Pivot Energy

Date:04/04/2024

Re: Conditional Use Permit Application for: 200 Folly, LLC – VAL028 Folly Road Project

Dear Members of the Board of Supervisors:

We are reaching out to formally resubmit our application for a Conditional Use Permit (CUP) for the proposed VAL028 – Folly Road Project (Project) in Northumberland County, Virginia. This resubmission follows the denial of our initial application on March 9th, 2023.

Our decommissioning plan includes procedures for the removal of solar panels and related infrastructure at the end of the project's life cycle. A dedicated fund has been established to cover decommissioning costs, ensuring that the site will be restored to its original condition. Soils investigation has been conducted to assess soil quality and suitability for solar panels. Soil mitigation measures have been implemented including erosion control, sediment management, and soil stabilization techniques. Strategic planning of landscape buffer screens around the perimeter of the site serves a dual purpose of obscuring the view of the solar panels from neighboring properties and enhancing the natural landscape.

In light of these updates, we kindly request the Board's reconsideration of our CUP application. Our proposed solar energy site both contributes to a cleaner environment and provides economic benefits to the community.

Additionally, if you have any questions or comments concerning this package, please feel free to contact me at 570-847-7555 or via email at rhickox@pivotenergy.net.

Sincerely,

Robert B. Hickox, III, M.S.
Project Developer

APPENDIX A – SUPPLEMENTARY DOCUMENTATION FOR CONDITIONAL USE PERMIT

MODULE 1: PROJECT DESCRIPTION
MODULE 2: PRELIMINARY SITE PLAN PACKAGE
MODULE 3: STORMWATER MANAGEMENT PLAN
MODULE 4: MAJOR WATER QUALITY IMPACT ASSESSMENT
MODULE 5: 200-FOOT SETBACK REDUCTION NARRATIVE
MODULE 6: EMERGENCY RESPONSE PLAN
MODULE 7: DECOMMISSIONING PLAN

Module 1: Project Description

Pivot Energy

Conditional Use Permit Application for: 200 Folly, LLC

(Part of Pivot Energy, LLC)

VAL028- Folly Road Project

Pivot Energy
1601 Wewatta St., # 700
Denver, CO 80202

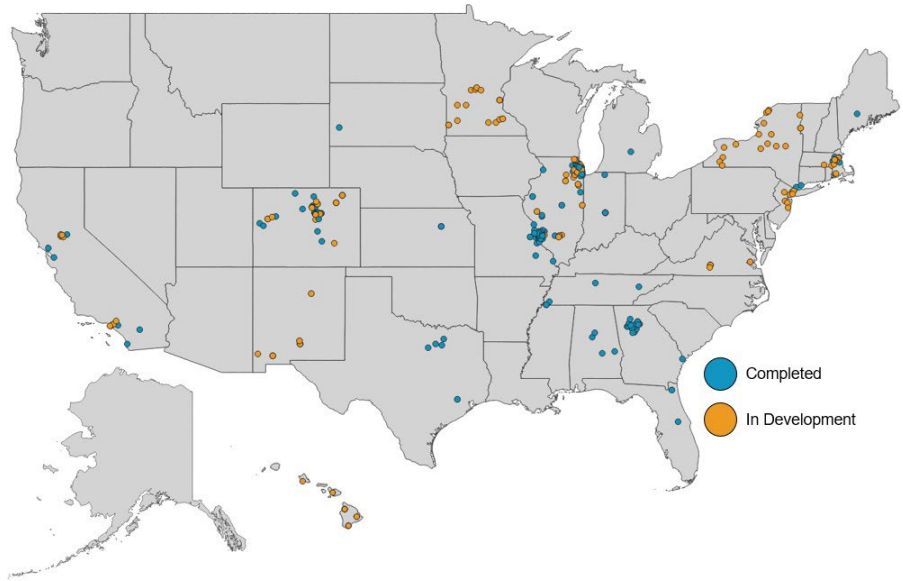
Executive Summary

Elk Development, LLC, a holding company of, Pivot Energy is pleased to apply for a Conditional Use Permit (CUP) from Northumberland County for 200 Folly, LLC's VAL028- Folly Road Project (aka: Folly Rd.) (the Project). This Project represents a small, solar photovoltaic (PV) facility of three (3) megawatts in capacity as measured in alternating-current (AC). The proposed project is located at 15531 Northumberland HWY, Burgess, Virginia. The subject parcel is identified as tax parcel 27-1-304, 27-1-304A, & 27-1-304B owned by Steven Jett. The site is to be accessed off Northumberland Highway, at the intersection of US-360 and SR-646. The parcels total 36.818 acres in size, and the project will encompass 14.87 acres of the parcel (fenced area).

This project will positively impact the local community by employing local labor, decarbonizing the local grid, offering a discount to local subscribing Dominion customers, and providing increased resources to the County over the life of the project. Pivot's lead developer on this project, Robert Hickox, has previous experience permitting similar solar projects in Virginia. With a strong development and customer relationship background in small utility, commercial, and community solar projects, Pivot continues to expand its offerings throughout the solar industry by working with low-income communities, residential renters and homeowners, agricultural customers, local businesses, & local government organizations.

Prior Solar Development Success:

Recently Completed and Ongoing Projects



Project Design

200 Folly, LLC seeks to develop a solar facility with a collective nameplate capacity up to 3MWac. The clean energy generated by the solar array will be sold and delivered to Dominion Energy's grid (the Grid) at 12kV, 3 phase distribution line running diagonally through the parcel. The Project is designed to be a community solar project that would offer a discount to local Dominion customers on their utility bill once operational. 200 Folly, LLC will be wholly own, operated, and maintained by Pivot Energy, a distributed power provider. The system will be installed at 15531 Northumberland HWY in Northumberland County. The subject parcel is identified as tax parcel 27-1-304, 27-1-304A, & 27-1-304B owned by Steven Jett. The site is to be accessed off Northumberland Highway, at the intersection of US-360 and SR-646. The parcels total 36.818 acres in size, and the project will encompass 14.87 acres of the parcels.

200 Folly will be comprised of approximately 7,770 solar PV panels from Tier 1 manufacturers. Elk Development and Pivot Energy only uses crystalline solar panel using silicon and inert borophosphosilicate glass on their solar facilities. These panel are recyclable and do not have the potential toxic effects of cadmium-telluride panels (CDTe).

Standard additional equipment includes single axis tracker components, DC to AC inverters, medium-voltage transformers and control cabinets, project switchgear, meters, and the attachment facilities to the current local grid.

These panels will be mounted to a single-axis tracking (SAT) system designed to maximize the panel production by following the rising and setting of the sun. This SAT system includes linked horizontal steel support beams known as torque tubes, with a centrally located drive train system. The rows will be 22 feet apart (center-to-center) and the square footage of the panels will account for approximately 24% of the total Project acreage. The racking system will be affixed to pile-driven metal beams at a depth of approximately 10 feet. At full tilt, the maximum height of any panel will be under fifteen feet (15').

The solar panels in each row will be wired together into a circuit. There will be a DC to AC string inverter for approximately every 3 rows, typically mounted on a piling adjacent to the tracker structure. Once the inverter converts the panels DC power to AC, this power will be transmitted from the string inverters via three-phase direct-buried cables (at a depth of approximately 4.5 feet) and aggregated at the AC collection switch gear before moving to the medium-voltage transformer. This transformer will be mounted on a concrete slab alongside project switchgear and control cabinet. After the transformer steps up the electric power voltage to match the existing Grid, the power is transmitted to the Project's protective recloser and metering equipment before connecting with Dominion's powerlines.

An internal access drive made from all-weather aggregate base will provide access to the array. This Site access will be restricted by a perimeter security fence in compliance with Federal and State regulations. Manual swing gates will be built at the main entrance and other required entry points as determined by maintenance crews and/or safety personnel. National Electric Code Standards for safety and signage will be met or exceeded.

The project will be obscured from view by providing fence and using natural and planted vegetative buffers will meet or exceed the standards outlined by the Northumberland's ordinance.

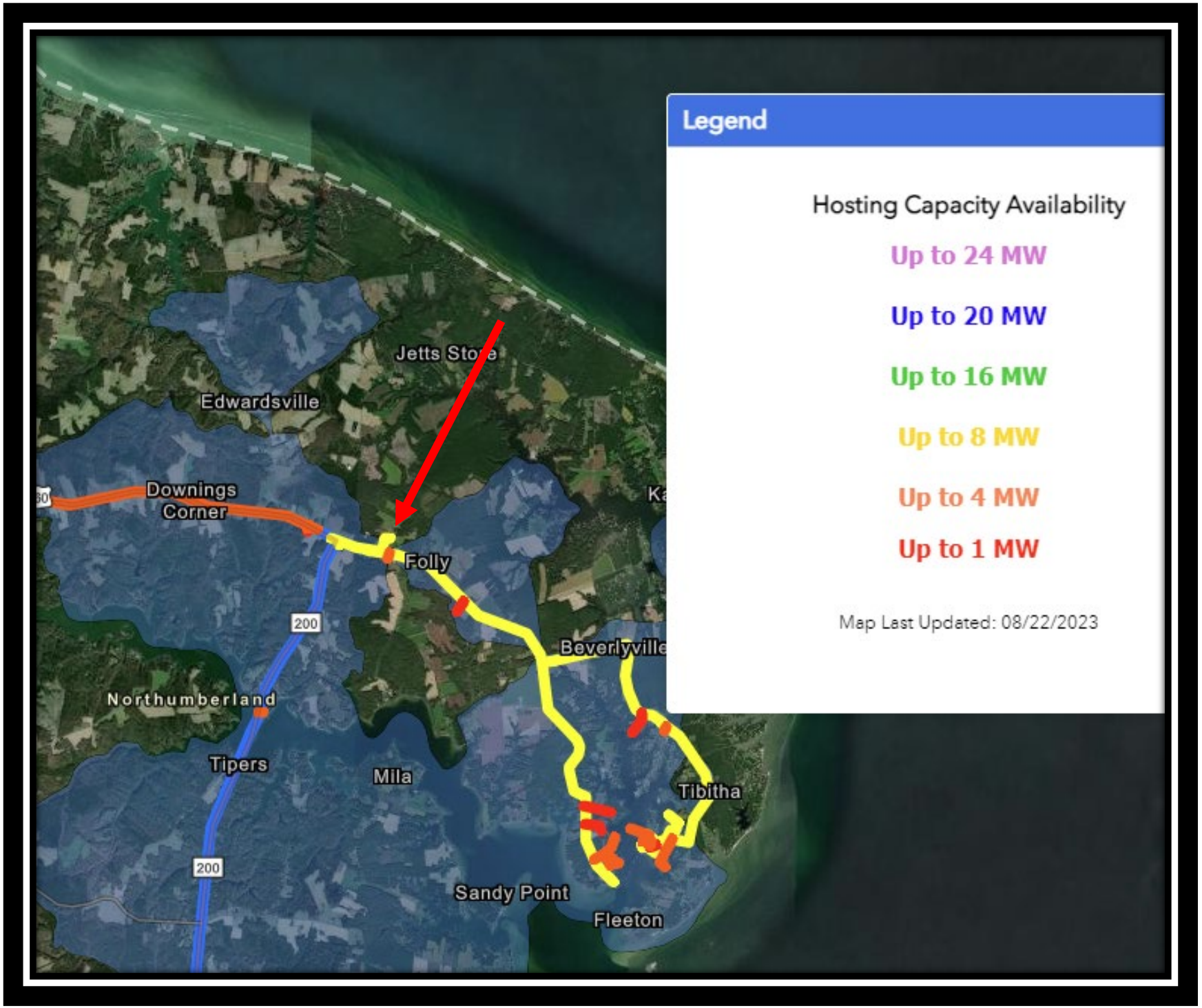
Siting

Pictured below is a map of the majority of Northumberland County showing Dominion's electrical service area and infrastructure. 200 Folly is referenced by the red arrow, which is within a small band of dominion's territory and the Northern-Neck Co-Op's territory just north of the project. As with any type of development in an area there are always concerns about why a particular site was chosen and why is that an ideal location. The follow traits are considered in the site selection:

- Is the site buildable with minimal earth work/ grading?
- Is the site in Dominion territory? (Dominion owes all the transmission lines in the County, co-ops flow through them)
- Can the existing 3-phase transmission lines support the facility?
- What is the capacity of the connecting substation? (across the Great Wicomico River)

The County will see further in our application narrative that the site is indeed buildable and of low impact to the surrounding area. The site also meets the other three desired criteria of being with the Dominion Service territory (the blue outlines pictured below) and is directly served by 8MW capacity transmission lines (pictured in yellow) flowing to a 20MW line (blue), and ultimately ending at the substation. Also, this same 20MW line carries all the electricity into Northumberland County. Each substation can only host a specific amount of power and while Pivot will be paying Dominion to upgrade this substation, only a finite amount of work can be done and still make for an economically viable project. This substation in particular has the remaining capacity to support 7.6 MW of electricity. The 200 Folly Project and Pivot's other neighboring Project (Old Glebe) intend to use 6 MW combined, once approved.

Pivot understands that many communities have concerns about solar facilities "taking over" the landscape and the rural nature of the County. We have reviewed the layout of the electrical grid in Northumberland County showing the solar facilities are limited to Richmond Rd./ Northumberland Hwy (US360), Jesse Dupont Memorial Hwy (VA200), Hampton Hall Rd. (VA202) due to the availability of the 3-phase transmission lines. This coupled with the reduced Dominion service territory (also following those roads) and the already limited capacity of the substation, would mean that Northumberland County could never become overrun with solar facilities. An approval of this Project would almost certainly limit any further near to medium term solar development in the County.


Legend
Hosting Capacity Availability
Up to 24 MW
Up to 20 MW
Up to 16 MW
Up to 8 MW
Up to 4 MW
Up to 1 MW
Map Last Updated: 08/22/2023
Jetts Store
Edwardsville
Downings Corner
Folly
200
Beverlyville
Northumberland
Tipers
Mila
Tibitha
200
Sandy Point
Fleeton

Environmental Impact

Land Use

The project area is currently agricultural field and an existing rock barrow area. The site fronts on 200 Folly Rd (VA-646) to the east and Northumberland Highway (US-360) to the south. Existing utilities onsite are unknown. Overhead power lines are located along the adjacent public roadways.

Topography

The site topography can be described as gently rolling hills with grassy fields and wooded areas. The site predominately slopes gently southwest, transitioning from elevated terrain to flatter sections in the middle, and steepening near the western side. Public LiDAR contours were sourced rather than conducting a topographic survey. The streams and wetlands within the project area were delineated by The Thrasher Group, Inc. in July 2022. The vertical datum used is the North American Vertical Datum 1988 (NAVD 88). The horizontal datum is the North American Datum 1983 (NAD 83), Virginia State Plane Coordinate System.

Soils

The soil delineation for this project was completed using the United States Department of Agriculture Natural Resource Conservation Service Web Soil Survey. Soil types expected within the subject parcel include Suffolk fine sandy loam (B), Sassafras fine sandy loam (B), Sloping sandy land, and Steep sandy land. Of these, Type B soils have a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained, or well drained soils that have moderately fine texture to moderately course texture. These soils have a moderate rate of water transmission. Soils such as Sloping sandy land and Steep sandy land fall outside of the standard Hydrologic Soil Group classification system.

As indicated by the Virginia Department of Energy geological mapping, the site is underlain by the Windsor Formation (QTw). The Windsor Formation varies from 0-40 feet thick and consists of interbedded gravel, sand, silt, and clay.

Wetlands & Receiving Waters

Pivot Energy has engaged a qualified environmental professional to conduct a field delineation to confirm that the site is designed away from the few identified, isolated wetlands to ensure no negative environmental impact. A summarized copy of this report is included in our application packet. Runoff from the subject parcel drains to Davis Mill Run. Two unnamed ponds are located on the parcel. Davis Mill Run flows along the western edge of the property. Davis Mill Run is a tributary of Little Wicomico River Watershed in the Potomac River basin.

Wildlife Habitats

Coordination with various state and federal agencies determined no adverse impacts to threatened or endangered species are anticipated as a result of the project. Refer to the Threatened and Endangered Species Assessment prepared by The Thrasher Group, Inc., Inc for additional information.

Cultural and Historical Resources

A Phase I Cultural Resources Survey was completed by Weller & Associates, Inc. in 2021. No previously recorded archaeological nor architectural sites are located within the project area. No new isolated archaeological finds or new archeological sites were identified. No new architectural resources were identified within the project area. Four historical resources located within
0.5 miles of the project were considered eligible or potentially eligible for listing in the NRHP. Refer to the Cultural Resource Assessment prepared by Weller & Associates, Inc. for additional information.

State Agency Diligence

Before solar projects in Virginia can begin construction, they must be vetted by the Virginia Department of Environmental Quality (VADEQ) regulation process in the form of permits by rule (PBR). This state-level oversight ensures that conditions and standards necessary to protect the Commonwealth's natural resources are met by a proposed project. This review, in coordination with the Virginia Department of Historic Resources, the Virginia Department of Wildlife Resources, and the Virginia Department of Conservation and Recreation analyze the proposal for potential impacts on wildlife, historic resources, prime farmland, and environmental impact.

The thorough diligence involved in securing VADEQ's PBR—and any subsequent mitigation measures required—offer strong protection for localities considering a project like ours. The land use decision within our CUP application is only the first of many steps a project must satisfy before submitting for a building permit.

Construction

Construction of the solar energy system, including access road and interconnection to the electric grid, is to occur in one phase. The project is anticipated to take 6 months to complete. Construction is scheduled to start in Q2 2025. Finish date is anticipated to be in Q4 2025. This schedule is based on the latest available information. Actual dates may vary based on regulatory requirements, weather, and other unforeseen issues. It is anticipated that onsite work will be conducted during the standard workweek (Monday through Friday) when workers will be onsite from 7:00AM to 5:00PM (10 hours). In the event of inclement weather, missed weekdays may be occasion made up on Saturdays to maintain construction schedules.

Construction activities associated with the project include establishing access, material delivery and storage, loading and hauling, construction of racking system with driven posts for foundations, mounting of solar modules, construction of equipment pads, installing equipment, trenching underground cable ductbanks, backfill and compaction, installing utility poles and aerial power lines, installing security fencing, and revegetation.

Construction of the solar energy system and site appurtenances is to occur in sections to limit disturbed area. The following is a general estimation of duration of the activities associated with the project. Some will occur simultaneously as work progresses. Estimated timing of the construction activities are as follows:

- Before any work begins the soils will be tested for contamination and to establish a baseline for subsequently periodic testing during the operational life of the project.
- Sediment control devices are to be installed in each area before any upslope earth disturbance commences. It is anticipated installing the sediment control devices will take approximately 1 week.
- Access road construction is anticipated to take roughly 1 week.
- Construction of the racking system and installation of solar modules will take approximately 4 months.
- Construction of the equipment pad and installation of equipment will take approximately 3 weeks.
- Trenching and cable installation will take approximately 6 weeks.
- Installing the poles and overhead power lines, including the interconnection, will take approximately 2 weeks.
- Final restoration, including seeding and mulching, is to be completed immediately as improvements are finished in each area. It is anticipated final restoration will take approximately 2 weeks.
- Sediment control devices are to be removed once the upslope area has been permanently stabilized. This should take less than 1 week.

Operations and Maintenance

After construction is complete, we anticipate minimal site access requirements for Project maintenance activities. At a minimum, the Project will undergo two annual preventative maintenance checks, once in the spring (~April) and once in the fall (~August). While all products installed on site are of the highest quality per industry standard testing practices & classifications, occasional dispatch to site may be required to correct outages on an as-needed basis. Corrective activities such as this may add two to four site access instances each year.

As the long-term owners & operators of the proposed Project, our team will also actively monitor site performance 24/7 and will address any issues in a timely manner. Based on performance impact, our contracted O&M providers will respond within 24, 48, or 72 hours depending on the outage type. Our sites are unmanned regularly unless maintenance is required, which would occur between Monday – Friday from 8 AM – 5 PM. Additionally, Pivot will provide for periodic soil testing to verify the environmental health of the soil during operation and share the Date with the County.

Average rainfall in the County of 200 Folly Rd. anticipated to be adequate for natural cleaning of the panels. Vegetative ground cover will be managed during the growing season in compliance with local requirements, including but not limited to land use permit specifications, water management plans, and site access agreements.

Solar Grazing – Vegetative Maintenance through Dual Ag Use

“Solar Grazing” is a method of vegetation control for solar sites that utilizes livestock. Sheep are best

suited due to their size and grazing behavior. Ground cover is established with a “Fuzz and Buzz” mix that is conducive to grazing as well as pollinating. Projects such as the proposed 200 Folly Rd. would contract with local sheep farmers to move onto site in the Spring, care for them during grazing season, and move off site in the Winter. Sheep are excellent at grazing under panels where mowing is more labor intensive. The perimeter fence protects sheep from predators and solar panels provide shelter from rain, wind, and direct sun on hot days.

Pivot Energy has established a partnership with United Agrivoltaics to help lead our Solar Grazing initiatives. With a network of sites across the country and partners in Solar Grazing since 2015, United Agrivoltaics will assist Pivot Energy in a vegetative maintenance plan for this dual use.

Additionally, Pivot is currently evaluating dual harvest crop production on all of our portfolio sites. Depending on site characteristics, tenant farmer availability. Pivot seeks to prioritize crops for hay/alfalfa production, herbs, or cover crop mixes.

Impacts and Mitigations

Water – No on-site source of potable water will be required during construction or operations for 200 Folly Rd.. If any on-site water source is required during construction or operation, it will be supplied by the host Project and sourced offsite. No new well will be dug for this project.

Sound – The majority of sound associated with the proposed Project will occur during construction. This is expected to be the result of material deliveries to the Property and support beam installation for the array. Impacts from noise are mitigated from a selected site that has few abutting neighbors and restricted hours of construction operations.

Once operational, 200 Folly Rd. will be practically inaudible. At a distance of 3ft from the security fence, our inverters and racking equipment create a sound comparable to a home HVAC unit. These sound measurements fall to less than 50dB at only 50ft from the perimeter—equivalent to background noise in the County.

Glare – No glare hazard is expected during construction or operations. Our Tier I panels are treated with anti-glare coating and are designed to absorb as much sunlight as possible. The setbacks and robust vegetative screening from neighbors will further obscure any visual impact of the proposed Project.

Odor – Our EPC team will store, collect, and dispose of any solid construction material waste to prevent any odors from the Site, mitigating any impact on neighboring properties. No detectable odors are produced from the solar array components during operations.

Dust – Possible dust occurrence during operations is most likely to result from delivery or construction trucks on the Site. This will be mitigated by spraying water on dry dirt and enforcing a 5 MPH speed limit within the construction area. Minimal vehicle or foot traffic during operations and vegetative groundcover will naturally mitigate against concerns for dust.

Security and Access – The perimeter fence around the array will be no taller than 8 feet in height and contain no barbed wire. This fence will be black or another neutral color with final design approval to be sought from the Planning Director. The gates within the fence will remain locked while access will be coordinated through our operations and maintenance personnel. Our Site will provide a "Knox Box" to provide 24/7 access for local emergency personnel. The Applicant will ensure suitable access from Pocket Road is maintained for fire or other emergency vehicles.

Soil Quality – soils sample will be taken before construction begin to establish the baseline soil health and sampled every 2-5 years at the county's direction to ensure the no soils contamination has occurred and to allow for any remediation in the event of any contaminations results.

Removal

At the end of the Project's life, it will be decommissioned and removed from the Property. Formal notice of end of operations will be sent to County via Certified Mail. The Project will then be completely removed from the Property and reasonably restored to previous condition within 365 days of receipt of notice. 200 Folly Rd. would expect County approval of our decommissioning plan—to include posting of surety funds—prior to building permit issuance. We have included a preliminary decommissioning cost estimate in our submission.

• Site preparation	$13,500
• Equipment removal	$442,100
• Site Restoration	$405,200
• Waste disposal/recycling	$23,300
Total	$884,100
• Equipment Salvage	($739,100)
Net Cost	$145,000

Please note that the repurposing of solar panels ,etc. will greatly offset the final net costs.

Typical for solar projects, a decommissioning bond will be sought to ensure the site and be reclaimed to it prior state. At the County's request the decommissioning g funds can be allocated upfront via an escrow account, listing the County as covered party.

Economic Development

Jobs

To the extent possible, 200 Folly Rd. will source local materials and labor for the construction and
maintenance of the project. We estimate that this project will create approximately 30 new construction positions and 1-2 operations positions. Operations jobs will be focused on facility upkeep with responsibilities such as vegetation management, equipment repair, and component maintenance. Typical cadence for site maintenance is every two to three months.

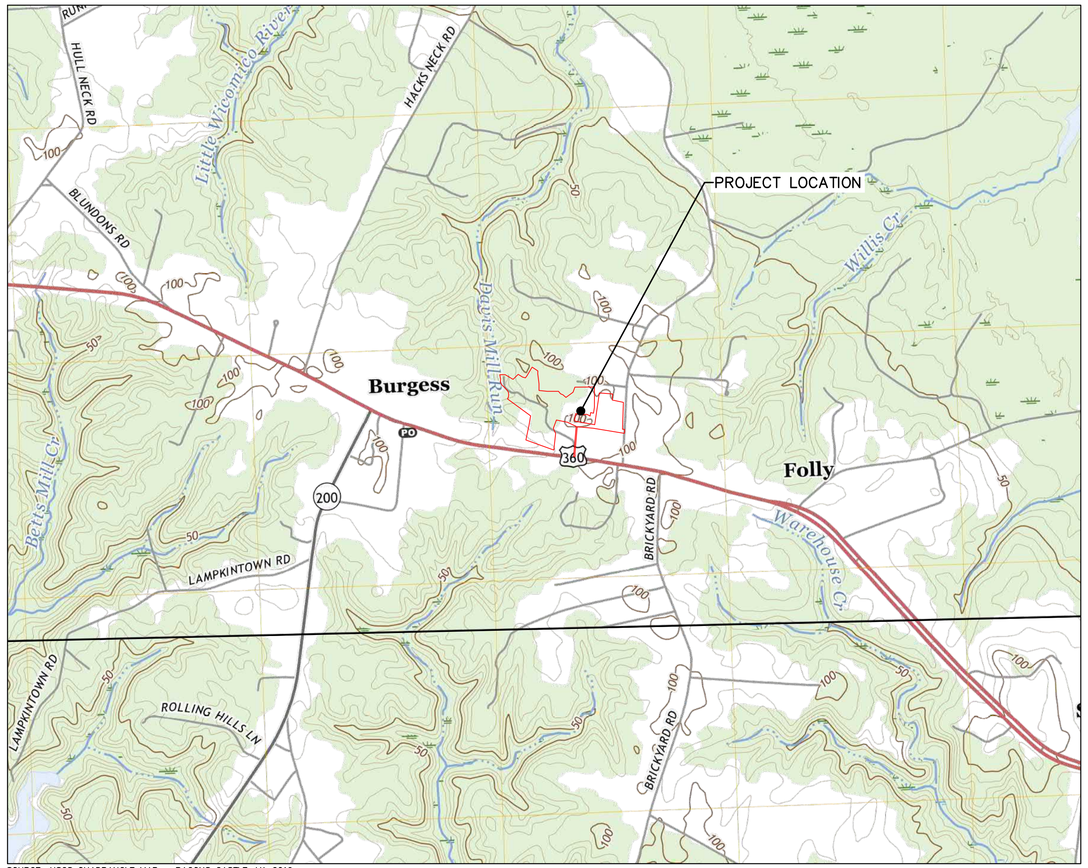
Increased County Revenue

Additionally, this project's lease revenue would provide direct fiscal benefit to the County. This has been outlined in a recent studies conduct in neighboring Counites for similarly sized projects. Benefits from the Couple Hwy project to the County are approximated to be:

- Considering the per diem spending of the construction workers, the total estimated one-time impact on Isle of Wight County would support approximately: 1) 3 jobs, 2) $98,000 in wages and benefits, 3) $180,500 in economic output, and 4) $24,000 in state and local tax revenue.
- Taxation of capital investments associated with the project would be approximately $3,500 in the project's first year of operation, with that figure projected to increase to approximately $7,000 in year 11 of the project as the value of the exemption is reduced for a cumulative total of approximately $300,000 over 25 years and approximately $425,000 over 35 years.
- The county real estate tax revenue from the fenced-in acreage after reassessment is estimated to be approximately $3,000 per year, for a cumulative total of approximately $75,000 over a 25-year operational life and approximately $105,000 over a 35-year operational life.

Module 2: Preliminary Site Plan Package

INCLUDES LANDSCAPE PLAN, EROSION AND SEDIMENT CONTROL PLAN, AND ENVIRONMENTAL SITE ASSESSMENT PLAN



SOURCE: USGS QUADRANGLE MAP – BACONS CASTLE, VA 2019

VICINITY MAP

1000 0 1000 2000

SCALE: 1" = 1000'

CONDITIONAL USE CONCEPT PLAN

VAL-028 SOLAR PROJECT

NORTHUMBERLAND COUNTY, VIRGINIA

GENERAL NOTES

1. SOLAR PANEL AND ELECTRICAL LAYOUT AND DESIGN PROVIDED BY PIVOT ENERGY, 6865 DEERPATH ROAD, STE 330, ELKRIDGE, MD 21075. 410-779-9377
2. SITE PLANS AND DESIGN PERFORMED BY DAWOOD ENGINEERING, INC., 11 GRANDVIEW CIRCLE, SUITE 116, CANONSBURG, PA 15317, 855-432-9663.
3. THE DEVELOPER SHALL COMPLY WITH ALL APPLICABLE COUNTY ORDINANCES IN EFFECT AT TIME OF SUBMISSION OF THE PLAN.
4. SITE DEVELOPMENT PLAN APPROVAL DOES NOT RELIEVE THE OWNER FROM ALL APPLICABLE SIGN REGULATIONS. ALL PROPOSED ON-SITE SIGNAGE SHALL CONFORM TO THE COUNTY ORDINANCES.
5. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO COMMENCING CONSTRUCTION. ANY DISCREPANCIES FOUND BETWEEN THE DRAWINGS AND SITE CONDITIONS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER IN WRITING.
6. NOTHING SHALL BE PLACED, PLANTED, SET OR PUT WITHIN THE AREA OF ANY EASEMENT THAT WOULD ADVERSELY AFFECT THE FUNCTION OF THE EASEMENT OR CONFLICT WITH THE EASEMENT AGREEMENT.
7. ALL EXISTING UTILITIES HAVE BEEN SHOWN IN ACCORDANCE WITH THE AVAILABLE INFORMATION. ACTUAL LOCATIONS MAY VARY FROM THOSE SHOWN. ADDITIONAL UTILITIES MAY BE ENCOUNTERED.
8. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL ABOVE AND BELOW GROUND UTILITIES AND STRUCTURES AND WILL BE RESPONSIBLE FOR THE PROTECTION OF THESE UTILITIES AND STRUCTURES AT ALL TIMES.
9. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE EXISTING UTILITIES AND MAINTAIN UNINTERRUPTED SERVICE. ANY DAMAGE DUE TO THE CONTRACTOR'S NEGLIGENCE SHALL BE REPAIRED IMMEDIATELY AND COMPLETELY AT HIS EXPENSE.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING A COPY OF ALL PERMITS RELATED TO THE CONSTRUCTION SHOWN ON THESE PLANS ON THE JOB SITE AT ALL TIMES.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK ZONE TRAFFIC SAFETY AS MANDATED BY DOT, OSHA, DEQ AND OTHER AGENCIES.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF CONSTRUCTION AND DEMOLITION WASTE MATERIAL.
13. CONTRACTOR SHALL DEVELOP A PLAN FOR CONSTRUCTION TO AVOID DIRECT IMPACT TO ANY OF THE HISTORICAL RESOURCES IDENTIFIED. IN ADDITION, SHOULD ANY ARCHAEOLOGICAL ARTIFACTS BE DISCOVERED DURING CONSTRUCTION THE LANDOWNER SHALL BE NOTIFIED IMMEDIATELY. THE LANDOWNER SHALL CONSIDER USING THE ISLE OF WIGHT COUNTY MUSEUM AS A REPOSITORY FOR DISCOVERED ARTIFACTS.
14. PERIODIC INSPECTIONS OF THE LAND DISTURBING ACTIVITIES SHOULD BE PERFORMED IN ACCORDANCE WITH SECTION 4VAC50-30-60 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS. RECORDS OF INSPECTIONS AND MAINTENANCE ACTIVITIES MUST BE MAINTAINED ON SITE.

ENVIRONMENTAL/SURVEY NOTES

1. EXISTING CONTOURS, BASE MAPPING, AND PROPERTY LINES SHOWN ARE BASED UPON A COMBINATION OF AERIAL PHOTOGRAPHY, LIDAR DATA, AND FIELD SURVEY BY THE THRASHER GROUP INC IN JULY 2021.
2. ENVIRONMENTAL FEATURES SHOWN ARE BASED UPON FIELD DELINEATION PERFORMED BY THE THRASHER GROUP, INC. IN JULY 2021.
3. SOILS ASSESSMENT DATA WAS OBTAINED FROM THE USDA SOIL SURVEY OF NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA.
4. ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE ONLY AND ARE BASED UPON SURFACE FEATURES AND RECORD DRAWINGS PROVIDED. LOCATIONS OF UNDERGROUND UTILITIES AND STRUCTURES MAY VARY FROM LOCATION SHOWN HEREON. ADDITIONAL BURIED UTILITIES AND STRUCTURES MAY BE ENCOUNTERED.
5. THE SITE IS NOT SITUATED WITHIN A FLOOD HAZARD AREA ACCORDING TO FEMA FLOOD INSURANCE RATE MAP PANEL NUMBER 51133C0140G, EFFECTIVE DATE 12/30/2021.
6. VERTICAL CONTROL IS BASED ON NAVD 88 GEOID 18.
7. HORIZONTAL CONTROL IS BASED ON VIRGINIA STATE PLANE COORDINATE SYSTEM-SOUTH ZONE, NAD 83 (2011).

LEGEND

(TYPICAL ALL PLAN SHEETS)

- Parcel Boundary Line
- Legal Right-Of-Way Line
- Center Line
- Edge Of Bituminous Paving
- Edge Of Gravel
- Curb
- Fence Line
- Guide Rail
- Building Line
- Tree Line
- Overhead Electric Line
- Underground Electric Line
- Overhead Telephone Line
- Underground Telephone Line
- Overhead Cable TV
- Underground Cable TV
- Water Line
- Sanitary Sewer Line
- Gas Line
- Storm Sewer Line
- Water Edge / Stream
- Wetlands
- Water Resource Area of Investigation
- Limit of Disturbance
- Soil Type and Limits
- Existing Minor Contour
- Existing Major Contour
- Proposed Cut Limit
- Proposed Fill Limit
- Proposed Minor Contour
- Proposed Major Contour
- Proposed Silt Fence

Visit va811.com Dig With CARE

CALL 811 BEFORE YOU DIG
ALLOW REQUIRED TIME FOR MARKING
RESPECT THE MARKS
EXCAVATE CAREFULLY

THE VIRGINIA UNDERGROUND UTILITY DAMAGE PREVENTION ACT, AS AMENDED, REQUIRES THREE BUSINESS DAYS NOTICE TO UTILITIES BEFORE YOU DIG, DRILL, OR BLAST. DIAL 8-1-1 OR 1-800-552-7001 NOT LESS THAN 3 BUSINESS DAYS NOR MORE THAN 15 BUSINESS DAYS PRIOR TO THE EXCAVATION OF A WORK AREA.

PLAN SHEET INDEX:

NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	DESCRIPTION

DOCUMENT PREPARED BY:

DAWOOD
11 Grandview Circle, Suite 116, Canonsburg, PA 15317
t: 724.746.0730 www.dawood.llc

SCALE:

DOCUMENT PREPARED FOR:

ELK DEVELOPMENT, LLC

6865 DEERPATH ROAD, SUITE 330
ELKRIDGE, MD 21075
410-779-9377

CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE

COVER SHEET

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JOHN T. PRICE ENGINEER PE081408

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-T1
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	C1

O:\2022\08S\2200547-05\LD\CAD\SKETCH\DRAWINGS\2200547.05-LD-SK-T1
June/23/2024 9:27 PM

REVISIONS

NO.	DATE	DESCRIPTION

DOCUMENT PREPARED BY:

DAWOOD
11 Grandview Blvd, Ste 116, Connellsville, PA 15377
t: 724.746.0730 www.dawood.tc

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

DOCUMENT PREPARED FOR:

ELK DEVELOPMENT, LLC
6865 DEERPATH ROAD, SUITE 330
ELKRIDGE, MD 21075
410-779-9377

CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE
EXISTING CONDITIONS SITE PLAN

COMMONWEALTH OF VIRGINIA — REGISTERED PROFESSIONAL ENGINEER — JOHN T. PRICE, P.E. — PE0401458

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-EC
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	C2

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PRE-DEVELOPMENT HABITAT TYPES	
DESCRIPTION	AREA (AC)
LOBLOLLY PINE DOMINANT	6.84
HARDWOOD AND SHRUBBY UNDERSTORY	1.26
HARDWOOD DOMINANT	1.36
OPEN HERBACEOUS AREAS/MAINTAINED LAWN	8.30
LOW-INTENSITY DEVELOPMENT	2.39
TOTAL LIMITS-OF-DISTURBANCE	20.13

LEGEND

- LOBLOLLY PINE DOMINANT
- HARDWOOD & SHRUBBY UNDERSTORY
- HARDWOOD DOMINANT
- OPEN HERBACEOUS AREAS/ MAINTAINED LAWN
- LOW-INTENSITY DEVELOPMENT

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NO.	DATE	REVISIONS: DESCRIPTION

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ELKRIDGE, MD 21075
410-779-9377

CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE
PRE-DEVELOPMENT HABITAT TYPES

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-EN
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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
JOHN THOMAS PAGE
PE081456

PRE-DEVELOPMENT EXISTING TREE COVER	
DESCRIPTION	AREA (AC)
TREE 6-IN DIAMETER OR GREATER	7.60
NON-FORESTED AREA	11.87
IMPERVIOUS AREA	0.66

LEGEND

- TREE 6-IN DIAMETER OR GREATER
- NON-FORESTED AREA
- IMPERVIOUS AREA

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE

EXISTING TREE COVER

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-TR
DRAWN BY	JWY
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TREE CLEARING SUMMARY	
DESCRIPTION	AREA (AC)
TOTAL TREE COVER IN LIMIT-OF-DISTURBANCE	7.60
TREE CLEARING FOR FOOTPRINT	5.84
TREE CLEARING FOR SHADE RELIEF	1.76
TREE CLEARING WITHIN RPA BUFFER	0.00

LEGEND

- TREE CLEARING FOR FOOTPRINT
- TREE CLEARING FOR SHADE RELIEF

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE
TREE CLEARING SUMMARY

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-TC
DRAWN BY	JWY
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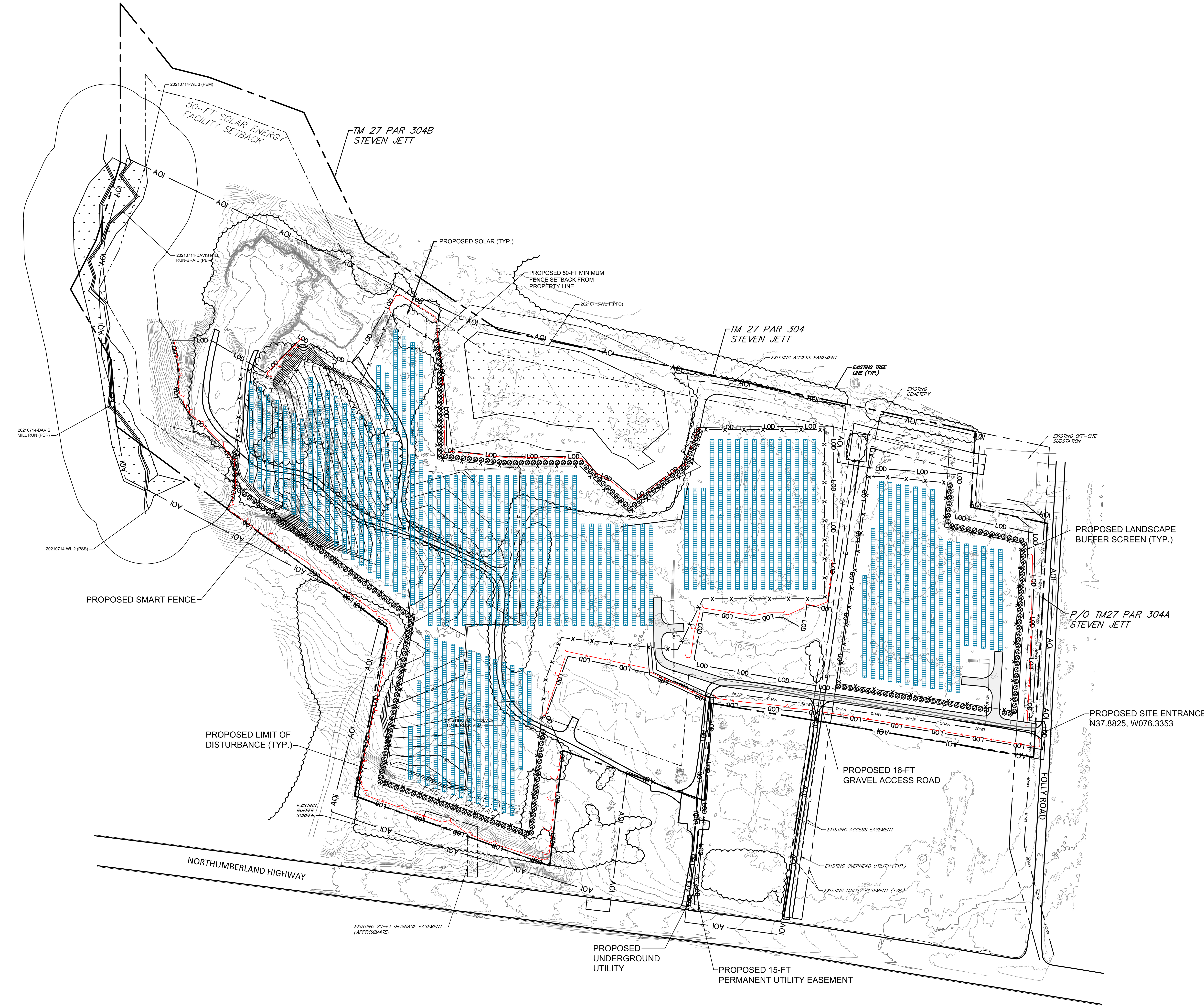

LEGEND

SF — PROPOSED SILT FENCE

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CONDITIONAL USE PLAN FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

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EROSION & SEDIMENT CONTROL PLAN

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-ES
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	C6

COMMONWEALTH OF PENNSYLVANIA
JOHN T. PESTE
PROFESSIONAL ENGINEER

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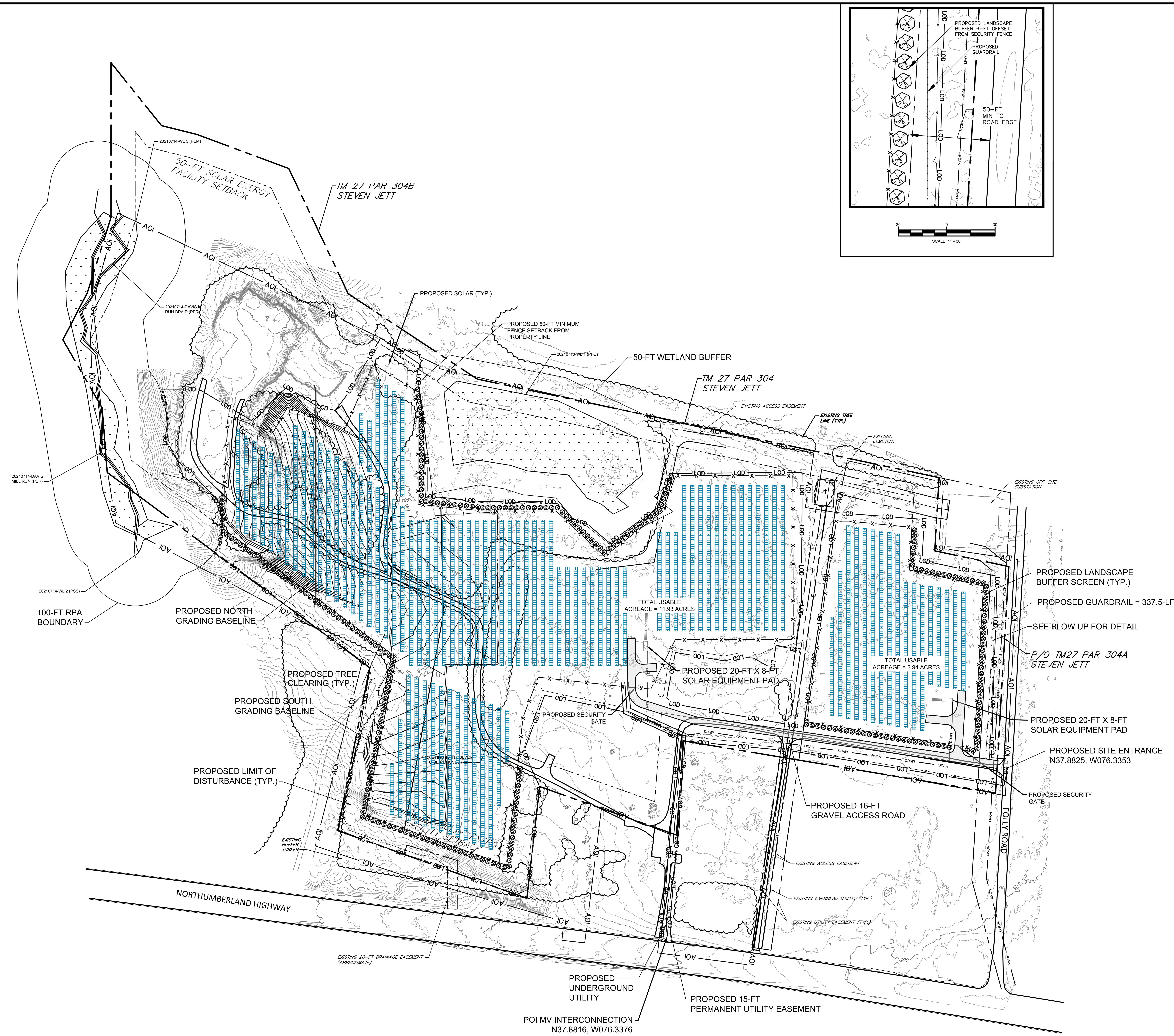

