COMMONWEALTH OF VIRGINIA
BEFORE THE
STATE CORPORATION COMMISSION

Application of NextEra Energy Transmission Virginia, Inc. For approval and certification of electric transmission facilities under Va. Code § 56-46.1 and the Utility Facilities Act, Va. Code §§ 56-265.1 *et. seq*.	**)**	**Case No. PUR-2026-00018**

APPLICATION OF NEXTERA ENERGY TRANSMISSION VIRGINIA, INC. FOR APPROVAL AND CERTIFICATION OF ELECTRIC FACILITIES FOR THE CONSTRUCTION OF A 500 KV TRANSMISSION LINE AND THE WOODSIDE SUBSTATION

ROUTING STUDY

Volume 3 of 3

PREPARED FOR
NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc.

DATE
January 2026

REFERENCE
0718854

Routing Study

MidAtlantic Resiliency Link Project



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SIGNATURE PAGE

Routing Study

MidAtlantic Resiliency Link Project

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CONTENTS

1. INTRODUCTION 1
1.1 OVERVIEW 1
1.2 PROJECT BACKGROUND 4
1.3 SCOPE OF REPORT 4
1.4 PROJECT DESCRIPTION 5
1.4.1 ROW Widths and Structure Types 5
1.4.2 Construction, Operation, and Maintenance Process 11
2. METHODOLOGY 12
2.1 GOAL OF THE ROUTING STUDY 12
2.2 DEFINING THE MARL PROJECT STUDY AREA 15
2.3 INVENTORY OF CONSTRAINTS AND OPPORTUNITIES 15
2.4 IDENTIFICATION AND ASSESSMENT OF PRELIMINARY DRAFT ROUTES 16
2.5 FIELD RECONNAISSANCE AND STAKEHOLDER ENGAGEMENT 16
2.6 ROUTE ALTERNATIVE ANALYSIS AND ROUTE RECOMMENDATION 17
2.7 ROUTE DEVELOPMENT CRITERIA AND GUIDELINES 17
3. MARL PROJECT STUDY AREA 24
3.1 MARL PROJECT STUDY AREA DESCRIPTION 24
3.2 MAJOR ROUTING CONSTRAINTS AND OPPORTUNITIES IN THE MARL PROJECT STUDY AREA 25
3.3 FIELD RECONNAISSANCE AND STAKEHOLDER ENGAGEMENT 32
4. ROUTE IDENTIFICATION 34
4.1 IDENTIFICATION OF CONCEPTUAL ROUTE CORRIDORS 34
4.1.1 Southwest Quadrant 36
4.1.2 Northwest Quadrant 38
4.1.3 Central Quadrant 38
4.1.4 Eastern Quadrant 40
4.2 IDENTIFICATION OF PRELIMINARY DRAFT ROUTE OPTIONS 41
4.3 STAKEHOLDER AND PUBLIC FEEDBACK 42
4.4 ROUTE REFINEMENT AND ROUTE SEGMENT ELIMINATION 43
4.5 IDENTIFICATION OF FINAL ALTERNATIVE ROUTES 50
4.5.1 Alternative Route A 52
4.5.2 Alternative Route B 52
4.5.3 Alternative Route C 53
4.5.4 Alternative Route D 53
4.5.5 Alternative Route E 54
4.5.6 Alternative Route F 55
5. ALTERNATIVE ROUTE COMPARISON 56
5.1 ROUTE LENGTH AND CONSTRUCTION FOOTPRINT 57
5.2 LAND USE AND SOCIAL RESOURCES 59
5.2.1 Paralleling Existing Infrastructure 59
5.2.2 Community and Recreational Resources 62

5.2.3 Protected Areas 66
5.2.4 Cultural Resources 73
5.2.5 Agricultural and Land Cover 77
5.3 NATURAL ENVIRONMENT 81
5.3.1 Water Resources 81
5.3.2 Sensitive Species and Habitats 88
5.4 ENGINEERING AND INFRASTRUCTURE 93
5.5 ESTIMATED COSTS 98
5.6 SELECTION OF THE PROPOSED ROUTE 98
5.6.1 Alternative Route A Selected as the Proposed Route 100
5.6.2 The Proposed Route Compared to the other Alternative Routes 101

6. CONCLUSION AND RECOMMENDATION 106

6.1 THE PROPOSED ROUTE DESCRIPTION 108
6.2 THE PROPOSED ROUTE ANCILLARY FACILITY WORKSPACES 113
6.3 RIPARIAN HABITAT EXCLUSION ZONES 115
6.4 THE PROPOSED ROUTE ANALYSIS 118
6.5 CONCLUSION 135

7. REFERENCES 136

APPENDIX A PENNSYLVANIA ENVIRONMENTAL REVIEW DOCUMENT
APPENDIX B WEST VIRGINIA ENVIRONMENTAL REVIEW DOCUMENT
APPENDIX C MARYLAND ENVIRONMENTAL REVIEW DOCUMENT
APPENDIX D VIRGINIA ENVIRONMENTAL REVIEW DOCUMENT
APPENDIX E MAPBOOKS FOR ROUTING STUDY
APPENDIX F VEGETATION MANAGEMENT PLAN
APPENDIX G DATA SOURCES
APPENDIX H WETLAND IDENTIFICATION MODEL REPORT
APPENDIX I PUBLIC OPEN HOUSE CONTENT
APPENDIX J VISUAL IMPACT ASSESSMENT

LIST OF TABLES

TABLE 1.4-1 PROJECT FEATURES FOR THE FINAL END-TO-END ALTERNATIVE ROUTES 6
TABLE 2.7-1 QUANTITATIVE CONSTRAINTS AND OPPORTUNITIES EVALUATION CRITERIA 20
TABLE 4.4-1 ROUTE SEGMENTS 45
TABLE 5.1-1 ROUTE LENGTH AND CONSTRUCTION FOOTPRINT EVALUATION CRITERIA 57
TABLE 5.2-1 PARALLELING EXISTING INFRASTRUCTURE EVALUATION CRITERIA 60
TABLE 5.2-2 COMMUNITY AND RECREATIONAL RESOURCES EVALUATION CRITERIA 63
TABLE 5.2-3 PROTECTED LAND EVALUATION CRITERIA 67
TABLE 5.2-4 SPECIFIC PROTECTED LANDS CROSSED BY THE ALTERNATIVE ROUTES 69
TABLE 5.2-5 CULTURAL RESOURCES EVALUATION CRITERIA 74
TABLE 5.2-6 AGRICULTURAL LAND EVALUATION CRITERIA 78
TABLE 5.2-7 LAND COVER EVALUATION CRITERIA 79
TABLE 5.3-1 WATERBODIES AND CROSSING TYPES FOR EACH ALTERNATIVE ROUTE 83

TABLE 5.3-2 WATER RESOURCES CRITERIA 85
TABLE 5.3-3 SENSITIVE SPECIES AND HABITATS 89
TABLE 5.4-1 ENGINEERING AND INFRASTRUCTURE CRITERIA 94
TABLE 5.5-1 ESTIMATED CAPITAL COSTS FOR THE ALTERNATIVE ROUTES 98
TABLE 5.6-1 ALTERNATIVE ROUTE EVALUATION RESULT MATRIX 99
TABLE 5.6-2 SUMMARY COMPARISON OF THE ALTERNATIVE ROUTES TO THE PROPOSED ROUTE 102
TABLE 5.6-3 SUMMARY OF COMPARISON TO THE PROPOSED ROUTE BASED ON EVALUATION CRITERIA 105
TABLE 6.1-1 THE PROPOSED ROUTE AND COUNTY CROSSINGS 109
TABLE 6.2-1 ANCILLARY FACILITY WORKSPACES FOR THE PROPOSED ROUTE 115
TABLE 6.3-1 IDENTIFIED RIPARIAN HABITAT EXCLUSION ZONES 116
TABLE 6.4-1 ROUTE LENGTH AND CONSTRUCTION FOOTPRINT ANALYSIS 118
TABLE 6.4-2 PARALLELING EXISTING INFRASTRUCTURE ANALYSIS 118
TABLE 6.4-3 COMMUNITY AND RECREATIONAL RESOURCES ANALYSIS 119
TABLE 6.4-4 PROTECTED LAND ANALYSIS 121
TABLE 6.4-5 SPECIFIC PROTECTED LANDS ANALYSIS 123
TABLE 6.4-6 CULTURAL RESOURCES ANALYSIS 125
TABLE 6.4-7 AGRICULTURAL LAND ANALYSIS 126
TABLE 6.4-8 LAND COVER ANALYSIS 127
TABLE 6.4-9 WATER RESOURCES ANALYSIS 128
TABLE 6.4-10 SENSITIVE SPECIES AND HABITATS 131
TABLE 6.4-11 ENGINEERING AND INFRASTRUCTURE CRITERIA 133

LIST OF FIGURES

FIGURE 1.1-1 MARL PROJECT OVERVIEW AND STUDY AREA 3
FIGURE 1.4-1 GRAPHICAL DEPICTION OF ADDITIONAL AERIAL EASEMENT BLOWOUT AREAS 7
FIGURE 1.4-2 SITING CORRIDOR SCHEMATIC 9
FIGURE 1.4-3 TYPICAL LATTICE TRANSMISSION LINE STRUCTURE 10
FIGURE 2.1-1 TYPICAL ROUTING PROCESS 13
FIGURE 2.1-2 ILLUSTRATION OF MARL PROJECT PARALLELING 14
FIGURE 3.2-1 MAJOR ROUTING CONSTRAINTS AND OPPORTUNITIES IN THE MARL PROJECT STUDY AREA 27
FIGURE 4.1-1 MARL PROJECT STUDY AREA QUADRANTS 35
FIGURE 4.1-2 EXISTING TRANSMISSION LINES IN THE SOUTHWEST AND NORTHWEST QUADRANTS 36
FIGURE 4.1-3 EXISTING TRANSMISSION LINES IN THE CENTRAL QUADRANT OF THE MARL PROJECT STUDY AREA 39
FIGURE 4.1-4 EXISTING TRANSMISSION LINES IN THE EASTERN QUADRANT OF THE MARL PROJECT STUDY AREA 40
FIGURE 4.5-1 ALTERNATIVE ROUTES 51
FIGURE 6-1 THE PROPOSED ROUTE 107
FIGURE 6-2 EXAMPLE MAP OF THE ANCILLARY FACILITIES 114
FIGURE 6-3 RIPARIAN HABITAT EXCLUSION ZONE 117

ACRONYMS AND ABBREVIATIONS

Acronym	Description
BioNet	Biodiversity Conservation Network
CDP	census designated place
COMAR	Code of Maryland Regulations
Dominion Energy	Virginia Electric and Power Company d/b/a Dominion Energy Virginia
ERM	Environmental Resources Management, Inc.
FirstEnergy	FirstEnergy Corp.
FMA	Fisheries Management Area
GIS	Geographic Information System
NHL	National Historic Landmark
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
INA	Irreplaceable Natural Area
kV	kilovolt
Md. Code Ann.	Annotated Code of Maryland
MARL Project	MidAtlantic Resiliency Link Project
MBTA	Migratory Bird Treaty Act
MP	milepost
NEET MA	NextEra Energy Transmission MidAtlantic, Inc.
NEET VA	NextEra Energy Transmission Virginia, Inc.
PA Code	Pennsylvania Code
PJM	PJM Interconnection LLC
Pub. Util.	Public Utilities
ROW	right-of-way
SGL	State Game Land
USACE	U.S. Army Corps of Engineers
Va. Code	Virginia Code
W. VA. Code R.	West Virginia Code of Regulations
WMA	Wildlife Management Area
WVDNR	West Virginia Division of Natural Resources

1. INTRODUCTION

This report summarizes the findings of a routing study (Routing Study) conducted by Environmental Resources Management, Inc. (ERM) on behalf of NextEra Energy Transmission MidAtlantic, Inc. (NEET MA) and NextEra Energy Transmission Virginia, Inc. (NEET VA). The Routing Study evaluated the natural environment, built environment, cultural resources, social resources, and engineering constructability for the MidAtlantic Resiliency Link Project (MARL Project) for NEET MA's and NEET VA's proposed new 107.5-mile, 500 kilovolt (kV) transmission line that will traverse portions of Pennsylvania, West Virginia, Maryland, and Virginia, as well as the new 500/138 kV Woodside Substation to be located in Frederick County, Virginia.[1]

The purpose of the Routing Study was to identify a preferred end-to-end route (Proposed Route) across all four states that meets the following criteria:

1. Reasonably minimizes potential impacts on the natural and built environment (including both the transmission line as well as the access roads and temporary workspaces to facilitate construction).
2. Maximizes placement of proposed infrastructure adjacent to existing linear infrastructure and routing opportunities, where available.
3. Minimizes special design requirements that could result in increased costs (e.g., engineering factors or special structure designs), and can be constructed and operated in a safe, timely, and reliable manner.

1.1 OVERVIEW

PJM Interconnection LLC (PJM) has directed NEET MA and NEET VA to develop, construct, own, operate, and maintain the MARL Project to resolve significant and widespread reliability criteria violations on the Bulk Electric System that serves the PJM Region,[2] due to load growth and anticipated resource retirements in the PJM Region. To meet this purpose and need, the MARL Project will have the following facilities:

- A new single-circuit 500 kV transmission line on lattice structures from the FirstEnergy Corp. (FirstEnergy)-owned 502 Junction Substation to the existing FirstEnergy-owned Black Oak 500/138 kV Substation to an interconnection with new 500 kV transmission lines to be constructed by FirstEnergy and Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion Energy).[3]

[1] NEET MA is responsible for constructing the portions of the MARL Project in Pennsylvania, West Virginia, and Maryland. NEET VA is responsible for constructing the portions of the MARL Project in Virginia, as well as a new 500/138 kV Woodside Substation in Frederick County, Virginia. The permitting of the substation is subject to the siting authority of Frederick County, and information in this Routing Study related to the Woodside Substation is provided for overall context of the full MARL Project.
[2] The PJM Region includes all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.
[3] The MARL Project does not include the FirstEnergy and Dominion Energy portions of the PJM-approved West Cluster solutions.

- A new Woodside 500/138 kV substation in Frederick County, Virginia, which will connect to existing Dominion Energy and FirstEnergy infrastructure.[4]

NEET MA's and NEET VA's facilities are collectively referred to as "the MARL Project." Figure 1.1-1 below depicts the MARL Project Study Area.

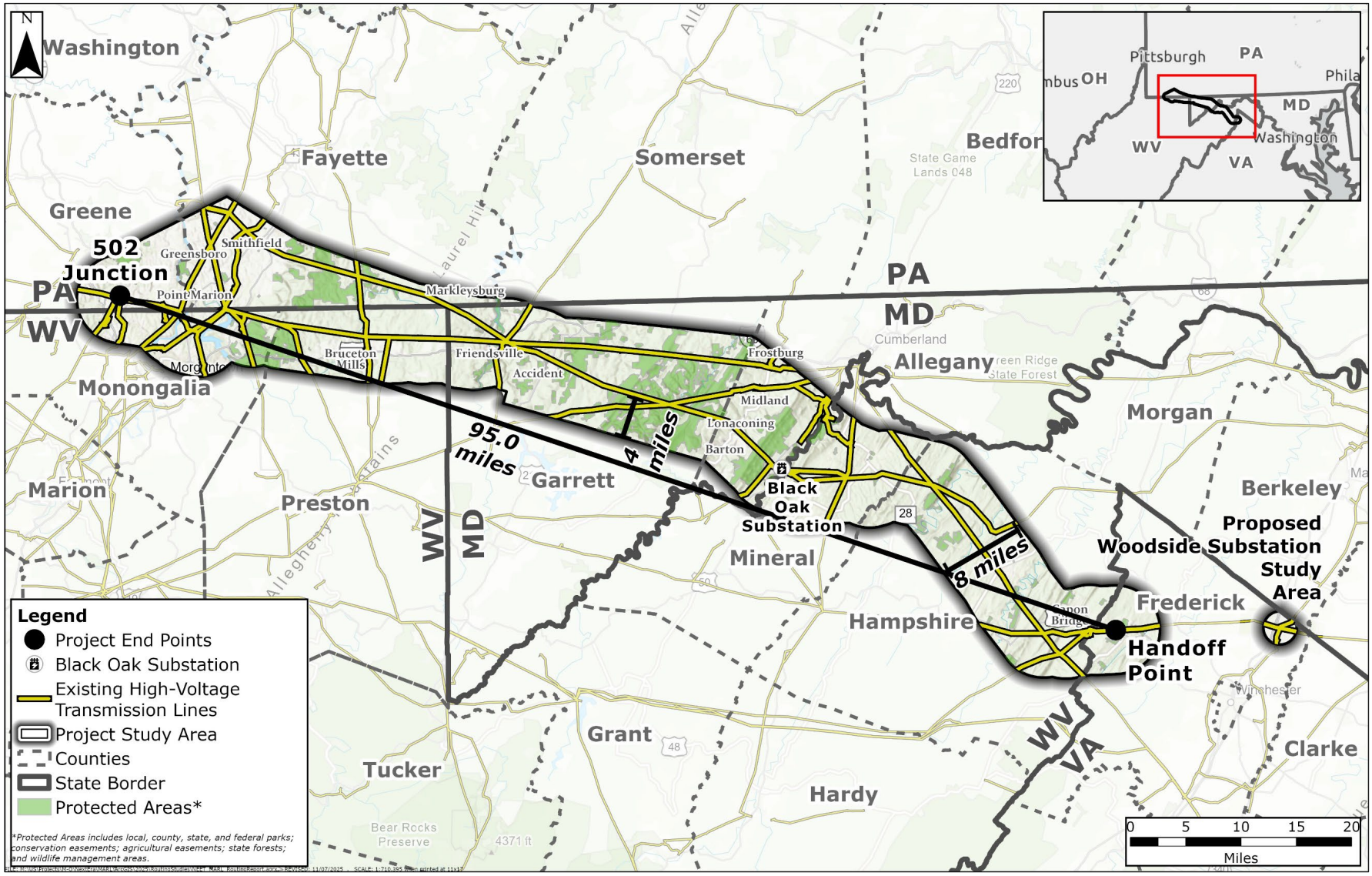
All mileposts (MPs) and distances associated with the MARL Project facilities listed above are rounded to the nearest 0.1 mile, and all land areas are rounded to the nearest 0.1 acre (unless otherwise specified). All references to MPs, distances, and acreages in this document are assumed to be approximate (e.g., a reference to "MP 1.2" or "124.3 acres" means "approximately at MP 1.2" or "approximately 124.3 acres," respectively).

Following PJM's direction to NEET MA and NEET VA to construct the MARL Project, NEET MA and NEET VA assembled a team of experienced internal subject-matter experts that have extensive experience in transmission development, including from its development, Transmission Planning, Engineering and Construction, Environmental Services, Land, Regulatory, Legal, Operations and Maintenance, and Tribal Relations groups, among other teams, and retained ERM as its expert outside routing and siting consultant (hereafter referred to as the "Routing Team") to develop and ultimately select the Proposed Route for the MARL Project. ERM was retained to perform the detailed routing and siting analysis (Routing Study) and prepare associated testimony for the respective state siting applications[5] for approval of the MARL Project as well as the environmental studies and permitting. NEET MA and NEET VA also retained ERM to lead the environmental scope of work associated with the transmission line routing analysis supporting the state siting applications and eventual federal, state, and local environmental permitting for the MARL Project. The ERM team is comprised of environmental scientists, planners, cultural resources specialists, and engineers. ERM was responsible for routing, permitting, and development of the Environmental Review Documents (Appendices A, B, C, and D) as well as supporting agency consultation.

[4] Specifically, the Woodside Substation will connect to Dominion Energy's existing 500 kV Bismark-Doubs transmission line, FirstEnergy's existing Stonewall 138 kV Substation via the Hampshire to Stonewall 138 kV line, and to FirstEnergy's upgraded Gore-Stonewall-Doubs 500 kV transmission line.

[5] NEET MA and NEET VA will be filing four state siting applications with the respective state public utility commissions. NEET MA is filing a Certificate of Public Convenience and Necessity application with the following state utility commissions: Maryland Public Service Commission and Public Service Commission of West Virginia. NEET MA is also filing a Certificate of Public Convenience and a Siting application with the Pennsylvania Public Utilities Commission. NEET VA is filing a Certificate of Public Convenience and Necessity application with the Virginia State Corporation Commission.

FIGURE 1.1-1 MARL PROJECT OVERVIEW AND STUDY AREA



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

In developing route alternatives for the MARL Project, the Routing Team considered the following:

- Facilities needed to construct and operate the MARL Project;
- Width of new right-of-way (ROW) that would be required;
- Amount of existing and proposed development in the area;
- Potential for impacts on the natural environment, built environment, cultural resources, and social resources;
- Engineering constructability; and
- MARL Project cost.

As discussed in Section 4, ERM identified six feasible Alternative Routes for the MARL Project.

1.2 PROJECT BACKGROUND

The MARL Project was approved by the PJM Board of Managers in December 2023 as part of PJM's annual Regional Transmission Expansion Plan process for 2022 and its resulting competitive solicitation process, which identified projects to address severe reliability issues in the region. As explained further in the respective state commission applications and supporting evidence, the MARL Project is needed to prevent extensive, severe, and widespread thermal overloads and potential voltage collapses, which could compromise the overall system reliability in the PJM Region and lead to widespread and extreme conditions, including system collapse and blackouts that could affect residents and businesses. These reliability needs are driven by exponential load growth in the region, the cumulative impact of generation changes including the deactivation and retirement of 11 gigawatts of generation resources, and changes in PJM's reliability criteria. Refer to the respective state commission applications and supporting testimony for a more detailed description of the MARL Project's background and need.

1.3 SCOPE OF REPORT

This Routing Study presents the steps and findings of how end-to-end route alternatives for the MARL Project were conceived across four states: Pennsylvania, West Virginia, Maryland, and Virginia. An overview map of the MARL Project Study Area is shown on Figure 1.1-1.

The following sections present ERM's overall approach to developing route alternatives that have an endpoint in Pennsylvania and another endpoint in Virginia. In developing the end-to-end route alternatives, ERM considered state-specific requirements and data, while also recognizing that the state-specific environmental data are different in each of the four states. Accordingly, ERM has developed state-specific Environmental Review Documents (Appendices A, B, C, and D) to present the different information that each state authority expects to see.

NEET MA and NEET VA requested ERM's services to define a study area for routing the MARL Project, collect information on routing constraints and opportunities within the study area, identify and compare route alternatives, select a Proposed Route, and document the routing efforts in this report. Mapbooks associated with the Routing Study are included in Appendix E, Mapbooks for Routing Study. More specifically, ERM's scope of work consisted of the following:

- Defining and describing the MARL Project Study Area;

- Gathering and assessing information about routing constraints and opportunities;
- Identifying and mapping routing constraints and opportunities within the MARL Project Study Area;
- Participating in public outreach efforts (e.g., public open houses and agency meetings) to gather input from stakeholders, agency staff, and the public;
- Identifying buildable route alternatives that meet the siting criteria of the four states;
- Comparing Alternative Routes based on an analysis of natural environment, built environment, cultural, and social impacts; and engineering constructability; and
- Recommending the Proposed Route and Alternative Routes to carry forward.

1.4 PROJECT DESCRIPTION

Table 1.4-1 shows the length, footprint acreage, number of structures, and structure characteristics for the six feasible Alternative Routes retained for evaluation analysis for the MARL Project. Refer to the respective state siting applications and supporting testimony for detailed discussions as they relate to engineering specifications for the MARL Project.

1.4.1 ROW WIDTHS AND STRUCTURE TYPES

The MARL Project will be constructed in a new ROW Corridor measuring, on average, 200 feet wide. The MARL Project will require a wider ROW Corridor in some areas where additional aerial easement rights are necessary to comply with electrical standards and requirements[6] (Figure 1.4-1). The full area of required MARL Project-specific ROW Corridor at any given point along the route is hereafter referred to as the "ROW Corridor." The number of aerial easement blowout areas for each Alternative Route are shown in Table 1.4-1, and the ROW Corridor for these areas ranges from 202 feet to 426 feet, averaging 289 feet wide (Figure 1.4-1).

[6] The aerial easement blowout area is a designated section within the ROW Corridor that requires additional transmission line easement area to accommodate engineering considerations (e.g., increased span lengths), which can result in greater line sway. These areas are necessary due to constraints, such as uneven terrain, steep slopes, or natural obstructions that make the standard ROW Corridor width impractical or unsafe.

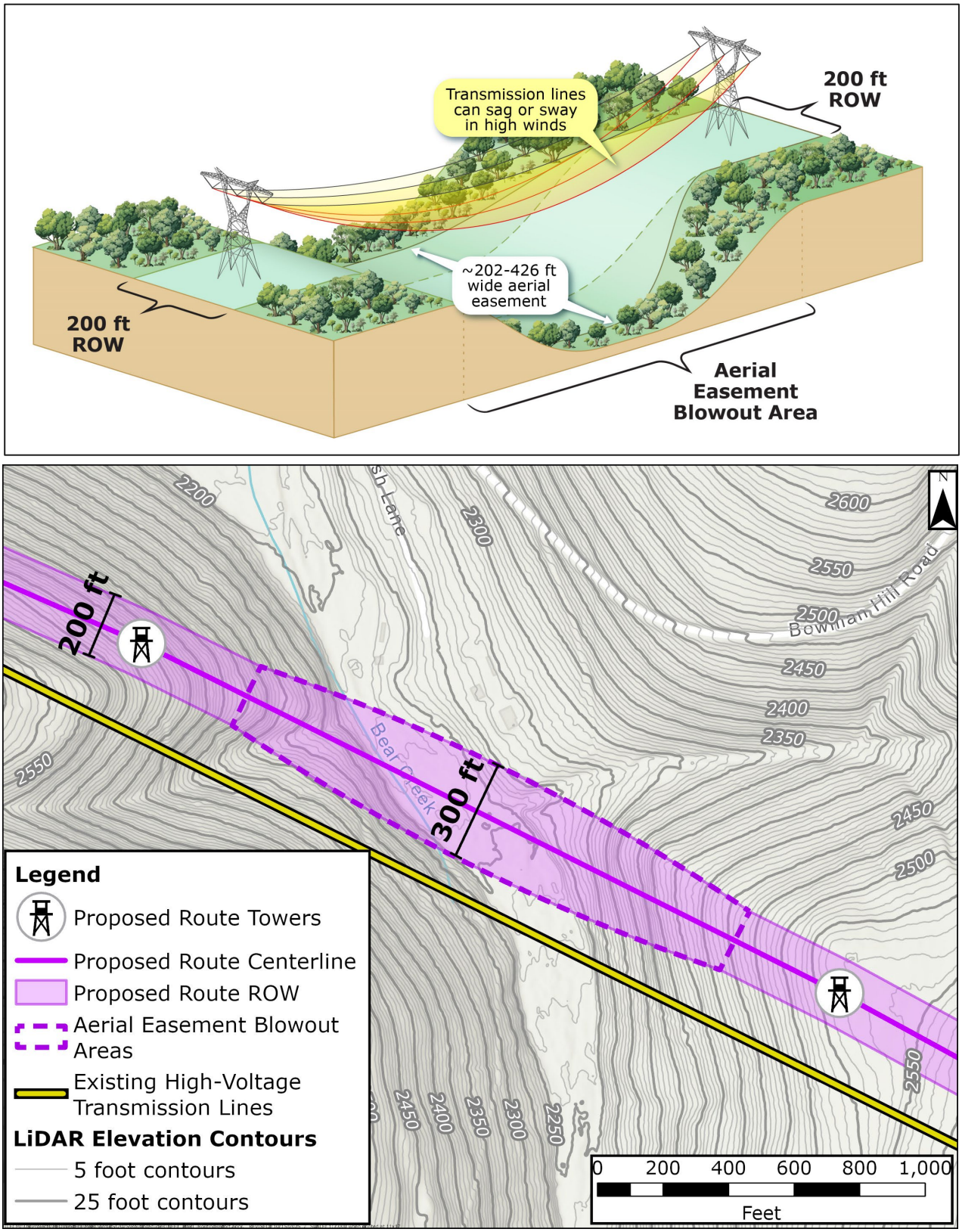
TABLE 1.4-1 PROJECT FEATURES FOR THE FINAL END-TO-END ALTERNATIVE ROUTES

Feature	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Centerline Length (miles)	107.5	107.3	113.6	115.2	106.3	119.1
Siting Corridor (acres)	6,208.6	6,197.5	6,598.5	6,798.1	6,180.6	7,112.0
ROW Corridor (acres)	2,669.0	2,671.4	2,835.5	2,839.0	2,651.5	2,964.3
Aerial Easement Blowout Area [a] (count)	24	31	28	24	28	32
Paralleling Existing Transmission Line ROW (miles)	56.4	59.7	64.5	43.1	50.8	43.2
Paralleling Existing Transmission Line ROW (percentage)	52.5%	55.6%	56.8%	37.4%	47.8%	36.3%
Structures (count)	452	452	478	492	446	519
Minimum Structure Height (feet)	85	85	85	85	85	85
Maximum Structure Height (feet)	190	190	190	190	190	190
Average Structure Height (feet)	145	145	145	145	145	140
Average Span Length (feet)	1,258	1,256	1,240	1,224	1,259	1,213
Maximum Span Length (feet)	2,927	2,927	2,955	2,739	2,927	2,955
Spans Greater than 1,600 feet (count)	33	42	31	34	39	38
Estimated Costs	$1,167,236,674	$1,175,521,094	$1,204,723,343	$1,241,099,297	$1,159,876,697	$1,256,130,573

ROW = right-of-way

[a] The aerial easement blowout area is a designated section within the ROW Corridor that requires additional transmission line easement area to accommodate engineering considerations (e.g., increased span lengths), which can result in greater line sway. These areas are necessary due to constraints, such as uneven terrain, steep slopes, or natural obstructions that make the standard ROW Corridor width impractical or unsafe.

FIGURE 1.4-1 GRAPHICAL DEPICTION OF ADDITIONAL AERIAL EASEMENT BLOWOUT AREAS



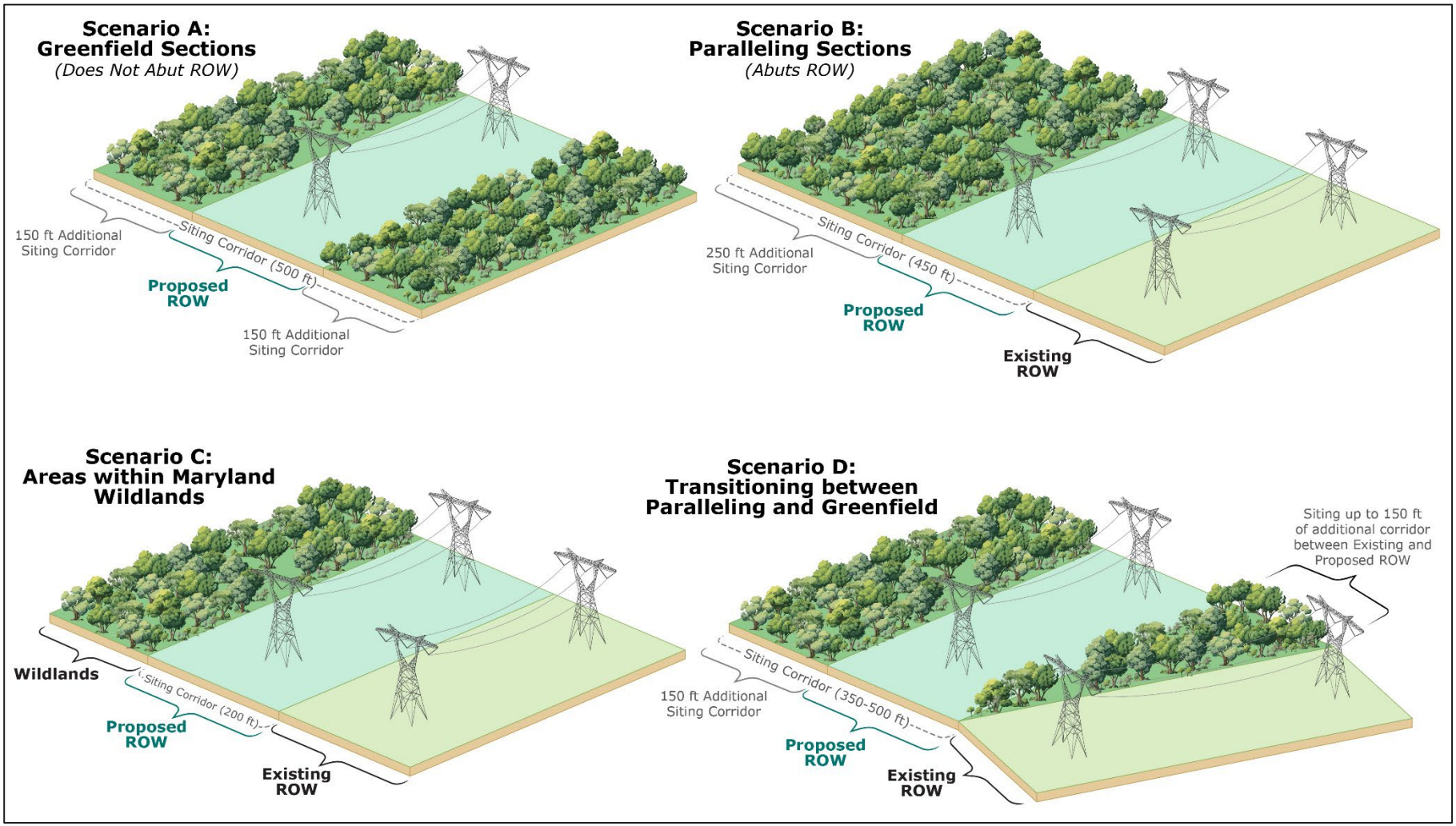
ft = feet; ROW = right-of-way

The MARL Project developed a predefined, Project-specific Siting Corridor, hereafter referred to as the "Siting Corridor," in which existing conditions were assessed to allow for reasonable flexibility to adjust the centerline on either side of the Alternative Routes, if necessary. The Siting Corridor was designed to abut and not overlap the ROW of any existing transmission lines when paralleling. The Siting Corridor width will range from 200 to 500 feet; however, in those areas that require aerial easement blowout, the maximum width for the Siting Corridor will be 715 feet. The Siting Corridor is inclusive of the MARL Project's ROW Corridor. The width of the Siting Corridor varies based on the MARL Project's ROW Corridor width and proximity to existing transmission lines. To account for the varying conditions along the ROW Corridor, such as paralleling existing transmission lines, greenfield sections, and legal requirements in the Maryland Wildlands, the Routing Team developed four scenarios that are shown on Figure 1.4-2 and described below:

A. **Scenario A:** For greenfield sections of the MARL Project that do not abut an existing transmission line corridor, the Siting Corridor is a 150-foot buffer on either side of the ROW Corridor. This typically results in a **500-foot-wide Siting Corridor** except in areas where additional aerial easement blowout rights are necessary.
B. **Scenario B:** For paralleling sections of the MARL Project that abut an existing transmission line corridor, the Siting Corridor is a 250-foot buffer of the ROW Corridor only on the opposite side of the existing transmission line corridor. This typically results in a **450-foot-wide Siting Corridor** except in areas where additional aerial easement blowout rights are necessary.
C. **Scenario C:** For areas of the MARL Project inside the Maryland Wildlands, the Siting Corridor does not extend beyond the ROW Corridor, and is therefore only a **200-foot-wide Siting Corridor.**
D. **Scenario D:** For areas where the MARL Project transitions from paralleling to greenfield sections, the Siting Corridor is a 150-foot buffer of the ROW Corridor on the opposite side of the existing transmission line corridor, and will also be a 150-foot buffer of the ROW Corridor on the side near the existing ROW that does not encroach on the existing transmission line corridor.

For the MARL Project, *paralleling* is defined as siting the proposed transmission line so the MARL Project ROW Corridor abuts the existing transmission line corridor. *Greenfield* is defined as a section of the MARL Project ROW Corridor for any portion of the route that does not abut an existing transmission line corridor.

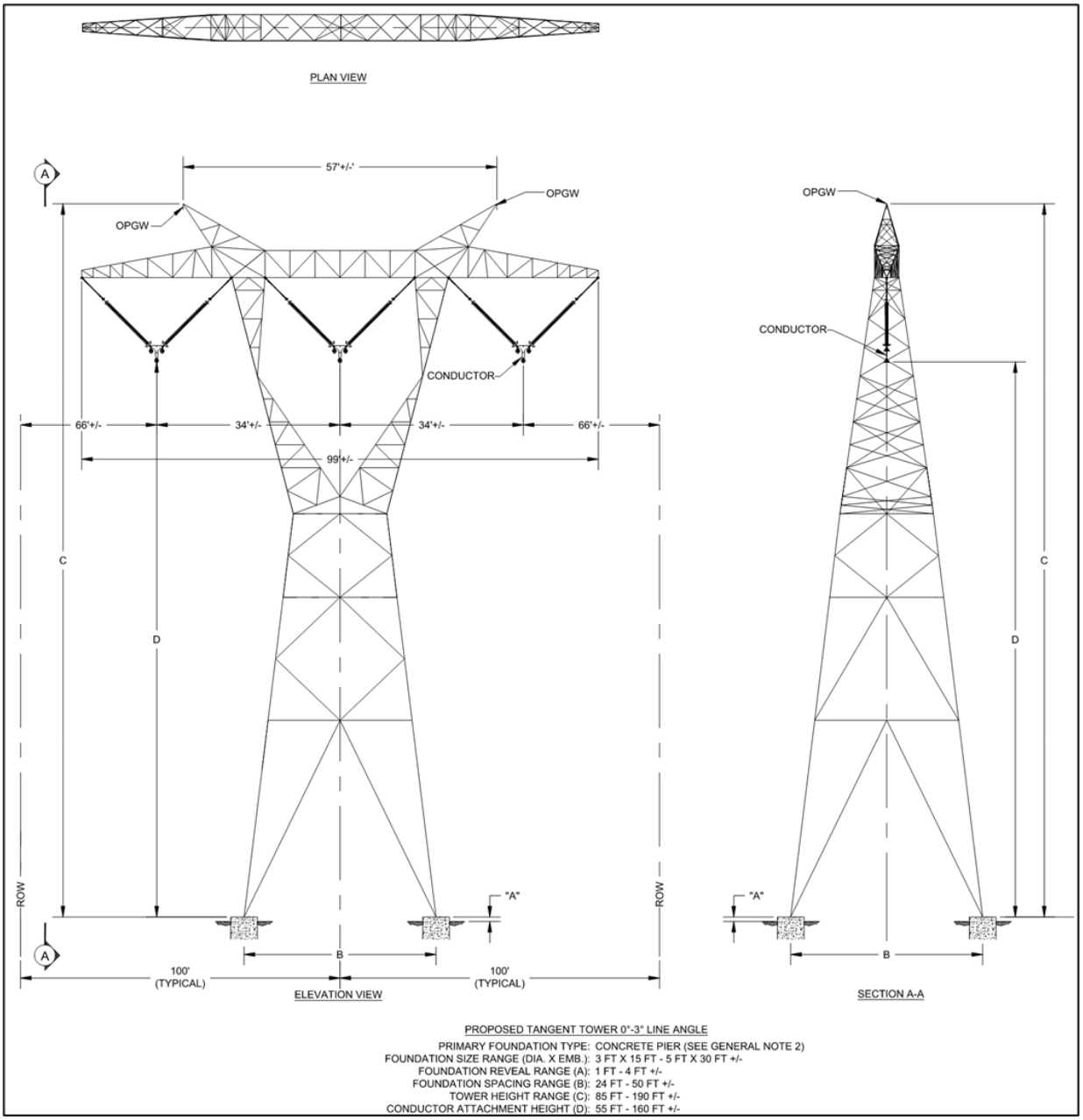
FIGURE 1.4-2 SITING CORRIDOR SCHEMATIC



ft = feet; ROW = right-of-way

NEET MA and NEET VA plan to use primarily lattice steel structures for the MARL Project. The proposed structures for the MARL Project will have four legs and be comprised of steel. Structure heights of all the Alternative Routes range from 85 to 190 feet, with an average structure height dependent on selected route and preliminary conceptual design, excluding foundation reveal. Final structure heights are subject to change based on final engineering. The average distance between towers (span) will be 1,258 feet for the MARL Project, with the span between transmission structures depending on the type of structure used, as well as topography, ground elevation, and nearby constraints. A typical lattice structure is shown on Figure 1.4-3.

FIGURE 1.4-3 TYPICAL LATTICE TRANSMISSION LINE STRUCTURE



FT = feet; OPGW = Optical Ground Wire; ROW = right-of-way

1.4.2 CONSTRUCTION, OPERATION, AND MAINTENANCE PROCESS

Construction of new overhead transmission lines will involve some or all of the steps listed below:

- Detailed survey of the route alignment;
- ROW acquisition and clearing;
- Construction of access roads and work pads, where necessary;
- Installation of tower foundations;
- Assembly and erection of new structures;
- Stringing and tensioning of conductors; and
- Final cleanup and land restoration.

More detailed discussion of the construction, operation, and maintenance process will be provided by the MARL Project's engineering expert (please see Testimony of Philip Givens). Required materials for the MARL Project's 500 kV structures will be delivered to each structure location within the ROW Corridor. Detailed foundation type and design will be determined based on the final engineering design, geophysical surveys, and geotechnical investigations prior to construction. Typical installation will be drilled piers with reinforced concrete; however, micropiles may be used in certain circumstances. Other foundation types will be considered on an as-needed basis. Structures will be erected with a crane or flown in via helicopter and anchored to the foundation during final assembly. In upland areas, the minimal amount of soils from each structure foundation construction will be used onsite to regrade the final ROW back to preconstruction conditions, to the maximum extent practicable. In wetland areas, excess soil will be removed from the excavation and hauled to an upland site within the ROW Corridor to be respread and stabilized. Typical construction equipment may include feller-bunchers, chippers, excavators or drilling equipment, earth moving equipment (e.g., bulldozer), cranes, wire stringing pullers and tensioners, skidsteers, backhoes, and trucks. To comply with state stormwater requirements, NEET MA and NEET VA will obtain coverage under the appropriate state stormwater permit for construction activities prior to any ground disturbance. A MARL Project-specific Erosion and Sediment Control Plan and Stormwater Pollution Prevention Plan will be developed in coordination with state and local agencies to meet applicable requirements, using best management practices.

Once the MARL Project is in-service, maintenance of the ROW Corridor under the transmission lines will be essential for the reliable operation of the lines as well as for public safety. Operation and maintenance of the MARL Project will include periodic inspections of the line and ROW Corridor and periodic vegetation management. Periodic inspections will occur through both aerial and ground patrols. Please refer to Appendix F for NEET MA's and NEET VA's Vegetation Management Plan.

2. METHODOLOGY

The process of routing a new electric transmission line begins with the definition of a study area encompassing and surrounding the beginning and endpoints for the new line. This is followed by evaluating routing opportunities and constraints within the study area, such as paralleling opportunities (e.g., roads or existing utility lines), land uses, planned developments, and environmental, visual, recreational, and cultural features. The study area is adjusted as needed based on constraints and opportunities. Feasible route alternatives, which avoid constraints and use opportunities to the extent practicable, are developed. Communication with stakeholders and analysis of impacts result in adjustments to routes throughout the process.

The fundamental objectives of the routing process are the same regardless of project or location: maximize paralleling opportunities with compatible linear features or land uses; avoid, and where avoidance cannot be achieved, minimize impacts, and then mitigate impacts where appropriate to the natural environment, built environment, cultural resources and social resources; incorporate engineering constructability to minimize to the extent practicable special engineering design requirements; and provide feasible, efficient, and equitable route alternatives that meet the purpose and need of a project.

2.1 GOAL OF THE ROUTING STUDY

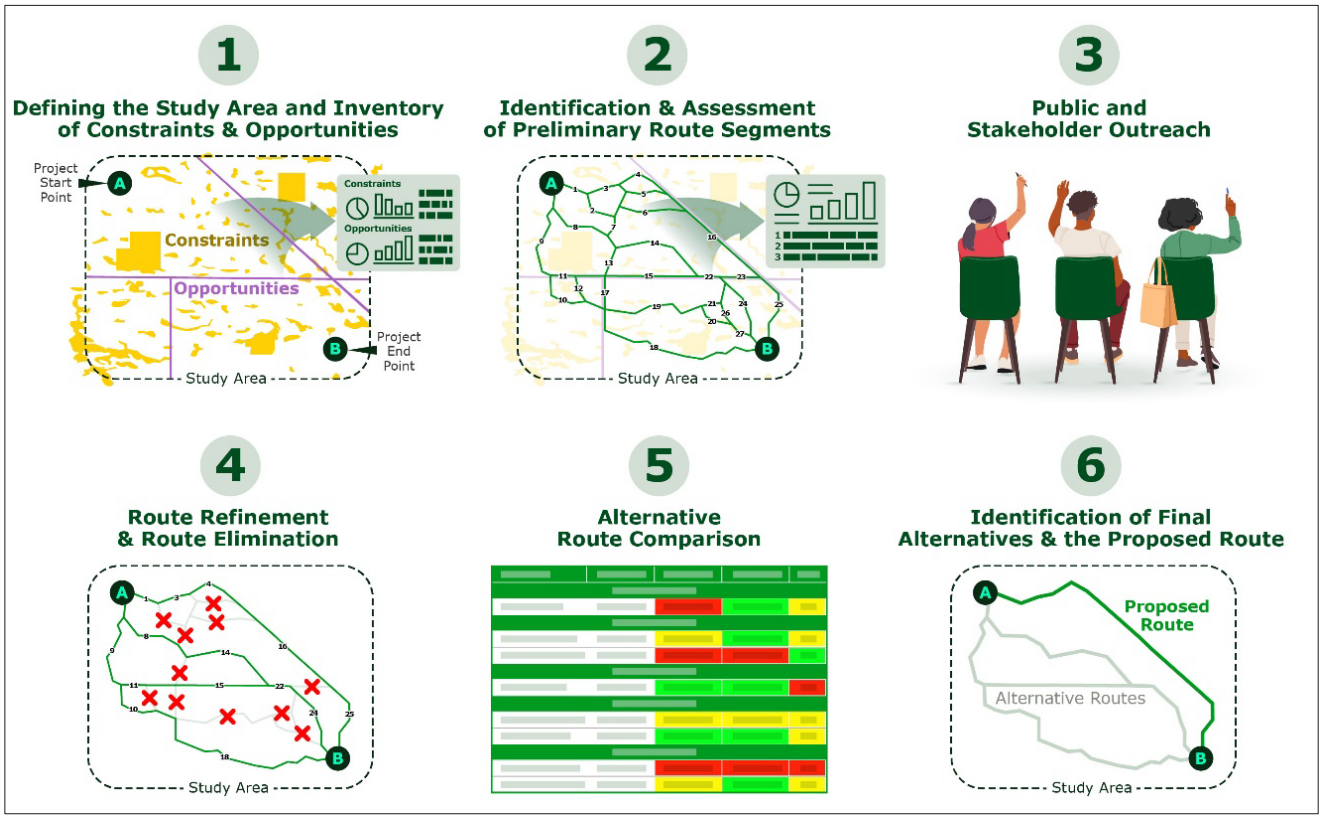
The goal of the routing process was to identify Alternative Routes that meet the technical and economic needs of the MARL Project while avoiding potential constraints (e.g., sensitive environmental resources, residential dwellings) and taking advantage of opportunity areas (e.g., existing linear infrastructure) to the greatest extent possible. Furthermore, the goal was to identify and evaluate opportunities and environmental constraints in the MARL Project Study Area to 1) facilitate the development of feasible Alternative Routes; 2) evaluate potential impacts associated with the Alternative Routes; and 3) ultimately, identify a Proposed Route that meets the MARL Project need that is constructable. The Proposed Route is the superior route that best 1) reasonably minimizes adverse impacts on area land uses and the natural environment and built environment; 2) minimizes special engineering design requirements that could result in increased costs; and 3) can be constructed and operated in a safe, timely, and reliable manner.

The Routing Study involved five main steps that included:

1. Definition of the MARL Project Study Area;
2. Identification of constraints and opportunities;
3. Identification and assessment of preliminary routes;
4. Execution of field reconnaissance and stakeholder engagement including open houses; and
5. Implementation of quantitative and qualitative analysis to identify feasible route alternatives, including the Proposed Route.

Furthermore, route viability was assessed through permitting risk, constructability, ROW acquisition, and cost after the least impactful alternatives were identified. As outlined below, the routing process establishes how the Routing Team identifies routes, screens route alternatives, and selects a Proposed Route (Figure 2.1-1).

FIGURE 2.1-1 TYPICAL ROUTING PROCESS

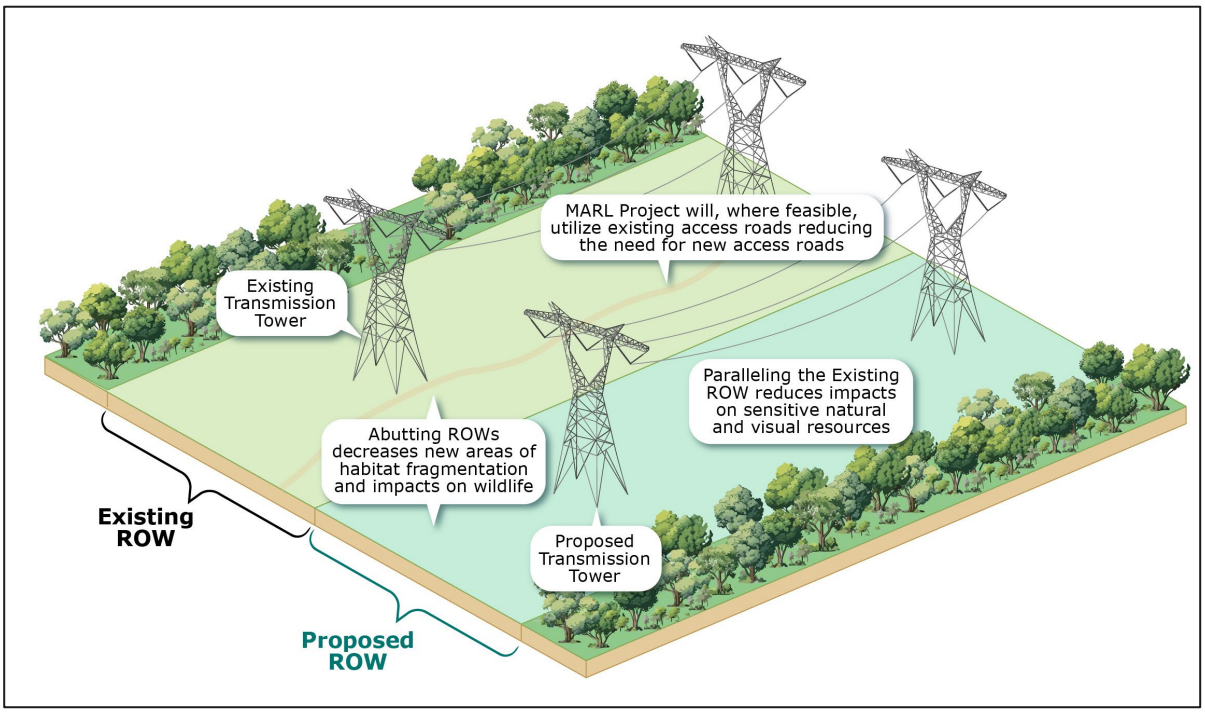


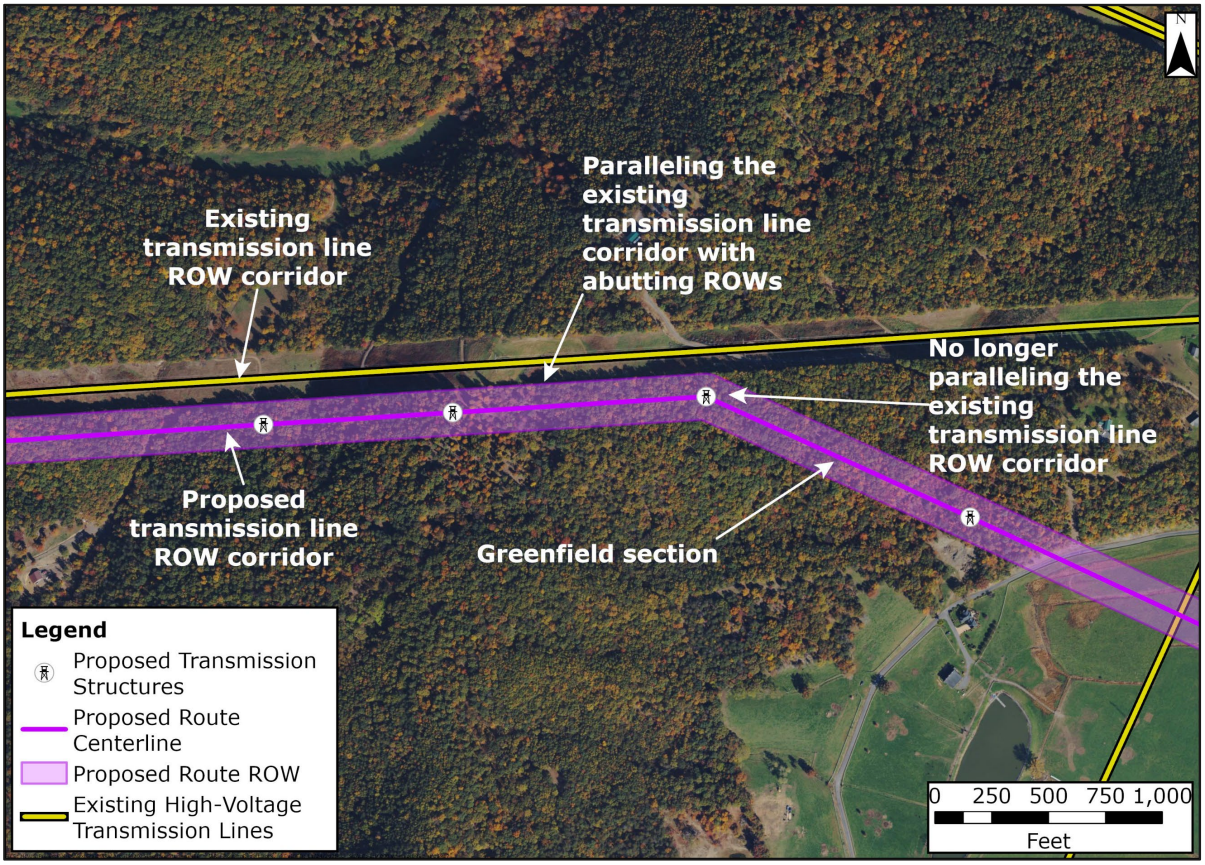
Both desktop and field reviews were performed by the Routing Team to identify key opportunities and constraints and to gain a comprehensive understanding of the landscape. The primary objective of the Routing Study was to identify at least three feasible transmission line route options for evaluation that minimized impacts on communities and the environment.

As part of the above, the Routing Team aimed to parallel existing transmission lines to the extent practicable to minimize visual, environmental, and access effects. Figure 2.1-2 provides an illustration of MARL Project paralleling. Benefits to paralleling existing transmission lines include:

- Limiting impacts on the local community;
- Providing easier construction access;
- Reducing the need for new access roads;
- Reducing impacts on sensitive natural and visual resources; and
- Decreasing new areas of habitat fragmentation and impacts on wildlife.

FIGURE 2.1-2 ILLUSTRATION OF MARL PROJECT PARALLELING





MARL Project = MidAtlantic Resiliency Link Project; ROW = right-of-way

2.2 DEFINING THE MARL PROJECT STUDY AREA

The first step in the routing process involved defining a geographic study area in alignment with PJM's identified electric reliability requirements, which included two fixed endpoints. The MARL Project Study Area was delineated to encompass the western terminus at the 502 Junction Substation in Greene County, Pennsylvania, and the eastern terminus at the PJM-designated handoff point in Frederick County, Virginia. In addition to these endpoints, the Study Area included a sufficiently broad area designed to capture geographically diverse opportunities for paralleling existing linear infrastructure—such as transmission lines, pipelines, and transportation corridors—thereby supporting the identification and evaluation of a reasonable range of routing alternatives. Additionally, and to the extent practicable, the limits of the Study Area were defined by reference to easily distinguished landmarks, such as roads or other features. This approach helped the Routing Team to clearly communicate the Study Area boundaries to stakeholders, including potentially affected landowners, county officials, and permitting agency staff. Section 3.1 describes the characteristics of the Study Area in detail.

2.3 INVENTORY OF CONSTRAINTS AND OPPORTUNITIES

The second step in the routing process involved identifying and mapping constraints that consisted of natural environment, built environment, cultural resources, and social resources; engineering considerations; and existing opportunities within the MARL Project Study Area. A geospatial database development played a critical role in the routing and siting of the MARL Project by integrating spatial data with analytical tools to support informed decision-making. This process involved collecting, organizing, and managing a wide range of geospatial data layers such as topography, slope, land use, environmental constraints, infrastructure, and socioeconomic factors. Using Geographic Information Systems (GIS), the Routing Team analyzed these datasets to identify optimal paths that minimize environmental impact, confirm constructability, and avoid populated or sensitive areas. Based on extensive data collection, this step resulted in an inventory of routing constraints and opportunities in the MARL Project Study Area, including, but not limited to:

- Existing electric transmission and other utility ROWs;
- Federal, state, county, and private road ROWs;
- Residences and residential areas and structures identified through high-resolution aerial imagery and LiDAR acquisition flown for and collected by NEET MA and NEET VA for MARL Project-specific data[7];
- Parcels;
- Planned developments;
- Public lands;
- Protected lands (e.g., federal, state, and local lands, parks, trails);

[7] NEET MA and NEET VA contracted SAM to capture high-resolution aerial imagery and LiDAR data for the MARL Project Study Area. Data acquisition was conducted during leaf-off conditions between December 2023 and February 2024, providing 3-inch-resolution imagery and LiDAR data used as part of the routing and siting process.

- Conservation easements (e.g., National Conservation Easement Database, state-specific databases);
- Parks and trails;
- Wetlands and waterbodies as well as floodplains;
- Forested land;
- Hospitals, schools, cemeteries, and convalescent centers;
- Natural heritage resources (e.g., conservation sites and habitat for rare, threatened, and endangered species);
- Visually sensitive resources—locations where views are protected by regulation or where higher quality views are an expected condition, regardless of regulatory status; and
- Archaeological and historic sites and other nationally or locally significant cultural resources.

2.4 IDENTIFICATION AND ASSESSMENT OF PRELIMINARY DRAFT ROUTES

The third step in the routing process was identifying broad conceptual route corridors—swaths of the MARL Project Study Area feasible for routing new transmission infrastructure—and excluding areas where transmission line routing would be impracticable due to land use or other constraints.

Following the route development criteria and guidelines listed in Section 2.7, ERM developed a network of preliminary route segments using GIS software and the constraint and opportunity database. To the extent practicable, preliminary route segments were identified that avoid natural environment and built environment constraints, cultural and social resources, as well as factor in engineering constructability, and parallel routing opportunities. Throughout this step, the Routing Team continued to collect and assess data on constraints obtained through desktop sources, field reconnaissance, and stakeholder/public engagement activities. The Routing Team used this information to validate and develop a better understanding of resources that could be affected and then identified routes to avoid or reduce potential impacts where feasible.

After the preliminary route segments were identified, the Routing Team assessed the viability of preliminary draft route options by evaluating environmental impacts, compatibility with existing and future land uses, permitting risk, community input, ability to acquire new ROW, constructability, and cost. Section 4 describes the route alternatives developed for the MARL Project as well as routes considered but dismissed from the MARL Project.

2.5 FIELD RECONNAISSANCE AND STAKEHOLDER ENGAGEMENT

The fourth step of the routing process consisted of conducting field reconnaissance and stakeholder/public engagement activities. These included establishing a MARL Project website, hosting open houses, distributing targeted mailings, and holding both virtual and in-person meetings. Section 4.3 discusses the specific platforms and surveys used to collect stakeholder and public feedback, and how that feedback was incorporated into the route selection process. These efforts were undertaken to gather local knowledge, identify sensitive resources, and inform routing and route selection. Collecting public feedback enabled the Routing Team to refine the preliminary draft route options identified during the third step, supporting further analysis and ultimately the selection of the Proposed Route. Section 3.3 describes the public engagement

activities conducted for the MARL Project and explains how feedback gathered through this process was incorporated into the development of Alternative Routes.

2.6 ROUTE ALTERNATIVE ANALYSIS AND ROUTE RECOMMENDATION

The fifth step of the routing process used data collected during field reconnaissance and stakeholder outreach activities to refine the preliminary draft route options, develop end-to-end route alternatives, and conduct both quantitative and qualitative analyses of those alternatives. In evaluating the final route alternatives, the Routing Team considered multiple factors, including public input received during engagement activities, constructability, feasibility, environmental and land use constraints, and compliance with applicable state siting requirements. Based on this comprehensive analysis, the team identified a set of Alternative Routes and ultimately selected a Proposed Route by comparing the relative advantages and disadvantages of each route. Routes determined to be too impactful, infeasible, or impracticable were not carried forward for further consideration as a potential Alternative Route.

2.7 ROUTE DEVELOPMENT CRITERIA AND GUIDELINES

The following criteria, guidelines, and considerations were developed by the Routing Team based on best practices and extensive experience in transmission line routing and siting projects. While there are no published studies or formal industry standards, the criteria reflect methodologies that have been applied to other greenfield projects and, in some cases, accepted by state commissions. These were considered and applied to the MARL Project, incorporating natural environment and built environment resources as well as land and engineering considerations provided by NEET MA and NEET VA that include, but are not limited to, the following:

- Maximize the separation distance from or minimize impacts on residential dwellings.
- Maximize the separation distance from or minimize impacts on commercial buildings.
- Maximize the separation distance from or minimize impacts on schools, churches, cemeteries, and other socially sensitive facilities.
- Minimize the removal of existing barns, garages, and other nonresidential structures.
- Minimize, to the extent possible, placement of structures within the middle of active agricultural and residential areas.
- Minimize impacts on agricultural use, including the operation of irrigation infrastructure, where possible.
- Maximize placement of the route to be immediately adjacent to existing transmission lines.
- Reduce circuitous routes and special design requirements, where possible.
- Minimize the number of affected parcels and/or landowners and follow parcel boundaries, to the extent possible, to prevent bifurcation of parcels, which could contribute to increased easement acquisition costs or creation of unbuildable lots.
- Minimize the crossing of large lakes, major rivers, and large wetland complexes.
- Minimize impacts on designated critical habitat, protected species, and other identified sensitive natural resources.

- Minimize new habitat fragmentation and impacts on designated areas of biodiversity concern.
- Minimize conflict with designated public resource lands such as local parks and other recreation lands, nature preserves, or other conservation areas.
- Minimize visibility from populated areas, scenic roadways, and designated scenic resources.
- Minimize interference with economic activities, including agricultural practices.
- Consider the proximity of floodplain boundaries, meandering rivers, creeks, and ravines due to banks subject to soil erosion and flooding, which can compromise the integrity of the design, and reduce the number crossings of meandering rivers, creeks, and/or ravines.
- Span over rivers, streams, and other water features to limit impacting the ordinary high-water mark and downstream hydrology.
- Place towers on high ground to minimize structure heights and avoid low areas (e.g., valleys, ravines) that extend tower heights and might result in more tree clearing, stream temperature changes, and construction access concerns.
- Consider accessibility of tower placement and line constructability (e.g., drainage ditches or dikes, use of existing roads or trails) to reduce construction access concerns.
- Consider the tower and line placement to minimize and/or avoid free-standing water areas to reduce costly foundations and constructability concerns.
- Consider the tower placement away from the brink of steep slopes to accommodate tower footprint and safe construction practices.
- Consider the space around towers for temporary construction activities.
- Consider the tower placement to provide for efficient span lengths of towers.
- Consider and avoid steep terrain with side slopes of 15 percent grade or more, if possible.
- Reduce and/or avoid clipping the corners of private properties, where possible.
- Minimize the number of existing high-voltage transmission line crossings.

Segments and route alternatives were quantitatively and qualitatively evaluated using the set of criteria developed by the Routing Team (Table 2.7-1) to align with MARL Project routing guidelines, minimize or avoid environmental and social constraints, and identify opportunities to parallel existing linear infrastructure, particularly existing transmission lines. Appendix G, Data Sources, provides a list of sources used for the Routing Study.

Route alternatives were developed through a comparative evaluation process that considered:

- Existing opportunities for paralleling;
- The presence and extent of constraints along potential routes; and
- When route alternatives were otherwise comparable in terms of constructability, length, and other technical factors, the Routing Team considered the types of constraints present along each route and their relative significance.

As part of the MARL Project, the Routing Team adhered to three principles when developing route alternatives:

- Parallel existing transmission lines where feasible.
- Avoid residential dwellings within the ROW Corridor where feasible.
- Minimize crossing conservation easements.

To support a comprehensive and balanced evaluation of routing alternatives for the MARL Project, the Routing Team applied both quantitative and qualitative assessments across a range of criteria, including natural environment, built environment, cultural resources, social resources, and engineering factors.

