS ROAD STA 00+69.8
CULVERT #5

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 0.15 AC.
Tc = 5 mins
i10=7.06
i100=9.15
C=0.46

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 398.55 CL elev. 398.69
Skew ____ ˘ Cover ____ ft.
Inv. El. 394.11 So= 0.013 Inv. El. 393.54
Orig. Gr. Elev. ____ L= 43.50' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 0.49 CFS
Q 100 = 0.63 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
15" RCP	0.49	0.49	0.4	0.5	0.5	0.5	0.9	0.9	0	0.6	0.3					
15" RCP	0.63	0.63	0.4	0.5	0.5	0.5	0.9	0.9	0	0.6	0.3					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

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Project UNITY SUBSTATION
WEST ACCESS ROAD STA 11+35
CULVERT #6

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 1.81 AC.
Tc = 17 mins
i10=4.58
i100=6.06
C=0.51

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 392.16 CL elev. 392.36
Skew ____ ˘ Cover ____ ft.
Inv. El. 388.37 So= 0.009 Inv. El. 388.02
Orig. Gr. Elev. ____ L= 39' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 4.23 CFS
Q 100 = 5.59 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
15" RCP	4.23	4.23	1.0	1.25	0.5	0.9	1.08	1.08	0.4	0.35	1.13					
15" RCP	5.59	5.59	1.3	1.63	0.5	1.0	1.13	1.13	0.7	0.35	1.48					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

SUBSTATION INTERIOR STORM SEWER

Design Storm Year = 10																	
POINT	DOWNSTREAM STRUCTURE	DRAIN AREA ACRES	RUNOFF COEFF. C	CA INCR	CA ACCUM	INLET TIME MIN	RAIN FALL IN/HR	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER	INVERT ELEVATIONS LOWER	LENGTH FEET	SLOPE FT./FT.	DIA INCHES	CAPA-CITY C.F.S.	VEL F.P.S.	FLOW TIME SEC	REMARKS
14		0.96	0.90	0.86	0.86	5.00	7.02	6.1									
	13								395.00	394.19	161.50	0.0050	18	8.0	5.0	32.4	
13		0.70	0.90	0.63	1.49	5.54	6.85	10.2									
	12								393.69	392.99	140.00	0.0050	24	17.3	5.7	24.4	
12		0.00	0.00	0.00	1.49	5.95	6.72	10.2									
	11								392.89	389.29	245.06	0.0147	24	27.4	8.1	30.4	
11		0.00	0.00	0.00	2.77	6.45	6.57	18.2									
	10								389.19	388.04	229.17	0.0050	30	29.0	6.2	36.8	24 x 38 ELLIPTICAL PIPE
16		0.84	0.90	0.76	0.76	5.00	7.02	5.3									
	15								392.60	391.87	147.00	0.0050	18	8.0	4.9	30.3	
15		0.58	0.90	0.52	1.28	5.50	6.86	8.8									
	11								391.37	390.60	154.00	0.0050	24	17.3	5.5	27.9	
24		0.96	0.90	0.86	0.86	5.00	7.02	6.1									
	23								395.00	394.19	161.50	0.0050	18	8.0	5.0	32.4	
23		0.69	0.90	0.62	1.49	5.54	6.85	10.2									
	22								393.69	393.00	138.20	0.0050	24	17.3	5.7	24.1	
22		0.00	0.00	0.00	1.49	5.94	6.72	10.2									
	21								392.90	389.29	224.08	0.0161	24	28.7	8.4	26.8	
21		0.00	0.00	0.00	2.75	6.39	6.59	18.1									
	20								389.19	388.04	229.38	0.0050	30	29.0	6.2	36.9	24 x 38 ELLIPTICAL PIPE
26		0.84	0.90	0.76	0.76	5.00	7.02	5.3									
	25								392.60	391.87	147.00	0.0050	18	8.0	4.9	30.3	
25		0.57	0.90	0.51	1.27	5.50	6.86	8.7									
	21								391.37	390.60	152.20	0.0050	24	17.3	5.5	27.6	

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Project UNITY SUBSTATION
SWM ACCESS ROAD STA 05+56
CULVERT #7

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 0.93 AC.
Tc = 13 mins
i10=5.16
i100=6.77
C=0.42

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 382.95 CL elev. 383.15
Skew ____ ˘ Cover ____ ft.
Inv. El. 379.13 So= 0.011 Inv. El. 378.73
Orig. Gr. Elev. ____ L= 36' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 2.02 CFS
Q 100 = 2.64 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
15" RCP	2.02	2.02	0.6	0.8	0.5	0.6	1.2	1.2	0	0.4	0.8					
15" RCP	2.64	2.64	0.7	0.9	0.5	0.6	1.2	1.2	0	0.4	0.8					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

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Project UNITY SUBSTATION
SWM ACCESS ROAD STA 08+95
CULVERT #8

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 0.19 AC.
Tc = 12 mins
i10=5.33
i100=6.99
C=0.39

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 387.92 CL elev. 388.12
Skew ____ ˘ Cover ____ ft.
Inv. El. 384.34 So= 0.01 Inv. El. 383.97
Orig. Gr. Elev. ____ L= 37' Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 0.39 CFS
Q 100 = 0.52 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
12" RCP	0.39	0.39	0.4	0.4	0.5	0.4	0.7	0.7	0	0.4	0.3					
12" RCP	0.52	0.52	0.4	0.4	0.5	0.4	0.7	0.7	0	0.4	0.3					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