VAL-028 DISTURBANCE SUMMARY	
DESCRIPTION	AREA (AC)
TOTAL LIMIT-OF-DISTURBANCE	20.13
SECURITY FENCE AREA	14.87
TREE CLEARING 6-IN DIAMETER OR GREATER	7.60
SOLAR PANEL ARRAY COVERAGE	10.52
IMPERVIOUS AREA	0.42
OPEN HERBACEOUS AREA	9.19

REVISIONS

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CONDITIONAL USE PLAN FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE

PRELIMINARY SITE PLAN

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-SP
DRAWN BY	JWY
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SHEET NO	C7

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER JOHN T. PE081456

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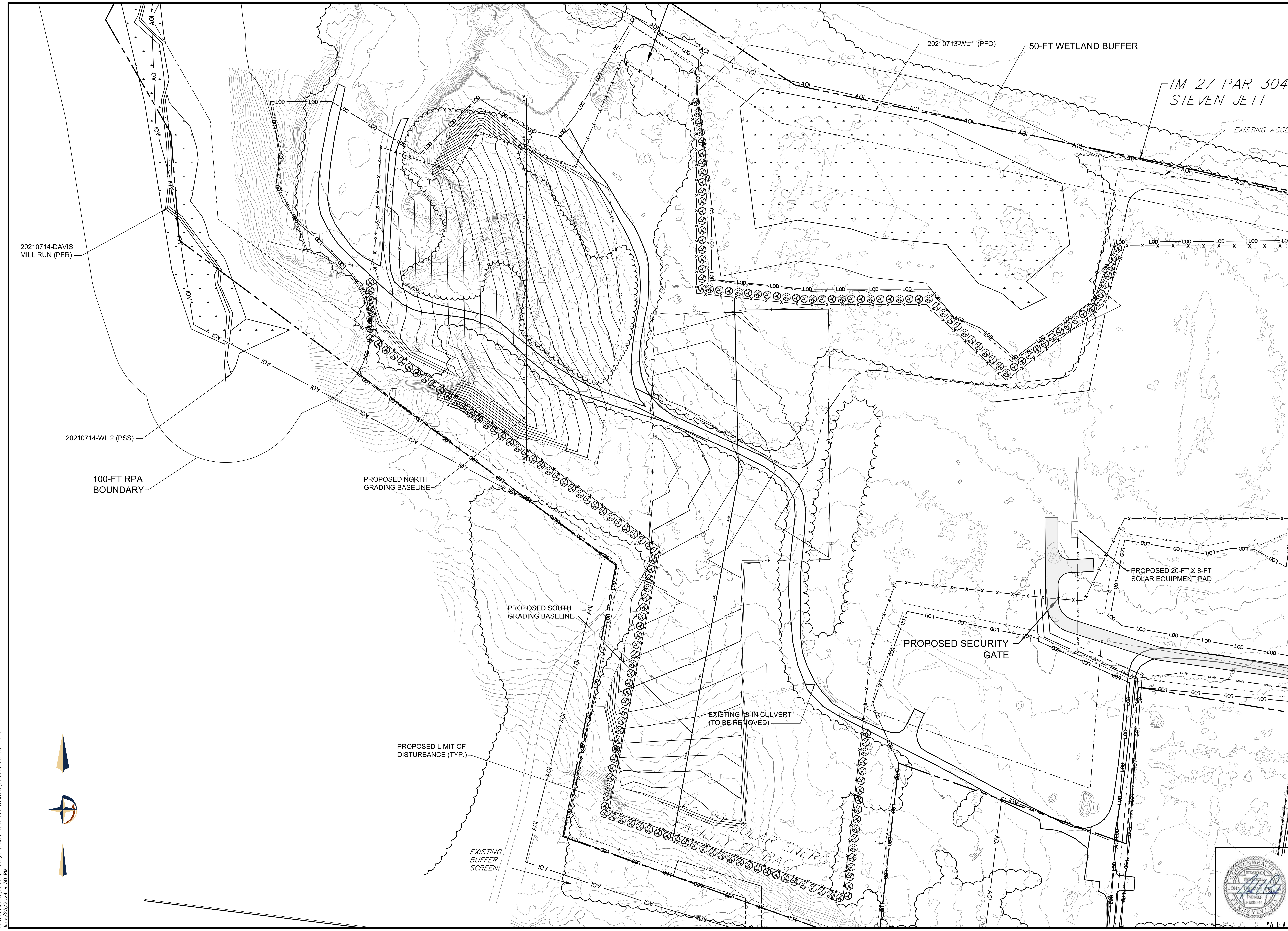

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE

GRADING PLAN

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-GR
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	C8

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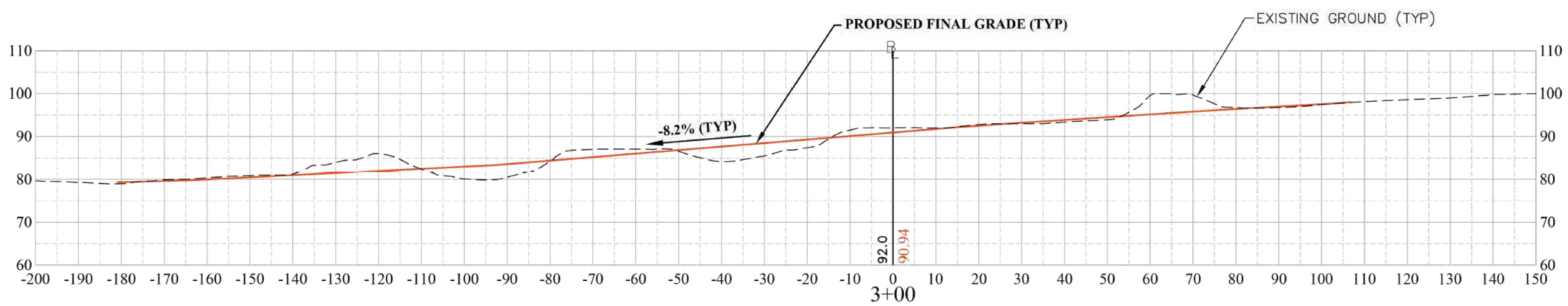

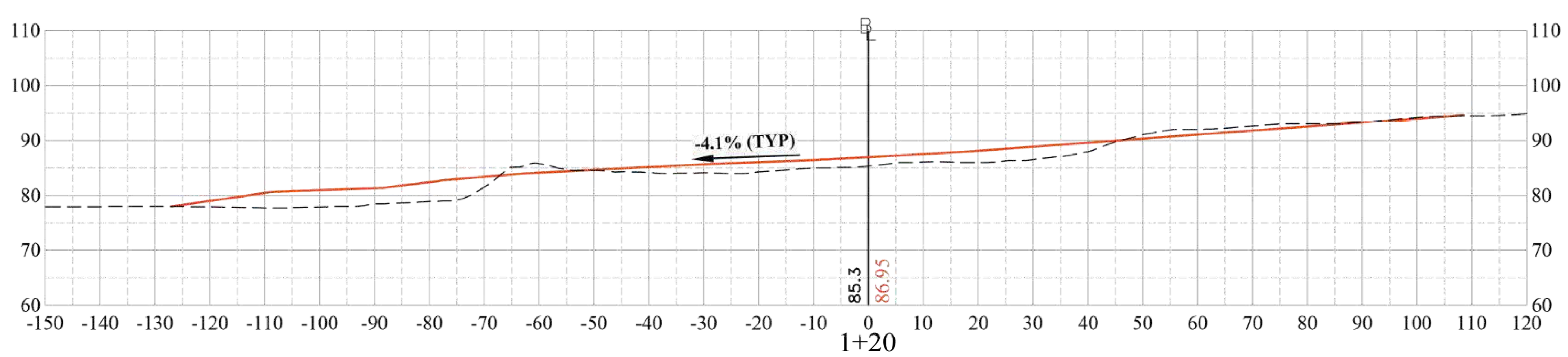

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE
NORTH GRADING SECTIONS

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-PR
DRAWN BY	JWY
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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
JOHN T. ...
PE081456

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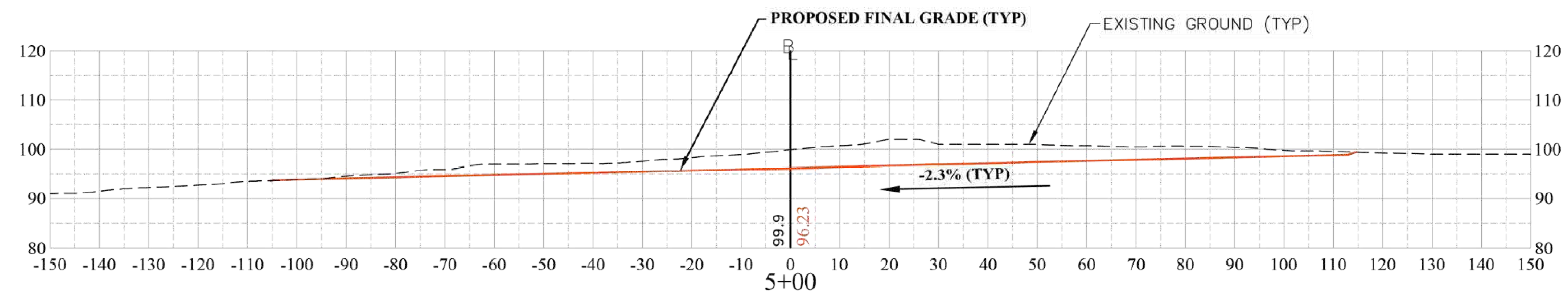

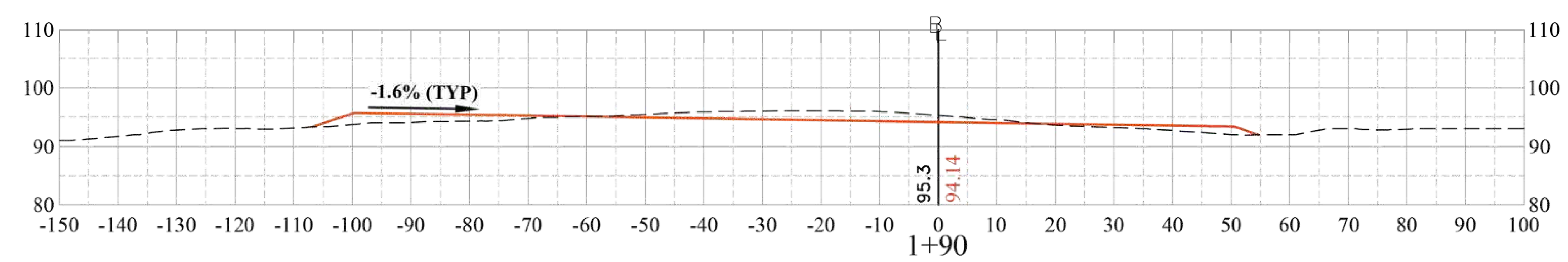

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE

SOUTH GRADING SECTIONS

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-PR
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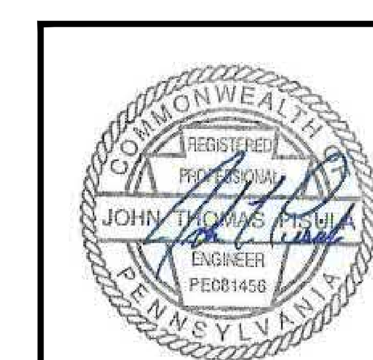
SHEET NO	C10



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VAL-028 LANDSCAPE SUMMARY	
DESCRIPTION	AREA (AC)
ERNST HONEYBEE FORAGE MIX OR EQ.	18.97
CONIFEROUS LANDSCAPE SCREEN	0.73
IMPERVIOUS AREA	0.43

LEGEND

- PROPOSED ERNST HONEY BEE FORAGE MIX
- PROPOSED LANDSCAPE SCREEN
- PROPOSED IMPERVIOUS AREA

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

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PROPOSED CONDITION

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-PC
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COMMONWEALTH OF PENNSYLVANIA — JOHN T. PHILLIPS — ENGINEER — PE081458

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HIGHLY ERODIBLE & HYDRIC SOILS	
DESCRIPTION	AREA (AC)
TOTAL LIMITS-OF-DISTURBANCE	20.13
HIGHLY ERODIBLE SOILS WITHIN LOD	6.59
HYDRIC SOILS WITHIN LOD	0.000

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE
ESA PLAN - HIGHLY ERODIBLE & HYDRIC SOILS

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-HEL
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	C12

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

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ESA PLAN - SHRINK-SWELL & MARINE CLAYS

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-SHSW
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	C13

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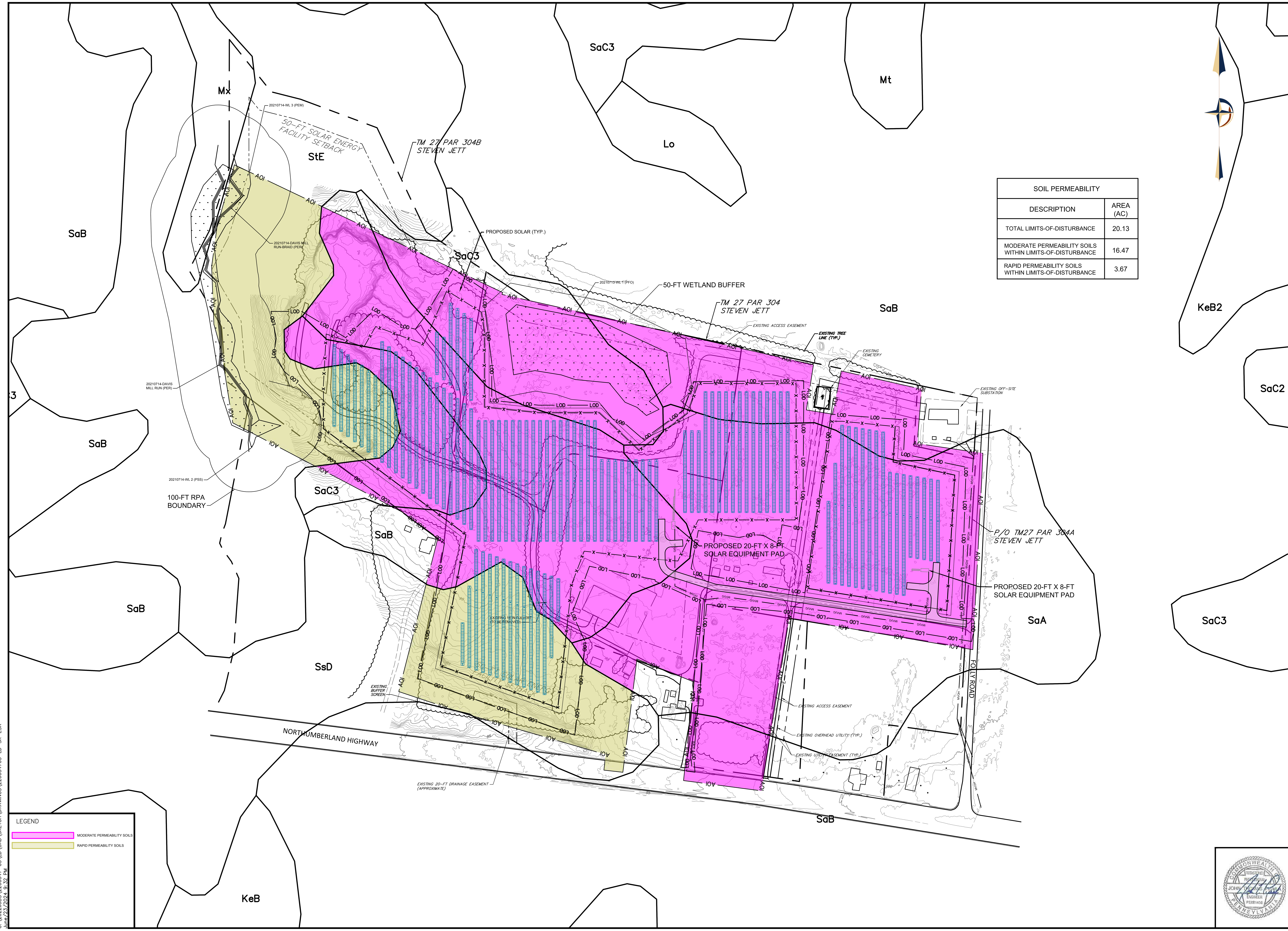

SOIL PERMEABILITY	
DESCRIPTION	AREA (AC)
TOTAL LIMITS-OF-DISTURBANCE	20.13
MODERATE PERMEABILITY SOILS WITHIN LIMITS-OF-DISTURBANCE	16.47
RAPID PERMEABILITY SOILS WITHIN LIMITS-OF-DISTURBANCE	3.67

LEGEND

- MODERATE PERMEABILITY SOILS
- RAPID PERMEABILITY SOILS

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CONDITIONAL USE PLAN FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE
ESA PLAN - SOIL PERMEABILITY

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-SPM
DRAWN BY	JWY
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COMMONWEALTH OF PENNSYLVANIA
JOHN T. PRUS
PROFESSIONAL ENGINEER
PE081456

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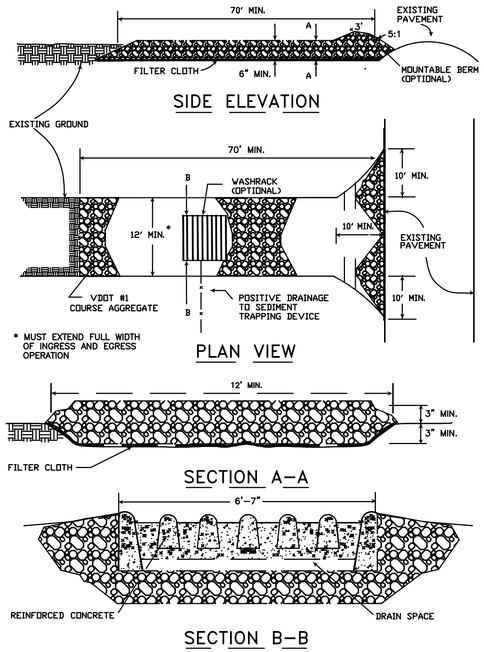
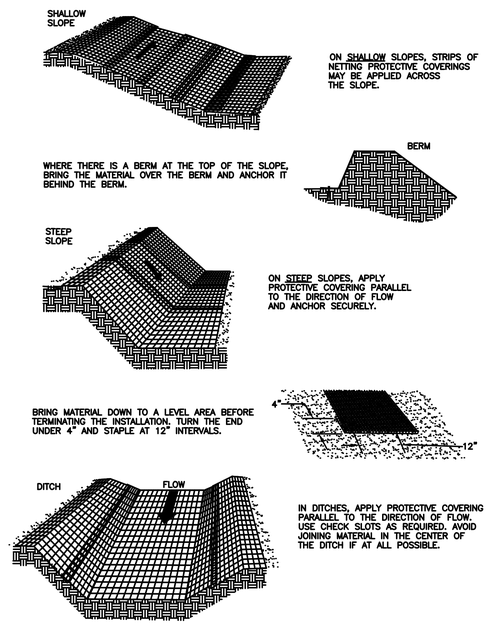
STONE CONSTRUCTION ENTRANCE



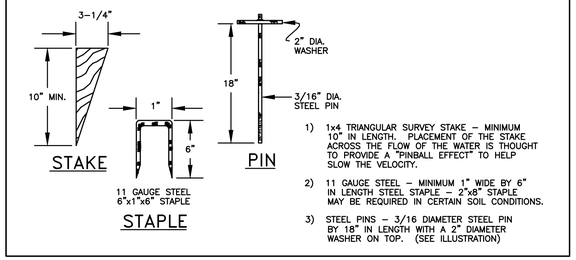
SOURCE: ADAPTED from 1983 Maryland Standards for Soil erosion and Sediment Control, and Va. DSWC — Plate 3.02-1

TYPICAL ORIENTATION OF TREATMENT – 1 (SOIL STABILIZATION BLANKET)



SOURCE: ADAPTED FROM LUDLOW PRODUCTS BROCHURE — PLATE: 3.36-1

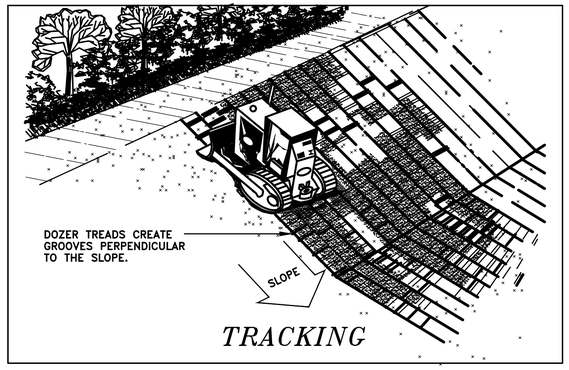
STAKES, STAPLES, & PINS FOR INSTALLATION OF TREATMENT – 2 SOIL STABILIZATION MATTING



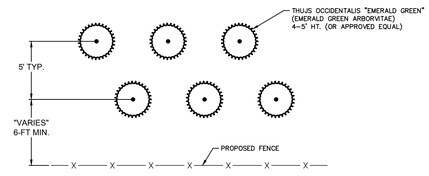
1) 1x4 TRIANGULAR SURVEY STAKE – MINIMUM 10" IN LENGTH. PLACEMENT OF THE STAKE ACROSS THE FLOW OF THE WATER IS THOUGHT TO PROVIDE A "PINBALL EFFECT" TO HELP SLOW THE VELOCITY.
2) 11 GAUGE STEEL – MINIMUM 1" WIDE BY 6" IN LENGTH STEEL STAPLE – 2"x8" STAPLE MAY BE REQUIRED IN CERTAIN SOIL CONDITIONS.
3) STEEL PINS – 3/16 DIAMETER STEEL PIN BY 18" IN LENGTH WITH A 2" DIAMETER WASHER ON TOP. (SEE ILLUSTRATION)

SOURCE: PRODUCT LITERATURE FROM GREENSTREAK, INC. — PLATE: 3.36–3

SOURCE: VA. DSWC — PLATE. 3.29–3



SOURCE: MICHIGAN SOIL EROSION AND SEDIMENTATION GUIDE — PLATE. 3.29–4



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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE

DETAILS

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — JOHN T. PRICE — ENGINEER — PE081408

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD–SK–DT
DRAWN BY	JWY
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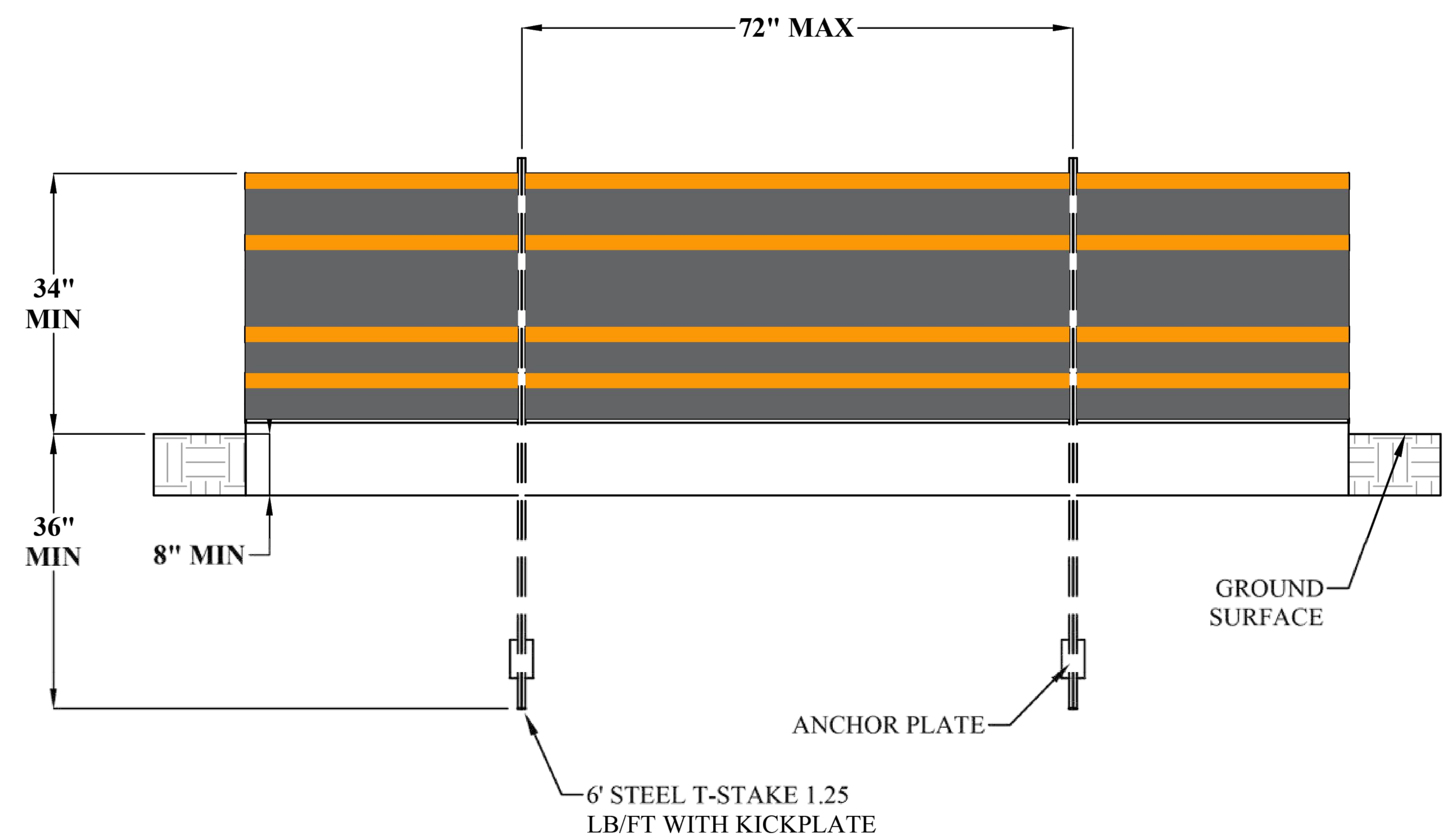

INSTALLATION INSTRUCTIONS:

STEP 1: EXCAVATE TRENCH
EXCAVATE TRENCH A MAXIMUM OF 4" WIDE AND 6" DEEP. THE TRENCH SHALL BE HAND-CLEANED FOLLOWING EXCAVATION TO REMOVE BULKY DEBRIS SUCH AS ROCKS, STICKS, AND SOIL CLODS.

STEP 2: PREPARE FENCE
LAY SMARTFENCE 42 OUT ON THE GROUND ALONG THE PROPOSED FENCE LINE AND NEXT TO THE ANCHOR TRENCH. REFERENCE NOTE ONE PRIOR TO BEGINNING.

STEP 3: INSTALL INITIAL POST
3A) FOR THE INITIAL POST, PLACE THE END OF SMARTFENCE 42 ALONG THE POST HEIGHT AND ROTATE THE POST 360 DEGREES, MAINTAINING TENSION ON THE FABRIC. SECURE THE FENCE TO THE POST AT ALL FOUR (4) ORANGE-COLORED BAND LOCATIONS WITH STEEL WIRE OR NYLON TIES AS PER NOTE TWO.

3B) DRIVE THE INITIAL POST (72" METAL T-POST) WITH THE ATTACHED FENCE TO A DEPTH OF 36" BELOW SURFACE.

STEP 4: INSTALL INTERIOR POSTS
USING SPACING NO GREATER THAN 6' ON CENTER, DRIVE INTERIOR POSTS TO 36" DEPTH BELOW SURFACE AND ATTACH THE FENCING AS YOU GO (SEE NOTE ONE AND SMARTFENCE DETAIL ON PAGE 2).
TO ATTACH FENCING, POSITION SMARTFENCE 42 IN FRONT OF THE ADJACENT T-POST, PULLING THE FENCING TIGHT AND FASTEN IT TO THE POST AT ALL FOUR (4) ORANGE-COLORED BAND LOCATIONS (AS PER NOTE TWO). IT IS CRITICAL THAT SMARTFENCE 42 IS PULLED TIGHT PRIOR TO ATTACHING IT TO EACH INTERIOR POST.

STEP 5: INSTALL FINAL POST
AFTER THE INTERIOR POSTS HAVE BEEN FASTENED, SECURE THE FENCE TO THE FINAL POST BY PULLING THE FINAL SECTION OF FENCING TAUT, AND THEN ROTATING THE POST 360 DEGREES WHILE MAINTAINING TENSION ON THE FENCE SYSTEM. SECURE THE FENCE TO THE POST AT ALL FOUR (4) ORANGE-COLORED BAND LOCATIONS WITH THE STEEL WIRE OR NYLON TIES AS PER NOTE TWO. DRIVE THE FINAL POST INTO THE GROUND TO A 36" DEPTH BELOW THE SURFACE.

STEP 6: BACKFILL TRENCH
ENSURE BOTTOM 8" OF FABRIC HAS BEEN PLACED IN TRENCH. BACKFILL TRENCH (OVERFILL) WITH SOIL PLACED AROUND FABRIC. COMPACT SOIL BACKFILL MANUALLY OR VIA MECHANICAL EQUIPMENT SUCH AS THE FRONT WHEEL OF A TRACTOR, SKID STEER, ROLLER, OR OTHER DEVICE (PER NOTE 5 OF ASTM D 6462 STANDARD PRACTICE FOR SILT FENCE INSTALLATION).

**BE CAREFUL NOT TO DAMAGE THE FABRIC DURING COMPACTION (DAMAGED FABRIC WILL NOT BE REPLACED).

NOTE ONE - INSTALL SPECIFICATIONS: SMARTFENCE 42 SHALL BE INSTALLED USING A 6' (72") METAL T-POST, 1.25 LBS PER FOOT WITH A KICK PLATE EMBEDDED 3' (36") DEEP ON NO MORE THAN 6' (72") CENTERS (SEE DETAIL ON PAGE 2.)

NOTE TWO - SUPPLIES FOR ATTACHING FENCING: TO FASTEN SMARTFENCE 42 TO STUDDED, METAL T-POSTS, USE ONE OF FOLLOWING METHODS:

- STEEL WIRE: WIRE-ATTACH SMARTFENCE 42 TO METAL T-POSTS USING 16-GAGE 304 SS WIRE WITH MITERED ENDS, SECURING WITH SAFETY PLIERS.
- NYLON TIES: PUNCTURE TWO 0.25" OPENINGS, SPACED AT A WIDTH APART THAT IS ROUGHLY EQUIVALENT TO THE POST WIDTH, AND SECURE THE FENCE TO THE POST USING 8" NYLON HEAVY-DUTY CABLE TIES (ZIP-TIES) THAT ARE UV RESISTANT AND HAVE A MINIMUM 120-LB TENSILE STRENGTH.

MAINTENANCE:

- CONTRACTOR SHALL CLEAN OUT SEDIMENT BEHIND THE SMARTFENCE 42 ONCE IT IS ONE THIRD THE HEIGHT OF THE FENCE. THE SEDIMENT SHALL BE INCORPORATED INTO THE FILL WITHIN THE DISTURBED AREA.

SILT FENCE (SMARTFENCE 42)

NOT TO SCALE

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NO. | DATE | DESCRIPTION

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ELK DEVELOPMENT, LLC
6865 DEERPATH ROAD, SUITE 330
ELKRIDGE, MD 21075
410-779-9377

CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE
DETAILS

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-DT
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	D2

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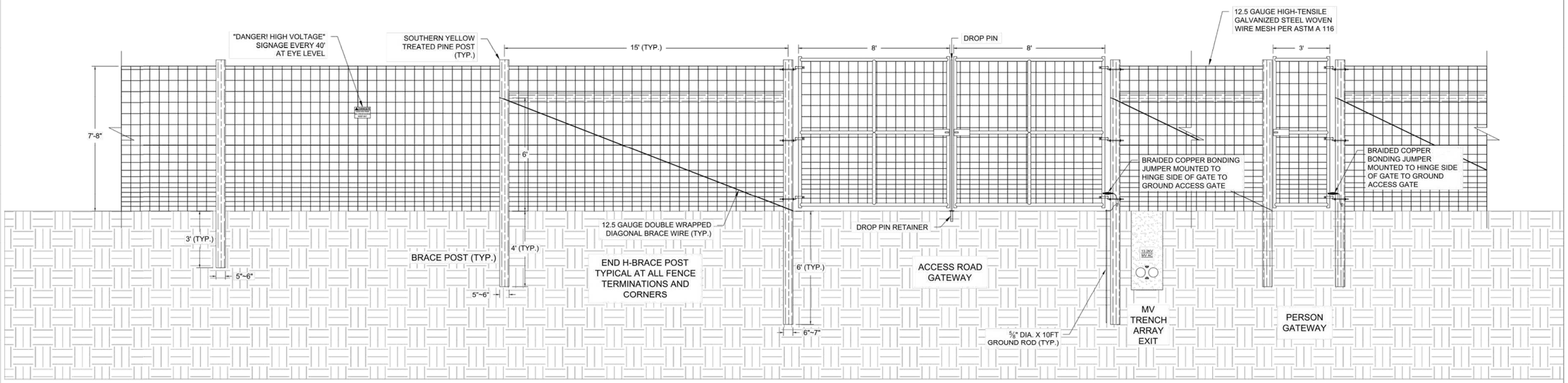
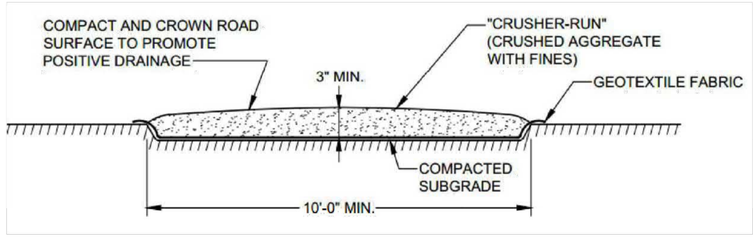
June/23/2024 9:32 PM



1 FENCING DETAILS

Scale: 3/8" = 1'

NOTE: PROOF-ROLL ACCESS ROAD AREAS WITH 20-TON FULLY-LOADED DUMP TRUCK OR SIMILAR PNEUMATIC-TIRE VEHICLE PRIOR TO PAD FOUNDATION WORK.



2 ACCESS ROAD DETAILS

Scale: NOT TO SCALE

NO.	DATE	REVISIONS DESCRIPTION

DOCUMENT PREPARED BY:

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DOCUMENT PREPARED FOR:

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CONDITIONAL USE PLAN
FOR
VAL-028 SOLAR PROJECT
NORTHUMBERLAND COUNTY, VIRGINIA

DRAWING TITLE

DETAILS

COMMONWEALTH OF PENNSYLVANIA — JOHN T. PERRY — ENGINEER — PE081456

DATE	JUNE 19, 2024
JOB NO.	2200547.05
FILE NAME	LD-SK-DT
DRAWN BY	JWY
CHECKED BY	JTP
SHEET NO	D3

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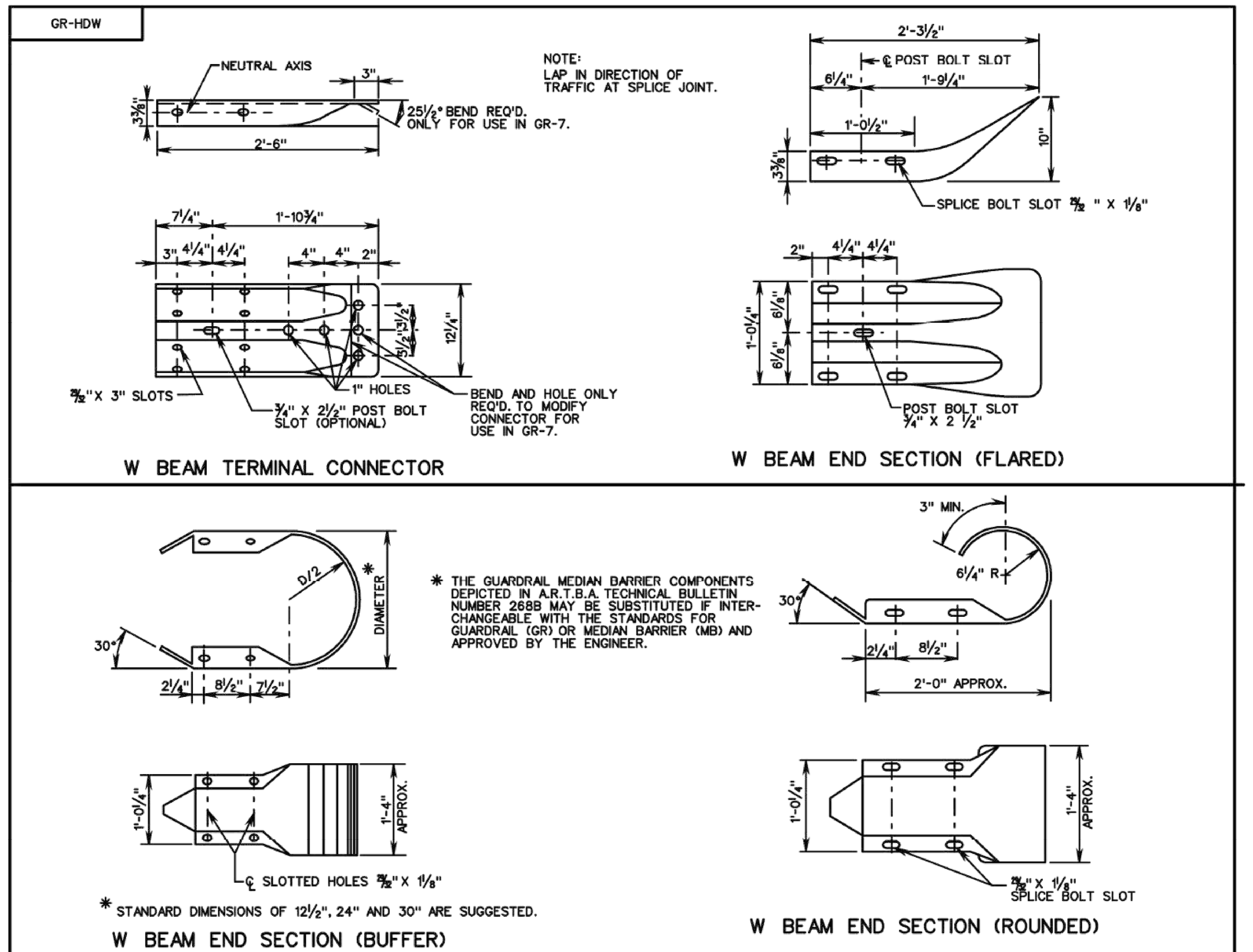
2016 ROAD & BRIDGE STANDARDS

GR-HDW



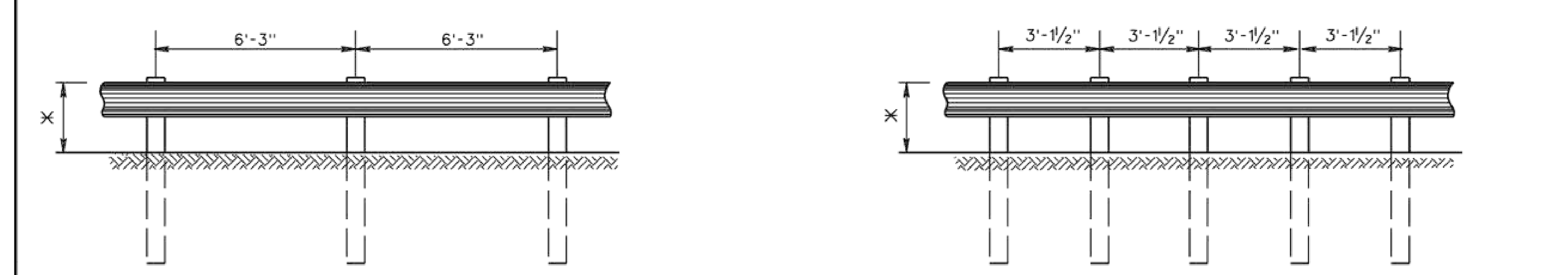
VDOT ROAD AND BRIDGE STANDARDS		STANDARD GUARDRAIL HARDWARE W-BEAM GUARDRAIL HARDWARE VIRGINIA DEPARTMENT OF TRANSPORTATION	SPECIFICATION REFERENCE
SHEET 2 OF 3	REVISION DATE		221 505
501.02			

2016 ROAD & BRIDGE STANDARDS

2016 ROAD & BRIDGE STANDARDS

GR-2, 2A

* 27 3/4" MIN - 28 3/4" MAX RAIL HEIGHT



GR-2
(6'-3" POST SPACING)
MAX DYNAMIC DEFLECTION = 3'

GR-2A
(3'-1 1/2" POST SPACING)
MAX DYNAMIC DEFLECTION = 2'

* OPTIONAL GR-2A METHOD USING NESTED RAIL

* OPTIONAL GR-2A METHOD USING ADDITIONAL RAIL ON BACK OF POST

* WHEN NESTED RAIL OR ADDITIONAL RAIL IS PLACED ON BACK OF POST FOR GR-2A THE POST SPACING WILL BE 6'-3".

NOTES:

GUARDRAIL LOCATIONS SHOWN ON PLANS ARE APPROXIMATE ONLY AND CAN BE ADJUSTED DURING CONSTRUCTION IF AND AS DIRECTED BY THE ENGINEER.

FOR DETAILS OF POST AND BLOCKOUTS SEE SHEET NO. 501.05.

FOR DETAILS OF RAIL ELEMENT, RAIL SPLICE JOINT, AND ASSOCIATED HARDWARE SEE SHEET NOS. 501.01 AND 501.02.

RAIL ELEMENTS ARE FURNISHED SHOP CURVED FOR RADII BETWEEN 5 FEET AND 150 FEET.

ALL GUARDRAIL POSTS SHALL BE SET PLUMB. POST SHALL NOT BE SET WITH A VARIATION OF MORE THAN 1/8" PER FOOT FROM VERTICAL. W-BEAM, BLOCKOUTS, AND POSTS SHALL BE SET AND ALIGNED WITHOUT ALTERATION OR FORCE, AS PER SECTION 505 OF THE SPECIFICATIONS.

ALL GR-2 AND GR-2A RAIL SHALL BE MAINTAINED AT A HEIGHT OF 27 3/4" MIN - 28 3/4" MAX AS MEASURED PER STANDARD GR-INS.

ALL W-BEAM RAILS SHALL BE LAPPED IN THE DIRECTION OF VEHICULAR TRAVEL FOR THE FINISHED ROADWAY.

THE OPTIONAL GR-2A METHODS OF NESTING THE RAIL OR USE OF AN ADDITIONAL RAIL ON THE BACK OF THE POST FOR STANDARD GR-2A SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.

FLARE RATES

DESIGN SPEED	INSIDE SHY LINE		BEYOND SHY LINE
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	9'	30:1	15:1 *
60	8'	26:1	14:1 *
50	6.5'	21:1	11:1 *
40	5'	16:1	8:1 *
30	4'	13:1	7:1 *

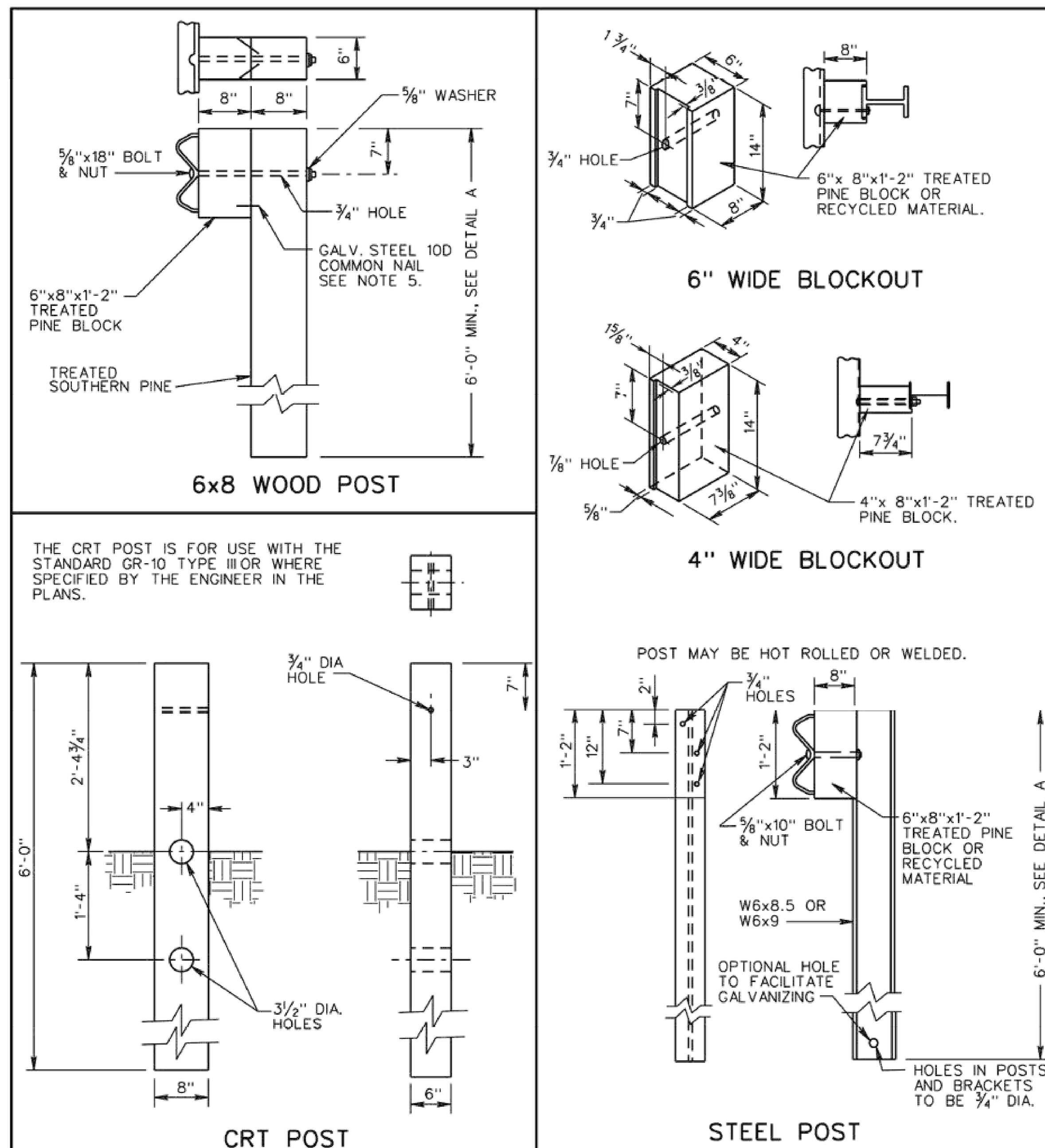
* SUGGESTED MAXIMUM FLARE RATE FOR SEMI-RIGID BARRIER SYSTEMS.