Although a wide array of criteria was considered in the evaluation of potential transmission line routes (as summarized in Table 2.7-1), the Routing Team elected not to assign explicit numerical weights or scores to individual routing criteria. Instead, the Routing Team opted for a hybrid quantitative-qualitative approach on route selection based on a comprehensive and balanced assessment rather than rigid numerical weighting. This approach was adopted for the following reasons:

- The relative importance of evaluation criteria (e.g., proximity to residential dwellings, presence of wetlands, constructability constraints) can vary significantly depending on geographic context. A rigid weighting system may overemphasize a single factor that is less relevant in one area but highly relevant in another. By avoiding fixed weights, the evaluation remains adaptable to site-specific conditions and local sensitive receptors.
- Flexible consideration of multiple criteria allows the routing process to be more responsive to stakeholder input, including feedback from landowners, communities, and regulatory agencies.
- This approach helps prevent unintentional bias or over-prioritization of one impact type over another. Numerical weighted scoring systems can create a false impression of mathematical precision and obscure how qualitative considerations influence route selection. A quantitative-qualitative hybrid approach promotes clearer communication with stakeholders and regulatory agencies, showing that decisions were based on a transparent understanding of constraints and opportunities rather than numeric weighting.

This methodology reflects best practices in infrastructure planning and supports that the selected route minimizes adverse impacts while meeting technical and regulatory requirements and addressing stakeholder preferences.

TABLE 2.7-1 QUANTITATIVE CONSTRAINTS AND OPPORTUNITIES EVALUATION CRITERIA

Constraints and Opportunities Evaluation Criteria	Measure
Route Length and Construction Footprint	
Centerline Length	Miles
ROW Corridor	Acres
Land Use and Social Resources	
Paralleling Existing Infrastructure [a]	
Paralleling Existing Transmission Lines	Miles; Percentage
Greenfield section (within 500 feet of Existing Transmission Lines)	Miles; Percentage
Greenfield section (within 500–1,000 feet of Existing Transmission Lines)	Miles; Percentage
Greenfield section (>1,000 feet of Existing Transmission Lines)	Miles; Percentage
Total Greenfield	Miles; Percentage
Paralleling railroad ROW	Miles; Percentage
Paralleling natural gas pipelines ROW	Miles; Percentage
Paralleling Highways	Miles; Percentage
Community and Recreational Resources [b, c, d, e, f, g, h, i]	
Parcels/ unique landowners	Count
Residential dwellings within ROW Corridor/ 250 feet / 500 feet of centerline	Count
Residential outbuildings within ROW Corridor / 250 feet / 500 feet of centerline	Count
Non-residential buildings within ROW Corridor / 250 feet / 500 feet of centerline	Count
Places of worship within 500 feet of the centerline	Count
Childcare Facilities within 500 feet of the centerline	Count
Public / private schools within 500 feet of centerline	Count
Trails crossings—Potomac Heritage National Scenic Trail and Hiking Trails	Count
State Scenic Byways	Count
Protected Lands [j, k, l, m, n, o, p]	
State Forest	Count; Miles; Acres
State Park	Count; Miles; Acres
Fisheries / Wildlife Management Area	Count; Miles; Acres
Pennsylvania State Wilderness Area	Count; Miles; Acres
Pennsylvania State Game Lands	Count; Miles; Acres
Maryland Wildlands	Count; Miles; Acres
Conservation Easements	Count; Miles; Acres
USACE Recreation Areas	Count; Miles; Acres
Total Protected Lands	Count; Miles; Acres
Cultural Resources [q, r, s, t]	
Cemeteries within ROW Corridor; 500 feet of centerline	Count
Archaeological Resources within ROW Corridor	Count
Architecture Resources—NRHP eligible, NRHP listed or NHL listed within ROW Corridor; 0.5-mile buffer from centerline	Count
Historic Districts Crossed	Count
Battlefields	Count; Acres

Constraints and Opportunities Evaluation Criteria	Measure
MD—Heritage Areas	Count; Acres
Agricultural Land [u]	
Not Prime Farmland Class	Acres
State Importance Farmland Class	Acres
Local Importance Farmland Class	Acres
Prime Farmland Class	Acres
Land Cover [v]	
Barren Land (Rock/Sand/Clay)	Acres
Cultivated Crops	Acres
Deciduous Forest	Acres
Developed, High Intensity	Acres
Developed, Low Intensity	Acres
Developed, Medium Intensity	Acres
Developed, Open Space	Acres
Emergent Herbaceous Wetlands	Acres
Evergreen Forest	Acres
Grassland/Herbaceous	Acres
Mixed Forest	Acres
Open Water	Acres
Pasture/Hay	Acres
Shrub/Scrub	Acres
Woody Wetlands	Acres
Forest Lands Total (Deciduous Forest, Evergreen Forest, and Mixed Forest)	Acres
Agricultural Lands Total (Pasture/Hay and Cultivated Crops)	Acres
Developed Lands Total (High, Low, Medium, Open Space)	Acres
Natural Environment	
Water Resources [w, x, y, z, aa, bb, cc, dd]	
NHD Stream/River Perennial [c]	Count; Feet
NHD Stream/River—Intermittent [c]	Count; Feet
NHD Waterbody	Count, Acres
Section 10 Navigable Waters	Count
Trout Streams and Coldwater Fisheries (all states)	Count; Feet
PA Trout Streams	Count; Feet
WV Trout Streams	Count; Feet
VA Trout Streams	Count; Feet
PA—Designated Use Streams (CWF, EV, HQ, TSF)	Count; Feet
MD—Designated Use Streams (Use III and III-P: Nontidal Cold Water and Public Water Supply)	Count; Feet
MD—Designated Use Streams (Use IV and IV-P: Recreational Trout Waters and Public Water Supply)	Count; Feet
VA—Threatened & Endangered Species Waters	Count; Feet
WV—Mussel Streams	Count; Feet

Constraints and Opportunities Evaluation Criteria	Measure
MD—Designated Use Streams (Use I and I-P Water Contact Recreation, Protection of Aquatic Live, and Public Water Supply)	Count; Feet
Modeled Wetlands [jj]	Acres
NWI—All Types	Acres
NWI—Freshwater Emergent	Acres
NWI—Freshwater Shrub Scrub	Acres
NWI—Freshwater Pond	Acres
NWI—Lake	Acres
NWI—Riverine	Acres
WV—DEP Wetlands	Acres
MD—DNR Wetlands of Special Concern	Acres
MD—DNR Wetlands	Acres
FEMA Flood Zone A/AE/AO—Areas with a 1% annual chance of flooding (100-year flood area)	Acres; Structure Count
FEMA Flood Zone X—Areas with 0.2% annual chance of flooding (500-year flood area)	Acres; Structure Count
FEMA Flood Zones Combined	Acres
Conservation and Habitat [y, i, ee, ff, gg, hh]	
USFWS Critical Habitat Final	Acres
USFWS Critical Habitat Proposed	Acres
State-listed Species Occurrence (from state NHI Element Occurrence Data)	Acres
Potentially Suitable State-listed Species, MBTA, and Foraging Bat Habitat	Acres
Potentially Suitable Monarch Butterfly	Acres
Bat Known Occupied Summer Habitat (all states)	Acres
Bat Hibernacula (all states)	Acres
Potentially Suitable Bat Roosting Habitat	Acres
MD—Irreplaceable Natural Areas	Count
MD—Irreplaceable Natural Areas	Acres
MD—Forest Interior Dwelling Species Confirmed	Acres
MD—Forest Interior Dwelling Species Probable	Acres
MD—Natural Heritage Areas	Acres
MD—Forests of Recognized Importance	Count
MD—Forests of Recognized Importance	Acres
MD—Federal or State-Listed Species	Acres
MD—Species of Concern	Acres
MD—BioNet Tier 1 (critically significant)	Acres
MD—BioNet Tier 2 (Extremely Significant)	Acres
MD—BioNet Tier 3 (Highly Significant)	Acres
MD—BioNet Tier 4 (Moderately Significant)	Acres
MD—BioNet Tier 5 (Significant)	Acres
PA—Natural Heritage Areas	Acres
VA—Ecological Core C1 (Outstanding)	Acres
VA—Ecological Core C2 (Very High)	Acres
VA—Ecological Core C3 (High)	Acres

Constraints and Opportunities Evaluation Criteria	Measure
VA—Ecological Core C4 (Moderate)	Acres
VA—Ecological Core C5 (General)	Acres
Engineering and Infrastructure Considerations [a, ee]	
Existing Transmission Line Crossings	
Electric Transmission Line Unknown kV Crossing	Count
Electric Transmission Line 69 kV Crossing	Count
Electric Transmission Line 115 kV Crossing	Count
Electric Transmission Line 132 kV Crossing	Count
Electric Transmission Line 138 kV Crossing	Count
Electric Transmission Line 500 kV Crossing	Count
Structures and Design	
Number of Structures	Count
Structures with Turn Angles 0-20 degrees	Count
Structures with Turn Angles 20-30 degrees	Count
Structures with Turn Angles greater than 30 degrees	Count
Span Length Greater than 1,600 feet	Count
Topography	
Very steep slope (31–90 degrees)	Miles
Steep slope (21–30 degrees)	Miles
Moderate slope (16–20 degrees)	Miles
Strongly sloping (6–15 degrees)	Miles
Flat to gentle slope (0–5 degrees)	Miles
Infrastructure Crossings	
Primary Road Crossing	Count
Secondary Road Crossing	Count
Tertiary Road Crossing	Count
Railroad Crossing	Count
Oil and Gas Wells: within the proposed ROW; 500 feet of centerline	Count
Natural Gas Pipeline Crossing (transmission / distribution / gathering)	Count
Wind turbines (within 500 feet and 0.5 mile of the centerline)	Count
Public Airports within 20,000 feet of the centerline	Count
Geologic Karst features within the ROW Corridor	Miles; Acres

Sources: [a] Rextag Infrastructure Data, [b] ReportAll [c] HIFLD, [d] MDOT, [e] WVDOT, [f] MDiMap, [g] WVGISTC, [h] PASDA, [i] ERM, [j] PAD-US, [k] NCED, [l] MDNR, [m] MDiMAP, [n] PASDA, [o] WVDEP, [p] VADCR, [q] PASHPO, [r] WVSHPO, [s] MHT, [t] VADHR, [u] USA SSURGO, [v] USGS NLCD 2024, [W] USGS NHD, [x] FEMA's National Flood Hazard Layer (NFHL), [y] USFWS, [z] MDE, [aa] PFBC, [bb] PADEP, [cc] WVDNR, [dd] VADWR, [ee] USGS, [ff] VADWR, [gg] PNHP, [hh] PADCNR, [jj] Appendix H, Wetland Identification Model Report

BioNet = Biodiversity Conservation Network; CWF = Coldwater Fishes; DEP = Department of Environmental Protection; DNR = Department of Natural Resources; EV = Exceptional Value; FEMA = Federal Emergency Management Agency; HQ = High Quality; kV = kilovolt; MBTA = Migratory Bird Treaty Act; MD = Maryland; NHD = National Hydrography Dataset; NHI = Natural Heritage Inventory; NHL = National Historic Landmark; NLCD = National Land Cover Database; NRHP = National Register of Historic Places; NWI = National Wetlands Inventory; PA = Pennsylvania; ROW = right-of-way; SSURGO = Soil Survey Geographic Database; TSF = Trout Stocking; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service; VA = Virginia; WV = West Virginia; WMA = Wildlife Management Area

3. MARL PROJECT STUDY AREA

3.1 MARL PROJECT STUDY AREA DESCRIPTION

The Routing Team developed a study area broad enough to incorporate a diversity of routing options with a focus on using existing high-voltage transmission lines between the MARL Project's endpoints and other existing linear infrastructure. The MARL Project Study Area encompasses 1,053 square miles, is 95 miles west to east (straight-line distance) (Figure 1.1-1), and varies from 8 to 16 miles wide across the following states and counties:

- Pennsylvania: Greene and Fayette Counties;
- West Virginia: Monongalia, Preston, Mineral, and Hampshire Counties;
- Maryland: Garrett and Allegany Counties; and
- Virginia: Frederick County.

As depicted on Figure 1.1-1 and in Appendix E-1, Major Constraints and Opportunities, the Study Area generally follows existing transmission lines between the two Project endpoints and is bound by the following features:

- Morgantown in Monongalia County, West Virginia, to the southwest.
- Masontown and Fairchance in Greene County, Pennsylvania, to the northwest.
- Approximate 4-mile buffer of the 502 Junction Substation to the west near Interstate 79 in Greene County, Pennsylvania.
- Cumberland and Frostburg, Maryland to the north.
- Approximate 4-mile buffer of the existing high-voltage transmission lines to the south, including:
    - Potomac Edison's[8] 138 kV transmission line traveling west to east in Monongalia and Preston Counties, West Virginia, and Garret County, Maryland (referred to as Hazelton to Lake Lynn 138 kV, Jennings to Hazelton 138 kV, and Frostburg to Jennings 138 kV).
- Potomac Edison's 500 kV transmission line (referred to as Hatfield's Ferry Power Station to Black Oak 500 kV) traveling southeast from Fayette County, Pennsylvania to Black Oak Substation in Mineral County, West Virginia.
    - Potomac Edison's 138 kV transmission line (referred to as Hampshire to Ridgeley 138 kV) traveling southeast in Hampshire County, West Virginia.
    - Potomac Edison's 138 kV transmission line (referred to as Hampshire to Stonewall 138 kV) traveling west to east in Hampshire County, West Virginia, and Frederick County, Virginia.
- Approximate 4-mile buffer of the MARL Project endpoint to the east near US-522 (North Frederick Pike) in Frederick County, Virginia (referred to as the handoff point).

The Study Area encompasses 34 census designated places (CDP), including, but not limited to:

- Cheat Lake CDP, West Virginia
- Jennings CDP, Maryland

[8] Potomac Edison is a subsidiary electric company owned by FirstEnergy.

- Detmold CDP, Maryland
- Danville CDP, Maryland
- Rawlings CDP, Maryland
- Fort Ashby CDP, West Virginia
- Springfield CDP, West Virginia
- Gore CDP, Virginia

The Study Area also encompasses 19 incorporated places shown on Appendix E-1 including, but not limited to:

- Smithfield, Pennsylvania
- Fairchance, Pennsylvania
- Point Marion, West Virginia
- Morgantown, West Virginia
- Brandonville and Bruceton Mills, West Virginia
- Friendsville, Maryland
- Accident, Maryland
- Lanaconing Town, Maryland
- Capon Bridge, West Virginia

The Study Area traverses a diverse Appalachian landscape, characterized by rolling to rugged terrain within the Allegheny Mountains and Ridge-and-Valley physiographic provinces. The land cover is predominantly forested, interspersed with agricultural fields, rural residences, and small towns, reflecting a mix of low-density rural and exurban land uses. Morgantown, home to West Virginia University, marks the western end with a more urbanized core, while Gore, a small unincorporated community in Frederick County, Virginia, anchors the east with a more sparsely developed setting. The existing high-voltage transmission lines in the Study Area traverse rugged terrain in Maryland and West Virginia such as Savage River State Forest and Dan's Mountain in Maryland and Knobly Mountain, White Horse Mountain, and Dillons Mountain in West Virginia. The Study Area contains outdoor recreational activities including hiking, kayaking, and fishing highlighted in Section 3.2.

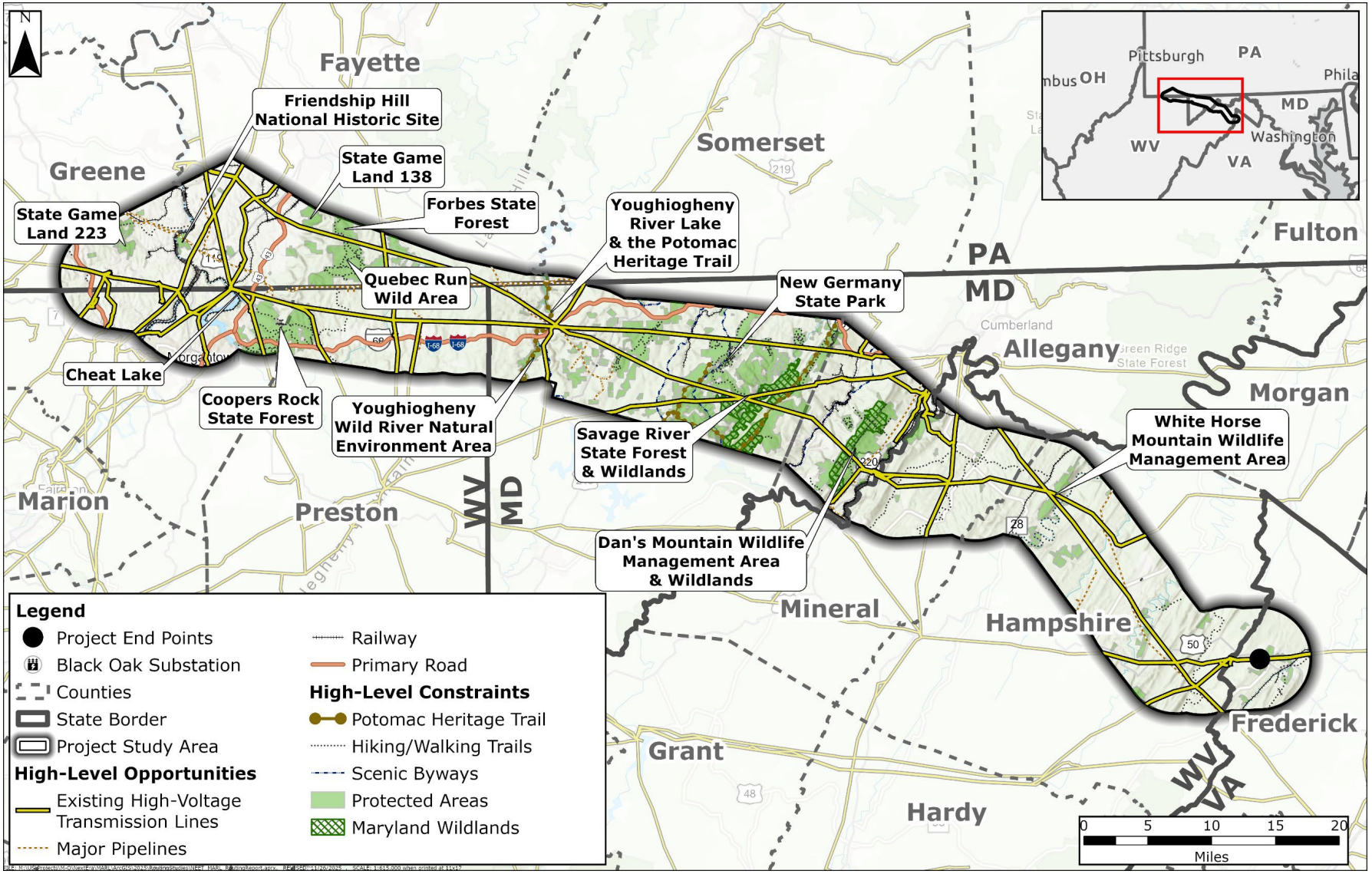
3.2 MAJOR ROUTING CONSTRAINTS AND OPPORTUNITIES IN THE MARL PROJECT STUDY AREA

This section summarizes the major constraints and opportunities in the MARL Project Study Area affecting transmission line routing. In accordance with the state siting requirements and/or guidelines,[9] ERM assessed constraints and opportunities for routing the MARL Project.

[9] 52 PA Code §57.75(e)(3); 52 PA Code §57.72(c)(7)-(13); 52 PA Code §69.3105; W. Va. Code R. §24-2-11a; W. Va. Code R. §150-3-9 (Electric Rule 9); COMAR §20.79.04.02–20.79.04.04; Md. Code Ann., Pub. Util., Section 7-207; and Guidelines for Transmission Line Applications Filed Under Title 56 of the Va. Code.

Routing opportunities within the Study Area included existing transmission lines, utility ROWs, and major roadways. Routing constraints included residential and non-residential buildings, existing and planned developments, public lands, and sensitive natural resources (e.g., streams, floodplains, wetlands). Often, features in the Study Area are both constraints and opportunities. For example, running parallel to existing transmission lines in a state forest could offer space for new ROWs, but it may not be compatible with the adjacent land uses (e.g., dwellings or businesses). ERM also identified routing constraints and opportunities through review of local land use plans and stakeholder engagement. Figure 3.2-1 depicts major routing constraints and opportunities in the Study Area and Appendix E-1 provides a detailed mapbook of these major routing constraints and opportunities within the Study Area. Appendix E-2, Terrain and Slope, provides a detailed mapbook of the slope and terrain that is throughout the Study Area.

FIGURE 3.2-1 MAJOR ROUTING CONSTRAINTS AND OPPORTUNITIES IN THE MARL PROJECT STUDY AREA



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

- **Existing Transmission Lines:** The MARL Project Study Area has several high-voltage transmission lines that were used as routing opportunities, including but not limited to:
  - A 500 kV transmission line operated by Keystone Appalachian Transmission Company from Fort Martin Power Station in Monongalia County, West Virginia, traveling north through the western portion of the Study Area. Referred to as "Ronco to Fort Martin 500 kV" in Section 4.1.
  - A 500 kV transmission line operated by Monongahela Power Company[10] from Hatfield's Ferry Power Station, traveling southeast through the Study Area. Referred to as "Hatfield's Ferry Power Station to Black Oak 500 kV" in Section 4.1.
  - A 500 kV transmission line operated by Potomac Edison from Black Oak to Bedington, traveling east-southeast. Referred to as "Black Oak to Bedington 500 kV" in Section 4.1.
  - A 138 kV transmission line operated by Potomac Edison from Lake Lynn Power Station, traveling east to Cumberland, Maryland. Referred to as "Hazelton to Lake Lynn 138 kV," "Jennings to Hazelton 138 kV" and "Frostburg to Jennings 138 kV" in Section 4.1.
  - A 138 kV transmission line operated by Potomac Edison from Cumberland, Maryland, traveling southeast to Capon Bridge, West Virginia. Referred to as "Hampshire to Ridgeley 138 kV" in Section 4.1.
  - A 138 kV transmission line operated by Potomac Edison from Romney, West Virginia, traveling east to the MARL Project endpoint in Frederick County, Virginia. Referred to as "French Mill to Hampshire 138 kV" or "Hampshire to Stonewall 138 kV" in Section 4.1.
  - A 500 kV transmission line operated by Virginia Electric & Power Company from Mount Storm Substation in Grant County, West Virginia, traveling east to the MARL Project endpoint in Frederick County, Virginia, and continuing to Doubs Substation in Frederick County, Maryland. Referred to as "Mt Storm to Doubs 500 kV" in Section 4.1.
- **Existing Natural Gas Pipelines:** The MARL Project Study Area has several natural gas pipelines, including gathering, distribution, and transmission. Several transmission pipelines were selected for routing opportunities, including, but not limited to:
  - A transmission natural gas pipeline operated by Columbia Gas Transmission, LLC traveling east to west along the Pennsylvania and West Virginia border.
  - A transmission natural gas pipeline operated by Texas Eastern Transmission, LP traveling southeast in Garrett County, Maryland.
  - A transmission natural gas pipeline operated by Texas Eastern Transmission, LP traveling south in Hampshire County, West Virginia.
- **Railways:** The Study Area has four predominant railways; however, these lines generally run southwest/northeast and do not offer opportunities to connect the MARL Project's endpoints.
- **Primary Road Networks:** The MARL Project Study Area has several primary roads including, but not limited to:
  - **Interstate 68**: Travels east to west from Monongalia County, West Virginia, to Garrett County, Maryland. This highway corridor was ultimately not used as an opportunity for

[10] Monongahela Power is a subsidiary of FirstEnergy.

routing due to its scenic nature, particularly as a national scenic highway known as the National Freeway that traverses Garrett and Allegany Counties, Maryland, and offers dramatic views of forested ridges, valleys, and mountain towns. In Monongalia and Preston Counties, West Virginia, Interstate 68 also offers several scenic opportunities near Coopers Rock State Forest.

- **Interstate 79:** Travels north to southwest of the MARL Project endpoint in Greene County, Pennsylvania. This highway corridor was not used as a routing opportunity due to its direction and location.
- **State Highway 43:** Travels north to south from Fairchance, Pennsylvania, to Morgantown, West Virginia. This highway corridor was not used as a routing opportunity due to its direction and location.

- **Protected Areas:** There are 188 protected areas in the MARL Project Study Area, including 69 agricultural easements, 44 conservation easements, 4 historic or cultural easements, 33 local parks or recreation areas, 1 military base, 16 private conservation areas, 2 recreation management areas, 6 state conservation areas, 4 state parks, 6 state resource management areas, and 2 state wilderness areas. There are also eight different state wildland areas designated in Maryland within the Study Area. The major constraints for routing include the following protected resources:
  - **Coopers Rock State Forest:** Coopers Rock State Forest is a 12,747-acre state forest located in Morgantown, West Virginia, that is managed by the West Virginia Division of Forestry. The northern section of this forest is known as the West Virginia University Research Forest and is a working forest used primarily for education and academic research. There are currently two existing high-voltage transmission lines within the research forest in the north that are used as routing opportunities for this Routing Study.
  - **Friendship Hill National Historic Site:** Friendship Hill National Historic Site is in Point Marion, Pennsylvania, on 675 acres of land near the Monongahela River and is managed by the National Park Service. It commemorates the life and legacy of Albert Gallatin, best known for his 13-year tenure as Secretary of the Treasury under Presidents Thomas Jefferson and James Madison. During his time in office, Gallatin significantly reduced the national debt, played a key role in the acquisition of the Louisiana Territory, and helped fund the Lewis and Clark Expedition.
  - **State Game Land No. 138:** Pennsylvania State Game Land No. 138 (SGL 138) is managed by the Pennsylvania Game Commission to provide hunting and trapping opportunities through the management of wildlife habitat. There is currently an existing 500 kV high-voltage transmission line in the southern portion that is used as a routing opportunity for this Routing Study.
  - **Forbes State Forest:** Forbes State Forest is an approximately 60,000-acre forest reserve managed by the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry. The southern portion is in the Study Area and there is currently an existing 500 kV high-voltage transmission line running through the state forest that is used as a routing opportunity for this Routing Study.

- **Youghiogheny River Lake:** The Youghiogheny River Lake, located north of Friendsville, Maryland, is a flood control reservoir managed by the U.S. Army Corps of Engineers (USACE) that is a popular recreation destination. The Eastern Continental Divide Trail, which is a 150-mile network of hiking and paddling that is part of the Potomac National Scenic Trail, also follows the Youghiogheny River Lake. There are currently two existing high-voltage transmission lines that cross the Youghiogheny River Lake north of Friendsville that are used as routing opportunities for this Routing Study.
- **Youghiogheny Wild River Natural Environmental Area:** The Youghiogheny Wild River Natural Environmental Area, located south of Friendsville and Interstate 68, is managed by the Maryland Park Service. It was the first officially designated state Wild River in Maryland and is used heavily for whitewater rafting and other recreational activities. The Eastern Continental Divide Trail, a 150-mile network of hiking and paddling that is part of the Potomac National Scenic Trail, also follows the river.
- **Savage River State Forest:** Savage River State Forest, located in Garrett County, Maryland, spans approximately 55,000 acres. It is used for recreation opportunities such as hiking, snowmobiling, camping, and hunting. The forest also supports sustainable timber harvesting through a forest stewardship plan. Of the 55,000 acres, 11,000 acres are designated as Maryland State Wildlands. Savage River State Forest contains two sections of the Potomac Heritage National Scenic Trail, including Meadow Mountain and Big Savage Mountain Trail. There are currently several routing opportunities within the state forest, including an existing 500 kV high-voltage transmission line operated by Potomac Edison traveling southeast through the middle of the forest and its associated Wildlands; an existing 138 kV high-voltage transmission line traveling west to east through the northern portion of the forest operated by Potomac Edison; and an existing 138 kV high-voltage transmission line traveling northeast operated by Potomac Edison going through the associated Wildlands.
- **Dan’s Mountain Wildlife Management Area:** Dan’s Mountain Wildlife Management Area (WMA) contains approximately 9,500 acres in Allegany County, Maryland, and is managed by the Maryland Department of Natural Resources. Approximately 50 percent of the WMA is designated as Maryland State Wildlands. There is currently an existing 500 kV high-voltage transmission line bisecting the WMA and Wildlands that is used as a routing opportunity for the Routing Study.
- **Maryland State Wildlands System**: The Maryland Wildlands System is a network of state-designated protected areas managed by the Maryland Department of Natural Resources. There are eight state-designated Wildlands in the Study Area that are part of Savage River State Forest and Dan’s Mountain WMA including: Bear Pen, Big Savage, Big Savage Mountain, Dan’s Mountain, High Rock, Middle Fork, Savage Ravines, and South Savage. Bear Pen, Big Savage Mountain, Big Savage, Savage Ravines, and Dan’s Mountain currently have existing high-voltage transmission lines bisecting the protected areas that are used as routing opportunities for this Routing Study.

- **White Horse Mountain Wildlife Management Area**: The White Horse Mountain WMA is a 1,725-acre conservation and recreation area located in Hampshire County, West Virginia, and is managed by the West Virginia Division of Natural Resources (WVDNR). The Potomac Conservancy held a conservation easement on White Horse Mountain to protect it from development and transferred ownership to WVDNR to manage the land as a public recreation area and WMA. The area contains rugged ridgeline topography including Valley Mountain and River Mountain. The area currently contains two high-voltage transmission lines bisecting the WMA that travel southeast and are used as routing opportunities for this Routing Study.

- **Scenic Byways:** There are several state-designated scenic byways, in the MARL Project Study Area including Mountain Maryland Scenic Byways and The Historic National Road in Garrett and Allegany Counties and the Laurel Highlands Scenic Byway in Fayette County, Pennsylvania.
- **Recreation:** There are several recreational opportunities within the MARL Project Study Area including hiking, mountain biking, boating, kayaking, hunting, and fishing. The Study Area contains three sections of the Potomac Heritage National Scenic Trail. Cheat Lake and the Youghiogheny River Lake offer kayaking and boating recreational opportunities. Recreational areas in the Study Area include but are not limited to those areas identified under the protected areas noted above and the following:
  - **Walking, Hiking, Backpacking, and Biking Trails:** The Study Area contains 329 miles of multi-use trails located in Savage River State Forest, Coopers Rock State Forest, Quebec Run Wild Area, Forbes State Forest, Dan's Mountain WMA, Monongahela and Cheat River, and various private trails. These trails include two sections of the Potomac National Scenic Trail (Meadow Mountain and Big Savage Trail), the Margraff Trail System, Mount Aetna Trails, Bowman Hill North, New Germany State Park Trails, The Alleghany Trail (Section 1), to name a few.
  - **Boating, Kayaking, and Whitewater Rafting:** There are many water-based recreational activities in the various streams, rivers, and lakes in the Study Area including 11.2 miles of the Youghiogheny River Trail, which includes an area of whitewater rafting south of Friendsville, Maryland. The Study Area also has water trails on Patterson Creek, Cacapon River, Upper Monongahela River, and the South Branch and North Branch of the Potomac River.
  - **Fishing:** The Study Area contains many fishing opportunities across the 1,200+ miles of perennial streams, including 700+ miles of coldwater fisheries and trout streams. There are also 11+ miles of trout-stocked streams in Maryland, and 6 miles of trout-stocked streams in Pennsylvania.
  - **Camping:** There are various private and state-managed campgrounds in the Study Area including Coopers Rock State Forest, New Germany State Park, Hill Run Group Campsite in Dan's Mountain, and Big Run State Park Campground.
  - **Hunting:** There are various private and public hunting areas in the Study Area including Savage River State Forest, SGL 138, SGL 223, Dan's Mountain WMA, White Horse Mountain WMA, and Coopers Rock State Forest.

- **Cultural Resources:** There are many cultural resources in the MARL Project Study Area including resources listed in the National Register of Historic Places (NRHP), cemeteries, historic districts, and battlefields. Friendship Hill National Historic Site is also located in Fayette County, Pennsylvania, and includes the Gallatin house.
- **Sensitive Environmental Areas:** There are several sensitive environmental areas in the MARL Project Study Area including, but not limited to:
  - **Trout Streams:** West Virginia has many designated trout streams in Monongalia, Preston, and Hampshire Counties. Fayette County, Pennsylvania, contains many coldwater fisheries, Exceptional Value and High Quality Coldwater Fishery streams. Garrett and Allegany Counties, Maryland, contain many coldwater, recreational trout waters, and trout-stocked streams.
  - **Maryland Nontidal Wetlands of Special State Concern:** There are 37 Nontidal Wetlands of Special Concern within the Study Area. These wetlands are protected under Maryland's Nontidal Wetlands Protection Act and Code of Maryland Regulations (COMAR 26.23.06) and require a 100-foot protective buffer.
  - **Forests of Recognized Importance (Maryland):** In Maryland, Forests of Recognized Importance are forested areas that receive special attention and protection due to their ecological and water-quality significance. This includes 100-foot forested buffers along important streams.
  - **Biodiversity Conservation Network (Maryland):** The Biodiversity Conservation Network (BioNet) in Maryland is a dataset designed to guide conservation efforts across the state. Developed and maintained by Maryland Department of Natural Resources, BioNet identifies and maps biologically significant lands using multiple ecological criteria.
  - **Irreplaceable Natural Areas (Maryland):** Maryland established Irreplaceable Natural Areas (INAs) in June 2022 to preserve native biodiversity on state lands. There are 47 INAs in the Study Area that are part of Savage River State Forest, Dan's Mountain WMA, and the Youghiogheny River Natural Environmental Area.
  - **Virginia Natural Landscape Assessment Ecological Cores:** This dataset identifies large patches of natural land with at least 100 acres of interior cover known as a core area. These cores are broken down into categories of ecological importance (C1—Outstanding, C2—Very High, C3—High, C4—Moderate, and C4—General).

3.3 FIELD RECONNAISSANCE AND STAKEHOLDER ENGAGEMENT

The Routing Team conducted field reconnaissance reviews of various locations within the MARL Project Study Area and along identified route segments from public roads during 2025. These site visits were used to visually assess terrain, land use, vegetation, residential development, and existing infrastructure conditions. Photographs and field observations collected during these visits supplemented the desktop data to aid in the analysis and evaluation of route segments. Field reconnaissance also provided valuable on-the-ground context, helped the Routing Team verify data accuracy and identify potential constraints not visible in the high-resolution aerial imagery flown for the MARL Project, and helped refine the Routing Team's understanding of local conditions.

Starting in early 2025, the Routing Team initiated outreach to agencies and stakeholders as part of route development and evaluation. Throughout the outreach, the Routing Team gathered feedback on the Study Area and then the preliminary draft route options through engagement with the public, elected officials, regulatory and planning groups, land managing agencies, and the public. This led to the development of the final Alternative Routes identified in Section 4.5. NEET MA and NEET VA announced the MARL Project via mail and website in February 2025 and held eight in-person open houses in May to share information and receive feedback. NEET MA and NEET VA maintains the website with up-to-date Project information and an interactive online map displaying the current routes and high-level constraint and opportunity data. Additionally, during open comment periods, the public was able to pin geographically related comments on this platform. The Routing Team used stakeholder feedback to refine and optimize routes and help support decisions to remove segments from further consideration. Refer to Section 4 for how the routes were identified. A detailed list of agencies and stakeholders that have been engaged on the MARL Project can be found in the state commission applications and supporting testimony.

4. ROUTE IDENTIFICATION

The routing process for the MARL Project was structured as a multi-phased, iterative approach that integrated both quantitative and qualitative assessments at each stage. The Routing Team began by identifying broad conceptual route corridors within the MARL Project Study Area that generally followed existing transmission lines that maintained a similar directional alignment between the two MARL Project endpoints. From these conceptual route corridors, the Routing Team developed preliminary route segments that were evaluated using measurable criteria such as line length, potential for paralleling, and parcel crossings, as well as qualitative factors including land use compatibility, community context, and field observations. These route segments were presented as preliminary draft route options for public input through open houses and an online survey (Appendix I, Public Open House Content).

Following the public input period, the Routing Team assessed the input and further refined route segments. These refined route segments were consolidated into longer "trunks" or route groupings that were further evaluated quantitatively and qualitatively. Through continued refinement and comparative evaluation of the route groupings, the Routing Team ultimately identified six full end-to-end route alternatives that reflect technical and regulatory requirements and address stakeholder preferences. These six Alternative Routes and their respective features are presented in Table 1.4-1.

4.1 IDENTIFICATION OF CONCEPTUAL ROUTE CORRIDORS

As stated in Section 2, ERM collected data and analyzed the MARL Project Study Area for constraints and opportunities to identify route alternatives. To initiate the process, conceptual route corridors were developed as broad, general areas within which the MARL Project could feasibly be located and generally followed the existing transmission lines within the Study Area. The conceptual route corridors were developed at a high level to avoid mapped large area constraints and/or incorporate notable opportunity features—existing transmission lines—that could be paralleled. The conceptual route corridors were designed to provide options that allowed for:

- Paralleling existing transmission lines where feasible;
- Maximizing the separation distance from or minimizing impacts on residential dwellings; and
- Minimizing conservation easement crossings.

Additional considerations during conceptual route corridor development included:

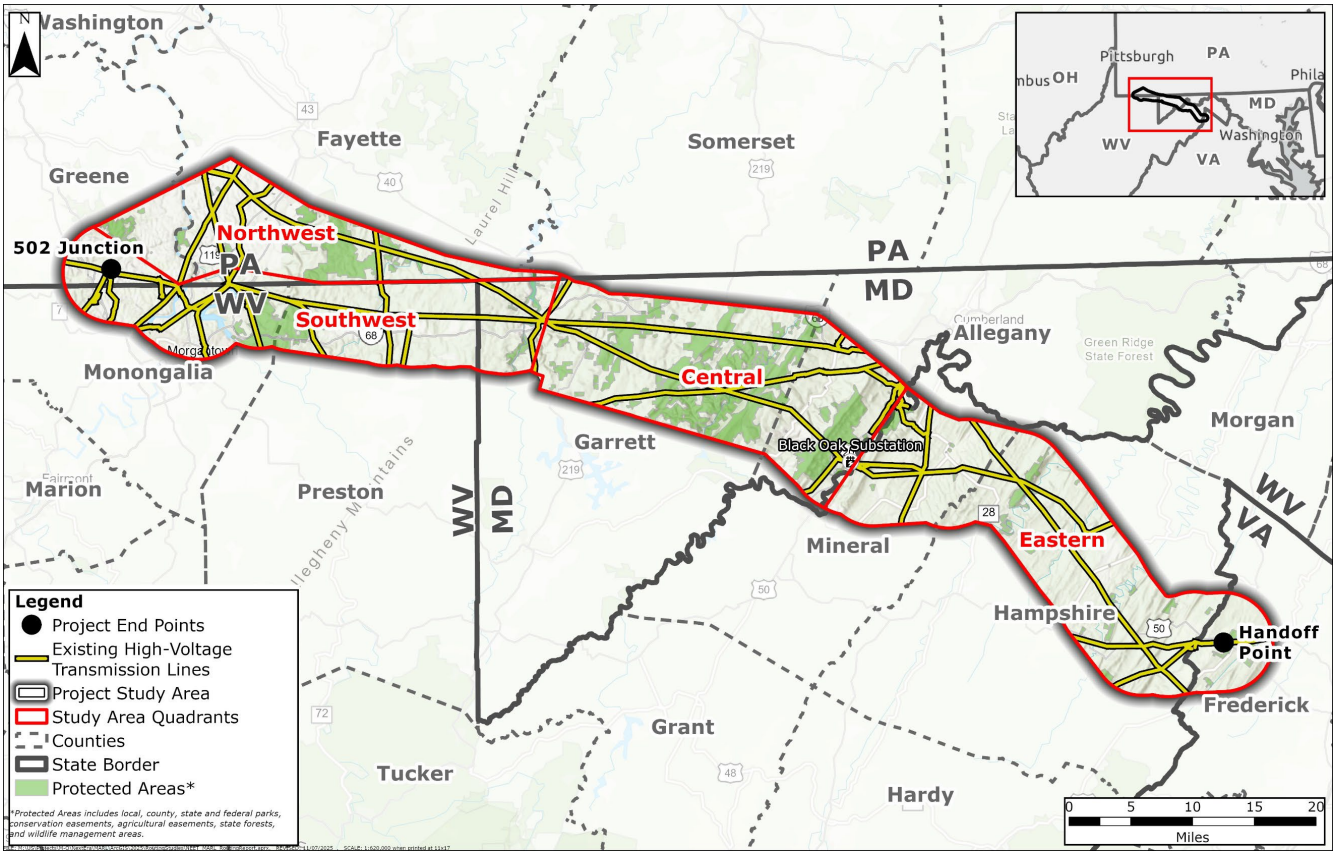
- Natural environment constraints (e.g., wetlands, wildlife habitats, protected lands);
- Built environment patterns (e.g., land use, residential neighborhoods, residential structures, commercial buildings);
- Engineering constructability (e.g., topography, access); and
- Regulatory and permitting constraints.

The conceptual route corridors were developed to parallel existing transmission lines to the greatest extent possible, focusing on those that traveled in the same general direction between the MARL Project's endpoints. This reduced the overall line length and associated potential

impacts. Appendix E-1 provides detailed mapping of the existing transmission lines within the Study Area.

To help facilitate development of conceptual route corridors, the Study Area was subdivided into four quadrants—Northwest, Southwest, Central, and Eastern—to facilitate a more organized and efficient review of routing alternatives across the large Study Area (Figure 4.1-1).

FIGURE 4.1-1 MARL PROJECT STUDY AREA QUADRANTS



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

Quantitatively, this enabled the evaluation of the criteria identified in Table 2.7-1 (e.g., length, paralleling, parcel crossings). Qualitatively, this allowed for an assessment of constraints that could not be quantitatively compared (e.g., land use patterns, community development, terrain characteristics). The combination of quantitative analysis and qualitative insight supported a transparent, data-driven decision-making process and made sure that development of route segments and alternatives were evaluated consistently throughout the process. This framework enabled the Routing Team to identify, evaluate, and refine potential route segments within each quadrant, ultimately supporting the development of end-to-end Alternative Routes.

Within each quadrant, routing efforts prioritized opportunities to parallel existing transmission lines and other compatible linear features, where feasible, while also avoiding large concentrations of developed areas. This approach was intended to:

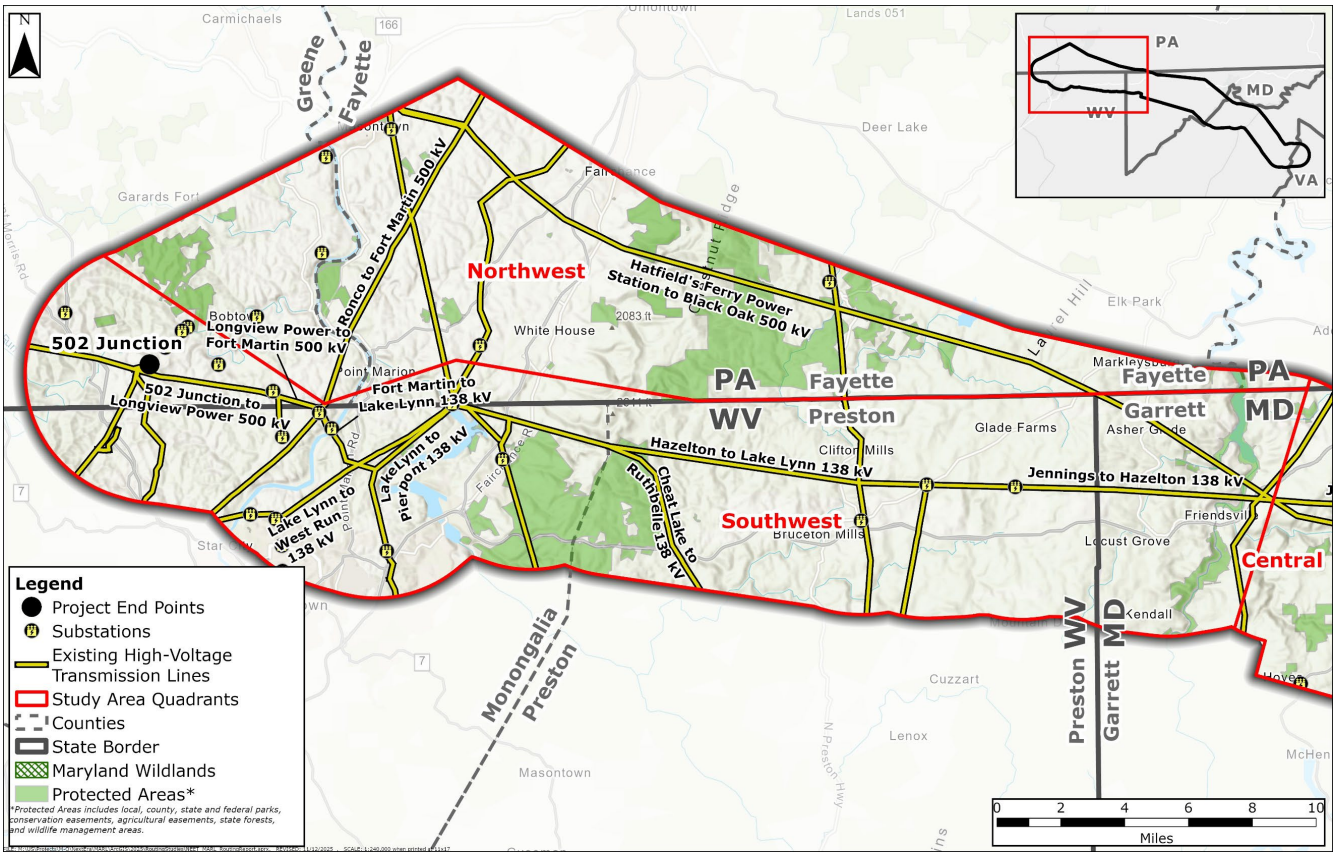
- Minimize impacts on the natural environment;
- Reduce potential conflicts with the existing built environment;
- Streamline permitting and stakeholder engagement; and
- Enhance constructability and long-term operational efficiency.

The Study Area has four quadrants that are as follows.

4.1.1 SOUTHWEST QUADRANT

Beginning at 502 Junction in Greene County, Pennsylvania, this area includes the southern portion of Greene and Fayette Counties. It also includes areas of northern Monongalia County and northern Preston County, West Virginia. This quadrant ends after the Youghiogheny River near Friendsville in Maryland where two primary existing transmission lines cross (Jennings to Hazelton 138 kV and Hatfield's Ferry Power Station to Black Oak 500 kV). Refer to Figure 4.1-2 for the southwest quadrant details.

FIGURE 4.1-2 EXISTING TRANSMISSION LINES IN THE SOUTHWEST AND NORTHWEST QUADRANTS



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

The southwest quadrant includes the following existing transmission lines targeted for paralleling:

- **502 Junction to Longview Power 500 kV Transmission Line:** This line travels east to southeast near the 502 Junction Substation and offered an opportunity for paralleling the existing transmission line immediately at the western terminus of the MARL Project. In this area, conceptual route corridors deviated from the existing transmission line in certain locations to reduce potential impacts on residential developments near Bald Hill Church Road and Matthews Road. Instead, the conceptual route corridors shifted south to traverse large expanses of undeveloped land and open fields, thereby minimizing residential proximity and potential land use conflicts.
- **Longview Power to Fort Martin 500 kV Transmission Line:** This line presented an opportunity for paralleling the existing transmission line to the southwest between Fort Martin and Longview Power, near Walnut Hill Road, where minimal residential development is present along the existing transmission lines.
- **Hazelton to Lake Lynn 138 kV Transmission Line:** This line extends approximately 18 miles west to east between the Lake Lynn Generating Station and the Hazelton Substation, offering numerous opportunities for paralleling the existing transmission line. It crosses through the northern section of Coopers Rock State Forest. Conceptual route corridors deviated from the existing transmission line in localized areas of residential development—such as near Fairchance Road in Monongalia County and Route 26 in Preston County, West Virginia—to minimize potential impacts on residents. The Routing Team also considered a conceptual route corridor to the north of the existing transmission line. Not directly paralleling adjacent to the existing transmission line provided options to avoid impacts on Coopers Rock State Forest, to the greatest extent possible, as well as crossings of the Cheat River north of Lake Lynn Dam, a Federal Energy Regulatory Commission-regulated hydroelectric dam. This conceptual route corridor to the north required approximately 16 miles of a greenfield section across private lands versus approximately 11 miles of paralleling adjacent to the existing transmission line.
- **Lake Lynn to West Run 138 kV Transmission Line and Fort Martin to Lake Lynn 138 kV Transmission Line:** The area between the Monongahela River and the Cheat River in Monongalia County contains two existing transmission lines: Lake Lynn to West Run 138 kV and Fort Martin to Lake Lynn 138 kV. These existing lines were initially considered for potential paralleling for the MARL Project conceptual route corridor; however, subsequent due diligence identified extensive residential development, and no routes within this area were advanced that met the criteria outlined in Section 2.7.
- **Cheat Lake to Ruthbelle 138 kV Transmission Line:** This line parallels the Hazleton to Lake Lynn 138 kV transmission line through Coopers Rock State Forest and deviates south toward Laurel Run West Virginia. Conceptual route corridors paralleled this existing transmission line through Coopers Rock State Forest.
- **Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line:** This line extends southeast through Forbes State Forest in Pennsylvania and crosses the Youghiogheny River into Maryland. Conceptual route corridors generally paralleled this existing transmission line, except in areas with higher residential density. As one of two existing transmission lines

that cross the Youghiogheny River near Friendsville, Maryland, it was specifically targeted for paralleling at the river crossing.

- **Jennings to Hazelton 138 kV:** This line runs approximately 18 miles west to east from Preston County, West Virginia, to Garrett County, Maryland, crossing the Youghiogheny River. It is the second of the two existing transmission lines that cross the Youghiogheny River near Friendsville, Maryland, and was similarly targeted for paralleling at that location.

4.1.2 NORTHWEST QUADRANT

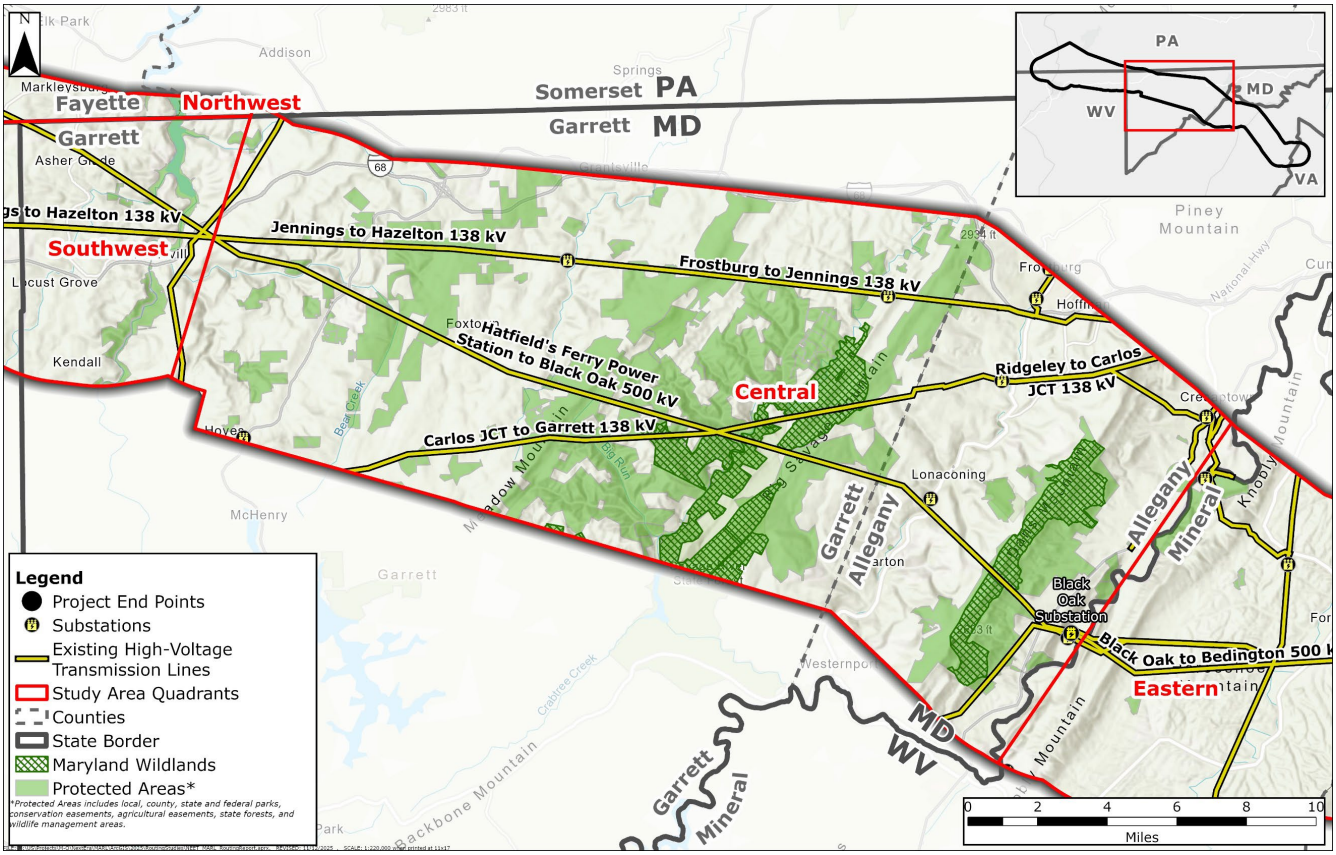
The northwest quadrant includes the southeastern corner of Greene County, Pennsylvania, and the southern portion of Fayette County, Pennsylvania, from the Friendship Hill National Historic Site in the east, through Haydentown, Elliotsville, and ending near Markleysburg, Pennsylvania. Refer to Figure 4.1-2 for the northwest quadrant details. The northwest quadrant includes two existing transmission lines targeted for paralleling: the Ronco to Fort Martin 500 kV Transmission Line and the Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line, which continues through the southwest and central quadrants.

These existing transmission lines provided conceptual route corridor optionality that avoided crossing Cheat Lake, Coopers Rock State Forest, and developed areas in Monongalia County. These conceptual route corridors provided a higher percentage of paralleling existing transmission lines. However, they required an overall longer length compared to the southern conceptual route corridors and had an increased amount of stream and state land crossings by crossing through three Pennsylvania state-managed lands (SGL 138, Quebec Run Wild Area, and Forbes State Forest).

4.1.3 CENTRAL QUADRANT

The central quadrant of the MARL Project Study Area begins after the Youghiogheny River in Friendsville, Maryland, extends through Garrett County into Allegany County, and ends at the North Branch of the Potomac River, which is the state line between Allegany County, Maryland, and Mineral County, West Virginia, near Danville, Maryland. Refer to Figure 4.1-3 for the central quadrant details.

FIGURE 4.1-3 EXISTING TRANSMISSION LINES IN THE CENTRAL QUADRANT OF THE MARL PROJECT STUDY AREA



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

The central quadrant includes the following existing transmission lines targeted for paralleling:

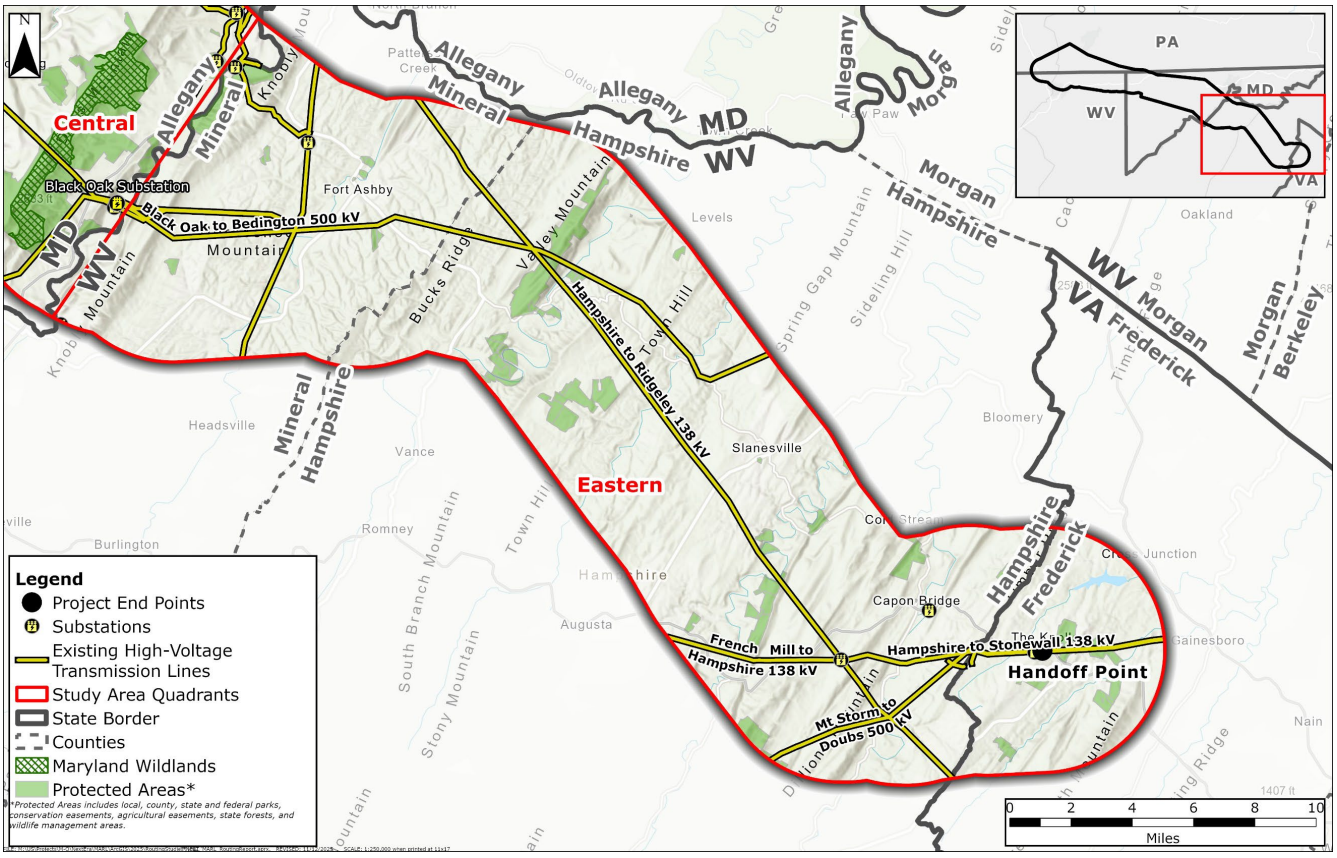
- **Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line:** This line travels in a southeast direction through the central portion of the MARL Project Study Area for 28 miles. It crosses through Savage River State Forest, Big Savage Wildlands, Dan's Mountain WMA, and Dan's Mountain Wildlands. The conceptual route corridors paralleled this existing transmission line through most of the central quadrant except in areas of residential development such as Fairview Road in Garrett County, Bear Creek Area near Kaese Mill, and as the line approaches Black Oak Substation.
- **Jennings to Hazelton 138 kV Transmission Line and Frostburg to Jennings 138 kV Transmission Line:** These two lines travel west to east for 25 miles through the central quadrant of the MARL Project Study Area. The conceptual route corridors paralleling these existing transmission lines provided optionality to avoid crossing larger sections of Savage River State Forest and avoid crossing through the Maryland Wildlands, including Dan's Mountain, Big Savage, and Bear Pen. The conceptual route corridors paralleled these lines for approximately 18 miles before a greenfield section heading south to avoid the built-up areas of Frostburg and connecting with the other existing transmission lines near Black Oak Substation. To avoid the Maryland Wildlands and Savage River State Forest crossings, these conceptual route corridors required approximately 12 miles of additional greenfield sections.

- **Carlos JCT to Garrett 138 kV:** This line travels west to northeast for 18 miles and crosses through Savage River State Forest, Bear Pen Wildlands, Big Savage Wildlands, and Savage Ravine Wildlands. Generally, this existing transmission line does not travel in the direction needed for the MARL Project to reach the endpoint; however, there were small sections of the existing transmission line targeted for paralleling adjacent to Bear Pen Wildlands to reduce greenfield sections in this part of Savage River State Forest.

4.1.4 EASTERN QUADRANT

The eastern quadrant of the MARL Project Study Area begins at the North Branch of the Potomac River, which is the state line between Allegany County, Maryland, and Mineral County, West Virginia, near Danville, Maryland, extends southeast through Hampshire County, West Virginia, and ends at the handoff point in Frederick County, Virginia. Refer to Figure 4.1-4 for the eastern quadrant details.

FIGURE 4.1-4 EXISTING TRANSMISSION LINES IN THE EASTERN QUADRANT OF THE MARL PROJECT STUDY AREA



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

The eastern quadrant includes the following existing transmission lines targeted for paralleling:

- **Black Oak to Bedington 500 kV Transmission Line:** This line extends east from the existing Black Oak Substation in Maryland and then through Fort Ashby and White Horse Mountain WMA. The conceptual route corridors parallel this existing transmission line to the extent feasible except for the residential development around the Fort Ashby area, which required greenfield sections of the conceptual route corridor further south that traverse through large undeveloped private lands. The Routing Team also considered a conceptual route corridor to the south that avoided impacts on White Horse Mountain WMA. This conceptual route corridor starts east of the Black Oak Substation, south of the existing transmission line and travels southeast to eventually parallel the Hampshire to Ridgeley 138 kV Transmission Line. However, this conceptual route corridor required approximately 12 miles of a greenfield section through private land and a new crossing of the South Branch of the Potomac River.
- **Hampshire to Ridgeley 138 kV Transmission Line:** This line travels southeast and crosses the Black Oak to Bedington 500 kV line just north of the White Horse Mountain WMA. The conceptual route corridors parallel this existing transmission line south through Hampshire County, West Virginia, until the Hampshire to Stonewall 138 kV line. The conceptual route corridors deviate from the existing transmission line in areas of residential development such as Points, Augusta, and Timber Mountain, West Virginia. The conceptual route corridors also deviate around newly developed conservation easements near North River.
- **French Mill to Hampshire 138 kV Transmission Line and Hampshire to Stonewall 138 kV Transmission Line:** These lines travel west to east for 16 miles from Hampshire County, West Virginia, to Frederick County, Virginia. The MARL Project terminates at the handoff point on the Hampshire to Stonewall 138 kV Transmission Line. The conceptual route corridors parallel these two existing transmission lines where feasible but deviate in areas of dense residential development such as Sycamore Drive and Sirbaugh Road in Capon Bridge, West Virginia, and around Fletcher Road in Gore, Virginia.
- **Mt. Storm to Doubs 500 kV Transmission Line:** This line travels east to northeast. There is significant residential development around the existing transmission line as it approaches the Virginia border. The MARL Project terminates at a handoff point adjacent to this existing transmission line. The conceptual route corridors parallel this line where feasible but deviate in areas of dense residential development in Capon Bridge, West Virginia, and Gore, Virginia.

4.2 IDENTIFICATION OF PRELIMINARY DRAFT ROUTE OPTIONS

After identification of the conceptual route corridors, the Routing Team identified and mapped preliminary route segments within the MARL Project Study Area quadrants for initial evaluation against the routing criteria and guidelines identified in Section 2.7. The preliminary route segments were quantitatively and qualitatively assessed on a continual basis by the Routing Team and adjusted as needed to support the development of preliminary route options for the MARL Project open houses and online survey, which were designed to gather stakeholder and public feedback. The objective of this process was to reduce the number of route segments such that those remaining were more suitable for routing a new transmission line and could be combined

into reasonable full end-to-end preliminary draft route options. These assessments were conducted by the Routing Team using a combination of data sources, including digital datasets, stakeholder and agency input, and windshield field reconnaissance.

Through the windshield field reconnaissance, additional qualitative observations were made that informed further refinement of the preliminary route segments. As a result, certain preliminary route segments were adjusted or removed based on field-verified conditions not observable in the high-resolution imagery, such as newly constructed homes, residences obscured from aerial view, unmarked cemeteries, engineering constraints, and other site-specific factors. These field-based insights complemented the quantitative data and verified that route development was grounded in both spatial analysis and real-world conditions.

The Routing Team compiled data analytics for each preliminary route segment using common starting and ending points and compared them against each other in the four quadrants of the MARL Project Study Area, removed those preliminary route segments that were less favorable, and then carried forward those remaining route segments. These remaining routes segments compromised the MARL Project "preliminary draft route options" that were presented to the public at the open houses and through the online survey. The preliminary draft route options that were shared publicly included route segments spanning approximately 310 total miles within the Study Area. These preliminary draft route options are shown on Appendix E-3, Preliminary Draft Route Options, and Appendix I.

4.3 STAKEHOLDER AND PUBLIC FEEDBACK

Stakeholder and public engagement played a critical role in shaping the routing process for the MARL Project. The Routing Team recognized the importance of gathering local knowledge, understanding community concerns, and incorporating stakeholder input into the development of route alternatives. To achieve this, a multi-faceted public outreach effort was launched, combining digital tools with in-person engagement across the four-state MARL Project Study Area and can be found in the state commission applications and supporting testimony.

The first step was an interactive online mapping survey, conducted in two phases. The initial online mapping survey, active from February 22 to April 5, 2025, invited landowners and stakeholders to share their primary concerns within the MARL Project Study Area. A total of 22,769 postcards were mailed to landowners within 2 miles of existing transmission lines that were targeted for paralleling to notify them of the survey. Landowners and the public were able to provide geographically-referenced specific feedback through an intuitive online platform. The MARL Project received 540 survey responses that helped the Routing Team identify sensitive areas and refine preliminary route segments.

The second phase of the online mapping survey, active from May 3 to June 6, 2025, presented the preliminary draft route options to the public. A total of 10,398 postcards were mailed to landowners within 1 mile of the preliminary draft route options. Using the interactive mapping tool, participants could explore the preliminary draft route options, highlight areas of concern, and submit comments directly tied to specific locations. The MARL Project received 719 survey responses that helped the Routing Team identify concerns along the preliminary draft route options, prioritize sensitive areas, and refine preliminary draft route options.