SUBSTATION INTERIOR STORM SEWER HYDRAULIC GRADE LINE

INLET STATION	OUTLET WATER SURFACE ELEV	L_o FT	D_o IN	Q_o ZW C.F.S.	S_{fo} FT/FT	H_f FT	JUNCTION LOSS V_o F.P.S.	H_o FT	Q_{IN} C.F.S.	V_{IN} F.P.S.	Q_i*V_i	$V_i^2/2g$ FT	H_i	ANGLE	H_Δ	H_t	$1.3H_t$	$.5H_t$	FINAL H	INLET WATER SURFACE ELEV.	RIM ELEV
	392.20	152.20	24	8.71	0.001	0.19	5.5	0.1													
25									5.3	4.9	25.8	0.4	0.13	0	0.00	0.25	0.32	N/A	0.51	392.72	395.15
	393.07	147.00	18	5.31	0.002	0.32	4.9	0.1													
26													0.00	0	0.00	0.09	N/A	N/A	0.41	393.48	395.44
	389.64	229.38	24	18.14	0.006	1.48	6.2	0.2													
21									10.2	8.4	84.9	1.1	0.38	0	0.00	0.53	0.69	N/A	2.16	391.80	394.33
	391.80	224.08	24	10.17	0.002	0.45	8.4	0.3													
22									10.2	5.7	58.3	0.5	0.18	90	0.36	0.81	N/A	N/A	1.26	393.06	397.45
	394.60	138.20	24	10.17	0.002	0.24	5.7	0.1													
23									6.1	5.0	30.2	0.4	0.13	0	0.00	0.26	0.34	N/A	0.58	395.18	397.90
	395.39	161.50	18	6.07	0.003	0.46	5.0	0.1													
24													0.00	0	0.00	0.10	N/A	N/A	0.56	395.95	397.90
	392.20	154.00	24	8.77	0.001	0.20	5.5	0.1													
15									5.3	4.9	25.8	0.4	0.13	0	0.00	0.25	0.32	N/A	0.52	392.71	395.15
	393.07	147.00	18	5.31	0.002	0.32	4.9	0.1													
16													0.00	0	0.00	0.09	N/A	N/A	0.41	393.48	395.44
	389.64	229.17	24	18.21	0.006	1.48	6.2	0.2													
11									10.2	8.1	82.6	1.0	0.35	0	0.00	0.50	0.66	N/A	2.14	391.78	394.33
	391.78	245.06	24	10.23	0.002	0.50	8.1	0.3													
12									10.2	5.7	58.7	0.5	0.18	90	0.36	0.79	N/A	N/A	1.29	393.07	397.45
	394.59	140.00	24	10.23	0.002	0.24	5.7	0.1													
13									6.1	5.0	30.2	0.4	0.13	0	0.00	0.26	0.34	N/A	0.59	395.18	397.90
	395.39	161.50	18	6.07	0.003	0.46	5.0	0.1													
14													0.00	0	0	0.10	N/A	N/A	0.56	395.95	397.90

LD-269
Rev. May 2016

Project UNITY SUBSTATION
ACCESS ROAD STA 37+58.61
CULVERT #9

Plan Sheet No. ____ Designer ____ Sheet ____ of ____
Rev. Date ____ Date ____

HYDROLOGICAL DATA:
D.A.= 0.58 AC.
Tc = 5 mins
i10=7.06
i100=9.15
C=0.58

STATION: ____
AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____
freq. TWelev.

Shoulder elev. 396.97 CL elev. 397.15
Skew ____ ˘ Cover ____ ft.
Inv. El. 393.65 So= 0.01 Inv. El. 393.33
Orig. Gr. Elev. ____ L= 32.5 Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 2.37 CFS
Q 100 = 3.08 CFS

RISK ASSESSMENT
ADT ____, Length ____
Detours Available ____
Overtopping Stage ____
Flood Plain Management ____
Criteria and Significant Impact ____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	Smooth	End Treat.	COMMENTS
15" RCP	2.37	2.37	0.65	0.81	0.5	0.6	0.93	0.93	0	0.32	0.61					
15" RCP	3.08	3.08	0.75	0.75	0.5	0.6	0.93	0.93	0	0.32	0.61					

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____
Base Flood 1% Exceed. Prob. ____ Elev. ____

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

DRAINAGE CALCULATIONS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	AS SHOWN
PROJECT 5017950	NAME	DATE	SHEET: 1707908-C-901		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-901.dwg		
APPROVED BY	KAS	8/18/23			

Dewberry

Ditch Computations LD-268

PROJECT: Unity Substation
DATE: 2023.07.24
COUNTY: Lunenburg
ENGINEER: GKA/Dewberry Engineers Inc.