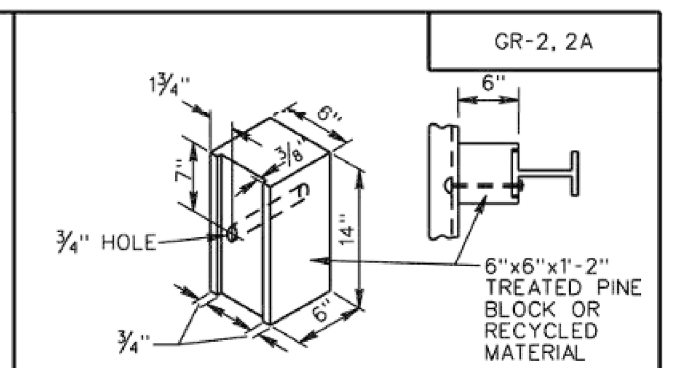
VDOT ROAD AND BRIDGE STANDARDS		A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE. STANDARD BLOCKED-OUT W-BEAM GUARDRAIL (STRONG POST SYSTEM) VIRGINIA DEPARTMENT OF TRANSPORTATION	SPECIFICATION REFERENCE
SHEET 1 OF 2	REVISION DATE 08/14		221 505
501.04			

2016 ROAD & BRIDGE STANDARDS

2016 ROAD & BRIDGE STANDARDS

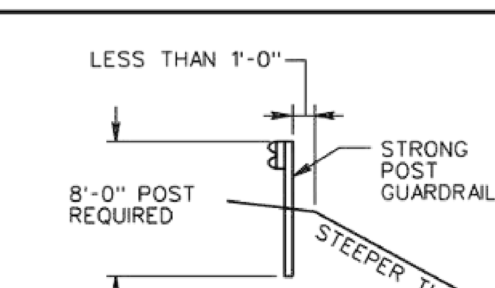
GR-2, 2A





FOR USE WHEN REPAIRING DAMAGED GUARDRAIL CONTAINING STEEL BLOCKOUTS.

BLOCKOUT FOR MAINTENANCE REPAIR ONLY



DETAIL A

GUARDRAIL INSTALLATION SITES REQUIRING LONGER GUARDRAIL POSTS

NOTES:

1. ALL BOLTS, NUTS, WASHERS, AND OTHER STEEL ITEMS ARE TO BE GALVANIZED.
2. ALTERNATE TYPE POSTS AND BLOCKOUT MAY BE INTERCHANGED ON ANY ONE PROJECT WITH THE RESTRICTION THAT THE SAME TYPE OF POST AND BLOCKOUT MUST BE USED IN ANY SINGLE RUN OF GUARDRAIL.
3. FOR DETAILS OF GUARDRAIL ELEMENT SPLICE JOINT, HARDWARE, ETC. SEE SHEET NOS. 501.01 AND 501.02.
4. DRIVE NAIL ON BOTH SIDES WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 5/8" x 18 BOLT IS INSTALLED.

SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE. STANDARD BLOCKED-OUT W-BEAM GUARDRAIL (STRONG POST SYSTEM, POST AND BLOCKOUT DETAILS) VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS	
221 236 505		REVISION DATE 08/14	SHEET 2 OF 2
			501.05

2016 ROAD & BRIDGE STANDARDS

NO.	DATE	REVISIONS DESCRIPTION

DOCUMENT PREPARED BY:
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SCALE:

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SHEET NO	D4

COMMONWEALTH OF PENNSYLVANIA JOHN T. P... REGISTERED PROFESSIONAL ENGINEER PE081456

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Module 3: Stormwater Management Plan

CLARK | AZAR & ASSOCIATES

VAL028 - Folly Road Solar Facility

200 Folly, LLC

200 Folly Road
Heathsville, VA 22473

Stormwater Management Engineering Report

8/24/2022

Prepared: August 2022

Prepared by: Sean Lindaman, P.E.
Approved by: Jason Azar, P.E.

Project No. 880.001

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TABLE OF CONTENTS

Stormwater Management Engineering Report
Folly Road Solar Facility
Northumberland County, Virginia

SECTION

I. STORMWATER MANAGEMENT NARRATIVE

I. Site Introduction

200 Folly, LLC proposes to construct a new solar farm in Northumberland County Virginia. The proposed site is bordered on the east by Folly Road, the southeast by single family residential properties, the south by Northumberland Highway, the west by forested lands, the northeast by an electrical substation and the north by farmland. The property area is 34.54 ac.

II. Existing Conditions

The site is currently a vacant property that is partially used for farm land and partially forested. The western end of the site includes an RPA. The site flows in a few different directions but all makes its way towards the stream on the western end of the site which ties into the Little Wicomico River. There is also a wetland on the north side of the site.

III. Proposed Conditions

The majority of the site will be cleared to make way for solar arrays. There will be an access drive from Folly Road into the site. Underground lines will connect the electric together. Landscaping trees will be added along the perimeter adjacent single family homes to screen the property.

IV. Stormwater Management: Quality

The entirety of the post development site was designed per the Virginia Department of Environmental Quality's Runoff Reduction Method. The site is composed of all type B hydrologic soils. The site is being designed to receive an interconnection approval from a regional transmission company or electric company prior to December 31, 2024. Per a memo released by DEQ regarding solar arrays released on March 29, 2022 and amended on April 14, 2022, the site will therefore not be required to meet the updated requirements for solar farms. Therefore the solar array posts and beams were the only areas of the solar array that were computed as impervious. The updated guidance suggests that this area can be added to the VRRM spreadsheet as simple disconnection.

Due to the large amount of undisturbed area and forest that is being maintained by the site along with the limited amount of impervious area, the total phosphorus reduction for the site is met prior to any measures being added. The simple disconnection provides further benefit, exceeding the target phosphorus removal by 2.49 pounds per year.

V. Stormwater Management: Quantity

The existing site is mostly undeveloped and consists of trees in good condition or open space in good condition with a minimal amount of impervious. A portion of this area will be cleared to make way for the solar arrays and a path to them. The site was analyzed for the 1 and 10-year runoff per DEQ requirements. Due to the size of the site, the 10 year storm required a greater amount of storage to hold the flow below pre-development conditions. Per the Virginia Stormwater Management Handbook and TR-55, the total storage required for the site is 27,985 cf. That area was spread across 3 extended detention areas. The extended detentions will be built with a downstream berm to impound the water and a low flow pipe to drain it down. The berms were spread across the site to provide flow attenuation in several directions. The total storage provided by the three berms is 28,778 cf. In a larger storm event when the 28,778 cf is taken up, the berms will act as level spreaders with water flowing over the top of the berms reducing erosion for the site and slowing the flow of upstream water.

VI. Conclusions

The new Folly Road Solar Facility will provide green electricity to the power grid. Due to the site receiving an interconnection approval prior to December 31, 2024, the stormwater quality design was based off the grandfathered design methods as noted in a solar array memo from DEQ. Based on this the target Phosphorus removal is met for the site without providing any additional treatment devices. Three stormwater quantity extended detention berms will be installed around the site to provide attenuation of the 1 and 10 year design storms.

II. 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: VAL018 - Folly Road Solar Facility
Date: 29-Jul
BMP Design Specifications List: 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

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		15.29			15.29 *
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed		17.51			17.51
Impervious Cover (acres)		1.74			1.74
					34.54

** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method*

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)	**-1.37**	**	**TP LOAD REDUCTION NOT REQUIRED**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary	
Forest/Open Space Cover (acres)	15.29
Weighted Rv (forest)	0.03
% Forest	44%
Managed Turf Cover (acres)	17.51
Weighted Rv (turf)	0.20
% Managed Turf	51%
Impervious Cover (acres)	1.74
Rv (impervious)	0.95
% Impervious	5%
Site Area (acres)	**34.54**
Site Rv	**0.16**

Treatment Volume and Nutrient Loads	
Treatment Volume (acre-ft)	0.4675
Treatment Volume (cubic feet)	20,363
TP Load (lb/yr)	12.79
TN Load (lb/yr) (Informational Purposes Only)	91.53

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)		15.29			15.29	0.03
Managed Turf (acres)		17.51			17.51	0.20
Impervious Cover (acres)		1.74			1.74	0.95
				Total	34.54	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr)	11.75
Post Development Treatment Volume in D.A. A (ft^3)	18,698

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
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50		1.04	0	1,798	1,798	3,597	0	0.00	2.26	1.13	1.13	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	

Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)				
0		0.00	0.00	0.00
0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)				
0	0.00	16.15	8.07	8.07
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
60	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)				
25	0.00	0.00	0.00	0.00
25		0.00	0.00	0.00
4. Grass Channel (RR)				
20	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
6. Bioretention (RR)				
40	0.00	0.00	0.00	0.00

6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00		60	0.00	0.00	0.00	0.00
7. Infiltration (RR)														**7. Infiltration (RR)**				
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)														**8. Extended Detention Pond (RR)**				
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)														**9. Sheetflow to Filter/Open Space (RR)**				
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	1.04	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	1,798	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	11.75	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	1.13	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	10.62	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	1,798
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	8.07

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

10. Wet Swale (no RR)														**10. Wet Swale (Coastal Plain) (no RR)**				
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
11. Filtering Practices (no RR)														**11. Filtering Practices (no RR)**				
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00		45	0.00	0.00	0.00	0.00
12. Constructed Wetland (no RR)														**12. Constructed Wetland (no RR)**				
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00		55	0.00	0.00	0.00	0.00
13. Wet Ponds (no RR)														**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		30	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		20	0.00	0.00	0.00	0.00
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00

13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
14. Manufactured Treatment Devices (no RR)														**14. Manufactured BMP (no RR)**				
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	1.04	**AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	-1.37
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	11.75
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	1.13
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	1.13
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr	10.62

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	8.07
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	8.07

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)	15.29	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	1.74	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	1.04	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	17.51	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	0.00	0.00	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	20,363

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)	1,798	0	0	0	0	1,798
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	11.75	0.00	0.00	0.00	0.00	11.75
TP LOAD REDUCTION ACHIEVED (lb/yr)	1.13	0.00	0.00	0.00	0.00	1.13
TP LOAD REMAINING (lb/yr)	10.62	0.00	0.00	0.00	0.00	10.62
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	8.07	0.00	0.00	0.00	0.00	8.07

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	12.79
TP LOAD REDUCTION REQUIRED (lb/yr)	-1.37
TP LOAD REDUCTION ACHIEVED (lb/yr)	1.13
TP LOAD REMAINING (lb/yr):	11.67
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00 **

** TARGET TP REDUCTION EXCEEDED BY 2.49 LB/YEAR **

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	91.53
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	8.07
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	83.45

Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.66	3.23	5.03

Use NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/)

***Notes (see below):**

[1] The curve numbers and runoff volumes computed in this spreadsheet for each drainage area are limited in their applicability for determining and demonstrating compliance with water quantity requirements. See VRRM User's Guide and Documentation for additional information.

[2] Runoff Volume (RV) for pre- and post-development drainage areas must be in volumetric units (e.g., acre-feet or cubic feet) when using the Energy Balance Equation. Runoff measured in watershed-inches and shown in the spreadsheet as RV(watershed-inch) can only be used in the Energy Balance Equation when the pre- and post-development drainage areas are equal. Otherwise RV(watershed-inch) must be multiplied by the drainage area.

[3] Adjusted CNs are based on runoff reduction volumes as calculated in D.A. tabs. An alternative CN adjustment calculation for Vegetated Roofs is included in BMP specification No. 5.

Drainage Area Curve Numbers and Runoff Depths *

Curve numbers (CN, CNadj) and runoff depths ($RV_{Developed}$) are computed with and without reduction practices.

Drainage Area A		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	15.29	0.00	0.00	Total Area (acres):	34.54
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	1,798
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	17.51	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	1.74	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ A)}$		
					60		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.22	0.42	1.32			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.21	0.41	1.30			
Adjusted CN*		59	60	60			

**See Notes above*

Drainage Area B		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ B)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

Drainage Area C		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ C)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

Drainage Area D		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ D)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

Drainage Area E		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ E)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

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

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Project Title: VAL018 - Folly Road Solar Facility

Date: 44771

Total Rainfall = 43 inches

Site Land Cover Summary

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	15.29	0.00	0.00	15.29	44
Managed Turf (acres)	0.00	17.51	0.00	0.00	17.51	51
Impervious Cover (acres)	0.00	1.74	0.00	0.00	1.74	5
					34.54	100

Site Tv and Land Cover Nutrient Loads

Site Rv	0.16
Treatment Volume (ft^3)	20,363
TP Load (lb/yr)	12.79
TN Load (lb/yr)	91.53

Total TP Load Reduction Required (lb/yr)	-1.37	**	TP LOAD REDUCTION NOT REQUIRED

Site Compliance Summary

Total Runoff Volume Reduction (ft^3)	1,798
Total TP Load Reduction Achieved (lb/yr)	1.13
Total TN Load Reduction Achieved (lb/yr)	8.07
Remaining Post Development TP Load (lb/yr)	11.67
Remaining TP Load Reduction (lb/yr) Required	**0.00**

**** TARGET TP REDUCTION EXCEEDED BY 2.49 LB/YEAR ****

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	15.29	0.00	0.00	0.00	0.00	15.29
Managed Turf (acres)	17.51	0.00	0.00	0.00	0.00	17.51
Impervious Cover (acres)	1.74	0.00	0.00	0.00	0.00	1.74
Total Area (acres)	**34.54**	**0.00**	**0.00**	**0.00**	**0.00**	**34.54**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	1.13	0.00	0.00	0.00	0.00	1.13

TN Load Reduced (lb/yr)	8.07	0.00	0.00	0.00	0.00	8.07

Drainage Area A Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	15.29	0.00	0.00	15.29	44
Managed Turf (acres)	0.00	17.51	0.00	0.00	17.51	51
Impervious Cover (acres)	0.00	1.74	0.00	0.00	1.74	5
					34.54	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	1.04
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	1.13
Total TN Load Reduction Achieved in D.A. (lb/yr)	8.07

Drainage Area B Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Drainage Area C Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Drainage Area D Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Drainage Area E Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.66	3.23	5.03

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		60	0	0	0	0
RR (ft^3)		1,798	0	0	0	0
1-year return period	RV wo RR (ws-in)	0.22	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	0.21	0.00	0.00	0.00	0.00
	CN adjusted	59	0	0	0	0
2-year return period	RV wo RR (ws-in)	0.42	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	0.41	0.00	0.00	0.00	0.00
	CN adjusted	60	0	0	0	0
10-year return period	RV wo RR (ws-in)	1.32	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	1.30	0.00	0.00	0.00	0.00
	CN adjusted	60	0	0	0	0

III. TR-55 COMPUTATIONS

WinTR-55 Current Data Description

--- Identification Data ---

User: SL
Project: Folly Solar Farm
SubTitle: PreDevelopment
State: Virginia
County: Northumberland NOAA_C
Filename: J:\880.001 - VA Solar SWM\CIVIL\COMPUTATIONS\Folly\PreDev__ONE DA.w55

Date: 8/12/2022
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
A	SITE	Outlet	34.54	58	.485

Total area: 34.54 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 2-Yr (cfs)	10-Yr (cfs)	1-Yr (cfs)
SUBAREAS			
A	6.60	32.72	1.92
REACHES			
OUTLET	6.60	32.72	1.92

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	1-Yr (cfs)	(hr)
SUBAREAS						
A	6.60	12.27	32.72	12.21	1.92	12.37
REACHES						
OUTLET	6.60		32.72		1.92	

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
A	34.54	0.485	58	Outlet	SITE

Total Area: 34.54 (ac)

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
A							
SHEET	100	0.0200	0.240				0.234
SHALLOW	1140	0.0061	0.050				0.251
					Time of Concentration		.485

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
A	Open space; grass cover > 75%	(good)	B	13.039	61
	Paved parking lots, roofs, driveways		B	.895	98
	Woods	(good)	B	20.602	55
	Total Area / Weighted Curve Number			34.54	58

WinTR-55 Current Data Description

--- Identification Data ---

User: SL
Project: Folly Solar Farm
SubTitle: PostDevelopment
State: Virginia
County: Northumberland NOAA_C
Filename: J:\880.001 - VA Solar SWM\CIVIL\COMPUTATIONS\Folly\PostDev__ONE DA.w55

Date: 8/12/2022
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
A	SITE	Outlet	34.54	61	.485

Total area: 34.54 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 2-Yr (cfs)	10-Yr (cfs)	1-Yr (cfs)
SUBAREAS			
A	10.17	40.16	3.89
REACHES			
OUTLET	10.17	40.16	3.89

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	1-Yr (cfs)	(hr)
SUBAREAS						
A	10.17	12.23	40.16	12.20	3.89	12.29
REACHES						
OUTLET	10.17		40.16		3.89	

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
A	34.54	0.485	61	Outlet	SITE

Total Area: 34.54 (ac)

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
A							
SHEET	100	0.0200	0.240				0.234
SHALLOW	1140	0.0061	0.050				0.251
					Time of Concentration		.485

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
A	Open space; grass cover > 75%	(good)	B	21.67	61
	Paved parking lots, roofs, driveways		B	1.737	98
	Woods	(good)	B	11.129	55
	Total Area / Weighted Curve Number			34.54	61

IV. STORMWATER QUANTITY REQUIREMENTS

Project Name **VAL028 - Folly Road Solar Facility** **Date** **4-Aug**

SWM Water Quantity Energy Balance Worksheet

DRAINAGE AREA A

SITE AREA (acre)	34.54

	1-year		10-year	
	PRE	POST (adjusted)	PRE	POST (adjusted)
P	2.66	2.66	5.03	5.03
CN	58	59	58	60
S=1000/CN-10	7.24	6.95	7.24	6.67
0.2S	1.45	1.39	1.45	1.33
$RV=(P-0.2S)^2/(P-0.2S)+S$	0.17	0.20	1.19	1.24

QPost Development <= I.F.* (Qpre-development* RVpre-development)/RVDeveloped)

I.F	0.9

CHANNEL PROTECTION			**FLOOD CONTROL**	
Qpre-development	1.92	From TR55	Qpre-development	32.72
QPost Development	3.89	From TR55	QPost Development	40.16
RVPost Development (with runoff reduction)	0.20	From RRM	RVPost Development (with runoff reduction)	1.24
Qallowable	1.53		Qallowable	31.28
Qallowable/QPost Development	0.39		Qallowable/QPost Development	0.78
Vs/Vr	0.33	Fig 11.7 of DEQ Manual	Vs/Vr	0.18
Vs	0.06		Vs	0.22
Storage required (cf)	8121		Storage required (cf)	27985

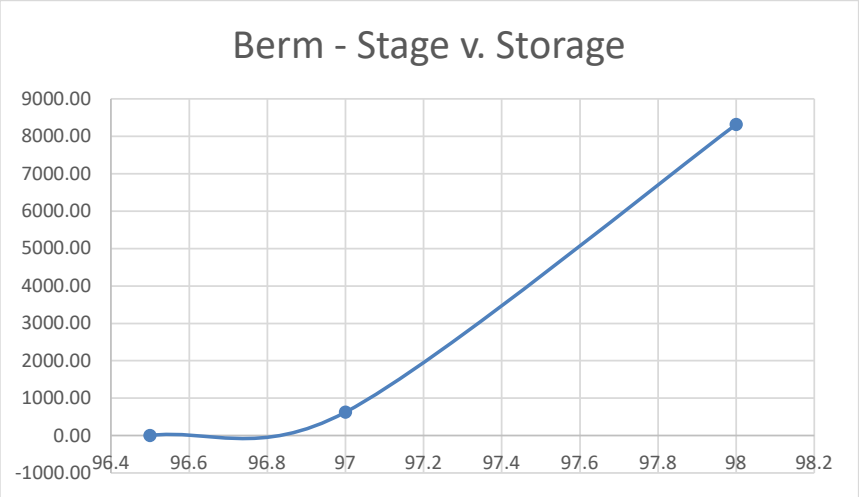
V. STAGE STORAGE COMPUTATIONS AND STORMWATER QUANTITY STORAGE PROVIDED

CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/4/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Berm A Stage Storage Comps	**Reviewed by:**	JA

Berm "A" Stage Storage

	AREA	ELEV	STAGE VOLUME	VOID RATIO	TOTAL STORAGE
BOTTOM	0	96.5			0.00
	2508	97	627.00	1.0	627.00
EMBANKMENT	12864	98	7686.00	1.0	8313.00

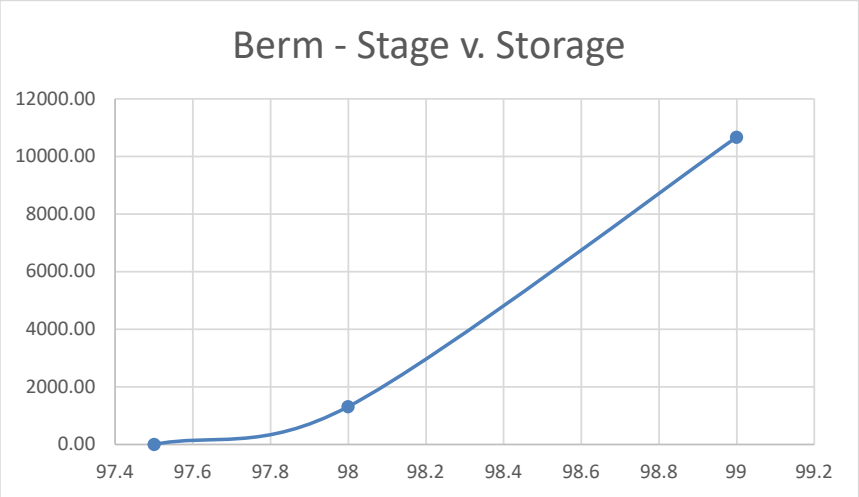


CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/24/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Berm B Stage Storage Comps	**Reviewed by:**	JA

Berm "B" Stage Storage

	AREA	ELEV	STAGE VOLUME	VOID RATIO	TOTAL STORAGE
BOTTOM	0	97.5			0.00
	5240	98	1310.00	1.0	1310.00
EMBANKMENT	13475	99	9357.50	1.0	10667.50

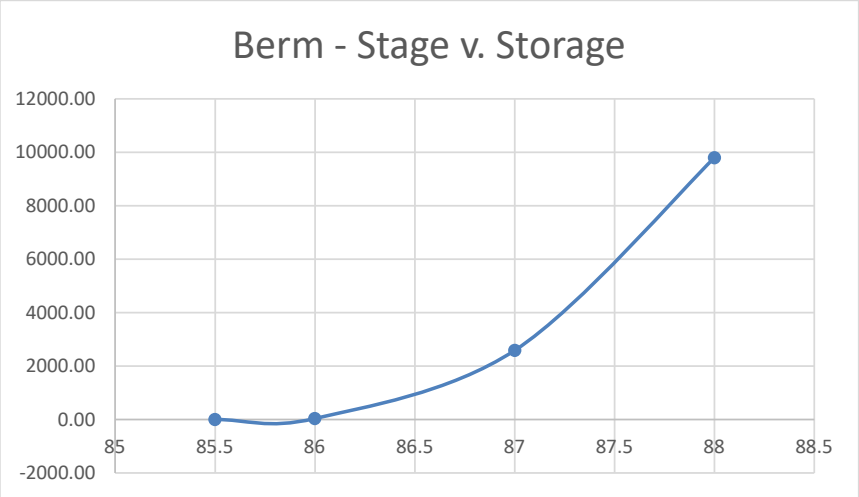


CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/24/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Berm C Stage Storage Comps	**Reviewed by:**	JA

Berm "C" Stage Storage

	AREA	ELEV	STAGE VOLUME	VOID RATIO	TOTAL STORAGE
BOTTOM	0	85.5			0.00
	169	86	42.25	1.0	42.25
	4928	87	2548.50	1.0	2590.75
EMBANKMENT	9485	88	7206.50	1.0	9797.25

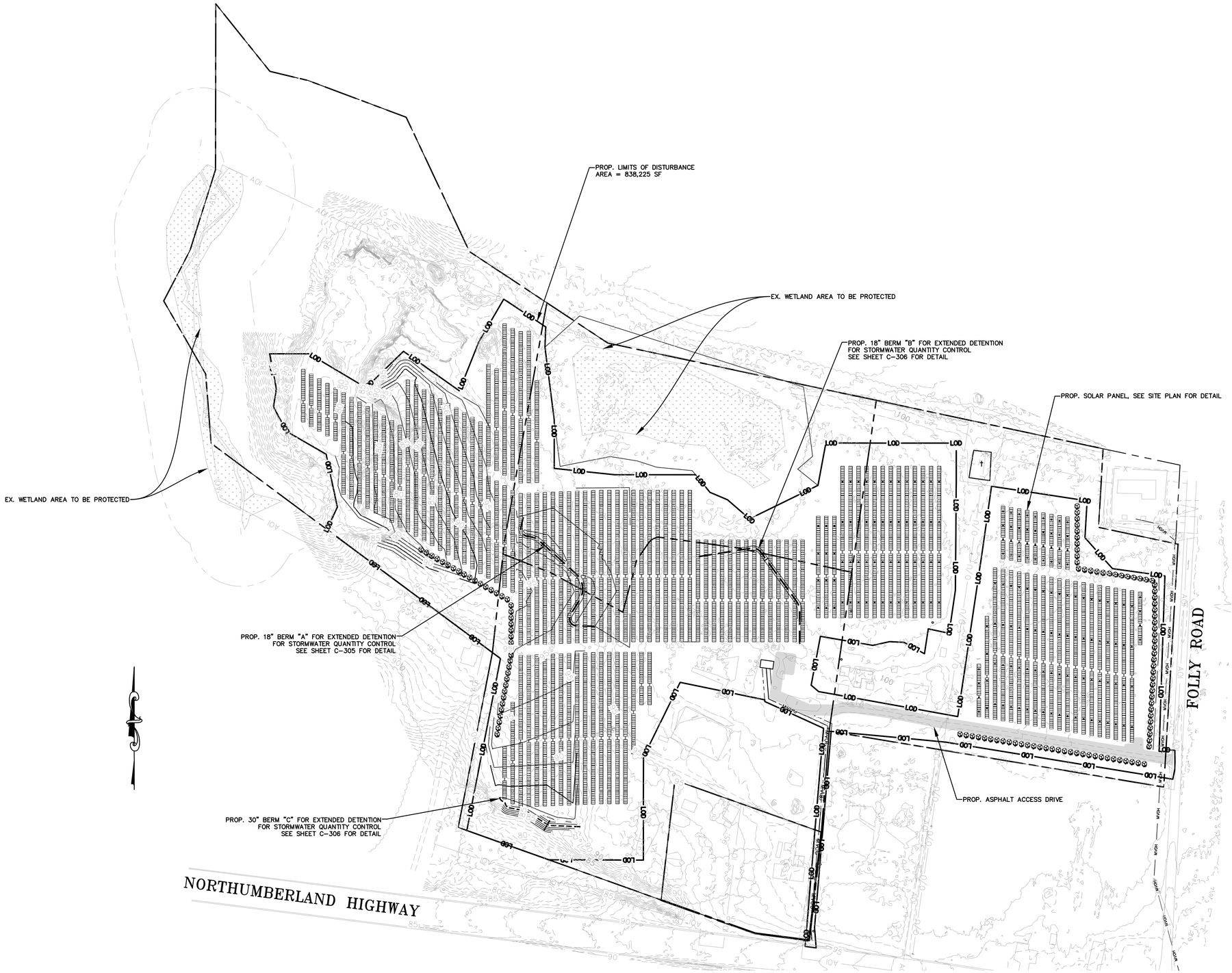


CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/24/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Water Quanity Summary	**Reviewed by:**	JA

Total Storage Volume

STORAGE VOLUME REQUIRED	**27,985**	**CF**
Storage Volume A	8,313	**CF**
Storage Volume B	10,668	**CF**
Storage Volume C	9,797	**CF**
TOTAL STORAGE VOLUME	**28,778**	**CF**



COMMONWEALTH OF VIRGINIA
JASON AZAR
Lic. No. 051113
PROFESSIONAL ENGINEER
9/8/22

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CHECKED: JA DATE: 9/8/2022
APPROVED: JA DATE: 9/8/2022
SURVEY DATE:
SURVEY BY:
FIELD BOOK No.:

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600 WHITE OAKS BOULEVARD, BRIDGEPORT, WV 26330
PHONE (304) 624-4108 • FAX (304) 624-7831

PHASE No.
CONTRACT No.
PROJECT No. 101-070-10406

DESIGN EXHIBIT FOR 200 FOLLY, LLC NORTHUMBERLAND COUNTY, VA VAL-028

SHEET No.
STORMWATER MANAGEMENT PLAN
C-300

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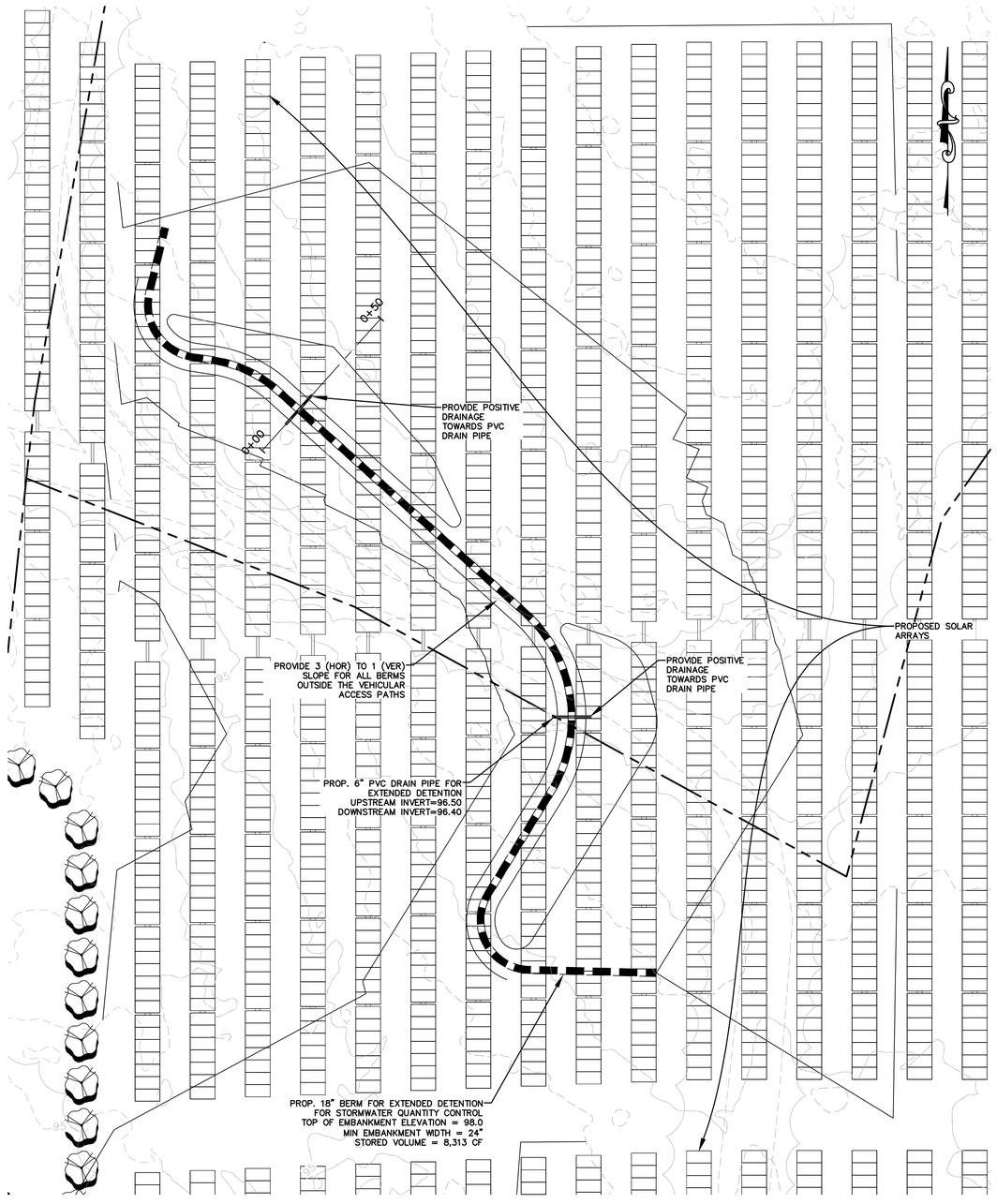

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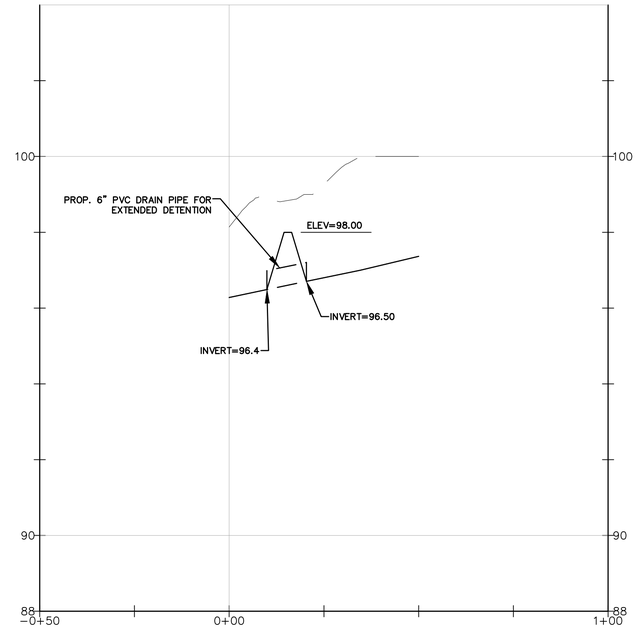

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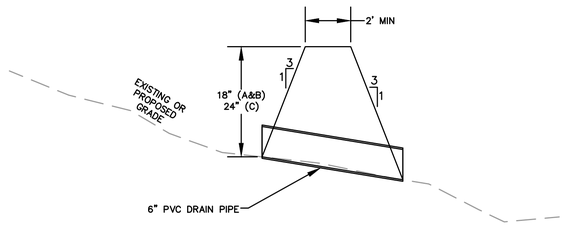

3 EXTENDED DETENTION BERM DETAIL
N.T.S.

0 20' 40'
GRAPHIC SCALE

COMMONWEALTH OF VIRGINIA
JASON JAR
Lic. No. 051113
PROFESSIONAL ENGINEER
9/8/22

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CONTRACT No.
PROJECT No. 101-070-10406

DESIGN EXHIBIT FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028

SHEET No.
STORMWATER MANAGEMENT DETAILS
C-305

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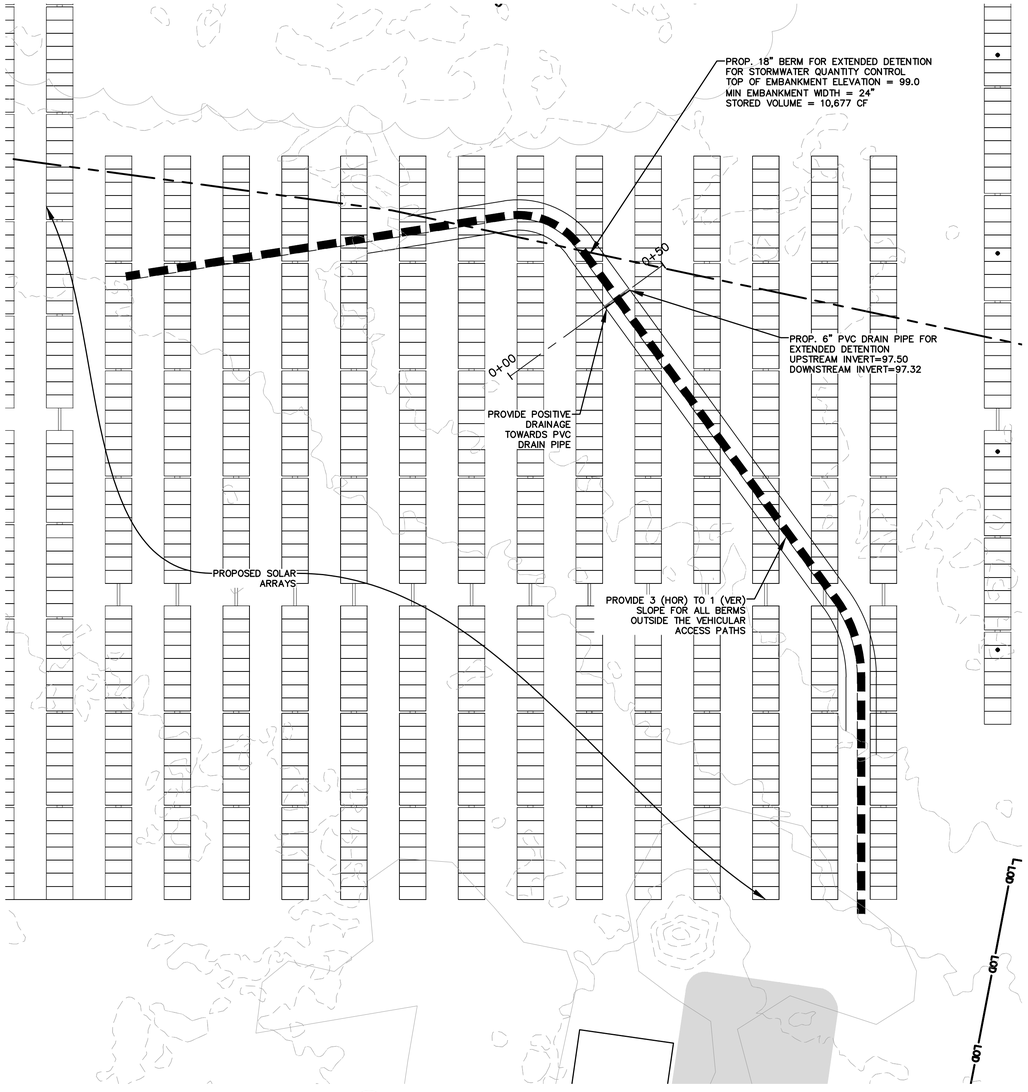

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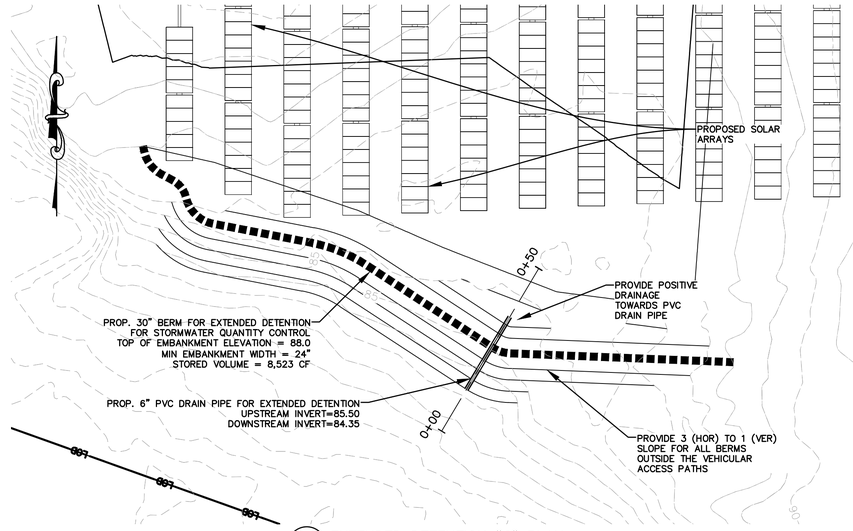

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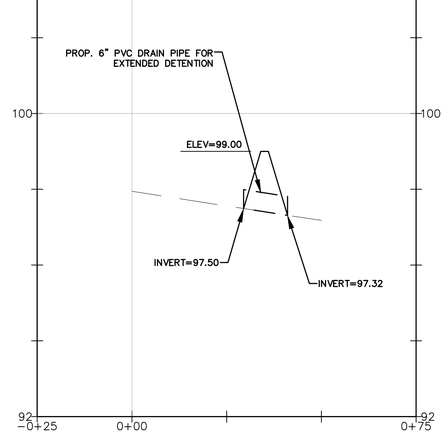

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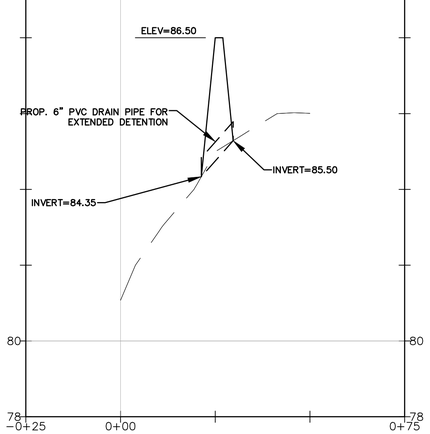

4 EXTENDED DETENTION "C" SECTION
SCALE: 1" = 20' (HOR) 1" = 2' (VER)

COMMONWEALTH OF VIRGINIA
JASON SEAR
Lic. No. 051113
9/8/22
PROFESSIONAL ENGINEER

0 20' 40'
GRAPHIC SCALE

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PHASE No.
CONTRACT No.
PROJECT No. 101-070-10406

DESIGN EXHIBIT FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028

SHEET No.
STORMWATER MANAGEMENT DETAILS
C-306

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Module 4: Major Water Quality Impact Assessment

Major Water Quality Impact Assessment

FOR THE

VAL028 Folly Road Solar Project

Northumberland County, Virginia

PREPARED FOR:

200 Folly, LLC
6865 Deerpath Road, Suite 330
Elkridge, MD 21075

PREPARED BY:

The Thrasher Group, Inc.
600 White Oaks Boulevard
Bridgeport, WV 26330

Table of Contents

Appendices

Chapter 1: Introduction

A. Project Description

This Water Quality Impact Assessment is intended to satisfy Northumberland County Code §54-28 under Article V for Site Plan Development Process. The purpose of the proposed VAL028 Folly Road Solar Facility Project (Project) is to establish a community scale solar power generation facility that will supply electric power to the Dominion grid and support the initiative to increase the ratio of green, renewable energy production in the Commonwealth of Virginia.

The Project will involve the construction and operation of a three-megawatt ground-mounted solar energy facility with a final fenced footprint of approximately 14.35-acres. The facility will consist of multiple arrays of photovoltaic solar modules supported by a racking system in a single-axis tracker configuration. In this configuration, the solar panels will rotate on a single axis, tracking the sun from east-to-west to increase efficiency. The AC output of the facility is interconnected into an existing Dominion three-phase circuit. There will be no new construction of substations and this project will not incorporate energy storage systems.

Ground disturbance will be required to construct the facility and will primarily consist of targeted surface grading to meet manufacturer required surface elevations and grades. Piles will also be driven to install the support structure for the racking system. Approximately 7.26 acres of timbering are expected but will be minimized as much as practicable. Existing open spaces will be optimized as much as practicable. The estimated limits of disturbance (LOD) for the Project is 19.2 acres. The proposed final surface will be stabilized with native herbaceous species. The planting schedule will focus on plants that will attract and provide habitat for pollinator species and other wildlife. Where the facility faces a residential property or roadway, a landscape buffer consisting of coniferous tree species will be planted and maintained.

Access to the site will be achieved by upgrading an existing driveway off of Folly Road at approximate coordinates 37.883584°N, 76.335291°W and establishing a 16-foot wide driving surface for equipment, materials, and personnel.

B. Location

The proposed Project is located north of United States (US) Route 360 in Burgess, Virginia (VA). The site is depicted in the United States Geologic Survey (USGS) Burgess 7.5-minute quadrangle of Northumberland County, VA. The approximate center coordinates of the Project are 37.883310°N, 76.338201°W. The site encompasses portions of two parcels (Parcel numbers: 27-1-304 and 27-1-304B) that are currently owned by Mr. Steven Jett of Burgess, VA. Please see Figure 1 for the USGS Site Location and Figure 2 for the Aerial Site Location (Appendix A).