Concurrent with the second phase of the online mapping survey, the Routing Team hosted eight in-person open house meetings across the MARL Project Study Area in May 2025 and a virtual open house option on October 14, 2025, specific to the Maryland portion of the MARL Project. This public engagement effort aimed to educate the public about the MARL Project, gather constraint information not captured in existing datasets, and solicit input for route adjustments (please see Testimony of Kaitlin McCormick). The goal of the public engagement initiative was to collect any additional data to inform the route evaluation and selection process. Landowners within a 1-mile buffer of preliminary route options, along with local and state officials, received mailed invitations to attend the open houses:

- Monday, May 5, 2025, in Hampshire County, Slanesville, West Virginia 25444
- Tuesday, May 6, 2025, in Garrett County, Friendsville, Maryland 21531
- Wednesday, May 7, 2025, in Allegany County, Lonaconing, Maryland 21539
- Thursday, May 8, 2025, in Mineral County, Willey Ford, West Virginia 26767
- Monday, May 12, 2025, in Monongalia County, Morgantown, West Virginia 26506
- Tuesday, May 13, 2025, in Fayette County, Fairchance, Pennsylvania 15436
- Wednesday, May 14, 2025, in Preston County, Bruceton Mills, West Virginia 26525
- Tuesday, May 20, 2025, in Fredrick County, Gore, Virginia 22637
- Tuesday, October 14, 2025 (Virtual Maryland Open House)

At the end of the close of the online survey on June 6, 2025, a total of 1,259 comments were received in addition to feedback heard at the open houses. These comments provided critical qualitative insights that complemented the Routing Team's quantitative analysis, helping to refine route segments and eliminate routes that posed unacceptable impacts or constraints.

The team also held a virtual open house on October 14, 2025, related to the evaluation of the route options that crossed the designated Maryland Wildlands Preservation System. The team continued to receive input on the MARL Project from the community-project hotline and e-mail address.

In addition to public input, the Routing Team engaged with a wide range of local, state, and federal agencies across the four states. These agencies provided technical feedback, regulatory guidance, and data that further informed the routing process. This comprehensive public engagement effort—combining digital tools, in-person meetings, virtual open house, and agency coordination—was instrumental in shaping the final routes. The feedback received helped guide the transition from conceptual route corridors to refined route segments, ultimately contributing to the identification of six full end-to-end route alternatives for regulatory review. A full list of agencies consulted is included in the state commission applications and supporting testimony.

4.4 ROUTE REFINEMENT AND ROUTE SEGMENT ELIMINATION

Following the public engagement efforts outlined in Section 4.3, the Routing Team conducted additional evaluations to refine the preliminary draft route options/route segments using the evaluation criterion in Table 2.7-1.

As part of the route refinement process, route segments were combined, modified, or dismissed based on stakeholder concerns, engineering constructability, and natural environment, built environment, cultural, and social criteria. In total, 84 route segments were evaluated, each representing a potential part of the Alternative Routes. Refer to Appendix E-4, Route Segments. These segments were not static; they were dynamic elements subject to change based on engineering constructability, land use compatibility, environmental sensitivity, and most importantly, public and stakeholder feedback.

Through the combination of the online surveys, open house meetings, and agency coordination, the Routing Team gathered extensive input. This feedback was paired with quantitative data—such as segment length, proximity to existing infrastructure, and parcel crossings—and qualitative insights from field reconnaissance, community context, and land ownership patterns.

The results of this comprehensive evaluation are detailed below and are shown in Table 4.4-1. Table 4.4-1 provides details on each route segment and provides rationale on why a route segment was dismissed, carried forward, and/or refined. As a result, the following was determined:

- Thirty-five segments were dismissed due to constraints such as engineering, built environment, or natural environmental concerns highlighted by agencies and reiterated by public input.
- Forty-nine segments were carried forward, forming the backbone of the final route alternatives.

Of the segments carried forward, 41 were refined—some shortened, rerouted, or adjusted—to better align with stakeholder concerns and constructability. These route segments were then combined into longer, more continuous route groupings, which served as the foundation for assembling the final end-to-end route alternatives. Route groupings represented feasible routing paths that span significant portions of the MARL Project Study Area and were used to narrow down final route alternatives. The same quantitative and qualitative assessment was performed on these route groupings that resulted in the identification of the full end-to-end final Alternative Routes. The preliminary route options presented to the public and the final route alternatives identified are shown on Appendix E-5, Preliminary Draft Route Options and Final Route Alternatives.

This process was not only about dismissing routes but also about refining and adapting potential route segment options. Segments like 13d and 20b, each over 8 and 14 miles respectively, were reevaluated to account for engineering, and natural and built environment factors, demonstrating the complexity and scale of the routing effort.

Ultimately, this overall routing and siting approach led to the development of six full end-to-end route alternatives, each composed of carefully selected and refined route segments. These routes represent not only technical feasibility but input from the public, stakeholders, and regulatory agencies.

TABLE 4.4-1 ROUTE SEGMENTS

Segment	County [a]	Status	Length (miles)	Notes
Pennsylvania				
1a	Greene	Route segment considered but dismissed	0.9	Dismissed due to engineering considerations to meet the existing utilities requirements in 502 Junction Substation
1b	Greene	Final route segment	0.9	Added due to engineering considerations to meet the existing utilities requirements in 502 Junction Substation
2	Greene	Final route segment	1.8	No change
3a	Greene	Route segment considered but dismissed	3.2	Dismissed due to residential property land use considerations and to narrow the number of segments to more favorable routing options
15	Greene	Final route segment	2.1	Refined due to topographical constraints and to reduce sharp turn angles
4a	Fayette	Final route segment	3.4	Refined due to planned residential development discovered during open houses
5a	Fayette	Final route segment	4.2	Refined due to topographical constraints and to reduce sharp turn angles
15a	Fayette	Final route segment	5.4	Refined to reflect stakeholder feedback received during open houses, including indications of landowner openness to allow the route on their property
15b	Fayette	Route segment considered but dismissed	5.2	Dismissed due to proximity to residential dwellings, sharp turn angles, and to narrow the number of segments to more favorable routing options
16	Fayette	Final route segment	4.2	Refined due to topographical constraints and planned residential development discovered during open houses
17a	Fayette	Final route segment	2.9	Refined due to engineering considerations to reduce the number of sharp turn angles
17b	Fayette	Route segment considered but dismissed	3.0	Dismissed due to proximity to residential dwellings
18a	Fayette	Final route segment	3.3	Refined to more closely parallel the existing transmission line, reduce proximity to residential dwellings, and reduce impacts to a commercial business
18b	Fayette	Route segment considered but dismissed	5.2	Dismissed due to longer route length, proximity to residential dwellings, and extensive greenfield development
19	Fayette	Final route segment	4.1	Refined due to engineering considerations to reduce the number of sharp turn angles
20a	Fayette	Route segment considered but dismissed	15.1	Dismissed due to proximity to residential dwellings and impacts to an agricultural easement

Segment	County [a]	Status	Length (miles)	Notes
20b	Fayette	Final route segment	15.0	Refined due to topographical constraints and to reduce the number of sharp turn angles
West Virginia				
3b	Monongalia	Final route segment	3.6	Refined to reflect stakeholder feedback received during open houses, including indications of landowner openness to allow the route on their property
4b	Monongalia	Route segment considered but dismissed	3.8	Dismissed due to planned residential development discovered during open houses
4b to 5a	Monongalia	Route segment considered but dismissed	0.7	Dismissed due to planned residential development discovered during open houses
5b	Monongalia	Final route segment	5.4	Refined due to planned residential development discovered during open houses
5c	Monongalia	Route segment considered but dismissed	4.0	Dismissed due to proximity to residential dwellings, planned residential development, and infrastructure crossing constraints
5c to 5b	Monongalia	Route segment considered but dismissed	0.5	Dismissed due to proximity to residential dwellings
6a	Monongalia	Final route segment	1.2	Added to more closely parallel the existing transmission line and reduce impacts on residents on the north side of the existing line
7a	Monongalia	Route segment considered but dismissed	1.1	Dismissed due to greenfield development and topographical constraints
7b	Monongalia	Route segment considered but dismissed	2.3	Dismissed due to proximity to residential dwellings
7c	Monongalia	Final route segment	1.4	No change
8a	Preston	Route segment considered but dismissed	4.5	Dismissed due to its greater route length, increased greenfield development, and higher water resource impacts
8b	Preston	Route segment considered but dismissed	2.2	Dismissed due to topographical constraints, sharp turn angles, and additional greenfield development
8c	Preston	Final route segment	2.7	Refined due to engineering considerations to more closely parallel the existing transmission line corridor
8d	Preston	Route segment considered but dismissed	2.6	No change
8e	Preston	Final route segment	3.0	Added to provide greater optionality to parallel existing transmission lines through Coopers Rock State Forest
9a	Preston	Final route segment	1.6	No change
9c	Preston	Final route segment	7.5	No change
10a	Preston	Route segment considered but dismissed	4.7	Dismissed due to its greater route length and increased greenfield development

Segment	County [a]	Status	Length (miles)	Notes
10b	Preston	Final route segment	3.9	No change
11	Preston	Final route segment	2.1	No change
12a	Preston	Route segment considered but dismissed	1.7	Dismissed due to planned residential development discovered at the open houses
12b	Preston	Final route segment	1.6	Refined to reduce proximity to residential dwellings and reduce the number of sharp turn angles
13b	Preston	Route segment considered but dismissed	1.9	Dismissed due to infrastructure crossing considerations
28	Mineral	Final route segment	9.1	Refined to more closely parallel the existing transmission line based on landowner feedback received during open houses
29a	Mineral	Route segment considered but dismissed	4.8	Dismissed due to proximity to residential dwellings and crossing of a local park
29b	Mineral	Final route segment	4.7	Refined due to topographical constraints and to reduce the number of sharp turn angles
29c	Hampshire	Final route segment	13.4	Refined due to engineering considerations to reduce the number of sharp turn angles
30	Hampshire	Final route segment	4.3	Refined to more closely parallel the existing transmission line and follow property boundaries
30a	Hampshire	Final route segment	5.6	Refined to more closely parallel the existing transmission line based on stakeholder feedback during the open houses
30b	Hampshire	Route segment considered but dismissed	2.6	Dismissed due to increased greenfield development, sharp turn angles, and proximity to residential dwellings
31a	Hampshire	Route segment considered but dismissed	5.5	Dismissed due to sharp turn angles, proximity to residential dwellings, and to narrow the number of segments to more favorable routing options
31b	Hampshire	Final route segment	5.1	Refined due to engineering considerations to reduce the number of sharp turn angles
32a	Hampshire	Final route segment	1.0	Refined due to topographical constraints
32b	Hampshire	Route segment considered but dismissed	1.8	Dismissed due to crossing a new conservation easement discovered during the stakeholder engagement process
33a	Hampshire	Final route segment	5.4	Refined due to engineering considerations to reduce the number of sharp turn angles
33b	Hampshire	Final route segment	6.5	Refined to more closely parallel the existing transmission line and reduce the complexity of infrastructure crossings
34	Hampshire	Final route segment	0.2	No change
35	Hampshire	Final route segment	1.1	No change

Segment	County [a]	Status	Length (miles)	Notes
36a	Hampshire	Final route segment	1.3	Added to parallel the existing transmission line and reduce the number of 500 kV crossings
36b	Hampshire	Route segment considered but dismissed	1.6	Dismissed due to greenfield development and complexity of the existing transmission line crossings
Maryland				
13a	Garrett	Final route segment	8.7	Refined due to engineering considerations to reduce the number of sharp turn angles
13c	Garrett	Route segment considered but dismissed	1.8	Dismissed due to proximity to residential dwellings and to narrow the number of segments to more favorable routing options
13d	Garrett	Final route segment	8.8	Refined due to new residential development discovered during open houses and residential dwelling proximity when crossing the Youghiogheny River on the south side of the existing transmission line
14	Garrett	Final route segment	1.4	Refined due to infrastructure crossing considerations
21a	Garrett	Final route segment	1.9	Refined due to engineering and topographical constraints when crossing the Youghiogheny River
21b	Garrett	Route segment considered but dismissed	1.8	Dismissed due to proximity to residential dwellings and engineering and topographical constraints when crossing the Youghiogheny River
22a	Garrett	Final route segment	4.4	Refined due to proposed residential development discovered during open houses
22b	Garrett	Route segment considered but dismissed	3.7	Dismissed due to proposed residential development discovered during open houses
22c	Garrett	Final route segment	3.7	Refined to more closely parallel the existing transmission line through the Bear Creek Rural Legacy easement
22d	Garrett	Route segment considered but dismissed	5.6	Dismissed due to topographical constraints and greenfield development
23	Garrett	Final route segment	9.2	Refined due to engineering constraints and aerial blowout requirements near Big Run stream
23a	Garrett	Route segment considered but dismissed	2.0	Dismissed due to longer route length and greenfield development
24a	Garrett	Route segment considered but dismissed	2.8	Dismissed due to proposed residential development discovered during open houses
24b	Garrett	Route segment considered but dismissed	1.4	Dismissed due to greenfield Maryland Wildland crossing and proximity to Fairview Road residential dwellings

Segment	County [a]	Status	Length (miles)	Notes
24c	Garrett	Final route segment	2.8	Added to reduce impacts on residential dwellings near Fairview Road and to increase paralleling the existing transmission line
25b	Garrett	Final route segment	11.9	Refined due to topographical and engineering constraints while crossing Georges Creek and to more closely parallel the existing transmission line in response to landowner feedback
26	Garrett	Final route segment	1.7	Refined due to topographical constraints and to reduce the number of sharp turn angles
26a	Garrett	Route segment considered but dismissed	5.8	Dismissed due to longer route length
26b	Garrett	Final route segment	5.5	Refined due to topographical constraints and to reduce the number of sharp turn angles and reduce stream crossing impacts
25a	Allegany	Route segment considered but dismissed	13.1	Dismissed due to topographical constraints on the north side of the existing transmission line
27	Allegany	Final route segment	23.8	Refined due to topographical and new wind farm development constraints and to reduce the number of sharp turn angles
Virginia				
37a	Frederick	Final route segment	0.8	Refined due to engineering considerations to reduce the number of sharp turn angles
37b	Frederick	Final route segment	0.8	Refined due to engineering considerations to reduce the number of sharp turn angles
38a	Frederick	Route segment considered but dismissed	1.8	Dismissed due to proximity to residential dwellings and greenfield development
38b	Frederick	Route segment considered but dismissed	1.5	Dismissed due to proximity to residential dwellings
38c	Frederick	Final route segment	1.7	Added to more closely parallel the existing transmission line corridors on the south side
39	Frederick	Route segment considered but dismissed	6.0	Dismissed due to extensive greenfield development and longer route length

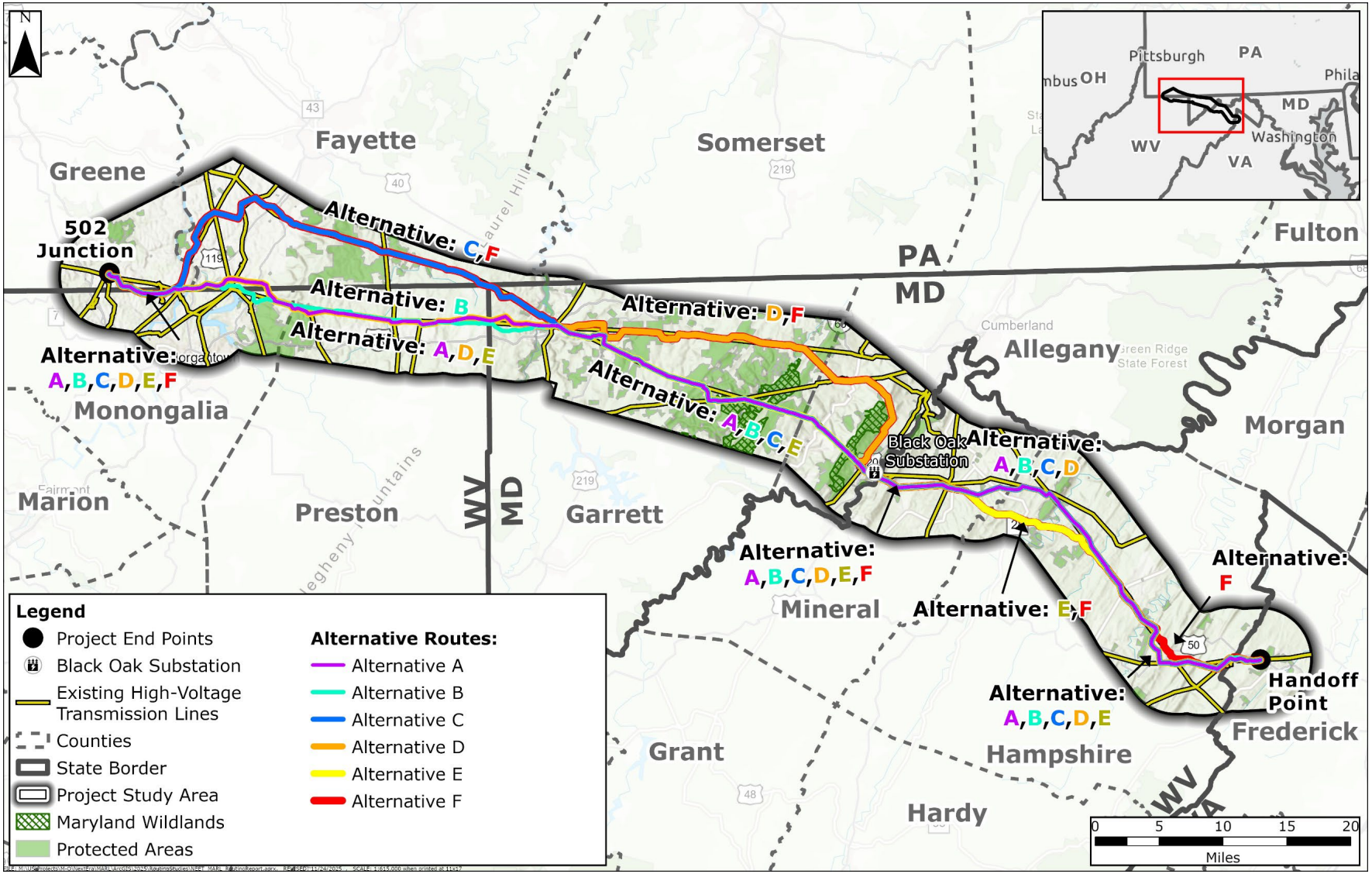
[a] Several route segments extend across county boundaries. The listed county represents the county in which the center point of the segment is located.

4.5 IDENTIFICATION OF FINAL ALTERNATIVE ROUTES

The Routing Team analyzed and combined the 49 route segments into six end-to-end Alternative Routes (A through F) for a detailed comparative analysis to ultimately determine a superior Proposed Route. From the more than 350 possible end-to-end routing combinations generated through the route segment analysis, a focused set of six representative alternatives was identified for detailed comparison. These six feasible Alternative Routes were selected to capture the full range of routing opportunities while minimizing overlap, making sure that each option meaningfully differed in terms of geographic alignment, land use context, and environmental setting. Selection emphasized routes that balanced engineering constructability with opportunities to avoid or reduce impacts on natural environmental and built environmental resources, cultural or social and/or recreational resources.

These six Alternative Routes (A through F) are described in the following sections and are shown on Figure 4.5-1. Appendix E-6, Alternative Routes Multi Panel, provides a detailed panel overview of the six feasible Alternative Routes that were identified by the Routing Team and Appendix E-7, Alternative Routes, provides a detailed mapbook of the MARL Project six feasible Alternative Routes that were identified by the Routing Team.

FIGURE 4.5-1 ALTERNATIVE ROUTES



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

4.5.1 ALTERNATIVE ROUTE A

Alternative Route A is comprised of route segments 1b, 2, 3b, 4a, 5a, 6a, 7c, 8e, 9c, 12b, 13a, 14, 22c, 23, 24c, 25b, 28, 29b, 30, 30a, 31b, 32a, 33b, 34, 35, 36a, 37b, and 38c. Alternative Route A was developed to parallel existing transmission lines and reduce greenfield sections to the extent possible. Alternative Route A parallels portions of the following transmission lines (listed in order from west to east):

- 502 Junction to Longview Power 500 kV Transmission Line
- Cheat Lake to Ruthbelle 138 kV Transmission Line
- Hazelton to Lake Lynn and Jennings to Hazelton 138 kV Transmission Lines
- Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line
- Carlos JCT to Garrett 138 kV Transmission Line
- Black Oak to Bedington 500 kV Transmission Line
- Hampshire to Ridgeley 138 kV Transmission Line
- French Mill to Hampshire 138 kV Transmission Line
- Hampshire to Stonewall 138 kV Transmission Line
- Mt. Storm to Doubs 500 kV Transmission Line

Alternative Route A is 107.5 miles long, crosses all four states (10.7 miles through Pennsylvania, 58.9 miles through West Virginia, 35.4 miles through Maryland, and 2.4 miles through Virginia), and requires 2,669.0 acres of ROW. Alternative Route A parallels existing transmission lines for 56.4 miles (52.5 percent of the total alignment) and proposes 51.0 miles of a greenfield section (47.5 percent of the total alignment). Alternative Route A crosses Coopers Rock State Forest, Youghiogheny River Lake and the Potomac Heritage Trail, Bear Creek Hatchery Fisheries Management Area (FMA), Savage River State Forest, including the associated Bear Pen and Big Savage Mountain Wildlands, Dans Mountain WMA and the associated Dans Mountain Wildlands, and the White Horse Mountain WMA—all of which have existing transmission lines that Alternative A parallels.

4.5.2 ALTERNATIVE ROUTE B

Alternative Route B is comprised of route segments 1b, 2, 3b, 4a, 5b, 8c, 11, 12b, 13d, 14, 22c, 23, 24c, 25b, 28, 29b, 30, 30a, 31b, 32a, 33b, 34, 35, 36a, 37a, and 38c. Alternative Route B was developed to traverse more into West Virginia, while paralleling the following existing transmission lines (listed in order from west to east):

- 502 Junction to Longview Power 500 kV Transmission Line
- Hazelton to Lake Lynn and Jennings to Hazelton 138 kV Transmission Line
- Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line
- Carlos JCT to Garrett 138 kV Transmission Line
- Black Oak to Bedington 500 kV Transmission Line
- Hampshire to Ridgeley 138 kV Transmission Line
- French Mill to Hampshire 138 kV Transmission Line

- Hampshire to Stonewall 138 kV Transmission Line
- Mt. Storm to Doubs 500 kV Transmission Line

Alternative Route B is 107.3 miles long, crosses all four states (8.5 miles through Pennsylvania, 60.9 miles through West Virginia, 35.5 miles through Maryland, and 2.4 miles through Virginia), and requires 2,671.4 acres of ROW. Alternative Route B parallels existing transmission lines for 59.7 miles (55.6 percent of the total alignment) and proposes 47.6 miles of a greenfield section (44.4 percent of the total alignment). Alternative Route B crosses Coopers Rock State Forest, Youghiogheny River Lake and the Potomac Heritage Trail, Bear Creek Hatchery FMA, Savage River State Forest, including the associated Bear Pen and Big Savage Mountain Wildlands, Dans Mountain WMA and the associated Dans Mountain Wildlands, and the White Horse Mountain WMA.

4.5.3 ALTERNATIVE ROUTE C

Alternative Route C is comprised of route segments 1b, 2, 3b, 15, 15a, 16, 17a, 18a, 19, 20b, 21a, 22c, 23, 24c, 25b, 28, 29b, 30, 30a, 31b, 32a, 33b, 34, 35, 36a, 37b, and 38c. Alternative Route C was developed to provide an alternative to crossing Coopers Rock State Forest and Preston County, West Virginia, while paralleling the existing 500 kV transmission lines in the northwestern quadrant of the MARL Project Study Area in Pennsylvania. Alternative Route C parallels portions of the following transmission lines (listed in order from west to east):

- 502 Junction to Longview Power 500 kV Transmission Line
- Ronco to Fort Martin 500 kV Transmission Line
- Hatfield’s Ferry Power Station to Black Oak 500 kV Transmission Line
- Carlos JCT to Garrett 138 kV Transmission Line
- Black Oak to Bedington 500 kV Transmission Line
- Hampshire to Ridgeley 138 kV Transmission Line
- French Mill to Hampshire 138 kV Transmission Line
- Hampshire to Stonewall 138 kV Transmission Line
- Mt. Storm to Doubs 500 kV Transmission Line

Alternative Route C is 113.6 miles long, crosses all four states (34.2 miles through Pennsylvania, 40.5 miles through West Virginia, 36.4 miles through Maryland, and 2.4 miles through Virginia), and requires 2,835.5 acres of ROW. Alternative Route C parallels existing transmission lines for 64.5 miles (56.8 percent of the total alignment) and proposes 49.1 miles of a greenfield section (43.2 percent of the total alignment). Alternative Route C crosses SGL 138, Forbes State Forest, Quebec Run Wild Area, Youghiogheny River Lake and the Potomac Heritage Trail, Bear Creek Hatchery FMA, Savage River State Forest, including the associated Bear Pen and Big Savage Mountain Wildlands, Dans Mountain WMA and the associated Dans Mountain Wildlands, and the White Horse Mountain WMA.

4.5.4 ALTERNATIVE ROUTE D

Alternative Route D is comprised of route segments 1b, 2, 3b, 4a, 5a, 6a, 7c, 8e, 9c, 12b, 13a, 14, 22a, 26, 26b, 27, 28, 29b, 30, 30a, 31b, 32a, 33b, 34, 35, 36a, 37b, and 38c. Alternative Route D was developed to provide an alternative that minimizes impacts on the Savage River

State Forest and associated Wildlands and Dan's Mountain WMA and associated Wildlands. Alternative Route D deviates from Alternative Routes A, B, and C after crossing the Youghiogheny River to continue paralleling the Jennings to Hazelton 138 kV transmission line traveling west to east, after which the route requires a large greenfield section traveling south to connect back to the existing transmission lines near Black Oak Substation. Alternative Route D parallels portions of the following transmission lines (listed in order from west to east):

- 502 Junction to Longview Power 500 kV Transmission Line
- Cheat Lake to Ruthbelle 138 kV Transmission Line
- Hazelton to Lake Lynn and Jennings to Hazelton 138 kV Transmission Line
- Frostburg to Jennings 138 kV Transmission Line
- Carlos JCT to Garrett 138 kV Transmission Line
- Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line
- Black Oak to Bedington 500 kV Transmission Line
- Hampshire to Ridgeley 138 kV Transmission Line
- French Mill to Hampshire 138 kV Transmission Line
- Hampshire to Stonewall 138 kV Transmission Line
- Mt. Storm to Doubs 500 kV Transmission Line

Alternative Route D is 115.2 miles, crosses all four states (10.7 miles through Pennsylvania, 58.9 miles through West Virginia, 43.2 miles through Maryland, and 2.4 miles through Virginia), and requires 2,839.0 acres of ROW. Alternative Route D parallels existing transmission lines for 43.1 miles (37.4 percent of the total alignment) and proposes 72.1 miles of a greenfield section (62.6 percent of the total alignment). Alternative Route D crosses Coopers Rock State Forest, Youghiogheny River Lake and the Potomac Heritage Trail, Savage River State Forest, Dans Mountain WMA, and the White Horse Mountain WMA.

4.5.5 ALTERNATIVE ROUTE E

Alternative Route E is comprised of route segments 1b, 2, 3b, 4a, 5a, 6a, 7c, 8e, 9c, 12b, 13a, 14, 22c, 23, 24c, 25b, 8, 29c, 31b, 32a, 33b, 34, 35, 36a, 37b, and 38c. Alternative Route E was developed to provide an alternative to crossing the White Horse Mountain WMA by routing a greenfield section traveling south of White Horse Mountain WMA and north of a grouping of agricultural conservation easements before crossing the South Branch of the Potomac River. Alternative Route D parallels portions of the following transmission lines (listed in order from west to east):

- 502 Junction to Longview Power 500 kV Transmission Line
- Cheat Lake to Ruthbelle 138 kV Transmission Line
- Hazelton to Lake Lynn and Jennings to Hazelton 138 kV Transmission Line
- Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line
- Carlos JCT to Garrett 138 kV Transmission Line
- Black Oak to Bedington 500 kV Transmission Line

- Hampshire to Ridgeley 138 kV Transmission Line
- French Mill to Hampshire 138 kV Transmission Line
- Hampshire to Stonewall 138 kV Transmission Line
- Mt. Storm to Doubs 500 kV Transmission Line

Alternative Route E is 106.3 miles, crosses all four states (10.7 miles through Pennsylvania, 57.8 miles through West Virginia, 35.4 miles through Maryland, and 2.4 miles through Virginia), and requires 2,651.5 acres of ROW. Alternative Route E parallels existing transmission lines for 50.8 miles (47.7 percent of the total alignment) and proposes 55.6 miles of a greenfield section (52.3 percent of the total alignment). Alternative Route E crosses Coopers Rock State Forest, Youghiogheny River Lake and the Potomac Heritage Trail, Bear Creek Hatchery FMA, Savage River State Forest, including the associated Bear Pen and Big Savage Mountain Wildlands, and Dan's Mountain WMA and the associated Dans Mountain Wildlands.

4.5.6 ALTERNATIVE ROUTE F

Alternative Route F is comprised of route segments 1b, 2, 3b, 15, 15a, 16, 17a, 18a, 19, 20b, 21a, 22a, 26, 26b, 27, 28, 29c, 31b, 32a, 33a, 34, 35, 36a, 37a, and 38c. Alternative Route F was developed to provide an alternative that parallels existing transmission lines in the northwest quadrant of the MARL Project Study Area, and avoid impacts on the Coopers Rock State Forest, Bear Pen Wildlands, Big Savage Mountain Wildlands, Dans Mountain Wildlands and White Horse Mountain WMA. Alternative Route F parallels portions of the following transmission lines (listed in order from west to east):

- 502 Junction to Longview Power 500 kV Transmission Line
- Ronco to Fort Martin 500 kV Transmission Line
- Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line
- Jennings to Hazelton and Frostburg to Jennings 138 kV Transmission Line
- Carlos JCT to Garrett 138 kV Transmission Line
- Black Oak to Bedington 500 kV Transmission Line
- Hampshire to Ridgeley 138 kV Transmission Line
- French Mill to Hampshire 138 kV Transmission Line
- Hampshire to Stonewall 138 kV Transmission Line
- Mt. Storm to Doubs 500 kV Transmission Line

Alternative Route F is 119.1 miles, crosses all four states (34.2 miles through Pennsylvania, 38.3 miles through West Virginia, 44.1 miles through Maryland, and 2.4 miles through Virginia), and requires 2,964.3 acres of ROW. Alternative Route F parallels existing transmission lines for 43.2 miles (36.3 percent of the total alignment) and proposes 75.9 miles of a greenfield section (63.7 percent of the total alignment). Alternative Route F crosses SGL 138, Forbes State Forest, Quebec Run Wild Area, Youghiogheny River Lake and the Potomac Heritage Trail, Savage River State Forest, and Dans Mountain WMA.

5. ALTERNATIVE ROUTE COMPARISON

Section 2 identifies the goal of the Routing Study for the MARL Project and the criteria and guidelines used for the development of route selection. The Routing Team recognizes that no single route can simultaneously minimize all potential impacts or eliminate the need for non-standard design elements. Routing decisions inherently involve trade-offs. For example, in forested regions, a route that avoids residential development may require extensive tree clearing, while a route that minimizes ecological disturbance may affect more dwellings.

Accordingly, the routing process aimed not to only reduce impacts across all resource categories, but also to achieve a balanced outcome when competing constraints cannot be avoided. This balance was achieved by a comparative evaluation of Alternative Routes, stakeholder input, and technical feasibility.

The multi-criteria evaluation (Table 2.7-1) for analysis of the Alternative Routes was a comprehensive process that integrated the natural environment, built environment, cultural resources, social resources, and engineering constructability to identify the superior and least impactful route. Each route was assessed using a robust framework outlined in Section 2.7. The Routing Team systematically compared the identified Alternative Routes across quantitative and qualitative measures, including route length and footprint; land use considerations such as paralleling existing infrastructure, impacts on communities, protected lands, cultural resources and land cover; natural environment considerations such as water resources, and ecological and sensitive species; engineering and infrastructure; and estimated costs.[11] This process achieved an optimal balance among all evaluation criteria and identified a Proposed Route that is superior to the five other Alternative Routes.

As outlined in Section 2.7, the Routing Team decided not to assign explicit numerical weights or scores to individual routing criteria. Instead, the Routing Team opted for a hybrid quantitative-qualitative approach on route selection based on a comprehensive and balanced assessment rather than rigid numerical weighting. Section 2.7 provides an explanation on why this approach was taken for the MARL Project. The sections below evaluate the Alternative Routes against the quantitative criteria outlined in Table 2.7-1. Using a combination of quantitative and qualitative information, each Alternative Route was assigned a category of performance:

- Superior—High performance for the listed criteria with low impacts on category resources relative to the other Alternative Routes.
- Moderate—Average performance for the listed criteria with moderate impacts on category resources relative to the other Alternative Routes.
- Inferior—Poor performance for the listed criteria with high impacts on category resources relative to the other Alternative Routes.

[11] In the sections below, "criteria" are the benchmarks used in the Alternatives Routes analysis. The criteria are Route Length, Construction Footprint, Paralleling Existing Infrastructure, Community and Recreational Resources, Protected Areas, Cultural Resources, Agricultural and Land Cover, Water Resources, Sensitive Species and Habitats, Engineering and Infrastructure, and Estimated Costs. "Metric" is used when discussing an individual measure within the criteria, e.g., number of parcels, number unique landowners, acreage of wetland resources.

The results of this analysis are discussed in detail in Sections 5.1 through 5.5 and are summarized in Section 5.6 to help provide clarity and transparency on the decision-making process for the selection of the Proposed Route. For consistent evaluation across multiple states, the Routing Team relied on MARL Project Study Area-wide datasets and, where possible, merged state-specific data for a more accurate comparison. For state-specific analysis, please refer to the Environmental Review Documents (Appendices A, B, C, and D).

5.1 ROUTE LENGTH AND CONSTRUCTION FOOTPRINT

Route length and construction footprint were evaluated to assess the physical scale and potential land disturbance associated with each Alternative Route. Route length reflects the total linear mileage of the transmission line, while construction footprint represents the area required for the ROW Corridor. These criteria helped to characterize the extent of land disturbance and the relative efficiency of each Alternative Route. The "efficiency" of an Alternative Route refers to its total length in comparison to the straight-line distance between two points, commonly described "as the crow flies." As shown on Figure 1.1-1, the MARL Project's straight-line distance between the two endpoints is 95.0 miles. Shorter routes with smaller footprints reduce impacts on the natural environment and built environment, provide cost savings, and improve efficiency and constructability.

Evaluating against these criteria helped identify Alternative Routes that balanced engineering feasibility and efficiency with natural environment and built environment considerations (Table 5.1-1).

TABLE 5.1-1 ROUTE LENGTH AND CONSTRUCTION FOOTPRINT EVALUATION CRITERIA

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Centerline Length	Miles	107.5	107.3	113.6	115.2	106.3	119.1
ROW Corridor	Acres	2,669.0	2,671.4	2,835.5	2,839.0	2,651.5	2,964.3

Alternative Route A

Alternative Route A had superior performance for route length and construction footprint evaluation criteria. It has a total centerline length of 107.5 miles and a ROW Corridor footprint of 2,669.0 acres. Among the six Alternative Routes, Alternative Route A is one of three that minimize both route length and area required for the ROW Corridor, supporting the MARL Project objective of reducing total disturbance while maintaining a technically feasible alignment.

Alternative Route B

Alternative Route B had superior performance for route length and construction footprint evaluation criteria. It has a total centerline length of 107.3 miles and a ROW Corridor footprint of 2,671.4 acres, nearly identical to Alternative Route A. These two routes performed comparably, with Alternative Route B being slightly shorter; however, it resulted in a marginally larger footprint (due to additional aerial easement blowout requirements).

Alternative Route C

Alternative Route C had moderate performance for route length and construction footprint evaluation criteria. It has a total centerline length of 113.6 miles and a ROW Corridor footprint of 2,835.5 acres. Alternative Route C is one of three routes that resulted in longer total centerline length and ROW Corridor. The longer centerline and larger footprint would result in greater overall disturbance. Alternative Route C overlaps with Alternative Route A for 75.2 miles (66.2 percent of total length) except for a 38.4-mile-long section in Greene and Fayette Counties, Pennsylvania, and Garrett County, Maryland, designed to parallel the existing 500 kV transmission lines in the northwest quadrant of the MARL Project Study Area. This resulted in an additional 6.1 miles of line length as compared to Alternative Route A.

Alternative Route D

Alternative Route D had moderate performance for route length and construction footprint evaluation criteria. It has a total centerline length of 115.2 miles and a ROW Corridor footprint of 2,839.0 acres. Alternative Route D has the second-longest route and second-largest total footprint evaluated. Alternative Route D overlaps with Alternative Route A for 77.7 miles (67.5 percent of total length) except in Maryland, where it deviates to avoid potential impacts on the Maryland Wildlands. This required an additional 7.7 miles of route length. As a result, Alternative Route D would have a larger impact on the natural environment and built environment relative to the shorter Alternative Routes.

Alternative Route E

Alternative Route E had superior performance for route length and construction footprint evaluation criteria. It is the shortest route (106.3 miles) and has the smallest ROW Corridor footprint (2,651.5 acres). Alternative Route E resulted in a reduction of 1.0 to 1.2 miles in total length, and a decrease in ROW Corridor area of 17.5 to 19.9 acres when compared to Alternative Routes A and B. Alternative Route E overlaps with Alternative Route A for 92.6 miles (87.1 percent of total length) except in Mineral and Hampshire Counties, West Virginia, to avoid potential impacts on White Horse Mountain WMA. While this results in a slightly shorter alignment (1.2 miles shorter), it does so with a higher percentage of greenfield development as shown in Section 5.2.1.

Alternative Route F

Alternative Route F had an inferior performance for route length and construction footprint evaluation criteria. At 119.1 miles and 2,964.3 acres of ROW Corridor, Alternative Route F is the longest and has the largest ROW Corridor of all Alternative Routes. Its greater linear extent and broader footprint would result in a higher overall land disturbance.

Superior Alternative Routes

Alternative Routes A, B, and E have the shortest route length and smallest ROW Corridor footprint. These routes vary by 1.2 miles in total length and less than 1 percent in ROW Corridor area, reflecting consistently compact and efficient alignments with reduced land disturbance. Alternative Route E achieved the shortest total distance and smallest footprint overall, while

Alternative Routes A and B were comparable in length and ROW Corridor, and fell within the same category of minimized impact.

Moderate and Inferior Alternative Routes

Alternative Route F had inferior performance, with the greatest total length and largest overall construction footprint of 7 to 12 percent greater than the best performing Alternative Routes (A, B, and E). Additionally, Alternative Routes C and D had moderate performance. Alternative Routes C, D, and F have broader ROW Corridor footprints and longer route alignments, resulting in lower performance than the other Alternative Routes.

5.2 LAND USE AND SOCIAL RESOURCES

The land use and social resources criteria used in the Alternative Routes evaluation covered many different topics and datasets. Each subsection below highlights groups of thematic information to provide a more nuanced and detailed review of each specific criterion.

5.2.1 PARALLELING EXISTING INFRASTRUCTURE

Paralleling new transmission facilities adjacent to established utility corridors helps reduce visual, natural environment, and built environment impacts by concentrating infrastructure within areas previously cleared by utility development. Where feasible, the Routing Team prioritized paralleling existing transmission lines to reduce impacts. Figure 2.1-2 provides an illustration of the MARL Project definition of paralleling. Benefits to paralleling are discussed in Section 2.1. Appendix E-8, Alternative Routes—Land Use and Social Resources—Paralleling, Community and Recreation, and Protected Areas, shows where each Alternative Route parallels existing transmission lines compared to where the Alternative Routes are greenfield development. Appendix J includes a Visual Impact Assessment conducted for the MARL Project.

The Routing Team evaluated each route for the following metrics associated with the Paralleling Existing Infrastructure evaluation criteria presented in Table 5.2-1:

- **Paralleling sections**—Evaluating both the percentage and total mileage of paralleling provided a balanced assessment of each route's efficiency. The percentage of paralleling allowed the Routing Team to compare routes on an equal basis, independent of overall route length, while the total mileage of paralleling highlighted the absolute extent of total paralleling along each Alternative Route. Section 2.1 provides the benefits of paralleling; each criteria evaluation section below, where appropriate, takes this into account.
- **Greenfield sections**—Similar to paralleling, the Routing Team also evaluated the total length and percentage of greenfield development. Alternative Routes with a high percentage of paralleling, but a longer section of greenfield development, might be less favorable than a route with a slightly lower percentage of paralleling.

TABLE 5.2-1 PARALLELING EXISTING INFRASTRUCTURE EVALUATION CRITERIA

Criteria	Alternative Route A		Alternative Route B		Alternative Route C		Alternative Route D		Alternative Route E		Alternative Route F	
	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%
Paralleling existing transmission lines [a]	56.4	52.5	59.7	55.6	64.5	56.8	43.1	37.4	50.8	47.7	43.2	36.3
Greenfield section development [b]	51.0	47.5	47.6	44.4	49.1	43.2	72.1	62.6	55.6	52.3	75.9	63.7
Paralleling railroad ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paralleling natural gas pipelines ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paralleling highways	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Rextag Infrastructure data

ROW = right-of-way

[a] Paralleling for the MARL Project is defined as siting the proposed transmission line so the MARL Project ROW Corridor abuts the existing transmission line corridor.

[b] Greenfield section for the MARL Project is defined as a section of the MARL Project ROW Corridor for any portion of the route that does not abut an existing transmission line corridor.

Alternative Route A

Alternative Route A had superior performance for paralleling existing infrastructure and greenfield development criteria. It achieved a strong balance between maximizing paralleling and minimizing total greenfield development. With 56.4 miles (52.5 percent) of paralleling existing transmission lines, Alternative Route A maintained a high overall paralleling ratio among all route options. With regards to greenfield development, Alternative Route A has a total greenfield length of 51.0 miles (47.5 percent).

Alternative Route B

Alternative Route B had superior performance for paralleling existing infrastructure and greenfield development criteria. It also achieved a strong balance between maximizing paralleling and minimizing greenfield development, with 59.7 miles (55.6 percent) of its length located along existing transmission lines. Alternative Route B maintained a high overall paralleling ratio among all the route options. Alternative Route B had a total greenfield development of 47.6 miles (44.4 percent). This alternative maximized paralleling of existing transmission lines while maintaining the shortest route length.

Alternative Route C

Alternative Route C had superior performance for paralleling existing infrastructure and greenfield development criteria. It achieved the highest percentage of paralleling with 56.8 percent (64.5 miles); however, this was achieved at the expense of a longer overall route. Alternative Route C resulted in a total greenfield length of 49.1 miles. Although the paralleling percentage is the highest overall, this route's total length and greater construction footprint offset some of those benefits.

Alternative Route D

Alternative Route D had inferior performance for paralleling existing infrastructure and greenfield development criteria. It has only 37.4 percent paralleling (43.1 miles) and the second-largest percentage for greenfield development at 62.6 percent (72.1 miles). Alternative Route D has the same alignment as Alternative Route A except in Maryland, where it deviates to avoid crossing through the Maryland Wildlands. Avoiding the Maryland Wildlands necessitates an additional 21.1 miles of greenfield development, for a total of 31.1 miles of greenfield development in Maryland compared to 10.0 miles of greenfield development for Alternative Route A in Maryland.

Alternative Route E

Alternative Route E had moderate performance for paralleling existing infrastructure and greenfield development criteria. It achieved less balance between maximizing paralleling and minimizing greenfield development with 47.7 percent paralleling (50.8 miles) and 52.3 percent greenfield (55.6 miles). Alternative Route E has the same alignment as Alternative Route A except in Mineral and Hampshire Counties, West Virginia, where the route deviates to avoid crossing through the White Horse Mountain WMA. Avoiding White Horse Mountain WMA necessitates an additional 4.6 miles of greenfield development in West Virginia compared to Alternative Route A.

While efficient in overall route length, Alternative Route E has a lower percentage of paralleling compared to the top three shortest routes (Alternative Route A, B, and E).

Alternative Route F

Alternative Route F had an inferior performance for paralleling existing infrastructure and greenfield development criteria. It has the lowest percentage of paralleling existing transmission lines (43.2 miles; 36.3 percent). Alternative Route F also had the highest total greenfield mileage with 75.9 miles (63.7 percent). These characteristics suggest greater potential visual, land use, and natural environment impacts compared to the other Alternative Routes.

Superior Alternative Routes

Alternative Routes A, B, and C exhibit the highest degrees of paralleling with existing transmission lines, ranging from 52.5 to 56.8 percent paralleling which is more than half of the route length. Alternative Route B has the best combination of total paralleling percent (55.6 percent) to total greenfield mileage with the lowest total greenfield mileage (47.6 miles). Alternative Route C had the highest percentage of paralleling existing transmission lines; however, it does so at a longer overall route length when compared to Alternative Routes A and B. While Alternative Route A had 3.3 fewer miles of paralleling than Alternative Route B, and 8.1 fewer miles of paralleling than Alternative Route C, it had similar total greenfield mileage compared to Alternative Route C (51.0 miles for Alternative Route A versus 49.1 miles for Alternative Route C). All three routes qualify as superior in terms of maximizing paralleling of existing transmission lines and minimizing total greenfield mileage.

Moderate and Inferior Alternative Routes

Alternative Routes D and F had an inferior performance in terms of paralleling, with less than 50 percent of their alignments paralleling with existing transmission lines, which resulted in substantially higher greenfield mileage. Alternative Route F performed the worst, with the lowest percentage of paralleling (36.3 percent) and the highest total greenfield length (75.9 miles). Alternative Route E performed moderately for these criteria.

5.2.2 COMMUNITY AND RECREATIONAL RESOURCES

Routing criteria for the MARL Project was developed to minimize impacts on the community and recreation resources. The resulting evaluation data are provided in Table 5.2-2 and shown on Appendix E-8. Key indicators included buildings—both residential and non-residential—located at varying distances from the route centerline, including within the ROW Corridor, within 250 feet of the centerline, and within 500 feet of the centerline. This provided a graduated view of potential impacts on the built environment. Within this category, residential dwellings were of particular concern and Alternative Routes were developed to minimize impacts, to the extent practical, on dwellings while balancing the goal of maximizing paralleling existing transmission lines. For the MARL Project, building footprints were digitized using high-resolution (3-inch) aerial imagery contracted by NEET MA and NEET VA and captured during leaf-off conditions between December 2023 and February 2024 and county property data. This dataset may not reflect proposed or recently built structures and could include classification errors inherent to desktop study limitations (e.g., forest cover, image resolution, interpretation of aerial data).

TABLE 5.2-2 COMMUNITY AND RECREATIONAL RESOURCES EVALUATION CRITERIA

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Parcels / unique landowners	Count	500	531	532	518	476	535
		388	403	405	394	367	399
Residential dwellings [a,b] within ROW Corridor/ 250 feet / 500 feet of centerline	Count	1	1	1	1	1	1
		29	40	29	37	26	42
		151	192	161	170	142	184
Residential outbuildings [a,c] within ROW Corridor / 250 feet / 500 feet of centerline	Count	6	6	9	7	5	9
		50	56	57	62	44	63
		273	286	280	308	222	269
Non-residential buildings [a,d] within ROW Corridor / 250 feet / 500 feet of centerline	Count	25	21	25	24	22	19
		74	68	79	81	58	67
		187	178	193	199	166	180
Places of worship within 500 feet of the centerline	Count	1	1	1	1	1	0
Childcare facilities within 500 feet of the centerline	Count	0	0	0	0	0	0
Public / private schools within 500 feet of centerline	Count	0	0	0	0	0	0
Trails crossings—Potomac Heritage National Scenic Trail and Hiking Trails	Count	3	3	3	2	3	2
		9	9	9	16	9	16
State Scenic Byways	Count	4	4	5	4	4	5

Source: ReportAll, HIFLD, MDOT, WVDOT, MDiMap, WVGISTC, PASDA, ERM

[a] Footprints were digitized using high-resolution (3-inch) aerial imagery contracted by NEET MA and NEET VA and captured during leaf-off conditions between December 2023 and February 2024 and county property data. This dataset may not reflect proposed or recently built structures and could include classification errors inherent to desktop study limitations (e.g., forest cover, image resolution, interpretation of aerial data).
[b] A residential dwelling is defined as a building used for people to live in and includes buildings such as single-family homes, multi-family units, mobile/manufactured homes, etc.
[c] A residential outbuilding is defined as a secondary structure located on the same property as a residential dwelling and includes buildings such as detached garages, sheds, greenhouses, etc.
[d] A non-residential building is defined as any structure located on a non-residential property and includes buildings used for commercial purposes industrial use, agricultural, community, or government.

Of note, there is one dwelling located within the ROW Corridor of all six Alternative Routes. This single dwelling, located in Hampshire County, West Virginia, was identified via field reconnaissance after open house route refinement. The Routing Team is currently investigating a solution to avoid direct impacts on this dwelling.

In addition to buildings, parcels, and landowners, the Routing Team also analyzed hiking trails, scenic byways, and community resources such as schools, childcare facilities, and places of worship. Appendix E-8 shows the community and recreational resources.

Alternative Route A

Alternative Route A was one of two routes, along with Alternative Route E, that had superior performance for community and recreational resources criteria. It consistently performed near the top across most metrics in this category. This route has the second-lowest number of unique landowners within the ROW Corridor, with 388 landowners across 500 parcels. In terms of residential proximity, Alternative Route A has the second-lowest number of residential dwellings within 500 feet of the centerline (151) and one of two routes with the second lowest within 250 feet (29), indicating limited direct impact on resident dwellings. The residential outbuildings count is also the second lowest among the Alternative Routes, further minimizing potential impacts on landowners. For non-residential buildings, Alternative Route A fell within the middle of the routes. Trail crossings, scenic byways, and places of worship are generally similar across all Alternative Routes.

Alternative Route B

Alternative Route B had inferior performance for community and recreational resources criteria. It has the highest number of residential dwellings within 500 feet of the centerline (192) and the second highest within 250 feet (40), highlighting its greater proximity to homes and the built environment in certain areas. This route has the second-highest number of unique landowners affected, with 403 landowners across 531 parcels (third highest). Additionally, Alternative Route B has the second-highest count of residential outbuildings within 500 feet of the centerline (286), further increasing potential landowner impacts. However, Alternative Route B performed well for non-residential buildings, with the second-lowest number among all Alternative Routes within 500 feet of the centerline (178). Trail crossings, scenic byways, and places of worship are generally similar across all Alternative Routes.

Alternative Route C

Alternative Route C had moderate performance for community and recreational resources criteria. It has the highest number of unique landowners (405) impacted by the ROW Corridor while crossing 532 unique parcels (second highest). Alternative Route C has the second-lowest number of residential dwellings within 250 feet of the centerline (29) and third-lowest number within 500 feet of the centerline (161). This route has the second-highest number of non-residential buildings within 500 feet of the centerline (193). Additionally, Alternative Route C crosses the highest number of scenic byways (5).

Alternative Route D

Alternative Route D had moderate performance for community and recreational resources criteria, with the metrics for parcels, unique landowners, and residential dwellings falling near the middle of the range compared to other Alternative Routes. However, Alternative Route D has the highest number of residential outbuildings (308) and non-residential buildings (199) located within 500 feet of the centerline, indicating a greater degree of proximity to built structures. While the counts for trail crossings, scenic byways, and places of worship are generally similar across the Alternative Routes, Alternative Route D has the highest total number of trail crossings overall (16); however, it crosses the Potomac Heritage National Scenic Trail twice, while most Alternative Routes cross this trail three times.

Alternative Route E

Alternative Route E was one of two routes, along with Alternative Route A, that had superior performance for community and recreational resources criteria. It has the lowest number of unique landowners (367) and crosses the lowest number of parcels (476). In terms of building proximity, Alternative Route E also has the lowest number of residential dwellings within 250 feet (26) and within 500 feet (142) of the centerline. Furthermore, this route has the fewest number of outbuildings and non-residential buildings within 250 and 500 feet of the centerline. Trail crossings, scenic byways, and places of worship are generally similar across all Alternative Routes.

Alternative Route F

Alternative Route F had inferior performance for community and recreational resources criteria. It crosses the greatest number of parcels (535); however, the number of unique landowners (399) affected is moderate compared to the other Alternative Routes. With respect to proximity to built features, Alternative Route F has the highest number of residential dwellings (42) and residential outbuildings (63) located within 250 feet of the centerline, indicating a greater degree of proximity to homes and associated structures. However, this route has the lowest count of non-residential buildings within the ROW Corridor and the second lowest within 250 feet. Similar to Alternative Route D, it has the highest number of trail crossings at 16; however, it crosses the Potomac Heritage National Scenic Trail twice, while most Alternative Routes cross this trail three times. Alternative Route F crosses the highest number of scenic byways (5).

Superior Alternative Routes

Alternative Routes A and E had superior performance in this category across most metrics and had the lowest number of impacts on the built environment. Focusing on residential proximity, these two Alternative Routes performed the best with Alternative Route E having the lowest number of residential dwellings within 250 feet and 500 feet of the centerline. Alternative Route A had the second-best performance regarding residential dwellings with the second-lowest proximity to dwellings within 250 feet and 500 feet of the centerline. Both Alternative Routes A and E also had the lowest proximity to residential outbuildings in addition to dwellings. Alternative Routes A and E had the lowest number of parcels and unique landowners crossed by the ROW Corridor, further indicating their smaller impact on the community and residents when compared to the other

Alternative Routes. These two Alternative Routes also performed well for trail crossings, scenic byways, and places of worship.

Moderate and Inferior Alternative Routes

Alternative Routes B and F had inferior performance because they have the largest impact on the built environment and notably the largest impact on residential dwellings within 250 feet of the centerline (40 and 42, respectively) and residential dwellings within 500 feet of the centerline (192 and 184, respectively). Additionally, Alternative Route B has the second-highest number of unique landowners crossed by the ROW Corridor (403). Alternative Route F crosses through the highest number of parcels (535) and highest number of hiking trails (16). Alternative Routes C and D had moderate performance with the third and fourth highest number of residential dwellings within 500 feet (161 and 170, respectively).

5.2.3 PROTECTED AREAS

Avoiding protected lands, including designated areas such as state forests, WMAs, FMAs, Maryland Wildlands, conservation easements, and recreational areas managed by the USACE, was part of the siting criteria used for the MARL Project. By minimizing potential impacts on these protected areas, the Routing Team was able to minimize impacts on sensitive ecological resources and the likelihood of cumbersome environmental permitting. Due to the location of these resources throughout the MARL Project Study Area as well as the fact that the existing transmission lines cross through these resources, all Alternative Routes cross the Youghiogheny River Lake, the Potomac Heritage National Scenic Trail, and the Maryland Savage River State Forest. However, some Alternative Routes were designed to avoid crossing through these resources, resulting in trade-offs with potential impacts. Alternative Routes C and F avoid crossing Coopers Rock State Forest in West Virigina, and Alternative Routes A, B, D, and E avoid crossing Pennsylvania SGL 138, Forbes State Forest, and Quebec Run Wild Area. Alternative Routes E and F also avoid crossing the White Horse Mountain WMA. Alternative Routes D and F avoid crossing through Maryland Wildlands associated with Savage River State Forest and Dan’s Mountain WMA.

Alternative Routes A, B, C, and E cross two privately owned conservation easements that are part of Maryland’s Rural Legacy Program. The Routing Team is working with the landowners of these conservation easements. The Routing Team made concerted efforts to minimize crossing protected lands, where possible, and avoid crossing conservation easements. As shown in this report, Alternative Routes were developed to reduce the impact on these resources. When crossing protected lands, the Routing Team focused, where feasible, on paralleling existing transmission lines. The Routing Team evaluated each Alternative Route for the criteria presented in Table 5.2-3 and as shown on Appendix E-8. In addition, Table 5.2-4 details the specific protected lands each Alternative Route crosses and any existing transmissions lines paralleled within the protected lands.

TABLE 5.2-3 PROTECTED LAND EVALUATION CRITERIA

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
State Forest	Count	2	2	2	2	2	2
	Miles	9.7	9.6	11.1	9.9	9.7	11.3
	Acres	248.3	246.1	281.4	245.6	248.3	278.7
State Park	Count	0	0	0	0	0	0
	Miles	0.0	0.0	0.0	0.0	0.0	0.0
	Acres	0.0	0.0	0.0	0.0	0.0	0.0
Fisheries / Wildlife Management Area	Count	3	3	3	2	2	1
	Miles	3.1	3.1	3.1	3.3	2.5	2.7
	Acres	75.8	75.8	75.8	79.1	61.0	64.2
Pennsylvania State Wilderness Area	Count	0	0	1	0	0	1
	Miles	0.0	0.0	0.2	0.0	0.0	0.2
	Acres	0.0	0.0	3.6	0.0	0.0	3.6
Pennsylvania State Game Lands	Count	0	0	1	0	0	1
	Miles	0.0	0.0	0.8	0.0	0.0	0.8
	Acres	0.0	0.0	20.0	0.0	0.0	20.0
Maryland Wildlands	Count	3	3	3	0	3	0
	Miles	2.4	2.4	2.4	0.0	2.4	0.0
	Acres	57.0	57.0	57.0	0.0	57.0	0.0
Conservation Easements	Count	3	3	3	1	2	0
	Miles	2.2	2.2	2.2	0.6	1.7	0.0
	Acres	55.2	55.2	55.2	14.9	40.4	0.0
USACE Recreation Areas	Count	1	1	1	1	1	1
	Miles	0.1	0.1	0.4	0.1	0.1	0.4
	Acres	3.9	4.3	14.3	3.9	3.9	14.3

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Total Protected Lands [a,b]	Count	8	8	10	5	7	6
	Miles	14.6	14.5	17.2	13.3	14.0	15.3
	Acres	368.4	366.6	435.5	328.6	353.5	380.9

Source: PAD-US, NCED, MDNR, MDiMAP, PASDA, WVDEP, VADCR

WMA = Wildlife Management Area; WVDNR = West Virginia Division of Natural Resources

[a] Total protected lands excludes the Maryland Wildlands to avoid double counting since Wildlands are within a state forest or WMA. In addition, White Horse Mountain WMA has an associated conservation easement. The White Horse Mountain WMA is a 1,725-acre conservation and recreation area located in Hampshire County, West Virginia, and is managed by the WVDNR. The Potomac Conservancy held a conservation easement on White Horse Mountain to protect it from development and transferred ownership to WVDNR to manage the land as a public recreation area and WMA. The statistics associated with White Horse Mountain WMA are included in both the "Conservation Easements" and "Fisheries / Wildlife Management Area" categories but are not double counted in total impact calculations.

[b] Totals may not match the sum of addends due to rounding.

TABLE 5.2-4 SPECIFIC PROTECTED LANDS CROSSED BY THE ALTERNATIVE ROUTES

Specific Protected Area [a]	State	Existing Transmission Line Corridor in Resource?	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Coopers Rock State Forest	WV	Yes—138 kV	Yes	Yes	No	Yes	Yes	No
State Game Lands 138	PA	Yes—500 kV	No	No	Yes	No	No	Yes
Forbes State Forest	PA	Yes—500 kV	No	No	Yes	No	No	Yes
Quebec Run Wild Area	PA	Yes—500 kV	No	No	Yes	No	No	Yes
Youghiogheny River Lake Recreation Area (USACE)	MD	Yes—500 kV and 138 kV	Yes	Yes	Yes	Yes	Yes	Yes
Maryland Rural Legacy Property (Bear Creek RL-0396)	MD	Yes—500 kV	Yes	Yes	Yes	No	Yes	No
Maryland Rural Legacy Property (Bear Creek RL-35354)	MD	Yes—500 kV	Yes	Yes	Yes	No	Yes	No
Bear Creek Hatchery FMA	MD	Yes—500 kV	Yes	Yes	Yes	No	Yes	No
Savage River State Forest	MD	Yes—500 kV and two 138 kV	Yes	Yes	Yes	Yes	Yes	Yes
Bear Pen Wildlands	MD	Yes—138 kV	Yes	Yes	Yes	No	Yes	No
Big Savage Mountain Wildlands	MD	Yes—500 kV and 138 kV	Yes	Yes	Yes	No	Yes	No
Dan’s Mountain WMA	MD	Yes—500 kV and 138 kV	Yes	Yes	Yes	Yes	Yes	Yes
Dan’s Mountain Wildlands	MD	Yes—500 kV	Yes	Yes	Yes	No	Yes	No
White Horse Mountain WMA	WV	Yes—500 kV and 138 kV	Yes	Yes	Yes	Yes	No	No

Source: PAD-US, NCED, MDNR, MDiMAP, PASDA, WVDEP, VADCR

FMA = Fisheries Management Area; kV = kilovolt; MD = Maryland; PA = Pennsylvania; USACE = U.S. Army Corps of Engineers; WMA = Wildlife Management Area; WV = West Virginia

[a] Protected area listed west to east.

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Alternative Route A

Alternative Route A parallels existing transmission lines through the following resources: Coopers Rock State Forest, the Youghiogheny River Lake Recreation Area (USACE), two Bear Creek Rural Legacy conservation easements, Bear Creek Hatchery FMA, Savage River State Forest, Bear Pen Wildlands, Big Savage Mountain Wildlands, Dan's Mountain WMA and Wildlands, and White Horse Mountain WMA. Alternative Route A avoided crossing through SGL 138, Forbes State Forest and Quebec Run Wild Area.

Alternative Route A had moderate performance for protected areas criteria. It is one of two routes with the second-lowest mileage (9.7 miles) of crossings through state forest lands and is one of three routes with the lowest acreage (3.9 acres) of impact within the USACE-managed Youghiogheny River Lake Recreation Area. However, like Alternative Routes B, C, and E, Alternative Route A crosses the Maryland Wildlands and two Rural Legacy conservation easements. While Alternative Route A crosses the Maryland Wildlands, the Routing Team designed the crossing to parallel the existing transmission line and maintain a ROW Corridor width of 200 feet based on statutory requirements. In total, Alternative Route A crosses eight protected land areas over 14.6 miles (368.4 acres), placing it near the middle of the Alternative Routes in terms of overall protected land acreage disturbance.

Alternative Route B

Similar to Alternative Route A, Alternative Route B parallels existing transmission lines through the following resources: Coopers Rock State Forest, the Youghiogheny River Lake Recreation Area (USACE), two Bear Creek Rural Legacy conservation easements, Bear Creek Hatchery FMA, Savage River State Forest, Bear Pen Wildlands, Big Savage Mountain Wildlands, Dan's Mountain WMA and Wildlands, and White Horse Mountain WMA. Alternative Route B avoids crossing SGL 138, Forbes State Forest and Quebec Run Wild Area.

Alternative Route B had a moderate performance for protected areas criteria (similar to Alternative Route A) with slightly higher impacts (4.3 acres) to the USACE-managed Youghiogheny River Lake Recreation Area. However, like Alternative Routes A, C, and E, Alternative Route B crosses the Maryland Wildlands and two Rural Legacy conservation easements. While Alternative Route B crosses the Maryland Wildlands, the Routing Team designed the crossing to parallel the existing transmission line and maintain a ROW Corridor width of 200 feet based on statutory requirements. In total, Alternative Route B crosses eight protected land areas over 14.5 miles (366.6 acres), placing it near the middle of the Alternative Routes in terms of overall protected land acreage disturbance.

Alternative Route C

Alternative Route C parallels existing transmission lines through the following resources: SGL 138, Forbes State Forest, Quebec Run Wild Area, the Youghiogheny River Lake Recreation Area (USACE), two Bear Creek Rural Legacy conservation easements, Bear Creek Hatchery FMA, Savage River State Forest, Bear Pen Wildlands, Big Savage Mountain Wildlands, Dan's Mountain WMA and Wildlands, and White Horse Mountain WMA. Alternative Route C avoids crossing Coopers

Rock State Forest by paralleling existing 500 kV transmission lines in the northwest quadrant of the MARL Project Study Area in Pennsylvania.

Alternative Route C had an inferior performance for protected areas criteria. It has the highest impacts in comparison to the other Alternative Routes. In total, it crosses ten protected lands totaling 17.2 miles and 435.5 acres of impact. However, like other Alternative Routes, Alternative Route C parallels existing transmission lines through these protected resources. Similar to Alternative Routes A, B, and E, Alternative Route C crosses the Maryland Wildlands and two Rural Legacy conservation easements. While Alternative Route C crosses the Maryland Wildlands, the Routing Team designed the crossing to parallel the existing transmission line and maintain a ROW Corridor width of 200 feet based on statutory requirements.

Alternative Route D

Alternative Route D parallels existing transmission lines through the following resources: Coopers Rock State Forest, the Youghiogheny River Lake Recreation Area (USACE), Savage River State Forest, Dan's Mountain WMA (greenfield section), and White Horse Mountain WMA. Alternative Route D avoids crossing SGL 138, Forbes State Forest, Quebec Run Wild Area, Bear Pen Wildlands, Big Savage Mountain Wildlands, and Dan's Mountain Wildlands.

Alternative Route D had superior performance for protected areas criteria. It has the lowest total impact on protected lands by crossing five protected lands totaling 13.3 miles and 328.6 acres. However, Alternative Route D does so because of a higher percentage of greenfield development and longer overall route length. Avoiding the Maryland Wildlands necessitates an additional 21.1 miles of greenfield development in Maryland and an additional 7.7 miles of total line length in Maryland compared to Alternative Routes A and E.