Access Road

Hydrology

From Station	To Station	LT RT	Invert Upstream	Invert Downstream	Area 1 (acres)	C 0.9	Area 2 (acres)	C 0.5	Area 3 (acres)	C 0.3	Incr CA	Total CA	T_C 10 yr (min)	T_C 2 yr (min)	10 yr i (in/hr)	2 yr i (in/hr)	10 yr Q (cfs)	2 yr Q (cfs)
000+75.00	001+00.00	LT	450.39	448.21	0.041	0.90	0.052	0.50	0.253	0.30	0.138	0.138	13.00	13.00	5.16	3.90	0.71	0.54
001+00.00	002+00.00	LT	448.21	442.16	0.039	0.90	0.143	0.50	0.039	0.30	0.119	0.257	8.00	8.00	6.18	4.73	1.59	1.22
002+00.00	003+00.00	LT	442.16	439.30	0.046	0.90	0.285	0.50	0.262	0.30	0.263	0.520	13.00	13.00	5.16	3.90	2.68	2.03
003+00.00	004+00.00	LT	439.30	436.97	0.045	0.90	0.431	0.50	0.364	0.30	0.366	0.885	12.00	12.00	5.33	4.04	4.72	3.58
004+00.00	005+00.00	LT	436.97	435.02	0.041	0.90	0.605	0.50	0.316	0.30	0.434	1.319	13.00	13.00	5.16	3.90	6.81	5.15
005+00.00	006+00.00	LT	435.02	433.39	0.028	0.90	0.391	0.50	0.075	0.30	0.243	1.563	13.00	13.00	5.16	3.90	8.06	6.10
006+00.00	007+00.00	LT	433.39	431.90	0.025	0.90	0.142	0.50	0.000	0.30	0.094	1.657	9.00	9.00	5.94	4.53	9.84	7.51
007+00.00	008+00.00	LT	431.90	430.28	0.025	0.90	0.028	0.50	0.000	0.30	0.037	1.693	5.00	5.00	7.06	5.44	11.95	9.21
008+00.00	009+00.00	LT	430.28	427.72	0.025	0.90	0.025	0.50	0.000	0.30	0.035	1.729	5.00	5.00	7.06	5.44	12.20	9.41
009+00.00	010+00.00	LT	427.72	425.64	0.025	0.90	0.036	0.50	0.000	0.30	0.040	1.769	5.00	5.00	7.06	5.44	12.49	9.63
010+00.00	011+00.00	LT	425.64	422.94	0.025	0.90	0.030	0.50	0.005	0.30	0.039	1.808	5.00	5.00	7.06	5.44	12.76	9.84
011+00.00	012+00.00	LT	422.94	420.14	0.025	0.90	0.029	0.50	0.000	0.30	0.037	1.845	5.00	5.00	7.06	5.44	13.03	10.04
012+00.00	012+50.00	LT	420.14	419.05	0.013	0.90	0.003	0.50	0.000	0.30	0.013	1.858	5.00	5.00	7.06	5.44	13.12	10.11
025+50.00	026+25.00	LT	385.66	382.18	0.025	0.90	0.039	0.50	0.461	0.30	0.180	0.180	15.00	15.00	4.85	3.65	0.87	0.66
026+25.00	027+00.00	LT	385.71	382.18	0.018	0.90	0.038	0.50	0.557	0.30	0.202	1.051	15.00	15.00	4.85	3.65	5.10	3.84
027+00.00	028+00.00	LT	387.32	385.71	0.025	0.90	0.043	0.50	0.146	0.30	0.088	0.849	12.00	12.00	5.33	4.04	4.53	3.43
028+00.00	029+00.00	LT	388.93	387.32	0.025	0.90	0.035	0.50	0.616	0.30	0.225	0.761	15.00	15.00	4.85	3.65	3.69	2.78
029+00.00	030+00.00	LT	390.67	388.93	0.025	0.90	0.037	0.50	0.278	0.30	0.124	0.536	12.00	12.00	5.33	4.04	2.86	2.17
030+00.00	031+00.00	LT	393.37	390.67	0.025	0.90	0.044	0.50	0.280	0.30	0.128	0.412	11.00	11.00	5.52	4.19	2.27	1.73
031+00.00	032+00.00	LT	394.88	393.37	0.025	0.90	0.070	0.50	0.409	0.30	0.180	0.284	15.00	15.00	4.85	3.65	1.38	1.04
032+00.00	033+00.00	LT	397.09	394.88	0.023	0.90	0.037	0.50	0.213	0.30	0.103	0.103	15.00	15.00	4.85	3.65	0.50	0.38
033+00.00	034+00.00	LT	397.09	391.63	0.026	0.90	0.053	0.50	0.248	0.30	0.125	0.125	15.00	15.00	4.85	3.65	0.60	0.46
034+00.00	035+00.00	LT	391.63	387.64	0.026	0.90	0.067	0.50	0.019	0.30	0.063	0.188	11.00	11.00	5.52	4.19	1.04	0.79
035+00.00	036+00.00	LT	391.45	387.64	0.025	0.90	0.065	0.50	0.007	0.30	0.057	0.248	5.00	5.00	7.06	5.44	1.75	1.35
036+00.00	000+50.00	LT	393.28	391.45	0.035	0.90	0.040	0.50	0.078	0.30	0.075	0.191	5.00	5.00	7.06	5.44	1.35	1.04
000+50.00	001+50.00	LT	400.00	393.28	0.025	0.90	0.054	0.50	0.007	0.30	0.051	0.116	5.00	5.00	7.06	5.44	1.31	1.01
001+50.00	002+50.00	LT	403.00	400.00	0.028	0.90	0.075	0.50	0.008	0.30	0.064	0.064	5.00	5.00	7.06	5.44	0.45	0.35

Stationing is from Western Access Road

Flow from culvert at STA 000+70.00 included

Ditch Geometry / Hydraulics

From Station	To Station	LT RT	Bottom B (ft)	Depth Y (ft)	Left Slope (H/V)	Right Slope (H/V)	Lining Type	Lining Width (ft)	n	Ditch Curve? R_d (ft)	Ditch Slope (ft/ft)	10 yr Depth (ft)	10 yr Velocity (ft/sec)	2 yr Depth (ft)	2 yr Velocity (ft/sec)	Tractive Force "τ" (lbs/ft^2)	Lining Adeq? (Max V)	Lining Adeq? (Max τ_{allow})	Free-board (ft)	Capacity Adeq?
000+75.00	001+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.087	0.30	2.66	0.27	2.46	0.77	YES	YES	1.20	YES
001+00.00	002+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.060	0.43	2.83	0.39	2.64	0.78	YES	YES	1.07	YES
002+00.00	003+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.029	0.61	2.44	0.54	2.26	0.51	YES	YES	0.89	YES
003+00.00	004+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.023	0.78	2.61	0.70	2.42	0.54	YES	YES	0.72	YES
004+00.00	005+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	6	0.045	NA	0.020	0.92	2.65	0.83	2.47	0.53	YES	YES	0.58	YES
005+00.00	006+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	6	0.045	NA	0.016	1.03	2.61	0.92	2.42	0.49	YES	YES	0.48	YES
006+00.00	007+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.015	1.12	2.64	1.01	2.47	0.49	YES	YES	0.38	YES
007+00.00	008+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.016	1.18	2.86	1.08	2.68	0.57	YES	YES	0.32	YES
008+00.00	009+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.026	1.09	3.41	0.99	3.20	0.83	YES	YES	0.41	YES
009+00.00	010+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.021	1.14	3.16	1.03	2.96	0.70	YES	YES	0.36	YES
010+00.00	011+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.027	1.10	3.52	1.00	3.30	0.88	YES	YES	0.40	YES
011+00.00	012+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.028	1.10	3.58	1.00	3.36	0.91	YES	YES	0.40	YES
012+00.00	012+50.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.022	1.16	3.27	1.05	3.06	0.75	YES	YES	0.34	YES
025+50.00	026+25.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.046	0.37	2.22	0.33	2.05	0.50	YES	YES	1.13	YES
026+25.00	027+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.047	0.70	3.44	0.63	3.21	0.98	YES	YES	0.80	YES
027+00.00	028+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.016	0.83	2.24	0.74	2.09	0.39	YES	YES	0.68	YES
028+00.00	029+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.016	0.76	2.12	0.68	1.98	0.36	YES	YES	0.74	YES
029+00.00	030+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.017	0.68	2.06	0.62	1.92	0.35	YES	YES	0.82	YES
030+00.00	031+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.027	0.58	2.28	0.52	2.12	0.46	YES	YES	0.93	YES
031+00.00	032+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.015	0.53	1.62	0.48	1.52	0.24	YES	YES	0.97	YES
032+00.00	033+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.022	0.34	1.46	0.31	1.36	0.22	YES	YES	1.16	YES
033+00.00	034+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.055	0.31	2.14	0.28	1.98	0.50	YES	YES	1.19	YES
034+00.00	035+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.040	0.40	2.18	0.36	2.02	0.47	YES	YES	1.10	YES
035+00.00	036+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.038	0.49	2.44	0.44	2.27	0.55	YES	YES	1.01	YES
036+00.00	000+50.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.036	0.45	2.23	0.41	2.09	0.48	YES	YES	1.05	YES
000+50.00	001+50.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.067	0.39	2.79	0.36	2.63	0.78	YES	YES	1.11	YES
001+50.00	002+50.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.030	0.31	1.59	0.28	1.50	0.27	YES	YES	1.19	YES