C. Field Assessments

A 35.42-acre environmental area of interest (AOI) located in the Great Wicomico-Pianktank watershed (Hydrologic Unit Code# 02080102) was developed to establish the scope of the desktop review and onsite environmental field investigations. Wetland and stream delineations of the AOI were conducted on July 13 and July 14, 2021. During the wetland and stream delineations, a forest stand evaluation was performed in order to assess potential habitat types within the AOI. The forest stand evaluation quantified the dominant species in each forest stand in addition to the height range of the canopy and the ranges of the average diameter at breast height (DBH). A jurisdictional determination visit with Mr. Keith Goodwin of the United States Army Corps of Engineers (USACE) occurred in November 2021. This visit yielded a preliminary jurisdictional determination stating that

all of the identified aquatic resources would be considered jurisdictional by the USACE. Please see Appendix B for Agency Correspondence.

D. Permitting and Applicable Environmental Regulations

The following list provides expected preliminary permitting and consultation requirements for the Project with local, state, and federal agencies:

- Northumberland County - Conditional Use Permit/Site Plan Development
- Northumberland County – Building Permit
- VA Department of Environmental Quality (VA DEQ) – Solar Permit by Rule
- VA DEQ – VA Pollutant Discharge Elimination System Construction Stormwater General Permit
- VA Department of Conservation and Recreation – Natural Heritage Database Review
- VA Department of Wildlife Resources – Wildlife Impact Analysis
- United States Fish and Wildlife Service – Threatened and Endangered Species Technical Assistance

Chapter 2: Hydrogeologic Resources

A. Geology

1. Topography and Bedrock

As shown on Figure 1 in Appendix A, the AOI is situated on a relatively flat terrace typical of the VA's Coastal Plain region. Agricultural fields and mixed forest are dominant surface conditions in the eastern and central regions of the AOI respectively. Steeper, more dissected topography and the headwaters of Davis Mill Run borders the AOI to the west. More developed conditions to the south are present and consist of US Highway 360 and residential and commercial structures. Elevations within the AOI range from approximately 60 feet above sea level (asl) along Davis Mill Run to approximately 100 feet asl near the center of the AOI.

The AOI is underlain by the Windsor Formation. The Windsor Formation (QTw) is a gray and yellowish to reddish brown sand, gravel, silt, and clay unit. It consists of a pebbly-sand base grading upward into a quartzose sand and massive clayey silt and silty clay (USGS). The Windsor Formation was deposited in shallow marine and lagoonal environments but lacks significant fossils outside of minor plant detritus and burrows (AAPG, 1985). The Windsor Formation contains high amounts of quartz and minimal amounts of clay indicating a low likelihood of containing shrink and swell clays. Additionally, the high amount of gravel, sand, and silt limit the volume of marine clays interbedded within this unit.

2. Soils

Soil within the AOI consists predominately of fine sandy loams on gentle to moderate slopes. The Suffolk fine sandy loam, 0 to 2 percent slopes (map unit SaA) comprises 30.8% of the AOI. Sassafras fine sandy loams (map units SaB and SaC3) comprises 46.3% of the AOI. Each of these soil groups have a "B" hydrologic soil rating, indicating moderate infiltration rates. Sloping sandy land (map unit SsD) and Steep sandy land (map unit StE) comprise 22.9% of the AOI. Neither of these soils have an identified hydrologic soil rating. None of the soils found within the AOI have a hydric soil rating. A map of identified soil groups in the AOI can be found on Figure 3 in Appendix A. Please see the Soil Resource Report in Appendix C.

Soil Unit Name	Soil Map Unit Symbol	Acres in AOI	Percent in AOI	Acres in LOD	Percent in LOD	Hydric Soil Rating
Suffolk fine sandy loam, 0 to 2 percent slopes	SaA	10.9	30.8%	6.5	34.1%	No
Sassafras fine sandy loam, gently sloping	SaB	10.9	30.7%	6.5	34.1%	No
Sassafras fine sandy loam, sloping, severely eroded	SaC3	5.5	15.6%	2.9	15.2%	No
Sloping sandy land	SsD	3.7	10.4%	2.1	10.7%	No
Steep sandy land	StE	4.4	12.5%	1.1	5.9%	No
Totals		**35.4**	**100.0%**	**19.2**	**100.0%**	

Each of the soils within the AOI are composed predominately of sand with minor amounts of silt and clay. The Suffolk fine sandy loam, 0 to 2 percent slopes, contains 71.0% sand, 17.0% silt, and 12.0% Clay. The Sassafras fine sandy loams, each contain 71.3% sand, 16.7% silt, and 12.0% clay. Both the Sloping sandy land and Steep sandy land soils contain 93.2% sand, 1.3% silt, and 5.5% clay. The relatively low clay volumes significantly reduce the risk of encountering shrink and swell clays of the smectite group, such as montmorillonite. Additionally, the 2016 Comprehensive Plan for Northumberland County adopted on November 10, 2016, indicates the AOI to be in an area considered to have a Low to Moderate Shrink Swell Potential. Marine clays are also absent in the AOI as indicated by the Soil Resource Report. Please see the Soil Resource Report in Appendix C.

Highly erodible soils are expected to be encountered near the edges of the AOI. According to the United States Department of Agriculture (USDA) Highly Erodible Land Report compiled in 1990, the following soils are considered highly erodible: Sassafras fine sandy loam, sloping, severely eroded, Sloping sandy land, and Steep sandy land. Maps of highly erodible soils, shrink-swell, marine clays and soil permeability are also depicted in the Environmental Site Assessment (ESA) drawings in Appendix D.

B. Hydrology

The proposed Project is located in the Coastal Plain Region and is not located in a sole source aquifer region. One stream, Davis Mill Run, flows from south to north along the westernmost edge of the AOI. Three wetlands are present within the AOI with two located along Davis Mill Run at the westernmost edge of the AOI. According to the Soil Resources Report, the water table may be encountered at a depth greater than 80 inches in the Suffolk fine sandy loam soil, and at depths between 48 to 72 inches in the Sassafras fine sandy loam soils. No water table depth information is available for the Sloping sandy land and Steep sandy land soils. The entirety of the site drains towards Davis Mill Run, eventually flowing to the Little Wicomico River.

C. Aquatic Resources

Aquatic resources within and around the Project area were delineated in July 2021. Resource protection areas (RPAs) as defined by the Chesapeake Bay Preservation Act, establishes a 100 foot vegetated buffer around the perimeter of wetland or perennial stream in order to protect water quality in the Chesapeake Bay watershed.

1. Wetlands

Existing Conditions

The current LOD does not encompass any delineated wetlands. During the environmental investigation of the entire AOI, one palustrine shrub-scrub (PSS) and two palustrine forested (PFO) wetlands were identified within the AOI. The PSS wetland comprises 0.046 acres, while the two PFO wetlands comprise 0.86 and 1.40 acres. A map of aquatic resources and RPAs can be found on Figure 4 in Appendix A.

Surrounding Conditions

No wetlands were observed in the immediate vicinity outside of the AOI. However, wetlands 20210713-WL 2 and 20210713-WL 3 do extend outside of the AOI along the riparian area of Davis Mill Run eventually discharging into the Little Wicomico River.

2. Streams

Existing Conditions

The current LOD does not encompass any delineated streams. During the environmental investigation, one perennial stream, Davis Mill Run, was identified on the western edge of the AOI.

Surrounding Conditions

No streams other than Davis Mill Run were identified immediately outside of the AOI. Based on the VA DEQ and Virginia Institute of Marine Sciences Wetland Condition Assessment Tool (WetCAT), this desktop model shows that nearby streams include Willis Creek to the northeast, Warehouse Creek to the southeast, Betts Mill Creek to the southwest, and unnamed tributaries associated with Horn Harbor to the south. Surface flow within the site is all located within the drainage area of Davis Mill Run.

3. Groundwater Resources

Within the Project area and surveyed AOI, no groundwater wells were observed. Based on the USGS Groundwater watch, there is one USGS Groundwater well (375213076190206) 1.38 miles southeast of the Project area. As of January 2022, the measured depth to groundwater is 108.5 feet below land surface.

D. Impacts to Hydrogeologic Resources

No aquatic resources will be filled or directly impacted by the Project. Wetland 20210713-WL 1 is considered an isolated feature and is not representative of an RPA. In order to mitigate potential hydrologic impacts or effects, a 50-foot setback from the PFO wetland will be maintained from the edge of development. Additionally, no permanent development will occur within 100-feet of an RPA.

Timbering and minor surface grading will be required within the LOD representing an alteration to pre-construction stormwater flow. As such, stormwater quantity best management practices (BMPs) will be implemented within the LOD. The BMPs will consist of constructed detention berms which allow for stormwater retention and low-volume discharge over time. A total of three berms were sited to provide flow attenuation in several directions throughout the LOD. Should a significant rainfall event occur that is outside of the required analysis threshold (1 and 10-year runoffs), the berms will act as a level spreader and limit the potential of eroding concentrated stormwater flows. The total required stormwater storage for the site is 27,985 cubic feet with the proposed stormwater berms providing 28,778 cubic feet of storage.

Qualitatively, the site meets the requirements for phosphorus reduction by allowing surrounding vegetated areas to be undisturbed. The stormwater projection (Appendix E) states that the current estimates exceed target phosphorus removal by 2.49 pounds per year while nitrogen removal from vegetative plantings will result in 8.07 pounds per year.

Chapter 3: Landscape Resources

A. Biological Resources

1. Forested Areas and Observations

Within the proposed LOD, there are approximately seven acres of forest that contain trees with an average diameter at breast height of at least six inches. During the field environmental investigations, three distinct forest types were observed. Characteristics of the forest stands are provided in the table below.

Name	Height range (in feet)	Diameter ranges (inches)	Dominant Species	Understory	Acres in LOD
Loblolly dominant	40-60	3-9	Loblolly pine, white oak, sweetgum, tulip poplar	American holly	5.11
Hardwood dominant	40-65	4-10	Tree-of-heaven, tulip poplar, sycamore, black gum	American holly	1.13
Mixed hardwood and pine	40-70	4-7	Loblolly pine, white oak, red maple, black gum, tulip poplar	American holly, laurel	1.02

The loblolly dominated forest stand is located on a flat rise with little microtopography. Below the understory *Smilax rotundifolia* was observed. The loblolly dominated section comprises 5.11 acres of the LOD and is located in the northern part of the Project area. The mixed hardwood and pine community occurs primarily on the western edge of the LOD/AOI with 1.02-acres entirely within the LOD. This forested habitat is situated on a gentle western slope rolling towards Davis Mill Run. Overall, this forest type includes a dense understory of American holly and mountain laurel. The hardwood dominant forest type occurs on the western edge of the LOD encompassing approximately 1.13-acres. This habitat type was observed on a spoil pile with varying topography. A mix of hardwood species (including non-native tree-of-heaven) were observed in this area. A map (Figure 5) depicting forest stands and habitat types can be found in Appendix A.

B. Native Plant Species

Native tree species observed included *Pinus taeda, Quercus alba, Nyssa sylvatica, Liquidambar styraciflua, Platanus occidentalis, Liriodendron tulipifera,* and *Acer rubrum.* Native shrubs and understory species observed include *Ilex opaca* and *Kalmia latifolia.* Herbs and forbs observed during the field visit include *Rhexia virginiana, Andropogon virginicus, Cynodon dactylon, Mitchella repens, Hypericum mutilum.*

C. Supported Habitat

According to the Natural Heritage Database Review completed by the VA DC on July 26, 2021 (Appendix B), the northwestern portion of the AOI is located in a C4 Ecological Core. Ecological Cores are areas of unfragmented natural cover with at least 100-acres of interior that provide habitat for a wide range of species, from interior-dependent forest species to habitat generalists, as well as species that utilize marsh, dune, and beach habitats. The cores are ranked from C1 to C5 with C5 being the least ecologically relevant.

The AOI is also located within Virginia Coastal Avian Protection Zones 12 and 13; however, solar projects are not required to complete any surveys or assessments for impacts. An Initial Project Assessment (IPA) was completed through the VA Department of Game and Inland Fisheries (VADGIF) for the Project. Approximately 392 species are known or likely to occur within a two-mile radius around the AOI. However, there were no known or documented occurrences of any species with a status concern for conservation within the study area. The IPA is in Appendix B.

A review of the United States Fish and Wildlife's Service (USFWS) Information for Planning and Consultation (IPaC) determined that the Project is in the historical range of one Federal threatened and species, the northern long-eared bat (*Myotis septentrionalis*). The Project layout is not within a known-use area and not near a known roost-tree or foraging area. A VADGIF database search also documents there are no winter hibernaculum or known maternity roosts within or near the AOI (Appendix B.)

D. Impacts to Landscape Resources

The proposed Project will require seven acres of habitat conversion from forest to open herbaceous meadow; however, the majority of the solar footprint was sited to utilize areas currently occupied as herbaceous field and maintained lawn. As stated above, a majority of the LOD is not within an Ecological Core that is ecologically relevant and any proposed tree clearing will be along existing forested edge. Additionally, the AOI is not near a known maternity roost or winter hibernaculum for listed bat species and there are no known occurrences within a two-mile buffer of the AOI of species that have a status concern for conservation.

Within the LOD, areas disturbed by construction will be seeded with a native/naturalized herbaceous seed mixture that contains pollinator species in addition to fast growing grasses and forbs that will limit the exposure of graded soil to erosional forces. A coniferous buffer screen will also be planted along the boundary of the facility where it faces a residential area or roadway. The combination of avoidance and minimization measures implemented during siting of the facility and the proposed post-construction restoration plan limit impacts to landscape resources. Please see the Proposed Conditions plan sheet in Appendix A.

Chapter 4: Project Design

A. Grading and Fill Material

The Project's LOD has been designed to reduce ground disturbance in sensitive areas and utilize existing flat areas as much as practicable. Localized surface grading will be necessary throughout portions of the LOD specifically in the western and southwestern areas; however, grading or earthwork within an RPA and the associated 100-foot buffer is not proposed.

The proposed surface grading is required to achieve north-south facing slopes that are conducive to efficient operation of the solar arrays. The grading design is balanced and no off-site borrow or waste material sites are necessary.

Outside of the proposed surface grading areas, earth disturbance will be limited to piling installation for the racking system, access road improvements, tree removal, tracking of equipment, and perimeter erosion and sediment control measure installation. The total LOD will encompass approximately 19.20-acres.

B. Increases in Impervious Surfaces

Currently, impervious surfaces within the LOD consist of an existing stone driveway near the southeastern edge of the LOD. The Project will involve upgrades to the access road which will involve the placement of additional stone and widening the road to 16-feet. In addition to the solar array posts and beams throughout the facility, a solar equipment pad with an area of approximately 375 square feet will also be constructed near the terminus of the access road. Per a memo released by the VA DEQ on March 29, 2022 and amended April 14, 2022, only the solar array posts and beams are considered impervious for stormwater design calculation purposes. In total, the installation of the solar arrays and solar equipment pad and upgrades to the access road will result in a total increase of approximately 1.1-acres of impervious area.

C. Tree Clearing

Proposed tree clearing for the Project is estimated to remove 7.26 acres of forested habitat of which 5.23-acres are for the facility and 2.03-acres are for shade relief. The areas proposed to be cleared include areas identified in the loblolly pine dominant habitat type in Figure 3 and hardwood understory and mixed hardwood forest types. Tree species that will be affected by tree clearing include, *Pinus taeda, Ailanthus altissima, Quercus alba,* and *Liriodendron tulipifera.* Please see the Tree Clearing Summary plan sheet in Appendix A.

D. Runoff Estimations

Runoff estimations were completed for 1-year and 10-year storm events. Rainfall totals for the 1-year storm event is 2.7 inches and rainfall for the 10-year storm event is approximately 5.1 inches. The calculated runoff load for the site prior to construction is 1.92 cubic feet per second (cfs) during the 1-year storm and 32.72 cfs during the 10-year storm event. The estimated load at Project completion is 3.89 cfs during the 1-year storm event and 40.16 cfs during the 10-year storm event. Please see the Stormwater Management Plan in Appendix C.

Chapter 5: Avoidance and Minimization, Mitigation

A. Avoidance and Minimization

The Project was sited and designed to avoid impacts to natural resources where possible. As a result, the Project will have no impact on the following resources:

- Streams
- Wetlands
- RPAs and RPA buffers
- Sensitive Habitats

In addition, earth disturbance was minimized by utilizing terrain that best suits solar energy production. Therefore, only localized surface grading is required to achieve suitable north-south facing slopes and earth work for the site will be balanced, avoiding the need for off-site borrow or waste sites. Tree removal and habitat fragmentation were also minimized by siting the facility primarily within open, herbaceous areas and areas previously disturbed by others.

B. Mitigation

As the Project will have limited impacts to the natural environment, extensive mitigation measures are not necessary. However, the Project will include establishing a pollinator friendly native/naturalized seed mixture as a post-construction cover type, planting a native/naturalized coniferous buffer screen where the facility will face a residential property or roadway, avoid impacting vegetation or trees beyond the LOD, and maintaining a significant vegetative buffer between the LOD and nearby aquatic resources including RPAs.

Chapter 6: Conclusion and Summary Table

The Project will involve the construction and operation of a three-megawatt ground-mounted solar energy facility with a final fenced footprint of approximately 14.35-acres. The facility will consist of multiple arrays of photovoltaic solar modules supported by a racking system in a single-axis tracker configuration.

This type of facility requires the preparation of a Major Water Quality Impact Assessment Report as a component of a Conditional Use Permit application with Northumberland County, VA. The table below provides a summary of the hydrogeological and ecological concerns addressed by this report.

Concern	Response
Disturbance and/or destruction of wetlands and justification for such action	No wetlands will be disturbed as a result of the Project.
Disruptions or reductions in the supply of water to wetlands, streams, lakes rivers or other water bodies	Post-construction stormwater BMPs will be implemented to avoid an increase from current stormwater discharges. Perimeter sediment filtering BMPs will be installed and maintained during construction to limit the discharge of sediment and sediment laden water outside of the LOD.
Disruptions to existing hydrology, including wetland and stream circulation patterns	The Project has been designed to minimize grading and will not impair existing hydrologic patterns.
Source location and description of fill material	No foreign fill material will be imported or discharged at the site as a result of the Project. Earthwork associated with the Project will be balanced.
Location of dredge material and location of dumping area for such material	No dredging or dumping will occur as a result of the Project.
Location of and impacts on shellfish beds, submerged aquatic vegetation, and fish spawning areas.	No shellfish beds will be impacted by the Project.
Percent of site to be cleared for Project	Tree removal of approximately 42% of the site would occur. Temporary vegetation disruption would occur on approximately 88% of the site.

Concern	Response
Estimation of pre and post development loads in runoff	The calculated runoff load for the site prior to construction is 1.92 cfs during the 1-year storm and 32.72 cfs during the 10-year storm event. The estimated load at Project completion is 3.89 cfs during the 1-year storm event and 40.16 cfs during the 10-year storm event.
Percent increase in impervious surfaces and the types of surfacing material used	Total impervious surface area will increase to 5.03% from 1.07% of the Project area and consist of stone on access roads, equipment pad(s), and the posts and beams for the solar arrays.
Anticipated duration and phasing schedule of the Project	Upon permit approvals, site clearing will begin in 2023 with the Dominion interconnection completed mid-2024. The estimated system turn-on date is currently June 17, 2024.
Listing of all requisite permits from all applicable agencies for the Project	The Project will require local, state, and federal permits/clearances prior to construction. Please see Chapter 1 Section D.
Proposed stormwater management system for nonpoint source quality and quantity control.	A system of berms that can handle stormwater runoff in excess of a 10-year storm will reduce the potential for non-point source pollution and meet post construction stormwater quantity requirements. Estimated phosphorus removal will exceed VA DEQ targets by 2.49 pounds per year.
Creation of wetlands to replace those lost	No wetland impacts are proposed and no wetlands will be created as a part of the Project.

Chapter 7: References

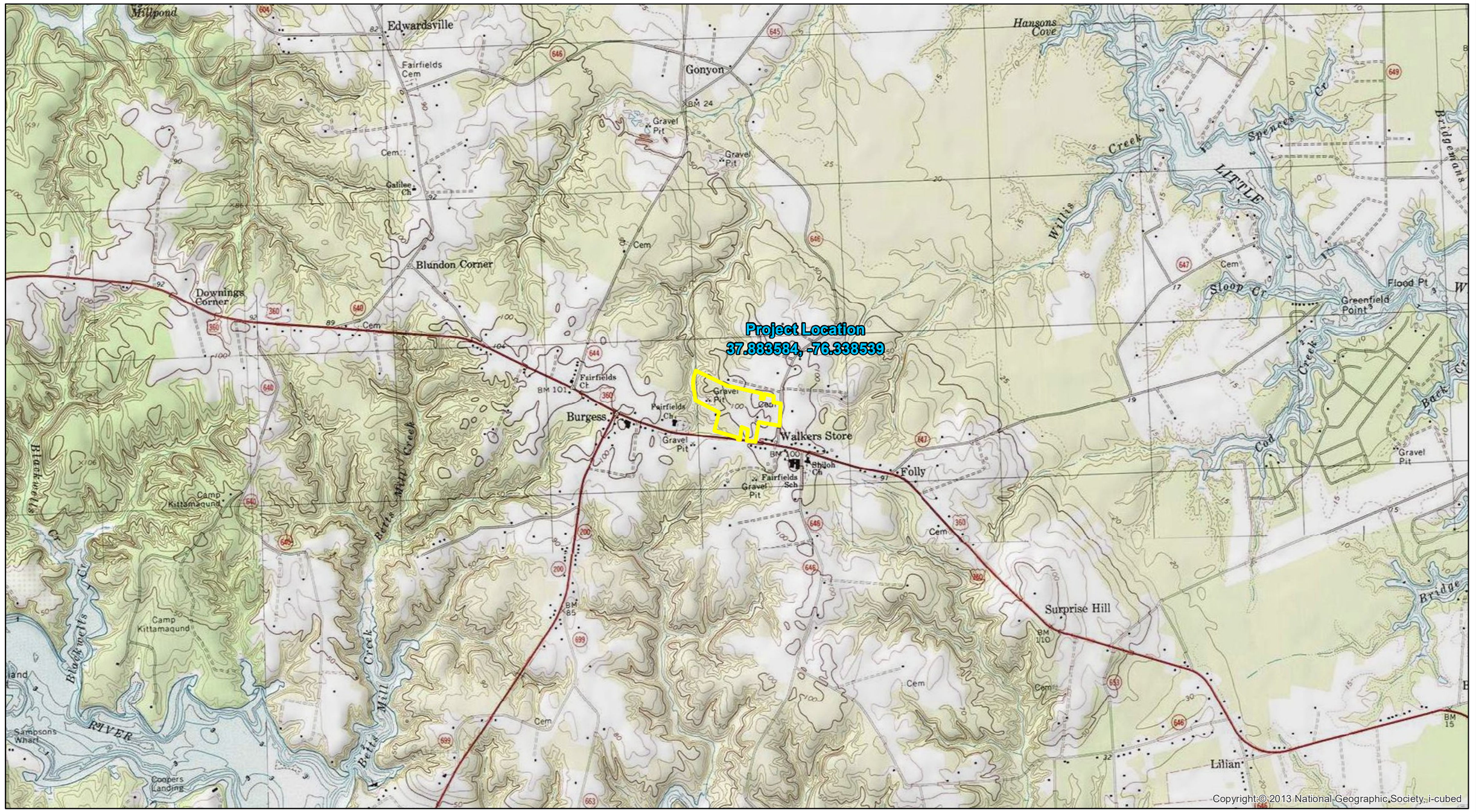
- American Association of Petroleum Geologist (AAPG). Eastern Section. The Late Cenozoic Geology of Southeastern Virginia and the Great Dismal Swamp Field Trip Guidebook, Williamsburg, VA: 1985.
- Federal Emergency Management Agency Flood Map, https://msc.fema.gov/portal/home
- Natural Resources Conservation Service (NRCS). (2021). Soil Survey of Lancaster and Northumberland Counties, Virginia. Washington, D.C.: United States Department of Agriculture.
- Northumberland County, Virginia, 2016 Comprehensive Plan, https://www.co.northumberland.va.us/Documents/Planning_Commission/Comp_Plan/CompPlan_Final_2016.pdf
- NRCS. (2010). Field Indicators of Hydric Soils in the United States. Washington, D.C.: USDA, NRCS.
- NRCS. (1990). Highly Erodible Land Report. Washington, D.C.: USDA, NRCS. https://efotg.sc.egov.usda.gov/references/public/VA/NorthumberlandandLancaster.pdf
- US Environmental Protection (EPA) Ecoregions. https://www.epa.gov/eco-research/ecoregions
- US EPA Enviromapper, https://enviro.epa.gov/enviro/em4ef.home
- US Fish and Wildlife Service Information for Planning and Consultation, https://ecos.fws.gov/ipac/.

- US Geological Survey Protected Areas Database of the United States, https://maps.usgs.gov/padus/
- US Geological Survey Virginia Geologic Map Data, https://mrdata.usgs.gov/geology/state/state.php?state=VA
- US Geological Survey National Water Information System https://waterdata.usgs.gov/nwis
- Virginia (VA) Department of Wildlife Resources. https://dwr.virginia.gov/wildlife/
- VA Fish and Wildlife Information Service. https://services.dwr.virginia.gov/fwis

APPENDIX A

PROJECT MAPPING

Figure 1: USGS Site Location
Figure 2: Aerial Site Location
Figure 3: Soil Types
Figure 4: Aquatic Resources
Figure 5: Forest Stand Delineation



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Surveyed By:	Date:
Project No.070-10406	
Sheet Number: Overall	

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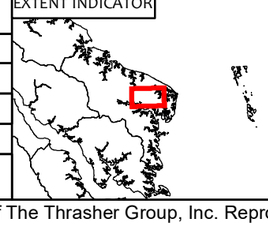

Legend

- Area of Interest (AOI)

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet

Figure 1: USGS Site Location
VAL028 Folly Road
Northumberland County - Virginia

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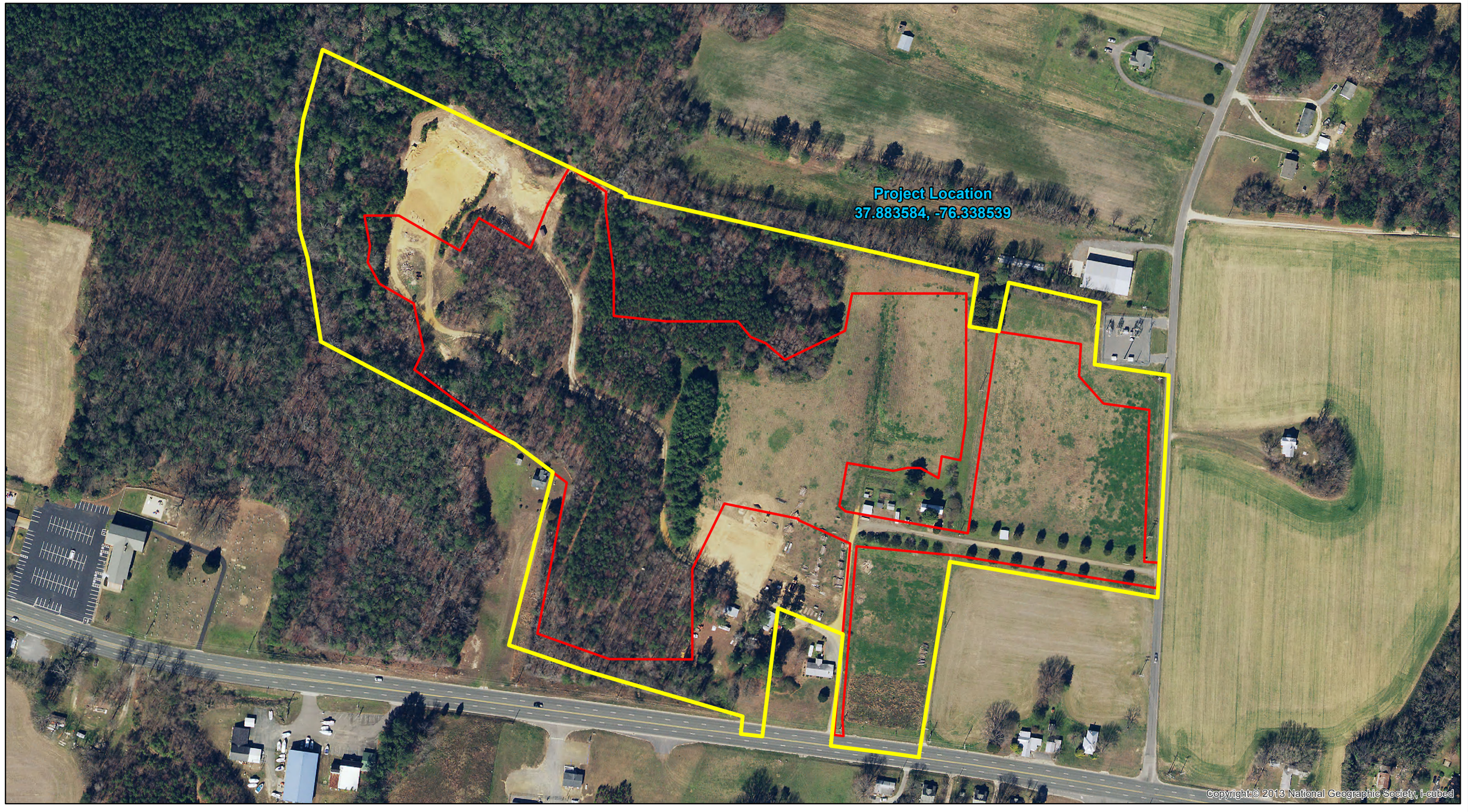

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Surveyed By:	Date:
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Sheet Number: Overall	

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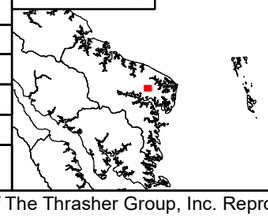

Legend

- Area of Interest (AOI)
- Limt of Disturbance (LOD)

1 inch = 200 feet

0 100 200 400 Feet

Figure 2: Aerial Site Location

VAL028 Folly Road

Northumberland County - Virginia

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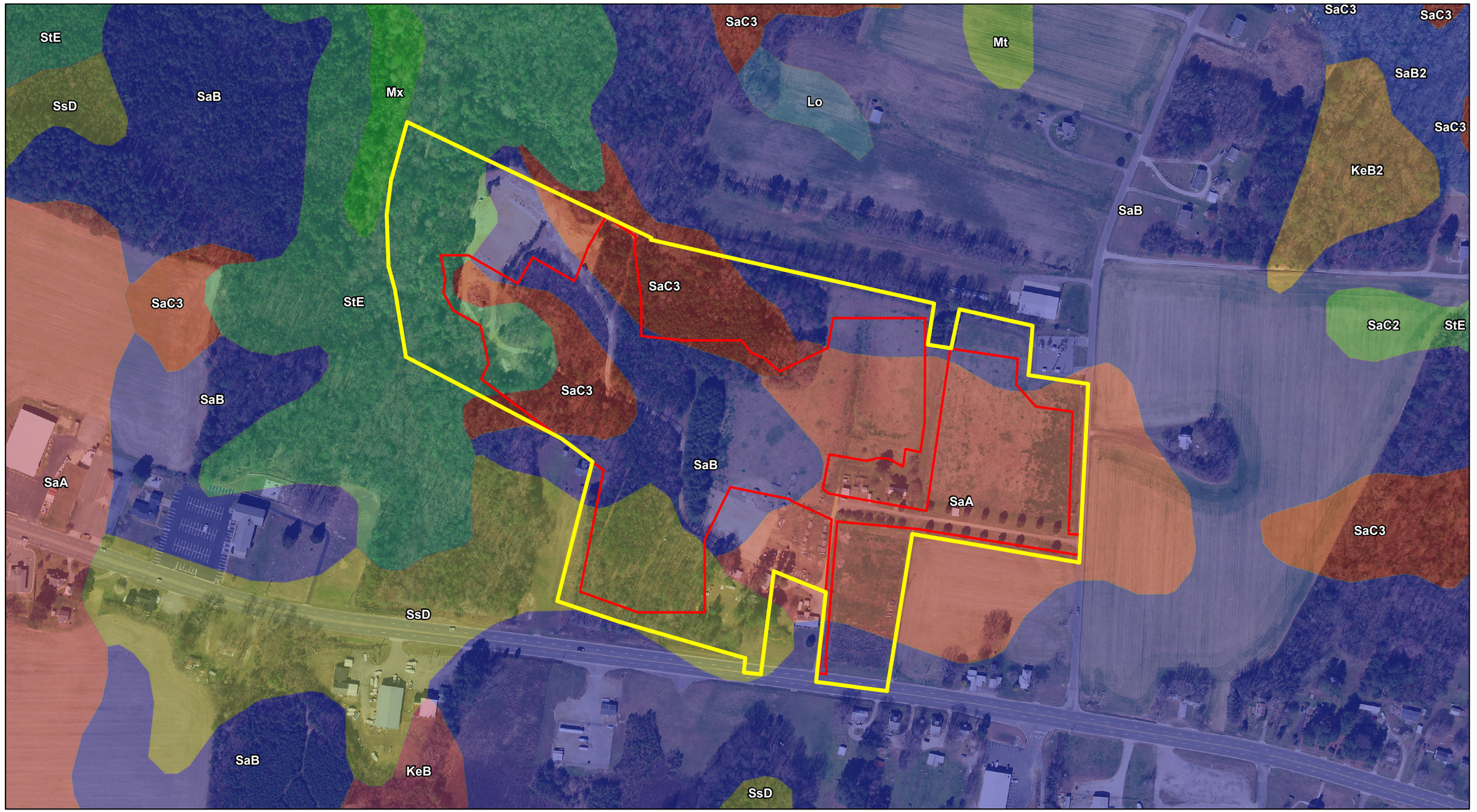

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Project No.070-10406	
Sheet Number: Overall	

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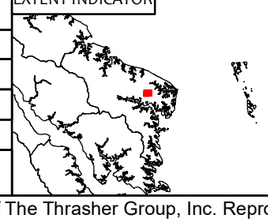

Legend

- Area of Interest (AOI)
- Limit of Disturbance (LOD)

Soil data is downloaded from the US Department of Agriculture, Natural Resource Conservation Service website and used without any edits or modifications. Please see enclosed soil survey for more information.

1 inch = 250 feet

0 125 250 500 Feet

Figure 3: Soil Types

VAL028 Folly Road

Northumberland County - Virginia

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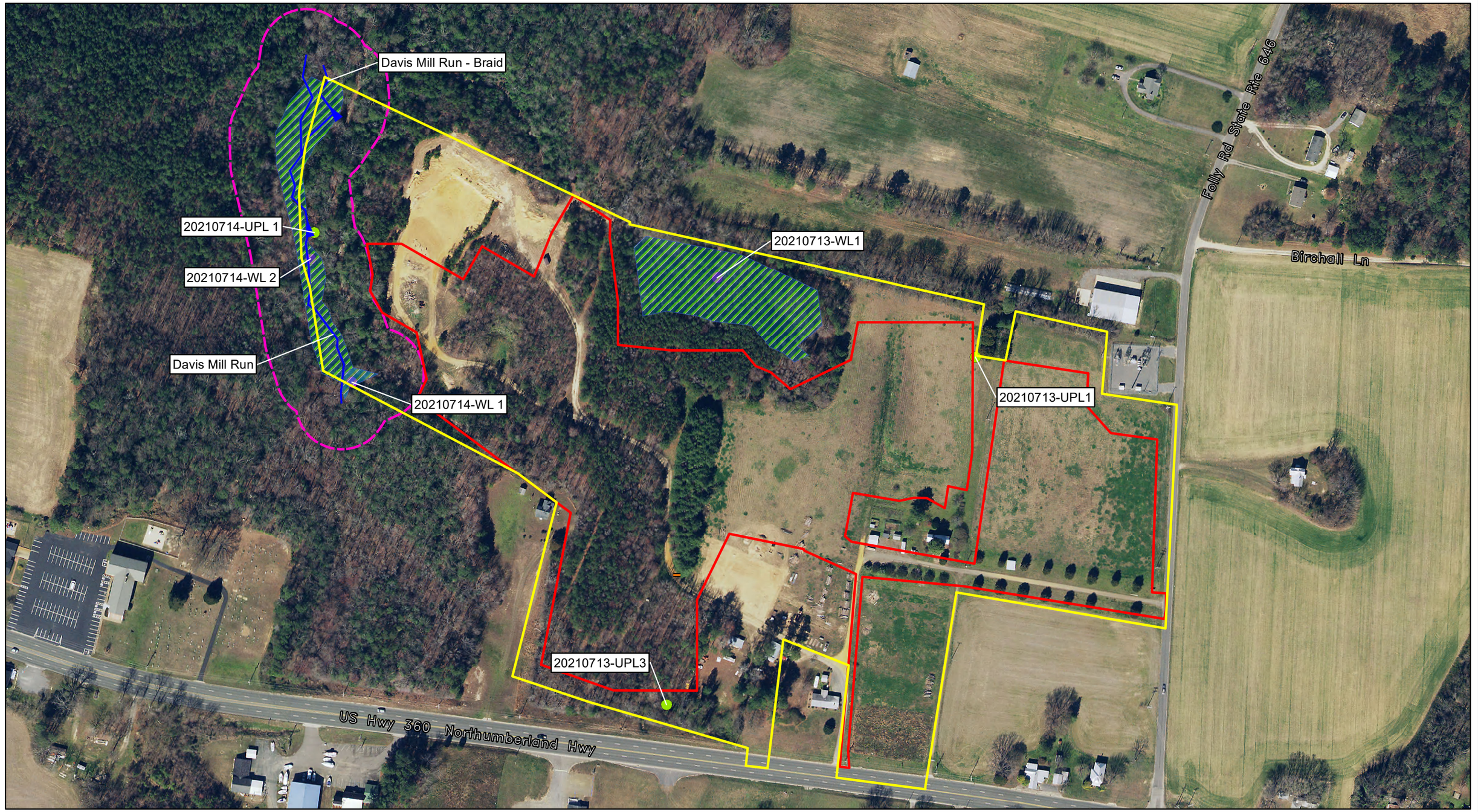

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Surveyed By:	Date:
Project No.070-10406	
Sheet Number: Overall	

EXTENT INDICATOR

Legend

- Culvert
- Area of Interest (AOI)
- Limit of Disturbance (LOD)
- Perennial Stream
- RPA Boundaries
- PFO Wetland
- PSS Wetland
- Wetland Data Point
- Upland Data Point

1 inch = 200 feet

0 100 200 400 Feet

Figure 4: Aquatic Resources

VAL028 Folly Road

Northumberland County - Virginia

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Document Path: R:\070\070-10406.00-VAL-028 and VAL-029 Solar Development-SGC Power, LLC-\GIS\VAL028\MXD\RPA Boundaries_VAL028.mxd

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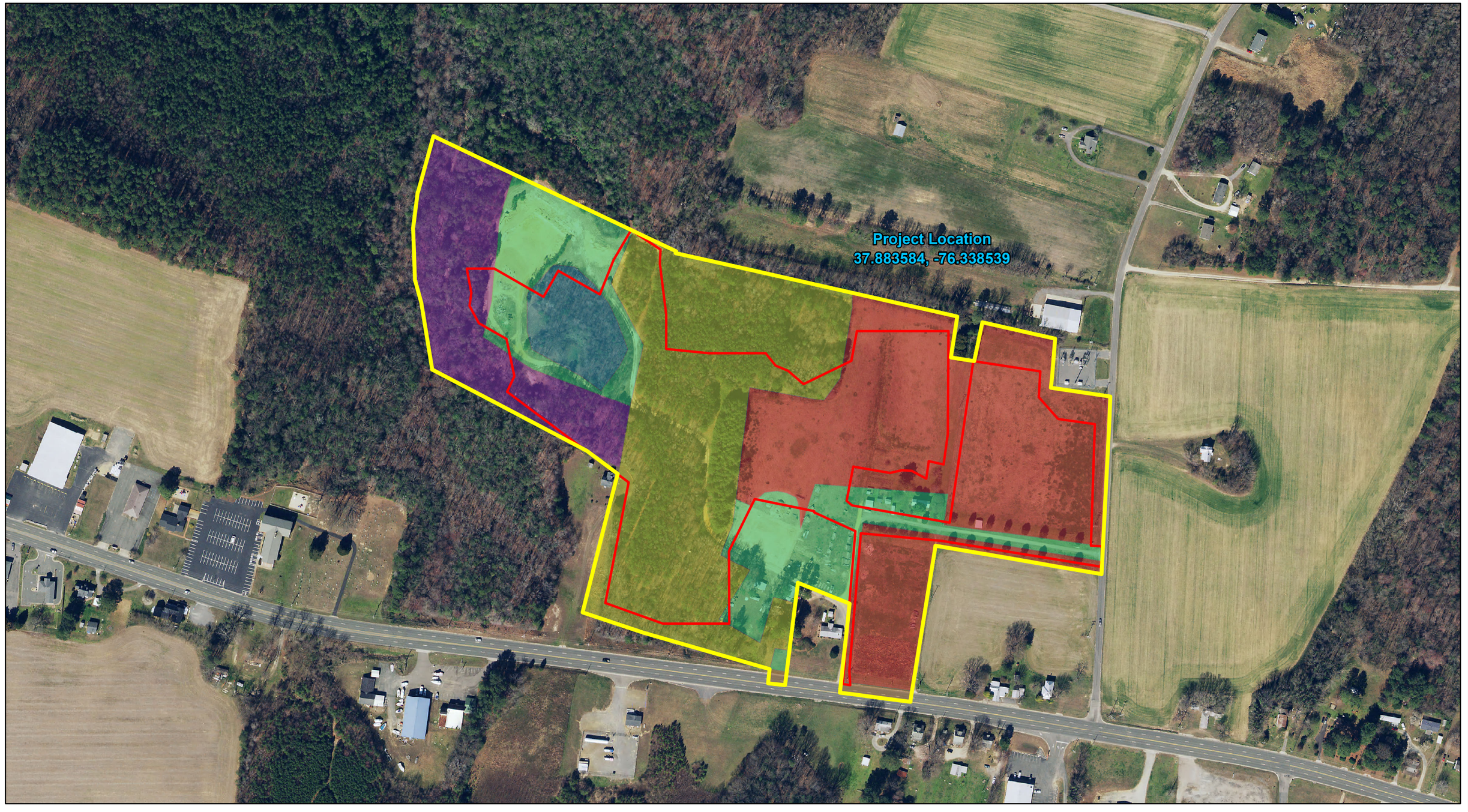

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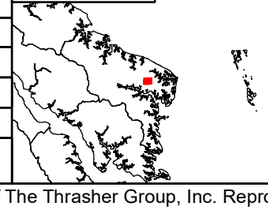

Legend

- Area of Interest (AOI)
- Limit of Disturbance (LOD)
- Loblolly Pine Dominant
- Hardwood and Shrubby Understory
- Hardwood Dominant
- Open Herbaceous Areas
- Low-intensity development
- Impervious surfaces

1 inch = 250 feet

0 125 250 500 Feet

Figure 5: Forest Stand Delineation
VAL028 Folly Road
Northumberland County - Virginia

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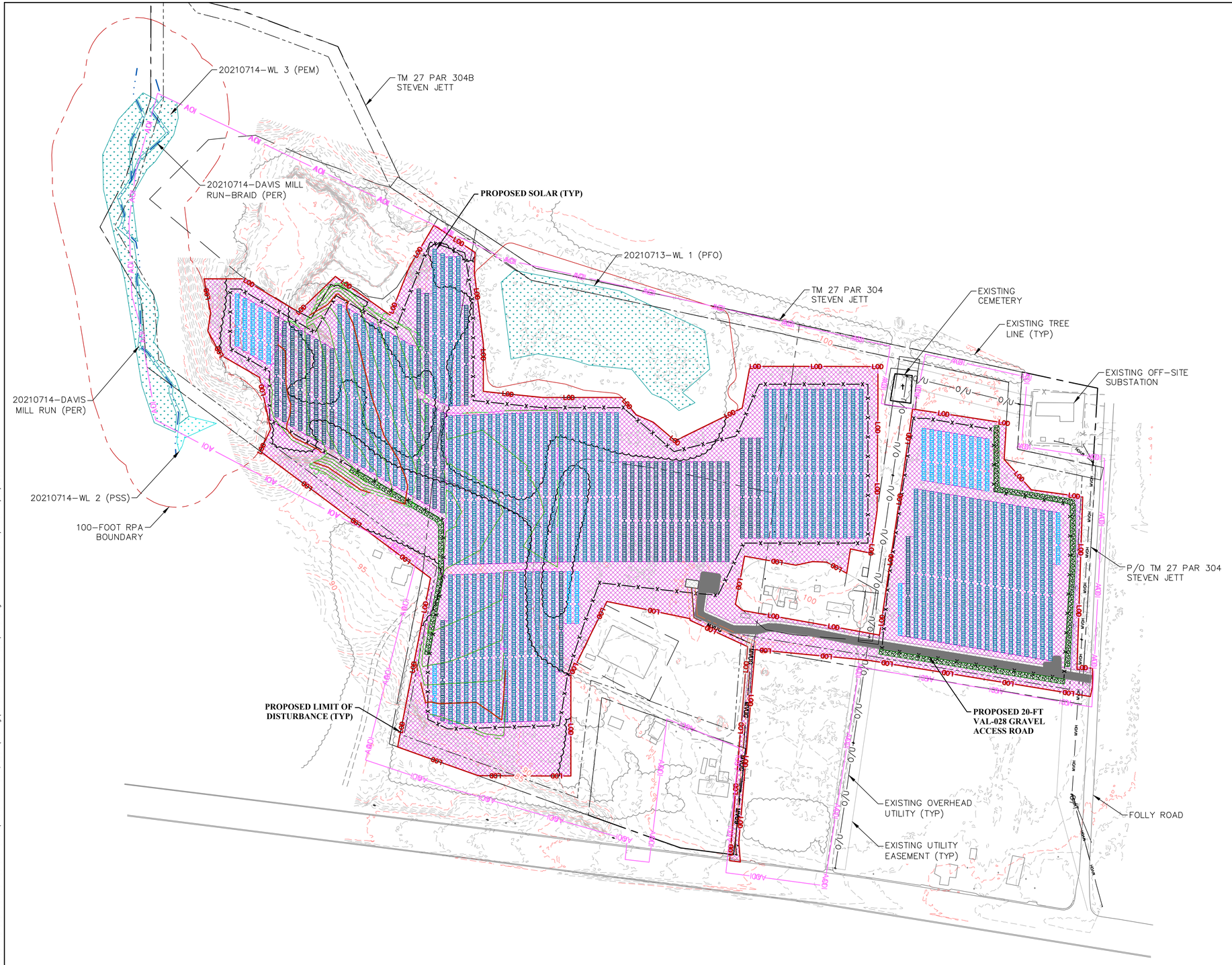

PLAN LEGEND

- EXISTING ENVIRONMENTAL AREA OF INTEREST
- EXISTING CONTOURS
- DELINEATED STREAM - EPHEMERAL
- DELINEATED STREAM - INTERMITTENT
- DELINEATED STREAM - PERENNIAL
- DELINEATED WETLAND - PALUSTRINE EMERGENT (PEM)
- DELINEATED WETLAND - PALUSTRINE FORESTED (PFO)
- DELINEATED WETLAND - PALUSTRINE SCRUB/SHRUB (PSS)
- EXISTING PROPERTY LINE
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING TREE LINE
- EXISTING OVERHEAD UTILITY
- EXISTING STRUCTURE
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED SECURITY FENCE
- PROPOSED UNDERGROUND UTILITY
- PROPOSED PERMANENT UTILITY EASEMENT
- PROPOSED GUARDRAIL
- NO DEVELOPMENT AREAS
- PROPOSED SOLAR
- PROPOSED IMPERVIOUS AREA
- PROPOSED ERNST HONEY BEE FORAGE MIX
- PROPOSED LANDSCAPE SCREEN

NOTES

1. EXISTING CONTOURS, BASE MAPPING, AND PROPERTY LINES SHOWN ARE BASED UPON A COMBINATION OF AERIAL PHOTOGRAPHY AND FIELD SURVEY BY TTG IN JULY, 2021.
2. ENVIRONMENTAL FEATURES SHOWN ARE BASED UPON FIELD DELINEATION PERFORMED IN JULY, 2021.
3. THERE ARE NO PONDS/IMPOUNDMENTS ON SUBJECT PROPERTY OR ADJACENT PROPERTIES.
4. THERE ARE NO IDENTIFIED CULTURAL RESOURCES OR THREATENED OR ENDANGERED SPECIES HABITATS IN THE SUBJECT PROPERTY.
5. THERE ARE NO PROPOSED WETLAND AND STREAM IMPACTS.
6. THERE ARE NO EXISTING ROAD CROSSINGS OF WETLANDS OR STREAMS.
7. PROPOSED VEGETATION PLANTING WILL BE COMPLETED PER THE PLANTING SCHEDULE CONTAINED WITHIN THE DETAILS OF THESE PLANS.