Alternative Route E

Alternative Route E parallels existing transmission lines through the following resources: Coopers Rock State Forest, the Youghiogheny River Lake Recreation Area (USACE), two Rural Legacy conservation easements, Bear Creek Hatchery FMA, Savage River State Forest, Bear Pen Wildlands, Big Savage Mountain Wildlands, and Dan's Mountain WMA and Wildlands. Alternative Route E avoids crossing White Horse Mountain WMA by routing a greenfield section further south.

Alternative Route E had moderate performance for protected areas criteria. It has average total mileage (14.0 miles) and acreage (353.5 acres) through seven protected lands. Similar to Alternative Routes A, B, and C, Alternative Route E crosses the Maryland Wildlands and two Rural Legacy conservation easements. While Alternative Route E crosses the Maryland Wildlands, the Routing Team designed the crossing to parallel the existing transmission line and maintain a ROW Corridor width of 200 feet based on statutory requirements.

Alternative Route F

Alternative Route F parallels existing transmission lines through the following resources: SGL 138, Forbes State Forest, Quebec Run Wild Area, the Youghiogheny River Lake Recreation Area (USACE), Savage River State Forest, and Dan's Mountain WMA. Alternative Route F avoids crossing Coopers Rock State Forest by paralleling an existing 500 kV transmission line in the

northwest quadrant of the MARL Project Study Area in Pennsylvania, and avoids crossing the Maryland Wildlands by routing north via a large greenfield segment. Alternative Route F also avoids White Horse Mountain WMA by routing a greenfield section to the south.

Alternative Route F had moderate performance for protected areas criteria. It has the second-highest impact on protected areas with a total of 15.3 miles and 380.9 acres. Additionally, it has the highest state forest lands crossed by miles (11.3 miles), the second-lowest impacts on WMA, and no impacts on Maryland Wildlands and conservation easements. While Alternative Route F avoids these resources it did so with trade-offs of more miles of greenfield development to navigate around these resources, resulting in the lowest amount of parallelling existing transmission lines (36.3 percent).

Superior Alternative Routes

Alternative Route D demonstrated the lowest overall impact on protected lands compared to the other Alternative Routes. While all Alternative Routes cross through protected lands, Alternative Route D did so while paralleling existing transmission lines, and has the fewest number (5), and results in the lowest mileage (13.3 miles) and acreage (328.6 acres) of protected lands. This reduced impact on protected lands could result in less permitting requirements and potentially fewer ecological impacts. However, avoiding the Maryland Wildlands necessitates an additional 21.1 miles of greenfield development in Maryland and an additional 7.7 miles of total line length in Maryland compared to Alternative Routes A and E.

Moderate and Inferior Alternative Routes

Alternative Route C had inferior performance and exhibited the greatest level of impact on protected lands, both in mileage (17.2 miles), number of crossed areas (10), and the largest acreage of impact (435.5 acres). These higher impacts on protected lands could result in more permitting, more ecological impacts, and increased mitigation requirements and ecological impacts. Alternative Routes A, B, E, and F had a moderate performance across these criteria, with all four having average total acreage of impacts (368.4, 366.6, 353.5, and 380.9, respectively) and average count of crossings (8, 8, 7, and 6, respectively).

5.2.4 CULTURAL RESOURCES

The evaluation of cultural resources along the Alternative Routes is an important component of the MARL Project's siting process, by making sure that historic, archaeological, and community assets are identified and protected. Each route was assessed for proximity to NRHP listed or eligible resources, and National Historic Landmark (NHL) listed resources. These included archaeological sites, architectural resources, historic districts, cemeteries, and battlefields. Assessment was also made of designated heritage areas and historic easements. The Routing Team consulted each state's historic preservation offices to obtain relevant data, as well as relevant federal databases to conduct the analysis. The Routing Team evaluated each route for the criteria presented in Table 5.2-5 and shown on Appendix E-9, Alternative Routes—Land Use and Social Resources—Cultural Resources.

TABLE 5.2-5 CULTURAL RESOURCES EVALUATION CRITERIA

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Cemeteries within ROW Corridor; 500 feet of centerline	Count	0	0	0	0	0	0
		4	5	4	4	4	3
Archaeological Resources within ROW Corridor	Count	6	7	6	5	6	5
Architecture Resources—NRHP eligible, NRHP listed, or NHL listed within ROW Corridor; 0.5-mile buffer from centerline	Count	4	4	4	4	4	4
		7	10	13	6	7	12
Historic Districts Crossed	Count	6	5	4	6	6	4
Battlefields	Count	1	1	1	1	1	1
	Acres	38.0	38.0	38.0	38.0	38.0	12.9
MD—Heritage Areas	Count	1	1	1	1	1	1
	Acres	128.3	140.0	120.4	164.1	128.3	156.1

Source: PASHPO, WVSHPO, MHT, VADHR

MD = Maryland; NHL = National Historic Landmarks; NRHP = National Register of Historic Places; ROW = right-of-way

Alternative Route A

Alternative Route A had superior performance for cultural resources criteria. It is one of four that has the second-lowest number of cemeteries within 500 feet of the centerline (4) and one of three routes that has the second-lowest number of archaeological resources within the ROW Corridor (6). All Alternative Routes cross the same number of NRHP-eligible/NRHP-listed/NHL-listed resources within the ROW Corridor (4); however, Alternative Route A is one of two routes that has the second-lowest number of architecture resources within 0.5-mile of the centerline (7). It is one of three routes that has the highest number of historic districts crossed (6), along with Alternative Routes D and E. All Alternative Routes cross one Maryland heritage area (Mountain Maryland Gateway to the West Heritage Area), with Alternative Route A being one of two routes having the second-lowest amount of Maryland heritage areas within the ROW Corridor (128.3 acres). Additionally, all Alternative Routes cross one battlefield site (Hanging Rock), located in Capon Bridge, Hampshire County, West Virginia. Alternative Routes A, B, C, D, and E parallel an existing transmission line through the eastern corner of Hanging Rock Battlefield, and all have the same amount of acreage impacts (38.0 acres).

Alternative Route B

Alternative Route B had moderate performance for cultural resources criteria. It has the highest number of cemeteries within 500 feet of the centerline (5) and archaeological resources within the ROW Corridor (7). Alternative Route B also had moderate performance for architecture resources within 0.5-mile of the centerline. It crossed the second-lowest number of historic districts (5). Additionally, Alternative Route B crossed the one Maryland heritage area (Mountain Maryland Gateway to the West Heritage Area), with this route having the third-highest amount within the ROW Corridor (140.0 acres). Alternative Routes A, B, C, D, and E parallel an existing transmission line through the eastern corner of Hanging Rock Battlefield, and all have the same amount of acreage impacts (38.0 acres).

Alternative Route C

Alternative Route C had inferior performance for cultural resources criteria. For cemeteries within 500 feet of the centerline and archaeological resources within the ROW Corridor, Alternative Route C performed similar to Alternative Route A. Alternative Route C crossed the highest number of architecture resources within 0.5-mile of the centerline (13). Alternative Route C was one of two routes that crossed the lowest number of historic districts (4) and had the least impact on Mountain Maryland Gateway to the West Heritage Area. However, Alternative Route C crosses near one NHL, Friendship Hill National Historic Site in Point Marion, Fayette County, Pennsylvania. Alternative Routes A, B, C, D, and E parallel an existing transmission line through the eastern corner of Hanging Rock Battlefield, and all have the same amount of acreage impacts (38.0 acres).

Alternative Route D

Alternative Route D had superior performance for cultural resources criteria, falling near the top across most metrics. Alternative Route D is one of two routes that crosses the lowest number of archaeological resources (5) and one of four routes that had the second-lowest number of

cemeteries (4). Alternative Route D crosses the lowest number of NRHP-eligible/NRHP-listed/NHL-listed resources within 0.5-mile (6) of the centerline. However, the route is one of three routes that crosses the highest number of historic districts (6) and had the highest amount of Mountain Maryland Gateway to the West Heritage Area within the ROW Corridor (164.1 acres). Alternative Routes A, B, C, D, and E parallel an existing transmission line through the eastern corner of Hanging Rock Battlefield, and all have the same amount of acreage impacts (38.0 acres).

Alternative Route E

Alternative Route E had superior performance for cultural resources criteria. Its impacts are identical to Alternative Route A. It crosses the same number of cemeteries (4), archaeological resources (6), and historic districts (6). Alternative Route E is one of two routes that has the second-lowest number of architecture resources within 0.5-mile of the centerline (7). The impacts on Mountain Maryland Gateway to the West Heritage Area are identical to Alternative Route A, with 128.3 acres within the ROW Corridor. Alternative Routes A, B, C, and D, and E parallel an existing transmission line through the eastern corner of Hanging Rock Battlefield, and all have the same amount of acreage impacts (38.0 acres).

Alternative Route F

Alternative Route F had an inferior performance for cultural resources criteria. It has the second-highest count within 0.5-mile of the centerline (12). However, Alternative F provides the smallest impact on the Hanging Rock Battlefield by crossing 12.9 acres of the site and has the lowest number of cemeteries with 500 feet of the centerline (3). Alternative Route F is one of two routes that has lowest count of archaeological resources within the ROW Corridor (5) and historic districts crossed (4). Alternative Route F had the second-highest amount of Mountain Maryland Gateway to the West Heritage Area within the ROW Corridor, and crosses near one NHL, Friendship Hill National Historic Site in Point Marion, Fayette County, Pennsylvania.

Superior Alternative Routes

Alternative Routes A, D, and E provide the lowest impact on cultural resources. While the variability among cultural data is minimal, these Alternative Routes cross the second-lowest number of cemeteries (4) and have a low number of impacts on archaeological resources and architecture resources. Alternative Route D slightly outperformed Alternative Route A. However, Alternative Route D has the highest impact on heritage areas, impacting 35.8 acres more of Mountain Maryland Gateway to the West Heritage Area.

Moderate and Inferior Alternative Routes

Alternative Routes C and F had inferior performance and have the highest impacts on cultural resources. The variability among cultural data is minimal, but these Alternative Routes performed slightly worse than the other Alternative Routes. Alternative Routes C and F cross the highest number of architecture resources within 0.5-mile of the centerline. While Alternative Route F provided the lowest impact on the Hanging Rock Battlefield, and Alternative Route C provided the lowest impact on the Mountain Maryland Gateway to the West Heritage Area, both Alternative Routes cross near an NHL, Friendship Hill National Historic Site. Alternative Route B had moderate

performance, with Alternative Route B having the highest impacts on cemeteries and archaeological resources.

5.2.5 AGRICULTURAL AND LAND COVER

Agricultural lands within the MARL Project Study Area range from prime farmland—characterized by exceptional soil quality and productivity—to less fertile soils that may still hold local significance. Land cover refers to the varying footprints of an area and may be developed (e.g., residential and commercial land uses) and undeveloped areas (e.g., forested, pastureland, wetlands). Together, agricultural land classifications and land cover data provide a basis for evaluating how a project may affect soils, water resources, aquatic habitats and species, wetlands, floodplains, vegetation, wildlife, and special-status species. For example, forested vegetation may be converted to herbaceous or scrub/shrub land cover for the duration of the MARL Project.

To minimize new fragmentation of forested habitat, the MARL Project has been designed to parallel existing transmission line ROWs to the greatest extent practicable. Agricultural lands located within the ROW Corridor—many of which are also found along paralleling opportunities—would be temporarily unavailable for agricultural production during construction. However, once the MARL Project is in operation, most farming activities could continue to occur within the ROW Corridor in coordination with the landowners. This may result in short-term impacts on farming operations, including crop harvesting and grazing. However, agricultural activities will generally be permitted to resume during operation, and no long-term change in land cover is anticipated.

Each Alternative Route presents a distinct footprint and associated level of impact on agricultural lands and land cover. The analysis considers factors such as soil quality, crop productivity, and the extent of forest, wetland, and pastureland crossed. Routes with larger total acreage within the ROW Corridor generally correlate with greater impacts. Alternative Routes A, B, and E provide the least impact on the total footprint because of the lower ROW Corridor acres required for the routes, whereas Alternative Routes C, D, and F provide greater impacts. The Routing Team evaluated each route for the following criteria presented in Table 5.2-6 and Table 5.2-7 and as shown on Appendix E-10, Alternative Routes—Land Use and Social Resources—Agricultural and Land Cover.

TABLE 5.2-6 AGRICULTURAL LAND EVALUATION CRITERIA

Agricultural Land	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Not Prime Farmland Class	Acres	1,789.5	1,780.9	1,926.7	1,895.7	1,782.4	2,033.6
State Importance Farmland Class	Acres	389.7	411.7	325.7	426.1	379.7	338.8
Local Importance Farmland Class	Acres	399.3	399.7	399.3	399.3	389.2	369.1
Prime Farmland Class	Acres	90.4	79.1	183.8	101.0	100.2	205.8

Source: USA SSURGO

TABLE 5.2-7 LAND COVER EVALUATION CRITERIA

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Barren Land (Rock/Sand/Clay)	Acres	20.2	25.2	21.4	29.9	20.2	31.0
Cultivated Crops	Acres	45.4	61.6	41.7	39.5	45.4	35.9
Deciduous Forest	Acres	1,836.0	1,821.8	1,927.6	1,906.3	1,820.5	1,960.4
Developed, High Intensity	Acres	0.0	0.0	1.3	0.0	0.0	1.3
Developed, Low Intensity	Acres	16.2	18.2	19.5	14.1	15.4	16.2
Developed, Medium Intensity	Acres	2.0	1.4	5.3	2.0	2.0	5.3
Developed, Open Space	Acres	82.2	84.1	86.4	85.0	80.3	91.7
Emergent Herbaceous Wetlands	Acres	0.0	0.0	2.2	0.0	0.0	2.2
Evergreen Forest	Acres	24.0	27.1	26.1	27.1	15.3	18.8
Grassland/Herbaceous	Acres	25.3	32.0	13.7	35.8	27.1	27.4
Mixed Forest	Acres	171.4	171.8	191.3	184.6	166.9	198.8
Open Water	Acres	13.0	13.7	8.1	13.0	14.3	9.6
Pasture/Hay	Acres	415.7	399.2	466.8	478.5	426.7	536.3
Shrub/Scrub	Acres	15.3	12.9	13.1	17.8	15.0	15.4
Woody Wetlands	Acres	2.5	2.5	11.1	5.5	2.5	14.1
Forest Lands Total [a] (Deciduous Forest, Evergreen Forest, and Mixed Forest)	Acres	2,031.4	2,020.7	2,145.0	2,118.0	2,002.7	2,178.0
Agricultural Lands Total [a] (Pasture/Hay and Cultivated Crops)	Acres	461.1	460.8	508.5	518.0	472.1	572.2
Developed Lands Total [a] (High, Low, Medium, Open Space)	Acres	100.4	103.7	112.5	101.1	97.7	114.5

Source: USGS NLCD 2024

[a] Totals may not match the sum of addends due to rounding.

Alternative Route A

Alternative Route A had superior performance for agricultural and land cover criteria. It has the second-smallest ROW Corridor (2,669.0 acres) and therefore would have less impact on select land cover than the longer Alternative Routes C, D, and F. Alternative Route A provides the second-lowest amount of agricultural land acreage within the ROW Corridor (461.1 acres), the third-lowest amount of forested land acreage within the ROW Corridor (2,031.4 acres) and the second-lowest amount of prime farmland acreage within the ROW Corridor (90.4 acres). Developed lands were similar across all Alternative Routes.

Alternative Route B

Alternative Route B had superior performance for agricultural and land cover criteria. It has the third-smallest ROW Corridor (2,671.4 acres) and therefore would have less impact on select land cover than the longer Alternative Routes C, D, and F. Alternative Route B has the lowest amount of agricultural land acreage within the ROW Corridor (460.8 acres), the second-lowest amount of forested land acreage within the ROW Corridor (2,020.7 acres) and the lowest amount of prime farmland in the ROW Corridor (79.1 acres). Developed lands were similar across all Alternative Routes.

Alternative Route C

Alternative Route C had inferior performance for agricultural and land cover criteria. It has the third-largest ROW Corridor (2,835.5 acres) and therefore would have more impact on select land cover than other Alternative Routes. Alternative Route C also has the third-highest amount of agricultural land acreage within the ROW Corridor (508.5 acres), the second-highest amount of forested land acreage within the ROW Corridor (2,145.0 acres) and the second-highest amount of prime farmland within the ROW Corridor (183.8 acres). Developed lands were similar across all Alternative Routes.

Alternative Route D

Alternative Route D had moderate performance for agricultural and land cover criteria. It has the second-largest ROW Corridor (2,839.0 acres) and therefore would have more impact on select land cover than other Alternative Routes. Alternative Route D has the second-highest amount of agricultural land acreage within the ROW Corridor (518.0 acres), but has the fourth-lowest amount of forested land acreage within the ROW Corridor (2,118.0 acres) and the fourth-lowest amount of prime farmland in the ROW Corridor (101.0 acres). Developed lands were similar across all Alternative Routes.

Alternative Route E

Alternative Route E had superior performance for agricultural and land cover criteria. It has the smallest ROW Corridor (2,651.5 acres) and therefore would have less impact on select land cover than the longer Alternative Routes C, D, and F. Alternative Route E has the third-lowest agricultural land acreage within the ROW Corridor (472.1 acres) and the lowest amount of forested land acreage within the ROW Corridor (2,002.7 acres). Developed lands were similar across all Alternative Routes.

Alternative Route F

Alternative Route F had inferior performance for agricultural and land cover criteria. It has the largest ROW Corridor (2,964.3 acres) and therefore would have more impact on select land cover than other Alternative Routes. Alternative Route F has the highest amount of agricultural land acreage within the ROW Corridor (572.2 acres), the highest amount of forested land acreage within the ROW Corridor (2,178.0 acres) and the highest amount of prime farmland within the ROW Corridor (205.8 acres). Developed lands were similar across all Alternative Routes.

Superior Alternative Routes

Alternative Routes A, B, and E have the lowest impacts on agricultural and forested lands and are three of the smaller ROW Corridors as well as three of the shortest alignments proposed. Alternative Routes A and B also include the highest percentage of paralleling existing transmission lines. Therefore, crossing these land cover types—forested and/or agricultural lands—minimizes potential additional habitat fragmentation and/or conflicting uses with agricultural lands. Overall, these three routes are less impactful to various land covers, and their shorter lengths have less overall impact on the existing environment.

Moderate and Inferior Alternative Routes

Alternative Routes C and F have the highest impacts on agricultural and forested lands, are two or the larger ROW Corridors, and are the two longest alignments proposed. Alternative Routes C and F are the two routes with the least percentage of paralleling and include more greenfield development, thereby increasing the impact on habitat fragmentation, conversion of forested habitat type, and potential conflicting uses with agricultural lands. Alternative Route D had moderate performance.

5.3 NATURAL ENVIRONMENT

The natural environment criteria used in the Alternative Routes evaluation covered many different environmental features and datasets. Each subsection below highlights groups of information for a detailed review of these topics.

5.3.1 WATER RESOURCES

Assessing the potential impact of transmission lines on water resources is essential because these areas provide critical ecological functions, support recreational uses, and are subject to additional permitting requirements and/or mitigation measures. The Routing Team prioritized minimizing impacts on sensitive water resources within the MARL Project Study Area, including coldwater fisheries and trout streams, wetlands, and floodplains. For consistent evaluation across multiple states, the team relied on study-area-wide datasets and, where possible, merged state-specific data for a more accurate comparison. This included merging trout stream and coldwater fishery data from individual state databases, which included the following datasets:

- Pennsylvania:
  - Class A Trout Streams
  - Naturally Reproducing Trout Streams

    - Wilderness Trout Streams
    - Designated Use Streams for Coldwater Fishes, Exceptional Value, High Quality, and Trout Stocking
- West Virginia:
    - Trout Streams
- Maryland:
    - Maryland Department of Natural Resources Trout Stock Streams
    - Designated Use III: Nontidal Cold Water—Natural Trout Water
    - Designated Use III-P: Nontidal Cold Water and Public Water Supply
    - Designated Use IV: Recreational Trout Waters
    - Designated Use IV-P: Recreational Trout Waters and Public Water Supply
- Virginia:
    - Virginia Water Quality Standards Trout Streams and Rivers

Some state-specific databases and details are presented in Table 5.3-1. Reducing impacts on water resources not only preserves natural ecosystems but also helps to reduce permitting processes. Where possible, the Routing Team attempted to parallel existing transmission lines across waterbodies to avoid additional habitat fragmentation and/or removal of canopy cover for these streams to minimize impacts on the species within the streams. Additionally, where feasible, the Routing Team proposed placing transmission structures peak to peak, to potentially reduce forested habitat as well as forested riparian buffers from being impacted. At these locations—referred to as riparian habitat exclusion zones—engineering solutions were developed to retain existing riparian vegetation within 100 feet on either side of the center of the stream. No vegetation clearing or ground disturbance will occur within these zones. These riparian habitat exclusion zones are discussed in more detail in Section 6.3.

All Alternative Routes cross some of the same large waterbodies. Where feasible, the Routing Team developed Alternative Routes that parallel existing transmission lines while crossing these large waterbodies. The waterbodies and crossing types for each Alternative Route are listed in Table 5.3-1. Notably, Alternative Route B is the only Alternative Route that crosses both the Cheat River and Cheat Lake (the impounded area south of the Lake Lynn Dam). Impacts on Cheat Lake can also be considered an impact on both land use and water resources as it is an area surrounded by campgrounds, trails, and other recreational, commercial, and residential developments. The Routing Team evaluated each route for the criteria presented in Table 5.3-2 and as shown on Appendix E-11, Alternative Routes—Natural Environment—Water Resources, which shows study-area-wide datasets for water resources. For more specific analysis on state-specific resources, please refer to the Environmental Review Documents (Appendices A, B, C, and D).

TABLE 5.3-1 WATERBODIES AND CROSSING TYPES FOR EACH ALTERNATIVE ROUTE

Large Waterbody [a]	State	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Monongahela River	PA	Greenfield crossing south of Point Marion Lock and Dam	Same as Alternative Route A	Greenfield crossing north of Point Marion Lock and Dam	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route C
Cheat River (north of Lake Lynn Dam)	PA	Greenfield crossing 0.8 mile north of Lake Lynn Dam	Greenfield crossing 0.3 mile north of Lake Lynn Dam	Does not cross	Same as Alternative Route A	Same as Alternative Route A	Does not cross
Cheat Lake (impounded area south of Lake Lynn Dam)	WV	Does not cross	Greenfield crossing	Does not cross	Does not cross	Does not cross	Does not cross
Georges Creek	PA	Does not cross	Does not cross	Greenfield crossing	Does not cross	Does not cross	Greenfield crossing
Big Sandy Creek	WV	Crossing parallel to existing 138 kV corridor northside	Crossing parallel to existing 138 kV corridor southside	Does not cross	Same as Alternative Route A	Same as Alternative Route A	Does not cross
Youghiogheny River	MD	Crossing parallel to existing 138 kV corridor	Same as Alternative Route A	Crossing parallel to existing 500 kV corridor	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route C
Savage River	MD	Crossing parallel to existing 500 kV corridor	Same as Alternative Route A	Same as Alternative Route A	Greenfield crossing	Same as Alternative Route A	Greenfield crossing
Georges Creek	MD	Crossing parallel to existing 500 kV corridor	Same as Alternative Route A	Same as Alternative Route A	Crossing parallel to existing 138 kV corridor	Same as Alternative Route A	Crossing parallel to existing 138 kV corridor
North Branch Potomac River	MD/WV	Crossing parallel to existing 138 kV corridor	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A
Patterson Creek	WV	Greenfield crossing	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A

Large Waterbody [a]	State	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
South Branch Potomac River	WV	Crossing within 500 feet to an existing 138 kV corridor	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Greenfield crossing	Greenfield crossing
North River	WV	Greenfield crossing	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative A	Same as Alternative Route A
Cacapon River	WV	Crossing parallel to existing 138 kV corridor	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A	Same as Alternative Route A

Source: USGS NHD

kV = kilovolt; MD = Maryland; NHD = National Hydrography Dataset; PA = Pennsylvania; WV = West Virginia

[a] Large waterbodies are defined as polygon areas in the NHD

TABLE 5.3-2 WATER RESOURCES CRITERIA

Water Resources	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
NHD Stream/River—Perennial	Count	81	77	76	99	79	93
	Corridor Length (feet)	27,326.6	26,002.9	24,614.3	30,557.4	27,231.4	27,948.3
NHD Stream/River—Intermittent	Count	37	37	47	37	37	43
	Corridor Length (feet)	9,911.6	9,403.4	13,628.2	9,911.6	9,663.1	12,156.6
NHD Waterbody	Count	14	12	13	17	13	14
	Area (acres)	4.2	5.2	5.0	6.6	4.1	7.1
Section 10 Navigable Waters	Count	3	3	2	3	3	2
Trout Streams and Coldwater Fisheries (all states) [a]	Count	39	33	50	50	39	61
	Corridor Length (feet)	13,513.2	10,950.6	16,728.8	15,891.5	13,512.9	19,350.3
PA Trout Streams	Count	1	0	2	1	1	2
	Corridor Length (feet)	258.2	0.0	729.4	258.2	258.2	729.4
WV Trout Streams	Count	7	7	3	7	7	3
	Corridor Length (feet)	1,821.7	1,867.9	703.6	1,821.7	1,821.7	946.9
VA Trout Streams	Count	0	0	0	0	0	0
	Corridor Length (feet)	0.0	0.0	0.0	0.0	0.0	0.0
PA—Designated Use Streams (CWF, EV, HQ, TSF)	Count	3	1	17	3	3	17
	Corridor Length (feet)	1,556.0	20.6	4,794.7	1,556.0	1,555.7	4,794.7
MD—Designated Use Streams (Use III and III-P: Nontidal Cold Water and Public Water Supply)	Count	27	24	27	38	27	38
	Corridor Length (feet)	9,410.2	8,595.0	10,034.0	12,043.5	9,410.2	12,667.3
MD—Designated Use Streams (Use IV and IV-P: Recreational Trout Waters and Public Water Supply)	Count	1	1	1	1	1	1
	Corridor Length (feet)	467.1	467.1	467.1	212.1	467.1	212.1

Water Resources	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
VA—Threatened & Endangered Species Waters	Count	1	1	1	1	1	1
	Corridor Length (feet)	438.6	438.6	438.6	438.6	438.6	438.6
WV—Mussel Streams	Count	8	8	6	8	8	6
	Corridor Length (feet)	2,221.3	2,218.3	1,612.8	2,221.3	2,394.1	1,996.5
MD—Designated Use Streams (Use I and I-P Water Contact Recreation, Protection of Aquatic Live, and Public Water Supply)	Count	1	1	1	5	1	5
	Corridor Length (feet)	264.6	264.6	264.6	1,117.1	264.6	1,117.1
Modeled Wetlands [b]	Acres	42.6	43.1	59.6	43.3	44.8	63.0
NWI—All Types [a]	Acres	42.7	43.6	53.9	48.8	44.1	62.8
NWI—Freshwater Emergent	Acres	3.9	3.6	5.3	3.4	3.7	5.0
NWI—Freshwater Shrub Scrub	Acres	11.7	10.9	20.8	15.9	11.8	26.1
NWI—Freshwater Pond	Acres	3.9	5.6	4.1	5.1	3.1	4.5
NWI—Lake	Acres	0.0	1.8	0.0	0.0	0.0	0.0
NWI—Riverine	Acres	23.2	21.6	23.7	24.4	25.6	27.2
WV—DEP Wetlands	Acres	8.0	9.3	5.6	8.0	10.4	7.9
MD—DNR Wetlands of Special Concern	Acres	0.0	0.0	0.0	0.0	0.0	0.0
MD—DNR Wetlands	Acres	5.7	4.3	5.2	7.0	5.7	6.5
FEMA Flood Zone A/AE/AO—Areas with a 1% annual chance of flooding (100-year flood area)	Acres	98.4	103.5	109.1	97.3	103.3	115.3
	Structure Count	8	8	7	9	7	7
FEMA Flood Zone X—Areas with 0.2% annual chance of flooding (500-year flood area)	Acres	3.5	3.5	4.0	3.0	5.0	5.1
	Structure Count	0	0	0	0	1	1
FEMA Flood Zones Combined [a]	Acres	101.9	107.0	113.1	100.3	108.3	120.4

Source: USGS NHD, FEMA's National Flood Hazard Layer (NFHL), USFWS, MDE, PFBC, PADEP, WVDNR, VADWR

CWF = Coldwater Fishes; DEP = Department of Environmental Protection; DNR = Department of Natural Resources; EV = Exceptional Value; FEMA = Federal Emergency Management Agency; HQ = High Quality; MD = Maryland; NHD = National Hydrography Dataset; NWI = National Wetlands Inventory; PA = Pennsylvania; TSF = Trout Stocking; VA = Virginia; WV = West Virginia

[a] Totals may not match the sum of addends due to rounding.

[b] ERM conducted a deep learning model to predict wetlands in the MARL Project Study Area. See Appendix H, Wetland Identification Model Report.

Alternative Route A

Alternative Route A had superior performance for water resources criteria. It has the lowest impact on modeled wetlands (42.6 acres) and National Wetlands Inventory (NWI) wetlands (42.7 acres). The route also has the second-lowest impact on National Hydrography Dataset waterbodies with 4.2 acres within the ROW Corridor and is one of two routes with the second-lowest number of trout stream crossings and coldwater fisheries, with 39 crossings and 13,513.2 feet. In addition, Alternative Route A has the second-lowest acreage of floodplains within the ROW Corridor (101.9 acres).

Alternative Route B

Alternative Route B had superior performance for water resources criteria. It has the second-lowest number of perennial stream crossings (77) and the smallest number of trout stream crossings and coldwater fisheries (33) as well as linear feet (10,950.6). This route has the second-lowest impact by acres on both modeled and NWI wetlands but has the lowest acreage of impact on NWI freshwater shrub scrub wetlands. In addition, Alternative Route B has the third-lowest acreage of floodplains within the ROW Corridor (107.0 acres).

Alternative Route C

Alternative Route C had inferior performance for water resources criteria. It has the second-highest impact by acres on both modeled and NWI wetlands (59.6 acres and 53.9 acres, respectively). However, Alternative Route C has the lowest linear feet of perennial streams within the ROW Corridor (24,614.3) but was one of two routes with the second-highest number of crossings of trout streams and coldwater fisheries (50 crossings and 16,728.8 linear feet). In addition, Alternative Route C has the second-highest acreage of floodplains within the ROW Corridor (113.1 acres).

Alternative Route D

Alternative Route D had moderate performance for water resources criteria. It has the highest number and linear feet of perennial stream crossings (99 and 30,557.4). Alternative Route D has the third-lowest impact by acres on modeled wetlands (43.3 acres) but has the fourth lowest for NWI wetlands (48.8 acres). However, Alternative Route D is one of two routes with the second-highest number of trout stream crossings and coldwater fisheries (50 crossings and 15,891.5 linear feet). Alternative Route D has the second-lowest acreage of floodplains within the ROW Corridor (100.3 acres).

Alternative Route E

Alternative Route E had moderate performance for water resources criteria. It is one of two routes with the lowest number of on trout stream crossings and coldwater fisheries, with 39 crossings and 13,512.9 linear feet. Alternative Route E has the third-lowest impact by acres on NWI wetlands (44.1 acres) and the fourth lowest for modeled wetlands (44.8 acres). Alternative Route E has the third-largest acreage of floodplains within the ROW Corridor (108.3 acres).

Alternative Route F

Alternative Route F had inferior performance for water resources criteria. It has the highest overall impact on water resources, and generally poor performance across these criteria. It has the second-highest impacts on perennial streams with 93 crossings and 27,948.3 linear feet within the ROW Corridor. In addition, it has the highest number of crossings and linear feet of trout streams and coldwater fisheries within the ROW Corridor, with almost twice the level of impacts on sensitive streams compared to Alternative Route B. This route has the highest impact on both modeled and NWI wetlands within the ROW Corridor compared to the other Alternative Routes. Alternative Route F has the highest acreage of floodplains within the ROW Corridor (120.4 acres).

Superior Alternative Routes

Alternative Routes A and B had the best performance across water resources and generally have the lowest impacts on water resources. Alternative Route B has the smallest number of trout streams and coldwater fisheries crossings and Alternative Route A is one of two routes with the second-smallest number of trout streams and coldwater fisheries crossings. In addition, Alternative Route A performed well with the lowest impact on wetlands; Alternative Route B has the second-lowest impact on wetlands. Overall, these two routes have the lowest impacts on water resources, likely due to their short length and small footprint relative to the other Alternative Routes.

Moderate and Inferior Alternative Routes

Alternative Routes C and F performed poorly across water resources with the highest impacts on streams, wetlands, and floodplains. Of these two Alternative Routes, Alternative Route F had the worst performance across most water resources with the largest impacts on wetlands and trout streams and coldwater fisheries compared to the other five Alternative Routes. Alternative Routes D and E had moderate performance across water resources.

5.3.2 SENSITIVE SPECIES AND HABITATS

Impacts on sensitive ecological resources, including impacts on known occupied individual species habitats, potentially suitable habitat for sensitive species, and sensitive habitat types have been minimized to the extent practicable across all Alternative Routes.

For consistent evaluation of impacts on these resources across multiple states, the Routing Team relied on study-area-wide datasets and, where possible, merged state-specific data for a more accurate comparison across the various Alternative Routes. This included merging known state- and federally listed species occurrence data from each state. However, there are multiple state-specific datasets that cannot be merged; these are presented in Table 5.3-3. The variability in state-specific information created challenges in evaluating Alternative Routes that cross four different states, with varying lengths in each state.

TABLE 5.3-3 SENSITIVE SPECIES AND HABITATS

Ecological Resources	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
USFWS Critical Habitat Final	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
USFWS Critical Habitat Proposed	Area (acres)	0.9	0.9	0.9	0.9	0.9	0.9
State-listed Species Occurrence (from state NHI Element Occurrence Data)	Area (acres)	235.1	237.5	228.4	235.5	197.4	183.5
Potentially Suitable State-listed Species, MBTA, and Foraging Bat Habitat	Area (acres)	2,650.8	2,651.8	2,809.5	2,823.0	2,634.2	2,941.5
Potentially Suitable Monarch Butterfly	Area (acres)	538.4	528.2	582.2	617.1	549.1	673.0
Bat Known Occupied Summer Habitat (all states)	Area (acres)	104.3	104.3	104.3	179.4	104.3	179.4
Bat Hibernacula (all states)	Area (acres)	388.9	388.8	420.3	388.9	388.8	420.3
Potentially Suitable Bat Roosting Habitat	Area (acres)	2,033.9	2,023.1	2,156.1	2,123.5	2,005.2	2,192.1
MD—Irreplaceable Natural Areas	Count	11	11	11	7	11	7
MD—Irreplaceable Natural Areas	Area (acres)	88.7	88.7	88.7	49.9	88.7	49.9
MD—Forest Interior Dwelling Species Confirmed	Area (acres)	0.0	0.0	0.0	5.3	0.0	5.3
MD—Forest Interior Dwelling Species Probable	Area (acres)	83.0	99.5	105.7	134.4	83.0	157.1
MD—Natural Heritage Areas	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
MD—Forests of Recognized Importance	Count	27	25	27	31	27	31
MD—Forests of Recognized Importance	Area (acres)	38.9	35.8	40.7	44.5	38.9	46.3
MD—Federal or State-Listed Species	Area (acres)	268.7	271.1	284.0	242.9	268.7	258.2
MD—Species of Concern	Area (acres)	7.2	7.2	7.2	36.6	7.2	36.6
MD—BioNet Tier 1 (critically significant)	Area (acres)	96.1	92.7	97.7	51.8	96.1	53.4
MD—BioNet Tier 2 (Extremely Significant)	Area (acres)	70.8	70.8	85.3	31.2	70.8	5.7
MD—BioNet Tier 3 (Highly Significant)	Area (acres)	345.1	351.2	339.9	534.9	345.1	529.7
MD—BioNet Tier 4 (Moderately Significant)	Area (acres)	226.3	209.3	240.9	195.0	226.3	209.0
MD—BioNet Tier 5 (Significant)	Area (acres)	76.9	89.1	103.1	117.7	76.9	144.0
PA—Natural Heritage Areas	Area (acres)	32.4	30.5	120.0	32.4	32.4	120.0
VA—Ecological Core C1 (Outstanding)	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
VA—Ecological Core C2 (Very High)	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
VA—Ecological Core C3 (High)	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
VA—Ecological Core C4 (Moderate)	Area (acres)	24.4	24.4	24.4	24.4	24.4	24.4
VA—Ecological Core C5 (General)	Area (acres)	50.0	46.5	50.0	50.0	50.0	46.5

Source: USFWS, USGS, WVDNR, MDNR, VADWR, PNHP, PADCNR

BioNet = Biodiversity Conservation Network; MBTA = Migratory Bird Treaty Act; MD = Maryland; NHI = National Heritage Inventory; PA = Pennsylvania; USFWS = U.S. Fish and Wildlife Service; VA = Virginia

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Potentially suitable and known occupied habitats that are currently compatible with a maintained ROW (i.e., non-forested) would be temporarily unavailable to sensitive species that rely upon these habitats during construction. This may result in short-term impacts on species that use these habitats; however, individuals would be expected to return to the area following construction, and no long-term change in habitat suitability would be anticipated. Potentially suitable and known occupied forested habitats would be converted to herbaceous and shrub/scrub habitats and would no longer be available to species that use forested habitats.

Each Alternative Route presents a distinct footprint and associated level of impact on sensitive species and/or their habitats. Alternative Routes with larger total acreage within the ROW Corridor generally correlate with greater impacts. Alternative Routes A, B, and E provide the least impact on the total footprint because of their lower ROW Corridor acres, whereas Alternative Routes C, D, and F provide greater impacts. The Routing Team evaluated each route for the following criteria presented in Table 5.3-3 and as shown on Appendix E-12, Alternative Routes—Natural Environment—Sensitive Species and Habitat, which shows study-area-wide datasets for sensitive species and habitat resources. For more specific analysis on state-specific resources please refer to the Environmental Review Documents (Appendices A, B, C, and D), which also includes agency coordination for each respective state.

Alternative Route A

Alternative Route A had superior performance for sensitive species and habitat criteria. Alternative Route A has the second-lowest acreage for potentially suitable state-listed species, Migratory Bird Treaty Act (MBTA), and foraging bat habitat (2,650.8 acres) and also the second-lowest acreage for potentially suitable monarch butterfly habitat (538.4 acres). It has the fourth-lowest acreage within the ROW Corridor for state-listed species occurrence (235.1 acres) This route is one of four with the lowest acreage (104.3 acres) for bat known occupied summer habitat, one of four with the lowest acreage for bat hibernacula (388.9 acres), and third lowest for potentially suitable bat roosting habitat (2,033.9 acres).

Alternative Route B

Similar to Alternative Route A, Alternative Route B had superior performance for sensitive species and habitat criteria. While Alternative Route B has the highest acreage within the ROW Corridor for state-listed species occurrence (237.5 acres) it has the third-lowest acreage amount for potentially suitable state-listed species, MBTA, and foraging bat habitat (2,651.8 acres); the lowest acreage for potentially suitable monarch butterfly habitat (528.2 acres); one of four routes with the lowest acreage (104.3 acres) for bat known occupied summer habitat; one of four with the lowest acreage for bat hibernacula (388.8 acres); and second-lowest acreage for potentially suitable bat roosting habitat (2,023.1 acres).

Alternative Route C

Alternative Route C had moderate performance for sensitive species and habitat criteria. Alternative Route C has the third-lowest acreage within the ROW Corridor for state-listed species occurrence (228.4 acres); the fourth-lowest acreage for potentially suitable state-listed species, MBTA, and foraging bat habitat (2,809.5 acres); and the fourth-lowest acreage for potentially

suitable monarch butterfly habitat (582.2 acres). This route is one of four with the lowest acreage (104.3 acres) for bat known occupied summer habitat but is one of two routes with the largest acreage for bat hibernacula (420.3 acres) due primarily to its proximity to three known bat locations in Pennsylvania and the associated bat hibernation buffers. It also has the second-largest acreage impact for potentially suitable bat roosting habitat (2,156.1 acres).

Alternative Route D

Alternative Route D had inferior performance for sensitive species and habitat criteria. Alternative Route D has generally the second-largest impact acreage for state-listed species occurrence (235.5 acres); potentially suitable state-listed species, MBTA, and foraging bat habitat (2,823.0 acres); potentially suitable monarch butterfly habitat (617.1 acres); and bat known occupied summer habitat (179.4 acres). In addition, Alternative Route D has the third-largest impact on potentially suitable bat roosting habitat (2,123.5 acres) but is one of four routes with the lowest impact on bat hibernacula (388.9 acres).

Alternative Route E

Alternative Route E had superior performance for sensitive species and habitat criteria. Alternative Route E has the second-lowest acreage within the ROW Corridor for state-listed species occurrence (197.5 acres) and the lowest acreage for potentially suitable state-listed species, MBTA, and foraging bat habitat (2,634.2 acres). Alternative Route E has the third-lowest acreage for potentially suitable monarch butterfly habitat (549.1 acres), similar to Alternative Route A. This route is one of four with the lowest acreage (104.3 acres) for bat known occupied summer habitat, one of four for the lowest for bat hibernacula (388.8 acres), and lowest for potentially suitable bat roosting habitat (2,005.2 acres).

Alternative Route F

Alternative Route F had inferior performance for sensitive species and habitat criteria. Alternative Route F generally has the largest impact acreage for all criteria but has the lowest acreage for state-listed species occurrence.

Superior Alternative Routes

Alternative Routes A, B, and E demonstrated superior performance across multiple sensitive species and habitat criteria within the ROW Corridor. These routes consistently had the lowest or among the lowest acreage impacts on sensitive species habitats, including potentially suitable state-listed species, MBTA, monarch butterfly, foraging bat and roosting bat habitats. All three routes shared the lowest acreage (104.3 acres) for bat known occupied summer habitat and were among the lowest for bat hibernacula (388.8–388.9 acres).

Moderate and Inferior Alternative Routes

Alternative Routes D and F demonstrated inferior performance across the multiple sensitive species and habitat criteria. Although Alternative Route F has the lowest acreage for state-listed species occurrence (183.5 acres), it has the highest total acreage for potentially suitable state-listed species, MBTA, and foraging bat habitat; monarch butterfly habitat; bat known occupied

summer habitat; bat hibernacula; and potentially suitable bat roosting habitat. These cumulative impacts place Alternative Routes D and F as the least favorable options from a sensitive species and habitat standpoint. Alternative Route C had moderate performance.

5.4 ENGINEERING AND INFRASTRUCTURE

The engineering and infrastructure criteria used in the Alternative Routes evaluation are essential for selecting a Proposed Route that balances minimizing impacts on the natural environment and built environment while still maintaining Project feasibility through reduced technical complexity in design and construction considerations. Each Alternative Route introduces unique challenges, including the number of existing high-voltage transmission line crossings, structural turn angles, terrain steepness, and proximity to other infrastructure. For instance, Alternative Routes that have a higher number of existing high-voltage 500 KV transmission line crossings present unique engineering and logistical challenges (e.g., potential need for an outage). The MARL Project Study Area has mountainous terrain, and engineering a transmission line with steeper slopes may require specialized structure designs, longer span lengths, potentially more outages during construction, and increased construction effort, as well as longer access roads for construction and/or operation. To minimize impacts on the community, the Alternative Routes require navigating around the built-up environment. This may have resulted in the introduction of sharp turn angles that require more complex structure types, which increase costs. Additionally, proximity to oil and gas wells, pipelines, and karst features introduces the need for detailed geotechnical and safety assessments. By systematically comparing these variables, the Routing Team assessed the Alternative Routes that minimize the technical, engineering, and construction challenges. The Routing Team evaluated each Alternative Route for the criteria presented in Table 5.4-1 and as shown on Appendix E-13, Alternative Routes—Engineering and Infrastructure.

TABLE 5.4-1 ENGINEERING AND INFRASTRUCTURE CRITERIA

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Existing Transmission Line Crossings							
Electric Transmission Line Unknown kV Crossing	Count	11	10	13	10	11	12
Electric Transmission Line 69 kV Crossing	Count	0	0	0	0	0	0
Electric Transmission Line 115 kV Crossing	Count	1	1	1	1	1	1
Electric Transmission Line 132 kV Crossing	Count	1	1	0	1	1	0
Electric Transmission Line 138 kV Crossing	Count	21	22	17	23	19	15
Electric Transmission Line 500 kV Crossing	Count	7	7	11	7	7	11
Structures and Designs							
Number of Structures	Count	452	452	478	492	446	519
Structures with Turn Angles 0–20 degrees	Count	361	346	374	383	352	390
Structures with Turn Angles 20–30 degrees	Count	41	47	51	50	46	68
Structures with Turn Angles greater than 30 degrees	Count	50	59	53	59	48	61
Span Length Greater than 1,600 feet	Count	33	42	31	34	39	38
Topography							
Very Steep Slope (31–90 degrees)	Miles	1.6	1.6	1.5	1.3	1.5	1.2
Steep Slope (21–30 degrees)	Miles	6.4	6.4	6.4	5.7	6.6	5.9
Moderate Slope (16–20 degrees)	Miles	5.4	5.4	5.7	5.0	5.5	5.3
Strongly Sloping (6–15 degrees)	Miles	40.2	41.2	41.8	42.3	39.5	43.7
Flat to Gentle Slope (0–5 degrees)	Miles	53.9	52.7	58.2	61.0	53.2	63.0
Infrastructure Crossings							
Primary Road Crossing	Count	2	2	2	2	2	2

Criteria	Unit	Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Secondary Road Crossing	Count	14	13	16	14	14	16
Tertiary Road Crossing	Count	140	139	148	144	133	150
Railroad Crossing	Count	4	4	5	4	4	5
Oil and Gas Wells: within the ROW Corridor; 500 feet of centerline	Count	4	3	6	4	4	6
	Count	22	19	30	20	22	28
Natural Gas Pipeline Crossing (transmission / distribution / gathering)	Count	7	6	7	7	7	5
	Count	16	12	24	13	16	21
	Count	4	4	7	5	4	8
Wind turbines (within 500 feet and 0.5 mile of the centerline)	Count	0	0	0	0	0	0
	Count	0	0	0	7	0	7
Airports within 20,000 feet of the centerline: public/private	Count	0	0	0	0	0	0
	Count	4	4	6	4	5	7
Geologic Karst Features (miles / acres of ROW)	Miles	12.0	11.5	18.2	13.6	12.0	18.8
	Acres	302.9	291.8	454.2	336.9	302.9	464

Source: REXTAG, USGS

kV = kilovolt; ROW = right-of-way

Alternative Route A

Alternative Route A had superior performance for engineering and infrastructure criteria. It is one of two routes with the second-lowest number of total structures (452), the lowest number of structures with 20–30-degree angles (41), and the second-lowest number of structures with greater than 30-degree angles (50). Alternative Route A is one of four routes with the lowest number of 500 kV crossings (7). It also has the second-lowest number of spans greater than 1,600 feet (33). It does cross through 1.6 miles of very steep slope in the Bear Creek Area of Maryland while paralleling existing transmission lines. In addition, Alternative Route A is one of three routes with the second-lowest number of oil and gas wells within the ROW Corridor and a moderate number of natural gas pipeline crossings (27). Overall, Alternative Route A demonstrates a strong balance between minimizing structural complexity and maintaining efficient routing.

Alternative Route B

Alternative Route B had moderate performance for engineering and infrastructure criteria. Like Alternative Route A, it has the second-lowest number of total structures (452), but a much higher percentage of those structures have sharp turn angles with 47 structures with turn angles 20-30 degrees and 59 structures with turn angles greater than 30 degrees. Alternative Route B was one of four routes with the lowest number of 500 kV crossings (7). It crosses through the same very steep slope as Alternative Route A for 1.6 miles.

Alternative Route C

Alternative Route C had inferior performance for engineering and infrastructure criteria. It presents several engineering challenges that make it one of the least favorable routing options. It has some of the highest counts for transmission line crossings, gathering pipelines, and oil and gas wells located within the ROW Corridor and 500 feet of the centerline. Alongside Alternative Route F, it also has the highest number of 500 kV crossings (11), indicating greater potential complexity for construction and design. It also has an elevated presence of oil and gas infrastructure near the route, largely due to its alignment through heavily developed natural gas areas in Pennsylvania. It has an average number of transmission structures (478), including an average number of structures with sharp angles and the lowest number of spans greater than 1,600 feet at 31. These factors contribute to increased complexity, positioning Alternative Route C as a less desirable choice from an engineering standpoint.

Alternative Route D

Alternative Route D had moderate performance for engineering and infrastructure criteria. It has the highest number of 138 kV transmission line crossings (23) but is one of four routes with the lowest number of 500 kV crossings (7). It has the second-highest number of structures (492) and the second-highest number of turn angled structures greater than 20 degrees (109). It avoids some of the steeper terrain in the MARL Project Study Area by routing north of the Bear Creek area in Maryland and as a result has the second-flattest alignment. Alternative Route D does cross near two wind farms with seven turbines within 0.5-mile of the centerline, which presents engineering challenges.

Alternative Route E

Alternative Route E had superior performance for engineering and infrastructure criteria. It has the lowest total number of structures (446), indicating a potentially more cost-effective design. Additionally, it was second lowest in the number of structures with turn angles greater than 20 degrees (94), suggesting fewer complex directional changes. Like Alternative Routes A, B, and D, it also has the lowest number of 500 kV transmission line crossings (7), minimizing interference with major transmission infrastructure.

Alternative Route F

Alternative Route F had inferior performance for engineering and infrastructure criteria. Due to its longer length, it has the highest number of structures (519). It also has the highest number of structures with turn angles greater than 20 degrees (129). Like Alternative Route C, it has the highest number of 500 kV transmission line crossings (11), which present the significant engineering challenges described above. It avoids some of the steeper terrain in the MARL Project Study Area by routing north of the Bear Creek area in Maryland. As a result, it has the second-flattest alignment. Additionally, like Alternative Route C, Alternative Route F has an elevated presence of oil and gas infrastructure near the route, largely due to its alignment through heavily developed natural gas areas in Pennsylvania.

Superior Alternative Routes

Alternative Routes A and E demonstrated strong performance across the engineering evaluation criteria. Alternative Route A stood out for its balance among the criteria, including the fewest structures with turn angles greater than 20 degrees, a tie for the lowest number of 500 kV transmission line crossings—one of the most significant engineering challenges—and the second-lowest count of spans exceeding 1,600 feet. Similarly, Alternative Route E performed well, with the lowest total number of structures, the second-fewest structures with turn angles over 20 degrees, and it tied for the lowest number of 500 kV crossings. These characteristics suggest both Alternative Routes offer efficient and less complex routing options, making them favorable from an engineering standpoint.

Moderate and Inferior Alternative Routes

Alternative Routes C and F performed as the least favorable options based on engineering criteria. Alternative Routes C and F have the highest number of 500 kV transmission line crossings (11), which presents one of the largest engineering challenges. Additionally, Alternative Routes C and F traverse areas with dense oil and gas infrastructure—including elevated counts of wells and pipeline crossings—due to their alignment through heavily developed natural gas regions in Pennsylvania. Alternative Route D had moderate performance. Alternative Routes D and F also stand out for having the largest number of total structures and the highest counts of structures with turn angles greater than 20 degrees, indicating more complex design requirements. Alternative Routes D and F also pass near two wind farm developments, with seven turbines located within 0.5-mile of the centerline, presenting further engineering constraints that must be addressed during planning and construction.

5.5 ESTIMATED COSTS

Table 5.5-1 provides the estimated capital costs for the development and construction of each of the six end-to-end Alternative Routes.

TABLE 5.5-1 ESTIMATED CAPITAL COSTS FOR THE ALTERNATIVE ROUTES

Alternative Route A	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
$1,167,236,674	$1,175,521,094	$1,204,723,343	$1,241,099,297	$1,159,876,697	$1,256,130,573

5.6 SELECTION OF THE PROPOSED ROUTE

The Routing Team conducted a comprehensive multi-criteria evaluation of the Alternative Routes, assessing criteria described in Sections 5.1 through 5.5. These criteria included route length, construction footprint, paralleling existing infrastructure, community and recreational resources, protected areas, cultural resources, agricultural and land cover, natural environmental features—including water and ecological resources—engineering and infrastructure considerations, and estimated costs. Table 5.6-1 provides a summary matrix highlighting the performance of each Alternative Route for each set of criteria.

TABLE 5.6-1 ALTERNATIVE ROUTE EVALUATION RESULT MATRIX

Alternative Routes	Route Length and Construction Footprint	Paralleling Existing Infrastructure	Community and Recreational Resources	Protected Areas	Cultural Resources	Agricultural and Land Cover	Water Resources	Sensitive Species and Habitats	Engineering and Infrastructure	Estimated Cost
Alternative Route A	Superior	Superior	Superior	Moderate	Superior	Superior	Superior	Superior	Superior	Superior
Alternative Route B	Superior	Superior	Inferior	Moderate	Moderate	Superior	Superior	Superior	Moderate	Superior
Alternative Route C	Moderate	Superior	Moderate	Inferior	Inferior	Inferior	Inferior	Moderate	Inferior	Moderate
Alternative Route D	Moderate	Inferior	Moderate	Superior	Superior	Moderate	Moderate	Inferior	Moderate	Inferior
Alternative Route E	Superior	Moderate	Superior	Moderate	Superior	Superior	Moderate	Superior	Superior	Superior
Alternative Route F	Inferior	Inferior	Inferior	Moderate	Inferior	Inferior	Inferior	Inferior	Inferior	Inferior

Superior—High performance for the listed criteria with low impacts on category resources relative to the other Alternative Routes.
Moderate—Average performance for the listed criteria with moderate impacts on category resources relative to the other Alternative Routes.
Inferior—Poor performance for the listed criteria with high impacts on category resources relative to the other Alternative Routes.

5.6.1 ALTERNATIVE ROUTE A SELECTED AS THE PROPOSED ROUTE

As shown in Table 5.6-1, Alternative Route A had superior performance for all routing criteria except for one, where it had a moderate performance. Specifically, Alternative Route A had superior performance for route length and footprint, paralleling existing infrastructure, community and recreational resources, cultural resources, agricultural and land cover, water resources, sensitive species and habitats, and engineering criteria. It had moderate performance for protected lands. It did not have inferior performance for any criteria when compared to other Alternative Routes. Notably, Alternative Route A is the only Alternative Route with superior performance for three primary categories of criteria the Routing Team strived to achieve at the start of the MARL Project: route length and construction footprint, paralleling existing infrastructure, and community and recreational resource—which were important decision criteria for the selection of the Proposed Route. Therefore, based on this analysis, the Routing Team selected Alternative Route A as the Proposed Route for the MARL Project. Alternative Route A offers the most balanced solution that maximizes opportunities to parallel existing transmission lines, minimizes potential impacts on both natural environment and built environment, and minimizes the engineering and construction-related challenges.

For route length and construction footprint, Alternative Route A had superior performance with the second-smallest ROW Corridor (2,669.0 acres) and the third-smallest length (107.5 miles—almost identical to Alternative Route B [107.3 miles]). Alternative Routes A, B, and E vary by 1.2 miles in total length and less than 1 percent in ROW Corridor area, reflecting reduced impacts relative to the other three Alternative Routes. Alternative Route A has 6 to 10 percent less ROW Corridor area compared to Alternative Routes C, D, and F.

For paralleling existing infrastructure, Alternative Route A had superior performance. Although Alternative Route A only had the third-highest percent paralleling with 52.5 percent paralleling existing transmission lines, it had similar total mileage of greenfield development as Alternative C (51.1 miles for Alternative A versus 49.1 miles for Alternative C) and significantly higher percentage paralleling compared to Alternative Routes D, E, and F which were all below 50 percent. Alternative Route A has 20 percent more paralleling than Alternative F, 18 percent more than Alternative D, and 8 percent more than Alternative E.

For community and recreational resources, Alternative Route A had superior performance with the second-lowest impact on residential dwellings and landowners. It has 29 residential dwellings within 250 feet (second lowest), 151 residential dwellings within 500 feet (second lowest), and 388 unique landowners crossed (second lowest). These were key decision criteria for the selection of the Proposed Route. This represents 21 percent less impact on residential dwellings (41 fewer dwellings) within 500 feet of the centerline compared to the highest impact Alternative (Alternative B).

For protected areas, Alternative Route A had moderate performance when compared to the other Alternative Routes. It has the second-lowest mileage of crossings through state forest lands and has the lowest acreage of impact within the USACE-managed Youghiogheny River Lake. However, like Alternative Routes B, C, and E, it crosses the Maryland Wildlands and two Rural Legacy Easements. In total, Alternative Route A parallels existing transmission lines through eight

protected land areas over 14.6 miles. The strategy to parallel existing transmission lines contributes to its strong performance in other criteria (e.g., residential and community impacts) by leveraging existing infrastructure to minimize additional impacts, resulting in increased crossing of protected lands since many existing transmission corridors are located within these areas.

For cultural resources, the variability of impacts was small, but Alternative Route A had superior performance with generally the second-lowest number of impacts. It has the second-lowest number of cemeteries within 500 feet of the centerline (4), second-lowest number archaeological resources within the ROW Corridor (6), the second-lowest number of architecture resources within 0.5-miles (7) of the centerline.

For agricultural and land cover, Alternative Route A has superior performance. Alternative Route A has the second-smallest ROW Corridor (2,669.0 acres) and has the second-lowest amount of agricultural lands and the third lowest of forested lands within the ROW Corridor, and therefore presents less footprint of impacts on these resources than the longer Alternative Routes C, D, and F.

For the natural environment, Alternative Route A had superior performance for the water resources criteria. It has the smallest acreage of wetlands within the ROW Corridor—including both modeled wetlands and NWI wetlands. Additionally, Alternative A has the second-smallest number of crossings of trout streams and coldwater fisheries (39). For sensitive species and habitat criteria, Alternative Route A had superior performance with the second-lowest acreage amount for potentially suitable state-listed species, MBTA, and foraging bat habitat (2,650.8 acres) and the second-lowest acreage for potentially suitable monarch butterfly habitat (538.4 acres). This route is also one of four with the lowest acreage (104.3 acres) for bat known occupied summer habitat, and one of four for the lowest for bat hibernacula (388.9 acres).

For engineering and infrastructure criteria, Alternative Route A had superior performance. It has the second-lowest number of total structures (452) and the lowest number of structures with 20–30-degree angles and greater than 30-degree angles (41 and 50, respectively). Alternative Route A, along with Alternative Routes B, D, and E, have the lowest number of 500 kV crossings (7). It also has the second-lowest number of spans greater than 1,600 feet (33).

5.6.2 THE PROPOSED ROUTE COMPARED TO THE OTHER ALTERNATIVE ROUTES

This section presents a comparison between the Proposed Route and the other five Alternative Routes. While portions of the Alternative Routes overlap with the Proposed Route, the Proposed Route includes several key differences that result in fewer impacts and improved overall performance compared to the other Alternative Routes.

Table 5.6-2 provides a summary comparison of 1) the percentage of overlap between the Alternative Routes and the Proposed Route and 2) the high-level differences between the Alternative Routes compared to the Proposed Route. Table 5.6-3 highlights the difference in performance evaluation for the Alternative Routes compared to the Proposed Route. The performance of each Alternative Route is shown in Table 5.6-1.

TABLE 5.6-2 SUMMARY COMPARISON OF THE ALTERNATIVE ROUTES TO THE PROPOSED ROUTE

Alternative Route	Percent Overlap with the Proposed Route	Descriptive Difference
Alternative Route B	73.4	Overall, Alternative Route B performed well across most evaluation criteria, although it exhibited several notable differences from the Proposed Route, particularly in the community and recreational resources, and engineering criteria. Alternative Route B deviates from the Proposed Route in Fayette County, Pennsylvania; Monongalia and Preston Counties, West Virginia; and a small section in the northwest corner of Garrett County, Maryland, before the Youghiogheny River crossing. It was developed to provide an Alternative Route on the opposite side of the Hazelton–Lake Lynn 138 kV transmission line, offering a slightly higher percentage of paralleling with existing transmission infrastructure. While Alternative Route B achieved the second-highest level of paralleling among all routes (55.6 percent compared to 52.5 percent for the Proposed Route), this improvement came with a tradeoff in greater proximity to residential areas. Alternative Route B has more residential dwellings within 250 feet of the centerline (40 compared to 29 for the Proposed Route) and within 500 feet (192 compared to 150). Additionally, Alternative Route B crosses Cheat Lake and extends closer to residential developments along its eastern shore, whereas the Proposed Route avoids these dense residential areas by crossing farther north through less developed lands. Alternative Route B also crosses the FERC Project Boundary for the Lake Lynn Hydroelectric Project (P-2459-279) and parallels existing transmission lines through Federal Bureau of Prisons lands at United States Penitentiary Hazelton, both of which may introduce added permitting and coordination challenges. From an engineering perspective, Alternative Route B had lower performance due to a higher number of structures requiring turn angles greater than 20 degrees (106 versus 91) and a higher number of long spans exceeding 1,600 feet (42 versus 33), which introduce engineering challenges. Both Alternative Route B and the Proposed Route had similar performance for protected resources, water resources, and sensitive species and habitat criteria.
Alternative Route C	64.4	Alternative Route C demonstrated moderate to lower performance across most evaluation criteria, with the exception of its strong performance in paralleling existing infrastructure, where it achieved the highest percentage among all routes (56.8 percent). Alternative Route C deviates from the Proposed Route in Greene and Fayette Counties, Pennsylvania, and the northwestern portion of Garrett County, Maryland, prior to crossing the Youghiogheny River. Alternative Route C was developed to provide an alternative to crossing Coopers Rock State Forest in Preston County, West Virginia, and to parallel the existing 500 kV transmission lines in the northwestern quadrant of the MARL Project Study Area in Pennsylvania. However, while this Alternative Route increases paralleling, the northern deviation introduces additional line length—it is 6.1 miles longer than the Proposed Route—and requires an additional 166.6 acres of ROW. These factors contribute to greater land disturbance

Alternative Route	Percent Overlap with the Proposed Route	Descriptive Difference
		and higher potential impacts on community and recreational resources, intersecting 32 more parcels, 17 more unique landowners, and 10 more dwellings within 500 feet of the centerline compared to the Proposed Route. For protected areas, Alternative Route C performed worse than the Proposed Route with 67.1 more acres through protected lands and crossing through two additional resources. Alternative Route C also performed worse for cultural resources, agricultural and land cover, water resources, and engineering criteria. For the engineering criteria, Alternative Route C has 23 additional structures, 13 more structures with turn angles greater than 20 degrees, and four additional 500 kV transmission line crossings than the Proposed Route.
Alternative Route D	67.5	Alternative Route D demonstrated moderate to inferior performance across most evaluation criteria, with the exception of superior performance for the protected areas and cultural resources criteria. Alternative Route D shares 67.5 percent of its corridor with the Proposed Route but diverges in Maryland to avoid the Maryland Wildlands by paralleling the existing Jennings–Hazelton 138 kV transmission line north of the Proposed Route. It then transitions through a substantial greenfield segment near Midland, Maryland, crossing Dan's Mountain WMA traveling south before rejoining the Proposed Route near the Black Oak Substation. This deviation results in 7.7 additional miles of transmission line in Maryland and requires 170.0 more acres of ROW Corridor compared to the Proposed Route. Avoiding the Maryland Wildlands also necessitates an additional 21.1 miles of greenfield development in Maryland, for a total of 31.1 miles of greenfield compared to 10.0 miles of greenfield development for the Proposed Route in Maryland. Due to this larger greenfield development footprint, Alternative Route D has lower performance than the Proposed Route for community and recreational resources, agricultural and land cover, water resources, sensitive species and habitat, and engineering criteria.
Alternative Route E	87.1	Overall, Alternative Route E performed well across the evaluation criteria. It is the shortest Alternative Route (106.3 miles) with the smallest ROW Corridor (2,651.5 acres) and is 1.1 miles shorter and has 17.5 fewer acres of ROW Corridor than the Proposed Route. It overlaps with the Proposed Route for 87.1 percent of its ROW Corridor, with the exception of a greenfield section in Mineral and Hampshire Counties, West Virginia. Alternative Route E was developed to provide an alternative to crossing the White Horse Mountain WMA and demonstrate the differences a more direct, but greenfield path could create. To avoid crossing the White Horse WMA, Alternative Route E necessitates an additional 4.6 miles of greenfield development in West Virginia compared to the Proposed Route (35.7 miles versus 31.2 miles for the Proposed Route in West Virginia), resulting in 47.7 percent paralleling for Alternative Route E versus 52.5 percent for the Proposed Route. Alternative Route E also had slightly lower performance for the water resources evaluation criteria with higher acreage of NWI wetlands within the ROW Corridor (44.1 versus 42.7 for the Proposed Route), 2.2 additional acres of modeled wetlands, and 11.2 additional acres of ROW Corridor inside a flood zone than the Proposed Route. In addition to the criteria comparison outlined in Sections 5.1 through 5.5, Alternative Route E also received significantly more negative feedback from our online surveys, primarily in the area of greenfield development in Hampshire and Mineral Counties, West Virginia, compared to the Proposed Route.