Access Road

Hydrology

From Station	To Station	LT RT	Invert Upstream	Invert Downstream	Area 1 (acres)	C 0.9	Area 2 (acres)	C 0.5	Area 3 (acres)	C 0.3	Incr CA	Total CA	T_C 10 yr (min)	T_C 2 yr (min)	10 yr i (in/hr)	2 yr i (in/hr)	10 yr Q (cfs)	2 yr Q (cfs)
010+50.00	011+00.00	RT	424.56	422.94	0.020	0.90	0.021	0.50	0.000	0.30	0.029	0.029	5.00	5.00	7.06	5.44	0.20	0.16
011+00.00	012+00.00	RT	422.94	420.14	0.025	0.90	0.035	0.50	0.032	0.30	0.050	0.079	7.00	7.00	6.45	4.94	0.51	0.39
012+00.00	013+00.00	RT	420.14	417.47	0.025	0.90	0.024	0.50	0.095	0.30	0.063	0.142	9.00	9.00	5.94	4.53	0.84	0.64
013+00.00	014+00.00	RT	417.47	413.49	0.025	0.90	0.071	0.50	0.274	0.30	0.141	0.282	12.00	12.00	5.33	4.04	1.51	1.14
014+00.00	015+00.00	RT	413.49	411.47	0.025	0.90	0.153	0.50	0.061	0.30	0.117	0.399	13.00	13.00	5.16	3.90	2.06	1.56
015+00.00	016+00.00	RT	411.47	408.96	0.025	0.90	0.263	0.50	0.397	0.30	0.273	0.673	14.00	14.00	5.00	3.77	3.36	2.54
016+00.00	017+00.00	RT	408.96	403.54	0.025	0.90	0.268	0.50	0.107	0.30	0.189	0.862	11.00	11.00	5.52	4.19	4.76	3.61
017+00.00	018+00.00	RT	403.54	399.23	0.025	0.90	0.258	0.50	0.012	0.30	0.155	1.017	12.00	12.00	5.33	4.04	5.42	4.11
018+00.00	019+00.00	RT	399.23	396.23	0.025	0.90	0.643	0.50	0.003	0.30	0.345	1.362	13.00	13.00	5.16	3.90	7.03	5.32
019+00.00	020+00.00	RT	396.23	393.23	0.025	0.90	0.059	0.50	0.147	0.30	0.097	1.459	13.00	13.00	5.16	3.90	7.53	5.69
020+00.00	021+00.00	RT	393.23	390.17	0.025	0.90	0.135	0.50	0.097	0.30	0.119	1.578	12.00	12.00	5.33	4.04	8.42	6.38
021+00.00	022+00.00	RT	390.17	386.29	0.026	0.90	0.310	0.50	0.000	0.30	0.179	1.757	12.00	12.00	5.33	4.04	9.37	7.10
022+00.00	023+00.00	RT	386.29	379.19	0.026	0.90	0.282	0.50	0.019	0.30	0.170	1.928	12.00	12.00	5.33	4.04	10.28	7.79

Ditch Geometry / Hydraulics

From Station	To Station	LT RT	Bottom B (ft)	Depth Y (ft)	Left Slope (H/V)	Right Slope (H/V)	Lining Type	Lining Width (ft)	n	Ditch Curve? R_d (ft)	Ditch Slope (ft/ft)	10 yr Depth (ft)	10 yr Velocity (ft/sec)	2 yr Depth (ft)	2 yr Velocity (ft/sec)	Tractive Force "τ" (lbs/ft^2)	Lining Adeq? (Max V)	Lining Adeq? (Max τ_{allow})	Free-board (ft)	Capacity Adeq?
010+50.00	011+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.032	0.23	1.34	0.21	1.27	0.22	YES	YES	1.28	YES
011+00.00	012+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.028	0.33	1.59	0.29	1.48	0.27	YES	YES	1.18	YES
012+00.00	013+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.027	0.40	1.78	0.36	1.66	0.32	YES	YES	1.10	YES
013+00.00	014+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.040	0.46	2.38	0.42	2.24	0.54	YES	YES	1.04	YES
014+00.00	015+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.020	0.58	1.99	0.53	1.86	0.35	YES	YES	0.92	YES
015+00.00	016+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.025	0.68	2.45	0.61	2.28	0.50	YES	YES	0.83	YES
016+00.00	017+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.054	0.67	3.57	0.60	3.33	1.07	YES	YES	0.83	YES
017+00.00	018+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.043	0.73	3.39	0.66	3.16	0.94	YES	YES	0.77	YES
018+00.00	019+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.030	0.86	3.14	0.78	2.94	0.76	YES	YES	0.64	YES
019+00.00	020+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	6	0.045	NA	0.030	0.88	3.20	0.80	3.00	0.78	YES	YES	0.62	YES
020+00.00	021+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	6	0.045	NA	0.031	0.92	3.32	0.83	3.09	0.83	YES	YES	0.58	YES
021+00.00	022+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	6	0.045	NA	0.039	0.92	3.73	0.83	3.48	1.05	YES	YES	0.58	YES
022+00.00	023+00.00	RT	0.00	1.50	3.00	3.00	5-EC-3 Ty1	5	0.036	NA	0.071	0.78	5.64	0.70	5.27	1.63	YES	YES	0.73	YES