VAL-028 LANDSCAPE SUMMARY	
DESCRIPTION	AREA (AC)
ERNST HONEY BEE FORAGE MIX OR EQUIVALENT	18.46
CONIFEROUS LANDSCAPE SCREEN	0.32
IMPERVIOUS AREA	0.46

100 ft. 0 100 ft. 200 ft.

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2022-08-26

NO.	BY	DATE	DESCRIPTION

SCALE:	
DRAWN:	DATE:
CHECKED:	DATE:
APPROVED:	DATE:
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

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CIVIL • ENVIRONMENTAL • CONSULTING • FIELD SERVICES
600 WHITE OAKS BOULEVARD, BRIDGEPORT, WV 26330
PHONE (304) 624-4108 • FAX (304) 624-7831

PHASE No.	
CONTRACT No.	
PROJECT No.	101-070-10406

ZONING PLANS FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028
PROPOSED CONDITIONS

SHEET No. **11**

PLOT DATE/TIME: 8/26/2022 1:04 PM

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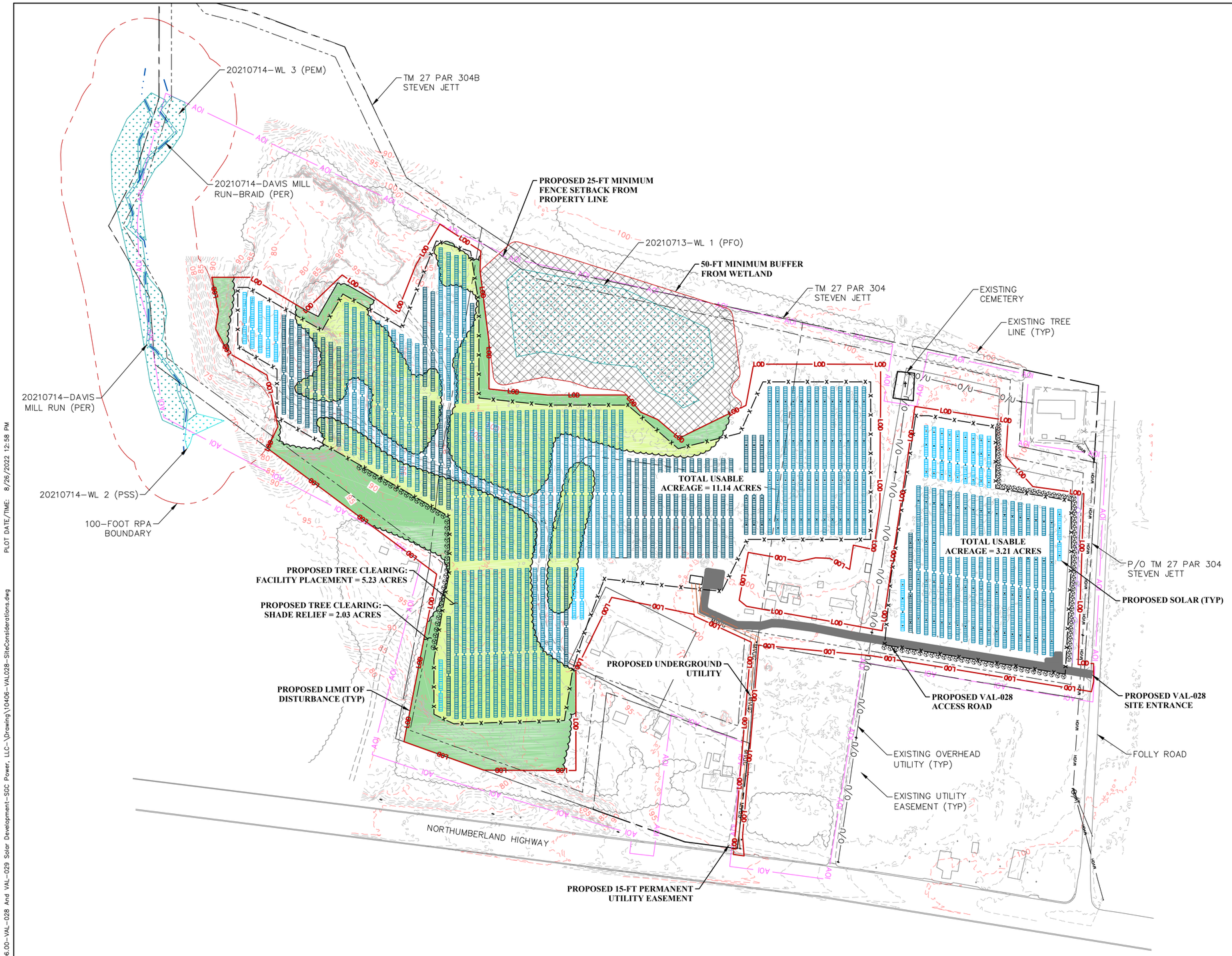

PLAN LEGEND

- EXISTING ENVIRONMENTAL AREA OF INTEREST
- EXISTING CONTOURS
- DELINEATED STREAM - EPHEMERAL
- DELINEATED STREAM - INTERMITTENT
- DELINEATED STREAM - PERENNIAL
- DELINEATED WETLAND - PALUSTRINE EMERGENT (PEM)
- DELINEATED WETLAND - PALUSTRINE FORESTED (PFO)
- DELINEATED WETLAND - PALUSTRINE SCRUB/SHRUB (PSS)
- EXISTING PROPERTY LINE
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING TREE LINE
- EXISTING OVERHEAD UTILITY
- EXISTING STRUCTURE
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED SECURITY FENCE
- PROPOSED UNDERGROUND UTILITY
- PROPOSED PERMANENT UTILITY EASEMENT
- PROPOSED GUARDRAIL
- NO DEVELOPMENT AREAS
- PROPOSED SOLAR
- PROPOSED TREE CLEARING: FACILITY PLACEMENT
- PROPOSED TREE CLEARING: SHADE RELIEF

NOTES

1. EXISTING CONTOURS, BASE MAPPING, AND PROPERTY LINES SHOWN ARE BASED UPON A COMBINATION OF AERIAL PHOTOGRAPHY AND FIELD SURVEY BY TTG IN JULY, 2021.
2. ENVIRONMENTAL FEATURES SHOWN ARE BASED UPON FIELD DELINEATION PERFORMED IN JULY, 2021.
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4. THERE ARE NO IDENTIFIED CULTURAL RESOURCES OR THREATENED OR ENDANGERED SPECIES HABITATS IN THE SUBJECT PROPERTY.
5. THERE ARE NO PROPOSED WETLAND AND STREAM IMPACTS.
6. THERE ARE NO EXISTING ROAD CROSSINGS OF WETLANDS OR STREAMS.

TREE CLEARING SUMMARY	
DESCRIPTION	AREA (AC)
TOTAL TREE COVER IN LIMITS-OF-DISTURBANCE	7.259
TREE CLEARING FOR FOOTPRINT	5.231
TREE CLEARING FOR SHADE RELIEF	2.028
TREE CLEARING WITHIN RPA BUFFER	0.000

100 ft. 0 100 ft. 200 ft.

PLOT DATE/TIME: 8/26/2022 12:58 PM

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NO.	BY	DATE	DESCRIPTION

SCALE:	
DRAWN:	DATE:
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APPROVED:	DATE:
SURVEY DATE:	
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FIELD BOOK No.:	

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CONTRACT No.

PROJECT No.
101-070-10406

DESIGN EXHIBIT FOR 200 FOLLY, LLC NORTHUMBERLAND COUNTY VIRGINIA TREE CLEARING SUMMARY

SHEET No.
5

APPENDIX B

AGENCY CORRESPONDENCE

August 22, 2022

Ms. Cory McCandless
Land Development Project Manager
200 Folly, LLC
6865 Deerpath Road
Elkridge, MD 21075
Transmitted via email: cory.mccandless@sgc-power.com

RE: Environmental Requirements Memorandum
Virginia Fish and Wildlife Information Service Maps 2-Mile Search
VAL028 – Folly Road Solar Project
Northumberland County, Virginia

Ms. McCandless:

The Virginia Fish and Wildlife Information Service (VAFWIS) geographic search tool was utilized to generate a map and report documenting species observations within a two-mile buffer of the center point of the VAL028 – Folly Road Solar Project (Project).

The VAFWIS map depicts species observation sites to the north, northeast, northwest, west, south, southwest, and southeast of the Project area. The VAFWIS system; however, does not provide a tool that can produce a label defining which species were observed in each species observation site. The two-mile search report provided with the VAFWIS map does however list 392 species that are known or likely to occur within a two-mile buffer of the Project. In the "confirmed" column, several species are listed as either "potential" or "yes". A "potential" in the "confirmed" column indicates that preferential habitat for the species is located within or near the two-mile buffer; however, there are no direct observations of the species. A "yes" in the "confirmed" column indicates that the species was observed on a specific date at that location.

There are no federal or state listed threatened or endangered species observations sites within or near the two-mile buffer of the Project. Three species observations are designated with a Virginia Wildlife Action Plan Tier and include the following:

- *Anguilla rostrata* – Tier III (High Conservation Need)
- *Terrapene carolina carolina* – Tier III (High Conservation Need)
- *Chelydra serpentina* – Tier IV (Moderate Conservation Need)

If you have any questions or need any additional information, please feel free to contact me at your convenience at (304) 624-4108 or jwilcox@thethrashergroup.com.

Sincerely,

THE THRASHER GROUP, INC.

JORDAN P. WILCOX
Environmental Project Manager II

29 Species Observations

37,53,00.9 -76,20,18.7
is **the Search Point**

Show Position Rings
(•) Yes ( ) No
1 mile and 1/4 mile at the **Search Point**

Show Search Area
(•) Yes ( ) No
2 Search distance miles radius

Search Point is at map center

Base Map Choices
Color Aerial Photography

Map Overlay Choices
Current List: Position, Search, SppObs

Map Overlay Legend

Position Rings 1 mile and 1/4 mile at the Search Point

2 mile radius Search Area

Data Observation Site

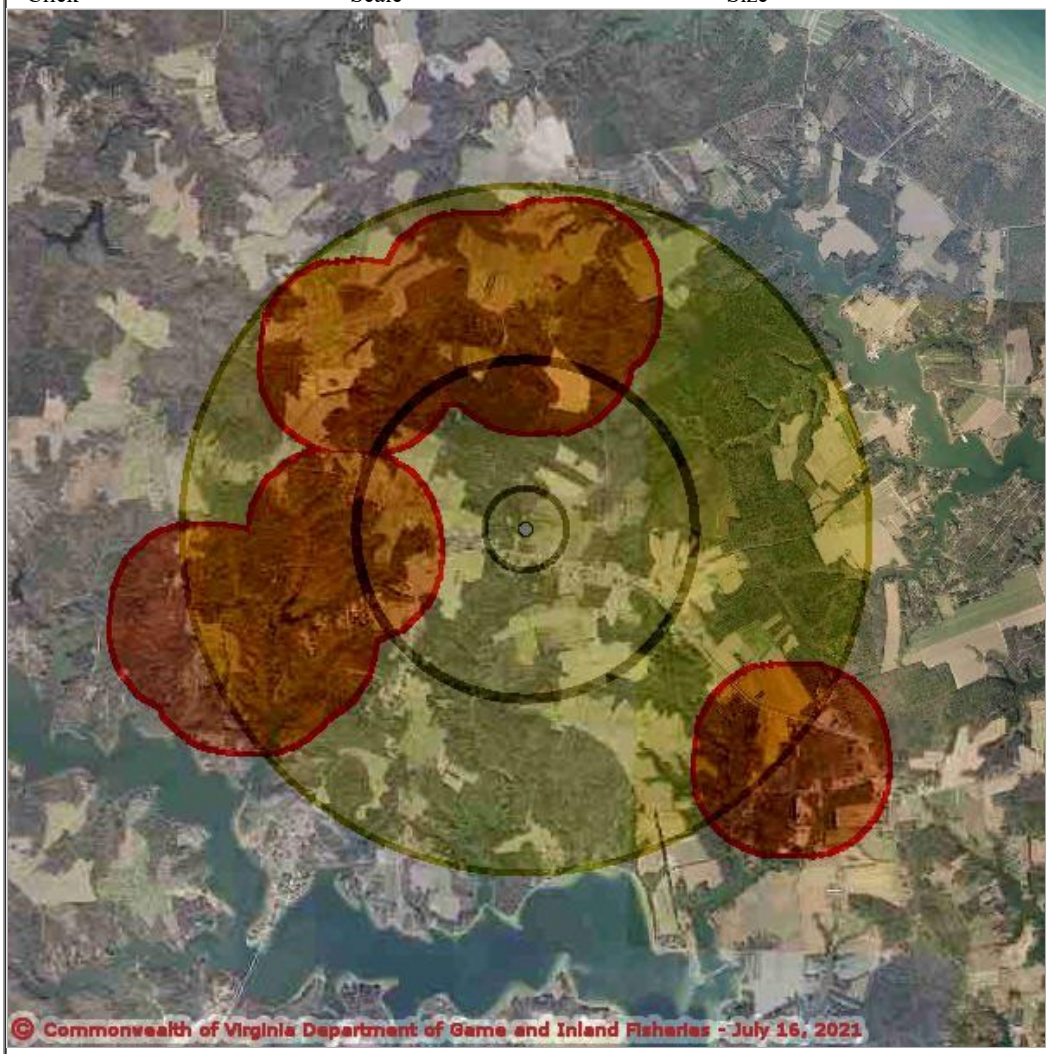
back | Refresh Browser Page

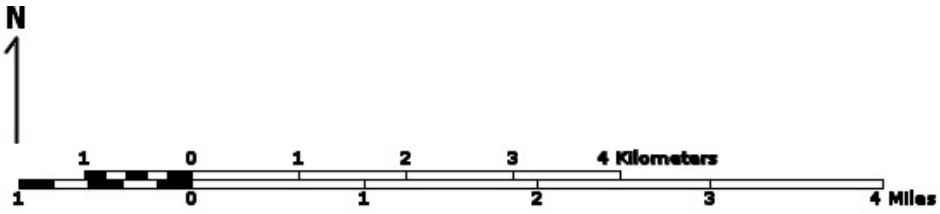
Map Click: Pan | Id | M

Map Scale: In | Zoom | Out

Screen Size: Small | Size | Big

Help





Point of Search 37,53,00.9 -76,20,18.7
Map Location 37,53,00.9 -76,20,18.7

Select **Coordinate System:**
(•) Degrees,Minutes,Seconds Latitude - Longitude
( ) Decimal Degrees Latitude - Longitude
( ) Meters UTM NAD83 East North Zone
( ) Meters UTM NAD27 East North Zone

Base Map source: Color Aerial Photography 2002 - Virginia Base Mapping Program, Virginia Geographic Information Network

Map projection is UTM Zone 18 NAD 1983 with left 377494 and top 4198543. Pixel size is 16 meters . Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixles. The map display represents 9600 meters east to west by 9600 meters north to south for a total of 92.1 square kilometers. The map display represents 31501 feet east to west by 31501 feet north to south for a total of 35.5 square miles.

Topographic maps and Black and white aerial photography for year 1990+-
are from the United States Department of the Interior, United States Geological Survey.
Color aerial photography aquired 2002 is from Virginia Base Mapping Program, Virginia Geographic Information Network.
Shaded topographic maps are from TOPO! ©2006 National Geographic
http://www.national.geographic.com/topo
All other map products are from the Commonwealth of Virginia Department of Game and Inland Fisheries.

map assembled 2021-07-16 10:04:59 (qa/qc March 21, 2016 12:20 - tn=1106037.0 dist=3218 I)
$poi=37.8835840 -76.3385388

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Virginia Department of Game and Inland Fisheries

2/23/2022 4:00:59 PM

Fish and Wildlife Information Service

VaFWIS Search Report Compiled on 2/23/2022, 4:00:59 PM

Help

Known or likely to occur within a **2 mile radius around point 37.8835840 -76.3385364** in **133 Northumberland County, VA**

View Map of Site Location

392 Known or Likely Species ordered by Status Concern for Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
030074	FESE	Ia	Turtle, Kemp's ridley sea	Lepidochelys kempii		BOVA
010032	FESE	Ib	Sturgeon, Atlantic	Acipenser oxyrinchus		BOVA
030071	FTST	Ia	Turtle, loggerhead sea	Caretta caretta		BOVA
040110	FTSE	Ia	Rail, eastern black	Laterallus jamaicensis jamaicensis		BOVA
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
030072	FTST	Ib	Turtle, green sea	Chelonia mydas		BOVA
100361	FTST	IIa	Beetle, northeastern beach tiger	Cicindela dorsalis dorsalis		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
030067	CC	IIa	Terrapin, northern diamond-backed	Malaclemys terrapin terrapin		BOVA
030063	CC	IIIa	Turtle, spotted	Clemmys guttata		BOVA
040052		IIa	Duck, American black	Anas rubripes		BOVA
040033		IIa	Egret, snowy	Egretta thula		BOVA
040029		IIa	Heron, little blue	Egretta caerulea caerulea		BOVA
040036		IIa	Night-heron, yellow-crowned	Nyctanassa violacea violacea		BOVA
040114		IIa	Oystercatcher, American	Haematopus palliatus		BOVA
040181		IIa	Tern, common	Sterna hirundo		BOVA

040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA
040140		IIa	Woodcock, American	Scolopax minor		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA
010131		IIIa	Eel, American	Anguilla rostrata	Yes	BOVA,SppObs
030068		IIIa	Turtle, woodland box	Terrapene carolina carolina	Yes	BOVA,SppObs
040037		IIIa	Bittern, least	Ixobrychus exilis exilis		BOVA
040100		IIIa	Bobwhite, northern	Colinus virginianus		BOVA
040046		IIIa	Brant	Branta bernicla brota		BOVA
040202		IIIa	Cuckoo, yellow-billed	Coccyzus americanus		BOVA
040094		IIIa	Harrier, northern	Circus hudsonius		BOVA
040035		IIIa	Night-heron, black-crowned	Nycticorax nycticorax hoactii		BOVA
040204		IIIa	Owl, barn	Tyto alba pratincola		BOVA
040418		IIIa	Sparrow, Nelson's	Ammospiza nelsoni		BOVA
040381		IIIa	Sparrow, saltmarsh	Ammodramus caudacutus		BOVA
040180		IIIa	Tern, Forster's	Sterna forsteri		BOVA
040186		IIIa	Tern, least	Sternula antillarum	Potential	BOVA,Habitat
040333		IIIa	Warbler, Kentucky	Geothlypis formosa		BOVA
040215		IIIa	Whip-poor-will, Eastern	Antrostomus vociferus		BOVA
040133		IIIa	Willet	Catoptrophorus semipalmatus semipalmatus		BOVA
100079		IIIa	Butterfly, monarch	Danaus plexippus		BOVA
040220		IIIb	Kingfisher, belted	Megaceryle alcyon		BOVA
120026		IIIb	Dolphin, bottlenose	Tursiops truncatus		BOVA
040247		IIIc	Swallow, bank	Riparia riparia		BOVA
020069		IVa	Salamander, eastern mud	Pseudotriton montanus montanus		BOVA
020058		IVa	Siren, greater	Siren lacertina		BOVA
030045		IVa	Ribbonsnake,	Thamnophis saurita		BOVA

			common	saurita		
030017		IVa	Scarletsnake, northern	Cemophora coccinea copei		BOVA
030046		IVa	Snake, common rainbow	Farancia erytrogramma erytrogramma		BOVA
040272		IVa	Catbird, gray	Dumetella carolinensis		BOVA
040337		IVa	Chat, yellow-breasted	Icteria virens virens		BOVA
040142		IVa	Dowitcher, short-billed	Limnodromus griseus		BOVA
040173		IVa	Gull, laughing	Leucophaeus atricilla		BOVA
040229		IVa	Kingbird, eastern	Tyrannus tyrannus		BOVA
040003		IVa	Loon, red-throated	Gavia stellata		BOVA
040344		IVa	Meadowlark, eastern	Sturnella magna		BOVA
040054		IVa	Pintail, northern	Anas acuta		BOVA
040106		IVa	Rail, clapper	Rallus crepitans		BOVA
040065		IVa	Scaup, greater	Aythya marila		BOVA
040391		IVa	Sparrow, field	Spizella pusilla		BOVA
040378		IVa	Sparrow, grasshopper	Ammodramus savannarum pratensis		BOVA
040382		IVa	Sparrow, seaside	Ammodramus maritimus		BOVA
040187		IVa	Tern, royal	Sterna maxima maximus		BOVA
040273		IVa	Thrasher, brown	Toxostoma rufum		BOVA
040375		IVa	Towhee, eastern	Pipilo erythrophthalmus		BOVA
040302		IVa	Warbler, black-and-white	Mniotilta varia		BOVA
040269		IVa	Wren, marsh	Cistothorus palustris		BOVA
050029		IVa	Bat, eastern red	Lasiurus borealis		BOVA
050030		IVa	Bat, hoary	Lasiurus cinereus		BOVA
050025		IVa	Bat, silver-haired	Lasionycteris noctivagans		BOVA
030050		IVb	Turtle, snapping	Chelydra serpentina	Yes	BOVA,SppObs
040221		IVb	Flicker, northern	Colaptes auratus		BOVA
040028		IVb	Heron, green	Butorides virescens		BOVA
040217		IVb	Swift, chimney	Chaetura pelagica		BOVA
040277		IVb	Thrush, wood	Hylocichla mustelina		BOVA
040340		IVb	Warbler, Canada	Cardellina canadensis		BOVA

040243		IVb	Wood-Pewee, Eastern	Contopus virens		BOVA
010001		IVc	Lamprey, least brook	Lampetra aepyptera		BOVA
010128		IVc	Madtom, tadpole	Noturus gyrinus		BOVA
030024		IVc	Snake, eastern hog-nosed	Heterodon platirhinos		BOVA
040248		IVc	Swallow, northern rough-winged	Stelgidopteryx serripennis		BOVA
010049			Anchovy, bay	Anchoa mitchilli		BOVA
010188			Bass, largemouth	Micropterus salmoides		BOVA
010183			Bluegill	Lepomis macrochirus		BOVA
010123			Bullhead, brown	Ameiurus nebulosus	Yes	SppObs
010122			Bullhead, yellow	Ameiurus natalis		BOVA
010062			Carp, common	Cyprinus carpio		BOVA
010390			Catfish, blue	Ictalurus furcatus		BOVA
010125			Catfish, channel	Ictalurus punctatus		BOVA
010106			Chubsucker, creek	Erimyzon oblongus	Yes	BOVA,SppObs
010250			Croaker, Atlantic	Micropogonias undulatus		BOVA
010366			Dace, rosyside	Clinostomus funduloides		BOVA
010397			Darter, tessellated	Etheostoma olmstedi	Yes	BOVA,SppObs
010104			Fallfish	Semotilus corporalis		BOVA
010312			Hogchoker	Trinectes maculatus		BOVA
010143			Killifish, banded	Fundulus diaphanus		BOVA
010145			Killifish, spotfin	Fundulus luciae		BOVA
010002			Lamprey, sea	Petromyzon marinus		BOVA
010129			Madtom, margined	Noturus insignis		BOVA
010043			Menhaden, Atlantic	Brevoortia tyrannus		BOVA
010408			Minnow, eastern silvery	Hybognathus regius		BOVA
010140			Minnow, sheepshead	Cyprinodon variegatus		BOVA
010148			Mosquitofish, eastern	Gambusia holbrooki	Yes	BOVA,SppObs
010054			Mudminnow, eastern	Umbra pygmaea	Yes	BOVA,SppObs
010144			Mummichog	Fundulus heteroclitus		BOVA

010163			Perch, pirate	Aphredoderus sayanus sayanus		BOVA
010166			Perch, white	Morone americana		BOVA
010056			Pickerel, chain	Esox niger	Yes	BOVA,SppObs
010182			Pumpkinseed	Lepomis gibbosus	Yes	BOVA,SppObs
010041			Shad, gizzard	Dorosoma cepedianum		BOVA
010080			Shiner, common	Luxilus cornutus		BOVA
010068			Shiner, golden	Notemigonus crysoleucas		BOVA
010303			Silverside, Atlantic	Menidia menidia		BOVA
010246			Spot	Leiostomus xanthurus		BOVA
010156			Stickleback, fourspine	Apeltes quadracus		BOVA
010178			Sunfish, bluespotted	Enneacanthus gloriosus		BOVA
010245			Weakfish	Cynoscion regalis		BOVA
020004			Bullfrog, American	Lithobates catesbeianus		BOVA
020003			Frog, Brimley's chorus	Pseudacris brimleyi		BOVA
020016			Frog, Coastal Plains leopard	Lithobates sphenocephalus utricularius		BOVA
020012			Frog, eastern cricket	Acris crepitans		BOVA
020008			Frog, green	Lithobates clamitans		BOVA
020013			Frog, pickerel	Lithobates palustris		BOVA
020018			Frog, upland chorus	Pseudacris feriarum		BOVA
020019			Frog, wood	Lithobates sylvaticus		BOVA
020065			Newt, red-spotted	Notophthalmus viridescens viridescens		BOVA
020071			Peeper, spring	Pseudacris crucifer		BOVA
020043			Salamander, eastern red-backed	Plethodon cinereus	Yes	BOVA,SppObs
020029			Salamander, four-toed	Hemidactylium scutatum		BOVA
020035			Salamander, marbled	Ambystoma opacum		BOVA
020038			Salamander, northern dusky	Desmognathus fuscus		BOVA
020070			Salamander, northern red	Pseudotriton ruber ruber		BOVA

020050			Salamander, southern two-lined	Eurycea cirrigera		BOVA
020049			Salamander, spotted	Ambystoma maculatum		BOVA
020051			Salamander, three-lined	Eurycea guttolineata		BOVA
020080			Salamander, white-spotted slimy	Plethodon cylindraceus		BOVA
020059			Toad, eastern American	Anaxyrus americanus americanus		BOVA
020060			Toad, eastern narrow-mouthed	Gastrophryne carolinensis		BOVA
020062			Toad, Fowler's	Anaxyrus fowleri		BOVA
020006			Treefrog, Cope's gray	Hyla chrysoscelis		BOVA
020009			Treefrog, green	Hyla cinerea		BOVA
030041			Brownsnake, Dekay's	Storeria dekayi		BOVA
030057			Cooter, northern red-bellied	Pseudemys rubriventris		BOVA
030016			Copperhead, eastern	Agkistrodon contortrix		BOVA
030022			Cornsnake, red	Pantherophis guttatus		BOVA
030049			Earthsnake, eastern smooth	Virginia valeriae valeriae		BOVA
030044			Gartersnake, eastern	Thamnophis sirtalis sirtalis		BOVA
030038			Greensnake, northern rough	Opheodrys aestivus aestivus	Yes	BOVA,SppObs
030026			Kingsnake, eastern	Lampropeltis getula		BOVA
030027			Kingsnake, northern mole	Lampropeltis rhombomaculata		BOVA
030002			Lizard, eastern fence	Sceloporus undulatus		BOVA
030029			Milksnake, eastern	Lampropeltis triangulum		BOVA
030018			Racer, northern black	Coluber constrictor constrictor		BOVA
030008			Racerunner, eastern six-lined	Aspidoscelis sexlineata sexlineata		BOVA
030023			Ratsnake, eastern	Pantherophis alleghaniensis		BOVA
030006			Skink, broad-	Plestiodon laticeps	Yes	BOVA,SppObs

			headed			
030004			Skink, common five-lined	Plestiodon fasciatus		BOVA
030007			Skink, little brown	Scincella lateralis		BOVA
030005			Skink, southeastern five-lined	Plestiodon inexpectatus		BOVA
030042			Snake, northern red-bellied	Storeria occipitomaculata occipitomaculata		BOVA
030020			Snake, northern ring-necked	Diadophis punctatus edwardsii		BOVA
030052			Turtle, eastern musk	Sternotherus odoratus		BOVA
030060			Turtle, eastern painted	Chrysemys picta picta		BOVA
030051			Turtle, southeastern mud	Kinosternon subrubrum subrubrum	Yes	BOVA,SppObs
030034			Watersnake, northern	Nerodia sipedon sipedon		BOVA
030019			Wormsnake, eastern	Carphophis amoenus amoenus	Yes	BOVA,SppObs
040346			Blackbird, red-winged	Agelaius phoeniceus		BOVA
040282			Bluebird, eastern	Sialia sialis		BOVA
040068			Bufflehead	Bucephala albeola		BOVA
040361			Bunting, indigo	Passerina cyanea		BOVA
040401			Bunting, snow	Plectrophenax nivalis nivalis		BOVA
040064			Canvasback	Aythya valisineria		BOVA
040357			Cardinal, northern	Cardinalis cardinalis		BOVA
040258			Chickadee, Carolina	Poecile carolinensis		BOVA
040214			Chuck-will's-widow	Antrostomus carolinensis		BOVA
040113			Coot, American	Fulica americana		BOVA
040024			Cormorant, double-crested	Phalacrocorax auritus		BOVA
040023			Cormorant, great	Phalacrocorax carbo		BOVA
040353			Cowbird, brown-headed	Molothrus ater		BOVA
040264			Creeper, brown	Certhia americana		BOVA
040373			Crossbill, white-	Loxia leucoptera		BOVA

			winged			
040255			Crow, American	Corvus brachyrhynchos		BOVA
040256			Crow, fish	Corvus ossifragus		BOVA
040364			Dickcissel	Spiza americana		BOVA
040198			Dove, mourning	Zenaida macroura carolinensis		BOVA
040069			Duck, long-tailed	Clangula hyemalis		BOVA
040076			Duck, ruddy	Oxyura jamaicensis		BOVA
040061			Duck, wood	Aix sponsa		BOVA
040093			Eagle, bald	Haliaeetus leucocephalus	Yes	BOVA,BAEANests
040030			Egret, cattle	Bubulcus ibis		BOVA
040032			Egret, great	Ardea alba egretta		BOVA
040072			Eider, king	Somateria spectabilis		BOVA
040367			Finch, house	Haemorhous mexicanus		BOVA
040366			Finch, purple	Haemorhous purpureus		BOVA
040239			Flycatcher, Acadian	Empidonax virescens		BOVA
040234			Flycatcher, great crested	Myiarchus crinitus		BOVA
040053			Gadwall	Mareca strepera		BOVA
040284			Gnatcatcher, blue-gray	Polioptila caerulea		BOVA
040067			Goldeneye, common	Bucephala clangula americana		BOVA
040371			Goldfinch, American	Spinus tristis		BOVA
040045			Goose, Canada	Branta canadensis		BOVA
040049			Goose, lesser snow	Chen caerulescens caerulescens		BOVA
040410			Goose, snow	Chen caerulescens		BOVA
040351			Grackle, boat-tailed	Quiscalus major		BOVA
040352			Grackle, common	Quiscalus quiscula		BOVA
040005			Grebe, horned	Podiceps auritus		BOVA
040008			Grebe, pied-billed	Podilymbus podiceps		BOVA
040004			Grebe, red-necked	Podiceps grisegena		BOVA
040360			Grosbeak, blue	Passerina caerulea		BOVA

040365			Grosbeak, evening	Coccothraustes vespertinus		BOVA
040165			Gull, great black-backed	Larus marinus		BOVA
040167			Gull, herring	Larus argentatus		BOVA
040170			Gull, ring-billed	Larus delawarensis		BOVA
040089			Hawk, broad-winged	Buteo platypterus		BOVA
040086			Hawk, Cooper's	Accipiter cooperii		BOVA
040088			Hawk, red-shouldered	Buteo lineatus lineatus		BOVA
040087			Hawk, red-tailed	Buteo jamaicensis		BOVA
040090			Hawk, rough-legged	Buteo lagopus johannis		BOVA
040085			Hawk, sharp-shinned	Accipiter striatus velox		BOVA
040027			Heron, great blue	Ardea herodias herodias		BOVA
040034			Heron, tricolored	Egretta tricolor		BOVA
040218			Hummingbird, ruby-throated	Archilochus colubris		BOVA
040252			Jay, blue	Cyanocitta cristata		BOVA
040387			Junco, dark-eyed	Junco hyemalis		BOVA
040098			Kestrel, American	Falco sparverius sparverius		BOVA
040119			Killdeer	Charadrius vociferus		BOVA
040285			Kinglet, golden-crowned	Regulus satrapa		BOVA
040286			Kinglet, ruby-crowned	Regulus calendula		BOVA
040245			Lark, horned	Eremophila alpestris		BOVA
040001			Loon, common	Gavia immer		BOVA
040051			Mallard	Anas platyrhynchos		BOVA
040251			Martin, purple	Progne subis		BOVA
040078			Merganser, common	Mergus merganser americanus		BOVA
040077			Merganser, hooded	Lophodytes cucullatus		BOVA
040079			Merganser, red-breasted	Mergus serrator serrator		BOVA
040271			Mockingbird, northern	Mimus polyglottos		BOVA
040112			Moorhen, common	Gallinula chloropus cachinnans		BOVA

040216			Nighthawk, common	Chordeiles minor		BOVA
040263			Nuthatch, brown-headed	Sitta pusilla		BOVA
040262			Nuthatch, red-breasted	Sitta canadensis		BOVA
040261			Nuthatch, white-breasted	Sitta carolinensis		BOVA
040348			Oriole, Baltimore	Icterus galbula		BOVA
040347			Oriole, orchard	Icterus spurius		BOVA
040095			Osprey	Pandion haliaetus carolinensis		BOVA
040330			Ovenbird	Seiurus aurocapilla		BOVA
040209			Owl, barred	Strix varia		BOVA
040206			Owl, great horned	Bubo virginianus		BOVA
040211			Owl, short-eared	Asio flammeus		BOVA
040312			Parula, northern	Setophaga americana		BOVA
040020			Pelican, brown	Pelecanus occidentalis carolinensis		BOVA
040101			Pheasant, ring-necked	Phasianus colchicus		BOVA
040236			Phoebe, eastern	Sayornis phoebe		BOVA
040197			Pigeon, rock	Columba livia		BOVA
040287			Pipit, American	Anthus rubescens		BOVA
040062			Redhead	Aythya americana		BOVA
040341			Redstart, American	Setophaga ruticilla		BOVA
040275			Robin, American	Turdus migratorius		BOVA
040149			Sandpiper, least	Calidris minutilla		BOVA
040134			Sandpiper, spotted	Actitis macularia		BOVA
040129			Sandpiper, upland	Bartramia longicauda		BOVA
040225			Sapsucker, yellow-bellied	Sphyrapicus varius		BOVA
040066			Scaup, lesser	Aythya affinis		BOVA
040075			Scoter, black	Melanitta americana		BOVA
040074			Scoter, surf	Melanitta perspicillata		BOVA
040073			Scoter, white-winged	Melanitta fusca deglandi		BOVA
040205			Screech-owl, eastern	Megascops asio		BOVA

040060			Shoveler, northern	Anas clypeata		BOVA
040370			Siskin, pine	Spinus pinus		BOVA
040141			Snipe, Wilson's	Gallinago delicata		BOVA
040389			Sparrow, chipping	Spizella passerina		BOVA
040395			Sparrow, fox	Passerella iliaca		BOVA
040342			Sparrow, house	Passer domesticus		BOVA
040377			Sparrow, savannah	Passerculus sandwichensis		BOVA
040398			Sparrow, song	Melospiza melodia		BOVA
040397			Sparrow, swamp	Melospiza georgiana		BOVA
040383			Sparrow, vesper	Pooecetes gramineus		BOVA
040394			Sparrow, white-throated	Zonotrichia albicollis		BOVA
040294			Starling, European	Sturnus vulgaris		BOVA
040249			Swallow, barn	Hirundo rustica		BOVA
040044			Swan, tundra	Cygnus columbianus columbianus		BOVA
040355			Tanager, scarlet	Piranga olivacea		BOVA
040356			Tanager, summer	Piranga rubra		BOVA
040057			Teal, blue-winged	Spatula discors		BOVA
040056			Teal, green-winged	Anas crecca carolinensis		BOVA
040189			Tern, Caspian	Hydroprogne caspia		BOVA
040278			Thrush, hermit	Catharus guttatus		BOVA
040260			Titmouse, tufted	Baeolophus bicolor		BOVA
040102			Turkey, wild	Meleagris gallopavo silvestris		BOVA
040299			Vireo, red-eyed	Vireo olivaceus		BOVA
040295			Vireo, white-eyed	Vireo griseus		BOVA
040297			Vireo, yellow-throated	Vireo flavifrons		BOVA
040081			Vulture, black	Coragyps atratus		BOVA
040080			Vulture, turkey	Cathartes aura		BOVA
040316			Warbler, black-throated blue	Setophaga caerulescens		BOVA
040319			Warbler, black-throated green	Setophaga virens		BOVA
040325			Warbler, blackpoll	Setophaga striata		BOVA

040307			Warbler, blue-winged	Vermivora cyanoptera		BOVA
040323			Warbler, chestnut-sided	Setophaga pensylvanica		BOVA
040338			Warbler, hooded	Setophaga citrina		BOVA
040314			Warbler, magnolia	Setophaga magnolia		BOVA
040311			Warbler, Nashville	Leiothlypis ruficapilla		BOVA
040329			Warbler, palm	Setophaga palmarum		BOVA
040326			Warbler, pine	Setophaga pinus		BOVA
040328			Warbler, prairie	Setophaga discolor		BOVA
040303			Warbler, prothonotary	Protonotaria citrea		BOVA
040305			Warbler, worm-eating	Helmitheros vermivorus		BOVA
040313			Warbler, yellow	Setophaga petechia		BOVA
040317			Warbler, yellow-rumped	Setophaga coronata		BOVA
040322			Warbler, yellow-throated	Setophaga dominica		BOVA
040332			Waterthrush, Louisiana	Parkesia motacilla		BOVA
040331			Waterthrush, northern	Parkesia noveboracensis		BOVA
040290			Waxwing, cedar	Bombycilla cedrorum		BOVA
040059			Wigeon, American	Mareca americana		BOVA
040058			Wigeon, Eurasian	Mareca penelope		BOVA
040227			Woodpecker, downy	Dryobates pubescens		BOVA
040226			Woodpecker, hairy	Dryobates villosus		BOVA
040222			Woodpecker, pileated	Dryocopus pileatus		BOVA
040223			Woodpecker, red-bellied	Melanerpes carolinus		BOVA
040224			Woodpecker, red-headed	Melanerpes erythrocephalus		BOVA
040268			Wren, Carolina	Thryothorus ludovicianus		BOVA
040265			Wren, house	Troglodytes aedon		BOVA
040270			Wren, sedge	Cistothorus platensis		BOVA
040266			Wren, winter	Troglodytes		BOVA

				troglodytes		
040336			Yellowthroat, common	Geothlypis trichas		BOVA
050028			Bat, big brown	Eptesicus fuscus		BOVA
050033			Bat, evening	Nycticeius humeralis		BOVA
050069			Beaver, American	Castor canadensis		BOVA
050051			Bobcat	Lynx rufus rufus		BOVA
050055			Chipmunk, Fisher's eastern	Tamias striatus fisheri		BOVA
050103			Cottontail, eastern	Sylvilagus floridanus mallurus		BOVA
050125			Coyote	Canis latrans		BOVA
050108			Deer, white-tailed	Odocoileus virginianus		BOVA
050050			Fox, common gray	Urocyon cinereoargenteus cinereoargenteus		BOVA
050049			Fox, red	Vulpes vulpes fulva		BOVA
050042			Mink, common	Neovison vison mink		BOVA
050017			Mole, eastern	Scalopus aquaticus aquaticus		BOVA
050019			Mole, star-nosed	Condylura cristata cristata		BOVA
050074			Mouse, common white-footed	Peromyscus leucopus leucopus		BOVA
050071			Mouse, eastern harvest	Reithrodontomys humulis virginianus		BOVA
050098			Mouse, house	Mus musculus musculus		BOVA
050099			Mouse, meadow jumping	Zapus hudsonius americanus		BOVA
050093			Muskrat, large-toothed	Ondatra zibethicus macrodon		BOVA
050001			Opossum, Virginia	Didelphis virginiana virginiana		BOVA
050045			Otter, northern river	Lontra canadensis lataxina		BOVA
050038			Raccoon	Procyon lotor lotor		BOVA
050078			Rat, marsh rice	Oryzomys palustris palustris		BOVA
050095			Rat, Norway	Rattus norvegicus norvegicus		BOVA
050010			Shrew, American pygmy	Sorex hoyi		BOVA

050015			Shrew, least	Cryptotis parva		BOVA
050007			Shrew, southeastern	Sorex longirostris longirostris		BOVA
050011			Shrew, southern short-tailed	Blarina carolinensis		BOVA
050047			Skunk, striped	Mephitis mephitis nigra		BOVA
050048			Skunk, striped	Mephitis mephitis mephitis		BOVA
050058			Squirrel, northern gray	Sciurus carolinensis pennsylvanicus		BOVA
050065			Squirrel, southern flying	Glaucomys volans volans		BOVA
050083			Vole, dark meadow	Microtus pennsylvanicus nigrans		BOVA
050091			Vole, pine	Microtus pinetorum scalopsoides		BOVA
050041			Weasel, long-tailed	Mustela frenata noveboracensis		BOVA
050054			Woodchuck	Marmota monax monax		BOVA
060025			Mussel, eastern elliptio	Elliptio complanata		BOVA
060095			Snail, European physa	Physella acuta		BOVA
070095			Crawfish, Devil	Lacunicambarus diogenes		BOVA
070126			Crayfish, Digger	Fallicambarus fodiens		BOVA
070094			Crayfish, no common name	Cambarus acuminatus		BOVA
070098			Crayfish, spiny cheek	Faxonius limosus		BOVA
070120			Crayfish, White River	Procambarus acutus		BOVA
070070			SHRIMP, EELGRASS	HIPPOLYTE PLEURACENTHA		BOVA
100043			Armyworm	Pseudaletia unipuncta		BOVA
100041			Borer, European corn	Ostrinia nubilatis		BOVA
100092			Butterfly, black swallowtail	Papilio polyxenes asterius		BOVA
100179			Butterfly, broad-winged skipper	Poanes viator		BOVA
100205			Butterfly, cabbage white	Pieris rapae		BOVA