Alternative Route	Percent Overlap with the Proposed Route	Descriptive Difference
Alternative Route F	20.2	Alternative F had inferior performance across most metrics in the evaluation criteria. Alternative Route F was developed to provide an Alternative Route that parallels existing transmission lines in the northwest quadrant of the MARL Project Study Area and avoids impacts on the Coopers Rock State Forest, Savage River State Forest and associated Wildlands, Dan's Mountain WMA and associated Wildlands, and White Horse Mountain WMA. To avoid these resources, Alternative Route F has an additional 11.6 miles of transmission line and 295.3 acres of ROW Corridor compared to the Proposed Route. It parallels existing transmission lines for 36.3 percent versus 52.5 percent for the Proposed Route, resulting in 24.9 additional miles of greenfield development compared to the Proposed Route. Alternative Route F performed worse than the Proposed Route in all evaluation criteria except for protected lands. For community and recreational resources, Alternative Route F has 33 additional dwellings within 500 feet of the centerline and crosses 35 more parcels compared to the Proposed Route. For water resources, Alternative Route F crosses 22 additional trout streams and coldwater fisheries (61 versus 39 for the Proposed Route), has 21 more acres of NWI wetlands and 35.3 more acres of floodplain inside the ROW Corridor compared to the Proposed Route. For the engineering criteria, Alternative Route F has four additional crossings of an existing 500 kV transmission line, 67 additional structures, and 38 additional structures with turn angles greater than 20 degrees when compared to the Proposed Route.

FERC =Federal Energy Regulatory Commission; kV = kilovolt; NWI = National Wetlands Inventory; ROW = right-of-way; WMA = Wildlife Management Area

Note: Totals may not match the sum of addends due to rounding.

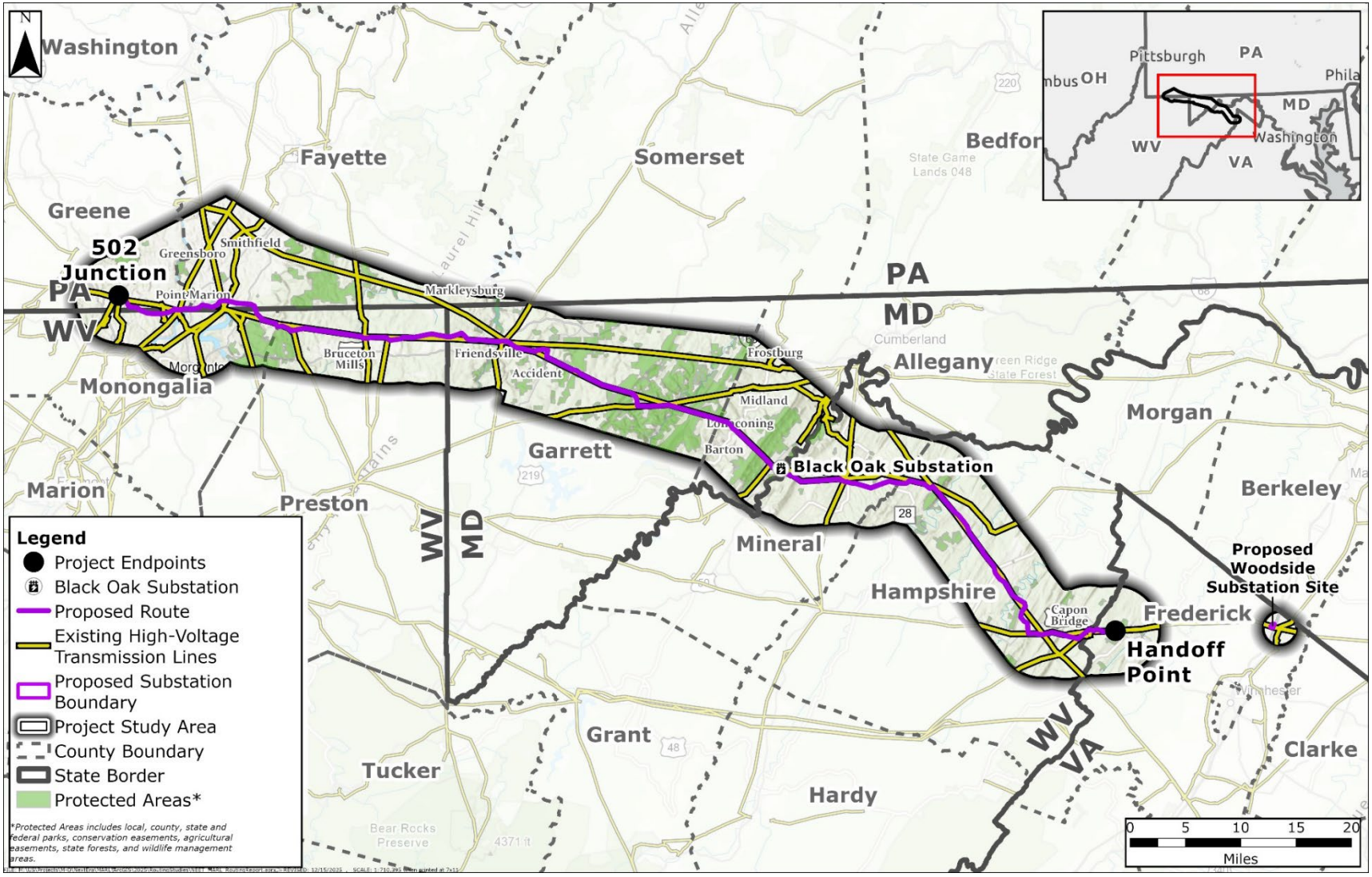
TABLE 5.6-3 SUMMARY OF COMPARISON TO THE PROPOSED ROUTE BASED ON EVALUATION CRITERIA

Alternative Route	Route Length and Construction Footprint	Paralleling Existing Infrastructure	Community and Recreational Resources	Protected Areas	Cultural Resources	Agricultural and Land Cover	Water Resources	Sensitive Species and Habitats	Engineering and Infrastructure	Estimated Cost
Alternative Route B	Same	Same	Lower	Same	Lower	Same	Same	Same	Lower	Same
Alternative Route C	Lower	Same	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower
Alternative Route D	Lower	Lower	Lower	Higher	Lower	Lower	Lower	Lower	Lower	Lower
Alternative Route E	Same	Lower	Same	Same	Same	Same	Lower	Same	Same	Same
Alternative Route F	Lower	Lower	Lower	Same	Lower	Lower	Lower	Lower	Lower	Lower

6. CONCLUSION AND RECOMMENDATION

Based on the evaluation conducted in Section 5, Alternative Route A was selected as the Proposed Route (Figure 6-1). In addition to the Proposed Route, the MARL Project includes ancillary facilities required for both construction and long-term operation and maintenance. These ancillary facility workspaces consist of access roads, structure pads, and wire work areas as discussed in Section 6.2 and shown on Appendix E-14, Proposed Route. Additionally, where feasible, the MARL Project has identified locations where forested riparian buffers will be preserved to protect sensitive waterbodies. These riparian habitat exclusion zones are discussed in Section 6.3 and shown on Appendix E-14. The preservation of these sensitive riparian buffers reduces the potential impact on resource criteria that were considered in the evaluation in Section 5. Section 6.4 provides analysis tables showing the Proposed Route with and without maintaining the riparian habitat exclusion zones, the associated ancillary facility workspaces, and the Woodside Substation.

FIGURE 6-1 THE PROPOSED ROUTE



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

6.1 THE PROPOSED ROUTE DESCRIPTION

The Proposed Route will generally encompass the geographic area between the endpoints of the 502 Junction Substation in Greene County, Pennsylvania, and the handoff point (a new 500 kV transmission line to be constructed by FirstEnergy) in Frederick County, Virginia. The proposed Woodside Substation is also in Frederick County, Virginia, but approximately 11 miles to the east of the eastern terminus of the Proposed Route handoff point. The total Proposed Route will be 107.5 miles in length, with a ROW Corridor of 2,669.0 acres.

Beginning at 502 Junction in Greene County, Pennsylvania, the Proposed Route mostly parallels two existing transmission lines traveling southeast for 2.7 miles before entering Monongalia County, West Virginia, near MP 2.7. It then travels east for 3.1 miles before reentering Greene County, Pennsylvania, near Fort Martin Power Station at MP 5.8. The Proposed Route travels east for 1.4 miles in Greene County, Pennsylvania, before crossing the Monongahela River and entering Fayette County, Pennsylvania, at MP 13.8. In Fayette County, Pennsylvania, the Proposed Route travels east as a greenfield section through undeveloped private property for 6.6 miles before reentering Monongalia County, West Virginia, near MP 13.8. The Proposed Route travels east to southeast for 2.8 miles in northeastern corner of Monongalia County, West Virginia, while paralleling the existing Hazelton to Lake Lynn 138 kV Transmission Line near Coopers Rock State Forest. It crosses into Preston County, West Virginia, near Patterson Run at MP 16.6, where it primarily parallels the existing Hazelton to Lake Lynn 138 kV Transmission Line, traveling east for 15.8 miles before entering Garrett County, Maryland, near MP 32.5. In Garrett County, the Proposed Route parallels the existing Jennings to Hazelton 138 kV Transmission Line and Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line traveling east to southeast for 27.8 miles before entering Allegany County, Maryland, near MP 60.3. In Allegany County, Maryland, the Proposed Route parallels the existing Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line, traveling southeast for 7.6 miles before entering Mineral County, West Virginia, near Black Oak Substation at MP 67.9. In Mineral County, West Virginia, the Proposed Route travels east while mostly paralleling the existing Black Oak to Bedington 500 kV Transmission Line for 10.9 miles before entering Hampshire County, West Virginia, at MP 78.8. The Proposed Route then travels southeast for 26.2 miles while mostly paralleling the existing Hampshire to Ridgeley 138 kV Transmission Line. The Proposed Route enters Frederick County, Virginia, near MP 105.0 and travels east for 2.4 miles following the Mount Storm to Doubs 500 kV and Stonewall to Hampshire 138 kV Transmission Lines and paralleling where feasible, except in areas with residential development adjacent to the existing transmission lines before handing off to a new 500 kV transmission line to be constructed by FirstEnergy at MP 107.5. A detailed description of the Proposed Route in each county is outlined below.

The Proposed Route will require 452 structures, with an average span length of 1,258 feet. It will parallel existing transmission lines for 56.4 miles (52.5 percent of the Proposed Route), and strive to limit impacts on sensitive areas and communities to the extent possible. Table 6.1-1 highlights the lengths, ROW Corridor, and percentage of paralleling existing transmission lines for the Proposed Route in each county.

TABLE 6.1-1 THE PROPOSED ROUTE AND COUNTY CROSSINGS

County and State [a]	Length (miles)	ROW Corridor (acres)	Paralleling Existing Transmission Line (%)
Greene County, PA	4.1	103.1	55.3
Fayette County, PA	6.6	163.8	0.0
Monongalia County, WV	5.9	143.5	23.1
Preston County, WV	15.8	392.6	49.4
Garrett County, MD	27.8	695.0	71.6
Allegany County, MD	7.6	202.9	72.6
Mineral County, WV	10.9	267.2	46.1
Hampshire County, WV	26.2	641.4	51.5
Frederick County, VA	2.4	59.4	41.8
Total [b]	**107.5**	**2,669.0**	**52.5**

MA = Maryland; PA = Pennsylvania; ROW = right-of-way; VA = Virginia; WV = West Virginia
[a] Counties are listed west to east
[b] Totals may not match the sum of addends due to rounding.

Greene County, Pennsylvania: MP 0.0 to MP 2.7

The Proposed Route begins at the 502 Junction Substation origin point in Greene County, Pennsylvania, heading southwest near Bald Hill while paralleling two separate existing transmission lines. The Proposed Route then proceeds in an easterly direction for 0.8 mile before crossing an existing 500 kV transmission line and heading in a general southeasterly direction for 1.8 miles to avoid residential development built up adjacent to the existing line near Bald Hill, exiting Pennsylvania near MP 2.7.

Monongalia County, West Virginia: MP 2.7 to MP 5.8

The Proposed Route enters Monongalia County, West Virginia, north of Maidsville, West Virginia, and west of Old Taylortown Road near MP 2.7, then heads in an easterly direction for 3.1 miles through undeveloped private land as a greenfield section of the line before heading north back into Greene County, Pennsylvania, to avoid Fort Martin Power Plant and its associated infrastructure.

Greene County, Pennsylvania: MP 5.8 to MP 7.1

The Proposed Route reenters Pennsylvania at MP 5.8, crosses the existing Longview Power property to Fort Martin 500 kV line, and heads in an easterly direction. The route then crosses the Monongahela River near MP 7.1 and enters Fayette County, Pennsylvania.

Fayette County, Pennsylvania: MP 7.1 to 13.8

The Proposed Route continues in an easterly-northeasterly direction, crossing undeveloped private land while avoiding residential developments near Davison Road and Bortz Road until it crosses the Cheat River near MP 10.1 north of the Lake Lynn Hydro Station. The Proposed Route avoids residential developments east of the Cheat River near Lake Lynn Road and continues east within Fayette County as a greenfield section of the line. It follows large, undeveloped private lands and crosses the Mon-Fayette Expressway (PA Turnpike 43) near MP 12.8. At MP 13.2, the Proposed

Route heads in a southeasterly direction, exiting the state of Pennsylvania at MP 13.8 and reentering West Virginia to begin paralleling the existing Hazelton to Lake Lynn 138 kV Transmission Line.

Monongalia County, West Virginia: MP 13.8 to 16.6

The Proposed Route heads south across undeveloped private property over Ryan Hollow. At MP 15.0, the Proposed Route crosses the existing Hazelton to Lake Lynn 138 kV Transmission Line to parallel it on the south side for 2.8 miles. It then deviates from the existing line to avoid residential homes before crossing into Preston County near MP 16.6.

Preston County, West Virginia: MP 16.6 to 32.4

The Proposed Route enters Coopers Rock State Forest for 0.3 mile for a greenfield section before paralleling the existing Cheat Lake to Ruthbelle 138 kV Transmission Line for 1.0 mile. At MP 18.0, the Proposed Route exits Coopers Rock State Forest and heads in a northeasterly direction, crossing over the existing Cheat Lake to Ruthbelle 138 kV Transmission Line and Patterson Run and Laural Run streams before paralleling the Hazelton to Lake Lynn 138 kV Transmission Line.

From MP 19.3 to MP 24.4, the Proposed Route continues paralleling the existing Hazelton to Lake Lynn 138 kV Transmission Line, deviating between MP 20.3 to MP 20.5 to avoid a residential structure. At MP 24.4, the Proposed Route heads in a southeasterly direction for 0.2 mile before heading in an easterly direction for 0.8 mile, where it deviates around residential and agricultural buildings near MP 24.8, crossing two existing 138 kV transmission lines before paralleling the Hazelton to Lake Lynn 138 kV Transmission Line at MP 25.5. It continues paralleling this line from MP 25.5 to MP 26.8 before turning in a southeasterly direction to avoid residential homes and a substation located between MP 26.8 to MP 28.3. At MP 28.3, the Proposed Route crosses to the northern side of the Hazelton to Lake Lynn 138 kV Transmission Line and heads in an easterly direction for 0.9 mile before deviating to avoid residential homes located along the existing transmission line between MP 29.3 and MP 32.4. At MP 32.4, the Proposed Route exits the state of West Virginia and enters the state of Maryland.

Garrett County, Maryland: MP 32.4 to 60.3

The Proposed Route begins at the West Virgina-Maryland border at the western end of the South Branch Laurel Run stream (MP 32.5) and west of Blue Goose Road, approximately 1 mile north of Interstate 68, then heads in a northeasterly direction for approximately 1.5 miles before crossing Route 42/Friendsville Road, turning in a southeasterly direction for approximately 0.6 mile. From this point, the Proposed Route crosses Buffalo Run stream and turns in an easterly direction, paralleling the existing Jennings to Hazelton 138 kV Transmission Line for 0.6 mile before deviating around some residential homes near MP 35.7, then continuing to parallel the Jennings to Hazelton 138 kV line for 1.1 miles, and crossing over the Youghiogheny River / USACE Recreation Management Area near MP 37.3. The Proposed Route then deviates from the existing 138 kV transmission line to avoid residential homes and crosses over Interstate 68 around MP 37.7. At MP 37.9 to 38.1, the Proposed Route crosses an existing 115 kV transmission line and the Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line. It then turns in a southeasterly direction, crosses the existing Jennings to Hazelton 138 kV Transmission Line, and

parallels the existing Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line for 2.5 miles, crossing a tributary to Bear Creek and Fikes Run. At MP 41.0, the Proposed Route deviates from the existing transmission line to avoid residential development on Sale Barn Road, heading northeast-east for approximately 1.9 miles before heading in a southerly direction, crossing over Bear Creek and the associated challenging terrain. At MP 42.9 the Proposed Route begins paralleling the existing Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line again.

The Proposed Route crosses over private lands from MP 42.9 to MP 43.8 before entering Maryland Department of Natural Resources (DNR) State Lands, where it parallels the existing transmission line from MP 43.9 to MP 45.2 and crosses the Bear Creek Hatchery FMA parcel, Bear Creek, and Savage River State Forest. The Proposed Route then crosses a small area of private lands from MP 45.2 to MP 45.7. At MP 45.3, the Proposed Route deviates from the existing Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line to avoid spanning a Maryland DNR Wetlands of Special State Concern at MP 45.7 to MP 45.9, which is also located in Savage River State Forest. The Proposed Route crosses another portion of the Savage River State Forest, paralleling the existing transmission line, from MP 45.7 to 46.4. After exiting the Savage River State Forest, the Proposed Route parallels the existing transmission line for 3.1 miles across private lands before crossing another portion of Savage River State Forest from MP 49.6 to MP 49.9 and again from MP 50.2 to MP 51.6. Between MP 50.6 and MP 51.3, the Proposed Route shifts slightly from the existing transmission line to address terrain challenges and to meet the MARL Project's engineering requirements for aerial easement blowout. At MP 51.4, the Proposed Route crosses the existing 500 kV transmission line, heading south to avoid the residential area near Fairview Road. The Proposed Route continues in a southeasterly direction for 1.3 miles, crossing another small section of the Savage River State Forest. Beginning at MP 52.7, the Proposed Route travels in an easterly direction, paralleling the existing Carlos JCT to Garrett 138 kV Transmission Line crossing Savage River State Forest. At MP 53.3, the Proposed Route crosses the Carlos JCT to Garrett 138 kV Transmission Line on private property to continue paralleling it on the southern side. At MP 53.5, the Proposed Route enters Savage River State Forest and Bear Pen Wildlands, crossing Bear Pen Run until MP 54.6, where it exits and crosses private lands. The Proposed Route again enters Savage River State Forest and Bear Pen Wildlands at MP 55.1. At MP 55.5, the Proposed Route turns slightly in a southeasterly direction, again paralleling the existing Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line and crossing Savage River through Savage River State Forest and Big Savage Mountain Wildlands (MP 56.2 to MP 56.7). From MP 56.7 to MP 57.6, the Proposed Route travels across private lands and then parallels the existing transmission line from MP 57.6 to MP 59 within Savage River State Forest across Big Savage Mountain. The Proposed Route continues from MP 59 to MP 60.3 on private lands before crossing another small section of Savage River State Forest from MP 60.3 to MP 60.6.

Allegany County, Maryland: MP 60.3 to 67.9

At MP 60.3, the Proposed Route enters Allegany County, Maryland, continuing to parallel the existing Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line until MP 61.5, where it deviates from the existing transmission line due to terrain and engineering concerns. At MP 62.3, the Proposed Route continues to parallel the existing Hatfield's Ferry Power Station to

Black Oak 500 kV Transmission Line. At MP 64.4, the Proposed Route parallels the existing Hatfield's Ferry Power Station to Black Oak 500 kV Transmission Line through Maryland DNR State Lands, Dan's Mountain WMA, and Dan's Mountain Wildlands, exiting the Maryland DNR State Lands near MP 66.4. At MP 66.6, the Proposed Route deviates from the existing transmission line to traverse south around Black Oak Substation. At MP 67.9, the Proposed Route crosses the North Branch Potomac River and enters back into West Virginia.

Mineral County, West Virginia: MP 67.9 to 78.8

At MP 67.9, the Proposed Route exits the state of Maryland and reenters West Virginia after crossing the North Branch of the Potomac River in Mineral County. From MP 67.9 to MP 73.2, the Proposed Route parallels the existing Black Oak to Bedington 500 kV Transmission Line in a general easterly direction before heading southeasterly across Patterson Creek near MP 73.7, close to Potomac State College Farms. From MP 73.3 to MP 79.9, the Proposed Route heads in an easterly direction across private properties, deviating from the existing transmission line to avoid the built-up landscape of homes, the college, and Dam Site #21. The Proposed Route crosses into Hampshire County near MP 78.8.

Hampshire County, West Virginia: MP 78.8 to 105.0

In Hampshire County, the Proposed Route heads northeast to parallel the existing Black Oak to Bedington 500 kV Transmission Line near MP 79.9. It parallels the existing transmission line from MP 79.9 to MP 81.2 before deviating and turning in a southeasterly to northeasterly direction (MP 81.3 to MP 82.2) to avoid residential development near Greenspring Valley Road. The Proposed Route then heads in a southeasterly direction along an existing Hampshire to Ridgeley 138 kV Transmission Line. Near MP 82.5, the Proposed Route crosses the White Horse Mountain WMA and remains there for 0.6 mile. The Proposed Route continues in a southerly direction and crosses the South Branch of the Potomac River, paralleling the existing Hampshire to Ridgeley 138 kV Transmission Line from MP 83.5 to MP 85.1. At MP 85.1, the Proposed Route deviates from the existing transmission line to avoid residential homes and other structures before paralleling the existing Hampshire to Ridgeley 138 kV Transmission Line again at MP 87.6. The Proposed Route follows the existing Hampshire to Ridgeley 138 kV Transmission Line for 3.8 miles in a southeasterly direction before deviating from MP 91.4 to MP 93.5 to avoid residential and agricultural buildings near the existing line. At MP 93.5, the Proposed Route continues to parallel the existing Hampshire to Ridgeley 138 kV Transmission Line in a southeasterly direction for 1.1 miles before deviating to avoid the Cacapon & Lost Rivers Land Trust easement near MP 95.5. From MP 95.5 to MP 99.0, the Proposed Route heads in a southerly direction where it meets up with the existing French Mill to Hampshire 138 kV Transmission Line. At MP 99.0, the Proposed Route parallels this line, heading in an easterly direction along the northern side of the existing transmission line before crossing to the southern side around MP 99.8. The Proposed Route deviates for 0.6 mile from the existing French Mill to Hampshire 138 kV Transmission Line due to the convergence point of two existing transmission lines and a substation north of MP 100.4, at which point it parallels the existing Hampshire to Stonewall 138 kV Transmission Line, crossing the Cacapon River at MP 102.2. At MP 102.5, the Proposed Route deviates from the existing transmission line and heads in a southeasterly direction for a greenfield section, where it meets up

with the existing Mt. Storm to Doubs 500 kV Transmission Line at MP 103.6, paralleling it in a northeasterly direction from MP 103.7 to MP 105.0. At MP 105.0, the Proposed Route exits West Virginia and enters Virginia.

Frederick County, Virginia: MP 105.0 to 107.5

The Proposed Route enters Virginia in Frederick County at approximately MP 105.0, continuing southeast and paralleling the existing Mt. Storm to Doubs 500 kV Transmission Line for approximately 0.3 mile. The Proposed Route then deviates from the existing transmission line for approximately 0.6 mile to avoid residential properties off Fletcher Road. The Proposed Route then continues in a southeasterly direction until reaching the existing transmission line. At this point, it crosses the existing Mt. Storm to Doubs 500 kV and the Hampshire to Stonewall 138 kV Transmission Lines perpendicularly, crossing near MP 106.2. Once the Proposed Route crosses the transmission lines, it immediately heads east, paralleling the transmission lines on the south side, crossing over Isaacs Creek at MP 106.5. Near MP 106.7, the Proposed Route deviates from the existing transmission line to avoid a substation and residential development, crossing Parishville Road and terminating at the handoff point.

6.2 THE PROPOSED ROUTE ANCILLARY FACILITY WORKSPACES

The ancillary facility workspaces consist of both temporary and permanent access roads, temporary structure pads at each tower location, and temporary wire work areas for conductor stringing operations. These facilities will be located within and outside of the ROW Corridor. The ancillary facility workspaces vary in size due to topographic constraints and ground conditions.

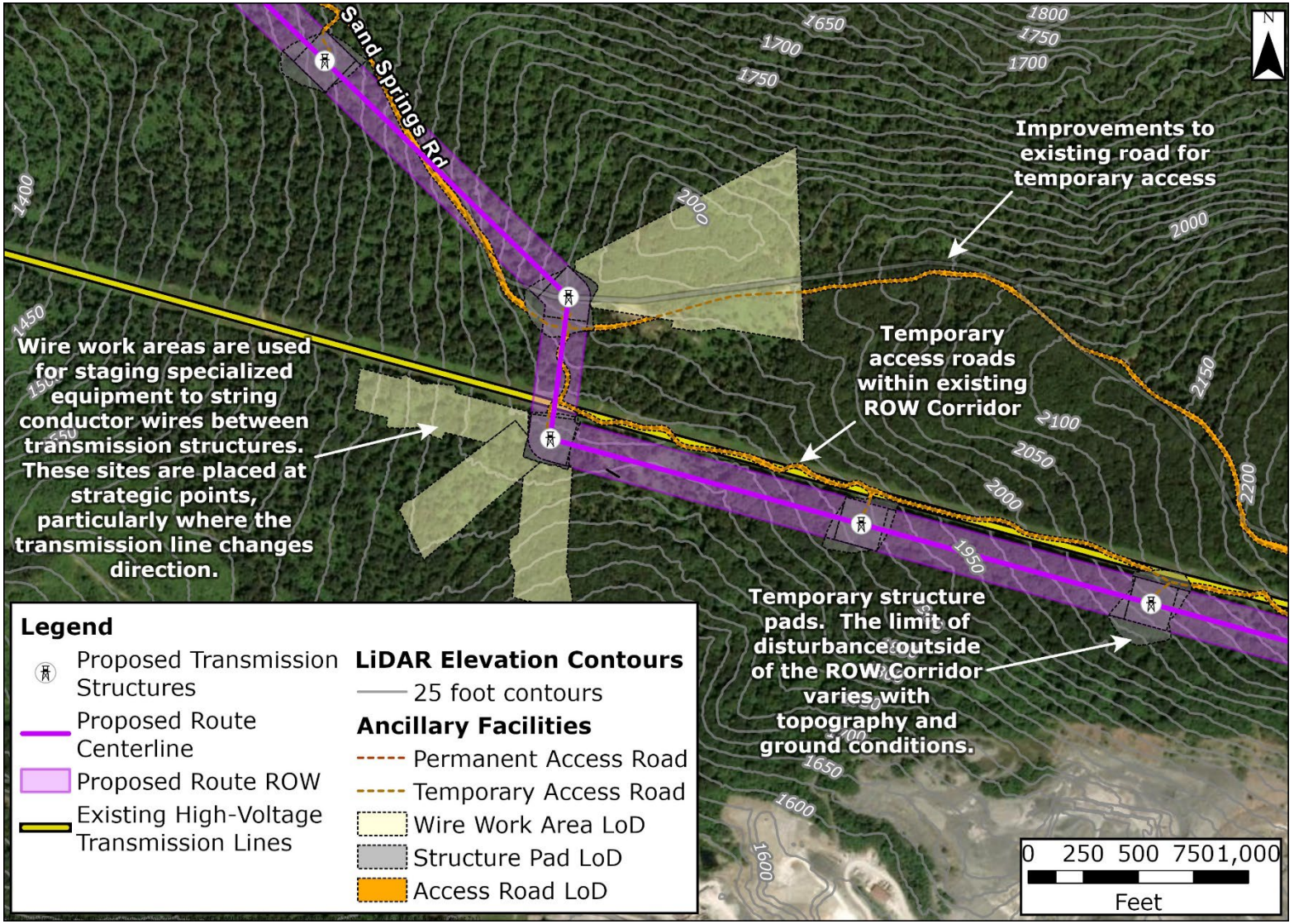
Access roads will include both improvements to existing roads and construction of new roads. They may be located within the ROW Corridor or extend beyond it, depending on site-specific access needs. Access roads are designated as either:

- Temporary—used solely during construction and treated as temporary impacts. Restoration is planned following construction.
- Permanent—required for ongoing operation and maintenance. These are reported in the Environmental Review Documents (Appendices A, B, C, and D) as permanent impacts.

Structure pads are constructed at each tower location to provide stable surfaces for equipment during installation and will have the appropriate dimensions to meet the terrain constraints. All structure pads are considered temporary construction impacts. The limit of disturbance associated with structure pads is variable and influenced by topography and ground conditions. These areas are treated as temporary impacts, with restoration planned post-construction.

Wire work areas are temporary work areas used for staging specialized equipment to string conductor wires between transmission structures. These sites are placed at strategic points, particularly where the transmission line changes direction. These areas are treated as temporary impacts, with restoration planned post-construction. Figure 6-2 depicts these ancillary facility workspaces relative to the Proposed Route near Sand Springs Road in Monongalia County, West Virginia.

FIGURE 6-2 EXAMPLE MAP OF THE ANCILLARY FACILITIES



LoD = limit of disturbance; ROW = right-of-way

Table 6.2-1 provides a summary of the ancillary facility workspaces within and outside of the ROW Corridor.

TABLE 6.2-1 ANCILLARY FACILITY WORKSPACES FOR THE PROPOSED ROUTE

Measure	Permanent Access Roads	Temporary Access Roads	Structure Pads	Wire Work Areas
Count of facility	NA	NA	452	108
LoD outside of the ROW Corridor (acres) [a]	7.1	231.4	123.3	233.9
Within ROW Corridor (miles)	2.7	70.7	NA	NA
Outside of the ROW Corridor (miles)	2.6	77.4	NA	NA

LoD = limit of disturbance; NA = not applicable; ROW = right-of-way

[a] Ancillary facility workspaces located inside the ROW Corridor are accounted for with the ROW Corridor acreage and are not presented to avoid double counting of impacts.

6.3 RIPARIAN HABITAT EXCLUSION ZONES

Where feasible, the MARL Project has identified initial locations of riparian habitat associated with streams that could be maintained to minimize impacts where topographic and engineering constraints allowed for such considerations along the Proposed Route. As part of this effort, the MARL Project has identified 20 locations where forested riparian buffers will be preserved to protect sensitive waterbodies (Table 6.3-1). These areas total 26.3 acres and contain 5,989.2 linear feet of stream length to be preserved. At these locations—referred to as riparian habitat exclusion zones—engineering solutions were developed to retain existing riparian vegetation within 100 feet on either side of the center of the stream. No vegetation clearing or ground disturbance will occur within these zones. As detailed MARL Project engineering continues to progress, additional areas that might be able to be maintained could be identified. If such a scenario arises, the impacts on resource areas could be reduced. Figure 6-3 is an example of a riparian habitat exclusion zone. Table 6.3-1 provides a list and descriptions of the identified riparian habitat exclusion zones.

Section 6.4 shows how resources will benefit from this engineering mitigation by comparing the results with and without incorporation of the riparian habitat exclusion zone. It also highlights how the preservation of riparian habitat exclusion zones contributes to minimizing impacts on sensitive environmental features and supports broader MARL Project mitigation objectives. The Proposed Route ROW Corridor incorporates the 20 riparian habitat exclusion zones. The associated statistics are shown in the tables below under the column headers “Proposed Route (with riparian).”

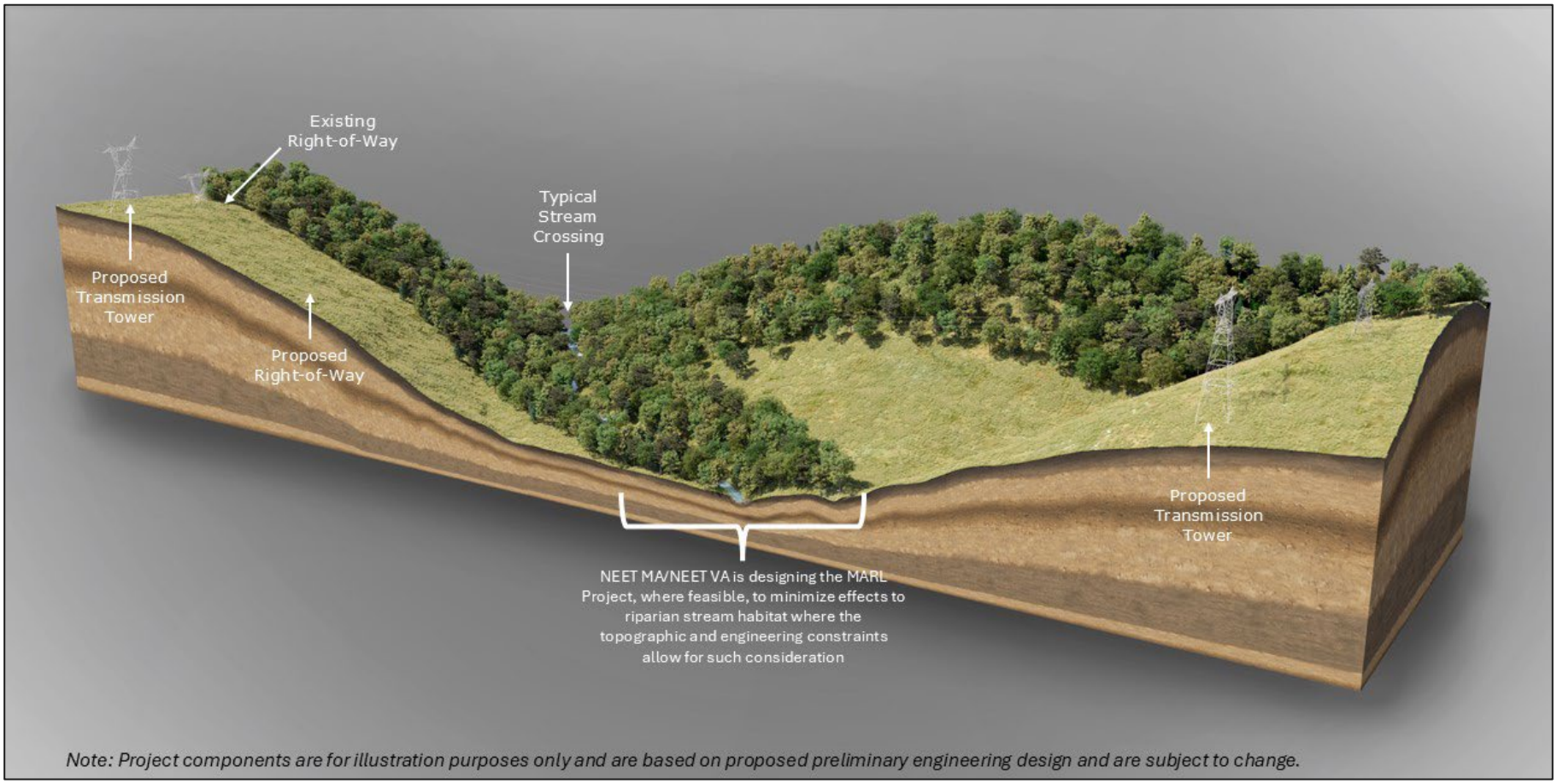
TABLE 6.3-1 IDENTIFIED RIPARIAN HABITAT EXCLUSION ZONES

Nearest MP	Stream Name	State	County	Stream Type	Linear Stream Length (feet)	Riparian Habitat Exclusion Zone (acres)
18.5	Patterson Run	WV	Preston	Trout Stream	384.1	1.8
19.1	Laurel Run / Big Sandy Creek	WV	Preston	Trout Stream/Mussel Stream	301.1	1.4
24.1	Big Sandy Creek	WV	Preston	High Quality Stream	204.5	0.9
37.3	Youghiogheny River	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	389.8	1.2
39.8	Unnamed Tributary to Bear Creek	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	201.8	0.9
40.7	Fikes Run	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	211.2	1.0
41.5	Unnamed Tributary to Bear Creek	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	271.4	1.2
41.9	Cove Run	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	356.8	1.6
42.4	Bear Creek	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	318.0	1.5
43.3	Bear Creek	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	206.1	0.9
44.8	Bear Creek 4	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	652.1	2.9
49.7	South Branch Casselman River	MD	Garrett	Use III: Nontidal Cold Water—Natural Trout Water	261.0	1.2
53.8	Bear Pen Run 1	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	203.4	0.9
54.4	Silver Bell Run	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	201.1	0.9
56.2	Savage River	MD	Garrett	Use III-P: Nontidal Cold Water and Public Water Supply	228.7	0.8
60.3	Laurel Run	MD	Allegany	Use III-P: Nontidal Cold Water and Public Water Supply	357.5	1.6
62.1	George's Creek	MD	Allegany	Use IV-P: Recreational Trout Waters and Public Water Supply	467.1	2.1
63.5	Unnamed Tributary to Jackson Run	MD	Allegany	Use III-P: Nontidal Cold Water and Public Water Supply	244.1	1.1
67.9	North Branch Potomac River [a]	MD/WV	Allegany / Mineral	Trout Streams	264.6	1.2
95.5	North River	WV	Hampshire	High Quality/Mussel Stream	264.8	1.2

MD = Maryland; MP = milepost; WV = West Virginia

[a] The North Branch of the Potomac River is located within both Maryland and West Virginia.

FIGURE 6-3 RIPARIAN HABITAT EXCLUSION ZONE



MARL Project = MidAtlantic Resiliency Link Project; NEET MA = NextEra Energy Transmission MidAtlantic, Inc.; NEET VA = NextEra Energy Transmission Virginia, Inc.

6.4 THE PROPOSED ROUTE ANALYSIS

The tables in this section (Table 6.4-1 through Table 6.4-11) correspond to those presented in Section 5[12] but are presented below to reflect the Proposed Route only. These tables show how the preservation of riparian habitat exclusion zones minimizes impacts on sensitive environmental features by comparing the results with and without the riparian habitat exclusion zones. The tables also outline the criteria within the ancillary facility workspaces outside of the ROW Corridor as well as the Woodside Substation.

TABLE 6.4-1 ROUTE LENGTH AND CONSTRUCTION FOOTPRINT ANALYSIS

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
Centerline length	Miles	107.5	107.5	2.6	77.4	NA	NA
ROW Corridor / Workspace / Substation	Acres	2,669.0	2,642.4	7.1	231.4	357.2	72.1

NA= not applicable; ROW = right-of-way

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).

[a] Acreage was calculated for areas outside of the ROW Corridor only.

TABLE 6.4-2 PARALLELING EXISTING INFRASTRUCTURE ANALYSIS

Criteria	Proposed Route	
	Miles	%
Paralleling existing transmission lines [a]	56.4	52.5
Greenfield section development [b]	51.1	47.5
Paralleling railroad ROW	0.0	0.0
Paralleling natural gas pipelines ROW	0.0	0.0
Paralleling highways	0.0	0.0

Source: Rextag Infrastructure data

ROW = Right-of-Way

[a] Paralleling for the MARL Project is defined as siting the proposed transmission line so the MARL Project ROW Corridor abuts the existing transmission line corridor.

[b] Greenfield section for the MARL Project is defined as a section of the MARL Project ROW Corridor for any portion of the route that does not abut an existing transmission line corridor.

[12] Table 5.3-1 is not included in Section 6 of the Routing Study as it is not a table that reported analytics for the Proposed Route.

TABLE 6.4-3 COMMUNITY AND RECREATIONAL RESOURCES ANALYSIS

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
Parcels / unique landowners	Count	500	500	27	468	413	2
		388	388	24	364	335	2
Residential dwellings [b,c] within ROW Corridor or LoD / 250 feet / 500 feet of centerline	Count	1	1	0	0	0	1
		29	29	NA	NA	NA	NA
		151	151	NA	NA	NA	NA
Residential outbuildings [b,d] within ROW Corridor or LoD / 250 feet / 500 feet of centerline	Count	6	6	0	4	1	2
		50	50	NA	NA	NA	NA
		273	273	NA	NA	NA	NA
Non-residential buildings [b,e] within ROW Corridor or LoD / 250 feet / 500 feet of centerline	Count	25	25	0	3	3	0
		74	74	NA	NA	NA	NA
		187	187	NA	NA	NA	NA
Places of worship within 500 feet of the centerline	Count	1	1	NA	NA	NA	NA
Childcare facilities within 500 feet of the centerline	Count	0	0	NA	NA	NA	NA
Public / private schools within 500 feet of centerline	Count	0	0	NA	NA	NA	NA
Trails crossings—Potomac Heritage National Scenic Trail and Hiking Trails	Count	3	3	0	0	0	0
		9	9	0	5	0	0
State Scenic Byways	Count	4	4	0	0	0	0

Source: ReportAll, HIFLD, MDOT, WVDOT, MDiMap, WVGISTC, PASDA, ERM

LoD= limit of disturbance; NA= not applicable; ROW = right-of-way

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

[a] Acreage was calculated for areas outside of the ROW Corridor only.

[b] Footprints were digitized using high-resolution (3-inch) aerial imagery contracted by NEET MA and NEET VA and captured during leaf-off conditions between December 2023 and February 2024 and county property data. This dataset may not reflect proposed or recently built structures and could include classification errors inherent to desktop study limitations (e.g., forest cover, image resolution, interpretation of aerial data).

[c] A residential dwelling is defined as a building used for people to live in and includes buildings such as single-family homes, multi-family units, mobile/manufactured homes, etc.
[d] A residential outbuilding is defined as a secondary structure located on the same property as a residential dwelling and includes buildings such as detached garages, sheds, greenhouses, etc.
[e] A non-residential building is defined as any structure located on a non-residential property and includes buildings used for commercial purposes industrial use, agricultural, community, or government.

TABLE 6.4-4 PROTECTED LAND ANALYSIS

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
State Forest	Count	2	2	1	2	2	0
	Miles	9.7	9.7	0.3	6.0	NA	NA
	Acres	248.3	241.5	0.8	15.4	47.3	0.0
State Park	Count	0	0	0	0	0	0
	Miles	0.0	0.0	0.0	0.0	NA	NA
	Acres	0.0	0.0	0.0	0.0	0.0	0.0
Fisheries / WMA	Count	3	3	0	3	3	0
	Miles	3.1	3.1	0.0	2.2	NA	NA
	Acres	75.8	75.8	0.0	5.7	3.7	0.0
Pennsylvania State Wilderness Area	Count	0	0	0	0	0	0
	Miles	0.0	0.0	0.0	0.0	NA	NA
	Acres	0.0	0.0	0.0	0.0	0.0	0.0
Pennsylvania State Game Lands	Count	0	0	0	0	0	0
	Miles	0.0	0.0	0.0	0.0	NA	NA
	Acres	0.0	0.0	0.0	0.0	0.0	0.0
Maryland Wildlands	Count	3	3	0	0	0	0
	Miles	2.4	2.4	0.0	0.0	NA	NA
	Acres	57.0	55.3	0.0	0.0	0.0	0.0
Conservation Easements	Count	3	3	0	3	5	0
	Miles	2.2	2.2	0.0	3.1	NA	NA
	Acres	55.2	54.4	0.0	8.7	12.0	0.0
USACE Recreation Areas	Count	1	1	0	0	0	0
	Miles	0.1	0.1	0.0	0.0	NA	NA
	Acres	3.9	2.7	0.0	0.0	0.0	0.0

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
Total Protected Lands [b,c]	**Count**	**8**	**8**	**1**	**7**	**9**	**0**
	Miles	**14.6**	**14.6**	**0.3**	**9.3**	**NA**	**NA**
	Acres	**368.4**	**359.6**	**0.8**	**24.5**	**62.1**	**0.0**

Source: PAD-US, NCED, MDNR, MDiMAP, PASDA, WVDEP, VADCR

NA= not applicable; ROW = right-of-way; USACE = U.S. Army Corps of Engineers; WMA = Wildlife Management Area; WVDNR = West Virginia Division of Natural Resources

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).

[a] Acreage was calculated for areas outside of the ROW Corridor only.

[b] Total protected lands excludes the Maryland Wildlands to avoid double counting since Wildlands are within a state forest or WMA. In addition, White Horse Mountain WMA has an associated conservation easement. The White Horse Mountain WMA is a 1,725-acre conservation and recreation area located in Hampshire County, West Virginia, and is managed by the WVDNR. The Potomac Conservancy held a conservation easement on White Horse Mountain to protect it from development and transferred ownership to WVDNR to manage the land as a public recreation area and WMA. The statistics associated with White Horse Mountain WMA are included in both the "Conservation Easements" and "Fisheries / Wildlife Management Area" categories but are not double counted in total impact calculations.

[c] Totals may not match the sum of addends due to rounding.

TABLE 6.4-5 SPECIFIC PROTECTED LANDS ANALYSIS

Specific Protected Area [a]	State	Existing Transmission Line in Resource?	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [b]	Temporary Access Roads [b]	Other Temporary Ancillary Facilities [b]	Woodside Substation
Coopers Rock State Forest	WV	Yes—138 kV	Yes	Yes	No	Yes	Yes	No
State Game Lands 138	PA	Yes—500 kV	No	No	No	No	No	No
Forbes State Forest	PA	Yes—500 kV	No	No	No	No	No	No
Quebec Run Wild Area	PA	Yes—500 kV	No	No	No	No	No	No
Youghiogheny River Lake Recreation Area (USACE)	MD	Yes—500 kV and 138 kV	Yes	Yes	No	No	No	No
Maryland Rural Legacy Property (Bear Creek RL-0396)	MD	Yes—500 kV	Yes	Yes	No	Yes	Yes	No
Maryland Rural Legacy Property (Bear Creek RL-35354)	MD	Yes-500 kV	Yes	Yes	No	Yes	Yes	No
Bear Creek Hatchery FMA	MD	Yes—500 kV	Yes	Yes	No	Yes	Yes	No
Savage River State Forest	MD	Yes—500 kV and two 138 kV	Yes	Yes	Yes	Yes	Yes	No
Bear Pen Wildlands	MD	Yes—138 kV	Yes	Yes	No	No	No	No
Big Savage Mountain Wildlands	MD	Yes—500 kV and 138 kV	Yes	Yes	No	No	No	No
Dan’s Mountain WMA	MD	Yes—500 kV and 138 kV	Yes	Yes	No	Yes	Yes	No
Dan’s Mountain Wildlands	MD	Yes—500 kV	Yes	Yes	No	No	No	No

Specific Protected Area [a]	State	Existing Transmission Line in Resource?	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [b]	Temporary Access Roads [b]	Other Temporary Ancillary Facilities [b]	Woodside Substation
White Horse Mountain WMA	WV	Yes—500 kV and 138 kV	Yes	Yes	No	Yes	Yes	No

Source: PAD-US, NCED, MDNR, MDiMAP, PASDA, WVDEP, VADCR

FMA = Fisheries Management Area; kV = kilovolt; MD = Maryland; PA = Pennsylvania; USACE = U.S. Army Corps of Engineers; WMA = Wildlife Management Area; WV = West Virginia

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

[a] Protected area listed west to east

[b] Acreage was calculated for areas outside of the ROW Corridor only.

TABLE 6.4-6 CULTURAL RESOURCES ANALYSIS

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
Cemeteries within ROW Corridor or Workspace; 500 feet of centerline	Count	0	0	0	0	0	0
		4	4	NA	NA	NA	NA
Archaeological Resources within ROW Corridor or Workspace	Count	6	6	0	3	1	0
Architecture Resources—NRHP eligible, NRHP listed or NHL listed within ROW Corridor; 0.5-mile buffer from centerline / Workspace	Count	4	4	0	1	0	0
		7	7	NA	NA	NA	NA
Historic Districts Crossed	Count	6	6	0	1	0	0
Battlefields	Count	1	1	0	1	1	0
	Acres	38.0	38.0	0.0	0.1	14.5	0.0
MD—Heritage Areas	Count	1	1	1	1	1	0
	Acres	128.3	126.1	0.02	9.8	16.5	0.0

Source: PASHPO, WVSHPO, MHT, VADHR

NA= not applicable; ROW = right-of-way; MD = Maryland; NHL = National Historic Landmarks; NRHP = National Register of Historic Places; ROW = right-of-way

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).

[a] Acreage was calculated for areas outside of the ROW Corridor only.

TABLE 6.4-7 AGRICULTURAL LAND ANALYSIS

Agricultural Land	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
Not Prime Farmland Class	Acres	1,789.5	1,764.3	5.1	161.1	247.3	2.7
State Importance Farmland Class	Acres	389.7	389.3	0.7	33.5	61.1	8.1
Local Importance Farmland Class	Acres	399.3	398.9	1.1	27.5	45.4	0.0
Prime Farmland Class	Acres	90.4	90.0	0.2	9.4	3.5	61.3

Source: USA SSURGO

Notes:
No riparian = Proposed Route without riparian habitat exclusion zones
With riparian = Proposed Route with riparian habitat exclusion zones
Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).
[a] Acreage was calculated for areas outside of the ROW Corridor only.

TABLE 6.4-8 LAND COVER ANALYSIS

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
Barren Land (Rock/Sand/Clay)	Acres	20.2	20.2	0.1	3.7	2.8	0.0
Cultivated Crops	Acres	45.4	45.3	0.0	0.7	6.7	28.5
Deciduous Forest	Acres	1,836.0	1,823.8	6.1	142.5	265.6	2.8
Developed, High Intensity	Acres	0.0	0.0	0.0	0.0	0.0	0.0
Developed, Low Intensity	Acres	16.2	14.4	0.0	7.8	0.3	0.9
Developed, Medium Intensity	Acres	2.0	2.0	0.0	0.5	0.0	0.0
Developed, Open Space	Acres	82.2	79.9	0.1	39.9	4.5	6.3
Emergent Herbaceous Wetlands	Acres	0.0	0.0	0.0	0.0	0.0	0.0
Evergreen Forest	Acres	24.0	24.0	0.0	1.6	2.4	0.0
Grassland/Herbaceous	Acres	25.3	24.8	0.0	2.3	2.2	0.0
Mixed Forest	Acres	171.4	163.2	0.0	9.3	23.4	0.0
Open Water	Acres	13.0	11.3	0.0	0.0	0.0	0.0
Pasture/Hay	Acres	415.7	415.7	0.7	22.1	47.6	33.7
Shrub/Scrub	Acres	15.3	15.3	0.0	1.1	1.8	0.0
Woody Wetlands	Acres	2.5	2.5	0.0	0.0	0.0	0.0
Forest Lands Total [b] (Deciduous Forest, Evergreen Forest, and Mixed Forest)	**Acres**	**2,031.4**	**2,011.0**	**6.1**	**153.4**	**291.4**	**2.8**
Agricultural Lands Total [b] (Pasture/Hay and Cultivated Crops)	**Acres**	**461.1**	**461.0**	**0.7**	**22.8**	**54.3**	**62.2**
Developed Lands Total [b] (High, Low, Medium, Open Space)	**Acres**	**100.4**	**96.3**	**0.1**	**48.2**	**4.8**	**7.2**

Source: USGS NLCD 2024

Notes:
No riparian = Proposed Route without riparian habitat exclusion zones
With riparian = Proposed Route with riparian habitat exclusion zones
Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).
[a] Acreage was calculated for areas outside of the ROW Corridor only.
[b] Totals may not match the sum of addends due to rounding.

TABLE 6.4-9 WATER RESOURCES ANALYSIS

Water Resources	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
NHD Stream/River—Perennial	Count	81	61	0	23	8	0
	Corridor Length (feet)	27,326.6	21,432.4	0.0	958.5	269.1	0.0
NHD Stream/River—Intermittent	Count	37	37	1	9	5	0
	Corridor Length (feet)	9,911.6	9,911.6	171.0	614.7	827.5	0.0
NHD Waterbody	Count	14	14	0	0	3	0
	Area (acres)	4.2	3.2	0.0	0.0	0.1	0.0
Section 10 Navigable Waters	Count	3	2	0	0	0	0
Trout Streams and Coldwater Fisheries (all states) [b]	Count	39	22	0	6	1	0
	Corridor Length (feet)	13,513.2	8,150.1	0.0	391.3	3.6	0.0
PA Trout Streams	Count	1	1	0	0	0	0
	Corridor Length (feet)	258.2	258.2	0.0	0.0	0.0	0.0
WV Trout Streams	Count	7	3	0	0	0	0
	Corridor Length (feet)	1,821.7	668.4	0.0	0.0	0.0	0.0
VA Trout Streams	Count	0	0	0	0	0	0
	Corridor Length (feet)	0.0	0.0	0.0	0.0	0.0	0.0
PA—Designated Use Streams (CWF, EV, HQ, TSF)	Count	3	3	0	2	0	0
	Corridor Length (feet)	1,556.0	1,556.0	0.0	56.9	0.0	0.0
MD—Designated Use Streams (Use III and III-P: Nontidal Cold Water and Public Water Supply)	Count	27	15	0	4	1	0
	Corridor Length (feet)	9,410.2	5,667.6	0.0	334.5	3.6	0.0

Water Resources	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
MD—Designated Use Streams (Use IV and IV-P: Recreational Trout Waters and Public Water Supply)	Count	1	0	0	0	0	0
	Corridor Length (feet)	467.1	0.0	0.0	0.0	0.0	0.0
VA—Threatened & Endangered Species Waters	Count	1	1	0	0	0	0
	Corridor Length (feet)	438.6	438.6	0.0	0.0	0.0	0.0
WV—Mussel Streams	Count	8	6	0	1	0	0
	Corridor Length (feet)	2,221.3	1,752.0	0.0	45.0	0.0	0.0
MD—Designated Use Streams (Use I and I-P Water Contact Recreation, Protection of Aquatic Live, and Public Water Supply)	Count	1	0	0	0	0	0
	Corridor Length (feet)	264.6	0.0	0.0	0.0	0.0	0.0
Modeled Wetlands [c]	Acres	42.6	36.6	0.0	0.8	3.4	0.0
NWI—All Types [b]	Acres	42.7	37.5	0.0	1.0	0.9	0.0
NWI—Freshwater Emergent	Acres	3.9	3.9	0.0	0.1	0.2	0.0
NWI—Freshwater Shrub Scrub	Acres	11.7	11.4	0.0	0.3	0.3	0.0
NWI—Freshwater Pond	Acres	3.9	3.9	0.0	0.1	0.3	0.0
NWI—Lake	Acres	0.0	0.0	0.0	0.0	0.0	0.0
NWI—Riverine	Acres	23.2	18.3	0.0	0.4	0.2	0.0
WV—DEP Wetlands	Acres	8.0	6.0	0.0	0.2	0.2	0.0
MD—DNR Wetlands of Special Concern	Acres	0.0	0.0	0.0	0.0	0.0	0.0
MD—DNR Wetlands	Acres	5.7	3.2	0.0	0.0	3.3	0.0
FEMA Flood Zone A/AE/AO—Areas with a 1% annual chance of flooding (100-year flood area)	Acres	98.4	88.6	0.0	6.7	0.8	0.0
	Structure Count	8	8	NA	NA	NA	NA
FEMA Flood Zone X—Areas with 0.2% annual chance of flooding (500-year flood area)	Acres	3.5	3.2	0.0	0.2	0.0	0.0
	Structure Count	0	0	NA	NA	NA	NA

Water Resources	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
FEMA Flood Zones Combined [b]	Acres	101.9	91.8	0.0	6.9	0.8	0.0

Source: USGS NHD, FEMA's National Flood Hazard Layer (NFHL), USFWS, MDE, PFBC, PADEP, WVDNR, VADWR

CWF = Coldwater Fishes; DEP = Department of Environmental Protection; DNR = Department of Natural Resources; EV = Exceptional Value; FEMA = Federal Emergency Management Agency; HQ = High Quality; MD = Maryland; NHD = National Hydrography Dataset; NWI = National Wetlands Inventory; NA = not applicable; PA = Pennsylvania; TSF = Trout Stocking; VA = Virginia; WV = West Virginia

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).

[a] Acreage was calculated for areas outside of the ROW Corridor only.

[b] Totals may not match the sum of addends due to rounding.

[c] ERM conducted a deep learning model to predict wetlands in the MARL Project Study Area. See Appendix H, Wetland Identification Model Report.

TABLE 6.4-10 SENSITIVE SPECIES AND HABITATS

Ecological Resources	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
USFWS Critical Habitat Final	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
USFWS Critical Habitat Proposed	Area (acres)	0.9	0.9	0.0	0.0	0.0	0.0
State-Listed Species Occurrence (from state NHI Element Occurrence Data)	Area (acres)	235.1	233.5	3.0	25.2	24.3	0.0
Potentially Suitable State-listed Species, MBTA, and Foraging Bat Habitat	Area (acres)	2,650.8	2,626.0	7.1	223.2	356.9	71.3
Potentially Suitable Monarch Butterfly Habitat	Area (acres)	538.4	535.7	0.9	65.4	56.0	40.0
Bat Known Occupied Summer Habitat (all states)	Area (acres)	104.3	102.4	0.7	11.8	17.3	0.0
Bat Hibernacula (all states)	Area (acres)	388.9	385.7	1.6	37.6	54.2	0.0
Potentially Suitable Bat Roosting Habitat	Area (acres)	2,033.9	2,013.5	6.1	153.3	291.4	2.8
MD—Irreplaceable Natural Areas	Count	11	10	0	3	7	0
MD—Irreplaceable Natural Areas	Area (acres)	88.7	82.4	0.0	0.2	12.3	0.0
MD—Forest Interior Dwelling Species Confirmed	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
MD—Forest Interior Dwelling Species Probable	Area (acres)	83.0	79.5	0.0	5.3	22.4	0.0
MD—Natural Heritage Areas	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
MD—Forests of Recognized Importance	Count	27	15	0	2	8	0
MD—Forests of Recognized Importance	Area (acres)	38.9	20.9	0.0	0.1	0.6	0.0
MD—Federal or State-Listed Species	Area (acres)	268.7	260.7	0.8	25.2	47.9	0.0
MD—Species of Concern	Area (acres)	7.2	6.2	0.0	0.0	0.2	0.0

Ecological Resources	Unit	Proposed Route (no riparian)	Proposed Route (with riparian)	Permanent Access Roads [a]	Temporary Access Roads [a]	Other Temporary Ancillary Facilities [a]	Woodside Substation
MD—BioNet Tier 1 (critically significant)	Area (acres)	96.1	93.0	0.8	19.5	15.9	0.0
MD—BioNet Tier 2 (Extremely Significant)	Area (acres)	70.8	67.8	0.0	1.2	12.1	0.0
MD—BioNet Tier 3 (Highly Significant)	Area (acres)	345.1	340.6	0.0	13.3	47.2	0.0
MD—BioNet Tier 4 (Moderately Significant)	Area (acres)	226.3	223.9	0.2	13.9	29.0	0.0
MD—BioNet Tier 5 (Significant)	Area (acres)	76.9	73.9	0.0	5.4	22.4	0.0
PA—Natural Heritage Areas	Area (acres)	32.4	32.4	0.0	5.4	5.9	0.0
VA—Ecological Core C1 (Outstanding)	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
VA—Ecological Core C2 (Very High)	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
VA—Ecological Core C3 (High)	Area (acres)	0.0	0.0	0.0	0.0	0.0	0.0
VA—Ecological Core C4 (Moderate)	Area (acres)	24.4	24.4	0.0	0.3	4.0	0.0
VA—Ecological Core C5 (General)	Area (acres)	50.0	50.0	0.0	0.4	13.1	0.0

Source: USFWS, USGS, WVDNR, MDNR, VADWR, PNHP, PADCNR

BioNet = Biodiversity Conservation Network; MBTA = Migratory Bird Treaty Act; MD = Maryland; NHI = National Heritage Inventory; PA = Pennsylvania; USFWS = U.S. Fish and Wildlife Service; VA = Virginia

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).

[a] Acreage was calculated for areas outside of the ROW Corridor only.

TABLE 6.4-11 ENGINEERING AND INFRASTRUCTURE CRITERIA

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian) [a]	Permanent Access Roads [b]	Temporary Access Roads [b]	Other Temporary Ancillary Facilities [b]	Woodside Substation
Existing Transmission Line Crossings							
Electric Transmission Line Unknown kV Crossing	Count	11	11	NA	NA	NA	NA
Electric Transmission Line 69 kV Crossing	Count	0	0	NA	NA	NA	NA
Electric Transmission Line 115 kV Crossing	Count	1	1	NA	NA	NA	NA
Electric Transmission Line 132 kV Crossing	Count	1	1	NA	NA	NA	NA
Electric Transmission Line 138 kV Crossing	Count	21	21	NA	NA	NA	NA
Electric Transmission Line 500 kV Crossing	Count	7	7	NA	NA	NA	NA
Structures							
Number of Structures	Count	452	452	NA	NA	NA	NA
Structures with Turn Angles 0-20 degrees	Count	361	361	NA	NA	NA	NA
Structures with Turn Angles 20-30 degrees	Count	41	41	NA	NA	NA	NA
Structures with Turn Angles greater than 30 degrees	Count	50	50	NA	NA	NA	NA
Span Length Greater than 1,600 feet	Count	33	33	NA	NA	NA	NA
Topography							
Very Steep Slope (31-90 degrees)	Miles	1.6	1.6	NA	NA	NA	NA
Steep Slope (21-30 degrees)	Miles	6.4	6.4	NA	NA	NA	NA
Moderate Slope (16-20 degrees)	Miles	5.4	5.4	NA	NA	NA	NA
Strongly Sloping (6-15 degrees)	Miles	40.2	40.2	NA	NA	NA	NA
Flat to Gentle Slope (0-5 degrees)	Miles	53.9	53.9	NA	NA	NA	NA

Criteria	Unit	Proposed Route (no riparian)	Proposed Route (with riparian) [a]	Permanent Access Roads [b]	Temporary Access Roads [b]	Other Temporary Ancillary Facilities [b]	Woodside Substation
Infrastructure Crossings							
Primary Road Crossing	Count	2	2	NA	NA	NA	NA
Secondary Road Crossing	Count	14	14	NA	NA	NA	NA
Tertiary Road Crossing	Count	140	140	NA	NA	NA	NA
Railroad Crossing	Count	4	4	NA	NA	NA	NA
Oil and Gas Wells: within the ROW Corridor or Workspace; 500 feet of centerline	Count	4	4	0	1	3	0
		22	22	NA	NA	NA	NA
Natural Gas Pipeline Crossing (transmission / distribution / gathering)	Count	7	7	NA	NA	NA	NA
		16	16	NA	NA	NA	NA
		4	4	NA	NA	NA	NA
Wind turbines (within 500 feet and 0.5 mile of the centerline)	Count	0	0	NA	NA	NA	NA
		0	0	NA	NA	NA	NA
Airports within 20,000 feet of the centerline: public/private	Count	0	0	NA	NA	NA	NA
		4	4	NA	NA	NA	NA
Geologic Karst Features (miles / acres of ROW)	Miles	12.0	12.0	0.5	11.0	NA	NA
	Acres	302.9	301.9	1.3	41.6	60.7	72.1

Source: REXTAG, USGS

kV = kilovolt; NA = not applicable; ROW = right-of-way

Notes:

No riparian = Proposed Route without riparian habitat exclusion zones

With riparian = Proposed Route with riparian habitat exclusion zones

Bolded/italicized values are different from the values shown for the Proposed Route (no riparian).

[a] Statistics for the Proposed Route including the riparian habitat exclusion zones is the same for all engineering and infrastructure criteria except for Geologic Karst Features due to counts and mileage lengths which do not change.

[b] Acreage was calculated for areas outside of the ROW Corridor only.

6.5 CONCLUSION

The purpose of the Routing Study was to identify a Proposed Route across all four states that met the following criteria:

1. Reasonably minimized potential impacts on the natural and built environment (including both the transmission line as well as the access roads and temporary workspaces to facilitate construction).
2. Maximized placement of proposed infrastructure adjacent to existing linear infrastructure and routing opportunities, where available.
3. Minimized special design requirements that could result in increased costs (e.g., engineering factors or special structure designs), and can be constructed and operated in a safe, timely, and reliable manner.

Following the steps outlined in in this Routing Study, the Routing Team identified six end-to-end Alternative Routes (A through F) that were comparatively analyzed using both quantitative and qualitative information that ultimately determined a superior Proposed Route. From this analysis, Alternative Route A was selected as the Proposed Route.

Alternative Route A offers the most balanced solution that maximizes opportunities to parallel existing transmission lines, minimizes potential impacts on both natural environment and built environment, and minimizes the engineering and construction-related challenges. As shown in Table 5.6-1, Alternative Route A had superior performance for all routing criteria except for one, where it had a moderate performance. Specifically, Alternative Route A had superior performance for route length and footprint, paralleling existing infrastructure, community and recreational resources, cultural resources, agricultural and land cover, water resources, sensitive species and habitats, and engineering criteria. It had moderate performance for protected lands. It did not have inferior performance for any criteria when compared to other Alternative Routes. Notably, Alternative Route A is the only Alternative Route with superior performance for three primary categories of criteria the Routing Team strived to achieve at the start of the MARL Project: route length and construction footprint, paralleling existing infrastructure, and community and recreational resource—which were important decision criteria for the selection of the Proposed Route.

The Proposed Route incorporates ancillary facility workspaces, including both temporary and permanent access roads, temporary structure pads at each tower location, and temporary wire work areas for conductor stringing operations. Additionally, where feasible, the Routing Team was able to identify 20 initial locations of riparian habitat associated with streams that could be maintained to minimize impacts where the topographic and engineering constraints allowed for such considerations along the Proposed Route. Therefore, the Proposed Route for the MARL Project is inclusive of the ancillary facility workspaces and the initial riparian habitat exclusive zones.

7. REFERENCES

See Appendix G, Data Sources.

Appendix D: Virginia Environmental Review Document

MidAtlantic Resiliency Link Project

PREPARED FOR
NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc.