West Access Road

Hydrology

From Station	To Station	LT RT	Invert Upstream	Invert Downstream	Area 1 (acres)	C 0.9	Area 2 (acres)	C 0.5	Area 3 (acres)	C 0.3	Incr CA	Total CA	T_C 10 yr (min)	T_C 2 yr (min)	10 yr i (in/hr)	2 yr i (in/hr)	10 yr Q (cfs)	2 yr Q (cfs)
000+70.00	001+50.00	RT	400.20	394.16	0.02	0.90	0.08	0.50	0.00	0.30	0.060	0.092	9.00	9.00	5.94	4.53	0.55	0.42
001+50.00	001+85.00	RT	401.14	400.20	0.02	0.90	0.03	0.50	0.00	0.30	0.032	0.032	5.00	5.00	7.06	5.44	0.23	0.18
003+50.00	004+00.00	RT	399.43	398.21	0.04	0.90	0.02	0.50	0.00	0.30	0.046	0.046	5.00	5.00	7.06	5.44	0.32	0.25
004+00.00	005+00.00	RT	398.21	396.97	0.05	0.90	0.03	0.50	0.00	0.30	0.057	0.103	5.00	5.00	7.06	5.44	0.73	0.56
005+00.00	006+00.00	RT	396.97	395.96	0.05	0.90	0.04	0.50	0.00	0.30	0.061	0.164	5.00	5.00	7.06	5.44	1.16	0.89
006+00.00	007+00.00	RT	395.96	394.96	0.05	0.90	0.04	0.50	0.00	0.30	0.065	0.229	5.00	5.00	7.06	5.44	1.62	1.25
007+00.00	008+00.00	RT	394.96	394.00	0.05	0.90	0.05	0.50	0.00	0.30	0.068	0.298	5.00	5.00	7.06	5.44	2.10	1.62
008+00.00	009+00.00	RT	394.00	392.94	0.05	0.90	0.06	0.50	0.00	0.30	0.072	0.370	5.00	5.00	7.06	5.44	2.61	2.01
009+00.00	010+00.00	RT	392.94	392.00	0.05	0.90	0.06	0.50	0.00	0.30	0.075	0.445	5.00	5.00	7.06	5.44	3.14	2.42
010+00.00	011+00.00	RT	392.00	391.00	0.05	0.90	0.07	0.50	0.00	0.30	0.076	0.521	5.00	5.00	7.06	5.44	3.68	2.83
011+00.00	011+35.00	RT	391.00	388.41	0.01	0.90	0.03	0.50	0.00	0.30	0.024	0.545	5.00	5.00	7.06	5.44	3.85	2.97
011+35.00	012+00.00	RT	391.21	388.41	0.03	0.90	0.15	0.50	0.00	0.30	0.101	0.865	5.00	5.00	7.06	5.44	6.11	4.71
012+00.00	013+00.00	RT	392.75	391.21	0.08	0.90	0.34	0.50	0.00	0.30	0.238	0.764	12.00	12.00	5.33	4.04	4.07	3.09
013+00.00	014+00.00	RT	394.00	392.75	0.03	0.90	0.15	0.50	0.00	0.30	0.100	0.526	10.00	10.00	5.72	4.36	3.01	2.29
014+00.00	015+00.00	RT	394.84	394.00	0.02	0.90	0.06	0.50	0.00	0.30	0.052	0.426	5.00	5.00	7.06	5.44	3.01	2.32
015+00.00	015+65.00	RT	395.32	394.84	0.25	0.90	0.31	0.50	0.00	0.30	0.374	0.374	5.00	5.00	7.06	5.44	2.64	2.03
011+35.00	012+00.00	LT	391.21	395.32	0.02	0.90	0.02	0.50	0.00	0.30	0.027	0.247	5.00	5.00	7.06	5.44	1.74	1.34
012+00.00	013+00.00	LT	392.75	391.21	0.03	0.90	0.02	0.50	0.00	0.30	0.035	0.220	5.00	5.00	7.06	5.44	1.55	1.20
013+00.00	014+00.00	LT	394.00	392.75	0.03	0.90	0.03	0.50	0.00	0.30	0.039	0.184	5.00	5.00	7.06	5.44	1.30	1.00
014+00.00	015+00.00	LT	394.84	394.00	0.03	0.90	0.07	0.50	0.00	0.30	0.061	0.146	5.00	5.00	7.06	5.44	1.03	0.79
015+00.00	015+65.00	LT	395.32	394.84	0.05	0.90	0.07	0.50	0.00	0.30	0.084	0.084	5.00	5.00	7.06	5.44	0.60	0.46