100159			Butterfly, clouded skipper	Lerema accius		BOVA
100157			Butterfly, common sootywing	Pholisora catullus		BOVA
100168			Butterfly, crossline skipper	Polites origenes		BOVA
100238			Butterfly, eastern tailed-blue	Everes comyntas		BOVA
100093			Butterfly, eastern tiger swallowtail	Papilio glaucus		BOVA
100145			Butterfly, Hayhurst's scallopwing	Staphylus hayhurstii		BOVA
100148			Butterfly, Juvenal's duskywing	Erynnis juvenalis		BOVA
100160			Butterfly, least skipper	Ancyloxypha numitor		BOVA
100211			Butterfly, orange sulphur	Colias eurytheme		BOVA
100198			Butterfly, salt marsh skipper	Panoquina panoquin		BOVA
100082			Butterfly, silver-spotted skipper	Epargyreus clarus		BOVA
100142			Butterfly, southern cloudywing	Thorybes bathyllus		BOVA
100202			Butterfly, spicebush swallowtail	Papilio troilus		BOVA
100180			Butterfly, Zabulon skipper	Poanes zabulon		BOVA
100042			Earworm, corn	Heliathis zea		BOVA
100016			Gnat	Culicoides stellifer		BOVA
100040			Moth, codling	Cydia pomonella		BOVA
100047			Moth, gypsy	Lymantria dispar		BOVA
110230			Tick, American dog	Dermacentor variabilis		BOVA
110232			Tick, brown dog	Rhipicephalus sanguineus		BOVA
110228			Tick, lone star	Amblyomma americanum		BOVA
110231			Tick, rabbit	Haemaphysalis leporispalustris		BOVA
110229			Tick, winter	Dermacentor albipictus		BOVA

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need;
II=VA Wildlife Action Plan - Tier II - Very High Conservation Need;
III=VA Wildlife Action Plan - Tier III - High Conservation Need;
IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.;
b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Compiled on 2/23/2022, 4:00:59 PM I1165662.0 report=1 searchType= R dist= 3218 poi= 37.8835840 -76.3385364

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audit no. 1165662 2/23/2022 4:00:59 PM Virginia Fish and Wildlife Information Service

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: July 26, 2021
Consultation Code: 05E2VA00-2021-SLI-4763
Event Code: 05E2VA00-2021-E-14165
Project Name: VAL028

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

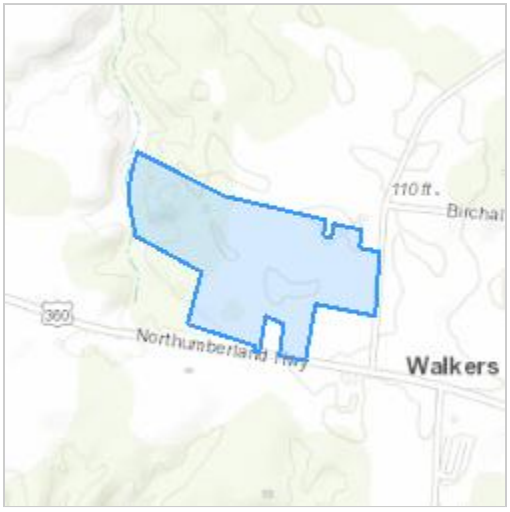
This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2021-SLI-4763
Event Code: 05E2VA00-2021-E-14165
Project Name: VAL028
Project Type: DEVELOPMENT
Project Description: Site Development for Photovoltaic Solar Energy Production Facility
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.883638250000004,-76.33790750353265,14z



Counties: Northumberland County, Virginia

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9045

Critical habitats

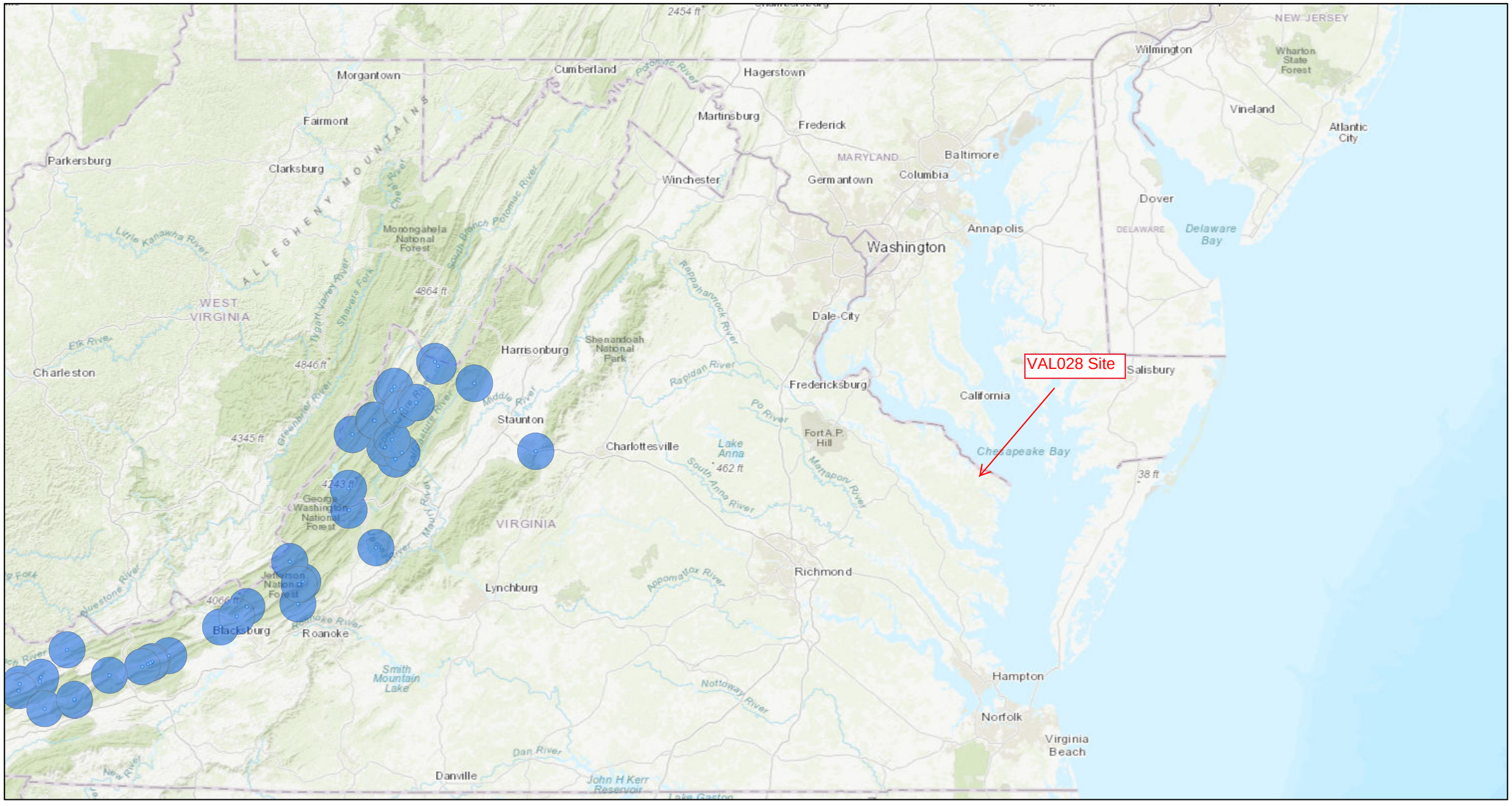
THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

ArcGIS Web Map



7/16/2021, 9:48:44 AM

Tri-colored and Little Brown Hibernaculum Half Mile Buffer

Tri-colored and Little Brown Hibernaculum 5.5 Mile Buffer

1:2,311,162

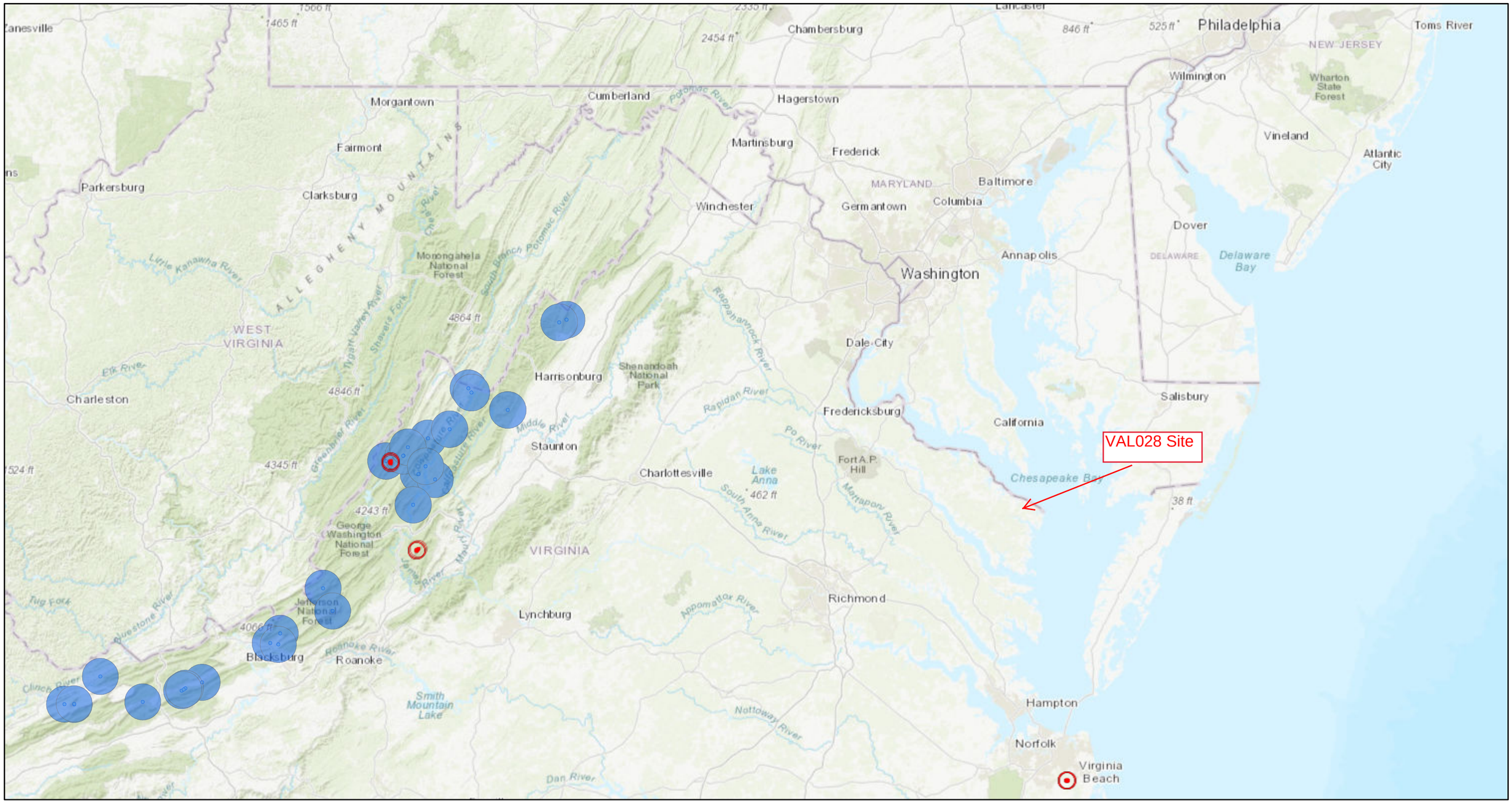
0 20 40 80 mi

0 35 70 140 km

Esri, HERE, Garmin, FAO, USGS, EPA, NPS

Dept. Game and Inland Fisheries
Esri, HERE, Garmin, FAO, USGS, EPA, NPS |

NLEB Locations and Roost Trees



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NLEB Known Occupied Maternity Roost (Summer Habitat)

NLEB Hibernaculum 5.5 Mile Buffer

NLEB Hibernaculum Half Mile Buffer

1:2,311,162

0 20 40 80 mi

0 35 70 140 km

Esri, HERE, Garmin, FAO, USGS, EPA, NPS

VA Dept. Game & Inland Fisheries

Esri, HERE, Garmin, FAO, USGS, EPA, NPS |

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Nathan Burrell
Deputy Director of Government and Community Relations

Thomas L. Smith
Deputy Director of Operations

July 26, 2021

Gina Panasik
The Thrasher Group
4000 Town Center Boulevard
Canonsburg, PA 15317

Re: 070-10406-100, VAL028 Solar

Dear Ms. Panasik:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in Biotics, natural heritage resources have not been documented within the submitted project boundary including a 100 foot buffer. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. In addition, the project boundary does not intersect any of the predictive models identifying potential habitat for natural heritage resources.

In addition, if tree clearing is proposed in the northwest portion of the property, the proposed project may fragment an Ecological Core **(C4)** as identified in the Virginia Natural Landscape Assessment (https://www.dcr.virginia.gov/natural-heritage/vaconvisvnla), one of a suite of tools in Virginia ConservationVision that identify and prioritize lands for conservation and protection. Mapped cores in the project area can be viewed via the Virginia Natural Heritage Data Explorer, available here: http://vanhde.org/content/map.

Ecological Cores are areas of unfragmented natural cover with at least 100 acres of interior that provide habitat for a wide range of species, from interior-dependent forest species to habitat generalists, as well as species that utilize marsh, dune, and beach habitats. Cores also provide benefits in terms of open space, recreation, water quality (including drinking water protection and erosion prevention), and air quality (including carbon sequestration and oxygen production), along with the many associated economic benefits of these functions. The cores are ranked from C1 to C5 (C5 being the least ecologically relevant) using many prioritization criteria, such as the proportions of sensitive habitats of natural heritage resources they contain.

Fragmentation occurs when a large, contiguous block of natural cover is dissected by development, and other forms of permanent conversion, into one or more smaller patches. Habitat fragmentation results in biogeographic

changes that disrupt species interactions and ecosystem processes, reducing biodiversity and habitat quality due to limited recolonization, increased predation and egg parasitism, and increased invasion by weedy species.

Therefore minimizing fragmentation is a key mitigation measure that will reduce deleterious effects and preserve the natural patterns and connectivity of habitats that are key components of biodiversity. DCR recommends efforts to minimize edge in remaining fragments, retain natural corridors that allow movement between fragments and designing the intervening landscape to minimize its hostility to native wildlife (natural cover versus lawns).

DCR recommends the development of an invasive species management plan for the project and the planting of Virginia native pollinator plant species that bloom throughout the spring and summer, to maximize benefits to native pollinators. DCR recommends planting these species in at least the buffer areas of the planned facility, and optimally including other areas within the project site. For screening zones outside the perimeter fencing, DCR recommends native species appropriate for the region be used. Guidance on plant species can be found here: http://www.dcr.virginia.gov/natural-heritage/solar-site-native-plants-finder. In addition, Virginia native species alternatives to the non-native species listed in the Virginia Erosion and Sediment Control Handbook (Third Edition 1992), can be found in the 2017 addendum titled "Native versus Invasive Plant Species", here: https://www.deq.virginia.gov/home/showpublisheddocument?id=2466. Page 3 of the addendum provides a list of native alternatives for non-natives commonly used for site stabilization including native cover crop species (i.e. Virginia wildrye).

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

New and updated information is continually added to Biotics. Please re-submit a completed order form and project map for an update on this natural heritage information if the scope of the project changes and/or six months (January 26, 2022) has passed before it is utilized.

A fee of $590.00 has been assessed for the service of providing this information. Please find attached an invoice for that amount. Please return one copy of the invoice along with your remittance made payable to the Treasurer of Virginia, DCR Finance, 600 East Main Street, 24th Floor, Richmond, VA 23219. Payment is due within thirty days of the invoice date. Please note late payment may result in the suspension of project review service for future projects.

The Virginia Department of Wildlife Resources (VDWR) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from https://vafwis.dgif.virginia.gov/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dwr.virginia.gov.

Should you have any questions or concerns, please contact me at 804-225-2429. Thank you for the opportunity to comment on this project.

Sincerely,

Tyler Meader

Tyler Meader
Natural Heritage Locality Liaison

CC: Susan Tripp, DEQ

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

February 17, 2022

PRELIMINARY JURISDICTIONAL DETERMINATION

Northern Virginia Regulatory Section
NAO-2021-02614 (Davis Mill Run)

Mr. Jordan Wilcox
The Thrasher Group, Inc.
600 White Oaks Boulevard
Bridgeport, West Virginia 26330

Dear Mr. Wilcox:

This letter is in regard to the request you submitted on behalf of SGC Power, LLC for a preliminary jurisdictional determination of the aquatic resources (e.g., wetlands, streams, and ponds) within an approximate 35.42-acre study area located north of Northumberland Highway (Route 360) and west of Folly Road (Route 646) in Northumberland County, Virginia (Tax Map Parcels #27(1)-304, 27(1)-304A, 27(1)-304B).

The attached map entitled “Figure 5: Delineation VAL028 Folly Road Site”, prepared by The Thrasher Group, Inc. and stamped as received by the Corps on January 25, 2022, depicts the approximate location and extent of aquatic resources identified within the defined study area. This letter is not confirming the Cowardin classifications of these aquatic resources.

These aquatic resources exhibit wetland criteria as defined in the 1987 Corps of Engineers Wetland Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region. This site also contains aquatic resources with an ordinary high water mark.

Please be aware that you may be required to obtain a Corps permit for any discharge of dredged and/or fill material, either temporary or permanent, into a water of the U.S. In addition, you may be required to obtain a Corps permit for certain activities occurring within, under, or over a navigable water of the U.S. subject to the Section 10 of the Rivers and Harbors Act. Furthermore, you may be required to obtain state and local authorizations, including a Virginia Water Protection Permit from the Virginia Department of Environmental Quality (DEQ), a permit from the Virginia Marine Resources Commission (VMRC), and/or a permit from your local wetlands board.

This delineation and preliminary jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. Therefore, if you or your tenant are US Department of Agriculture (USDA) program participants, or anticipate participation in USDA programs, you should discuss the

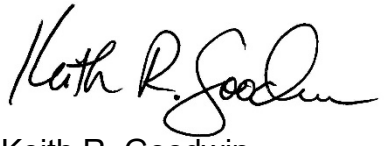
applicability of a certified wetland determination with the local USDA service center, prior to starting work.

This is a preliminary jurisdictional determination and is not a legally binding determination regarding whether Corps jurisdiction applies to the aquatic resources in question. To determine Corps' jurisdiction, you may request and obtain an approved jurisdictional determination.

This delineation of aquatic resources can be relied upon for no more than five years from the date of this letter. New information may warrant revision. Enclosed is a copy of the "Preliminary Jurisdictional Determination Form". Please review the document, sign, and return one copy to me either via email (keith.r.goodwin@usace.army.mil) or via standard mail to U.S. Army Corps of Engineers, Regulatory Office, and ATTN: Keith Goodwin, 803 Front Street Norfolk, Virginia 23510.

If you have any questions, please contact me at (757) 201-7327 or via email at keith.r.goodwin@usace.army.mil.

Sincerely,

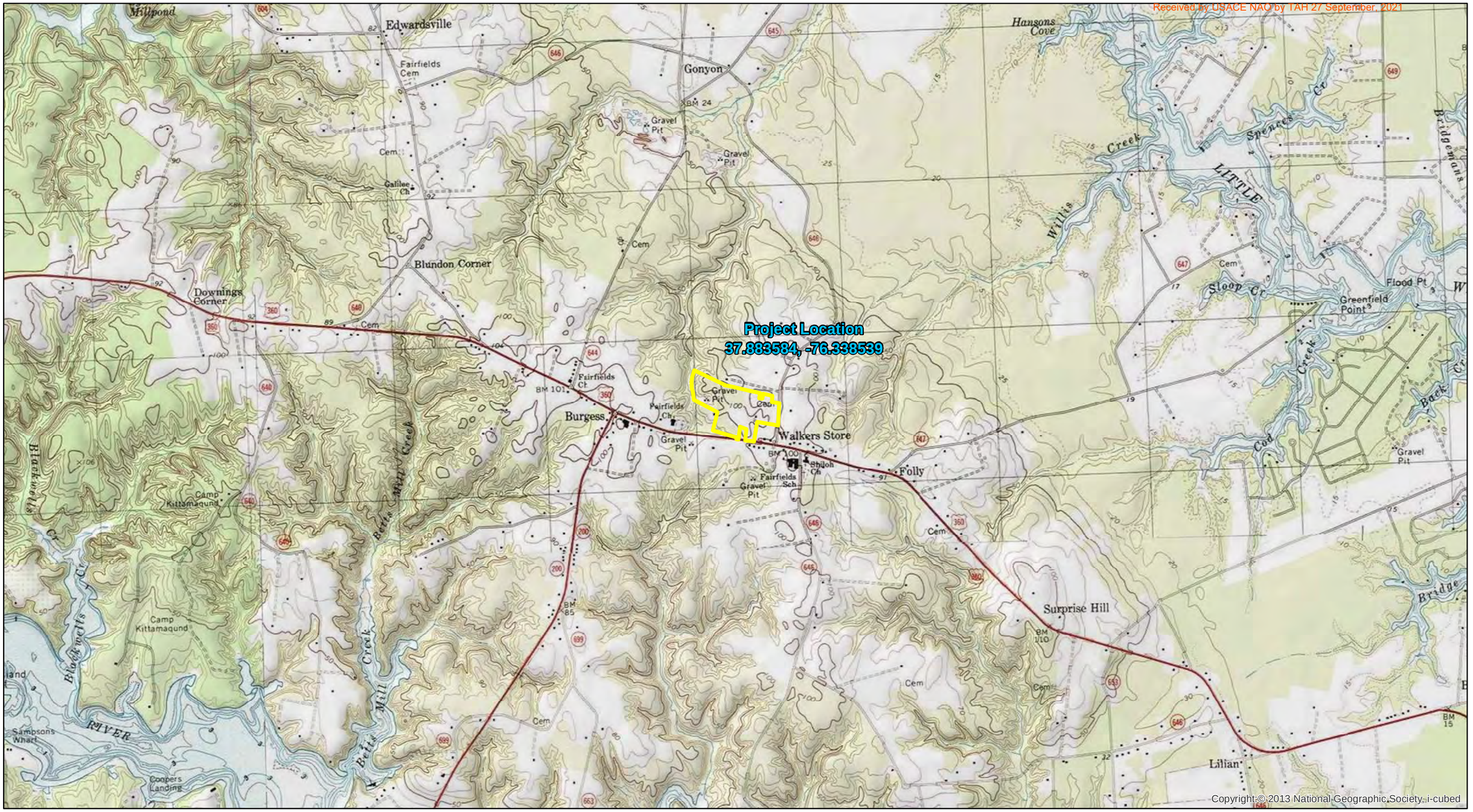


Keith R. Goodwin
Environmental Scientist
Northern Virginia Regulatory Section

Enclosures: Delineation Map
Preliminary Jurisdictional Determination Form
Supplemental Preapplication Information

cc: Northumberland County
Virginia Department of Environmental Quality

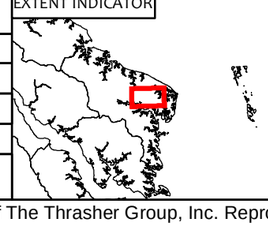
Received by USACE NAO by TAH 27 September, 2021



DETAILS:

Quad: Burgess	
Drawn By: lhovermale	Date: 7/19/2021
Surveyed By:	Date:
Project No.070-10406	
Sheet Number: Overall	

EXTENT INDICATOR



Legend

- Area of Interest (AOI)

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet

Figure 1: USGS Site Location

VAL028 Folly Road

Northumberland County - Virginia

THRASHER

Document Path: R:\070\070-10406.00-VAL-028 and VAL-029 Solar Development-SGC Power, LLC-\GIS\VAL028\MXD\USGS Site Location_VAL028.mxd

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U.S. Army Corps of Engineers
Norfolk District
Regulatory Branch
Received: January 25, 2022

Davis Mill Run - Braid
20210714-UPL 4
20210714-WL 3
Davis Mill Run
20210714-WL 2
20210713-WL1
20210713-UPL1
20210713-UPL3
Folly Rd
Birchall Ln
US Hwy 360 Northumberland Hwy

DETAILS:

Quad: Burgess	
Drawn By: astolarski	Date: 1/25/2022
Surveyed By:	Date:
Project No.070-10406	
Sheet Number: Overall	

EXTENT INDICATOR

Legend

Seep	Perennial Stream
Wetland Data Point	Area of Interest (AOI)
Upland Data Point	PFO Wetland
Culvert	PSS Wetland

1 inch = 200 feet
0 100 200 400 Feet

Figure 5: Delineation
VAL028 Folly Road Site
Northumberland County - Virginia

THRASHER

Document Path: R:\070\070-10406.00-VAL-028 and VAL-029 Solar Development-SGC Power, LLC-\GIS\VAL028\MXD\Delination_VAL028_1.mxd

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DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

February 17, 2022

Supplemental Preapplication Information
Project Number: NAO-2021-02614
Location: Northumberland Highway (Route 360), Northumberland County, Virginia

1. A search of the Virginia Department of Historic Resources data revealed the following:

   ☐ No known historic properties are located on the property.

   ☐ Tribal consultation may be required.

   ☒ The following known architectural resources are located on the property: 066-0119 Jeff House

   ☐ The following known archaeological resources are located on the property:

   ☒ The following known historic resources are located in the vicinity of the property (potential for effects to these resources from future development):

066-0116 Fairfield Baptist Church and Cemetery	066-0117 House/Route 360
066-0120 Jones House	066-0121 Hammack House
066-0122 Johnson House	066-0123 Barrett
066-0124 Jeff House #2	066-0125 Jeff House #3
066-0126 Burgess Cabinet Shop	066-0129 Hager House

NOTE:
1) The information above is for planning purposes only. In most cases, the property has not been surveyed for historic resources. Undiscovered historic resources may be located on the subject property or adjacent properties and this supplemental information is not intended to satisfy the Corps' requirements under Section 106 of the National Historic Preservation Act (NHPA).
2) Prospective permittees should be aware that Section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant.

2. A search of the data supplied by the U.S. Fish & Wildlife Service, the Virginia Department of Conservation and Recreation and the Virginia Department of Game and Inland Fisheries revealed the following:

   ☐ No known populations of threatened or endangered species are located on or within the vicinity of the subject property.

   ☒ The following federally-listed species may occur within the vicinity of the subject property:

   Northern Long-eared bat (*Myotis septentrionalis*)

   ☐ The following state-listed (or other) species may occur within the vicinity of the subject property:

   Little Brown Bat (*Myotis lucifugus*)
   Tri-colored Bat (*Perimyotis subflavus*)

Please note this information is being provided to you based on the preliminary data you submitted to the Corps relative to project boundaries and project plans. Consequently, these findings and recommendations are subject to change if the project scope changes or new information becomes available and the accuracy of the data.

Appendix 2 - PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. **REPORT COMPLETION DATE FOR PJD:** 17-FEB-2022

B. **NAME AND ADDRESS OF PERSON REQUESTING PJD:**

Applicant: Cory McCandless
SGC Power, LLC
6865 Deerpath Road
Suite 330
Elkridge, Maryland 21075

Agent: Jordan Wilcox
The Thrasher Group
600 White Oaks Boulevard
Bridgeport, West Virginia 26330

C. **DISTRICT OFFICE, FILE NAME, AND NUMBER:**
NAO, Folly Road Solar Project (VAL028), NAO-2021-02614

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: Virginia County/parish/borough: Northumberland County City: Burgess

Center coordinates of site (lat/long in degree decimal format):
Lat.: 37.883584° Long.: -76.338539°
Universal Transverse Mercator: 18 S 382291.56 m E 4193742.49 m N

Name of nearest waterbody: Davis Mill Run

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): November 23, 2021

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site Number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
Stream_01	37.88492	-76.34169	527 linear feet	Non-wetland waters	Section 404
Wetland_01	37.88447	-76.338536	1.404 acres	Wetland	Section 404
Wetland_02	37.885017	-76.341672	1.415 acres	Wetland	Section 404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the.JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there “may be” waters of the U.S. and/or that there “may be” navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

- [X] Maps, plans, plots or plat submitted by or on behalf of the PJD requestor: Map entitled “*Figure 5: Delineation VAL028 Folly Road Site*”, prepared by The Thrasher Group, dated January 25, 2022, and stamped as received by the Corps on January 25, 2022, depicts the approximate location and extent of the aquatic resources identified within the defined study area.
- [X] Data sheets prepared/submitted by or on behalf of the PJD requestor.
  - [X] Office concurs with data sheets/delineation report. Revised following site visit on 11/23/21.
  - [ ] Office does not concur with data sheets/delineation report. Rationale:
- [ ] Data sheets prepared by the Corps:
- [ ] Corps navigable waters' study:
- [ ] U.S. Geological Survey Hydrologic Atlas:
  - [ ] USGS NHD data.
  - [ ] USGS 8 and 12 digit HUC maps.
- [X] U.S. Geological Survey map(s). Cite scale & quad name: Burgess, Virginia

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

- X Natural Resources Conservation Service Soil Survey. Citation: USDA-NCSS Digital SSURGO and STATSGO Data
- X National wetlands inventory map(s). Cite name: USFWS Digital Wetland and Riparian Data
- ___ State/local wetland inventory map(s):
- ___ FEMA/FIRM maps:
- X Aerial Photographs: 2009IR; 2013IR; 2015IR; 2018; 2021
- ___ Previous determination(s). File no. and date of response letter:
- ___ Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and date of Regulatory staff member completing PJD

Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

APPENDIX C

SOIL REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Northumberland and Lancaster Counties, Virginia

July 29, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,350 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

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: Northumberland and Lancaster Counties, Virginia
Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Oct 11, 2019—Oct 15, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

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
SaA	Suffolk fine sandy loam, 0 to 2 percent slopes	7.5	37.7%
SaB	Sassafras fine sandy loam, gently sloping	6.8	34.5%
SaC3	Sassafras fine sandy loam, sloping, severely eroded	3.5	17.6%
SsD	Sloping sandy land	1.4	7.2%
StE	Steep sandy land	0.6	3.0%
Totals for Area of Interest		**19.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Northumberland and Lancaster Counties, Virginia

SaA—Suffolk fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2y7k6
Elevation: 30 to 330 feet
Mean annual precipitation: 27 to 52 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Suffolk and similar soils: 92 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Suffolk

Setting

Landform: Marine terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bt - 8 to 36 inches: sandy clay loam
C - 36 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

SaB—Sassafras fine sandy loam, gently sloping

Map Unit Setting

National map unit symbol: 40md
Elevation: 30 to 330 feet
Mean annual precipitation: 27 to 52 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sassafras and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sassafras

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 36 inches: sandy clay loam
H3 - 36 to 70 inches: loamy fine sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

SaC3—Sassafras fine sandy loam, sloping, severely eroded

Map Unit Setting

National map unit symbol: 40mh
Elevation: 30 to 330 feet
Mean annual precipitation: 27 to 52 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Sassafras and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sassafras

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 36 inches: sandy clay loam
H3 - 36 to 70 inches: loamy fine sand

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

SsD—Sloping sandy land

Map Unit Setting

National map unit symbol: 40mn
Mean annual precipitation: 27 to 52 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Sloping sandy land: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sloping Sandy Land

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

H1 - 0 to 6 inches: fine sand
H2 - 6 to 60 inches: sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydric soil rating: No

StE—Steep sandy land

Map Unit Setting

National map unit symbol: 40mp
Mean annual precipitation: 27 to 52 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Steep sandy land: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Steep Sandy Land

Setting

Landform: Marine terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

H1 - 0 to 6 inches: fine sand
H2 - 6 to 60 inches: sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (val028)

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

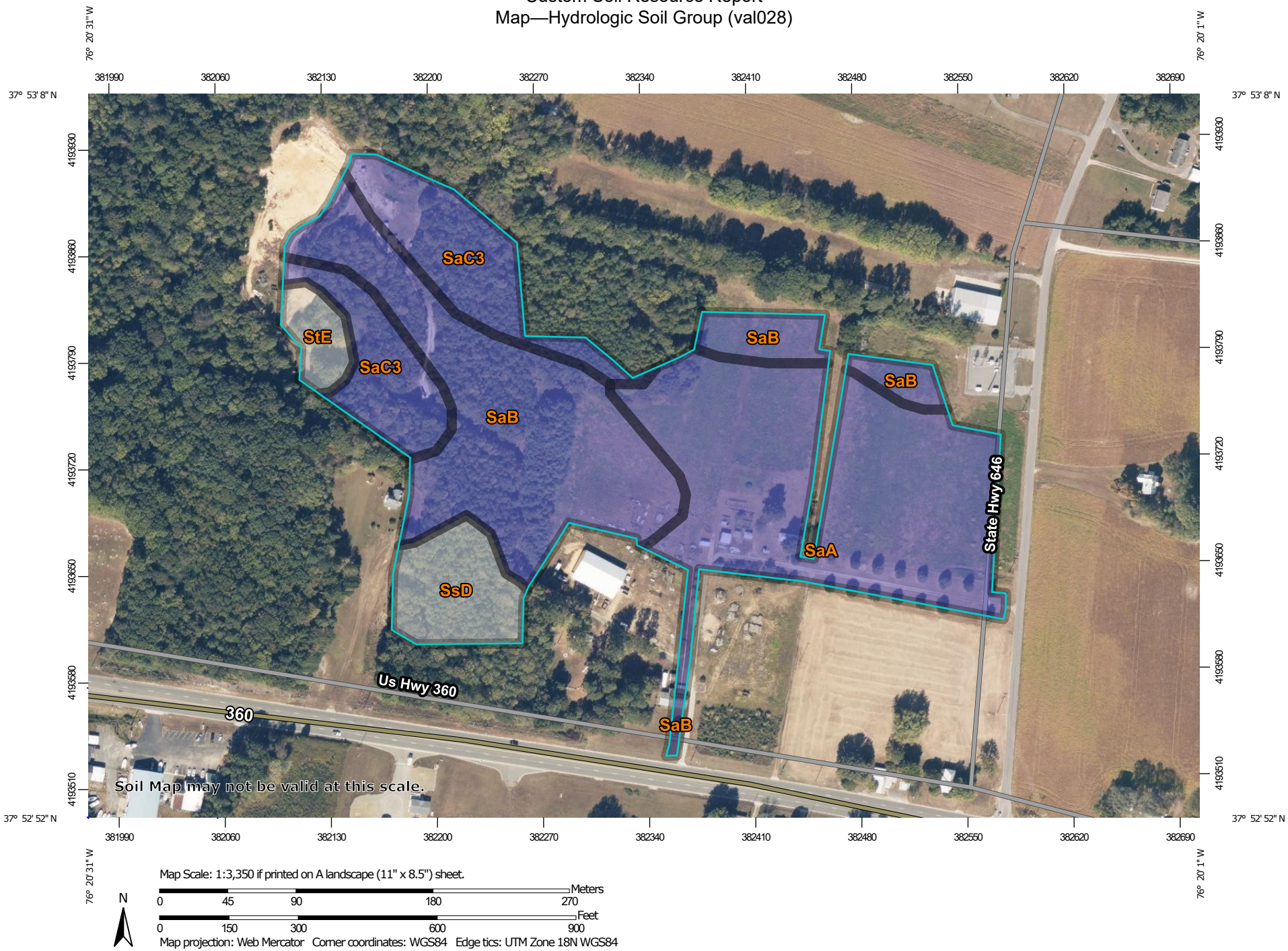
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group (val028)



Map Scale: 1:3,350 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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: Northumberland and Lancaster Counties, Virginia
Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Oct 11, 2019—Oct 15, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group (val028)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
SaA	Suffolk fine sandy loam, 0 to 2 percent slopes	B	7.5	37.7%
SaB	Sassafras fine sandy loam, gently sloping	B	6.8	34.5%
SaC3	Sassafras fine sandy loam, sloping, severely eroded	B	3.5	17.6%
SsD	Sloping sandy land		1.4	7.2%
StE	Steep sandy land		0.6	3.0%
Totals for Area of Interest			**19.8**	**100.0%**

Rating Options—Hydrologic Soil Group (val028)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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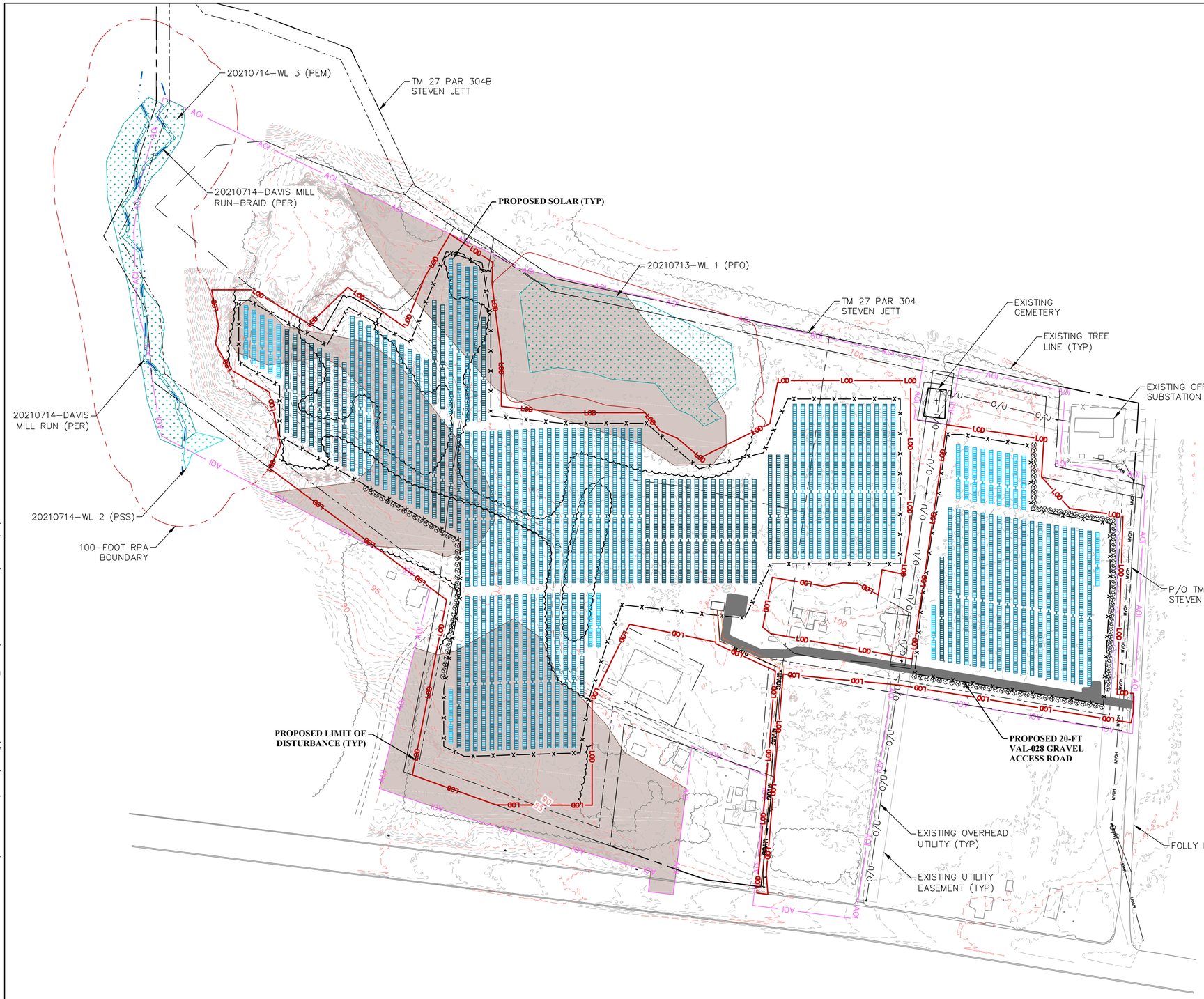
APPENDIX D

ESA PLAN SHEETS



PLAN LEGEND

- AOI — EXISTING ENVIRONMENTAL AREA OF INTEREST
- EXISTING CONTOURS
- DELINEATED STREAM - EPHEMERAL
- DELINEATED STREAM - INTERMITTENT
- DELINEATED STREAM - PERENNIAL
- DELINEATED WETLAND - PALUSTRINE EMERGENT (PEM)
- DELINEATED WETLAND - PALUSTRINE FORESTED (PFO)
- DELINEATED WETLAND - PALUSTRINE SCRUB/SHRUB (PSS)
- EXISTING PROPERTY LINE
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING TREE LINE
- O/U — EXISTING OVERHEAD UTILITY
- EXISTING STRUCTURE
- LOD — PROPOSED LIMIT OF DISTURBANCE
- PROPOSED SECURITY FENCE
- MVUG — MVUG — PROPOSED UNDERGROUND UTILITY
- PROPOSED PERMANENT UTILITY EASEMENT
- PROPOSED GUARDRAIL
- NO DEVELOPMENT AREAS
- PROPOSED SOLAR
- EXISTING HIGHLY ERODIBLE SOILS

NOTES

1. EXISTING CONTOURS, BASE MAPPING, AND PROPERTY LINES SHOWN ARE BASED UPON A COMBINATION OF AERIAL PHOTOGRAPHY AND FIELD SURVEY BY TTG IN JULY, 2021.
2. ENVIRONMENTAL FEATURES SHOWN ARE BASED UPON FIELD DELINEATION PERFORMED IN JULY, 2021.
3. THERE ARE NO PONDS/IMPOUNDMENTS ON SUBJECT PROPERTY OR ADJACENT PROPERTIES.
4. THERE ARE NO IDENTIFIED CULTURAL RESOURCES OR THREATENED OR ENDANGERED SPECIES HABITATS IN THE SUBJECT PROPERTY.
5. THERE ARE NO PROPOSED WETLAND AND STREAM IMPACTS.
6. THERE ARE NO EXISTING ROAD CROSSINGS OF WETLANDS OR STREAMS.
7. ENVIRONMENTAL ASSESSMENT DATA PROCURED FROM THE NORTHUMBERLAND COUNTY 2016 COMPREHENSIVE PLAN AND THE USDA/NRCS SOIL SURVEY OF NORTHUMBERLAND AND LANCASTER COUNTIES, VA.
8. NO HYDRIC SOILS ARE PRESENT WITHIN THE AOI.

HIGHLY ERODIBLE SOILS	
DESCRIPTION	AREA (AC)
TOTAL LIMITS-OF-DISTURBANCE	19.243
HIGHLY ERODIBLE SOILS WITHIN LIMITS-OF-DISTURBANCE	4.959

100 ft. 0 100 ft. 200 ft.

COMMONWEALTH OF VIRGINIA
ROBERT RANDY MILNE
Lic. No. 0402054255
PROFESSIONAL ENGINEER

PLOT DATE/TIME: 8/26/2022 3:56 PM

CAD FILE: R:\070\070-10406.00-VAL-028 And VAL-029 Solar Development-SGC Power, LLC-\Drawing\10406-VAL028-ESA_Plan.dwg

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PHASE No.	
CONTRACT No.	
PROJECT No.	101-070-10406

ZONING PLANS FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028
ESA PLAN – HIGHLY ERODIBLE SOILS

SHEET No.
12

PLAN LEGEND

- EXISTING ENVIRONMENTAL AREA OF INTEREST
- EXISTING CONTOURS
- DELINEATED STREAM - EPHEMERAL
- DELINEATED STREAM - INTERMITTENT
- DELINEATED STREAM - PERENNIAL
- DELINEATED WETLAND - PALUSTRINE EMERGENT (PEM)
- DELINEATED WETLAND - PALUSTRINE FORESTED (PFO)
- DELINEATED WETLAND - PALUSTRINE SCRUB/SHRUB (PSS)
- EXISTING PROPERTY LINE
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING TREE LINE
- EXISTING OVERHEAD UTILITY
- EXISTING STRUCTURE
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED SECURITY FENCE
- PROPOSED UNDERGROUND UTILITY
- PROPOSED PERMANENT UTILITY EASEMENT
- PROPOSED GUARDRAIL
- NO DEVELOPMENT AREAS
- PROPOSED SOLAR
- LOW SHRINK-SWELL SUSCEPTIBILITY SOILS
- MODERATE SHRINK-SWELL SUSCEPTIBILITY SOILS

NOTES

1. EXISTING CONTOURS, BASE MAPPING, AND PROPERTY LINES SHOWN ARE BASED UPON A COMBINATION OF AERIAL PHOTOGRAPHY AND FIELD SURVEY BY TTG IN JULY, 2021.
2. ENVIRONMENTAL FEATURES SHOWN ARE BASED UPON FIELD DELINEATION PERFORMED IN JULY, 2021.
3. THERE ARE NO PONDS/IMPOUNDMENTS ON SUBJECT PROPERTY OR ADJACENT PROPERTIES.
4. THERE ARE NO IDENTIFIED CULTURAL RESOURCES OR THREATENED OR ENDANGERED SPECIES HABITATS IN THE SUBJECT PROPERTY.
5. THERE ARE NO PROPOSED WETLAND AND STREAM IMPACTS.
6. THERE ARE NO EXISTING ROAD CROSSINGS OF WETLANDS OR STREAMS.
7. ENVIRONMENTAL ASSESSMENT DATA PROCURED FROM THE NORTHUMBERLAND COUNTY 2016 COMPREHENSIVE PLAN AND THE USDA/NRCS SOIL SURVEY OF NORTHUMBERLAND AND LANCASTER COUNTIES, VA.

SHRINK-SWELL SUSCEPTIBILITY SOILS	
DESCRIPTION	AREA (AC)
TOTAL LIMITS-OF-DISTURBANCE	19.243
LOW SHRINK-SWELL WITHIN LIMITS-OF-DISTURBANCE	5.638
MODERATE SHRINK-SWELL WITHIN LIMITS-OF-DISTURBANCE	13.584

100 ft. 0 100 ft. 200 ft.