DATE
January 2026

REFERENCE
0718854



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SIGNATURE PAGE

Appendix D: Virginia Environmental Review Document

MidAtlantic Resiliency Link Project

0718854

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CONTENTS

1.	INTRODUCTION AND BACKGROUND	1
1.1	MARL PROJECT DESCRIPTION	9
1.2	OBJECTIVES OF THE ENVIRONMENTAL REVIEW DOCUMENT	15
2.	ENVIRONMENTAL SETTING AND IMPACTS FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES	17
2.1	PROJECT COMPONENTS AND SITE DESCRIPTION	17
2.1.1	Corridor Widths	17
2.1.2	Aerial Easement Locations	22
2.1.3	Ancillary Facility Workspaces Outside of the ROW Corridor	22
2.1.4	Virginia Site Description	24
2.2	LAND USE	25
2.2.5	Commercial and Industrial areas and Buildings	36
2.2.7	Conservation Easements and Lands	37
2.2.8	Recreational Resources	37
2.2.9	Schools, Cemeteries, and Places of Worship	38
2.2.10	Transportation Infrastructure	38
2.2.11	Airports and Heliports	43
2.3	NATURAL RESOURCES	49
2.3.1	Watersheds	49
2.3.2	Wetlands	52
2.3.3	Waterbodies	54
2.3.4	Natural Heritage Resources	60
2.3.5	Protected Species	67
2.3.6	Vegetation	86
2.4	VISUAL RESOURCES	96
2.4.1	Existing Conditions	96
2.4.2	Impacts	104
2.5	CULTURAL RESOURCES	108
2.5.1	Existing Conditions	109
2.5.2	Impacts	118
2.6	ENVIRONMENTAL JUSTICE	123
2.6.1	Environmental Justice Methodology	124
2.6.2	Existing Conditions	124
2.6.3	Impacts	125
2.7	GEOLOGICAL RESOURCES	129
2.7.1	Physiographic Setting, Geology, and Groundwater	129
2.7.2	Soils	134

3. COMPARISON OF ROUTE ALTERNATIVES AND CONCLUSION 143

3.1 LAND USE 143
3.1.1 Lengths, Footprints, Parcels, and Paralleling 143
3.1.2 Land Ownership, Planning, and Zoning 144
3.1.3 Land Use and Land Cover 144
3.1.4 Resource Protection Areas and Resource Management Areas 145
3.1.5 Residential and Non-Residential Buildings 145
3.1.6 Schools, Cemeteries, and Places of Worship 145
3.1.7 Transportation Infrastructure 146
3.2 NATURAL RESOURCES 146
3.2.1 Wetlands 146
3.2.2 Waterbodies 147
3.2.3 Virginia Department of Conservation and Recreation Conservation Site 147
3.2.4 Ecological Cores 147
3.2.5 Forests 147
3.3 VISUAL RESOURCES 147
3.4 CULTURAL RESOURCES 148
3.5 ENVIRONMENTAL JUSTICE 148
3.6 CONCLUSIONS AND RECOMMENDATIONS 148

4. REFERENCES 151

SECTION 2, ENVIRONMENTAL SETTING AND IMPACTS FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 151
Section 2.2, Land Use 151
Section 2.3, Natural Resources 152
Section 2.4, Visual Resources 154
Section 2.5, Cultural Resources 155
Section 2.6, Environmental Justice 155
Section 2.7, Geological Resources 156

ATTACHMENTS

ATTACHMENT 1, VIRGINIA ERD RESOURCE MAPBOOKS
ATTACHMENT 1A, TOPOGRAPHY MAPBOOK
ATTACHMENT 1B, LAND COVER MAPBOOK
ATTACHMENT 1C, WATER RESOURCES MAPBOOK
ATTACHMENT 1D, SENSITIVE SPECIES AND HABITATS MAPBOOK
ATTACHMENT 1E, CULTURAL RESOURCES MAPBOOK
ATTACHMENT 1F, SOILS MAPBOOK
ATTACHMENT 2, WETLAND AND WATERBODY DESKTOP ASSESSMENT
ATTACHMENT 3, VIRGINIA AGENCY CORRESPONDENCE
ATTACHMENT 4, PRE-APPLICATION ANALYSIS REPORT

LIST OF TABLES

TABLE 1-1	GUIDELINES FOR TRANSMISSION LINE APPLICATIONS FILED UNDER TITLE 56 OF THE CODE OF VIRGINIA	2
TABLE 1.1-1	MARL PROJECT FEATURES WITHIN THE PROPOSED ROUTE AND ALTERNATIVE ROUTES	11
TABLE 2.1-1	ANCILLARY FACILITY WORKSPACES FOR THE PROPOSED ROUTE	23
TABLE 2.1-2	ANCILLARY FACILITY WORKSPACES FOR ALTERNATIVE ROUTES B AND F IN VIRGINIA	23
TABLE 2.2-1	LAND COVER CLASSIFICATIONS WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE	28
TABLE 2.2-2	LAND COVER CLASSIFICATIONS WITHIN THE SITING CORRIDORS AND ROW CORRIDORS	30
TABLE 2.2-3	LAND COVER CLASSIFICATIONS WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)	31
TABLE 2.2-4	DWELLINGS NEAR THE PROPOSED AND ALTERNATIVE ROUTE CENTERLINES AND WOODSIDE SUBSTATION SITE	36
TABLE 2.2-5	DWELLINGS NEAR ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIORS (ALL ROUTES)	36
TABLE 2.2-6	ROADS WITHIN AND NEAR THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE	41
TABLE 2.2-7	AIRPORTS AND HELIPORTS LOCATED WITHIN 10 NAUTICAL MILES OF THE MARL PROJECT	45
TABLE 2.2-8	RUNWAY IMAGINARY SURFACE CLASSIFICATIONS FOR PUBLIC AIRPORTS WITHIN 10 NAUTICAL MILES OF ALL MARL PROJECT COMPONENTS	46
TABLE 2.3-1	WETLAND LOSS MITIGATION RATIOS	54
TABLE 2.3-2	WATERBODIES CROSSED BY THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND WITHIN THE WOODSIDE SUBSTATION SITE (NUMBER OF CROSSINGS)	55
TABLE 2.3-3	WATERBODIES WITHIN ANCILLARY FACILITY WORKSAPCES OUTSIDE OF THE ROW CORRIDORS (NUMBER OF CROSSINGS)	58
TABLE 2.3-4	ECOLOGICAL CORES WITHIN THE SITING CORRIDORS AND THE WOODSIDE SUBSTATION SITE (ACRES)	65
TABLE 2.3-5	TOTAL LENGTH AND PERCENTAGE OF THE MARL PROJECT THAT PARALLELS EXISTING TRANSMISSION LINES IN VIRGINIA	65
TABLE 2.3-6	CONSERVATION SITES WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)	66
TABLE 2.3-7	ECOLOGICAL CORES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)	67
TABLE 2.3-8	ECOLOGICAL CORES WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)	67
TABLE 2.3-9	FEDERALLY LISTED OR PROPOSED THREATENED OR ENDANGERED SPECIES POTENTIALLY OCCURRING WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE	69
TABLE 2.3-10	POTENTIALLY SUITABLE BAT HABITAT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)	71
TABLE 2.3-11	POTENTIALLY SUITABLE MONARCH BUTTERFLY HABITAT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)	73
TABLE 2.3-12	STATE AND FEDERALLY LISTED AND PROPOSED SPECIES AND SPECIES OF COLLECTION CONCERN POTENTIALLY OCCURRING WITHIN 2 MILES OF THE SITING CORRIDORS	74
TABLE 2.3-13	POTENTIALLY SUITABLE HABITAT FOR STATE-LISTED SPECIES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)	76

TABLE 2.3-14 MIGRATORY BIRDS WITH POTENTIAL TO OCCUR WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE 77
TABLE 2.3-15 POTENTIALLY SUITABLE HABITAT FOR STATE-LISTED SPECIES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 78
TABLE 2.3-16 POTENTIALLY SUITABLE BAT HABITAT WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES) 80
TABLE 2.3-17 POTENTIALLY SUITABLE BAT HABITAT AND KNOWN OCCURRENCES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES) 81
TABLE 2.3-18 POTENTIALLY SUITABLE MONARCH BUTTERFLY HABITAT WITHIN THE SITING CORRIDOR, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES) 82
TABLE 2.3-19 POTENTIALLY SUITABLE MONARCH BUTTERFLY HABITAT WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES) 82
TABLE 2.3-20 POTENTIALLY SUITABLE HABITAT FOR VIRGINIA-LISTED SPECIES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES) 84
TABLE 2.3-21 POTENTIALLY SUITABLE HABITAT FOR VIRGINIA-LISTED SPECIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES) 85
TABLE 2.3-22 LAND COVER TYPES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 89
TABLE 2.3-23 NATURAL VEGETATION WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 90
TABLE 2.3-24 AREA OF MODELED FOREST CONSERVATION VALUES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 91
TABLE 2.3-25 LAND COVER TYPES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES) 91
TABLE 2.3-26 NATIVE VEGETATION WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES) 93
TABLE 2.3-27 LAND COVER WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES) 93
TABLE 2.3-28 NATURAL VEGETATION WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES) 94
TABLE 2.3-29 AREA OF MODELED FOREST CONSERVATION VALUES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES) 95
TABLE 2.3-30 AREA OF MODELED FOREST CONSERVATION VALUES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES) 95
TABLE 2.4-1 LANDSCAPE UNITS CROSSED BY THE PROPOSED AND ALTERNATIVE ROUTE SITING CORRIDORS AND THE WOODSIDE SUBSTATION SITE IN VIRGINIA 101
TABLE 2.4-2 EXISTING LANDSCAPE UNITS AND VIEWER GROUPS WITHIN THE PROPOSED ROUTE AND ALTERNATIVE ROUTE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE 104
TABLE 2.5-1 ARCHAEOLOGICAL SITES WITHIN THE 1-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE 111
TABLE 2.5-2 SUMMARY OF ARCHITECTURAL RESOURCES WITHIN THE 1-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE 113
TABLE 2.5-3 ARCHITECTURAL RESOURCES WITHIN THE 1-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE 115
TABLE 2.5-4 ARCHAEOLOGICAL RESOURCES WITHIN THE PROPOSED ROUTE AND ALTERNATIVE ROUTE ROW CORRIDORS AND THE WOODSIDE SUBSTATION SITE 119
TABLE 2.5-5 ARCHITECTURAL RESOURCES WITHIN THE 0.5-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE 120

TABLE 2.5-6 ELIGIBLE AND LISTED ARCHITECTURAL RESOURCES WITHIN THE 0.5-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES BY NATIONAL REGISTER OF HISTORIC PLACES STATUS 121
TABLE 2.5-7 ABOVEGROUND ARCHITECTURAL RESOURCES WITHIN 500 FEET OF ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS 122
TABLE 2.6-1 ENVIRONMENTAL JUSTICE INDICATORS FOR CENSUS BLOCK GROUPS WITHIN 10 MILES OF THE ROUTES 127
TABLE 2.7-1 FARMLAND SOIL CLASSES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 135
TABLE 2.7-2 RISK RATINGS FOR CORROSION TO STEEL FROM SOIL CONTACT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 136
TABLE 2.7-3 RISK RATINGS FOR CORROSION TO CONCRETE FROM SOIL CONTACT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 136
TABLE 2.7-4 SOIL DRAINAGE CLASSIFICATIONS WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 137
TABLE 2.7-5 FARMLAND SOIL CLASSES WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 138
TABLE 2.7-6 RISK RATINGS FOR CORROSION TO STEEL FROM SOIL CONTACT WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 139
TABLE 2.7-7 RISK RATINGS FOR CORROSION TO STEEL FROM SOIL CONTACT WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES) 139
TABLE 2.7-8 RISK RATINGS FOR CORROSION TO CONCRETE FROM SOIL CONTACT WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 139
TABLE 2.7-9 RISK RATINGS FOR CORROSION TO CONCRETE FROM SOIL CONTACT WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES) 140
TABLE 2.7-10 SOIL DRAINAGE CLASSIFICATIONS WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES) 140
TABLE 2.7-11 SOIL DRAINAGE CLASSIFICATIONS WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES) 141
TABLE 3.1-1 ROUTE LENGTH, CONSTRUCTION FOOTPRINT, AND PARALLELING 144
TABLE 3.1-2 LAND OWNERSHIP 144
TABLE 3.1-3 RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS 145
TABLE 3.2-1 NATURAL RESOURCES CROSSED 146

LIST OF FIGURES

FIGURE 1.1-1 MARL PROJECT OVERVIEW, PROPOSED ROUTE, AND ALTERNATIVE ROUTES 13
FIGURE 1.1-2 MARL PROJECT IN VIRGINIA 14
FIGURE 2.1-1 GRAPHICAL DEPICTION OF ADDITIONAL AERIAL EASEMENT BLOWOUT AREAS 18
FIGURE 2.1-2 SITING CORRIDOR SCHEMATIC 20
FIGURE 2.1-3 ILLUSTRATION OF MARL PROJECT PARALLELING 21
FIGURE 2.1-4 EXAMPLE MAP OF ANCILLARY FACILITY WORKSPACES 24
FIGURE 2.2-1 LAND COVER EXISTING CONDITIONS 27
FIGURE 2.2-2 TRANSPORTATION FACILITIES NEAR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 39
FIGURE 2.2-3 TRANSPORTATION FACILITIES NEAR THE WOODSIDE SUBSTATION SITE 40
FIGURE 2.2-4 AIRPORTS AND HELIPORTS LOCATED WITHIN 10 NAUTICAL MILES OF THE MARL PROJECT 44
FIGURE 2.3-1 WATERSHEDS EXISTING CONDITIONS 51
FIGURE 2.3-2 NATURAL HERITAGE AREAS EXISTING CONDITIONS 63
FIGURE 2.3-3 LAND COVER EXISTING CONDITIONS 72
FIGURE 2.3-4 LEVEL III AND LEVEL IV ECOREGIONS 88
FIGURE 2.4-1 EXISTING LANDSCAPE UNITS (FREDERICK COUNTY) 103
FIGURE 2.6-1 CENSUS BLOCK GROUPS WITHIN 10 MILES OF THE PROPOSED ROUTE, ALTERNATIVE ROUTES, AND WOODSIDE SUBSTATION SITE 126
FIGURE 2.7-1 PHYSIOGRAPHIC PROVINCES IN VIRGINIA 131

ACRONYMS AND ABBREVIATIONS

Acronym	Description
AGL	above ground level
amsl	above mean sea level
BCC	bird of conservation concern
BG	block group
bgs	below ground surface
BMP	best management practice
CBG	census block group
CC	Collection Concern
CFR	Code of Federal Regulations
CPCN	Certificate of Public Convenience and Necessity
CT	census tract
CWA	Clean Water Act
DCR	Virginia Department of Conservation and Recreation
DHR	Virginia Department of Historic Resources
Dominion Energy	Virginia Electric and Power Company d/b/a Dominion Energy Virginia
EJ	environmental justice
EMF	electromagnetic field
ERD	Environmental Review Document

Acronym	Description
ERM	Environmental Resources Management, Inc.
ESA	Endangered Species Act
ESC	erosion and sediment control
FAA	Federal Aviation Administration
FCV	Forest Conservation Value
FE	Federally Endangered
FPE	Federally Proposed for Endangered
FPT	Federally Proposed as Threatened
GIS	Geographic Information System
HUC	Hydrologic Unit Code
I-	Interstate
ID	identification
IFP	Instrument Flight Procedure
IPaC	Information for Planning and Consultation System
kV	kilovolt
LIII	Level III Ecoregion
LIV	Level IV Ecoregion
LoD	limit of disturbance
MARL Project	MidAtlantic Resiliency Link Project
MBTA	Migratory Bird Treaty Act
MD	Maryland
MP	milepost
NA	not applicable
ND	no data
NEET MA	NextEra Energy Transmission MidAtlantic, Inc.
NEET VA	NextEra Energy Transmission Virginia, Inc.
NHD	National Hydrography Dataset
NHDPlus HR	National Hydrography Dataset Plus High-Resolution
NHP	Natural Heritage Program
NHR	Natural Heritage Resource
nm	nautical mile
NRHP	National Register of Historic Places
NUG	Non-Utility Generator
NWI	National Wetlands Inventory
PA	Pennsylvania
PEM	Palustrine Emergent

Acronym	Description
PFO	Palustrine Forested
PJM	PJM Interconnection LLC
PSS	Palustrine Scrub-Shrub
ROW	right-of-way
RTE	rare, threatened, and endangered
RTO	regional transmission organization
SCC	Virginia State Corporation Commission
SE	State Endangered
SPCC	Spill Prevention, Control, and Countermeasures
ST	State Threatened
SWPPP	stormwater pollution prevention plan
TCP	Traffic Control Plan
TERP	Terminal Instrument Procedure
US	U.S. Route
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VA	Virginia
Va. Code	Code of Virginia
VA DWR	Virginia Department of Wildlife Resources
VaFWIS	Virginia Fish and Wildlife Information Service
VCRIS	Virginia Cultural Resources Information System
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDHR	Virginia Department of Historic Resources
VPDES	Virginia Pollutant Discharge Elimination System
VEJA	Virginia Environmental Justice Act
VSMH	Virginia Stormwater Management Handbook
WERMS	Wildlife Environmental Review Map Service
WIM	Wetland Identification Model
WV	West Virginia

1. INTRODUCTION AND BACKGROUND

This report includes the environmental findings of the Proposed Route and five Alternative Routes that were identified in the Routing Study conducted by Environmental Resources Management, Inc. (ERM) on behalf of NextEra Energy Transmission MidAtlantic, Inc. (NEET MA) and NextEra Energy Transmission Virginia, Inc. (NEET VA). The Routing Study presented for the MidAtlantic Resiliency Link (MARL) Project included the following: 1) introduction and background; 2) methodology used for the routing and siting for the MARL Project; 3) Study Area and major constraints and opportunities within the Study Area; 4) route identification, including routes carried forward and dismissed for consideration; 5) comparison of routes carried forward; and 6) identification of the Proposed Route. The Routing Study evaluated the natural environment, built environment, cultural resources, social resources, and engineering constructability for the MARL Project for NEET MA's and NEET VA's proposed new 107.5-mile, 500 kilovolt (kV) transmission line that will traverse portions of Pennsylvania, West Virginia, Maryland, and Virginia, as well as the new 500/138 kV Woodside Substation to be located in Frederick County, Virginia.[1]

NEET MA and NEET VA will be filing four state siting applications with the relative state public utility commissions[2] and specifically one county in Virginia (Frederick County). Title 56 of the Code of Virginia (Va. Code § 56) provides the Virginia State Corporation Commission (SCC) with jurisdiction over the regulation of Virginia public utilities and public service corporations. The process begins when the developer files an application with the SCC pursuant to the Utility Facilities Act (Va. Code §§ 56-265.1 – 265.9). Generally, construction and operation of transmission lines and/or associated facilities operating at 138 kV or higher in Virginia require the issuance of a Certificate of Public Convenience and Necessity (CPCN) from the SCC. In addition, transmission line projects must show compliance with *Guidelines for Transmission Line Applications Filed Under Title 56 of the Code of Virginia*. This Environmental Review Document (ERD) provides the environmental information required by Virginia, and Table 1-1 summarizes these filing requirements and the ERD sections in which the specific information may be found.

[1] NEET MA is responsible for constructing the portions of the MARL Project in Pennsylvania, West Virginia, and Maryland. NEET VA is responsible for constructing the portions of the MARL Project in Virginia, as well as a new 500/138 kV Woodside Substation in Frederick County, Virginia. The permitting of the substation is subject to the siting authority of Frederick County, and information in this Routing Study related to the Woodside Substation is provided for overall context of the full MARL Project.

[2] NEET MA is filing a CPCN application with the following state utility commissions: Maryland Public Service Commission and Public Service Commission of West Virginia. NEET MA is also filing a Certificate of Public Convenience and a Siting application with the Pennsylvania Public Utilities Commission. NEET VA is filing a CPCN application with the Virginia SCC.

TABLE 1-1 GUIDELINES FOR TRANSMISSION LINE APPLICATIONS FILED UNDER TITLE 56 OF THE CODE OF VIRGINIA

Filing Requirements	Application / ERD Section(s)
I. Necessity for the Proposed Project	
I.A. State the primary justification for the proposed project (for example, the most critical contingency violation including the first year and season in which the violation occurs). In addition, identify each transmission planning standard(s) (of the Applicant, regional transmission organization ("RTO"), or North American Electric Reliability Corporation) projected to be violated absent construction of the facility.	See Application.
I.B. Detail the engineering justifications for the proposed project (for example, provide narrative to support whether the proposed project is necessary to upgrade or replace an existing facility, to significantly increase system reliability, to connect a new generating station to the Applicant's system, etc.). Describe any known future project(s), including but not limited to generation, transmission, delivery point or retail customer projects, that require the proposed project to be constructed. Verify that the planning studies used to justify the need for the proposed project considered all other generation and transmission facilities impacting the affected load area, including generation and transmission facilities that have not yet been placed into service. Provide a list of those facilities that are not yet in service.	See Application.
I.C. Describe the present system and detail how the proposed project will effectively satisfy present and projected future electrical load demand requirements. Provide pertinent load growth data (at least five years of historical summer and winter peak demands and ten years of projected summer and winter peak loads where applicable). Provide all assumptions inherent within the projected data and describe why the existing system cannot adequately serve the needs of the Applicant (if that is the case). Indicate the date by which the existing system is projected to be inadequate.	See Application.
I.D. If power flow modeling indicates that the existing system is, or will at some future time be, inadequate under certain contingency situations, provide a list of all these contingencies and the associated violations. Describe the critical contingencies including the affected elements and the year and season when the violation(s) is first noted in the planning studies. Provide the applicable computer screenshots of single-line diagrams from power flow simulations depicting the circuits and substations experiencing thermal overloads and voltage violations during the critical contingencies described above.	See Application.
I.E. Describe the feasible project alternatives, if any, considered for meeting the identified need including any associated studies conducted by the Applicant or analysis provided to the RTO. Explain why each alternative was rejected.	See Application.
I.F. Describe any lines or facilities that will be removed, replaced, or taken out of service upon completion of the proposed project, including the number of circuits and normal and emergency ratings of the facilities.	See Application.
I.G. Provide a system map, in color and of suitable scale, showing the location and voltage of the Applicant's transmission lines, substations, generating facilities, etc., that would affect or be affected by the new transmission line and are relevant to the necessity for the proposed line. Clearly label on this map all points referenced in the necessity statement.	See Application.
I.H. Provide the desired in-service date of the proposed project and the estimated construction time.	See Application.
I.I. Provide the estimated total cost of the project as well as total transmission-related costs and total substation-related costs. Provide the total estimated cost for each feasible alternative considered. Identify and describe the cost classification (e.g. "conceptual cost," "detailed cost," etc.) for each cost provided.	See Application.

Filing Requirements	Application / ERD Section(s)
I.J. If the proposed project has been approved by the RTO, provide the line number, regional transmission expansion plan number, cost responsibility assignments, and cost allocation methodology. State whether the proposed project is considered to be a baseline or supplemental project.	See Application.
I.K. If the need for the proposed project is due in part to reliability issues and the proposed project is a rebuild of an existing transmission line(s), provide five years of outage history for the line(s), including for each outage the cause, duration and number of customers affected. Include a summary of the average annual number and duration of outages. Provide the average annual number and duration of outages on all Applicant circuits of the same voltage, as well as the total number of such circuits. In addition to outage history, provide five years of maintenance history on the line(s) to be rebuilt including a description of the work performed as well as the cost to complete the maintenance. Describe any system work already undertaken to address this outage history.	See Application.
I.L. If the need for the proposed project is due in part to deterioration of structures and associated equipment, provide representative photographs and inspection records detailing their condition.	See Application.
I.M. In addition to the other information required by these guidelines, applications for approval to construct facilities and transmission lines interconnecting a Non-Utility Generator ("NUG") and a utility shall include the following information:	See Application.
I.N. Describe the proposed and existing generating sources, distribution circuits or load centers planned to be served by all new substations, switching stations and other ground facilities associated with the proposed project.	See Application.
II. Description of the Proposed Project	
A. Right-Of-Way ("ROW")	
II.A.1. Provide the length of the proposed corridor and viable alternatives.	See Table 1.1-1.
II.A.2. Provide color maps of suitable scale (including both general location mapping and more detailed GIS-based constraints mapping) showing the route of the proposed line and its relation to: the facilities of other public utilities that could influence the route selection, highways, streets, parks and recreational areas, scenic and historic areas, open space and conservation easements, schools, convalescent centers, churches, hospitals, burial grounds/cemeteries, airports and other notable structures close to the proposed project. Indicate the existing linear utility facilities that the line is proposed to parallel, such as electric transmission lines, natural gas transmission lines, pipelines, highways, and railroads. Indicate any existing transmission ROW sections that are to be quitclaimed or otherwise relinquished. Additionally, identify the manner in which the Applicant will make available to interested persons, including state and local governmental entities, the digital GIS shape file for the route of the proposed line.	See Attachment 1, Virginia ERD Resource Mapbooks.
II.A.3. Provide a separate color map of a suitable scale showing all the Applicant's transmission line ROWs, either existing or proposed, in the vicinity of the proposed project.	See Application.
II.A.4. To the extent the proposed route is not entirely within existing ROW, explain why existing ROW cannot adequately service the needs of the Applicant.	See Application.
II.A.5. Provide drawings of the ROW cross section showing typical transmission line structure placements referenced to the edge of the ROW. These drawings should include:	See Application.
II.A.5.a. ROW width for each cross section drawing;	See Application.
II.A.5.b. Lateral distance between the conductors and edge of ROW;	See Application.
II.A.5.c. Existing utility facilities on the ROW; and	See Application.
II.A.5.d. For lines being rebuilt in existing ROW, provide all of the above (i) as it currently exists, and (ii) as it will exist at the conclusion of the proposed project.	NA

Filing Requirements	Application / ERD Section(s)
II.A.6. Detail what portions of the ROW are subject to existing easements and over what portions new easements will be needed.	See Application.
II.A.7. Detail the proposed ROW clearing methods to be used and the ROW restoration and maintenance practices planned for the proposed project.	See Application.
II.A.8. Indicate the permitted uses of the proposed ROW by the easement landowner and the Applicant.	See Application.
II.A.9. Describe the Applicant's route selection procedures. Detail the feasible alternative routes considered. For each such route, provide the estimated cost and identify and describe the cost classification (e.g. "conceptual cost," "detailed cost," etc.). Describe the Applicant's efforts in considering these feasible alternatives. Detail why the proposed route was selected and other feasible alternatives were rejected. In the event that the proposed route crosses, or one of the feasible routes was rejected in part due to the need to cross, land managed by federal, state, or local agencies or conservation easements or open space easements qualifying under §§ 10.1-1009 – 1016 or §§ 10.1-1700 – 1705 of the Code (or a comparable prior or subsequent provision of the Code), describe the Applicant's efforts to secure the necessary ROW.	See Routing Study.
II.A.10. Describe the Applicant's construction plans for the project, including how the Applicant will minimize service disruption to the affected load area. Include requested and approved line outage schedules for affected lines as appropriate.	See Application.
II.A.11. Indicate how the construction of this transmission line follows the provisions discussed in Attachment 1 of these Guidelines.	See Application.
II.A.12.a. Detail counties and localities through which the line will pass. If any portion of the line will be located outside of the Applicant's certificated service area: (1) identify each electric utility affected; (2) state whether any affected electric utility objects to such construction; and (3) identify the length of line(s) proposed to be located in the service area of an electric utility other than the Applicant; and	See Application.
II.A.12.b. Provide three (3) color copies of the Virginia Department of Transportation "General Highway Map" for each county and city through which the line will pass. On the maps show the proposed line and all previously approved and certificated facilities of the Applicant. Also, where the line will be located outside of the Applicant's certificated service area, show the boundaries between the Applicant and each affected electric utility. On each map where the proposed line would be outside of the Applicant's certificated service area, the map must include a signature of an appropriate representative of the affected electric utility indicating that the affected utility is not opposed to the proposed construction within its service area.	See Application.
B. Line Design and Operational Features	
II.B.1. Detail the number of circuits and their design voltage, initial operational voltage, any anticipated voltage upgrade, and transfer capabilities.	See Application.
II.B.2. Detail the number, size(s), type(s), coating and typical configurations of conductors. Provide the rationale for the type(s) of conductor(s) to be used.	See Application.
II.B.3. With regard to the proposed supporting structures over each portion of the ROW for the preferred route, provide diagrams (including foundation reveal) and descriptions of all the structure types, to include:	See Application.
II.B.3.a. mapping that identifies each portion of the preferred route;	See Attachment 1, Virginia ERD Resource Mapbooks.
II.B.3.b. the rationale for the selection of the structure type;	See Application.
II.B.3.c. the number of each type of structure and the length of each portion of the ROW;	See Application.
II.B.3.d. the structure material and rationale for the selection of such material;	See Application.
II.B.3.e. the foundation material;	See Application.
II.B.3.f. the average width at cross arms;	See Application.

Filing Requirements	Application / ERD Section(s)
II.B.3.g. the average width at the base;	See Application.
II.B.3.h. the maximum, minimum and average structure heights;	See Routing Study and Table 1.1-1.
II.B.3.i. the average span length; and	See Routing Study and Table 1.1-1.
II.B.3.j. the minimum conductor-to-ground clearances under maximum operating conditions.	See Application.
II.B.4. With regard to the proposed supporting structures for all feasible alternate routes, provide the maximum, minimum and average structure heights with respect to the whole route.	See Application.
II.B.5. For lines being rebuilt, provide mapping showing existing and proposed structure heights for each individual structure within the ROW, as proposed in the application.	NA
II.B.6. Provide photographs for typical existing facilities to be removed, comparable photographs or representations for proposed structures, and visual simulations showing the appearance of all planned transmission structures at identified historic locations within one mile of the proposed centerline and in key locations identified by the Applicant.	See Appendix J, Visual Impact Assessment, of the Routing Study.
II.C. Describe and furnish plan drawings of all new substations, switching stations, and other ground facilities associated with the proposed project. Include size, acreage, and bus configurations. Describe substation expansion capability and plans. Provide one-line diagrams for each.	See Application.
III. Impacts of Line on Scenic, Environmental, and Historic Features	
III.A. Describe the character of the area that will be traversed by this line, including land use, wetlands, etc. Provide the number of dwellings within 500 feet, 250 feet and 100 feet of the centerline, and within the ROW for each route considered. Provide the estimated amount of farmland and forestland within the ROW that the proposed project would impact.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.B. Describe any public meetings the Applicant has had with neighborhood associations and/or officials of local, state or federal governments that would have an interest or responsibility with respect to the affected area or areas.	See Application.
III.C. Detail the nature, location, and ownership of each building that would have to be demolished or relocated if the project is built as proposed.	See Application.
III.D. Identify existing physical facilities that the line will parallel, if any, such as existing transmission lines, railroad tracks, highways, pipelines, etc. Describe the current use and physical appearance and characteristics of the existing ROW that would be paralleled, as well as the length of time the transmission ROW has been in use.	See Routing Study and Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.E. Indicate whether the Applicant has investigated land use plans in the areas of the proposed route and indicate how the building of the proposed line would affect any proposed land use.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.

Filing Requirements	Application / ERD Section(s)
III.F. Government Bodies	
III.F.1. Indicate if the Applicant determined from the governing bodies of each county, city and town in which the proposed facilities will be located whether those bodies have designated the important farmlands within their jurisdictions, as required by § 3.2-205 B of the Code.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.F.2. If so, and if any portion of the proposed facilities will be located on any such important farmland:	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.F.2.a. Include maps and other evidence showing the nature and extent of the impact on such farmlands;	See Attachment 1, Virginia ERD Resource Mapbooks.
III.F.2.b. Describe what alternatives exist to locating the proposed facilities on the affected farmlands, and why those alternatives are not suitable; and	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.F.2.c. Describe the Applicant's proposals to minimize the impact of the facilities on the affected farmland.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G. Identify the following that lie within or adjacent to the proposed ROW:	
III.G.1. Any district, site, building, structure, or other object included in the National Register of Historic Places maintained by the U.S. Secretary of the Interior.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.2. Any historic architectural, archeological, and cultural resources, such as historic landmarks, battlefields, sites, buildings, structures, districts or objects listed or determined eligible by the Virginia Department of Historic Resources ("DHR");	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.3. Any historic district designated by the governing body of any city or county;	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.4. Any state archaeological site or zone designated by the Director of the DHR, or its predecessor, and any site designated by a local archaeological commission, or similar body;	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.

Filing Requirements	Application / ERD Section(s)
III.G.5. Any underwater historic assets designated by the DHR, or predecessor agency or board;	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.6. Any National Natural Landmark designated by the U.S. Secretary of the Interior;	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.7. Any area or feature included in the Virginia Registry of Natural Areas maintained by the Virginia Department of Conservation and Recreation ("DCR");	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.8. Any area accepted by the Director of the DCR for the Virginia Natural Area Preserves System;	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.9. Any conservation easement or open space easement qualifying under §§10.1-1009 – 1016, or §§ 10.1-1700 – 1705, of the Code (or a comparable prior or subsequent provision of the Code);	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.10. Any state scenic river;	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.11. Any lands owned by a municipality or school district; and	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.G.12. Any federal, state or local battlefield, park, forest, game or wildlife preserve, recreational area, or similar facility. Features, sites, and the like listed in 1 through 11 above need not be identified again.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.H. List any registered aeronautical facilities (airports, helipads) where the proposed route would place a structure or conductor within the federally-defined airspace of the facilities. Advise of contacts, and results of contacts, made with appropriate officials regarding the effect on the facilities' operations.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.

Filing Requirements	Application / ERD Section(s)
III.I. Advise of any scenic byways that are in proximity to or that will be crossed by the proposed transmission line and describe what steps will be taken to mitigate any visual impacts on such byways. Describe typical mitigation techniques for other highways' crossings.	See Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes.
III.J. Identify coordination with appropriate municipal, state, and federal agencies.	See Application.
III.K. Identify coordination with any non-governmental organizations or private citizen groups.	See Application.
III.L. Identify any environmental permits or special permissions anticipated to be needed.	See Application.
IV. Health Aspects of Electromagnetic Fields (EMF)	
IV.A. Provide the calculated maximum electric and magnetic field levels that are expected to occur at the edge of the ROW. If the new transmission line is to be constructed on an existing electric transmission line ROW, provide the present levels as well as the maximum levels calculated at the edge of ROW after the new line is operational.	See Application.
IV.B. If the Applicant is of the opinion that no significant health effects will result from the construction and operation of the line, describe in detail the reasons for that opinion and provide references or citations to supporting documentation.	See Application.
IV.C. Describe and cite any research studies on EMF the Applicant is aware of that meet the following criteria:	See Application.
IV.C.1. Became available for consideration since the completion of the Virginia Department of Health's most recent review of studies on EMF and its subsequent report to the Virginia General Assembly in compliance with 1985 Senate Joint Resolution No. 126;	See Application.
IV.C.2. Include findings regarding EMF that have not been reported previously and/or provide substantial additional insight into findings; and	See Application.
IV.C.3. Have been subjected to peer review.	See Application.

DCR = Virginia Department of Conservation and Recreation; DHR = Virginia Department of Historic Resources; EMF = electromagnetic field; ERD = Environmental Review Document; GIS = Geographic Information System; ROW = right-of-way; RTO = regional transmission organization

1.1 MARL PROJECT DESCRIPTION

PJM Interconnection LLC (PJM) has directed NEET MA and NEET VA to develop, construct, own, operate, and maintain the MARL Project to resolve significant and widespread reliability criteria violations on the Bulk Electric System that serves the PJM Region, due to load growth and anticipated resource retirements in the PJM Region. To meet this purpose and need, the MARL Project will have the following facilities:

- A new single-circuit 500 kV transmission line on lattice structures from the FirstEnergy Corp. (FirstEnergy)-owned 502 Junction Substation to the existing FirstEnergy-owned Black Oak 500/138 kV Substation to an interconnection with a new 500 kV transmission line to be constructed by FirstEnergy and Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion Energy).[3]
- A new Woodside 500/138 kV substation in Frederick County, Virginia, which will connect to existing Dominion Energy and FirstEnergy infrastructure.[4]

The proposed transmission line will generally encompass the geographic area between the endpoints of the 502 Junction Substation in Greene County, Pennsylvania, and the handoff point (a new 500 kV transmission line to be constructed by FirstEnergy) in Frederick County, Virginia. The proposed Woodside Substation is also in Frederick County, Virginia, but approximately 11 miles to the east of the eastern terminus of the proposed transmission line handoff point. These facilities are collectively referred to as "the MARL Project." Figure 1.1-1 depicts the MARL Project Proposed Route and the Alternative Routes.

All mileposts (MPs) and distances associated with the MARL Project facilities listed above are rounded to the nearest 0.1 mile, and all land areas are rounded to the nearest 0.1 acre (unless otherwise specified). All references to MPs, distances, and acreages in this document are assumed to be approximate (e.g., a reference to "MP 1.2" or "124.3 acres" means "approximately at MP 1.2" or "approximately 124.3 acres," respectively).

NEET MA and NEET VA identified six end-to-end route alternatives (the Proposed Route and Alternative Routes B through F) for the overall MARL Project between the 502 Junction Substation and the handoff point (Routing Study). As identified in the Routing Study, the Routing Team has selected Alternative Route A as the Proposed Route. Figure 1.1-2 provides an overview of the Proposed Route and Alternative Routes in Virginia. Table 1.1-1 summarizes MARL Project features of the Proposed Route and Alternative Routes in Virginia.

[3] The MARL Project does not include the FirstEnergy and Dominion Energy portions of the PJM-approved West Cluster solutions.
[4] Specifically, the Woodside Substation site will connect to Dominion Energy's existing 500 kV Bismark-Doubs transmission line, FirstEnergy's existing Stonewall 138 kV Substation via the Hampshire to Stonewall 138 kV line, and to FirstEnergy's upgraded Gore-Stonewall-Doubs 500 kV transmission line. The permitting of the substation is subject to the siting authority of Frederick County; however, the information is being provided for overall context of the full MARL Project.

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TABLE 1.1-1 MARL PROJECT FEATURES WITHIN THE PROPOSED ROUTE AND ALTERNATIVE ROUTES

Project Feature	Proposed Route		Alternative Route B		Alternative Route C		Alternative Route D		Alternative Route E		Alternative Route F	
	VA County	Total	VA County	Total	VA County	Total	VA County	Total	VA County	Total	VA County	Total
Centerline Length (miles)	2.4	107.5	2.4	107.3	2.4	113.6	2.4	115.2	2.4	106.3	2.4	119.1
Siting Corridor (acres)	141.1	6,208.6	141.4	6,197.5	141.1	6,598.5	141.1	6,798.1	141.1	6,181.6	141.4	7,112.0
ROW Corridor (acres)	59.4	2,669.0	58.6	2,671.4	59.4	2,835.5	59.4	2,839.0	59.4	2,651.5	58.6	2,964.3
Aerial Easement Blowout Area [a] (count)	0	24	0	31	0	28	0	24	0	28	0	32
Paralleling Existing Transmission Line ROW (miles)	1.0	56.4	0.7	59.7	1.0	64.5	1.0	43.1	1.0	50.8	0.7	43.2
Paralleling Existing Transmission Line ROW (%)	41.8	52.5	28.3	55.6	41.8	56.8	41.8	37.4	41.8	47.7	28.3	36.3
Structures (count)	13	452	12	452	13	478	13	493	13	446	12	519
Minimum Structure Height (feet)	115	85	115	85	115	85	115	85	115	85	115	85
Maximum Structure Height (feet)	190	190	190	190	190	190	190	190	190	190	190	190
Average Structure Height (feet)	150	145	150	145	150	145	150	145	150	145	150	140
Average Span Length (feet)	1,015	1,258	1,060	1,256	1,015	1,240	1,015	1,224	1,015	1,259	1,060	1,213
Maximum Span Length (feet)	1,422	2,927	1,422	2,927	1,422	2,955	1,422	2,739	1,422	2,927	1,422	2,955
Spans Greater than 1,600 feet (count)	0	33	0	42	0	31	0	34	0	39	0	38

ROW = right-of-way; VA = Virginia

[a] The aerial easement blowout area is a designated section within the ROW Corridor that requires additional transmission line easement area to accommodate engineering considerations (e.g., increased span lengths), which can result in greater line sway. These areas are necessary due to constraints such as uneven terrain, steep slopes, or natural obstructions that make the standard ROW Corridor width impractical or unsafe.

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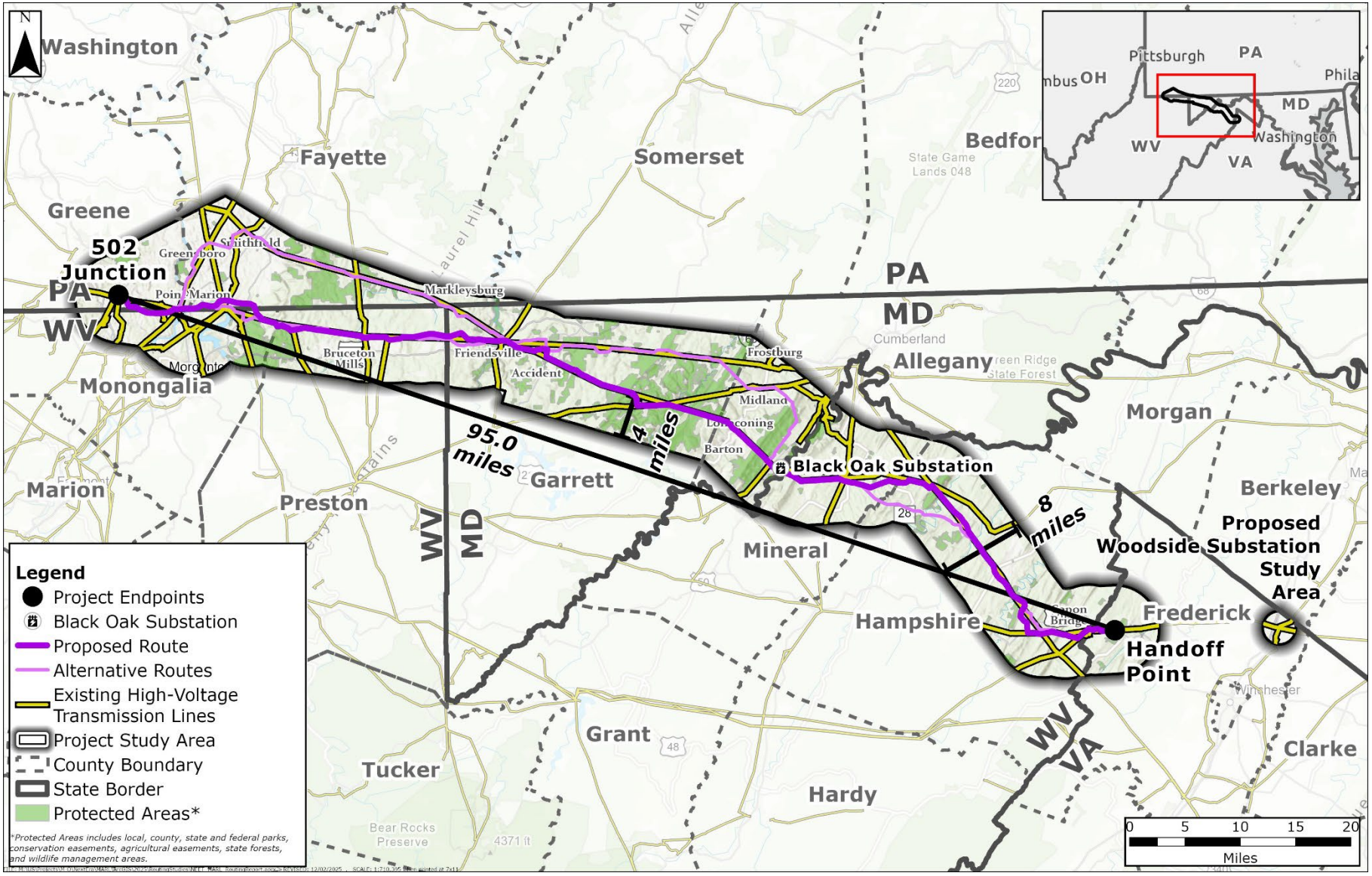
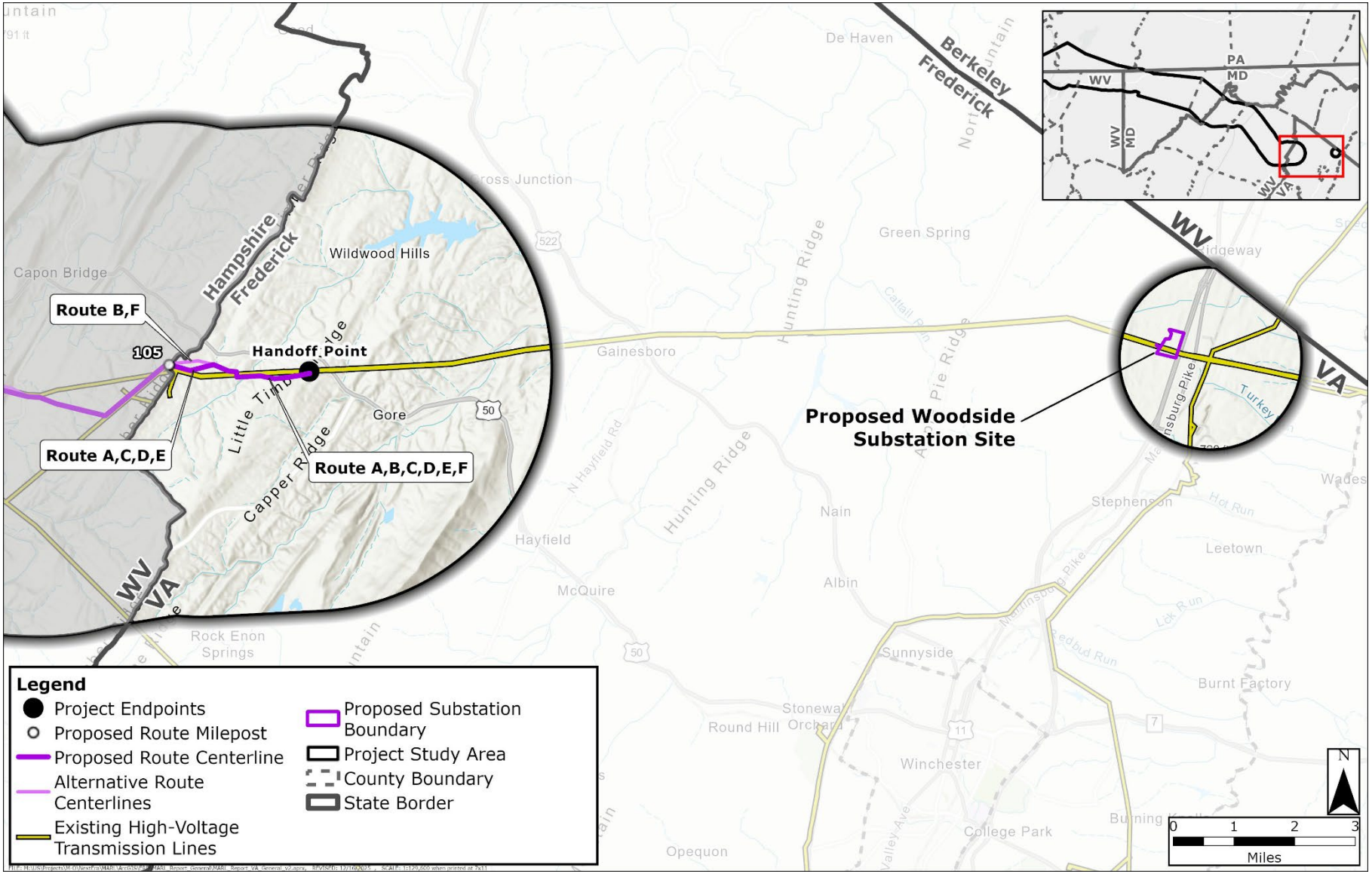
FIGURE 1.1-1 MARL PROJECT OVERVIEW, PROPOSED ROUTE, AND ALTERNATIVE ROUTES



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

FIGURE 1.1-2 MARL PROJECT IN VIRGINIA



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

1.2 OBJECTIVES OF THE ENVIRONMENTAL REVIEW DOCUMENT

The Routing Study presented ERM's overall approach to developing route alternatives that have an endpoint in Pennsylvania and another endpoint in Virginia. In developing the end-to-end route alternatives, ERM considered state-specific requirements and data, while also recognizing that the state-specific environmental data are different in each of the four states; therefore, ERM has developed state-specific appendices to present the different information that each of the state authorities expect to see. The objective of this ERD is to detail the environmental, cultural, and social existing conditions and potential impacts associated with the MARL Project Proposed Route and Alternative Routes for the specific state of Virginia requirements. Regardless of the state, specific information that is associated with the overall MARL Project may be found in the Routing Study and is not repeated herein.

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2. ENVIRONMENTAL SETTING AND IMPACTS FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES

The following section of the ERD describes the existing environmental, cultural, and social conditions, as well as the potential impacts associated with the Proposed Route and Alternative Routes for the MARL Project within Frederick County, Virginia. This information was developed using publicly available data sources and includes data obtained from relevant agencies. The information presented herein was developed by ERM based on best practices and extensive experience in transmission line routing and siting projects. While there are no published studies or formal industry standards, the approach reflects methodologies that have been applied to other greenfield projects and, in some cases, accepted by state commissions. The approach was considered and applied to the MARL Project, incorporating natural environment and built environment resources, as well as land and engineering considerations. Where appropriate for a resource area, ERM provides in that resource discussion the regulatory driver that may be applicable to the MARL Project once permits are determined upon completion of the CPCN application. In addition to the publicly available data sources that are used for the ERD, a number of enhanced desktop assessments have been completed in combination with extensive agency outreach and coordination to provide a robust analysis of resource impacts in support of this CPCN application. Additional enhanced desktop assessments, in combination with select field surveys, will be conducted and submitted to the SCC as a supplemental amendment to this ERD. Full field surveys will be conducted following approval of a final route to facilitate state and federal permitting. Attachment 1, Virginia ERD Resource Mapbooks, provides detailed resource information, pursuant to Va. Code § 56.

Each resource area includes a discussion of existing conditions, an assessment of potential impacts, and the identification of potential mitigation measures. Where feasible, Geographic Information System (GIS) analysis was used to quantify both existing conditions and projected impacts. In cases where quantitative data was unavailable or insufficient, qualitative information was provided to characterize certain resource areas.

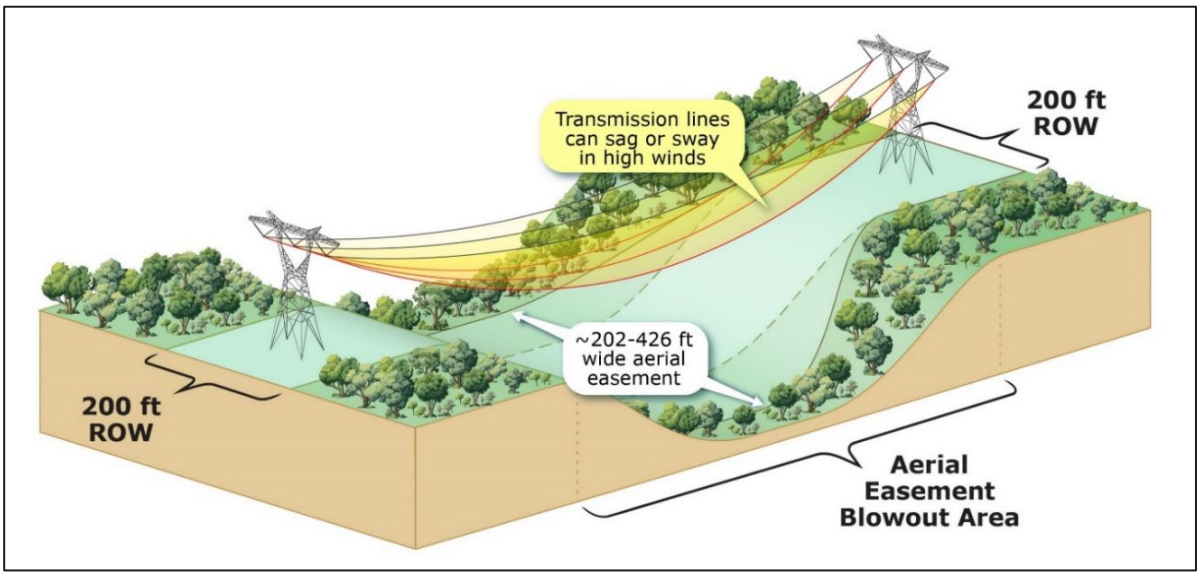
2.1 PROJECT COMPONENTS AND SITE DESCRIPTION

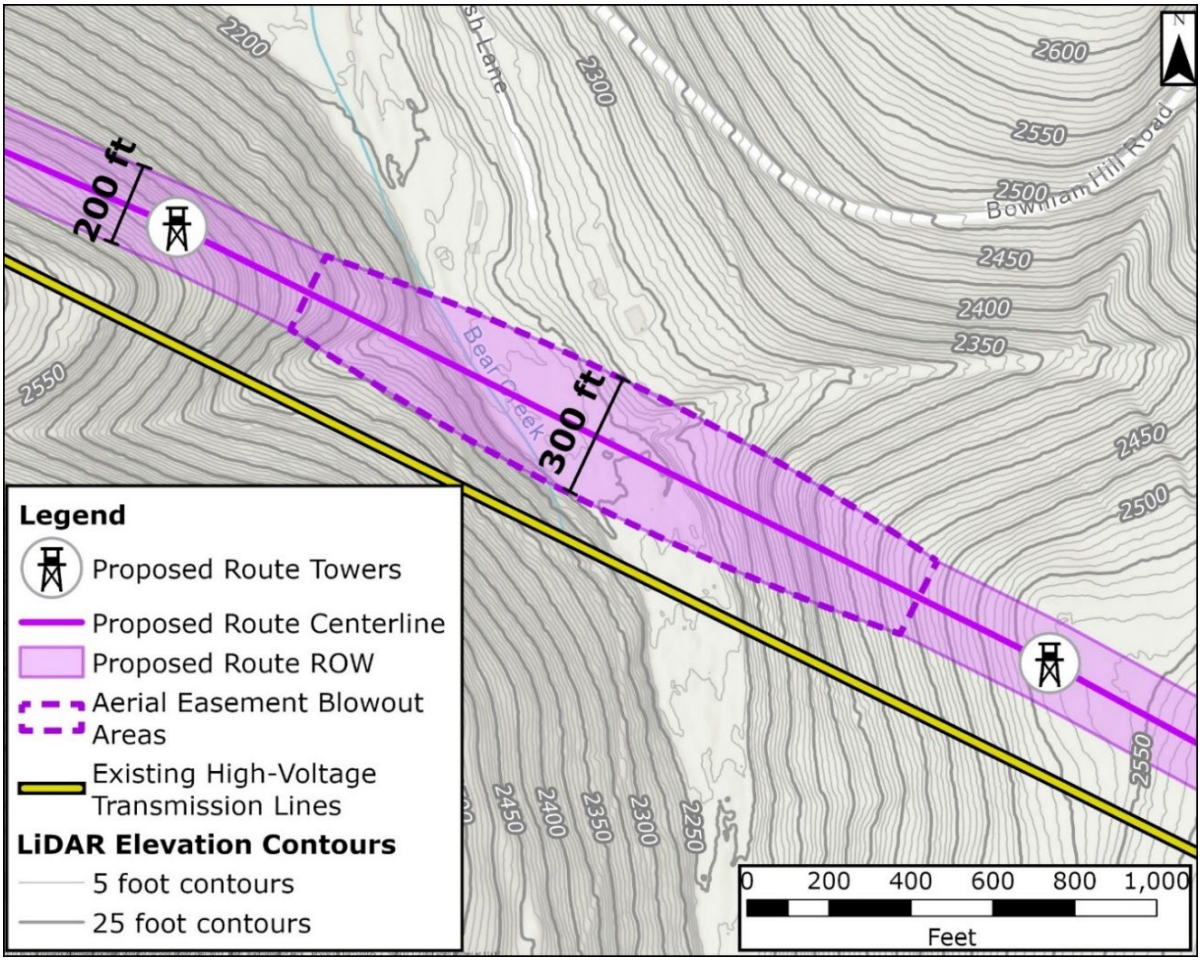
2.1.1 CORRIDOR WIDTHS

The MARL Project will be constructed in a new right-of-way (ROW) Corridor measuring, on average, 200 feet wide. The MARL Project will require a wider ROW Corridor in some areas where additional aerial easement rights are necessary to comply with electrical standards and requirements (Figure 2.1-1).[5] The full area of the required MARL Project-specific ROW Corridor at any given point along the route is hereafter referred to as the "ROW Corridor." The number of aerial easement blowout areas for the Proposed Route and Alternative Routes is shown in Table 1.1-1, and the ROW Corridor for these areas ranges from 202 feet to 426 feet, averaging 289 feet wide (Figure 2.1-1). Attachment 1a also identifies where the MARL Project will require a wider ROW Corridor in some areas where additional aerial easement rights are necessary to comply with electrical standards and requirements.

[5] The aerial easement blowout area is a designated section within the ROW Corridor that requires additional transmission line easement area to accommodate engineering considerations (e.g., increased span lengths), which can result in greater line sway. These areas are necessary due to constraints like uneven terrain, steep slopes, or natural obstructions that make the standard ROW Corridor width impractical or unsafe.

FIGURE 2.1-1 GRAPHICAL DEPICTION OF ADDITIONAL AERIAL EASEMENT BLOWOUT AREAS





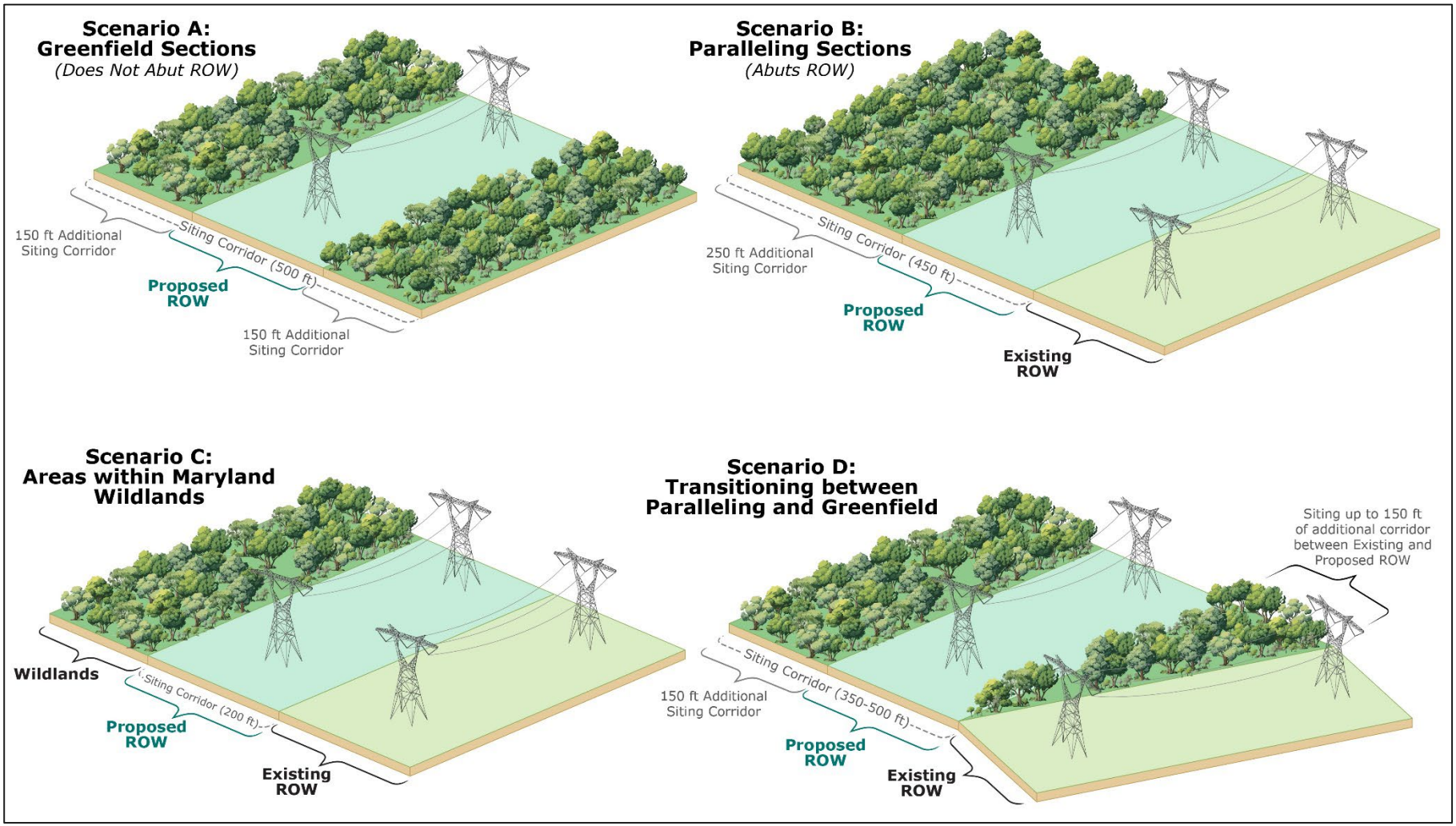
ft = feet; LiDAR = Light Detection and Ranging; ROW = right-of-way

The MARL Project developed a predefined, Project-specific Siting Corridor, hereafter referred to as the "Siting Corridor," in which existing conditions were assessed to allow for reasonable flexibility to adjust the centerline on either side of the Alternative Routes, if necessary. The Siting Corridor was designed to abut and not overlap the ROW of any existing transmission lines when paralleling. The Siting Corridor width will range from 200 to 500 feet; however, in those areas that require aerial easement blowout, the maximum width for the Siting Corridor will be 715 feet. The Siting Corridor is inclusive of the MARL Project's ROW Corridor. The width of the Siting Corridor varies based on the MARL Project's ROW Corridor width and proximity to existing transmission lines (Figure 2.1-2).

The Routing Team aimed to parallel existing transmission line corridors to the extent practicable, as this allows for minimizing visual, environmental, and access impacts. Figure 2.1-3 provides an illustration of MARL Project paralleling. Benefits to paralleling existing transmission line corridors include the following:

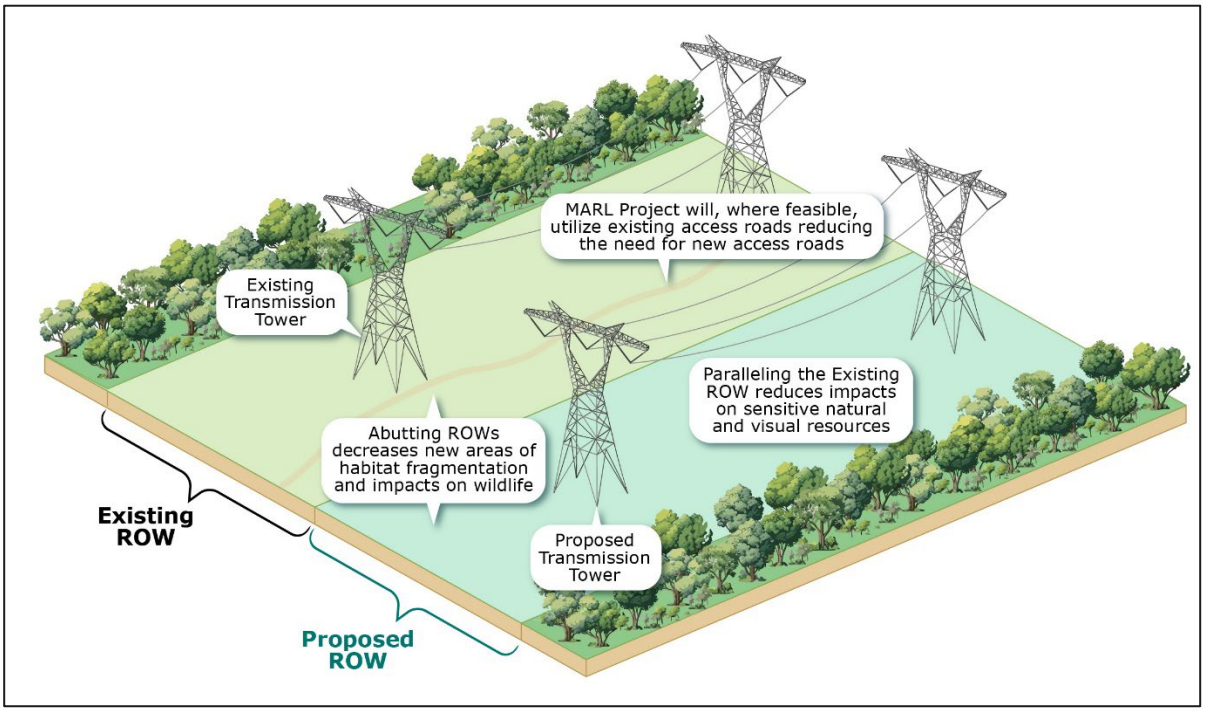
- Limits impacts on the local community;
- Provides easier construction access;
- Reduces the need for new access roads;
- Reduces impacts on sensitive natural and visual resources; and
- Decreases new areas of habitat fragmentation and impacts on wildlife.