Ditch Geometry / Hydraulics

From Station	To Station	LT RT	Bottom B (ft)	Depth Y (ft)	Left Slope (H/V)	Right Slope (H/V)	Lining Type	Lining Width (ft)	n	Ditch Curve? R_d (ft)	Ditch Slope (ft/ft)	10 yr Depth (ft)	10 yr Velocity (ft/sec)	2 yr Depth (ft)	2 yr Velocity (ft/sec)	Tractive Force "τ" (lbs/ft^2)	Lining Adeq? (Max V)	Lining Adeq? (Max τ_{allow})	Free-board (ft)	Capacity Adeq?
000+70.00	001+50.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.078	0.28	2.37	0.25	2.23	0.63	YES	YES	1.23	YES
001+50.00	001+85.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.027	0.24	1.28	0.23	1.22	0.19	YES	YES	1.26	YES
003+50.00	004+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.024	0.28	1.35	0.26	1.27	0.20	YES	YES	1.22	YES
004+00.00	005+00.00	RT	0.00	1.50	3.00	3.00	1-Bare Earth	3	0.030	NA	0.012	0.38	1.74	0.34	1.64	0.14	YES	YES	1.13	YES
005+00.00	006+00.00	RT	0.00	1.50	3.00	3.00	1-Bare Earth	3	0.030	NA	0.010	0.47	1.82	0.42	1.69	0.14	YES	YES	1.03	YES
006+00.00	007+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.010	0.61	1.44	0.56	1.36	0.18	YES	YES	0.89	YES
007+00.00	008+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.010	0.68	1.51	0.61	1.41	0.19	YES	YES	0.83	YES
008+00.00	009+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.011	0.72	1.66	0.65	1.55	0.22	YES	YES	0.78	YES
009+00.00	010+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.009	0.80	1.68	0.73	1.57	0.22	YES	YES	0.70	YES
010+00.00	011+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.010	0.83	1.78	0.75	1.66	0.25	YES	YES	0.67	YES
011+00.00	011+35.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.074	0.58	3.81	0.53	3.56	1.28	YES	YES	0.92	YES
011+35.00	012+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.043	0.77	3.49	0.69	3.26	0.98	YES	YES	0.73	YES
012+00.00	013+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.015	0.80	2.15	0.73	2.01	0.36	YES	YES	0.70	YES
013+00.00	014+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.013	0.73	1.83	0.66	1.70	0.27	YES	YES	0.77	YES
014+00.00	015+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.008	0.80	1.59	0.73	1.49	0.20	YES	YES	0.70	YES
015+00.00	015+65.00	RT	0.00	1.50	3.00	3.00	1-Bare Earth	4	0.030	NA	0.007	0.68	1.99	0.61	1.86	0.15	YES	YES	0.83	YES
011+35.00	012+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.063	0.44	2.93	0.40	2.74	0.83	YES	YES	1.06	YES
012+00.00	013+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.015	0.56	1.69	0.51	1.59	0.25	YES	YES	0.94	YES
013+00.00	014+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.013	0.53	1.48	0.48	1.38	0.20	YES	YES	0.97	YES
014+00.00	015+00.00	LT	0.00	1.50	3.00	3.00	1-Bare Earth	3	0.030	NA	0.008	0.46	1.64	0.42	1.54	0.11	YES	YES	1.04	YES
015+00.00	015+65.00	LT	0.00	1.50	3.00	3.00	1-Bare Earth	3	0.030	NA	0.007	0.38	1.37	0.35	1.29	0.08	YES	YES	1.12	YES

SWM Access Road

Hydrology

From Station	To Station	LT RT	Invert Upstream	Invert Downstream	Area 1 (acres)	C 0.9	Area 2 (acres)	C 0.5	Area 3 (acres)	C 0.3	Incr CA	Total CA	T_C 10 yr (min)	T_C 2 yr (min)	10 yr i (in/hr)	2 yr i (in/hr)	10 yr Q (cfs)	2 yr Q (cfs)
000+75.00	001+00.00	LT	396.05	395.00	0.011	0.90	0.031	0.50	0.000	0.30	0.025	0.025	5.00	5.00	7.06	5.44	0.18	0.14
001+00.00	002+00.00	LT	395.00	390.45	0.025	0.90	0.107	0.50	0.000	0.30	0.076	0.102	9.00	9.00	5.94	4.53	0.60	0.46
002+00.00	003+00.00	LT	390.45	386.02	0.025	0.90	0.119	0.50	0.000	0.30	0.082	0.184	6.00	6.00	6.74	5.18	1.24	0.95
003+00.00	004+00.00	LT	386.02	383.49	0.025	0.90	0.107	0.50	0.000	0.30	0.076	0.260	5.00	5.00	7.06	5.44	1.84	1.42
004+00.00	005+00.00	LT	383.49	381.99	0.025	0.90	0.094	0.50	0.000	0.30	0.070	0.330	5.00	5.00	7.06	5.44	2.33	1.80
005+00.00	005+60.00	LT	381.99	379.17	0.014	0.90	0.044	0.50	0.000	0.30	0.034	0.365	5.00	5.00	7.06	5.44	2.57	1.98
005+60.00	006+00.00	LT	381.79	379.17	0.010	0.90	0.036	0.50	0.000	0.30	0.027	0.174	5.00	5.00	7.06	5.44	1.23	0.95
006+00.00	007+00.00	LT	385.39	381.79	0.025	0.90	0.141	0.50	0.000	0.30	0.093	0.147	9.00	9.00	5.94	4.53	0.87	0.67
007+00.00	007+75.00	LT	387.64	385.39	0.022	0.90	0.068	0.50	0.000	0.30	0.054	0.054	7.00	7.00	6.45	4.94	0.35	0.27
007+75.00	008+00.00	LT	387.64	387.55	0.005	0.90	0.017	0.50	0.000	0.30	0.013	0.013	8.00	8.00	6.18	4.73	0.08	0.06
008+00.00	009+00.00	LT	387.55	384.38	0.029	0.90	0.142	0.50	0.000	0.30	0.097	0.110	12.00	12.00	5.33	4.04	0.58	0.44
004+04.53	005+00.00	RT	384.92	380.76	0.025	0.90	0.032	0.50	0.000	0.30	0.038	0.038	5.00	5.00	7.06	5.44	0.27	0.21
005+00.00	005+60.00	RT	380.76	378.67	0.015	0.90	0.020	0.50	0.000	0.30	0.023	0.062	5.00	5.00	7.06	5.44	0.43	0.33
005+60.00	006+00.00	RT	381.55	378.67	0.013	0.90	0.021	0.50	0.000	0.30	0.022	0.084	5.00	5.00	7.06	5.44	0.59	0.46
006+00.00	007+00.00	RT	385.39	381.55	0.025	0.90	0.025	0.50	0.000	0.30	0.035	0.062	5.00	5.00	7.06	5.44	0.44	0.34
007+00.00	007+75.00	RT	387.65	385.39	0.020	0.90	0.018	0.50	0.000	0.30	0.027	0.027	5.00	5.00	7.06	5.44	0.19	0.15