COMMONWEALTH OF VIRGINIA
ROBERT RANDY MILNE
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8/26/2022

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PROJECT No. 101-070-10406

ZONING PLANS FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028
ESA PLAN – SHRINK-SWELL & MARINE CLAYS

SHEET No. 13

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PLAN LEGEND

- EXISTING ENVIRONMENTAL AREA OF INTEREST
- EXISTING CONTOURS
- DELINEATED STREAM - EPHEMERAL
- DELINEATED STREAM - INTERMITTENT
- DELINEATED STREAM - PERENNIAL
- DELINEATED WETLAND - PALUSTRINE EMERGENT (PEM)
- DELINEATED WETLAND - PALUSTRINE FORESTED (PFO)
- DELINEATED WETLAND - PALUSTRINE SCRUB/SHRUB (PSS)
- EXISTING PROPERTY LINE
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING TREE LINE
- EXISTING OVERHEAD UTILITY
- EXISTING STRUCTURE
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED SECURITY FENCE
- PROPOSED UNDERGROUND UTILITY
- PROPOSED PERMANENT UTILITY EASEMENT
- PROPOSED GUARDRAIL
- NO DEVELOPMENT AREAS
- PROPOSED SOLAR
- MODERATE PERMEABILITY SOILS
- RAPID PERMEABILITY SOILS

NOTES

1. EXISTING CONTOURS, BASE MAPPING, AND PROPERTY LINES SHOWN ARE BASED UPON A COMBINATION OF AERIAL PHOTOGRAPHY AND FIELD SURVEY BY TTG IN JULY, 2021.
2. ENVIRONMENTAL FEATURES SHOWN ARE BASED UPON FIELD DELINEATION PERFORMED IN JULY, 2021.
3. THERE ARE NO PONDS/IMPOUNDMENTS ON SUBJECT PROPERTY OR ADJACENT PROPERTIES.
4. THERE ARE NO IDENTIFIED CULTURAL RESOURCES OR THREATENED OR ENDANGERED SPECIES HABITATS IN THE SUBJECT PROPERTY.
5. THERE ARE NO PROPOSED WETLAND AND STREAM IMPACTS.
6. THERE ARE NO EXISTING ROAD CROSSINGS OF WETLANDS OR STREAMS.
7. ENVIRONMENTAL ASSESSMENT DATA PROCURED FROM THE NORTHUMBERLAND COUNTY 2016 COMPREHENSIVE PLAN AND THE USDA/NRCS SOIL SURVEY OF NORTHUMBERLAND AND LANCASTER COUNTIES, VA.

SOIL PERMEABILITY	
DESCRIPTION	AREA (AC)
TOTAL LIMITS-OF-DISTURBANCE	19.243
MODERATE PERMEABILITY SOILS	16.358
RAPID PERMEABILITY SOILS	1.301

100 ft. 0 100 ft. 200 ft.

COMMONWEALTH OF VIRGINIA
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8/26/2022

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PROJECT No.	101-070-10406

ZONING PLANS FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028
ESA PLAN – SOIL PERMEABILITY

SHEET No.
14

APPENDIX E

STORMWATER MANAGEMENT PLAN

CLARK | AZAR & ASSOCIATES

VAL028 - Folly Road Solar Facility

200 Folly, LLC

200 Folly Road
Heathsville, VA 22473

Stormwater Management Engineering Report

8/24/2022

Prepared: August 2022

Prepared by: Sean Lindaman, P.E.
Approved by: Jason Azar, P.E.

Project No. 880.001

Clark | Azar & Associates
(301) 528-2010
www.clarkazar.com
20440 Century Boulevard, Suite 220
Germantown, MD 20874

TABLE OF CONTENTS

Stormwater Management Engineering Report
Folly Road Solar Facility
Northumberland County, Virginia

SECTION

I. STORMWATER MANAGEMENT NARRATIVE

I. Site Introduction

200 Folly, LLC proposes to construct a new solar farm in Northumberland County Virginia. The proposed site is bordered on the east by Folly Road, the southeast by single family residential properties, the south by Northumberland Highway, the west by forested lands, the northeast by an electrical substation and the north by farmland. The property area is 34.54 ac.

II. Existing Conditions

The site is currently a vacant property that is partially used for farm land and partially forested. The western end of the site includes an RPA. The site flows in a few different directions but all makes its way towards the stream on the western end of the site which ties into the Little Wicomico River. There is also a wetland on the north side of the site.

III. Proposed Conditions

The majority of the site will be cleared to make way for solar arrays. There will be an access drive from Folly Road into the site. Underground lines will connect the electric together. Landscaping trees will be added along the perimeter adjacent single family homes to screen the property.

IV. Stormwater Management: Quality

The entirety of the post development site was designed per the Virginia Department of Environmental Quality's Runoff Reduction Method. The site is composed of all type B hydrologic soils. The site is being designed to receive an interconnection approval from a regional transmission company or electric company prior to December 31, 2024. Per a memo released by DEQ regarding solar arrays released on March 29, 2022 and amended on April 14, 2022, the site will therefore not be required to meet the updated requirements for solar farms. Therefore the solar array posts and beams were the only areas of the solar array that were computed as impervious. The updated guidance suggests that this area can be added to the VRRM spreadsheet as simple disconnection.

Due to the large amount of undisturbed area and forest that is being maintained by the site along with the limited amount of impervious area, the total phosphorus reduction for the site is met prior to any measures being added. The simple disconnection provides further benefit, exceeding the target phosphorus removal by 2.49 pounds per year.

V. Stormwater Management: Quantity

The existing site is mostly undeveloped and consists of trees in good condition or open space in good condition with a minimal amount of impervious. A portion of this area will be cleared to make way for the solar arrays and a path to them. The site was analyzed for the 1 and 10-year runoff per DEQ requirements. Due to the size of the site, the 10 year storm required a greater amount of storage to hold the flow below pre-development conditions. Per the Virginia Stormwater Management Handbook and TR-55, the total storage required for the site is 27,985 cf. That area was spread across 3 extended detention areas. The extended detentions will be built with a downstream berm to impound the water and a low flow pipe to drain it down. The berms were spread across the site to provide flow attenuation in several directions. The total storage provided by the three berms is 28,778 cf. In a larger storm event when the 28,778 cf is taken up, the berms will act as level spreaders with water flowing over the top of the berms reducing erosion for the site and slowing the flow of upstream water.

VI. Conclusions

The new Folly Road Solar Facility will provide green electricity to the power grid. Due to the site receiving an interconnection approval prior to December 31, 2024, the stormwater quality design was based off the grandfathered design methods as noted in a solar array memo from DEQ. Based on this the target Phosphorus removal is met for the site without providing any additional treatment devices. Three stormwater quantity extended detention berms will be installed around the site to provide attenuation of the 1 and 10 year design storms.

II. 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: VAL018 - Folly Road Solar Facility
Date: 29-Jul
BMP Design Specifications List: 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

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		15.29			15.29 *
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed		17.51			17.51
Impervious Cover (acres)		1.74			1.74
					34.54

** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method*

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)	**-1.37**	**	**TP LOAD REDUCTION NOT REQUIRED**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary	
Forest/Open Space Cover (acres)	15.29
Weighted Rv (forest)	0.03
% Forest	44%
Managed Turf Cover (acres)	17.51
Weighted Rv (turf)	0.20
% Managed Turf	51%
Impervious Cover (acres)	1.74
Rv (impervious)	0.95
% Impervious	5%
Site Area (acres)	**34.54**
Site Rv	**0.16**

Treatment Volume and Nutrient Loads	
Treatment Volume (acre-ft)	0.4675
Treatment Volume (cubic feet)	20,363
TP Load (lb/yr)	12.79
TN Load (lb/yr) (Informational Purposes Only)	91.53

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)		15.29			15.29	0.03
Managed Turf (acres)		17.51			17.51	0.20
Impervious Cover (acres)		1.74			1.74	0.95
				Total	34.54	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr)	11.75
Post Development Treatment Volume in D.A. A (ft^3)	18,698

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
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50		1.04	0	1,798	1,798	3,597	0	0.00	2.26	1.13	1.13	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	

Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)				
0		0.00	0.00	0.00
0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)				
0	0.00	16.15	8.07	8.07
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
60	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)				
25	0.00	0.00	0.00	0.00
25		0.00	0.00	0.00
4. Grass Channel (RR)				
20	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
6. Bioretention (RR)				
40	0.00	0.00	0.00	0.00

6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00		60	0.00	0.00	0.00	0.00
7. Infiltration (RR)														**7. Infiltration (RR)**				
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)														**8. Extended Detention Pond (RR)**				
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)														**9. Sheetflow to Filter/Open Space (RR)**				
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	1.04	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	1,798	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	11.75	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	1.13	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	10.62	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	1,798
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	8.07

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

10. Wet Swale (no RR)														**10. Wet Swale (Coastal Plain) (no RR)**				
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
11. Filtering Practices (no RR)														**11. Filtering Practices (no RR)**				
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00		45	0.00	0.00	0.00	0.00
12. Constructed Wetland (no RR)														**12. Constructed Wetland (no RR)**				
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00		55	0.00	0.00	0.00	0.00
13. Wet Ponds (no RR)														**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		30	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		20	0.00	0.00	0.00	0.00
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00

13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
14. Manufactured Treatment Devices (no RR)														**14. Manufactured BMP (no RR)**				
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	1.04	**AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	**AREA CHECK: OK.**

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	-1.37
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	11.75
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	1.13
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	1.13
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr	10.62

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	8.07
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	8.07

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)	15.29	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	1.74	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	1.04	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	17.51	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	0.00	0.00	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	20,363

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)	1,798	0	0	0	0	1,798
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	11.75	0.00	0.00	0.00	0.00	11.75
TP LOAD REDUCTION ACHIEVED (lb/yr)	1.13	0.00	0.00	0.00	0.00	1.13
TP LOAD REMAINING (lb/yr)	10.62	0.00	0.00	0.00	0.00	10.62
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	8.07	0.00	0.00	0.00	0.00	8.07

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	12.79
TP LOAD REDUCTION REQUIRED (lb/yr)	-1.37
TP LOAD REDUCTION ACHIEVED (lb/yr)	1.13
TP LOAD REMAINING (lb/yr):	11.67
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00 **

** TARGET TP REDUCTION EXCEEDED BY 2.49 LB/YEAR **

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	91.53
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	8.07
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	83.45

Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.66	3.23	5.03

Use NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/)

***Notes (see below):**

[1] The curve numbers and runoff volumes computed in this spreadsheet for each drainage area are limited in their applicability for determining and demonstrating compliance with water quantity requirements. See VRRM User's Guide and Documentation for additional information.

[2] Runoff Volume (RV) for pre- and post-development drainage areas must be in volumetric units (e.g., acre-feet or cubic feet) when using the Energy Balance Equation. Runoff measured in watershed-inches and shown in the spreadsheet as RV(watershed-inch) can only be used in the Energy Balance Equation when the pre- and post-development drainage areas are equal. Otherwise RV(watershed-inch) must be multiplied by the drainage area.

[3] Adjusted CNs are based on runoff reduction volumes as calculated in D.A. tabs. An alternative CN adjustment calculation for Vegetated Roofs is included in BMP specification No. 5.

Drainage Area Curve Numbers and Runoff Depths *

Curve numbers (CN, CNadj) and runoff depths ($RV_{Developed}$) are computed with and without reduction practices.

Drainage Area A		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	15.29	0.00	0.00	Total Area (acres):	34.54
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	1,798
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	17.51	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	1.74	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ A)}$		
					60		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.22	0.42	1.32			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.21	0.41	1.30			
Adjusted CN*		59	60	60			

**See Notes above*

Drainage Area B		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ B)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

Drainage Area C		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ C)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

Drainage Area D		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ D)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

Drainage Area E		A Soils	B Soils	C Soils	D Soils		
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	Total Area (acres):	0.00
	CN	30	55	70	77	Runoff Reduction Volume (ft^3):	0
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00		
	CN	39	61	74	80		
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00		
	CN	98	98	98	98		
					$CN_{(D.A.\ E)}$		
					0		
		1-year storm	2-year storm	10-year storm			
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*		0.00	0.00	0.00			
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*		0.00	0.00	0.00			
Adjusted CN*		0	0	0			

**See Notes above*

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

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Project Title: VAL018 - Folly Road Solar Facility

Date: 44771

Total Rainfall = 43 inches

Site Land Cover Summary

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	15.29	0.00	0.00	15.29	44
Managed Turf (acres)	0.00	17.51	0.00	0.00	17.51	51
Impervious Cover (acres)	0.00	1.74	0.00	0.00	1.74	5
					34.54	100

Site Tv and Land Cover Nutrient Loads

Site Rv	0.16
Treatment Volume (ft^3)	20,363
TP Load (lb/yr)	12.79
TN Load (lb/yr)	91.53

Total TP Load Reduction Required (lb/yr)	-1.37	**	TP LOAD REDUCTION NOT REQUIRED

Site Compliance Summary

Total Runoff Volume Reduction (ft^3)	1,798
Total TP Load Reduction Achieved (lb/yr)	1.13
Total TN Load Reduction Achieved (lb/yr)	8.07
Remaining Post Development TP Load (lb/yr)	11.67
Remaining TP Load Reduction (lb/yr) Required	**0.00**

**** TARGET TP REDUCTION EXCEEDED BY 2.49 LB/YEAR ****

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	15.29	0.00	0.00	0.00	0.00	15.29
Managed Turf (acres)	17.51	0.00	0.00	0.00	0.00	17.51
Impervious Cover (acres)	1.74	0.00	0.00	0.00	0.00	1.74
Total Area (acres)	**34.54**	**0.00**	**0.00**	**0.00**	**0.00**	**34.54**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	1.13	0.00	0.00	0.00	0.00	1.13

TN Load Reduced (lb/yr)	8.07	0.00	0.00	0.00	0.00	8.07

Drainage Area A Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	15.29	0.00	0.00	15.29	44
Managed Turf (acres)	0.00	17.51	0.00	0.00	17.51	51
Impervious Cover (acres)	0.00	1.74	0.00	0.00	1.74	5
					34.54	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	1.04
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	1.13
Total TN Load Reduction Achieved in D.A. (lb/yr)	8.07

Drainage Area B Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Drainage Area C Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Drainage Area D Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Drainage Area E Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.00	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.66	3.23	5.03

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		60	0	0	0	0
RR (ft^3)		1,798	0	0	0	0
1-year return period	RV wo RR (ws-in)	0.22	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	0.21	0.00	0.00	0.00	0.00
	CN adjusted	59	0	0	0	0
2-year return period	RV wo RR (ws-in)	0.42	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	0.41	0.00	0.00	0.00	0.00
	CN adjusted	60	0	0	0	0
10-year return period	RV wo RR (ws-in)	1.32	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	1.30	0.00	0.00	0.00	0.00
	CN adjusted	60	0	0	0	0

III. TR-55 COMPUTATIONS

WinTR-55 Current Data Description

--- Identification Data ---

User: SL
Project: Folly Solar Farm
SubTitle: PreDevelopment
State: Virginia
County: Northumberland NOAA_C
Filename: J:\880.001 - VA Solar SWM\CIVIL\COMPUTATIONS\Folly\PreDev__ONE DA.w55

Date: 8/12/2022
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
A	SITE	Outlet	34.54	58	.485

Total area: 34.54 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 2-Yr (cfs)	10-Yr (cfs)	1-Yr (cfs)
SUBAREAS			
A	6.60	32.72	1.92
REACHES			
OUTLET	6.60	32.72	1.92

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	1-Yr (cfs)	(hr)
SUBAREAS						
A	6.60	12.27	32.72	12.21	1.92	12.37
REACHES						
OUTLET	6.60		32.72		1.92	

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
A	34.54	0.485	58	Outlet	SITE

Total Area: 34.54 (ac)

SL

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
A							
SHEET	100	0.0200	0.240				0.234
SHALLOW	1140	0.0061	0.050				0.251
					Time of Concentration		.485

Folly Solar Farm
PreDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
A	Open space; grass cover > 75%	(good)	B	13.039	61
	Paved parking lots, roofs, driveways		B	.895	98
	Woods	(good)	B	20.602	55
	Total Area / Weighted Curve Number			34.54	58

WinTR-55 Current Data Description

--- Identification Data ---

User: SL
Project: Folly Solar Farm
SubTitle: PostDevelopment
State: Virginia
County: Northumberland NOAA_C
Filename: J:\880.001 - VA Solar SWM\CIVIL\COMPUTATIONS\Folly\PostDev__ONE DA.w55

Date: 8/12/2022
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
A	SITE	Outlet	34.54	61	.485

Total area: 34.54 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.3	4.3	5.1	6.4	7.5	8.8	2.7

Storm Data Source: Northumberland NOAA_C County, VA (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 2-Yr (cfs)	10-Yr (cfs)	1-Yr (cfs)
SUBAREAS			
A	10.17	40.16	3.89
REACHES			
OUTLET	10.17	40.16	3.89

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	1-Yr (cfs)	(hr)
SUBAREAS						
A	10.17	12.23	40.16	12.20	3.89	12.29
REACHES						
OUTLET	10.17		40.16		3.89	

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
A	34.54	0.485	61	Outlet	SITE

Total Area: 34.54 (ac)

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
A							
SHEET	100	0.0200	0.240				0.234
SHALLOW	1140	0.0061	0.050				0.251
					Time of Concentration		.485

SL

Folly Solar Farm
PostDevelopment
Northumberland NOAA_C County, Virginia

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
A	Open space; grass cover > 75%	(good)	B	21.67	61
	Paved parking lots, roofs, driveways		B	1.737	98
	Woods	(good)	B	11.129	55
	Total Area / Weighted Curve Number			34.54	61

IV. STORMWATER QUANTITY REQUIREMENTS

Project Name **VAL028 - Folly Road Solar Facility** **Date** **4-Aug**

SWM Water Quantity Energy Balance Worksheet

DRAINAGE AREA A

SITE AREA (acre)	34.54

	1-year		10-year	
	PRE	POST (adjusted)	PRE	POST (adjusted)
P	2.66	2.66	5.03	5.03
CN	58	59	58	60
S=1000/CN-10	7.24	6.95	7.24	6.67
0.2S	1.45	1.39	1.45	1.33
$RV=(P-0.2S)^2/(P-0.2S)+S$	0.17	0.20	1.19	1.24

QPost Development <= I.F.* (Qpre-development* RVpre-development)/RVDeveloped)

I.F	0.9

CHANNEL PROTECTION			**FLOOD CONTROL**	
Qpre-development	1.92	From TR55	Qpre-development	32.72
QPost Development	3.89	From TR55	QPost Development	40.16
RVPost Development (with runoff reduction)	0.20	From RRM	RVPost Development (with runoff reduction)	1.24
Qallowable	1.53		Qallowable	31.28
Qallowable/QPost Development	0.39		Qallowable/QPost Development	0.78
Vs/Vr	0.33	Fig 11.7 of DEQ Manual	Vs/Vr	0.18
Vs	0.06		Vs	0.22
Storage required (cf)	8121		Storage required (cf)	27985

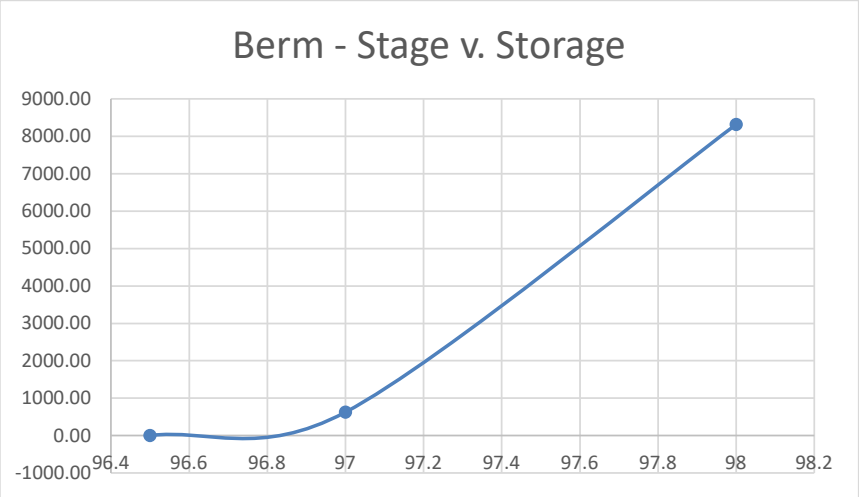
V. STAGE STORAGE COMPUTATIONS AND STORMWATER QUANTITY STORAGE PROVIDED

CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/4/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Berm A Stage Storage Comps	**Reviewed by:**	JA

Berm "A" Stage Storage

	AREA	ELEV	STAGE VOLUME	VOID RATIO	TOTAL STORAGE
BOTTOM	0	96.5			0.00
	2508	97	627.00	1.0	627.00
EMBANKMENT	12864	98	7686.00	1.0	8313.00

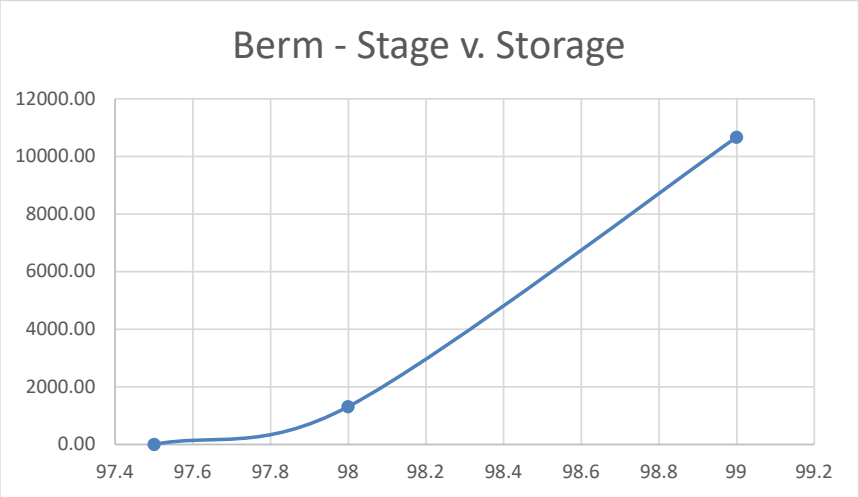


CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/24/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Berm B Stage Storage Comps	**Reviewed by:**	JA

Berm "B" Stage Storage

	AREA	ELEV	STAGE VOLUME	VOID RATIO	TOTAL STORAGE
BOTTOM	0	97.5			0.00
	5240	98	1310.00	1.0	1310.00
EMBANKMENT	13475	99	9357.50	1.0	10667.50

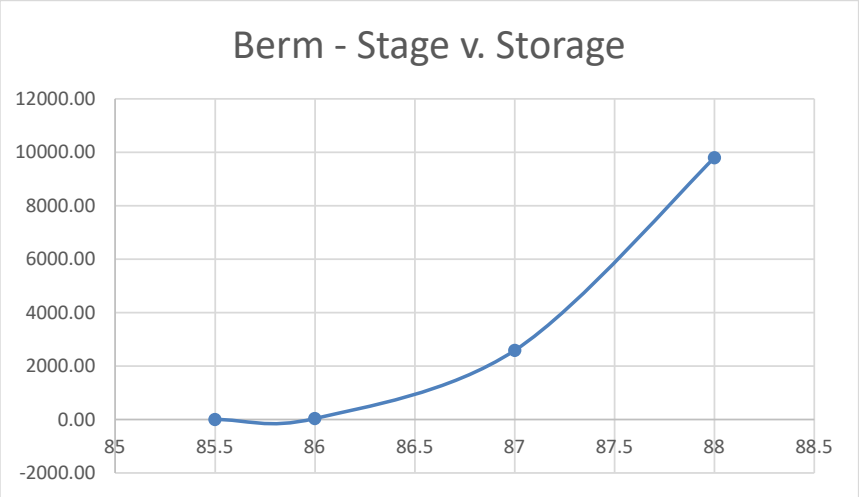


CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/24/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Berm C Stage Storage Comps	**Reviewed by:**	JA

Berm "C" Stage Storage

	AREA	ELEV	STAGE VOLUME	VOID RATIO	TOTAL STORAGE
BOTTOM	0	85.5			0.00
	169	86	42.25	1.0	42.25
	4928	87	2548.50	1.0	2590.75
EMBANKMENT	9485	88	7206.50	1.0	9797.25

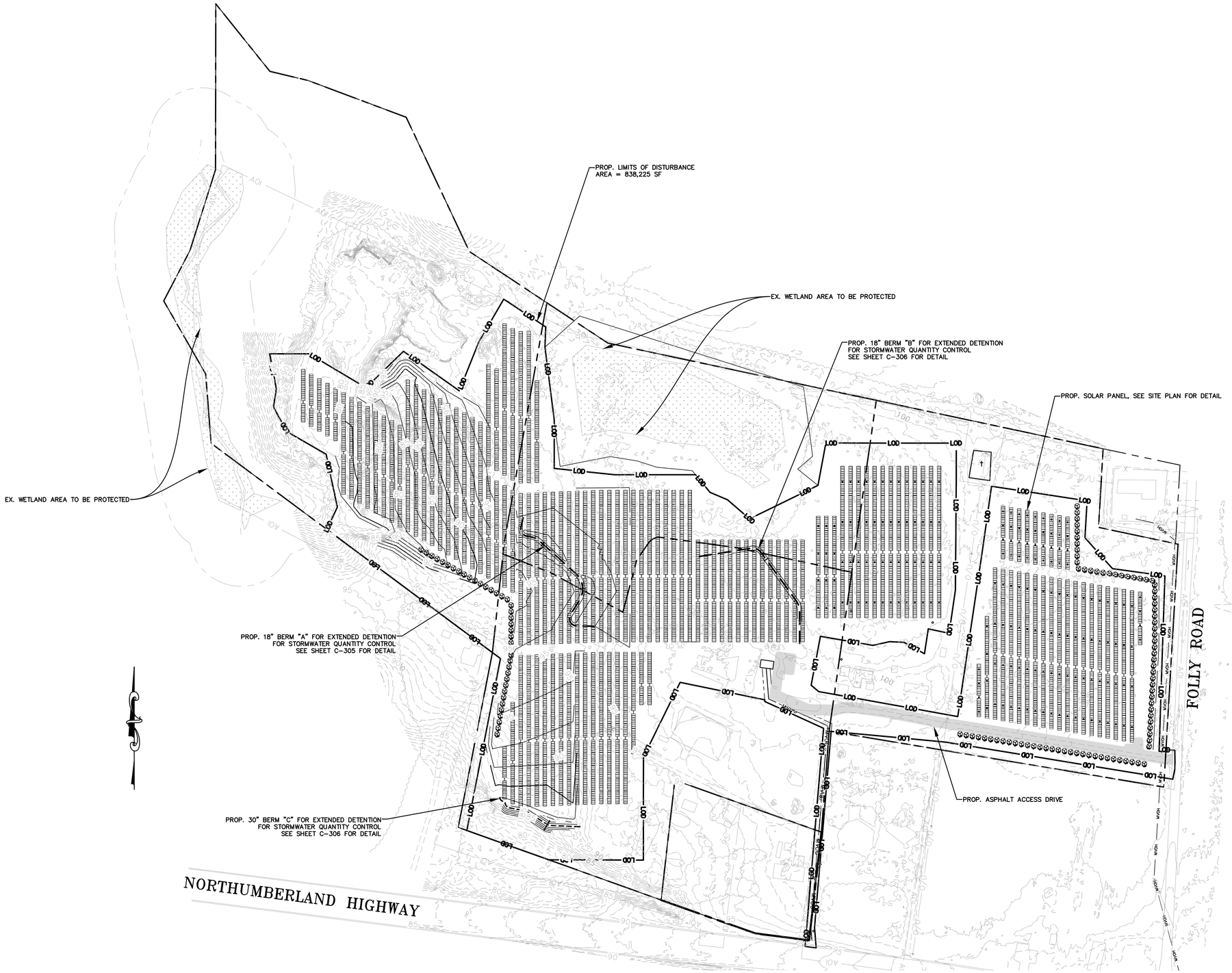


CLARK | AZAR & ASSOCIATES

Project:	VAL028 - Folly Road Solar Facility	**Date:**	8/24/2022
Project Number:	880.001	**Calculated by:**	SL
Calculation:	Water Quanity Summary	**Reviewed by:**	JA

Total Storage Volume

STORAGE VOLUME REQUIRED	**27,985**	**CF**
Storage Volume A	8,313	**CF**
Storage Volume B	10,668	**CF**
Storage Volume C	9,797	**CF**
TOTAL STORAGE VOLUME	**28,778**	**CF**



COMMONWEALTH OF VIRGINIA
JASON AZAR
Lic. No. 051113
PROFESSIONAL ENGINEER
9/8/22

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NO.	BY	DATE	DESCRIPTION

SCALE: SEE PLAN
DRAWN: SL DATE: 9/8/2022
CHECKED: JA DATE: 9/8/2022
APPROVED: JA DATE: 9/8/2022
SURVEY DATE:
SURVEY BY:
FIELD BOOK No.:

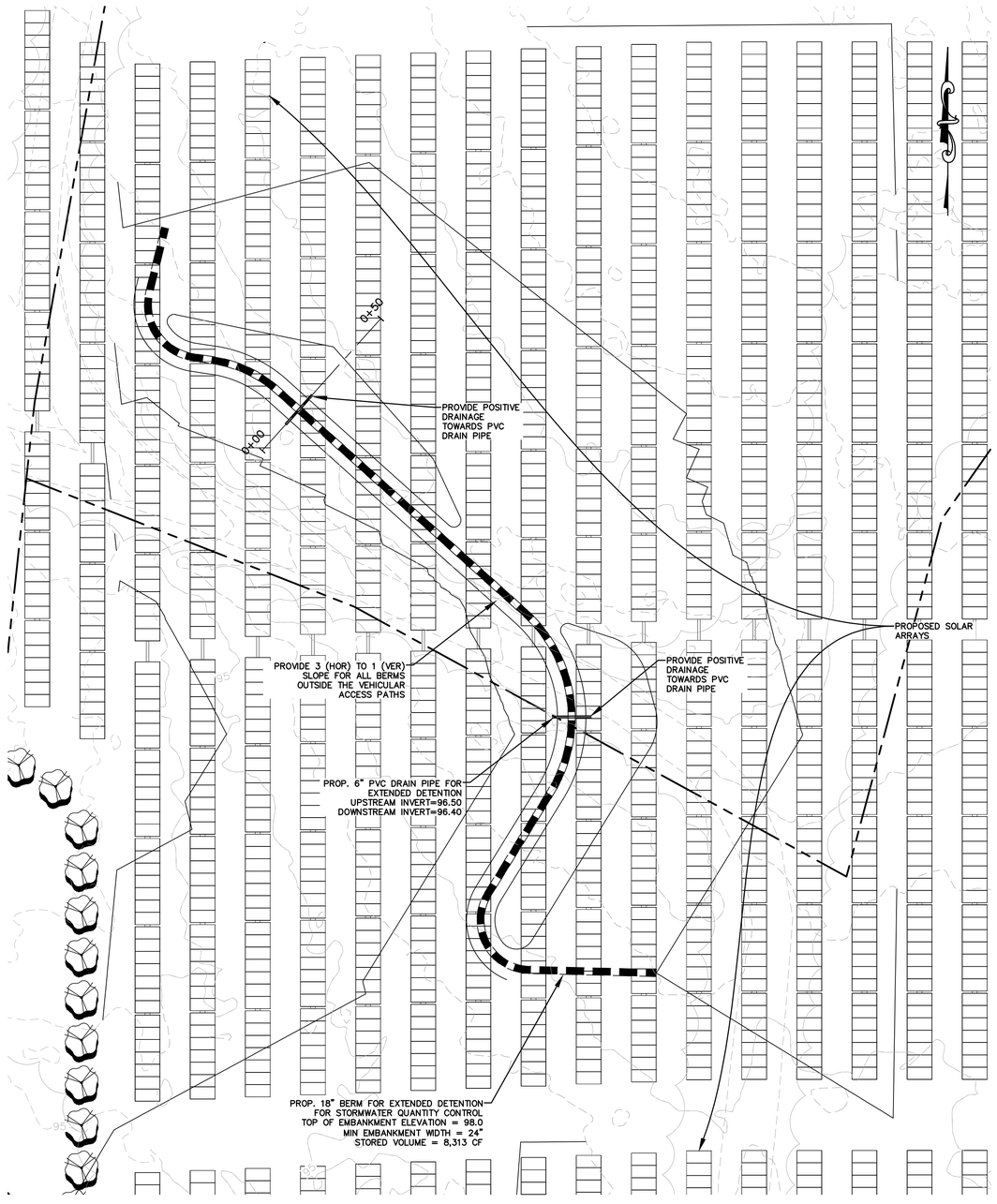
THRASHER
THE THRASHER GROUP INC.
CIVIL • ENVIRONMENTAL • CONSULTING • FIELD SERVICES
600 WHITE OAKS BOULEVARD, BRIDGEPORT, WV 26330
PHONE (304) 624-4108 • FAX (304) 624-7831

PHASE No.
CONTRACT No.
PROJECT No. 101-070-10406

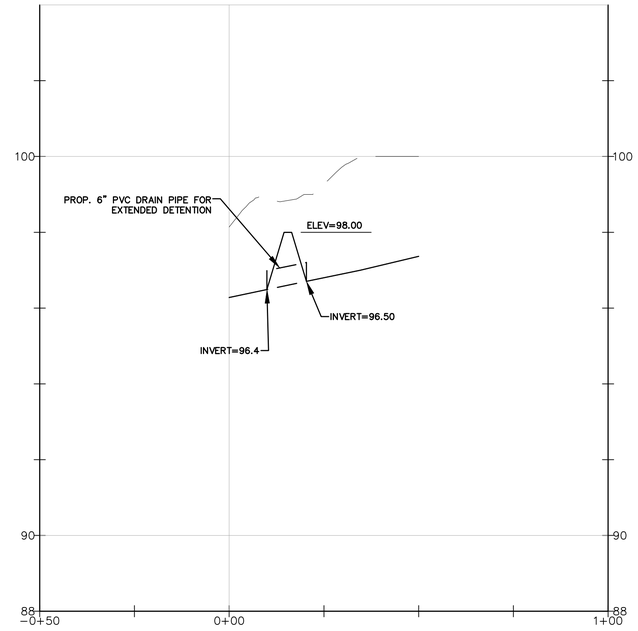
DESIGN EXHIBIT FOR 200 FOLLY, LLC NORTHUMBERLAND COUNTY, VA VAL-028

SHEET No.
STORMWATER MANAGEMENT PLAN
C-300

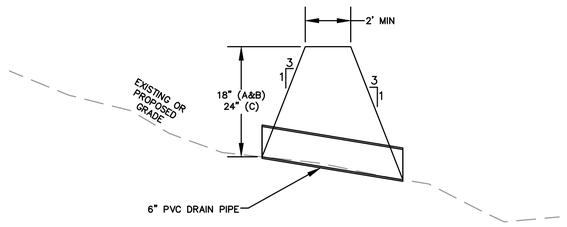
CAD FILE: J:\880.001 - VA Solar SWM\CAD\FOLLY\DWG\C-300 - SWM PLAN.dwg PLOT DATE/TIME: 9/8/2022 4:19 PM



1 EXTENDED DETENTION "A" PLAN
SCALE: 1" = 20' (HOR)



2 EXTENDED DETENTION "A" SECTION
SCALE: 1" = 20' (HOR) 1" = 2' (VER)



3 EXTENDED DETENTION BERM DETAIL
N.T.S.

0 20' 40'
GRAPHIC SCALE

COMMONWEALTH OF VIRGINIA
JASON JAR
Lic. No. 051113
PROFESSIONAL ENGINEER
9/8/22

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NO.	BY	DATE	DESCRIPTION

SCALE: SEE PLAN
DRAWN: SL DATE: 9/8/2022
CHECKED: JA DATE: 9/8/2022
APPROVED: JA DATE: 9/8/2022
SURVEY DATE:
SURVEY BY:
FIELD BOOK No.:

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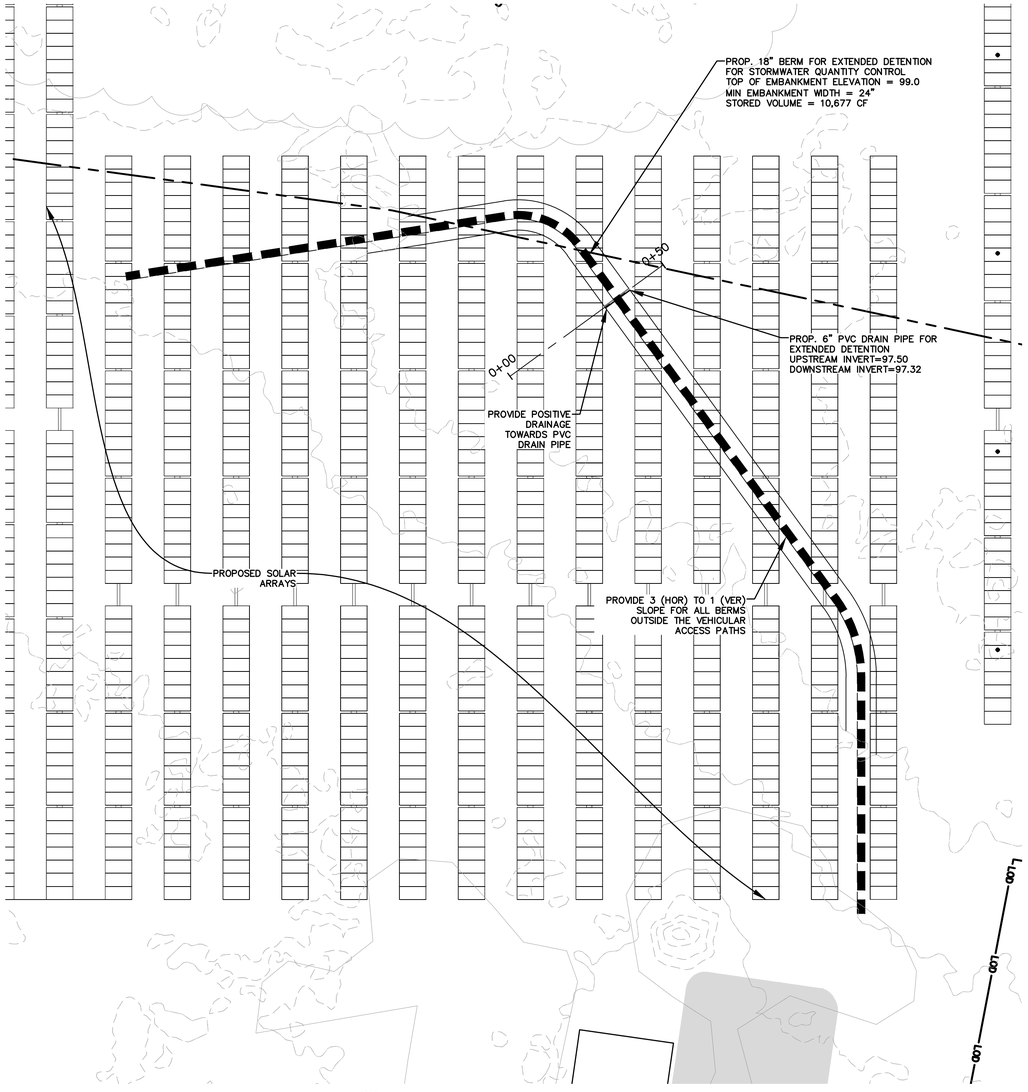
600 WHITE OAKS BOULEVARD, BRIDGEPORT, WV 26330
PHONE (304) 624-4108 • FAX (304) 624-7831

PHASE No.
CONTRACT No.
PROJECT No. 101-070-10406

DESIGN EXHIBIT FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028

SHEET No.
STORMWATER MANAGEMENT DETAILS
C-305

CAD FILE: J:\880.001 - VA Solar SWM\CAD\FOLLY\DWG\C-300 - SWM PLAN.dwg PLOT DATE/TIME: 9/8/2022 4:18 PM



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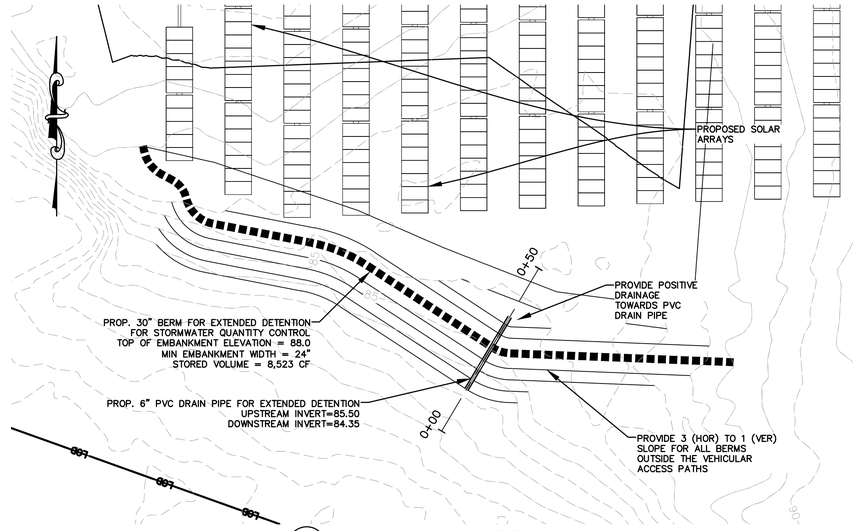
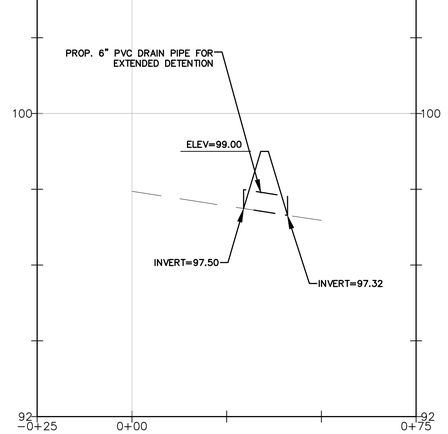
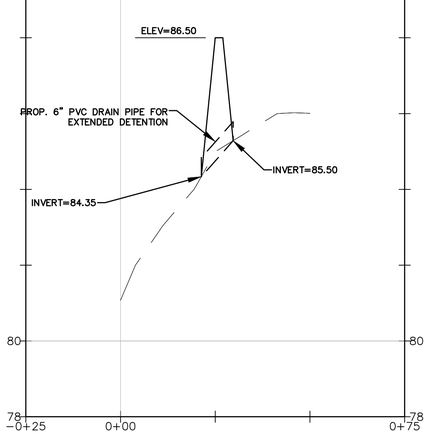
SCALE: 1" = 20' (HOR)



1 EXTENDED DETENTION "C" PLAN
SCALE: 1" = 20' (HOR)



3 EXTENDED DETENTION "B" SECTION
SCALE: 1" = 20' (HOR) 1" = 2' (VER)



4 EXTENDED DETENTION "C" SECTION
SCALE: 1" = 20' (HOR) 1" = 2' (VER)

COMMONWEALTH OF VIRGINIA
JASON SEAR
Lic. No. 051113
9/8/22
PROFESSIONAL ENGINEER

0 20' 40'
GRAPHIC SCALE

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NO.	BY	DATE	DESCRIPTION

SCALE: SEE PLAN
DRAWN: SL DATE: 9/8/2022
CHECKED: JA DATE: 9/8/2022
APPROVED: JA DATE: 9/8/2022
SURVEY DATE:
SURVEY BY:
FIELD BOOK No.:

THRASHER
THE THRASHER GROUP INC.
CIVIL • ENVIRONMENTAL • CONSULTING • FIELD SERVICES
600 WHITE OAKS BOULEVARD, BRIDGEPORT, WV 26330
PHONE (304) 624-4108 • FAX (304) 624-7831

PHASE No.
CONTRACT No.
PROJECT No. 101-070-10406

DESIGN EXHIBIT FOR
200 FOLLY, LLC
NORTHUMBERLAND COUNTY, VA
VAL-028

SHEET No.
STORMWATER MANAGEMENT DETAILS
C-306

CAD FILE: J:\880.001 - VA Solar SWM\CAD\FOLLY\DWG\C-300 - SWM PLAN.dwg PLOT DATE/TIME: 9/8/2022 4:19 PM

Module 5: 200-Foot Setback Reduction Narrative

Facility Setback Reduction Report

VAL028 – Folly Road Solar Facility

200 Folly Road, LLC
Northumberland County, Virginia

THRASHER

600 White Oaks Blvd.
PO Box 940
Bridgeport, WV 26330

May, 2022

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APPENDICES

Appendix A:

- Figure 3: USGS Site Location
- Figure 4: VDOT Guardrail Detail

1.0 Purpose and Location

Northumberland County maintains a Zoning Ordinance (ZO) for the purpose of promoting the health, safety, and general welfare of the public. Solar energy facilities are a regulated activity under the ZO. According to the ZO, medium-scale and utility scale solar energy facilities are required to have a minimum 200-foot setback from roadways operated and maintained by the Virginia Department of Transportation.

The purpose of this Set-back Reduction Narrative is to evaluate and provide supporting documentation for a reduction of the 200-foot setback where the VAL028 – Folly Road Solar Facility (VAL028) faces a VDOT maintained roadway.

The proposed VAL028 solar energy facility is located in Burgess, Virginia, along Folly Road, a rural 2 lane road located off of US Route 360 (Northumberland Highway). This report was prepared to ensure that the proposed methods for protecting the solar energy facility from motor vehicles are within the guidelines of AASHTO (American Association of State Highway and Transportation Officials) publications, meet VDOT specifications, and that the solar energy facility is beyond the clear zone limits of all public roads. Please see the USGS Site Location Map depicting the location of the VAL028 solar energy facility in Appendix A.

2.0 Existing Conditions

Folly Road is a rural two-lane bi-directional roadway in flat terrain. The average daily traffic (ADT) on this roadway is listed at 160 vehicles per day based on studies performed by the VDOT traffic division as of July 27, 2020. A printout of the ADT date is provided below.