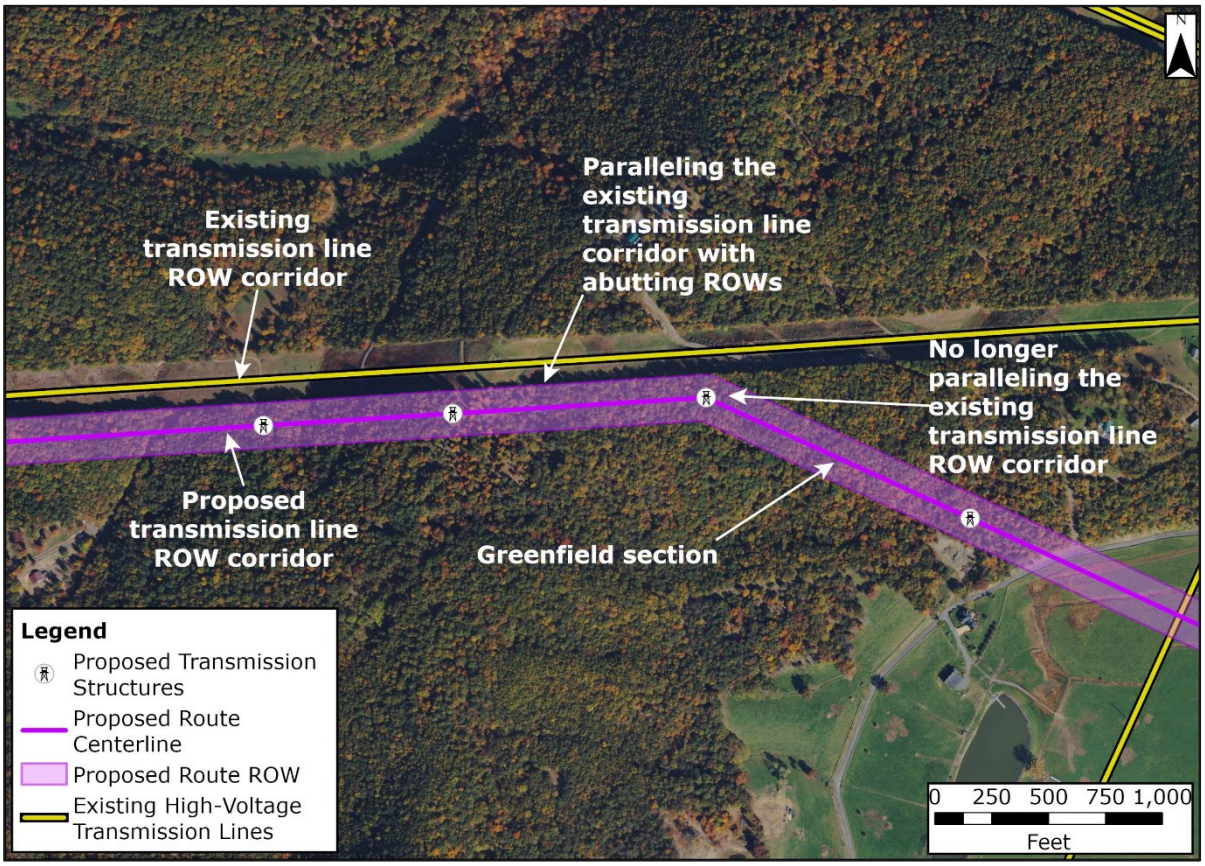
FIGURE 2.1-2 SITING CORRIDOR SCHEMATIC



ft = feet; ROW = right-of-way

FIGURE 2.1-3 ILLUSTRATION OF MARL PROJECT PARALLELING





MARL Project = MidAtlantic Resiliency Link Project; ROW = right-of-way

2.1.2 AERIAL EASEMENT LOCATIONS

There are no locations along the Proposed Route or five Alternative Routes within Virginia that require a wider ROW Corridor, where additional aerial easement rights are necessary to comply with electrical standards and requirements.

2.1.3 ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR

In addition to the transmission line, the MARL Project includes ancillary facility workspaces required for both construction and long-term operation and maintenance. These ancillary facility workspaces consist of the following (Figure 2.1-4):

- Access roads;
- Structure pads at each tower location; and
- Wire work areas for conductor stringing operations.

The limit of disturbance (LoD) associated with ancillary facility workspaces is addressed exclusively within the impact sections of the ERD for the Proposed Route and Alternative Routes. These LoD areas vary in size due to topographic constraints and ground conditions. Because the ancillary facility workspaces are located within or immediately adjacent to the Siting Corridor, the existing conditions of the Siting Corridor are considered representative of those at the ancillary facility locations. For the purposes of impact analysis, the entire extent of the LoD outside of the ROW Corridor is treated as affected.

Access roads will include both improvements to existing roads and the construction of new roads. They may be located within the ROW Corridor or extend beyond it, depending on site-specific access needs. Access roads are designated as either:

- Temporary—used solely during construction and treated as temporary impacts. Restoration is planned following construction.
- Permanent—required for ongoing operation and maintenance. These are reported in the ERD as permanent impacts.

Structure pads are constructed at each tower location to provide stable surfaces for equipment during installation and will have the appropriate dimensions to meet the terrain constraints. All structure pads are considered temporary construction impacts. The LoD associated with structure pads is variable and influenced by topography and ground conditions. These areas are treated as temporary impacts, with restoration planned post-construction.

Wire work areas are temporary work areas used for staging specialized equipment to string conductor wires between transmission structures. These sites are placed at strategic points, particularly where the transmission line changes direction. These areas are treated as temporary impacts, with restoration planned post-construction.

Table 2.1-1 and Table 2.1-2 show the ancillary facilities and associated LoD in Virginia.

TABLE 2.1-1 ANCILLARY FACILITY WORKSPACES FOR THE PROPOSED ROUTE [a]

Measure	Permanent Access Roads		Temporary Access Roads		Structure Pads		Wire Work Areas	
	VA County	Total	VA County	Total	VA County	Total	VA County	Total
Count of Facility	NA	NA	NA	NA	13	452	4	108
LoD Outside of the ROW Corridor (acres)	0.0	7.1	1.9	231.4	3.5	123.3	8.1	233.9
Within ROW Corridor (miles)	0.0	2.7	2.0	70.7	NA	NA	NA	NA
Outside of the ROW Corridor (miles)	0.0	2.6	0.7	77.4	NA	NA	NA	NA

LoD = limit of disturbance; NA = not applicable; ROW = right-of-way; VA = Virginia

[a] Alternative Routes C, D, and E overlap in Virginia.

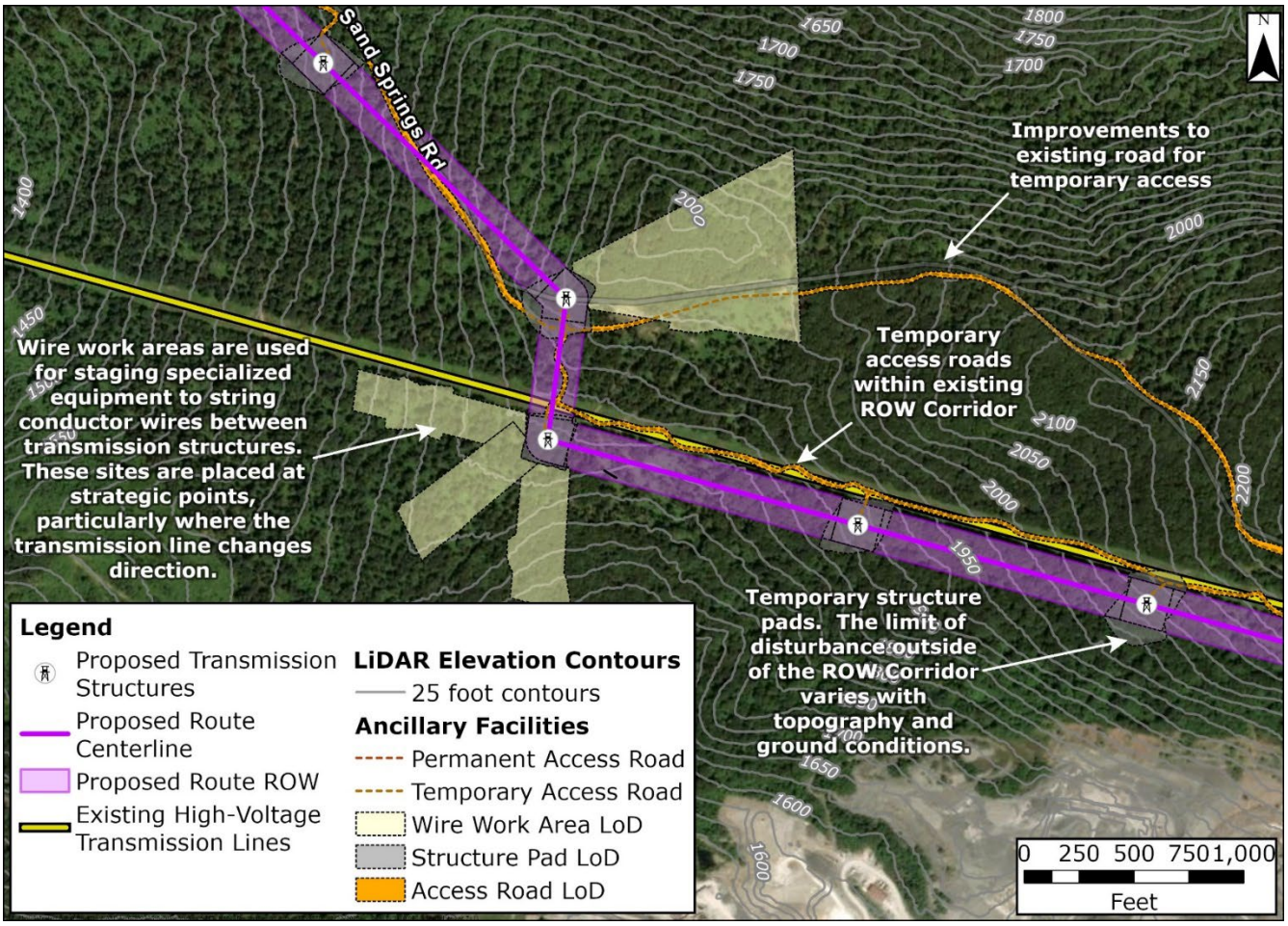
TABLE 2.1-2 ANCILLARY FACILITY WORKSPACES FOR ALTERNATIVE ROUTES B AND F IN VIRGINIA [a]

Measure	Permanent Access Roads	Temporary Access Roads	Structure Pads	Wire Work Areas
Count of Facility	0	NA	12	3
LoD Outside of the ROW Corridor (acres)	0.0	1.9	2.8	8.1
Within ROW Corridor (miles)	0.0	1.7	NA	NA
Outside of the ROW Corridor (miles)	0.0	0.7	NA	NA

LoD = limit of disturbance; NA = not applicable; ROW = right-of-way; VA = Virginia

[a] Alternative Routes B and F overlap in Virginia. Statistics are only shown for Virginia since ancillary facility workspaces were not required for Alternative Routes in other states.

FIGURE 2.1-4 EXAMPLE MAP OF ANCILLARY FACILITY WORKSPACES



LiDAR = Light Detection and Ranging; LoD = limit of disturbance; ROW = right-of-way

2.1.4 VIRGINIA SITE DESCRIPTION

The Proposed Route and the five Alternative Routes are similar in length (Table 1.1-1) within Frederick County, Virginia, as shown on Figure 1.1-2. The Proposed Route and Alternative Routes C, D and E follow the same alignment in Virginia and are, therefore, discussed together throughout this ERD. Similarly, Alternative Routes B and F follow the same alignment in Virginia and are, therefore, discussed together throughout this ERD. As the Proposed Route and five Alternative Routes proceed to the Virginia border, Alternative Routes B and F diverge north of the shared alignment of the Proposed Route and Alternative Routes C, D, and E. East of MP 105.8, all six routes follow a shared alignment for 1.6 miles to the handoff point.

2.1.4.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES C, D, AND E

The shared alignment of the Proposed Route and Alternative Routes C, D, and E enter Virginia in Frederick County at MP 105.0 (as measured on the Proposed Route). The alignment continues southeast, paralleling an existing 500 kV transmission corridor for 0.3 mile. The routes then deviate away from the existing 500 kV transmission corridor for 0.6 mile to avoid residential properties on Fletcher Road. The Proposed Route and Alternative Routes C, D, and E then continue

in a southeasterly direction until reaching the existing transmission corridor. At this point the routes cross the corridor perpendicularly, crossing both 500 kV and 138 kV transmission lines near MP 106.2 (as measured on Alternative Route A). Once the routes cross the transmission line corridors, they immediately head east, paralleling the transmission line corridors on the south side and crossing over Isaacs Creek at MP 106.5. Near MP 106.7 (as measured on the Proposed Route), the routes deviate away from the existing transmission lines to avoid a substation and residential development, crossing Parishville Road and terminating at the handoff point.

2.1.4.2 ALTERNATIVE ROUTES B AND F

The shared alignment of Alternative Routes B and F enter Virginia in Frederick County at MP 104.9 (as measured on Alternative Route B), less than 200 feet north of where the shared alignment of the Proposed Route and Alternative Routes C, D, and E enter Virginia. Alternative Routes B and F alignment continues northeasterly for 0.5 mile then turns southeasterly, meeting up with the Proposed Route and Alternatives C, D and E near MP 105.6 (as measured on Alternative Route B). Alternative Routes B and F then continue in a southeasterly direction until reaching the existing transmission line corridor. At this point, the routes cross the corridor perpendicularly, crossing a 500 kV transmission line and a 138 kV transmission line near MP 106.0 (as measured on Alternative Route B). Once the routes cross the transmission line corridors, they immediately head east, paralleling the transmission line corridors on the south side. Near MP 106.5 (as measured on Alternative Route B), the routes deviate away from the existing transmission line corridors, crossing Parishville Road and terminating at Structure 107-2 near the handoff point.

2.1.4.3 WOODSIDE SUBSTATION SITE

The proposed Woodside Substation site will be located on two parcels that total an approximately 72-acre site that is 7.1 miles north of the Town of Winchester, along Interstate 81 (I-81). The site is between Carter Machinery and the Fruit Hill site to the north, Ridgeway Estates subdivision to the west, Thistle Lane to the south, and I-81 to the east. The Woodside Substation will interconnect with the existing Dominion Energy Bismark-Doubs 500 kV transmission line, two new FirstEnergy 138 kV transmission lines that will connect the MARL Project with the nearby existing FirstEnergy Stonewall 138 kV substation, and the new FirstEnergy Gore-Doubs-Goose Creek 500 kV transmission line.

2.2 LAND USE

This section describes existing land ownership, land use, land cover, land use planning and zoning, residential and nonresidential development, and planned development in the Siting Corridors for the Proposed Route and Alternative Routes B through F in Virginia and the Woodside Substation site, as well as the impacts of the MARL Project on these resources.

2.2.1 LAND OWNERSHIP AND PUBLIC LANDS

Public lands serve as a routing constraint because they can only be crossed with permission from the applicable land managing or controlling agency. There are no federal, state, or local public lands within the Proposed Route and Alternative Route Siting Corridors in Virigina. The Proposed Route and Alternative Routes, as well as the Woodside Substation site, will be constructed entirely on private land; therefore, the MARL Project would not affect land ownership patterns.

2.2.2 LAND USE AND LAND COVER

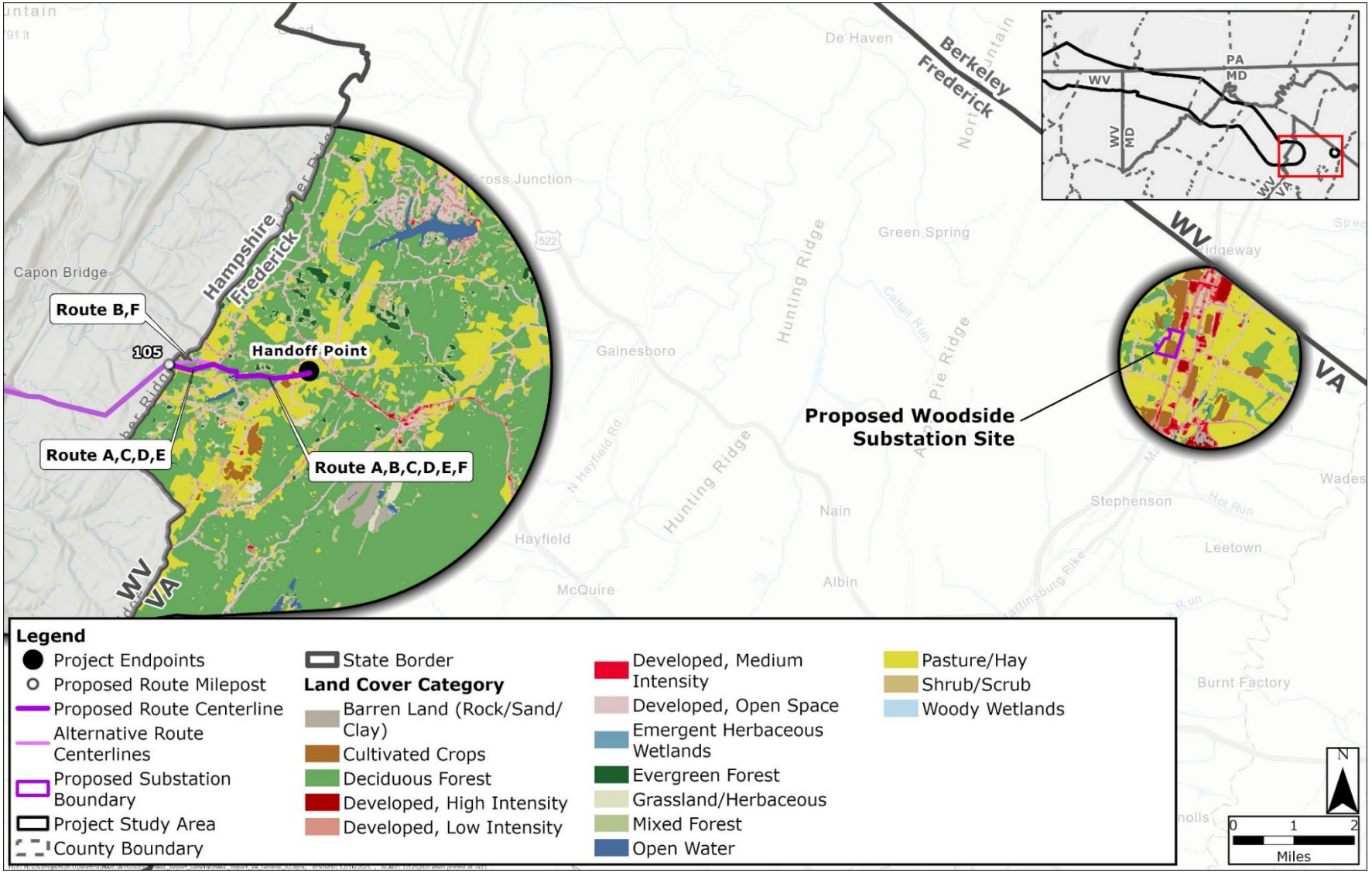
This section describes land use and land cover classifications within and applicable to the Proposed Route and Alternative Route Siting Corridors and ROW Corridors, as well as the Woodside Substation site.

2.2.2.1 EXISTING CONDITIONS

Land use and land cover (hereafter, "land cover") was cataloged within the Proposed Route and Alternative Route Siting Corridors and Woodside Substation site using GIS data from the National Land Cover Database (USGS 2024). Land cover refers to the visible, topographic, vegetation, and human-influenced characteristics of land, whereas land use refers to the actual way that land is used, regardless of what land cover is visible. For example, an area of Developed, Medium Intensity land cover could include a variety of land use types, such as low or medium intensity residential or other developed uses such as commercial or industrial. Figure 2.2-1 shows existing land cover categories crossed by the Siting Corridors for the Proposed Route and Alternative Routes and the Woodside Substation site; Attachment 1b, Land Cover Mapbook, shows this information in more detail.

Table 2.2-1 shows the acreage of land cover classifications within the shared Siting Corridor for the Proposed Route and Alternative Routes C, D, and E; the shared Siting Corridor for Alternative Routes B and F; and the Woodside Substation site. The Proposed Route and Alternative Route Siting Corridors and Woodside Substation site are all solely located in Frederick County.

FIGURE 2.2-1 LAND COVER EXISTING CONDITIONS



Source: USGS 2024

MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

TABLE 2.2-1 LAND COVER CLASSIFICATIONS WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE

Land Cover Category	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site	
	Acres	%	Acres	%	Acres	%
Cultivated Crops	1.4	1.0	1.4	1.0	28.5	39.0
Deciduous Forest	103.2	73.2	95.8	67.7	2.9	4.0
Developed, Low Intensity	0.2	0.1	0.2	0.1	1.1	1.5
Developed, Medium Intensity	0.1	0.1	0.1	0.1	0.0	0.0
Developed, Open Space	7.3	5.2	7.9	5.6	6.6	9.0
Evergreen Forest	1.5	1.1	1.5	1.1	0.0	0.0
Mixed Forest	9.0	6.4	10.0	7.1	0.0	0.0
Pasture/Hay	18.4	13.0	24.6	17.4	33.8	46.4
Total [a]	**141.1**	**100%**	**141.4**	**100%**	**72.9**	**100%**

Source: USGS 2024

[a] Totals may not match the sum of addends due to rounding.

Proposed Route and Alternative Routes C, D, and E

The primary land cover categories within the shared Siting Corridor for the Proposed Route and Alternative Routes C, D, and E include Deciduous Forest (73.2 percent), Pasture/Hay (13.0 percent), and Mixed Forest (6.4 percent). Overall, forest (including Deciduous, Evergreen, and Mixed) covers nearly 81 percent of the Siting Corridor. Developed land—nearly all of which is Developed, Open Space land, specifically maintained vegetation along road ROWs—covers 5.4 percent of the Siting Corridor.

Alternative Routes B and F

The primary land cover types within the shared Siting Corridor for Alternative Routes B and F include Deciduous Forest (67.7 percent), Pasture/Hay (17.4 percent), and Mixed Forest (7.1 percent). Overall, forest (including Deciduous, Evergreen, and Mixed) covers nearly 76 percent of the Siting Corridor. Developed land—nearly all of which is Developed, Open Space land, specifically maintained vegetation along road ROWs—covers 5.8 percent of the Siting Corridor.

Woodside Substation Site

The current use of the Woodside Substation site is primarily agricultural. As a result, the primary land cover types within the site include Pasture/Hay (46.4 percent) and Cultivated Crops (39.0 percent). Developed land categories within the site (10.5 percent) are associated with a farmhouse property that would be acquired and removed by NEET VA as part of the MARL Project.

2.2.2.2 IMPACTS

This section discusses the impacts of the Proposed Route, Alternative Routes, and Woodside Substation site on land cover. Table 2.2-2 summarizes the acreage of land cover crossed by each Siting Corridor and ROW Corridor, as well as the acreage of land cover within the Woodside Substation site for reference. Table 2.2-3 summarizes the amount of each land cover category affected by workspaces for temporary ancillary facilities outside of the ROW Corridors for the Proposed Route / Alternative Routes C, D, and E and Alternative Routes B and F. There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.

Section 2.3, Natural Resources, describes how these land cover changes would affect physiographic setting, geology, groundwater, soils, waterbodies, wetlands, floodplains, natural heritage areas, protected species, and vegetation. Section 2.4, Visual Resources, describes the visual impacts associated with the removal of trees within the ROW Corridor and ancillary facilities. The remainder of this section describes the general land cover impacts of the Proposed Route and Alternative Routes, highlights notable differences in land cover impacts among the Alternative Routes, and provides contextual comparisons between the land cover in the ROW Corridors and the MARL Project Study Area in Virginia.

TABLE 2.2-2 LAND COVER CLASSIFICATIONS WITHIN THE SITING CORRIDORS AND ROW CORRIDORS

Land Cover Category	Proposed Route / Alternative Routes C, D, and E				Alternative Routes B and F				Woodside Substation Site	
	Siting Corridor		ROW Corridor		Siting Corridor		ROW Corridor			
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Cultivated Crops	1.4	1.0	0.2	0.4	1.4	1.0	0.2	0.4	28.5	39.0
Deciduous Forest	103.2	73.2	44.3	74.6	95.8	67.7	41.3	70.5	2.9	4.0
Developed, Low Intensity	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	1.1	1.5
Developed, Medium Intensity	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Developed, Open Space	7.3	5.2	3.0	5.0	7.9	5.6	3.1	5.3	6.6	9.0
Evergreen Forest	1.5	1.1	<0.1	0.1	1.5	1.1	<0.1	0.1	0.0	0.0
Mixed Forest	9.0	6.4	3.3	5.5	10.0	7.1	3.1	5.3	0.0	0.0
Pasture/Hay	18.4	13.0	8.6	14.4	24.6	17.4	10.8	18.5	33.8	46.4
Total [a]	**141.1**	**100%**	**59.4**	**100%**	**141.4**	**100%**	**58.6**	**100%**	**72.9**	**100%**

Source: USGS 2024

ROW = right-of-way

[a] Totals may not match the sum of addends due to rounding.

TABLE 2.2-3 LAND COVER CLASSIFICATIONS WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Land Cover Category	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Deciduous Forest	0.0	0.9	5.9	0.0	0.9	5.4
Developed, Low Intensity	0.0	< 0.1	0.0	0.0	< 0.1	0.0
Developed, Open Space	0.0	< 0.1	< 0.1	0.0	< 0.1	< 0.1
Evergreen Forest	0.0	0.0	1.4	0.0	0.0	1.4
Mixed Forest	0.0	0.0	1.1	0.0	0.0	1.0
Pasture/Hay	0.0	0.9	3.1	0.0	1.0	3.0
Total [b]	**0.0**	**1.9**	**11.6**	**0.0**	**1.9**	**10.8**

Source: USGS 2024

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.

[b] Totals may not match the sum of addends due to rounding.

Proposed Route and Alternative Routes C, D, and E

The distribution of land uses within the ROW Corridor for the Proposed Route and Alternative Routes C, D, and E will be similar to the distribution described for the Siting Corridor. The ROW Corridor will primarily affect Deciduous Forest (74.6 percent) and Pasture/Hay (14.4 percent) land cover types, while developed land (all of which is Developed, Open Space) will be 5.0 percent of the ROW Corridor. Similarly, the temporary ancillary facilities outside of the ROW Corridor will primarily affect Deciduous Forest and Pasture/Hay land cover types.

MARL Project construction would result in temporary restrictions on access to land used for work areas within the ROW Corridor, which affects the ability to use that land. In addition, MARL Project construction would result in temporary access restrictions to land used for ancillary facility workspaces outside of the ROW Corridors, including temporary access roads, construction work areas, construction equipment staging areas, laydown areas, and other construction work areas. These areas would be restricted prior to and during construction and reopened to previous uses upon completion of construction.

During construction, forested portions of the ROW Corridor will be cleared of trees and vegetation coverage will be converted to herbaceous and scrub/shrub land cover for the life of the MARL Project. The 47.6 acres of forest (combined, all forest types) represent 0.3 percent of the total forested land in the MARL Project Study Area in Virginia. To the greatest extent practicable, the MARL Project will parallel existing transmission lines to avoid and minimize impacts from new forested habitat fragmentation. If construction and operation results in fragmentation of existing forested areas, this fragmentation would not likely meaningfully change the overall forest patterns in Virginia due to the extensive remaining forested areas in the counties crossed by the routes.

The MARL Project ROW Corridors would affect 8.8 acres of agricultural lands, which represent 0.3 percent of cultivated crops and pasture/hay available within the MARL Project Study Area in Virginia. During construction, agricultural lands within the ROW Corridors will be unavailable for agricultural production, resulting in temporary impacts on farming such as crop harvesting and grazing. Additionally, land clearing associated with transmission infrastructure could affect soil erosion and compaction. As stated in Section 2.7, Geological Resources, best management practices (BMPs) for the protection of topsoil and avoidance of degradation of farmland could include minimization of soil disturbance where possible, salvage of topsoil removed during grading activities for redistribution during the final reclamation of a site to facilitate the re-establishment of desirable vegetation, and stabilization of soil post-construction. During operation, agricultural activities will generally be allowed to continue, resulting in no long-term change in land cover.

The 8.7 acres of forest and 4.0 acres of agricultural land within the ancillary facility workspaces outside of the ROW Corridor for the Proposed Route and Alternative Routes C, D, and E represent less than 0.1 percent of the total forested and agricultural land in the MARL Project Study Area. Reforestation of these areas would be possible after construction, taking at least 20 years to reach maturity. Land cover within ancillary facility workspaces outside of this ROW Corridor would be allowed to return to preconstruction conditions, although regrowth of trees within previously forested areas would occur over a period of 20 or more years, effectively resulting in a long-term

conversion of forested land to herbaceous and scrub/shrub. Areas of developed, open space and agriculture (pasture/hay) will maintain their function once construction is completed.

During MARL Project operation, changes in land cover would occur where structures are installed and forested land is converted to herbaceous and shrub/scrub habitat to accommodate the ROW Corridor. MARL Project operation will have minimal impact on farming operations because livestock grazing and row crops can typically coexist with the transmission line. To the degree that the ROW Corridor crosses orchards, nurseries, tree farms, or other agricultural activities that involve trees or other vegetation with a natural mature height of greater than 10 feet, such vegetation would be replaced with herbaceous and scrub/shrub habitat. Equipment and vehicles that do not exceed 14 feet in height (including those that can be extended to no more than 14 feet in height) will also be allowed to operate within the ROW Corridor. Operation will not change the land cover categorization or land uses in developed areas, except that new third-party structures will not be permitted by NEET VA within the ROW Corridor.

To minimize permanent changes to land cover, NEET VA will use existing paved and/or gravel/dirt roads for temporary construction and long-term maintenance access within and outside of the ROW Corridor, where feasible. To minimize tree clearing in forested areas, the MARL Project would only clear trees required to establish the ROW Corridor and within the ancillary facility workspaces. NEET VA will coordinate with affected landowners prior to establishment of ROW easements and construction to negotiate measures to minimize impacts on the long-term viability of the use of the property.

Alternative Routes B and F

The distribution of land cover types within the shared ROW Corridor for Alternative Routes B and F and ancillary facilities is similar to the distribution for the Proposed Route and Alternative Routes C, D, and E. The 44.4 acres of Deciduous, Evergreen, and Mixed Forest in the ROW Corridor and 8.7 acres within the ancillary facilities workspaces represent 0.3 percent and less than 0.1 percent (respectively) of the total forested land in the MARL Project Study Area in Virginia. The 11.0 acres of agricultural lands in the ROW Corridor and 4.0 acres within the ancillary facilities workspaces represent less than 0.3 percent and less than 0.1 percent (respectively) of agricultural land in the MARL Project Study Area in Virginia.

Impacts of Alternative Routes B and F on land cover are similar to those discussed for the Proposed Route and Alternative Routes C, D, and E, most notably those impacts discussed regarding forestry uses and agricultural lands. These include long-term conversion of forest to herbaceous and scrub/shrub land cover within the ROW Corridor, as well as temporary access restrictions to the ROW Corridor, which will restrict agricultural activities during construction.

NEET VA will employ the same approaches to avoid or minimize impacts from Alternative Routes B and F as described for the Proposed Route and Alternative Routes C, D, and E.

Woodside Substation Site

The Woodside Substation site will primarily impact the 62.3 acres of existing agricultural land (Cultivated Crops and Pasture/Hay) within the substation site, along with developed land associated with the existing homestead on the property. These impacts will result in permanent conversion of the existing farmstead and farm property to industrial uses associated with the substation site.

2.2.3 LAND USE PLANNING AND ZONING

Section 15.2-2223 of the Va. Code requires localities to adopt a comprehensive plan that provides guidance for physical development within their jurisdiction. Comprehensive plans assess existing and future land uses, anticipate development trends, and make recommendations for guiding the long-term development decisions of a city or county. Virginia also requires localities to review and update their comprehensive plans at least once every 5 years to adjust to actual or projected changes in land use conditions or needs (Va. Code § 15.2-2230). The sections below provide further discussion of the plans, as well as local zoning regulations, in relation to the MARL Project.

2.2.3.1 EXISTING CONDITIONS

The Comprehensive Plan for Frederick County, Virginia (Frederick County 2021) guides the county's land use policy and legislative actions, including objectives for natural resource management, accessible housing, cultural heritage protection, and economic development. The comprehensive plan's future land use recommendations are intended to guide zoning decisions and direct capital projects. The plan highlights the importance of reliable utilities, including electric transmission, in supporting office and industrial development.

The Frederick County *2025-2030 Capital Improvement Plan* (Frederick County 2025) guides the county's investment in public facilities and infrastructure. The plan is reviewed and adopted annually, with completed and abandoned projects removed. The plan includes upgrades for Clearbrook Park, which is 1.3 miles south of the Woodside Substation site and within the Woodside Substation Study Area in Virginia. The anticipated park upgrades include playground replacements and additional parking (Frederick County 2025).

Under Virginia law, public utilities planning to construct transmission lines of 138 kV or higher generally are required to obtain a CPCN from the SCC, which, if granted, preempts local zoning ordinances (Va. Code § 56-265.2) and makes the transmission line components of a project meeting this criterion exempt from local zoning regulations. Substations and other facilities may be subject to local land use approvals and screening standards, including buffers and landscaping. Because NEET VA intends to obtain a CPCN from the SCC, the transmission line components of the MARL Project will be exempt from zoning requirements.

The Frederick County comprehensive plan designates the area within the shared Siting Corridor for the Proposed Route and Alternative Routes C, D, and E, as well as the shared Siting Corridor for Alternative Routes B and F as Rural Areas. These areas are primarily intended for agricultural and forestry operations and less suitable for residential or commercial development, although the comprehensive plan acknowledges that substantial areas of new residential development have occurred or been approved for Rural Areas (Frederick County 2021). The MARL Project will not

change the comprehensive plan's overall intent for Rural Areas to remain forested and undeveloped. The MARL Project will also support the comprehensive plan's goals for targeted development in the county's Urban Areas by supporting increased demand and electrical system reliability in areas designated and intended for future growth, specifically in Urban Areas where more energy is typically used and needed.

The Woodside Substation site location is within the Sewer and Water Service Area, where infrastructure development such as electric transmission is encouraged (Frederick County 2021). The Woodside Substation site is within the Rural Areas zoning district, where "Public utilities, transmission and distribution facilities" are permitted by-right (Frederick County Zoning Ordinance § 165-401.02).

2.2.3.2 IMPACTS

The MARL Project is generally consistent with the goals and strategies of the Frederick County comprehensive plan, which emphasizes maintaining agricultural and forested land uses in Rural Areas, while targeting new development to Urban Areas. The shared ROW Corridors for the Proposed Route and Alternative Routes will not change the intended land use patterns within the county's Rural Areas. An improved regional electrical transmission system will also support comprehensive plan development and growth initiatives in Urban Areas by promoting reliability of electricity delivered to existing and future residences and businesses.

The Frederick County Planning Commission determined that the Woodside Substation is in substantial accord with the Frederick County comprehensive plan (Attachment 3, Virginia Agency Correspondence). In addition, the Woodside Substation site is within the Rural Areas zoning district, where substations are permitted by-right.

2.2.4 RESIDENTIAL AREAS AND DWELLINGS

This section describes residential areas, dwellings, and commercial areas within and applicable to the Proposed Route and Alternative Route Siting Corridors and ROW Corridors, as well as the Woodside Substation site.

2.2.4.1 EXISTING CONDITIONS

Dwellings within the Siting Corridors and Woodside Substation site were identified through review of various digital datasets, maps, and recent (2025) digital aerial photography. Table 2.2-4 lists the number of dwellings within 100, 250, and 500 feet of the centerlines of the Proposed Route and Alternative Routes, as well as the Woodside Substation site. Table 2.2-5 lists the number of dwellings within these distance zones for the ancillary facilities workspaces. There are no dwellings within 500 feet on either side of the non-shared portion of the Proposed Route and Alternative Route ROW Corridors; therefore, the analysis for ancillary facilities in Table 2.2-5 is applicable to all routes. In addition, the counts in Table 2.2-4 and Table 2.2-5 are independent; thus, a home may be within 100, 250, or 500 feet of a route centerline and ancillary facilities workspaces. Most of the dwellings near the Woodside Substation site are in the Ridgeway Estates subdivision.

TABLE 2.2-4 DWELLINGS NEAR THE PROPOSED AND ALTERNATIVE ROUTE CENTERLINES AND WOODSIDE SUBSTATION SITE

Distance from MARL Project Feature	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Within 100 feet	0	0	0
Within 250 feet	0	2	2
Within 500 feet	0	8	7

TABLE 2.2-5 DWELLINGS NEAR ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIORS (ALL ROUTES)

Distance from MARL Project Feature	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities	Total [a]
Within 100 feet	0	1	0	1
Within 250 feet	0	1	2	3
Within 500 feet	0	3	4	7

[a] To avoid double-counting, dwellings are counted according to the closest type of ancillary facility workspace (e.g., a dwelling within 500 feet of both temporary access road workspace and within 250 feet of other temporary ancillary facilities is counted in the other temporary ancillary facilities column). This count is independent of the count of dwellings near the shared ROW Corridor for the Proposed Route and Alternative Routes; therefore, some dwellings may be within 500 feet of both the ROW Corridor and ancillary facility workspaces.

2.2.4.2 IMPACTS

Impacts on dwellings could include noise, dust, and other visual impacts. Noise and dust would be generated as a result of earth-moving and other construction activities, particularly at the Woodside Substation site, which would be cleared and graded as part of MARL Project construction. NEET VA would address noise and dust concerns through compliance with the requirements of Frederick County and other applicable ordinances and permits. Visual impacts from operation could occur due to the presence of newly constructed transmission infrastructure and the Woodside Substation within view of dwellings, particularly in the Ridgeway Estates subdivision adjacent to the Woodside Substation site. NEET VA will maintain existing vegetation to the extent possible and plans to install a landscaped buffer to minimize impacts. Section 2.4 provides a more complete evaluation of the visual impacts of the MARL Project, along with a discussion of other mitigation measures that NEET VA would implement.

In general, construction and operation impacts of the Proposed Route and Alternative Routes C, D, and E on dwellings would be similar to the impacts of Alternative Routes B and F.

2.2.5 COMMERCIAL AND INDUSTRIAL AREAS AND BUILDINGS

There are no commercial or industrial areas or buildings within 0.25 mile of the Siting Corridors for the Proposed Route and Alternative Routes.

The Woodside Substation site is 0.25 mile west of an area of industrial and commercial businesses along Martinsburg Pike (U.S. Route [US] 11) and 0.25 mile south of an industrial property on the west side of I-81. Establishments in these areas include Carter Machinery, a McKesson pharmaceutical supplies building, and other commercial and industrial buildings.

Impacts of the Woodside Substation on commercial and industrial areas could include increased traffic during construction (to the degree that construction traffic uses US 11). Additionally, the Woodside Substation would change the landscape visible from these sites, although visual impacts would be minimal, due to the relatively low sensitivity of viewers (Section 2.4).

2.2.6 PLANNED DEVELOPMENTS

ERM obtained information about planned developments through publicly available data on Frederick County websites (Frederick County n.d.-a, n.d.-b) and the *Frederick County 2025–2030 Capital Improvement Plan* (Frederick County 2025). There are no planned residential, commercial, or industrial developments within the Siting Corridor or ROW Corridor.

2.2.7 CONSERVATION EASEMENTS AND LANDS

Land conservation easements help preserve Virginia's heritage, provide recreational opportunities, and improve water and habitat quality and overall quality of life. In addition to managing lands under its jurisdiction, the Virginia Department of Conservation and Recreation (VDCR) helps landowners, land trusts, and localities by serving as a clearinghouse, keeping an inventory of protected lands, and providing grants and information on easements and land protection. The agency also helps by identifying important open space and lands rich with plant and animal diversity.

There are no easements within the Siting Corridor or within 0.25 mile of the Siting Corridor for the Proposed Route and Alternative Routes C, D, and E; Alternative Routes B and F; or the Woodside Substation site (VDCR 2025). Therefore, Virginia conservation easements are not further discussed in this report.

2.2.8 RECREATIONAL RESOURCES

ERM reviewed information on recreational resources using publicly available datasets from ArcGIS Online and U.S. Geological Survey (USGS) Protected Areas Database of the United States. There are no federal, state, or local recreation resources within 0.5 mile of the Siting Corridors or the Woodside Substation site; therefore, recreational resources are not further discussed in this report.

2.2.9 SCHOOLS, CEMETERIES, AND PLACES OF WORSHIP

ERM reviewed the digital mapping sources described above to identify cemeteries, schools, and places of worship within 0.25 mile of each Siting Corridor and the Woodside Substation site. ERM's review of schools considered public and private pre-kindergarten through secondary schools, religious schools, daycare centers (excluding in-home daycares), technical schools, after-school enrichment and tutoring programs, and college/university campuses. There are no schools, cemeteries, or places of worship within 0.25 mile of the Siting Corridors or Woodside Substation site; therefore, schools, cemeteries, and places of worship are not further discussed in this report.

2.2.10 TRANSPORTATION INFRASTRUCTURE

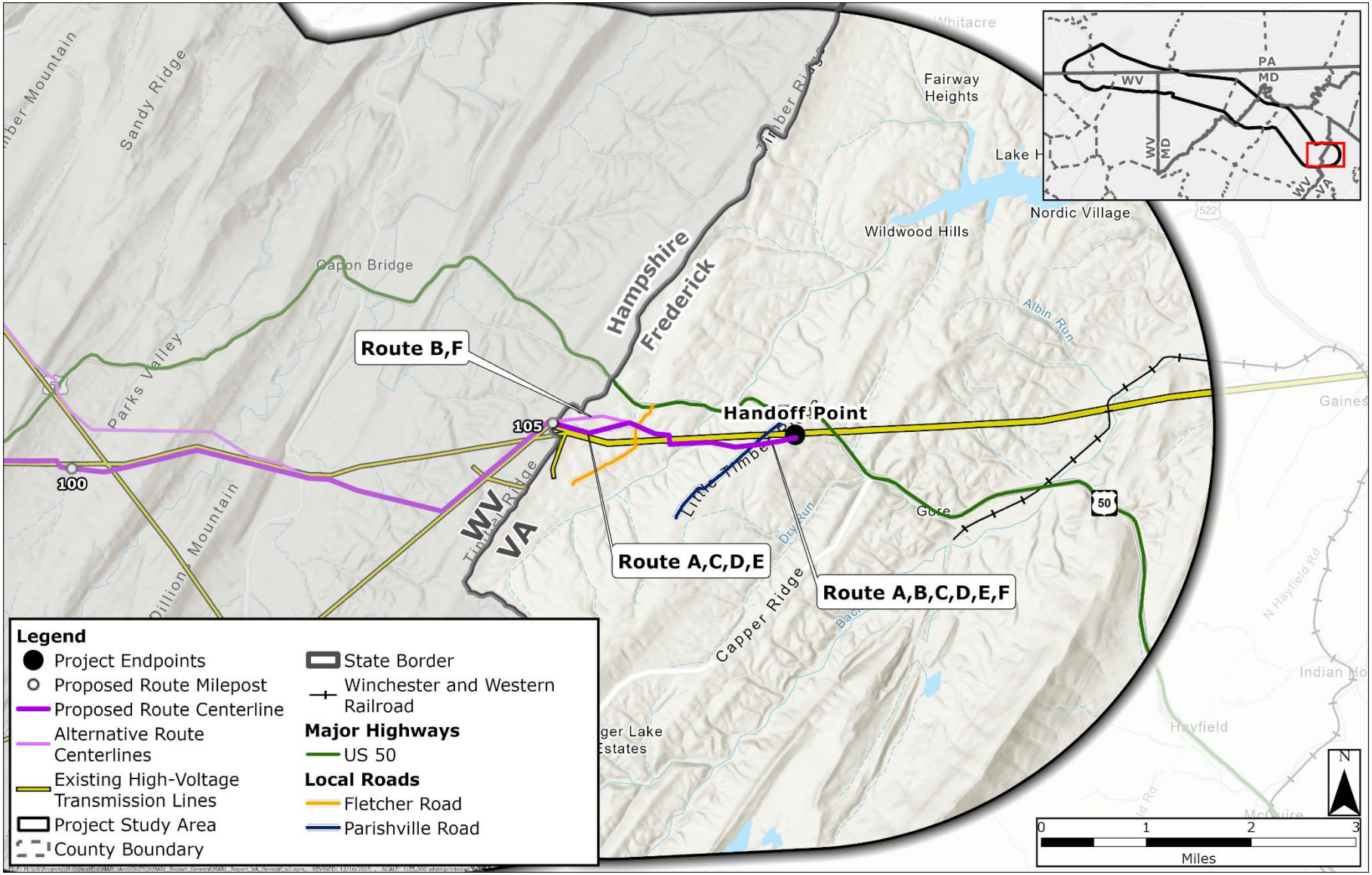
This section describes roads within the Siting Corridors for the MARL Project and at the Woodside Substation site.

2.2.10.1 EXISTING CONDITIONS

Figure 2.2-2 and Figure 2.2-3 show major transportation features within and near the Siting Corridors and Woodside Substation site, respectively. Public roads crossed by the Siting Corridors are listed below. Except where noted, all Siting Corridors cross the same roads. Table 2.2-6 summarizes the characteristics of these roads.

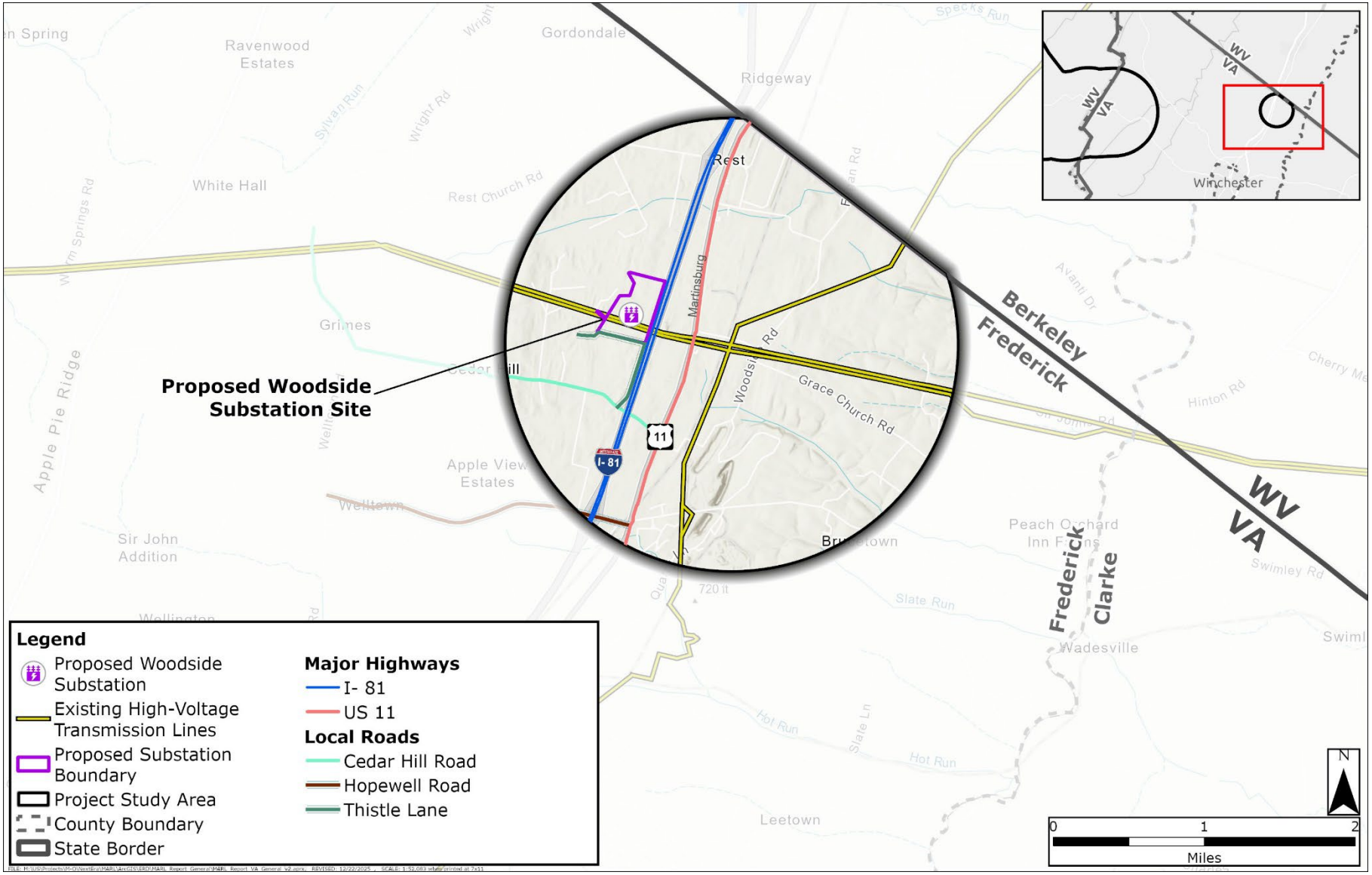
- Evelyn Lee Lane (Alternative Routes B and F only)
- Fletcher Road
- Parishville Road

FIGURE 2.2-2 TRANSPORTATION FACILITIES NEAR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES



MD = Maryland; PA = Pennsylvania; US = U.S. Route; VA = Virginia; WV = West Virginia

FIGURE 2.2-3 TRANSPORTATION FACILITIES NEAR THE WOODSIDE SUBSTATION SITE



I = Interstate; MD = Maryland; PA = Pennsylvania; US = U.S. Route; VA = Virginia; WV = West Virginia

TABLE 2.2-6 ROADS WITHIN AND NEAR THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE

Road	Description	Annual Average Daily Traffic (Year)
I-81	Limited-access freeway with 2 lanes in each direction, paved shoulders, a wide, landscaped median, and grade-separated interchanges	54,000 (2022)
US 50	Paved and striped, with one lane in each direction and a typical paved width of approximately 24 feet; Intermittent unpaved or graveled shoulders	8,500 (2022)
US 11	Three total travel lanes, including one lane in each direction and a bi-directional center turn lane, with a typical paved width of approximately 40 feet and no shoulders	7,700 (2022)
Fletcher Road	Paved, unstriped local road with a nominal typical width of 22 feet and no shoulders	100 (2020)
Evelyn Lee Lane	Unpaved, narrow lane	ND
Parishville Road	Paved, unstriped local road with a nominal typical width of 24 feet and no shoulders	430 (2017)
Hopewell Road	Paved, striped road with one travel lane in each direction, a typical paved width of 24 feet, and no shoulders	5,000 (2022)
Cedar Hill Road	Paved, striped road with one travel lane in each direction, a typical paved width of 22 feet, and no shoulders	790 (2022)
Thistle Lane	Unpaved and paved, unmarked local road with a typical paved width of 20 feet and no shoulders	20 (2020)

Source: VDOT 2025b

I- = Interstate; ND = no data; US = U.S. Route

In addition, MARL Project vehicles accessing the Siting Corridor during construction and operation are likely to use US 50 to reach those locations.

Access to the Woodside Substation site would typically be from I-81 via Hopewell Road, US 11, Cedar Hill Road, and Thistle Lane.

The Winchester & Western Railroad runs generally parallel to and east of US 11 near the Woodside Substation site, crossing US 11 and Hopewell Road near the Hopewell Road interchange with I-81. The Winchester & Western is a short-line freight railroad operated by OmniTRAX that runs from Williamsport, Maryland, to Winchester, Virginia (OmniTRAX 2025).

The Virginia Department of Transportation's Six-Year Improvement Program (VDOT 2025a) does not include any road or railroad improvement projects in or near the Siting Corridors or Woodside Substation site. Frederick County's Northeast Land Use Plan (Frederick County 2023), an amendment to the Frederick County Comprehensive Plan (Frederick County 2021) recommends a major collector road system west of and parallel to I-81 that crosses the substation site. At a meeting on October 1, 2025, the Frederick County Planning Commission determined that the Woodside Substation site plan was in substantial accord with the Frederick County Comprehensive Plan, in part because the conceptual site plan accommodates a future through road on the site (Frederick County Planning Commission 2025).

Frederick County's Interstate Road Improvement Plan (Frederick County 2024a) and 2026 Primary Road Improvement Plan (Frederick County 2024b) and the Winchester-Frederick County Metropolitan Planning Organization's 2035 Transportation Plan Update (Win-Fred MPO 2012) identify transportation priorities for upgrades to I-81 (widening, interchange upgrades) and US 11 (widening to a four- to six-lane system) and intersection improvements along US 50; however, any improvement projects on these roads require state funding and contracting. As a result, there are no known or reasonably foreseeable planned transportation improvements along the roads listed in Table 2.2-6.

2.2.10.2 IMPACTS

During MARL Project construction, crossings of the roads described in Section 2.2.10.1 would result in temporary impacts on traffic. These impacts would take the form of multiple, separate, short-duration (5- to 20-minute) intermittent closures of some roads for safety as the transmission lines are being installed between the structures on either side of each road crossing. Any closures on Fletcher Road and Parishville Road would not result in substantial traffic impacts.

In addition, the MARL Project will require the use and upgrade of some existing roads to access the ROW Corridor, as well as the installation of temporary construction roads from existing public roads along the ROW Corridor. Upgrade of existing roads and installation of new temporary roads may result in temporary traffic impacts, such as single lane or shoulder closures, especially where new access roads meet existing roads. MARL Project operation (including routine maintenance) will require minimal use of access roads and would not meaningfully affect local traffic.

NEET VA will coordinate with state and local road authorities to implement any upgrades of existing roads or temporary road closures of shoulders or lanes on public roads necessary to install temporary access roads. As part of the permitting process for the MARL Project,

NEET VA will prepare a Traffic Control Plan (TCP) for all road crossings in coordination with the Virginia Department of Transportation, county road officials, and other entities responsible for roads to minimize traffic impacts. The TCP will include traffic management measures, such as the use of road signs, flagging crews, lane closures, and detours. The TCP will also include measures to maintain access for emergency vehicles during construction. Additionally, NEET VA will avoid construction activities during school bus drop-off and pick-up times, as well as peak traffic times on affected roads to the degree possible. Other typical protective measures for transmission line installation include, but are not limited to clearance poles, cranes, or bucket trucks placed on each side of the road to protect the roadway during cable pulling activities.

The Proposed Route and Alternative Routes would not cross the Winchester & Western Railroad; therefore, the MARL Project would have no impact on railroads.

2.2.11 AIRPORTS AND HELIPORTS

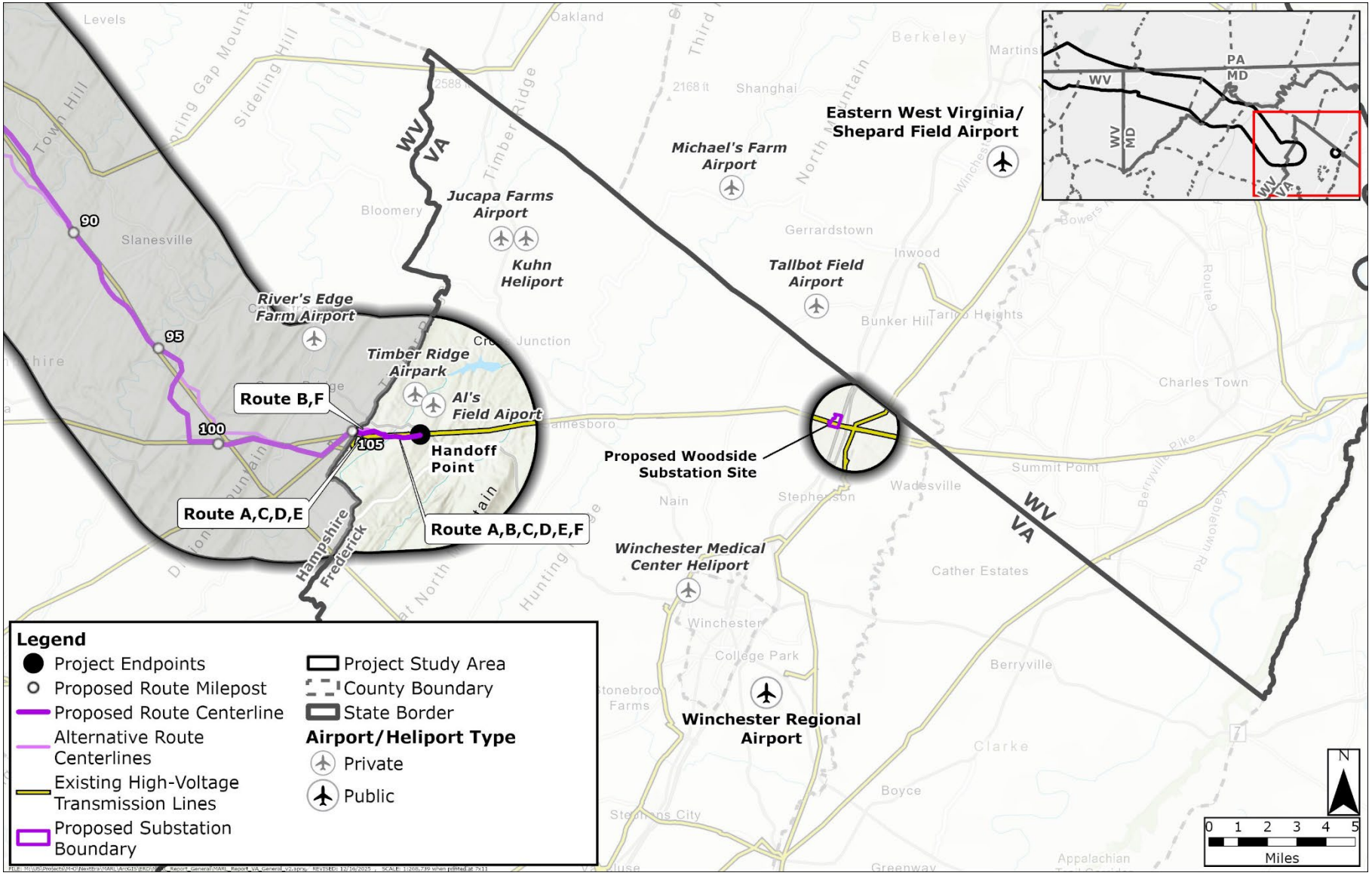
Transmission line structures have the potential to affect airspace in and around airports. This section describes the airports near the MARL Project Study Area in Virginia, the airspace regulations that could affect the MARL Project, and potential impacts of transmission line structures on airports and navigable airspace.

2.2.11.1 EXISTING CONDITIONS

Airports Near the MARL Project

ERM reviewed the Federal Aviation Administration's (FAA) website to identify public use airports, airports operated by a federal agency or the U.S. Department of Defense, airports or heliports with at least one FAA-approved instrument approach procedure, and public use or military airports under construction (FAA n.d.-a). Based on this review, 10 airports (6 in Virginia and 4 in West Virginia), as depicted on Figure 2.2-4 and listed and described in Table 2.2-7, are within 10 nautical miles (nm) of the proposed facilities, pursuant to the Code of Federal Regulations, Title 14, Section 157.5 (14 CFR § 157.5).

FIGURE 2.2-4 AIRPORTS AND HELIPORTS LOCATED WITHIN 10 NAUTICAL MILES OF THE MARL PROJECT



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

TABLE 2.2-7 AIRPORTS AND HELIPORTS LOCATED WITHIN 10 NAUTICAL MILES OF THE MARL PROJECT

Airport/Heliport Name	FAA ID	Approximate Distance and Direction from Nearest MARL Project Component [a]	Use	Maximum Runway Length (feet)
Al's Field Airport	48VA	0.9 nm northeast of Handoff Point	Private	1,500
Timber Ridge Airpark	VA46	1.2 nm north of Handoff Point	Private	2,700
River's Edge Farm Airport	38WV	3.0 nm north of Siting Corridors	Private	1,800
Talbott Field Airport	8WV8	3.7 nm north of Woodside Substation site	Private	1,015
Jucapa Farms Airport	9VG9	6.3 nm north-northeast of Handoff Point	Private	1,500
Kuhn Heliport	4VA2	6.6 nm north-northeast of Handoff Point	Private	NA
Winchester Medical Center Heliport	2VA4	6.9 nm southwest of Woodside Substation site	Private	NA
Michaels Farms Airport	WV17	7.9 nm north-northwest of Woodside Substation site	Private	2,000
Winchester Regional Airport	OKV	8.3 nm south-southwest of Woodside Substation site	Public	5,498
Eastern West Virginia Regional / Shepherd Field Airport	MRB	9.0 nm north-northeast of Woodside Substation site	Public	8,815

Source: FAA n.d.-a, n.d.-b

FAA = Federal Aviation Administration; ID = identification; NA = not applicable; nm = nautical mile

[a] Distance (nm) is measured from the end or edge of the nearest runway to the nearest MARL Project feature.

Federal Aviation Administration Regulations

The FAA oversees air transportation in the United States, focusing on air transportation safety, including the enforcement of safety standards for aircraft manufacturing, operation, and maintenance. The FAA also manages air traffic in the United States and evaluates physical objects that may affect the safety of aeronautical operations through an obstruction evaluation. The prime objective of an FAA obstruction evaluation is to ensure the safety of air navigation and the efficient use of navigable airspace by aircraft. The regulations that govern objects that may affect navigable airspace are codified by 14 CFR Part 77.

The FAA only regulates public use and federally operated (military use) airports and heliports. Of the airports identified in Table 2.2-7, the only public use airports within 10 nm of any MARL Project feature are Winchester Regional Airport and Eastern West Virginia Regional / Shepherd Field Airport, which are both near the Woodside Substation site. Table 2.2-8 summarizes information about each of these airports. Private use airports without at least one instrument approach procedure do not require evaluation under 14 CFR Part 77 and are not further discussed.

TABLE 2.2-8 RUNWAY IMAGINARY SURFACE CLASSIFICATIONS FOR PUBLIC AIRPORTS WITHIN 10 NAUTICAL MILES OF ALL MARL PROJECT COMPONENTS

Airport Characteristic	Winchester Regional Airport		Eastern West Virginia Regional Airport / Shepherd Field	
Airport Code	OKV		MRB	
Runway ID	14/32		08/26	
Established Airport Elevation [a]	726.2		564.8	
Runway End, Heading	14: 134°	32: 314°	08: 71°	26: 251°
Runway Elevation [a]	726.2	700.8	564.8	549.6
Obstruction Category [b]	D	Precision instrument approach	C	Precision instrument approach

Source: FAA n.d.-b

amsl = above mean sea level; CFR = Code of Federal Regulations; nm = nautical mile
[a] All elevations are in feet amsl.
[b] Obstruction Categories (14 CFR Part 77): C = Non-precision Approach with visibility minimums greater than ¾ statute mile; D= Non-prevision Approach with visibility minimums as low as ¾ statute mile

The FAA establishes civil airport imaginary surfaces (described below) for each airport and each runway, pursuant to 14 CFR Part 77. Imaginary surfaces are intended to prevent existing or proposed objects from extending from the ground into navigable airspace.

In addition to the civil and military airport imaginary surfaces, FAA Order 8260.3G establishes imaginary surfaces associated with Terminal Instrument Procedures (TERPs). TERPs are FAA guidelines that prescribe standardized methods for designing and evaluating airport-specific Instrument Flight Procedures (IFPs), including approach and departure procedures, for civil and military airports. IFPs detail required flight paths, altitude restrictions, and maximum descent and takeoff gradients that guide aircraft through approach airspace and provide protocols for missed approaches. IFPs consider obstructions around the airport, including natural topography and

manmade structures, to establish Minimum and Required Obstacle Clearance Surfaces. This facet of TERPs allows safe aeronautical navigation in poor visibility conditions.

Civil airport imaginary surfaces are typically more restrictive than surfaces associated with TERPs to ensure that developers seek FAA consultation prior to constructing structures within controlled airspace. If a structure were to penetrate imaginary surfaces and/or FAA imaginary "Notice" surfaces (described in the following section) of an airport, the IFP for that airport may be required to include that obstruction on navigation charts. If the FAA identifies a structure as an obstruction to air navigation, the FAA will issue determinations regarding options for design requirements, such as prescribed maximum height thresholds. In some cases, the FAA may prohibit the construction of a structure at the proposed location.

Pursuant to 14 CFR Part 77, an existing object (including a mobile object) is, and a future object would be an obstruction to air navigation if it is of greater height than any of the following heights or surfaces:

- 499 feet above ground level (AGL) at the site of the object;
- 200 feet AGL or above the established airport elevation (whichever is higher) within 3 nm of the established reference point of an airport (excluding heliports), where the longest runway is more than 3,200 feet in actual length. That height increases in the proportion of 100 feet for each additional nm from the airport up to a maximum of 499 feet;
- A height within a terminal obstacle clearance area, including an initial approach segment, a departure area, and a circling approach area, that would result in the vertical distance between any point on the object and an established minimum instrument flight altitude within that area or segment to be less than the required obstacle clearance;
- A height within an enroute obstacle clearance area, including turn and termination areas, of a Federal Airway or approved off-airway route that would increase the minimum obstacle clearance altitude; or
- The surface of a takeoff and landing area of an airport or any imaginary surface established under 14 CFR §§ 77.19, 77.21, or 77.23.

None of the MARL Project's features discussed in this report would exceed surfaces or TERPs obstruction standards of the airports identified in Table 2.2-8.