Ditch Geometry / Hydraulics

From Station	To Station	LT RT	Bottom B (ft)	Depth Y (ft)	Left Slope (H/V)	Right Slope (H/V)	Lining Type	Lining Width (ft)	n	Ditch Curve? R_d (ft)	Ditch Slope (ft/ft)	10 yr Depth (ft)	10 yr Velocity (ft/sec)	2 yr Depth (ft)	2 yr Velocity (ft/sec)	Tractive Force "τ" (lbs/ft^2)	Lining Adeq? (Max V)	Lining Adeq? (Max τ_{allow})	Free-board (ft)	Capacity Adeq?
000+75.00	001+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.039	0.21	1.39	0.19	1.31	0.24	YES	YES	1.29	YES
001+00.00	002+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.046	0.32	1.99	0.28	1.85	0.43	YES	YES	1.18	YES
002+00.00	003+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.044	0.48	2.60	0.38	2.20	0.63	YES	YES	1.02	YES
003+00.00	004+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.025	0.54	2.12	0.49	1.99	0.41	YES	YES	0.96	YES
004+00.00	005+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.015	0.65	1.85	0.59	1.73	0.29	YES	YES	0.85	YES
005+00.00	005+60.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	4	0.045	NA	0.058	0.53	3.14	0.48	2.94	0.90	YES	YES	0.98	YES
005+60.00	006+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.089	0.37	3.06	0.33	2.87	0.96	YES	YES	1.13	YES
006+00.00	007+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	3	0.045	NA	0.038	0.38	2.03	0.34	1.91	0.42	YES	YES	1.13	YES
007+00.00	007+75.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.023	0.29	1.35	0.27	1.27	0.20	YES	YES	1.21	YES
007+75.00	008+00.00	LT	0.00	1.50	3.00	3.00	1-Bare Earth	2	0.030	NA	0.005	0.19	0.71	0.18	0.67	0.03	YES	YES	1.31	YES
008+00.00	009+00.00	LT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.039	0.33	1.88	0.29	1.75	0.38	YES	YES	1.18	YES
004+04.53	005+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.063	0.23	1.86	0.20	1.72	0.42	YES	YES	1.28	YES
005+00.00	005+60.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.031	0.30	1.58	0.28	1.49	0.27	YES	YES	1.20	YES
005+60.00	006+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.043	0.32	1.93	0.29	1.82	0.40	YES	YES	1.18	YES
006+00.00	007+00.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.042	0.28	1.78	0.26	1.67	0.35	YES	YES	1.22	YES
007+00.00	007+75.00	RT	0.00	1.50	3.00	3.00	2-EC-2 Ty2	2	0.045	NA	0.034	0.22	1.34	0.20	1.27	0.22	YES	YES	1.28	YES

Substation Ditch North

Hydrology

From Station	To Station	LT RT	Invert Upstream	Invert Downstream	Area 1 (acres)	C 0.9	Area 2 (acres)	C 0.5	Area 3 (acres)	C 0.3	Incr CA	Total CA	T_C 10 yr (min)	T_C 2 yr (min)	10 yr i (in/hr)	2 yr i (in/hr)	10 yr Q (cfs)	2 yr Q (cfs)
000+00.00	001+00.00	NA	393.15	391.95	0.40	0.90	0.11	0.50	0.00	0.30	0.416	0.416	5.00	5.00	7.06	5.44	2.94	2.26
001+00.00	002+00.00	NA	391.95	390.75	0.24	0.90	0.05	0.50	0.00	0.30	0.242	0.658	5.00	5.00	7.06	5.44	4.64	3.58
002+00.00	003+00.00	NA	390.75	389.55	0.35	0.90	0.05	0.50	0.00	0.30	0.335	0.993	5.00	5.00	7.06	5.44	7.01	5.40
003+00.00	004+00.00	NA	389.55	388.42	0.25	0.90	0.05	0.50	0.00	0.30	0.244	1.237	5.00	5.00	7.06	5.44	8.73	6.73
004+00.00	005+00.00	NA	388.42	387.40	0.51	0.90	0.07	0.50	0.00	0.30	0.498	4.484	5.00	5.00	7.06	5.44	31.66	24.40
005+00.00	006+00.00	NA	387.40	386.38	0.47	0.90	0.15	0.50	0.00	0.30	0.500	4.984	5.00	5.00	7.06	5.44	35.19	27.12
006+00.00	006+80.00	NA	386.38	385.50	0.25	0.90	0.12	0.50	0.00	0.30	0.280	5.264	5.00	5.00	7.06	5.44	37.17	28.65

Includes flow from internal drainage system

Ditch Geometry / Hydraulics

From Station	To Station	LT RT	Bottom B (ft)	Depth Y (ft)	Left Slope (H/V)	Right Slope (H/V)	Lining Type	Lining Width (ft)	n	Ditch Curve? R_d (ft)	Ditch Slope (ft/ft)	10 yr Depth (ft)	10 yr Velocity (ft/sec)	2 yr Depth (ft)	2 yr Velocity (ft/sec)	Tractive Force "τ" (lbs/ft^2)	Lining Adeq? (Max V)	Lining Adeq? (Max τ_{allow})	Free-board (ft)	Capacity Adeq?
000+00.00	001+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	6	0.045	NA	0.012	0.36	1.59	0.31	1.46	0.27	YES	YES	2.14	YES
001+00.00	002+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.012	0.47	1.84	0.41	1.71	0.27	YES	YES	2.03	YES
002+00.00	003+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	8	0.045	NA	0.012	0.58	2.08	0.51	1.93	0.33	YES	YES	1.92	YES
003+00.00	004+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	8	0.045	NA	0.011	0.68	2.19	0.58	2.02	0.35	YES	YES	1.83	YES
004+00.00	005+00.00	NA	4.00	3.00	3.00	3.00	2-EC-2 Ty2	12	0.045	NA	0.010	1.33	3.01	1.17	2.80	0.55	YES	YES	1.67	YES
005+00.00	006+00.00	NA	4.00	3.00	3.00	3.00	2-EC-2 Ty2	12	0.045	NA	0.010	1.40	3.09	1.23	2.89	0.57	YES	YES	1.60	YES
006+00.00	006+80.00	NA	4.00	3.00	3.00	3.00	2-EC-2 Ty2	12	0.045	NA	0.011	1.41	3.22	1.23	3.00	0.62	YES	YES	1.59	YES