FIGURE 1 - VDOT AADT DATA

Link ID	756857
OBJECTID	79823
DATA_DATE	August 17, 2020
ROUTE_COMMON_NAME	SC-646E (Northumberland County)
HTRIS_ID	6600646
ROUTE_ALIAS	66-646 Folly Rd
START_LABEL	66-645 Gonyon Rd
END_LABEL	US 360 W, Northumberland Hwy
ADT	160
ADT_QUALITY	R
PERCENT_4_TIRE	

Note: Folly Road attribute table. Reprinted from Virginia Department of Transportation Virginia Roads Website. 2020. https://www.virginiaroads.org/

Folly Road has no posted speed limits along the length of the roadway. A similar adjoining rural road has a 40 MPH posted speed limit and shall be used for this proposed report.

3.0 Proposed Protection Alternatives

The proposed VAL028 solar energy facility is located west of Folly Road with roughly 350 feet of the solar energy facility proposed to have protection from motor vehicles along the roadway in the form of a guard rail. The proposed protective barrier will run parallel of Folly Road between approximately 36 and 44-feet from the edge of pavement. Based on the AASHTO Roadside Design Guide 4th Edition 2011, the clear zone for Folly Road is between 7 and 10 feet due to a speed limit less than or equal to 40 MPH and an ADT of less than 750 vehicles. Please see the chart below.

FIGURE 2 - REQUIRED CLEAR ZONE TABLE

Design Speed (mph)	Design ADT	Foreslopes			Backslopes		
		1V:6H or flatter	1V:5H to 1V:4H	1V:3H	1V:3H	1V:5H to 1V:4H	1V:6H or flatter
≤40	UNDER 750[c]	7–10	7–10	[b]	7–10	7–10	7–10
	750–1500	10–12	12–14	[b]	12–14	12–14	12–14
	1500–6000	12–14	14–16	[b]	14–16	14–16	14–16
	OVER 6000	14–16	16–18	[b]	16–18	16–18	16–18
45–50	UNDER 750[c]	10–12	12–14	[b]	8–10	8–10	10–12
	750–1500	14–16	16–20	[b]	10–12	12–14	14–16
	1500–6000	16–18	20–26	[b]	12–14	14–16	16–18
	OVER 6000	20–22	24–28	[b]	14–16	18–20	20–22
55	UNDER 750[c]	12–14	14–18	[b]	8–10	10–12	10–12
	750–1500	16–18	20–24	[b]	10–12	14–16	16–18
	1500–6000	20–22	24–30	[b]	14–16	16–18	20–22
	OVER 6000	22–24	26–32[a]	[b]	16–18	20–22	22–24
60	UNDER 750[c]	16–18	20–24	[b]	10–12	12–14	14–16
	750–1500	20–24	26–32[a]	[b]	12–14	16–18	20–22
	1500–6000	26–30	32–40[a]	[b]	14–18	18–22	24–26
	OVER 6000	30–32[a]	36–44[a]	[b]	20–22	24–26	26–28
65–70[d]	UNDER 750[c]	18–20	20–26	[b]	10–12	14–16	14–16
	750–1500	24–26	28–36[a]	[b]	12–16	18–20	20–22
	1500–6000	28–32[a]	34–42[a]	[b]	16–20	22–24	26–28
	OVER 6000	30–34[a]	38–46[a]	[b]	22–24	26–30	28–30

Note: Required clear zone table reprinted from "*AASHTO Roadside Design Guide 4th Edition 2011* (p.3-3)

Due to the VAL028 solar energy facility being outside of the required clear zone of the roadway, protection is not required by VDOT or any highway agency for protection of motor vehicles. The protective barrier is being proposed for supplementary protection of the solar arrays and associated equipment and to justify a reduced setback. The proposed protective barrier is Guardrail Type GR-2.

Guardrail Type GR-2 is to be placed along the length of the traveled way of the adjacent roadway with a post spacing of 6 feet and 3 inches. This Guardrail has a maximum dynamic deflection of 3 feet under impact and shall be placed no closer to an object than 3 feet.

Typical details of the proposed protective barrier is provided in Appendix A. A projected layout of the protective barriers will be provided on the site plan as part of the conditional use permit application.

4.0 References

American Association of State Highway and Transportation Officials. (2011). *Roadside Design Guide, 4th Edition*. American Association of State Highway and Transportation Officials.

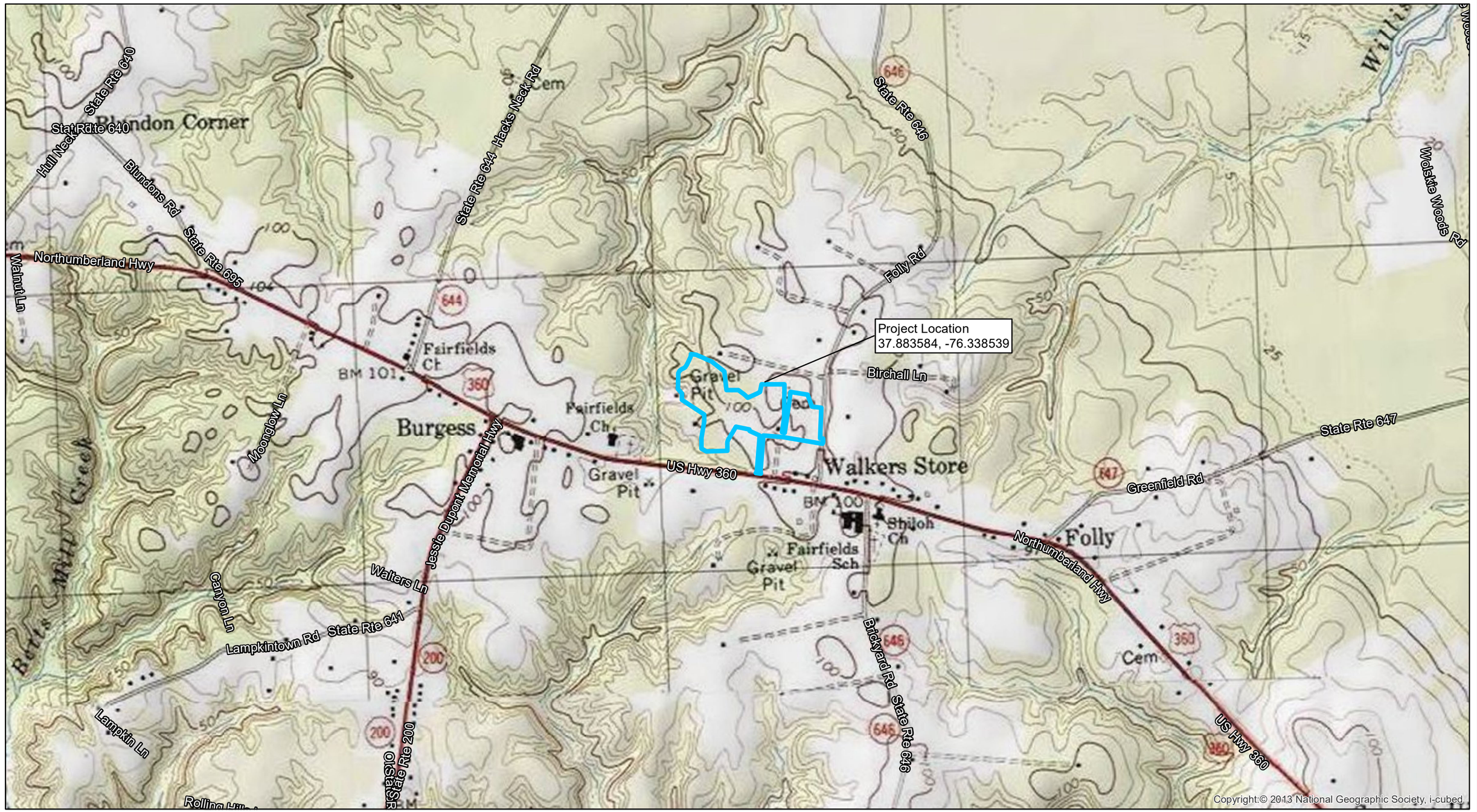
Virginia Department of Transportation. (2016). *2016 VDOT Road and Bridge Specifications.* Virginia Department of Transportation.

Virginia Department of Transportation. (2020). *VDOT 2020 Traffic Volume.* Virginia Roads. https://www.virginiaroads.org/datasets/VDOT::vdot-traffic-volume-2020/explore?location=37.868798%2C-76.350719%2C16.68

APPENDIX A

ADDITIONAL FIGURES:

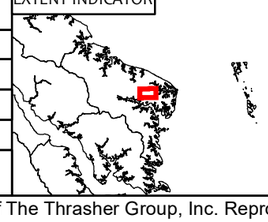
FIGURE 3: USGS SITE LOCATION MAP
FIGURE 4: VDOT GUARDRAIL DETAIL



DETAILS:

Quad: Burgess	
Drawn By: jwilcox	Date: 5/19/2022
Surveyed By:	Date:
Project No.070-10406	
Sheet Number: Overall	

EXTENT INDICATOR



Legend

- Project Footprint

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

Figure 3: USGS Site Location

VAL028 Folly Road Site

Northumberland County - Virginia

THRASHER

Document Path: R:\070\070-10406.00-VAL-028 and VAL-029 Solar Development-SGC Power, LLC-\GIS\VAL028\MXD\USGS Site Location_VAL028.mxd

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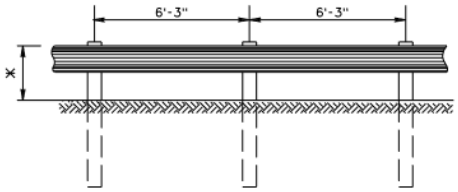
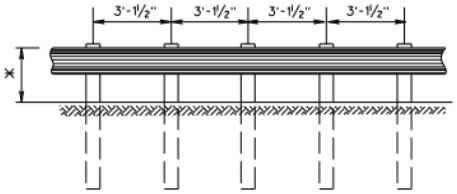
GR-2, 2A

* 27¾" MIN - 28¾" MAX RAIL HEIGHT



GR-2
(6'-3" POST SPACING)
MAX DYNAMIC DEFLECTION = 3'



GR-2A
(3'-1½" POST SPACING)
MAX DYNAMIC DEFLECTION = 2'

NOTES:

GUARDRAIL LOCATIONS SHOWN ON PLANS ARE APPROXIMATE ONLY AND CAN BE ADJUSTED DURING CONSTRUCTION IF AND AS DIRECTED BY THE ENGINEER.

FOR DETAILS OF POST AND BLOCKOUTS SEE SHEET NO. 501.05.

FOR DETAILS OF RAIL ELEMENT, RAIL SPLICE JOINT, AND ASSOCIATED HARDWARE SEE SHEET NOS. 501.01 AND 501.02.

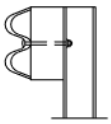
RAIL ELEMENTS ARE FURNISHED SHOP CURVED FOR RADII BETWEEN 5 FEET AND 150 FEET.

ALL GUARDRAIL POSTS SHALL BE SET PLUMB. POST SHALL NOT BE SET WITH A VARIATION OF MORE THAN 1/8" PER FOOT FROM VERTICAL. W-BEAM, BLOCKOUTS, AND POSTS SHALL BE SET AND ALIGNED WITHOUT ALTERATION OR FORCE, AS PER SECTION 505 OF THE SPECIFICATIONS.

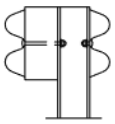
ALL GR-2 AND GR-2A RAIL SHALL BE MAINTAINED AT A HEIGHT OF 27¾" MIN - 28¾" MAX AS MEASURED PER STANDARD GR-1NS.

ALL W-BEAM RAILS SHALL BE LAPPED IN THE DIRECTION OF VEHICULAR TRAVEL FOR THE FINISHED ROADWAY.

THE OPTIONAL GR-2A METHODS OF NESTING THE RAIL OR USE OF AN ADDITIONAL RAIL ON THE BACK OF THE POST FOR STANDARD GR-2A SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.



* OPTIONAL GR-2A METHOD USING NESTED RAIL



* OPTIONAL GR-2A METHOD USING ADDITIONAL RAIL ON BACK OF POST

* WHEN NESTED RAIL OR ADDITIONAL RAIL IS PLACED ON BACK OF POST FOR GR-2A THE POST SPACING WILL BE 6'-3".

FLARE RATES			
DESIGN SPEED	INSIDE SHY LINE		BEYOND SHY LINE
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	9'	30:1	15:1 *
60	8'	26:1	14:1 *
50	6.5'	21:1	11:1 *
40	5'	16:1	8:1 *
30	4'	13:1	7:1 *

* SUGGESTED MAXIMUM FLARE RATE FOR SEMI-RIGID BARRIER SYSTEMS.

VDOT ROAD AND BRIDGE STANDARDS		A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	SPECIFICATION REFERENCE
SHEET 1 OF 2	REVISION DATE	STANDARD BLOCKED-OUT W-BEAM GUARDRAIL (STRONG POST SYSTEM)	221 505
501.04	08/14	VIRGINIA DEPARTMENT OF TRANSPORTATION	

FIGURE 4 - VDOT GUARDRAIL DETAIL

Module 6: Emergency Response Plan

DRAFT

Solar Emergency Response Plan

VAL-028 SOLAR PROJECT
15569 NORTHUMBERLAND HWY, BURGESS, VA 22432
NORTHUMBERLAND COUNTY

200 Folly, LLC / Pivot Energy
A. Weber, R. Hickox
August 2022

CONTENTS

1 General Project Information

The purpose of this plan is to provide recommended emergency response procedures to be implemented in the event of an emergency during the operation of the solar project.

1.1 Project Location/Address

The VAL-028 Solar project is located on approximately 14.5 acres of land located near 15569 Northumberland Highway in Burgess, VA 22432, in Northumberland County. The nearest cross street is Folly Road, to the east.

GPS coordinates for the site: 37.8837, -76.3368.

Emergency 911 Address:
[e911 # TBD] Northumberland Highway
Burgess, VA 22432

1.2 Project Description

The solar energy system is a 3.00 Megawatt-AC system composed of approximately (8,964) photovoltaic (PV) modules and (24) 125kW, 1500VDC/600VAC, 3-phase string inverters. The string inverters are [FINAL LOCATION WITHIN ARRAY TBD]and are aggregated and interconnected to a new pad-mounted switchboard installed near the main security gate (see Attachment 1 – Site Plan). The switchboard is then interconnected to a new single medium voltage (MV) transformer to step-up the system voltage from 600VAC to 34.5kV AC. The medium voltage transformer is then connected to a series of pole-mounted switches, relays and metering equipment that interconnects the array to the existing Dominion utility grid at an existing 3-phase distribution line along the north side of Northumberland Highway.

The solar modules are mounted on a Single-Axis Tracker (SAT) racking system, which utilizes driven posts for foundations. The array is monitored by a Supervisory Control And Data Acquisition (SCADA) system, which allows remote monitoring and control. The solar arrays are enclosed in 8-feet-tall agricultural style security fencing. At the conclusion of construction, the site is stabilized with slow growth, low maintenance, pollinator ground cover, per the permanent stabilization requirements in the approved Sediment Control Plans.

1.3 Site Access

There are two potential access points for this array. Please see Figure 1 below. Emergency response vehicles should utilize the existing 11-feet-wide paved driveway off the north side of Northumberland Highway, located approximately 700 feet west of the intersection with Folly Rd. This is identified as ACCESS #1 in Figure 1. This driveway also services the existing residences on these parcels. Proceeding straight north, this driveway intersects with a new 16-feet-wide gravel access road that extends left, or west, to the main 16-feet-wide security gate, identified as GATE 1 in Figure 1. This gate is locked with a Knox Box. Just past this gate, the gravel access road extends to the main equipment pad which hosts the MV transformer and the PV switchboard.

The site can also be accessed via a 16-foot-wide gravel access road off the west side of Folly Rd, located approximately 450 feet north of its intersection with Northumberland Highway. This is indicated as ACCESS #2 in Figure 1. However, thanks to an existing utility easement through the center of the array/parcel, an emergency vehicle would have to pass through 3 Knox Box locked security gates (Gates# 3, #2, then #1) to get to the main system disconnect if utilizing the Folly Rd access. For this reason, the Folly Rd entrance is recommended only for utility and maintenance personnel. ACCESS #2 does intersect with ACCESS #1, so it may serve as an alternate means of emergency access if needed.

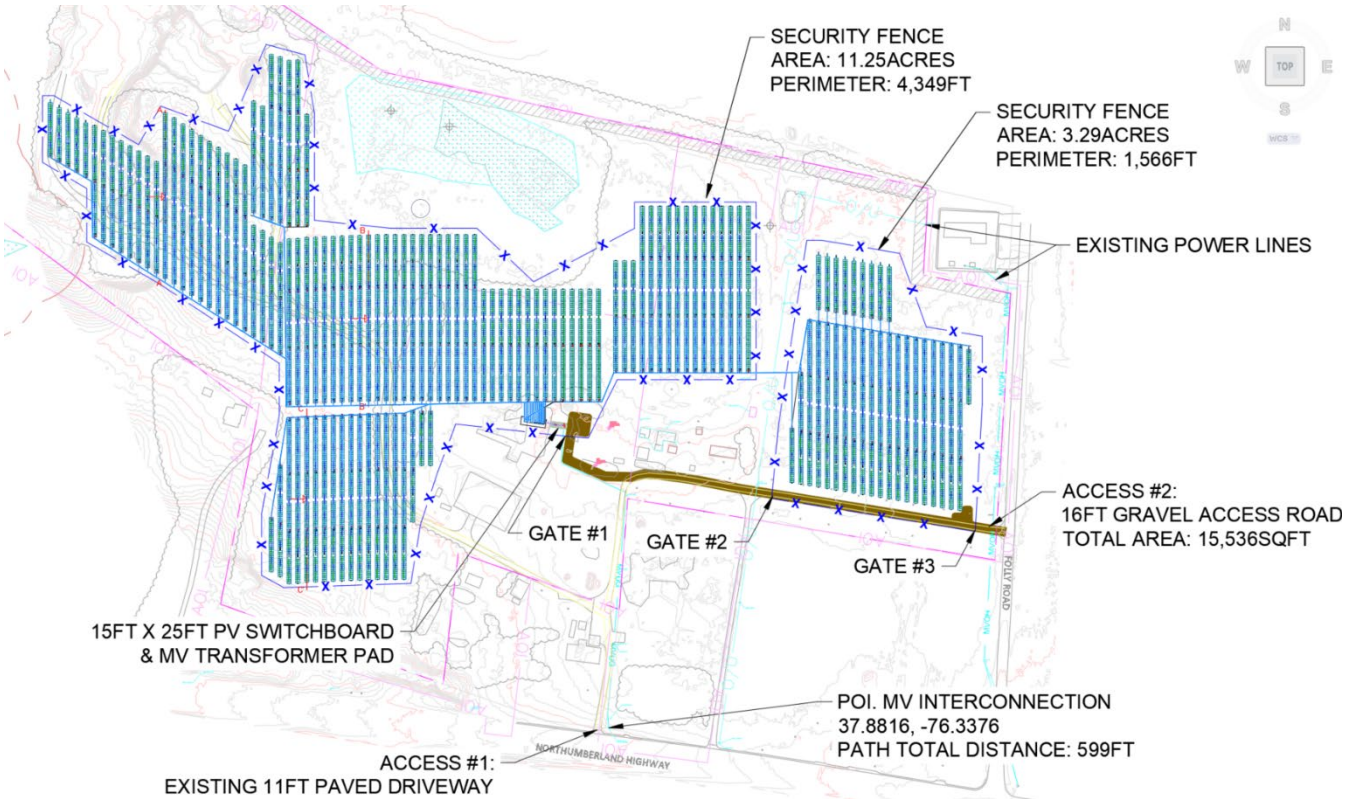


Figure 1. Site Access Locations

1.3.1 Access Aisles

Access to all areas within the solar arrays is provided via access aisles. Access aisles for this project are 12-feet-wide, clear grass pathways located between the arrays and the security fencing. This exceeds the NFPA 1, section 11.12.4.1 required clear area of 10ft around the arrays. Additionally, 20-feet-wide access aisles are provided every ~300 feet north-south within the arrays. The rows themselves are spaced 8.5ft apart in the east-west direction. These internal access aisles are primarily for use by operations and maintenance personnel and vehicles. Due to the vegetated surface and lesser widths, access aisles are not suitable for many emergency services vehicles. However, access aisles do provide emergency responders with access routes to all areas of the site via walking, pickup trucks or 4x4 vehicles.

1.3.2 Signage

Appropriate onsite signage is provided in accordance with NFPA-1 and NEC codes:

- Marking is provided to give emergency responders appropriate warning and guidance with respect to isolating the solar electric system. This signage facilitates identifying energized electrical lines that should not be cut and how and where to disconnect power from the array.
- Vinyl signs used for marking are weather resistant to UL 969 standards for weather rating (UL listing of markings is not required). Plastic or metal engraved signs do not need to meet the UL standard.

Sign Requirements:

Marking content: "CAUTION SOLAR CIRCUIT" or
"WARNING: PHOTOVOLTAIC POWER SOURCE"

- Per NFPA 1, section 11.12.2.1.4, a permanent plaque or directory is installed at the main system disconnect, as well as on each gate in the security fencing. The plaque denotes the location of each power source disconnecting means and is marked with "CAUTION: MULTIPLE SOURCES OF POWER". The plaque complies with NEC 110.21(B). A label is provided next to the plaque at the main disconnect indicating the name and 24/7 emergency contact phone number.

2 System Owner Information

[SYSTEM OWNER TBD] will own, operate, and maintain the VAL-028 Solar project.

2.1 System Owner Site Contacts

The [SYSTEM OWNER] Operations and Maintenance (O&M) team outlined below will be the prime points of contact for the solar project.

Primary O&M Contact	NAME 1, Title 1, 24/7 contact	Phone # 1	Email 1
Secondary O&M Contact	NAME 2, Title 2	Phone #2	Email 2
Tertiary O&M Contact	NAME 3, Title 3	Phone #3	Email 3

2.2 Emergency Services Authority

The project's Primary O&M Contact and Secondary O&M Contact will be responsible for overseeing emergency services compliance. Their duties include ensuring that the measures in this plan are complied with, all agencies and appropriate stakeholders (including but not limited to emergency response units, utility, solar O&M technicians, and project owner) are properly notified in the event notification is required, and that all required plans and reports are prepared and submitted in a timely manner. Third party O&M technicians contracted by the System Owner may be dispatched to the site to support with emergency response compliance.

2.3 Communication & Training Procedures

Safety is everyone's responsibility on site. All employees and subcontractors will receive safety training before they begin maintenance work onsite. This training will include pertinent information regarding hazardous material management, fire prevention, and how to respond to a fire emergency. The O&M Primary Contact will be responsible for ensuring that all personnel receive this training. All employees must:

- Complete an onsite training program identifying the fire risks for the project site
- Know the protocol and follow emergency procedures should an event occur
- Review and report potential fire hazards to the Onsite O&M Primary Contact

2.4 Fire Prevention

2.4.1 Purpose of the Fire Prevention Plan (FPP)

- Identify risk factors and hazards
- Eliminate the potential risks and/or causes of fires
- Prevent loss of life and property by fire
- Set up proper storage procedures, training, and identification of personnel responsible for maintaining and servicing the equipment and systems onsite in order to prevent and/or control a fire.
- Outline a procedure to follow for the safety of individuals onsite at the time of a fire occurrence.
- Set up proper identification of personnel, training, and procedures for maintaining and servicing the fire prevention/control equipment onsite.

2.4.2 Fire Prevention Inspections

Fire season occurs primarily in Spring and Fall. At a minimum, thorough site inspections will be performed by the O&M team semiannually prior to the fire seasons to look for and mitigate fire risk factors or hazards. Inspectors shall visually inspect the following, and an owner's representative will review to confirm compliance:

- Wiring and electrical conduits for exposed wires, broken insulation, fraying, corrosion, improperly mounted connectors and any indications of wear or rodent damage
- Electrical equipment, panels, and cutoff switches, ensuring they have clear NEC required access clearances and are free of surrounding vegetation
- Modules for signs of delamination, cracks, or other damage
- Racking for signs of corrosion. Torque check 10% of bolts.
- All site safety signage, ensuring it remains unobstructed and clearly legible
- Data acquisition sensors, ensuring they are clean and unobstructed

Maintenance of the site grounds will occur more frequently, as specified in the approved Landscape Plan. At these maintenance visits, the site grounds and landscaping will be inspected for:

- Dead landscaping trees or shrubs that need replacing
- Adequate separation between tree branches and shrubs (approximately 3x shrub height)
- Dense vegetation that needs thinning
- Dry brush, grasses, or other foliage

- Dead branches, limbs, or leaves within the security fencing
- Debris piles such as grass cuttings, leaves, pine needles, pinecones, or other ground litter
- Tall grass, brush, or plantings that need cutting
- Areas of deterioration, erosion and/or obstructions of site access roads and aisles

2.4.3 Fire Prevention Maintenance

Regular maintenance of the grounds at the site, both inside and outside the security fence, is required as specified in the approved Landscape Plan and Stormwater Management Plan. The O&M team will adjust maintenance frequency based on time of year and weather conditions. Site maintenance shall include, at a minimum:

- Maintaining ground cover vegetation as specified in the approved Stormwater Management Plan, Landscape Plan, and/or Permanent Stabilization guidelines in the approved Sediment Control Plan. Most native plants will have extensive root systems by their first year, so mowing or grazing will not damage them. As needed, trimmers will be used to address areas around structural elements and other places a mower or grazer cannot reach. Any vegetation that has stuck to the solar modules will be cleaned off.
- Pruning trees and shrubs in accordance with approved Landscape Plan and/or AHJ requirements to remove dead, injured or disproportional branches and maintain adequate spacing.
- Any dry or dead vegetation will be removed as necessary. Dead grasses and foliage will be mowed to the ground once the growing season has passed. At all times, the site shall be kept free of all dead vegetation and flammable debris.
- Remove vegetative debris piles and/or any branches or limbs within the array security fence.
- Collect any items of trash accumulated since previous site visit and dispose of properly offsite.
- Re-seed and fertilize any areas where vegetation has grown sparse, as needed.
- Clear site access roads and replace gravel where needed.

Any damaged system components discovered during the semiannual array inspections will promptly be corrected. Maintenance of these items may include:

- Removing and replacing sections of electrical wire or conduits that are damaged or show signs of wear.
- Cleaning, testing, and servicing all electrical equipment per manufacturer's recommendations and schedule.
- Repairing and replacing any damaged electrical equipment discovered during inspection.
- Removing vegetation or obstructions from NEC required access clearances for all electrical equipment.
- Resolving any outstanding, non-urgent equipment alerts. Urgent alerts will be addressed immediately upon detection by remote monitoring.
- Repairing any areas of racking showing rust per manufacturer's guidelines. Tightening loose bolts discovered during inspection.
- Replacing any safety signs or labels that are missing, have been damaged, or legibility has deteriorated.
- Cleaning data acquisition sensors, ensuring remote monitoring remains accurate.

3 Emergency Response

3.1 Emergency Response Jurisdictions

The project site is within the jurisdictional area of the County Emergency Medical Services (EMS)/Office of Emergency Management (OEM) and three Fire/First Response districts:

1. Division of Emergency Medical Services (EMS) and the Office of Emergency Management (OEM)
   (804) 580-7666 / P.O. Box 129 72 Monument Place Heathsville, VA 22473

2. Callao Fire Department
   (435) 693-3136 / 314 Northumberland Highway, Callao, VA, 22435

3. Fairfield Volunteer Fire Department - Glebe Point Fire House
   (804) 453-6390 / 90 Firehouse Road Burgess, Virginia, 22432

4. Kilmarnock Volunteer Fire Department
   (804) 435-1332 / 71 School St, Kilmarnock, VA 22482

3.2 Fire Response Conditions Unique to Photovoltaic Solar Arrays

Unlike typical electric or gas utilities, PV modules do not stop generating electricity when the disconnect switch is opened. Individual PV modules utilized in this project generate voltages around 50 Volts-DC and currents around 10-15 Amps when exposed to sunlight or any source of light. The modules utilized for this project are bifacial, meaning that both the top and bottom surfaces can generate electricity when exposed to light. The PV modules are connected into electrical "strings" that are capable of producing up to 1,500 Volts-DC. As long as the PV modules are illuminated, the strings of PV panels are energized. This is not just limited to the modules being illuminated by the sun; illumination by artificial light sources, such as fire department lights, or the light of a fire itself are capable of producing electrical power sufficient to cause a lock-on hazard. The only way to limit the potential is to physically cover both top and bottom collector surfaces.

Electrical disconnects provided for this solar array will de-energize the AC parts of the electrical system, from the utility point of interconnection up to and including the inverters. The disconnects will not de-energize the PV modules or wiring that connects the PV modules to the inverters.

3.2.1 Fire Response Hazards Unique to Photovoltaic Solar Arrays

Below is a summary of hazards associated with firefighting activities in photovoltaic solar arrays:

- Shock hazard due to the presence of water and PV power during suppression activities
  - Outdoor rated electrical enclosures may not resist water intrusion from the high-pressure stream of a fire hose.
  - PV panels damaged in the fire may not resist water intrusion.
  - Damaged conductors may not resist water intrusion
- Shock hazard due to direct contact with energized components
  - No means of complete electrical disconnect.

Due to the dangers presented above, it is not typical to practice fire suppression by means of water inundation within solar PV arrays.

3.3 Equipment Fires

Although extremely rare, the solar modules themselves, or the supporting electrical equipment could cause a fire. Class C fires are fires that involve energized electrical equipment. In the event of a Class C fire within the solar array, all non-emergency personal shall immediately exit the facility and contact the appropriate emergency response agency. When fighting a Class C fire, ALWAYS:

1. De-energize the circuit supplying the fire, to the extent possible. At a minimum, open the main array disconnect.
2. Use a non-conductive extinguishing agent such as carbon dioxide or Halon 1211. A multi-purpose dry chemical (ABC) extinguisher can also be used on Class C fires.
3. DO NOT use water, foam or other electrically conducive agents when fighting electrical fires.
4. IF the electricity is fully shut down to the equipment involved (i.e. not involving the PV modules), the fire generally becomes a standard combustible fire.
5. Always maintain a safe distance from damaged areas of the PV system to reduce risk of shock or arc.

If PV modules need to be touched or moved as part of the firefighting activities, the following safety measures are mandatory:

- ALWAYS wear electrical insulating gloves when handling photovoltaic modules, whether electrically connected or not, whether damaged or not.
- Modules should never be picked up or moved by anything but the frame.
- Defective or damaged modules should be removed from the PV area and covered or placed out of the sun.

3.4 Vegetation Fires

Fire prevention site inspections and maintenance will ensure the site will be largely free of combustible vegetation with only a ground cover of maintained vegetation adjacent and beneath the solar array. Flying embers from off-site fire may inundate the array area during fire events. Ignition of the ground cover could result in a fast moving, but low intensity fire that burns in a patchy manner on the site beneath the modules. This type of fire would be relatively short-duration as vegetative fuels are consumed rapidly. There would not be a sustained source of heat and/or flame.

In the event of a vegetation fire under or near the modules or inverters:

- DO NOT attempt to extinguish the flames with water or other chemicals as an electric shock or arc could occur.
- If possible, de-energize the array to the extent possible. At a minimum, open the main site disconnect.
- Let the fire burn vegetation and self-extinguish.
- If flames continue away from modules or inverters, attempt to extinguish flames.

3.5 Fire Events during Onsite Maintenance

In the event of a fire during a site maintenance visit, the following procedures will be followed:

- The person discovering the fire should immediately contact 911 to report the fire. The onsite O&M Primary Contact should then be contacted.
- Any personnel onsite should be removed from the immediate danger area in anticipation of an evacuation.
- The Onsite O&M Primary Contact will respond to the scene and ensure that the fire department has been dispatched. They will then determine evacuation needs, recruit/dispatch employees to assist with the evacuation and issue the following statement over the radio: “Attention, there is a fire emergency at (location name). Please evacuate (the affected area) and report to (designated meeting area).
- At this point, all employees in the affected area will stop work immediately, take steps to safely shut down equipment, exit the evacuation area, and report to the designated meeting area.
- In this scenario, fire extinguishers are to be used for escape purposes only.
- The Onsite O&M Primary Contact will take the necessary steps to ensure that no employee re-enters the evacuated area until the Fire Department arrives and assumes command.
- No employee is required or permitted to place themselves in harm’s way to facilitate extinguishment, evacuation, or rescue. All rescue operations will be performed by trained professionals upon their arrival.
- The O&M Primary Contact will issue an “All Clear” only when the Fire Department informs them that it is safe to do so.

3.6 Main Array Disconnect

First responders can de-energize the AC components of the Array through the following device:

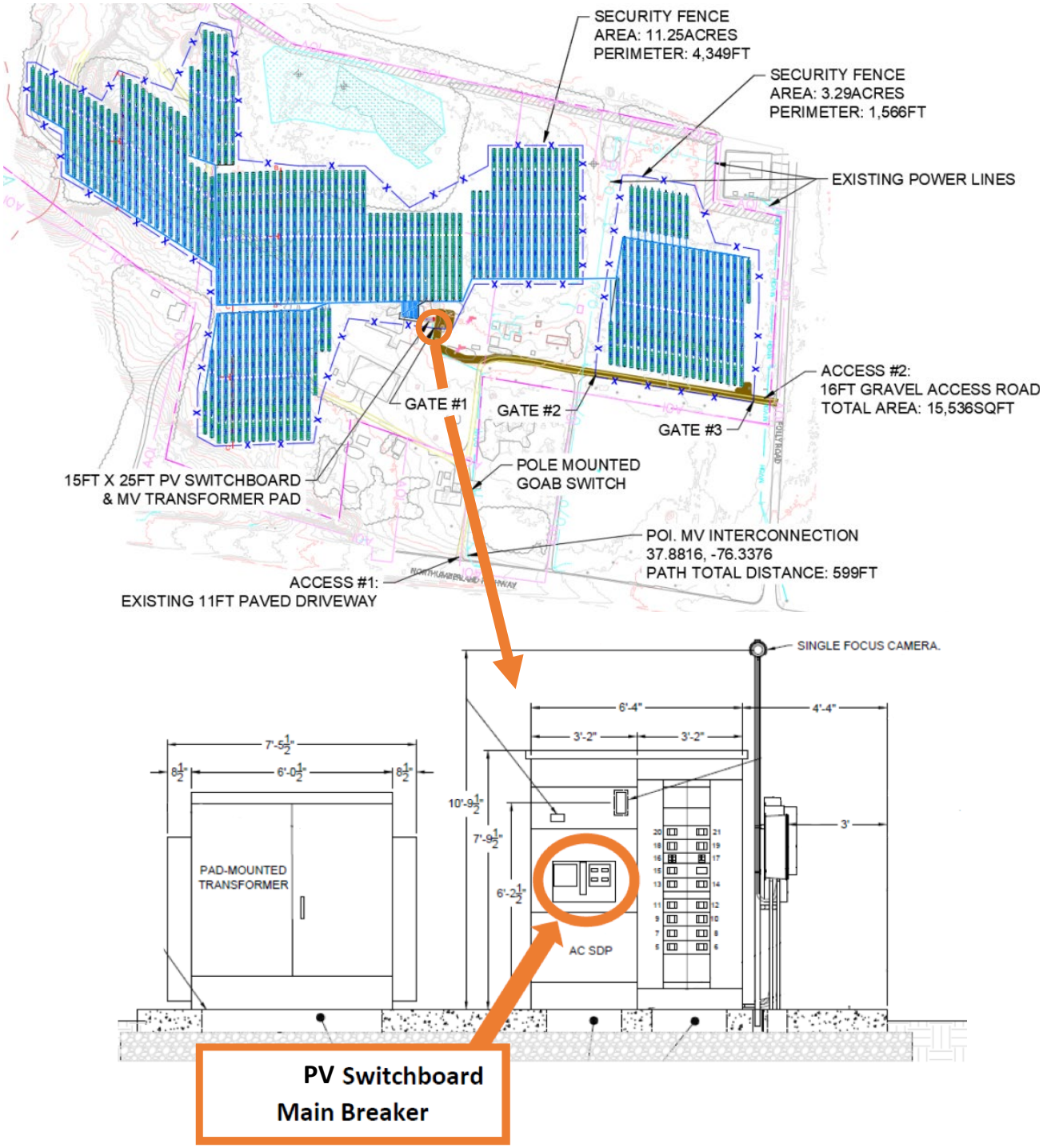


Figure 2 – Emergency Shutdown Switch Location

3.6.1 PV Switchboard Main Breaker – De-energize AC Power Only

Switch the PV Switchboard Main Breaker into the **"OFF"** Position. When the PV Switchboard Main Breaker is switched to the **"OFF"** Position, AC power is no longer available to the inverters. The inverters cease operation, and the system is offline.

3.6.2 Alternate Disconnect - Pole-Mounted Group Operated Air Break (GOAB) Switch De-energize AC Power Only

Shift the Pole-Mounted GOAB Switch into the **"OPEN"** position. When the switch is in the open position, utility AC power is no longer available to the inverters. The inverters cease operation and the system is offline. This option allows a shutoff closer to the Point of Interconnection (POI).

3.6.3 Utility Outages – AC Power Only

When utility power is removed from the Array, the inverters will recognize AC Power is no longer available from the utility grid and will cease operation. Inverters will not operate while AC Power is not available and will wait for five minutes after stable AC Power is available prior to reenergizing. This protects utility line workers and first responders during utility outages. A reminder that the PV modules will remain energized.

3.7 Fire fighter training sources:

- Fire Service Training, Underwriter's Laboratory
- Firefighter Safety and Response for Solar Power Systems, National Fire Protection Research Foundation
- Bridging the Gap: Fire Safety & Green Buildings, National Association of State Fire Marshalls
- Guidelines for Fire Safety Elements of Solar Photovoltaic Systems, Orange County Fire Chiefs Association
- Solar Photovoltaic Installation Guidelines, California Department of Forestry & Fire Protection, Office of the State Fire Marshall
- PV Safety & Firefighting, Matthew Paiss, Homepower Magazine

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Module 7: Decommissioning Plan

August 25, 2022

Northumberland County
Attn: County Zoning Administrator
Office of Building & Zoning
P.O. Box 129
Heathsville VA 22473

Subject: 200 Folly, LLC – Solar Facility Decommissioning Plan

Northumberland County:

This opinion of probable costs is based on the engineer's experience in the design and construction of energy facilities and is subject to final engineering. Costs have been split between plant disassembly, site restoration, and salvage which reflect the overall decommissioning process. This opinion assumes a third-party contractor, experienced in the construction and decommissioning of PV facilities will lead the effort. The reported costs include labor, materials, taxes, insurance, transport costs, equipment rental, contractor's overhead and contractor's profit. Labor costs have been estimated using regional labor rates and labor efficiencies from the Bureau of Labor Statistics along with previous decommissioning plan estimates completed for other similar projects.

The PV plant will be first disassembled, with all above and below grade components removed. This includes all buried cables. Concrete can be removed by machine to increase efficiency. It is expected that any disturbed areas within the site will be re-seeded with native grasses for vegetative stabilization.

Planting trees, shrubs, and other woody vegetation (re-forestation) or other beautification is not included in the costs. It is assumed that regrading the site to remove stormwater features is not required. The earth moving required to remove these features would likely trigger additional permits.

Salvage values have been estimated using publicly available data from cablemanagementusa.com, http://www.scrapmonster.com, as well as industry provided actual salvage values and previous experience with similar solar projects. The salvage values have been deducted from the total decommissioning cost.

Inflation is included in this estimate. A 2.5% annual increase in labor costs and a 1% annual increase in salvage value was assumed over the 25-year estimated lifetime of the solar array.

Anticipated Disassembly Methods

Item	Removal Method
PV Modules	Hand removal. Place modules face down on pallets, tape wire ends, tie down and transport via skid steer to staging area. Assumed salvage value.
Inverters	Inverters weight approximately 176 lbs and will be disassembled and removed by hand. Assumed salvage value.
Transformers	Assume no disassembly. Oil removal performed by scrap facility. Assumed salvage value.
Racking Frames	Stabilize with machine. Cut legs and lower to ground level. Cut cross beams to appropriate size and transport via dump truck to staging location. Assumed salvage value.
Racking Posts	Remove via post-puller and transport by dump truck to staging area. Assumed salvage value.
Racking Wiring	Disconnect PV module connectors, cut cable ties and remove wires from cable trays. Transport via dump truck to staging area. Assumed salvage value.
Underground Cables	Excavate to cable depth at one end of trench. Use tractor or backhoe to remove all cables in common trench. Transport via dump truck to staging location. Assumed salvage value.
Fence	Machine roll fence fabric. Remove post via post-puller and transport via dump truck to staging area. Assumed offsite disposal.
Concrete	Remove with excavator and jack hammer. Transport via dump truck to staging area. Assumed offsite disposal.
Gravel	Remove with skid steer with sweeper. Transport via dump truck to staging area. Assumed offsite disposal.
Re-seeding	Re-seed using an ATV pulled drill seeder, with native grasses.

If you have any questions or need any additional information, please contact me at 410-709-1143 or adria.weber@pivotenergy.net

Sincerely,

Adria Weber
NABCEP Certified PV Engineer #PV-102216-015102
PV Engineer 3
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pivotenergy.net

DECOMMISSIONING COST ANALYSIS
FOLLY RD SOLAR

	Description of Item	Quantity	Unit		Unit Labor Cost		Total Cost (2022)	Total Cost (After 25 Years)**	Logic
	I. DISASSEMBLY & DISPOSAL								
1.0	PV Modules	8,964	EA.	$	3.13	$	28,012.50	51,933.61	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 400 panels/day.
2.0	Inverter(s)	24	EA.	$	78.13	$	1,875.00	3,476.15	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 16/day.
3.0	Transformer(s)	1	EA.	$	312.50	$	312.50	579.36	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove in 2 hours.
4.0	Switchboards/Switchgear/Reclosers	4	EA.	$	312.50	$	1,250.00	2,317.43	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove each in 2 hours (4/day).
5.0	Racking Frame (Tracker)	340	EA.	$	27.78	$	9,444.44	17,509.47	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 45 strings/day.
6.0	Racking Posts	1,266	EA.	$	20.83	$	26,375.00	48,897.78	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 60 posts/day.
7.0	LV Wiring	197,129	LF	$	0.42	$	82,137.05	152,277.50	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 3000 LF/day (circuit length)
8.0	Fiber Optic Cable	604	LF	$	0.42	$	251.67	466.58	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 3000 LF/day (circuit length)
9.0	MV Wiring	604	LF	$	0.42	$	251.67	466.58	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 3000 LF/day (circuit length)
10.0	Ag Fence	5,915	LF	$	1.25	$	7,393.75	13,707.60	* Use Crew A-5 (2 Laborers; .25 Truck Driver; .25 Flatbed Truck) = $1,250/day. Assume crews can remove 1000 LF/day
11.0	Concrete	7	CY	$	72.78	$	480.40	890.64	* Use Crew B-3B (2 Laborers; 1 Equip Oper; 1 Truck Driver; 1 Backhoe; 1 Dump Trk) = $3,639/day. Assume crew can remove 50 CY/day
12.0	Gravel (Access Road, Level Spreaders)	144	CY	$	72.78	$	10,469.54	19,409.94	* Use Crew B-3B (2 Laborers; 1 Equip Oper; 1 Truck Driver; 1 Backhoe; 1 Dump Trk) = $3,639/day. Assume crew can remove 50 CY/day
13.0	Removal of utility poles	1	EA.	$	2,100.00	$	2,100.00	3,893.28	Estimate includes labor and all required tools and vehicles
					Subtotal	$	**170,353.52**	**315,825.90**	
	II. SITE RESTORATION								
13.0	Re-Seeding (includes seed)	7	AC	$	2,500.00	$	18,175.00	33,695.43	* Cost includes: (Seed: 4-7 species (native types) Also with estimate is labor: Spraying; Disking; Planting; Mulch; One man & machine
14.0	Re-Grading	150	CY	$	12.00	$	1,805.43	3,347.17	* (2 Laborers; 1 Equip Oper; 1 Truck Driver; 1 Backhoe; 1 Dump Trk) = $3,448/day. Assume crews can grade 300 CY/day.
					Subtotal	**$**	**19,980.43**	**37,042.60**	
	III. SALVAGE								
15.0	PV Modules	8,964	EA	$	5.00	$	44,820.00	57,478.60	
16.0	Inverters	24	EA	$	16.00	$	384.00	492.45	
17.0	Transformer(s)	8,500	LBS	$	0.42	$	3,570.00	4,578.28	www.scrapmonster.com
18.0	Switchboards/Switchgear/Reclosers	0	LBS	$	0.00	$	0.00	0.00	No longer carries scrap value
19.0	Racking Frame (Tracker)	344,950	LBS	$	0.20	$	67,269.16	86,268.12	www.scrapmonster.com - steel
20.0	Racking Posts	159,516	LBS	$	0.20	$	31,107.43	39,893.16	www.scrapmonster.com - steel
21.0	DC Wiring	33,550	LBS	$	1.12	$	37,576.54	48,189.36	cablemanagementusa.com - PV wire
22.0	LV AC Wiring	1,618	LBS	$	1.39		2,249.42	2,884.73	www.scrapmonster.com - 4/0 Al EC wire
23.0	MV Wiring	225	LBS	$	0.05	$	11.26	14.44	www.scrapmonster.com - ACSR wire
24.0	Ag Fence	5,057	LBS	$	0.00	$	0.00	0.00	No longer carries scrap value
					Subtotal	**$**	**186,987.82**	**239,799.16**	
									Legend
		DEMOLITION COST				**$**	**190,333.95**	**352,868.50**	* = Costs derived from RS Means Heavy Site estimating manual
		SALVAGE VALUE CREDIT				**$**	**186,987.82**	**239,799.16**	** = Assumes 2.5% annual increase in labor costs and 1% annual increase in salvage value
		NET DECOMMISSIONING COST				**$**	**3,346.13**	**113,069.34**	