Substation Ditch South

Hydrology

From Station	To Station	LT RT	Invert Upstream	Invert Downstream	Area 1 (acres)	C 0.9	Area 2 (acres)	C 0.5	Area 3 (acres)	C 0.3	Incr CA	Total CA	T_C 10 yr (min)	T_C 2 yr (min)	10 yr i (in/hr)	2 yr i (in/hr)	10 yr Q (cfs)	2 yr Q (cfs)
000+00.00	001+00.00	NA	398.52	395.84	0.04	0.90	0.14	0.50	0.00	0.30	0.11	0.11	5.00	5.00	7.06	5.44	0.76	0.59
001+00.00	002+00.00	NA	395.84	393.88	0.17	0.90	0.10	0.50	0.00	0.30	0.21	0.31	5.00	5.00	7.06	5.44	2.22	1.71
002+00.00	003+00.00	NA	393.88	392.88	0.20	0.90	0.08	0.50	0.00	0.30	0.22	0.53	5.00	5.00	7.06	5.44	3.76	2.90
003+00.00	004+00.00	NA	392.88	391.88	0.30	0.90	0.08	0.50	0.00	0.30	0.31	0.84	5.00	5.00	7.06	5.44	5.93	4.57
004+00.00	005+00.00	NA	391.88	390.88	0.20	0.90	0.05	0.50	0.00	0.30	0.21	1.05	5.00	5.00	7.06	5.44	7.40	5.70
005+00.00	006+00.00	NA	390.88	389.88	0.31	0.90	0.05	0.50	0.00	0.30	0.30	1.35	5.00	5.00	7.06	5.44	9.54	7.36
006+00.00	007+00.00	NA	389.88	388.88	0.26	0.90	0.05	0.50	0.00	0.30	0.26	1.61	5.00	5.00	7.06	5.44	11.38	8.77
007+00.00	008+00.00	NA	388.88	387.86	0.41	0.90	0.06	0.50	0.00	0.30	0.40	4.78	5.00	5.00	7.06	5.44	33.76	26.02
008+00.00	009+00.00	NA	387.86	386.81	0.05	0.90	0.58	0.50	0.00	0.30	0.34	5.12	5.00	5.00	7.06	5.44	36.14	27.85
009+00.00	010+00.00	NA	386.81	385.80	0.40	0.90	0.16	0.50	0.00	0.30	0.44	5.56	5.00	5.00	7.06	5.44	39.27	30.27
010+00.00	010+20.00	NA	385.80	385.50	0.00	0.90	0.02	0.50	0.00	1.30	0.01	5.57	5.00	5.00	7.06	5.44	39.36	30.33

Includes flow from internal drainage system

Ditch Geometry / Hydraulics

From Station	To Station	LT RT	Bottom B (ft)	Depth Y (ft)	Left Slope (H/V)	Right Slope (H/V)	Lining Type	Lining Width (ft)	n	Ditch Curve? R_d (ft)	Ditch Slope (ft/ft)	10 yr Depth (ft)	10 yr Velocity (ft/sec)	2 yr Depth (ft)	2 yr Velocity (ft/sec)	Tractive Force "τ" (lbs/ft^2)	Lining Adeq? (Max V)	Lining Adeq? (Max τ_{allow})	Free-board (ft)	Capacity Adeq?
000+00.00	001+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	5	0.045	NA	0.027	0.13	1.32	0.12	1.22	0.22	YES	YES	2.37	YES
001+00.00	002+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	6	0.045	NA	0.020	0.27	1.71	0.23	1.58	0.33	YES	YES	2.23	YES
002+00.00	003+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	7	0.045	NA	0.010	0.43	1.61	0.38	1.49	0.21	YES	YES	2.07	YES
003+00.00	004+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	8	0.045	NA	0.010	0.56	1.85	0.48	1.71	0.26	YES	YES	1.94	YES
004+00.00	005+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	8	0.045	NA	0.010	0.63	1.99	0.55	1.84	0.29	YES	YES	1.87	YES
005+00.00	006+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	9	0.045	NA	0.010	0.73	2.14	0.63	1.99	0.33	YES	YES	1.78	YES
006+00.00	007+00.00	NA	4.00	2.50	3.00	3.00	2-EC-2 Ty2	9	0.045	NA	0.010	0.79	2.24	0.69	2.09	0.35	YES	YES	1.71	YES
007+00.00	008+00.00	NA	4.00	2.80	3.00	3.00	2-EC-2 Ty2	12	0.045	NA	0.010	1.38	3.06	1.21	2.85	0.56	YES	YES	1.43	YES
008+00.00	009+00.00	NA	4.00	2.80	3.00	3.00	2-EC-2 Ty2	12	0.045	NA	0.011	1.38	3.12	1.22	2.91	0.58	YES	YES	1.42	YES
009+00.00	010+00.00	NA	4.00	2.80	3.00	3.00	2-EC-2 Ty2	13	0.045	NA	0.010	1.48	3.17	1.30	2.96	0.59	YES	YES	1.33	YES
010+00.00	010+20.00	NA	4.00	2.80	3.00	3.00	2-EC-2 Ty2	12	0.045	NA	0.015	1.34	3.66	1.18	3.41	0.81	YES	YES	1.46	YES

REVISIONS

REV	DATE	DESCRIPTION

Dewberry
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060; (p) 804.290.7957

COMMONWEALTH OF VIRGINIA
KEITH A. SCHOLTEN
Lic. No. 036569
8/18/23
PROFESSIONAL ENGINEER

DEWBERRY PROJECT NO.: 50157950

Dominion Energy

DRAINAGE CALCULATIONS

UNITY SUBSTATION
LUNENBURG COUNTY VIRGINIA

OPERATIONAL REGION		B/M No.		SCALE	
PROJECT	NAME	DATE	SHEET: 1707908-C-902		
DESIGNER	MFR	8/18/23			
PROJECT ENGINEER	GA	8/18/23	DRAWING: 1707908-C-902.dwg		
APPROVED BY	KAS	8/18/23			