Federal Aviation Administration Notice Requirements and Timing

Construction of any structure that exceeds any of the surfaces or heights identified in the previous sections requires notice to the FAA. In addition, pursuant to 14 CFR Part 77.9, a notice must be filed with the FAA for the following:

- Any construction or alteration that is more than 200 feet AGL at its site;

- Any construction or alteration exceeding an imaginary "Notice" surface, as defined in 14 CFR Part 77, including surfaces extending outward and upward at the following slopes:
  - 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport;
  - 50 to 1 for a horizontal distance of 10,000 feet from the nearest point of the nearest runway that is no more than 3,200 feet in actual length; or
  - 100 to 1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway that is more than 3,200 feet in actual length; or
- If requested by the FAA.

Construction or alteration of any structure meeting the criteria above requires submittal of a FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the FAA regional office with jurisdiction over the area, or submittal electronically via the FAA website. The required information to be provided with the notice includes the coordinates, site elevation, and structure height AGL for each pole/structure and the height of construction equipment (e.g., cranes).

State and Local Aviation Regulations

Va. Code § 5.1-25.1 prohibits erection of any structure that penetrates any licensed airport's clear zone, approach zone, imaginary surface, obstruction clearance surface, obstruction clearance zone, or surface or zone (as defined by the FAA or the regulations of the Virginia Department of Aviation) without first securing a permit from the Board of Aviation. This requirement does not apply to structures erected in a jurisdiction that has an ordinance regulating the height of such structures to prevent the penetration of zones and surfaces established in 14 CFR Part 77 and Rule 19 of the Virginia Department of Aviation. State law (Va. Code §§ 15.2-2280, 15.2-2282, 15.2-2293, and 15.2-2294) gives local jurisdictions the power to establish and regulate zoning districts, make airspace subject to their zoning ordinance, and establish airport safety zoning.

Frederick County's Airport (AP1) zoning district regulates structure heights near Winchester Regional Airport. The portions of the MARL Project in Virginia (including the Siting Corridors) would be outside of this zoning district.

2.2.11.2 IMPACTS

ERM conducted an airport analysis to review the height limitations associated with the FAA-defined imaginary surfaces for all runways at the public airports identified in Table 2.2-7. As part of a typical airport analysis, ERM conducts preliminary evaluations of transmission infrastructure heights and locations using the FAA-defined Civil and Department of Defense airport imaginary surfaces, and applies standard GIS tools, including ESRI's ArcGIS Pro software with Spatial Analyst, 3D Analyst, and Aviation Airports Extensions, to create and georeference imaginary surfaces in space and in relationship to transmission structures.

All MARL Project components are outside of the civil airport imaginary surfaces of the public airports identified in Table 2.2-7 and are, thus, outside of the relevant airport safety overlay zones for Winchester Regional Airport and Eastern West Virginia Regional Airport / Shepherd Field.

The proposed transmission line structures for the MARL Project would not exceed 200 feet AGL. NEET VA would likely use cranes to install the MARL Project's transmission structures. Based on the typical maximum crane height needed for construction (assumed to be approximately 35 feet above the structure height), these cranes may exceed the FAA notification thresholds. As a result, NEET VA may be required to submit FAA Form 7460-1, Notice of Proposed Construction or Alteration, pursuant to 14 CFR Part 77 for FAA notification. Any such submittal would occur after a route is selected by the SCC during the permitting phase of the MARL Project.

The FAA does not regulate the private airports and heliports listed in Table 2.2-7. The six private runways and two heliports listed in Table 2.2-7 are within 10 nm of the MARL Project facilities. An existing transmission line corridor (with collocated FirstEnergy 500 kV and Dominion Energy 138 kV transmission lines) is between the Handoff Point and Al's Field and Timber Ridge Airpark, the two closest private airports to the MARL Project (FAA n.d.-a). These existing transmission lines also lie between the MARL Project facilities and other private airports listed in Table 2.2-7. As a result, construction and operation of the MARL Project would not affect private airports.

MARL Project construction may require the use of helicopters for structure setting, wire-pulling operations, or equipment transport, on an as needed basis, if necessary due to topographic, constructability, or environmental constraints. Helicopter activity would primarily remain above the ROW Corridor and/or ancillary facilities workspaces (or between airports/heliports and the MARL Project). Helicopter flights would originate at existing public airports and heliports, or possibly at temporary helipads closer to the MARL Project facilities. The frequency and duration of such flights (if any) and location of temporary helipads (if any) would be determined as part of MARL Project design and permitting. This analysis assumes that airports or heliports used for these flights would have sufficient capacity to accommodate MARL Project-related flights. Pilots would obey relevant laws and regulations applicable to air operations.

2.3 NATURAL RESOURCES

This section describes natural resources, including watersheds, wetlands, waterbodies, natural heritage resources (NHRs), protected species, and vegetation in the Siting Corridors and ROW Corridors (including ancillary facilities outside of the ROW Corridors) for the Proposed Route, Alternative Routes B through F, and the Woodside Substation site, as well as the potential impacts of the MARL Project on these resources.

2.3.1 WATERSHEDS

Watersheds are used to define the geographic area within the boundaries of drainage divides throughout the country. For the purpose of classifying watersheds, the U.S is divided into four levels of hydrologic units—regions, subregions, accounting units, and cataloging units—which may contain all or part of a watershed. Each level is identified by a Hydrologic Unit Code (HUC). The 2-digit HUC is a major geographic area or region containing several rivers or the drainage area of a major river. Subsequent levels encompass progressively smaller areas based on the drainage divides of lower order waterbodies.

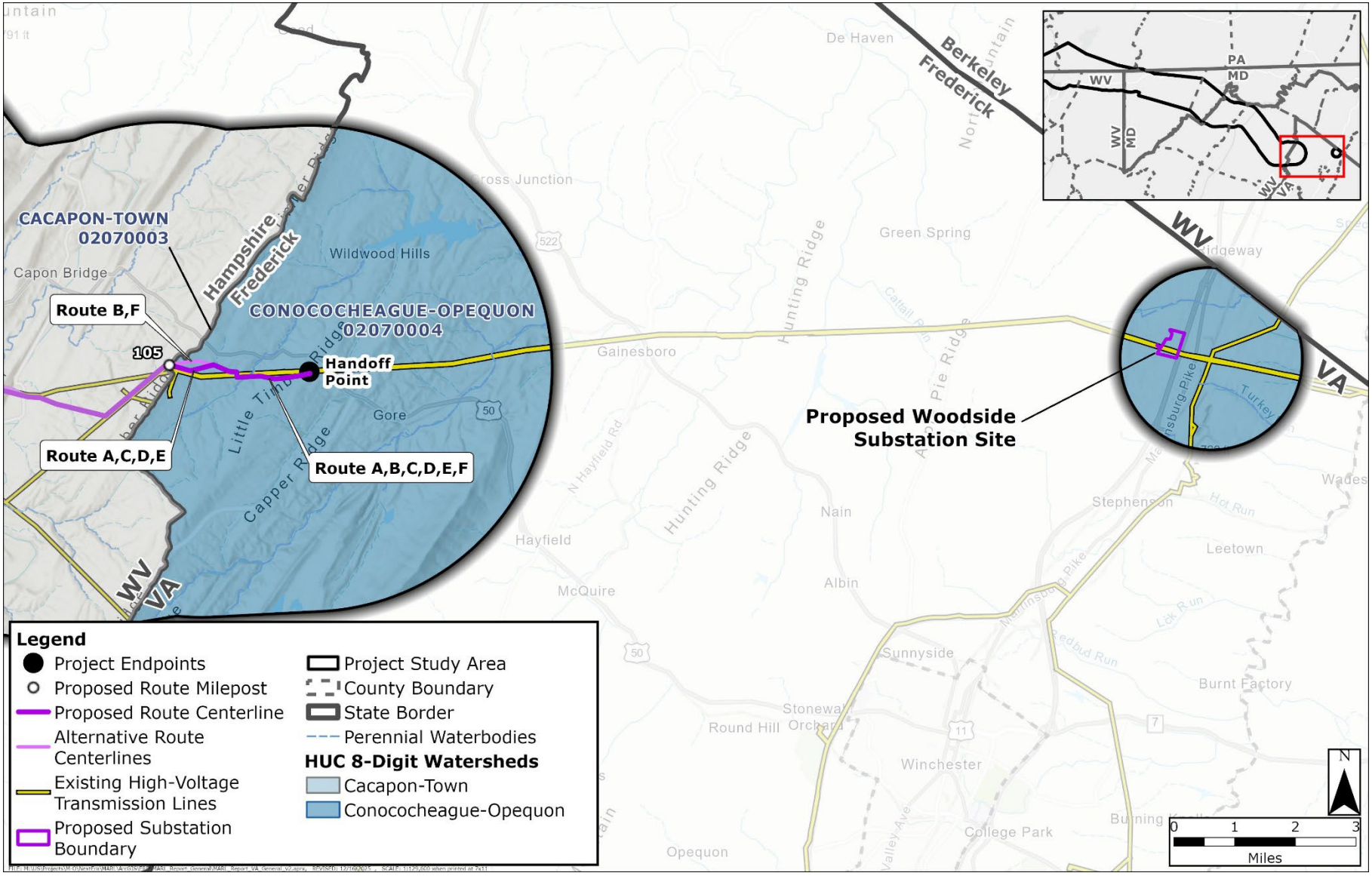
Within Virginia, the majority of the Proposed Route and Alternative Route Siting Corridors, as well as the entirety of the Woodside Substation site, are located within the Conococheague-Opequon watershed (USGS HUC 8-digit 02070004). A total of 0.2 acre to 0.3 acre of the Siting Corridors is also located within the Cacapon-Town watershed (USGS HUC 8-digit 02070003) (Figure 2.3-1).

The Proposed Route and Alternative Route Siting Corridors, as well as the Woodside Substation site, are within the following HUC areas within the Conococheague-Opequon watershed:

- The MidAtlantic HUC 2-digit (02) region, which discharges into the Atlantic Ocean, Long Island Sound, and the Riviere Richelieu, a tributary of the St. Lawrence River;
- The Potomac HUC 4-digit (0207) subregion, which drains about 14,600 square miles within the Potomac River Basin, including Washington D.C. and portions of Maryland, Pennsylvania, Virginia, and West Virginia;
- The Conococheague-Opequon HUC 8-digit (02070004) watershed, which drains about 2,250 square miles of Virginia by Conococheague Creek and Opequon Creek, both tributaries of the Potomac River; and
- The Back Creek HUC 10-digit (0207000404) watershed and the Opequon Creek HUC 10-digit (0207000409) watershed (USGS 2023).

The Siting Corridor is further split into two smaller HUC 12-digit subwatersheds: Isaacs Creek-Back Creek (020700040402) and Mine Spring Run-Back Creek (020700040401). The Woodside Substation site is located in the Turkey Run-Opequon Creek (020700040904) subwatershed.

FIGURE 2.3-1 WATERSHEDS EXISTING CONDITIONS



HUC = Hydrologic Unit Code; MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

The Conococheague-Opequon watershed is in Virginia, West Virginia, Pennsylvania, and Maryland, covering approximately 2,277 square miles (USGS 2024a). The terrain of the watershed is varied and includes rolling hills, mountain ridges, and valleys. The mountainous terrain contributes to the watershed's hydrological complexity. The watershed is drained by Conococheague Creek and Opequon Creek, which are both tributaries of the Potomac River. Surface water is affected by runoff from agricultural and urban land uses. Waterbodies within the Proposed Route and Alternative Route Siting Corridors in this watershed include Nixon Run, which bisects the Siting Corridor west of Fletcher Road, and Isaacs Creek, which bisects the Siting Corridor west of Parishville Road.

The Cacapon-Town watershed is primarily located in West Virginia, covering approximately 1,204 square miles (USGS 2024a). The terrain is steep and receives high levels of annual rainfall. The region also experiences significant snowpack in winter with long-term trends showing an increasing frequency of droughts affecting water availability and quality. The watershed is drained by the Cacapon River, a tributary of the Potomac River. Surface water quality is affected by sediment, nutrients, and organic matter. There are no named waterbodies in this watershed that are located within the Proposed Route and Alternative Route Siting Corridors.

2.3.2 WETLANDS

This section describes existing wetland resources within the Siting Corridors and ROW Corridors for the Proposed Route and Alternative Routes B through F, as well as the Woodside Substation site. In addition, a discussion of potential impacts of the MARL Project on wetland resources is also provided. A more detailed analysis is presented in Attachment 2, Wetland and Waterbody Desktop Assessment.

2.3.2.1 EXISTING CONDITIONS

Publicly available data from the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) were reviewed to assess the extent of wetland features within the Proposed Route and Alternative Route Siting Corridors and the Woodside Substation site. The USFWS NWI characterizes wetlands based on the Cowardin classification system, which is a system for categorizing wetlands and deepwater habitats. It classifies wetlands into five major "systems" that include Palustrine, Marine, Estuarine, Riverine, and Lacustrine. Palustrine wetlands are inland, nontidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation, often found in areas with standing water or saturated soil. Palustrine wetlands are further classified as Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), and Palustrine Forested (PFO) wetlands.

PEM wetlands are characterized by erect, rooted, and herbaceous hydrophytes (excluding mosses and lichens) that provide at least 30 percent aerial cover. PSS wetlands are dominated by woody vegetation less than 20 feet tall that provide at least 30 percent areal coverage. PFO wetlands are dominated by woody vegetation 20 feet tall or taller with a trunk diameter at breast height of 3 or more inches that provide at least 30 percent areal coverage. There are no NWI-mapped PEM, PSS, or PFO wetlands within the Siting Corridors or the Woodside Substation site.

Marine wetlands are wetlands subject to the ebb and flow of oceanic tides. Estuarine wetlands are wetlands partially enclosed by land but have open, partly obstructed, or sporadic access to the open ocean (FGDC 2013). The MARL Project is located outside of the Tidewater area of Virginia; therefore, there are no Marine or Estuarine wetlands in proximity to the MARL Project, and these resources are not further discussed in this section.

Riverine wetlands are directly connected to a river or stream, characterized by flowing water. Lacustrine wetlands are directly associated with lakes and other bodies of standing water, like ponds or reservoirs. Riverine and Lacustrine wetlands are discussed in Section 2.3.3, Waterbodies.

In addition to the review of publicly available data discussed above, a deep learning Wetland Identification Model (WIM) was used to further evaluate wetland resources within each Siting Corridor and provide a more robust and enhanced desktop analysis. Details of the WIM assessment are presented in Appendix H, Wetland Identification Model Report, of the Routing Study. No PEM, PSS, or PFO wetlands were predicted within the Proposed Route and Alternative Route Siting Corridors based on this modeling. In addition, formal wetland delineation field surveys were conducted for the Woodside Substation site in early 2025, and no jurisdictional wetland resources were identified.

2.3.2.2 IMPACTS

There are no NWI-mapped PEM, PSS, or PFO wetlands within the Proposed Route and Alternative Route ROW Corridors, and no PEM, PSS or PFO wetlands were predicted within the ROW Corridors based on the WIM assessment. In addition, no PEM, PSS, or PFO wetlands are mapped or predicted associated with the Proposed Route and Alternative Routes ancillary facilities located outside of the ROW Corridors. As stated above, no jurisdictional wetland resources were identified associated with the Woodside Substation site. As a result, there are expected to be limited impacts on wetland resources as a result of the MARL Project in Virginia.

The ROW Corridors and ancillary facility workspaces have been designed to minimize impacts on wetlands, including siting structures and access roads outside of wetland areas, to the maximum extent practicable. Existing roads will be used, when feasible, to minimize new disturbance. Impacts on wetlands within the ROW Corridors and ancillary facilities, if any, would include temporary impacts from construction activities, including vegetative clearing, matting (as needed), and equipment access, including temporary impacts from operational ROW vegetative maintenance activities in non-forested areas.

While PFO wetlands, if present, within the ROW Corridor will be permanently converted to PEM or PSS wetlands during operation due to long-term vegetation management requirements, PEM and PSS wetlands temporarily affected by construction will be allowed to reestablish with the ROW Corridor to the maximum extent practicable. In addition, PFO wetlands will be allowed to reestablish within ancillary facility workspaces; however, this will typically occur over a longer period of time.

Prior to construction, applicable permits will be obtained through the U.S. Army Corps of Engineers (USACE) and the Virginia Department of Environmental Quality (VDEQ) for authorization under Section 404 and Section 401 of the Clean Water Act (CWA) and the State

Water Control Law for nontidal wetland impacts, if any. As applicable, NEET VA will comply with the mitigation requirements and ratios of permits to compensate for unavoidable permanent impacts on nontidal wetlands, including conversion impacts. Mitigation ratios for permanent wetland loss are shown in Table 2.3-1, as per Administrative Code 9VAC25-260-10. Mitigation requirements will be determined by the USACE and VDEQ. Additionally, permanent conversion of wetland types (e.g., forested to emergent) requires a 1:1 mitigation.

TABLE 2.3-1 WETLAND LOSS MITIGATION RATIOS

Wetland Feature	Mitigation Ratio
PFO	2:1
PSS	1.5:1
PEM	1:1

PEM = Palustrine Emergent; PFO = Palustrine Forested; PSS = Palustrine Scrub-Shrub

To comply with state stormwater requirements, NEET VA will obtain coverage either under the Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharges of Stormwater from Construction Activities (VAR10) or an individual VPDES permit. A MARL Project-specific Erosion and Sediment Control (ESC) Plan and Stormwater Pollution Prevention Plan (SWPPP) will be developed based on the Virginia Stormwater Management Handbook (VSMH) and in coordination with state and local agencies to meet applicable requirements and implement BMPs. Appropriate BMPs will be used to manage stormwater runoff including silt sock, silt fence, construction entrances, temporary matting and bridges, and erosion matting as needed. Access roads will be designed in compliance with the VSMH, which indicates that both stone and temporary timber deck mats are suitable stabilization materials for access road construction (VDEQ 2024). Per the VSMH, temporary access road materials would be removed and the area restored to pre-construction conditions (e.g., decompact subgrade, replace topsoil, seed and mulch) following completion of construction activities. Dewatering, if necessary, will be discharged in accordance with the practices described in the VSMH and comply with applicable permit requirements. If other devices are proposed, NEET VA will obtain approval from the VDEQ prior to use. Implementation of these plans will further minimize impacts on wetlands within the ROW Corridor.

A Spill Prevention, Control, and Countermeasures (SPCC) Plan will be developed, if required, to avoid or minimize impacts on wetlands due to inadvertent releases of fuel or mechanical fluids in accordance with the U.S. Environmental Protection Agency (USEPA) regulations (40 CFR Part 112).

2.3.3 WATERBODIES

This section describes existing surface water resources, including linear waterbodies (streams/rivers), open waterbodies (lakes/ponds), and floodplains within the Siting Corridors and ROW Corridors for the Proposed Route and Alternative Routes B through F, as well as the Woodside Substation. In addition, a discussion of potential impacts on these resources is also provided. A more detailed analysis is presented in Attachment 2.

2.3.3.1 EXISTING CONDITIONS

Data from the USGS National Hydrologic Database (NHD) Plus High-Resolution dataset (NHDPlus HR), USGS topographic maps, and USFWS NWI mapping were used to identify potential waterbodies within the Proposed Route and Alternative Routes Siting Corridors, as well as the Woodside Substation site. Additionally, water quality standards, water quality classifications, and waterbody tiers (as provided by VDEQ's reports and Administrative Code 9VAC25-260) are summarized for mapped waterbodies within the Proposed Route and Alternative Routes Siting Corridors. Based on desktop review and field wetland and waterbody delineations conducted for the Woodside Substation site, there are no waterbodies present at this location.

Waterbodies within the Siting Corridors include perennial and intermittent tributaries to Isaacs Creek and open waterbody features (e.g., ponds/lakes). Based on the Virginia Department of Wildlife Resources (VA DWR) Wildlife Environmental Review Map Service (WERMS), Isaacs Creek is a threatened and endangered species water (VA DWR 2025a) (Section 2.3.5, Protected Species). Table 2.3-2 lists the number of waterbodies crossed by the Proposed Route and Alternative Route centerlines, as well as the number of waterbodies within the Woodside Substation site. Attachment 1c, Water Resources Mapbook, provides detailed waterbody mapping.

TABLE 2.3-2 WATERBODIES CROSSED BY THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND WITHIN THE WOODSIDE SUBSTATION SITE (NUMBER OF CROSSINGS)

Waterbody Features	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Intermittent	3	3	0
Perennial	7	7	0
Total Crossings	**10**	**10**	**0**

Source: USGS 2025; USFWS n.d.-a

Virginia Water Quality Standards

Section 401 of the CWA authorizes states to establish and enforce water quality standards to protect surface waters from degradation (United States Code, Title 33, Section 1341 [33 U.S.C. § 1341]). Under this provision, each state must define water quality goals for its waterbodies by designating their intended uses, setting specific water quality criteria, and implementing policies to maintain and enhance water quality. In Virginia, the VDEQ is responsible for administering Section 401 of the CWA.

Under Administrative Code 9VAC25-260-10, all waters in Virginia, including wetlands, are assigned a designated use, which is the intended use specified in water quality standards. Some waters may also have an existing use, which is the actual use supported by the existing water quality. All Virginia waters are designated for the following uses:

- Recreational uses, such as swimming and boating
- Propagation and growth of a balanced, indigenous population of aquatic life, including game fish
- Wildlife
- Production of edible and marketable natural resources (e.g., fish and shellfish)

Isaacs Creek and its tributaries are within the Potomac River Basin (Potomac River Subbasin). Under Administrative Code 9VAC25-260-390, this waterbody is described as a tributary of the Potomac River in Frederick and Clarke Counties, Virginia, and is assigned a special standard pH range of 6.5 to 9.5.

Under Administrative Code 9VAC25-260-30, existing in-stream water uses and the level of water quality needed to protect the existing use are maintained and protected. The three tiers of protection are defined as follows:

- Tier I Protection: Existing in-stream water uses and the level of water quality to protect the existing uses will be maintained and protected. As a minimum, all waters should meet adopted water quality standards.
- Tier II Protection: This protects water that is better than specified water quality standards. Only in limited circumstances may water quality be lowered in these waters.
- Tier III Protection: This involves exceptional waters where no new, additional, or increased discharge of sewage, industrial wastes, or other pollution are allowed. These waters must be specifically listed in the regulation.

There are no Tier III waterbodies identified in the Proposed Route or Alternative Route Siting Corridors (VDEQ 2025a). As stated previously, there are no waters associated with the Woodside Substation site.

The VDEQ defines seven water quality classifications (Administrative Code 9VAC25-260-50) and reports on waters not meeting designated uses. The seven classes are as follows:

- Class I: Open Ocean
- Class II: Tidal Waters in the Chowan Basin and the Atlantic Ocean Basin and Tidal Waters in the Chesapeake Bay and its tidal tributaries
- Class III: Nontidal Waters (Coastal and Piedmont Zones)
- Class IV: Mountainous Zones Waters
- Class V: Stockable Trout Waters
- Class VI: Natural Trout Waters
- Class VII: Swamp Waters

The water quality classification status for the waterbodies within the Proposed Route and Alternative Route Siting Corridors are categorized as Class IV, Natural Trout Waters. There are no other classes of waters within the Siting Corridors (VDEQ n.d.).

In accordance with Sections 303(d) and 305(b) of the CWA, Virginia is mandated to perform annual evaluations of its surface water resources and publish a list of waters that fail to meet the established water quality standards. The VDEQ assesses its surface water resources by evaluating whether the appropriate designated uses are met. The primary designated uses potentially applicable to the MARL Project include the following (VDEQ 2025b):

- Wildlife
- Aquatic life
- Fish consumption
- Shellfish harvest
- Recreation (primary and secondary contact)
- Public water supply use

Virginia's 2024 305(b)/303(d) Water Quality Assessment Integrated Report discusses the methodologies used to assess designated use attainment (VDEQ 2025b). This report categorizes designated use attainment status based on the five USEPA categories included as part of the USEPA's Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS). In addition, Virginia uses other sub-categories to supplement the federal categories to further characterize designated use attainment (VDEQ 2025b). The designated use attainment status for the waters within the Proposed Route and Alternative Route Siting Corridors are all categorized as Category 3A waters (VDEQ 2025c). Virginia Category 3A waters include waters for which there are insufficient or no data to determine if any uses are supported; no data are available within the data window of the current assessment to determine if waters are supported and the water was not previously listed as impaired.

Floodplains

Federal Emergency Management Agency maps were reviewed to determine whether mapped floodplains are present within the Proposed Route and Alternative Route Siting Corridors, as well as the Woodside Substation site (FEMA n.d.). Flood hazard areas identified on Flood Insurance Rate Maps are designated as Special Flood Hazard Areas. Special Flood Hazard Areas are defined as the area that will be inundated by the flood event having a 1 percent chance of being equaled or exceeded in any given year. The 1 percent annual chance flood is also referred to as the base flood or 100-year flood. High risk flood zones are labeled Zone A (with a floodplain present) or Zone AE (with a floodplain and floodway present). Moderate risk flood zones are labeled Zone X or also referred to as the 500-year flood. Attachment 1c provides detailed Federal Emergency Management Agency floodplain mapping.

The MARL Project crosses one Zone A floodplain in Virginia where the Proposed Route and Alternative Routes share an overlapping Siting Corridor. The shared Proposed Route and Alternative Route Siting Corridors cross 4.6 acres of one Zone A floodplain (1 percent annual flood hazard) associated with Isaacs Creek. There are no floodplains located within the Woodside Substation site.

2.3.3.2 IMPACTS

This section describes the impacts on surface water resources associated with the Proposed Route and Alternative Route ROW Corridors, as well as the ancillary facilities outside of the ROW Corridors. Because there are no waterbodies present at the Woodside Substation site, there are no waterbody impacts associated with this facility. Waterbodies will be aerially spanned by the transmission line conductors, and transmission structures will not be placed in waterbodies to avoid direct impacts on waterbodies and aquatic habitats associated with construction and transmission line operation.

In some areas, forested riparian buffers adjacent to waterbodies would be cut and permanently converted to maintained scrub/shrub or herbaceous cover within the ROW Corridor during operation. Removal of forested riparian vegetation would result in indirect impacts on waterbodies, including localized increases in water temperature and decreased dissolved oxygen levels. In addition, vegetation clearing, grading, or other earth disturbance activities associated with construction in proximity to waterbodies would temporarily result in increased potential for erosion and stormwater runoff impacts, including increased nutrient loading, turbidity, and sedimentation in waterbodies. Impacts on waterbodies as a result of temporary access road construction and/or culvert placement in waterbodies, if required, could increase sedimentation, disrupt flow, and aquatic habitat alterations during construction and/or operation. There are no permanent access roads associated with the Proposed Route and Alternative Routes.

Table 2.3-2 lists the number of waterbodies crossed by the Proposed Route and Alternative Route centerlines, as well as the number of waterbodies within the Woodside Substation site.
Table 2.3-3 lists the number of waterbodies within the ancillary facility workspaces outside of the ROW Corridors.

TABLE 2.3-3 WATERBODIES WITHIN ANCILLARY FACILITY WORKSAPCES OUTSIDE OF THE ROW CORRIDORS (NUMBER OF CROSSINGS)

Waterbody Features	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities
Intermittent	0	0	2	0	0	1
Perennial	0	1	2	0	1	2
Total Crossings	**0**	**1**	**4**	**0**	**1**	**3**

Source: USGS 2025; USFWS n.d.-a

During construction, NEET VA will adhere to in-stream timing restrictions and requirements contained within applicable federal, state, and local permits for construction within waterbodies, as needed. NEET VA will coordinate with the appropriate agencies if it cannot adhere to designated time-of-year restrictions. Additionally, where stream crossings are required for access, temporary span bridges will be used, where possible, to minimize in-water impacts. If permanent stream crossings are required, NEET VA will install bridges with in-stream support and/or culverts of appropriate size, as needed, to maintain flow and comply with the VDEQ Stormwater Manual.

As stated previously, NEET VA will obtain coverage either under VAR10 or an individual VPDES permit to comply with state stormwater requirements, as described in Section 2.3.2.2. A MARL Project-specific ESC Plan and SWPPP will be developed based on the VSMH and in coordination with state and local agencies to meet applicable requirements and implement BMPs. Appropriate BMPs will be used to manage stormwater runoff, including silt sock, silt fence, construction entrances, temporary matting and bridges, and erosion matting as needed. In addition, an SPCC Plan will be developed, if required, to avoid or minimize impacts on waterbodies due to inadvertent releases of fuel or mechanical fluids in accordance with the USEPA regulations (40 CFR Part 112). Implementation of these plans will further minimize impacts on waterbodies within the ROW Corridor.

Waterbodies temporarily affected by construction of the ROW Corridor, temporary access roads, or other temporary ancillary facilities will be restored to preconstruction conditions to the maximum extent practicable. Forested riparian corridors may be maintained in a scrub/shrub or emergent state during operation. NEET VA will comply with the mitigation requirements of permits to compensate for unavoidable permanent impacts on waterbodies. Final mitigation requirements will be determined by the USACE and VDEQ.

Proposed Route and Alternative Routes C, D, and E

The Proposed Route and Alternative Routes C, D, and E have 10 single and complete centerline crossings of NHD-mapped waterbodies, including 7 perennial waterbody crossings (Isaacs Creek, 5 crossings of Nixon Run, and 1 unnamed tributary to Nixon Run) and 3 unnamed intermittent tributaries to Isaacs Creek and Nixon Run. These waterbodies are all also classified as Riverine per NWI mapping.

Ancillary facility impacts outside of the ROW Corridor for the Proposed Route and Alternative Routes C, D, and E include one temporary access road crossing of Nixon Run. In addition, four other temporary ancillary facility workspaces outside of the ROW Corridor contain NHD-mapped waterbodies / NWI-mapped riverine wetlands. Nixon Run is located within two of these ancillary facility workspaces, and an unnamed intermittent tributary to Nixon Run and an unnamed intermittent tributary to Dry Run are located within separate ancillary facility workspaces.

See Attachment 2 for a summary of waterbody lengths and acreages crossed by the Proposed Route and Alternative Routes C, D, and E ROW Corridors, as well as the ancillary facility workspaces outside of the ROW Corridors.

Alternative Routes B and F

Alternative Routes B and F have 10 single and complete centerline crossings of NHD-mapped waterbodies, including 7 perennial waterbody crossings (Isaacs Creek, 5 crossings of Nixon Run, and 1 unnamed tributary to Nixon Run) and 3 unnamed intermittent tributaries to Isaacs Creek and Nixon Run. These waterbodies are all also classified as Riverine per NWI mapping.

Ancillary facility impacts outside of the ROW Corridor for Alternative Routes B and F include one temporary access road crossing of Nixon Run. In addition, three other temporary ancillary facility workspaces outside of the ROW Corridor contain NHD-mapped waterbodies / NWI-mapped riverine wetlands. Nixon Run is located within two of these ancillary facility workspaces, and an unnamed intermittent tributary to Dry Run is located within a separate ancillary facility workspace.

See Attachment 2 for a summary of waterbody lengths and acreages crossed by Alternative Routes B and F ROW Corridors, as well as ancillary facility workspaces outside of the ROW Corridors.

Floodplains

Floodplains will be aerially spanned by the transmission line conductors, and transmission structures will not be placed in floodplains to avoid direct impacts on floodplains during operation of the MARL Project to the maximum extent practicable. However, due to engineering design constraints, one structure is within a mapped floodplain within the shared Proposed Route and Alternative Route ROW Corridors.

The shared Proposed Route and Alternative Route ROW Corridors cross 1.7 acres of one Zone A floodplain (1 percent annual flood hazard) associated with Isaacs Creek. An additional less than 0.1 acre of impacts on this floodplain are associated with ancillary facilities outside of the Proposed Route ROW Corridor. There are no floodplains within the Woodside Substation site. The floodplain impacts associated with the Proposed Route and Alternative Route ROW Corridors and ancillary facilities are less than 0.1 percent of the 1,036.4 acres of floodplains present within the MARL Project Study Area in Virginia.

While temporary impacts on floodplains may result from vegetative clearing and ground disturbance associated with ROW construction activities, these areas will be restored as close to preconstruction conditions as practicable and only minimal direct impacts on floodplains are expected during operation. Activities within floodplains will also comply with local floodplain ordinances, state requirements, and the National Flood Insurance Program standards. Further, implementation of a MARL Project-specific ESC Plan and SWPPP, as well as appropriate BMPs and SPCC Plan will further minimize impacts on floodplains within the ROW Corridor.

2.3.4 NATURAL HERITAGE RESOURCES

This section describes existing NHRs within the Siting Corridors and ROW Corridors for the Proposed Route and Alternative Routes B through F, as well as impacts associated with the ROW Corridors and ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. The Virginia Natural Area Preserves Act of 1989 defines NHRs as habitats of rare,

threatened, or endangered (RTE) plant and animal species, rare or state-significant natural communities or geologic sites, and similar features of scientific interest benefiting the welfare of the citizens of the Commonwealth of Virginia (Va. Code §§ 10.1-209). The VDCR assigns a state rank (an "S-ranking") to the species, natural communities, and geologic features categorized by NHRs to indicate their conservation status and rarity within the Commonwealth of Virginia. State rankings range from S1 to S5, as follows (VDCR 2021a):

- Critically imperiled (S1)
- Imperiled (S2)
- Vulnerable (S3)
- Apparently secure (S4)
- Secure (S5)

The VDCR's Natural Heritage Program (NHP) was contacted to provide an environmental review of the Proposed Route and Alternative Routes to identify NHRs within the Siting Corridors. The requested NHP review included natural area preserves, conservation sites, stream conservation sites, and ecological cores (VDCR n.d.). The VDCR responded to ERM's request for environmental review of the Proposed Route and Alternative Routes in a letter dated October 10, 2025 (Attachment 3). The VDCR's review identified one conservation site and three ecological cores within the Siting Corridors for the Proposed Route and Alternative Routes. In addition, the NHP's ecological datasets for the area within 0.25 mile of the centerlines of the Siting Corridors and the Woodside Substation site were reviewed through VDCR's Natural Heritage Data Explorer.

The conservation sites and ecological cores are described below, while other NHRs from the VDCR environmental review (i.e., protected animal and plant species) are discussed in further detail in Section 2.3.5. Based on the NHP ecological datasets reviewed, there are no NHRs within the Woodside Substation site.

2.3.4.1 EXISTING CONDITIONS

Conservation Sites

Conservation sites identify a planning boundary delineating the NHP's best determination of the land and water area occupied by one or more protected species, rare or significant natural communities, or geologic sites that are necessary to maintain ecological processes that facilitate long-term survival of these resources. The size and dimensions of a conservation site are based on the habitat requirements of the plant and animal species or natural communities present and the physical features of the surrounding landscape. Features taken into consideration include hydrology, slope, aspect, vegetation structure, current land uses, and potential threats from invasive species. Conservation sites do not necessarily preclude human activities, but a site's viability may be greatly influenced by human activities. Conservation sites may require ecological management, such as invasive species control or water management, to maintain or enhance their viability.

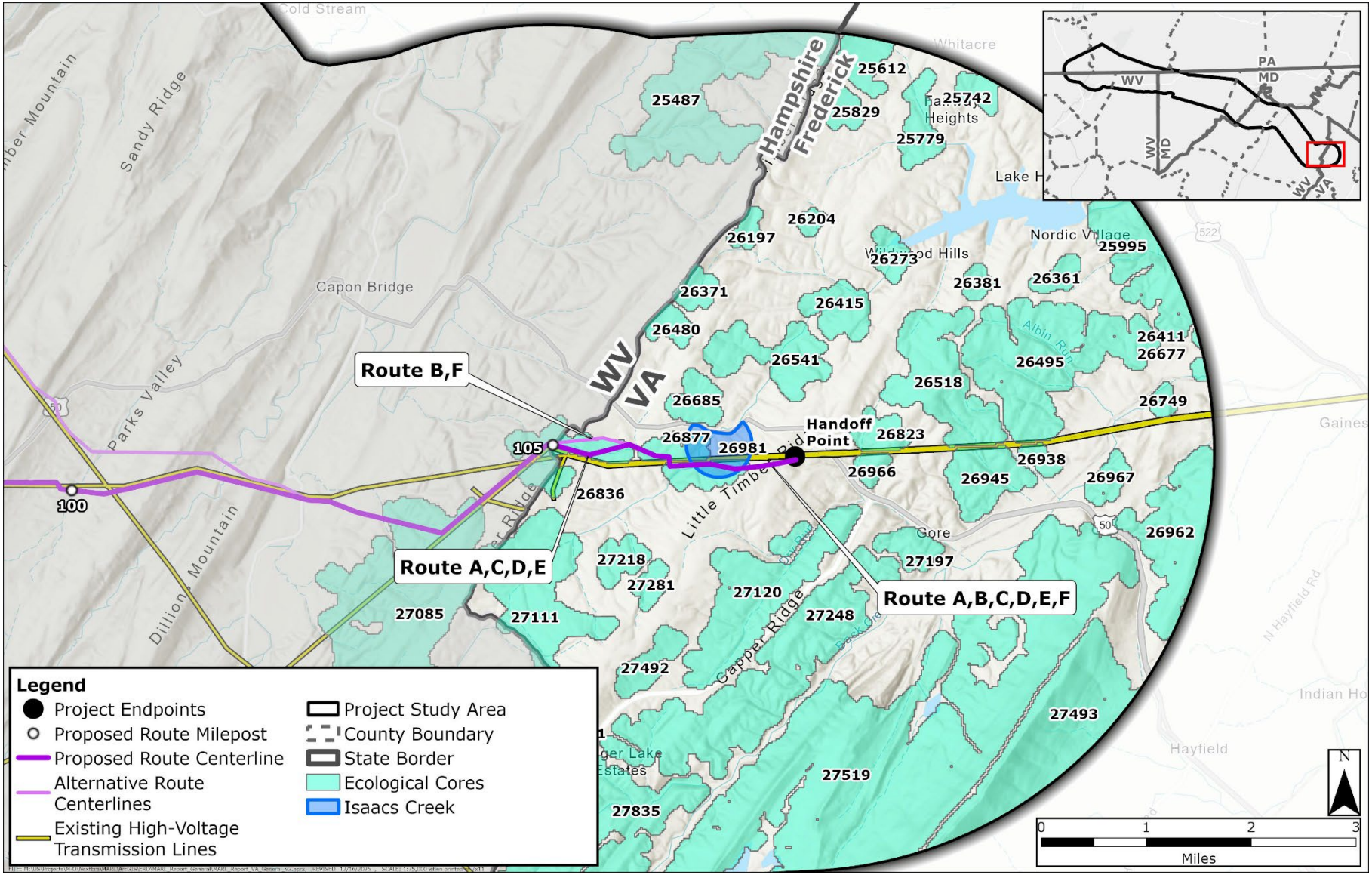
Each conservation site is given a biodiversity significance ranking (a "B-ranking") by the VDCR based on rarity, quality, and number of NHRs it contains. Conservation site rankings range from B1 to B5, as follows (VDCR 2021a):

- Outstanding significance (B1)
- Very high significance (B2)
- High significance (B3)
- Moderate significance (B4)
- General significance (B5)

The VDCR NHP review found that the shared Proposed Route and Alternative Route ROW Corridors cross the Isaacs Creek PROW Conservation Site. This conservation site contains approximately 154 acres of partially forested land, located adjacent to the eastbound lane of US 50 between Fairview Road and Parishville Road (Figure 2.3-2). Isaacs Creek flows south-to-north through the center of the site and in an approximate perpendicular orientation relative to the shared Proposed Route and Alternative Route Siting Corridors. Aerial imagery shows the conservation site with forested cover composed primarily of pine tree species (*Pinus spp.*), with relatively narrow areas of deciduous forest along Isaacs Creek. Gaps in forested cover exist along two utility ROWs and next to multiple residential properties located in the central and eastern portion of the site.

Isaacs Creek PROW Conservation Site is described as "High Priority" by the VDCR because it contains habitat and buffer for one or more NHR. The NHR within the conservation site is the Appalachian grizzled skipper (*Pyrgus centaureae wyandot*), a rare butterfly subspecies with a State Threatened conservation status. As a result, the Isaacs Creek PROW Conservation Site has a ranking of B3 (high significance). The existing conditions and impact assessment pertaining to the Appalachian grizzled skipper are detailed in Section 2.3.5. A total of 25.0 acres of the Isaacs Creek PROW Conservation Site is within the shared Siting Corridors for the Proposed Route and Alternatives Routes. There are no conservation sites within the Woodside Substation site.

FIGURE 2.3-2 NATURAL HERITAGE AREAS EXISTING CONDITIONS



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

Ecological Cores

Ecological cores are areas comprising at least 100 acres of continuous interior, natural cover (e.g., forests or woodlands) that provide habitat for a wide range of species, from interior-dependent forest species to habitat generalists. Smaller areas of continuous interior cover (i.e., 10 to 99 acres) are not classified as ecological cores but are classified as habitat fragments. Habitat fragments support ecological cores and provide similar functions and values. Together, ecological cores and habitat fragments provide the natural and economic benefits of open space, reestablishment, water quality (including erosion prevention and drinking water recharge and protection), and air quality (including carbon sequestration and oxygen production) (VDCR 2018). The VDCR ranks the integrity of ecological cores from C1 to C5 using nine prioritization criteria, including the NHR habitats within the cores. Habitat fragments are similarly classified, although none are ranked above C3 (VDCR 2023a; Attachment 3).

The VDCR ranking system for the integrity of ecological cores includes the following categories:

- Outstanding (C1)
- Very high (C2)
- High (C3)
- Moderate (C4)
- General (C5)

Generally, the VDCR assigns a higher ranking (e.g., C1 or C2) to larger and more biologically diverse ecological cores. Ecological integrity can be considered enhanced if the core is part of a larger complex of natural lands, or if the core contributes to water quality enhancement. Ecological cores ranked C1 and C2 are typically connected by extended landscape corridors with forests that comprise a statewide network of natural lands (VDCR 2018). Lower ranked ecological cores may have smaller fragments of forested habitat (10 to 99 acres of contiguous land cover); however, the VDCR notes habitat fragments can provide important ecological functions and values and recommends avoiding impacts on habitat fragments when feasible (VDCR 2018).

The VDCR NHP review found that the Proposed Route and Alternative Route ROW Corridors intersect three ecological cores with rankings of C5. Table 2.3-4 summarizes the total acreage of the three ecological cores within the Siting Corridors for the Proposed and Alternative Routes. There are no ecological cores within the Woodside Substation site (Attachment 1d, Sensitive Species and Habitats Mapbook).

TABLE 2.3-4 ECOLOGICAL CORES WITHIN THE SITING CORRIDORS AND THE WOODSIDE SUBSTATION SITE (ACRES)

Ecological Core ID (Rank)	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
26836 (5)	42.1	33.2	0.0
26877 (5)	18.3	18.3	0.0
26981 (5)	46.8	46.8	0.0
Total [a]	**107.2**	**98.3**	**0.0**

Source: VDCR 2023

ID = identification
[a] Total may not match the sum of addends due to rounding.

2.3.4.2 IMPACTS

Construction and operation would result in various temporary and permanent impacts on NHRs within the Proposed Route and Alternative Routes ROW Corridors, as well as ancillary facilities workspaces outside of the Proposed Route and Alternative Route ROW Corridors. Permanent impacts on conservation sites and ecological cores would result from construction, mainly from the conversion of forested habitats to maintained ROW. The permanent conversion of forested habitat to herbaceous and shrub/scrub habitat would result in the loss of NHR lands and could potentially increase forest fragmentation in the vicinity of the Proposed Route and Alternative Route ROW Corridors. The MARL Project has been designed to minimize the impacts on NHR lands by minimizing the total amount of tree clearing to the extent practicable, as well as impacts on wetlands and associated vegetation. The MARL Project was also designed to parallel existing high-voltage transmission line ROWs, where possible, to avoid and minimize impacts from forested habitat fragmentation to the greatest extent practicable (Table 2.3-5). The total length where the MARL Project will parallel existing ROWs varies by Alternative Route.

TABLE 2.3-5 TOTAL LENGTH AND PERCENTAGE OF THE MARL PROJECT THAT PARALLELS EXISTING TRANSMISSION LINES IN VIRGINIA

Paralleling	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F	
	Miles	%	Miles	%
Virginia route length	2.4	NA	2.4	NA
Virginia paralleling existing transmission lines	1.0	41.8	0.7	28.3

NA = not applicable

NEET VA will coordinate with applicable federal and state agencies and other stakeholders to determine avoidance and minimization measures, as appropriate, to minimize and prevent impacts on NHR lands. Construction and routine maintenance activities for the MARL Project will comply with MARL Project-specific permit requirements and conditions and will be conducted under MARL Project-specific plans and procedures to avoid and minimize impacts on NHR areas during construction and operation. Following construction, the MARL Project will result in the establishment and maintenance of natural vegetation that would be expected to be used by some wildlife species during the MARL Project's operational life.

MARL Project-specific impacts on NHR areas are further discussed below.

Conservation Sites

The portion of Isaacs Creek PROW Conservation Site that would be affected by construction within the shared ROW Corridor is forested. Impacts on the site would be permanent due to the conversion of forested habitat to maintained ROW. A total of 11.2 acres of forested habitat would be affected by construction of the shared ROW Corridor, representing 7 percent of the 154-acre site.

Impacts on Isaacs Creek PROW would also occur associated with temporary access roads and other temporary ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. Table 2.3-6 summarizes the acreage of conservation sites affected by temporary ancillary facilities outside of the ROW Corridors. Forested habitat within temporary ancillary facilities workspaces outside of the ROW Corridor would be allowed to return to preconstruction conditions, although regrowth of trees within previously forested areas would occur over a period of 20 or more years, effectively resulting in a long-term conversion of forested land to herbaceous and scrub/shrub habitat. Impacts on the Isaacs Creek PROW Conservation Site associated with temporary access roads and other temporary ancillary facilities represent 0.6 percent of the approximate 154 acres encompassed by the site. No impacts associated with permanent access roads would occur in Virginia.

TABLE 2.3-6 CONSERVATION SITES WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Natural Heritage Area Site	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Isaacs Creek PROW	0.0	0.2	0.7	0.0	0.2	0.7
Total [b]	**0.0**	**0.2**	**0.7**	**0.0**	**0.2**	**0.7**

Source: Attachment 3

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Total may not match the sum of addends due to rounding.

Ecological Cores

Impacts on ecological cores are driven by tree clearing and subsequent conversion of forested habitat to herbaceous and shrub/scrub habitat that are compatible with maintained ROW. Habitat conversion can result in changes that reduce ecosystem processes, biodiversity, population viability, and habitat quality (VDCR 2018).

The total acreage of ecological cores within the Proposed Route and Alternative Routes ROW Corridors that would be affected during construction ranges from 40.8 acres to 44.6 acres (Table 2.3-7, Attachment 1d). These impacts represent 5.5 percent to 6.0 percent of the 741.0 acres encompassed by these sites.

TABLE 2.3-7 ECOLOGICAL CORES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)

Ecological Core ID (Rank)	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
26836 (5)	42.1	17.7	33.2	13.8	NA
26877 (5)	18.3	7.6	18.3	7.6	NA
26981 (5)	46.8	19.3	46.8	19.3	NA
Total [a]	**107.2**	**44.6**	**98.3**	**40.8**	**NA**

Source: Attachment 3

ID = identification; NA = not applicable; ROW = right-of-way
[a] Total may not match the sum of addends due to rounding.

Impacts on ecological cores would also occur associated with temporary access roads and other temporary ancillary facilities outside of the Proposed Route and Alternative Route ROW Corridors. Table 2.3-8 summarizes the acreage of ecological cores affected by temporary ancillary facilities workspaces outside of the ROW Corridors. Impacts on ecological cores associated with temporary access roads and other temporary ancillary facilities each represent 0.9 percent of the approximate 741 acres encompassed by these sites. No impacts associated with permanent access roads would occur in Virginia.

TABLE 2.3-8 ECOLOGICAL CORES WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Ecological Core ID (Rank)	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
26836 (5)	0.0	0.0	0.6	0.0	0.0	0.0
26877 (5)	0.0	0.2	3.8	0.0	0.2	3.8
26981 (5)	0.0	0.2	2.1	0.0	0.2	2.1
Total [b]	**0.0**	**0.4**	**6.5**	**0.0**	**0.4**	**5.9**

Source: USGS 2024b; Attachment 3

ID = identification
[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Total may not match the sum of addends due to rounding.

2.3.5 PROTECTED SPECIES

This section describes existing RTE species that may potentially be present within the Siting Corridors and ROW Corridors for the Proposed Route and Alternative Routes B through F, as well as impacts associated with the ROW Corridors and ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors.

RTE species are generally defined as animal and plant species that are protected to varying degrees under state or federal law or proposed for protection. ERM reviewed protected species according to the following regulations:

- Federal- and state-listed species protected under the federal Endangered Species Act (ESA) enacted in 1973 and administered by the USFWS and the National Oceanic and Atmospheric Administration, in cooperation with the VA DWR, and state-listed species protected under the Virginia Endangered Plant and Insect Species Act administered by the Virginia Department of Agriculture and Consumer Services in cooperation with the VDCR;
- Bald eagles (*Haliaeetus leucocephalus*) protected under the federal Bald and Golden Eagle Protection Act enacted in 1940 and administered by the USFWS; and
- Migratory birds protected under the Migratory Bird Treaty Act (MBTA) enacted in 1918 and administered by the USFWS.

The VDCR provided an environmental review letter regarding current known listed species of concern and their habitats which occur within and adjacent to the Proposed Route Siting Corridor, received in October 2025. The VDCR's response is provided in Attachment 3. In addition, the following publicly available sources were used to identify protected species along and near the Proposed Route and Alternative Routes Siting Corridors and the Woodside Substation site:

- USFWS Information for Planning and Consultation System (IPaC) online system (USFWS n.d.-b)
- VDCR NHP (VDCR n.d.)
- VA DWR WERMS (VA DWR 2025a)
- Virginia Fish and Wildlife Information Service (VaFWIS) (VA DWR 2025b)
- Center for Conservation Biology Eagle Nest Locator (Watts and Byrd 2013)

In addition to the above database queries, ERM obtained digital data from the VDCR to identify locations that potentially support protected species within the Proposed Route and Alternative Route Siting Corridors, as well as the Woodside Substation site.

Query results from the VDCR include species known to occur in the area and communities known to contain protected species either historically or currently (VDCR n.d.). Query results from IPaC include species that may occur in the Proposed Route and Alternative Route Siting Corridor, as well as the Woodside Substation site (USFWS n.d.-b). Query results from the VaFWIS include species known to occur or likely to occur within a 2.0-mile radius of the Proposed Route and Alternative Routes (VA DWR 2025b). Species known to occur within the Proposed Route and Alternative Route Siting Corridors, as well as the Woodside Substation site, were identified based on review of digital VA DWR WERMS data (VA DWR 2025a). Bald eagle nest data and migratory bird information are provided in the Center for Conservation Biology database (Watts and Byrd 2013).

The following discussion likely overstates the potential for RTE species' use of the Siting and ROW Corridors and the resulting impacts associated with construction and routine maintenance activities, as not all habitats within the Siting and ROW Corridors provide potentially suitable habitat for all species. Further, not all potentially suitable habitat is actively, recently, or historically occupied by any particular species.

2.3.5.1 EXISTING CONDITIONS

Federally Listed Threatened and Endangered Species

To protect and recover imperiled species and the ecosystems they depend on, Congress passed the ESA in 1973, which states that threatened and endangered plant and animal species are of "[a]esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people" and that protection of these species and their habitats is required. The ESA is administered by both the National Oceanic and Atmospheric Administration and USFWS, and it protects fish, wildlife, plants, and invertebrates that are federally listed as endangered or threatened by prohibiting the "take" of these species and the interstate or international trade of the species, including their parts and products, unless permitted by federal law.

Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct" (33 U.S.C. § 1532). A federally endangered species is any species that is in danger of extinction throughout all or a significant portion of its range, with exceptions for certain insect pests (33 U.S.C. § 1532). A federally threatened species is any species that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range (33 U.S.C. § 1532).

Review of publicly available databases and coordination with the applicable resource agencies discussed above identified multiple federally listed and proposed species that have the potential to occur within and adjacent to the Proposed Route and Alternative Route Siting Corridors. Species include Indiana bat (*Mytois sodalis*), northern long-eared bat (*Myotis septentrionalis*), monarch butterfly (*Danaus plexippus*), and green floater (*Scripus ancistochaetus*). In addition, Indiana bat and monarch butterfly have the potential to occur within the Woodside Substation site. Tricolored bat (*Perimyotis subflavus*), while not included in the official IPaC reports for the portion of the MARL Project in Virginia, was included in the following analysis due to its inclusion in IPaC reports for the MARL Project location in neighboring states. Table 2.3-9 provides information on the federally listed and proposed species with potential to occur within the Siting Corridors or the Woodside Substation site.

TABLE 2.3-9 FEDERALLY LISTED OR PROPOSED THREATENED OR ENDANGERED SPECIES POTENTIALLY OCCURRING WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE

Common Name	Scientific Name	Protection Status	Preferred Habitat
Indiana bat [a]	*Myotis sodalis*	FE	Old-growth or late-successional interior forests. Partially dead or decaying trees are used for summer roosting and foraging. Hibernation occurs primarily in caves, mines, and tunnels.

Common Name	Scientific Name	Protection Status	Preferred Habitat
Northern long-eared bat	*Myotis septentrionalis*	FE	Old-growth or late-successional interior forests. Partially dead or decaying trees are used for summer roosting and foraging. Hibernation occurs primarily in caves, mines, and tunnels.
Tricolored bat [b]	*Perimyotis subflavus*	FPE, SE	Partly open landscapes with large trees and plentiful woodland edge.
Monarch butterfly [a]	*Danaus plexippus*	FPE	Migratory; fields, roadside areas, and open fields that contain milkweed.
Green floater	*Lasmigona subviridis*	FPT	Slow moving streams; in sand to gravel substrate.

Source: USFWS n.d.-b

FE = Federally Endangered; FPE = Federally Proposed as Endangered; FPT = Federally Proposed as Threatened; IPaC = Information for Planning and Consultation System; SE = State Endangered
[a] This species potentially occurs within the Woodside Substation site.
[b] This species was not included in the official IPaC reports but included here due to inclusion in neighboring states.

The total acres of potentially suitable habitat for protected species within the Siting Corridors and Woodside Substation site serves as an indicator of the potential for listed species use. Specifically, the existing vegetation and other natural features present within the Siting Corridors and the Woodside Substation site provide potentially suitable habitat for the federally listed species to varying degrees based on species-specific life history and/or route. Further details regarding the existing conditions and impacts on natural vegetation are provided in Section 2.3.6, Vegetation. Impacts on NHRs, wetland, and waterbodies that may provide potentially suitable habitat for RTE species are provided in Section 2.3.4, Natural Heritage Resources; Section 2.3.2, Wetlands; and Section 2.3.3, respectively. See Attachment 1b and Attachment 1d for supporting mapping.

Bats

Indiana, northern long-eared, and tricolored bats (bats) require forested habitat for roosting from April 1 to October 15. Potentially suitable roosting habitats include the following land cover types:

- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Woody Wetlands

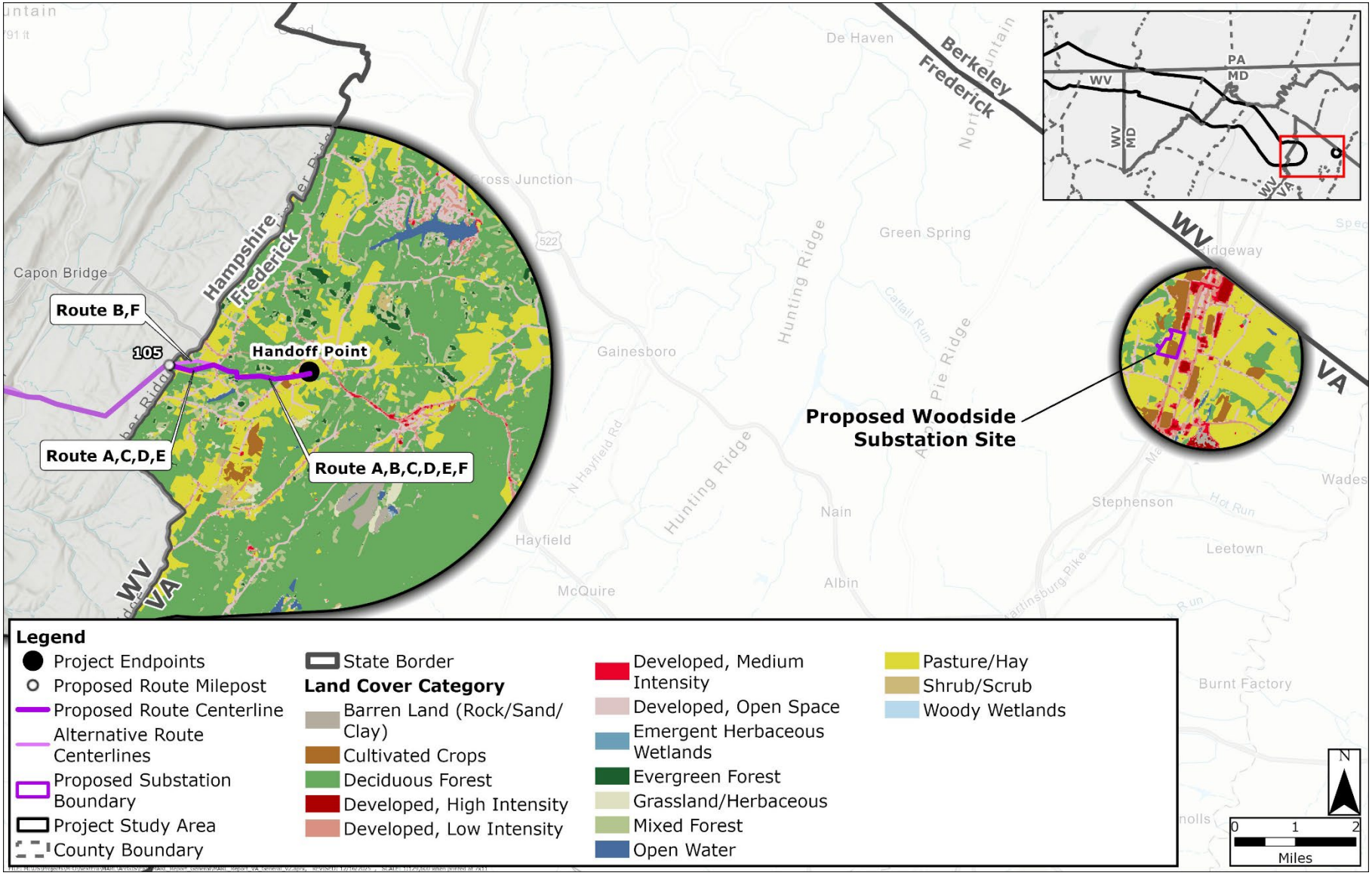
The total acreage of potentially suitable roosting habitat within the Proposed Route and Alternative Route Siting Corridors range from 107.3 acres to 113.8 acres. The Woodside Substation site provides 2.9 acres of potentially suitable roosting habitat (Table 2.3-10; Figure 2.3-3; Attachment 1b).

TABLE 2.3-10 POTENTIALLY SUITABLE BAT HABITAT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Potential roosting habitat	113.8	107.3	2.9
Potential foraging habitat	140.8	141.1	71.8
Known summer occurrence	0.0	0.0	0.0
Staging/hibernacula/swarming habitat	0.0	0.0	0.0

Source: USGS 2024b; VDCR n.d.

FIGURE 2.3-3 LAND COVER EXISTING CONDITIONS



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

During the active seasons (staging, maternity, swarming) listed bats use additional land cover types for foraging, including:

- Barren Land (Rock/Sand/Clay)
- Cultivated Crops
- Developed, Open Space
- Emergent Herbaceous Wetland
- Grassland/Herbaceous
- Open Water
- Pasture/Hay
- Shrub/Scrub

The total acreage of potentially suitable foraging habitat within the Proposed Route and Alternative Route Siting Corridors ranges from 140.8 acres to 141.1 acres. The Woodside Substation site provides 71.8 acres of potentially suitable foraging habitat (Table 2.3-10; Figure 2.3-3; Attachment 1b). There are no known occupied listed or proposed bat summer maternity buffers or winter hibernacula buffers within the Siting Corridors or the Woodside Substation site.

Monarch Butterfly

The monarch butterfly relies on open grassland and herbaceous habitats that meet the species' habitat requirements. The species is typically found in open situations where milkweed is present. Potentially suitable habitats include the following land cover types:

- Developed, Open Space
- Emergent Herbaceous Wetland
- Grassland/Herbaceous
- Pasture/Hay
- Shrub/Scrub

Potentially suitable habitat for monarch butterfly within the Proposed Route and Alternative Route Siting Corridors ranges from 25.6 acres to 32.5 acres, and the Woodside Substation site provides 40.4 acres of potentially suitable habitat (Table 2.3-11; Figure 2.3-3; Attachment 1b).

TABLE 2.3-11 POTENTIALLY SUITABLE MONARCH BUTTERFLY HABITAT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Monarch butterfly potential habitat	25.6	32.5	40.4

Source: USGS 2024b

Green Floater

The green floater is typically found in large rivers to small streams with stable sand and gravel substrates and stable, slow to moderate flow. While Isaacs Creek, which is crossed by the shared Proposed Route and Alternative Route Siting Corridors, could provide potentially suitable habitat based on desktop analysis, it is not listed in the current conditions regarding known distribution of the green floater throughout the range of the species (USFWS 2021). In addition, the VaFWIS database query did not identify this species as occurring within 2 miles of the shared Siting Corridors. There are no streams within the Woodside Substation site; therefore, there is no potentially suitable habitat present within this site.

Virginia Protected Species

Virginia has adopted separate codes for protecting animals and plants in the state. The Virginia ESA (Va. Code §§ 29.1-563 to –570) designates the VA DWR as the state agency with jurisdiction over state-listed endangered or threatened fish and wildlife. The Virginia ESA authorizes the Board of the VA DWR to adopt the federal list of endangered and threatened species and identify and protect state-listed wildlife. The Virginia ESA prohibits the taking, transportation, processing, sale, or offer for sale of those species.

Under the Virginia Endangered Plant and Insect Species Act (Administrative Code 2VAC5-320-10), the taking or possession of endangered or threatened plant and insect species is prohibited. The VDCR represents the Virginia Department of Agriculture and Consumer Services in providing comments regarding potential impacts on these species; the Virginia Department of Agriculture and Consumer Services is responsible for state-listed plants and insects.

A review of database query results from the VDCR NHP, VaFWIS, and VA DWR WERMS identified several species known or likely to occur within 2 miles of the Proposed Route and Alternative Route Siting Corridors (Table 2.3-12). Based on a review of the VA DWR WERMS data (VA DWR 2025a), there are no known occurrences of state-listed endangered or threatened species within the Woodside Substation site.

TABLE 2.3-12 STATE AND FEDERALLY LISTED AND PROPOSED SPECIES AND SPECIES OF COLLECTION CONCERN POTENTIALLY OCCURRING WITHIN 2 MILES OF THE SITING CORRIDORS

Common Name	Scientific Name	Protection Status	Preferred Habitat
Appalachian grizzled skipper	*Pyrgus wyandot*	ST	Shale barren outcrops, glades, forest edge, open oak forest, pine-oak barrens, as well as pastures and ROWs.
Bewick's wren	*Thryomanes bewickii*	SE	Old fields, hardwood and coniferous woodlands and Shrub/scrub.
Little brown bat	*Myotis lucifugus*	SE	Old-growth or late-successional interior forests. Partially dead or decaying trees are used for summer roosting and foraging. Hibernation occurs primarily in caves, mines, and tunnels.
Loggerhead shrike (resident / migrant)	*Lanius ludovicianus (L.l. migrans)*	ST	Open old field, grassland/herbaceous habitats with scattered trees and shrubs.

Common Name	Scientific Name	Protection Status	Preferred Habitat
Monarch butterfly [a]	*Danaus plexippus*	FP	Migratory; fields, roadside areas, and open fields that contain milkweed.
Northern long-eared bat [a]	*Mytotis sepetntrionalis*	FE, SE	Old-growth or late-successional interior forests. Partially dead or decaying trees are used for summer roosting and foraging. Hibernation occurs primarily in caves, mines, and tunnels.
Peregrin falcon	*Falco peregrinus*	ST	Various open situations from forested mountainous regions to urban habitats.
Regal fritillary [b]	*Speyeria idalia*	FP	Grassland/herbaceous uplands and wetlands, as well as old fields and savanna.
Timber rattlesnake	*Crotalus horridus*	CC	Forested hardwood, coniferous, and mixed uplands and wetlands, bare rock, scree, talus, and cliffs.
Tricolored bat [a]	*Perimyotis subflavus*	FP, SE	Partly open landscapes with large trees and plentiful woodland edge.
Wood turtle	*Glyptemys insculpta*	ST	Forested and herbaceous uplands, wetlands, and riparian habitats.

Source: VA DWR 2025a, 2025b

CC = Collection Concern; FE = Federally Endangered; FP = Federally Proposed; IPaC = Information for Planning and Consultation System; ROW = rights-of-way; SE = State Endangered; ST = State Threatened

[a] This species is also federally listed.

[b] This species was identified in the state database review but was not identified in the official IPaC reports.

Of the species in Table 2.3-12, only the Appalachian grizzled skipper was identified by the VDCR as potentially occurring within the shared Proposed Route and Alternative Route Siting Corridors. The shared Siting Corridors intersect the predicted suitable habitat modeling for this species associated with the Isaacs Creek PROW Conservation Site. As discussed in Section 2.3.4, the shared Siting Corridors intersect 25 acres of this conservation site. In addition, the VA DWR WERMS database identifies Isaacs Creek as a "Threatened and Endangered Species Waters" for the wood turtle (Attachment 1d); however, the VDCR Natural Heritage review indicates that the Proposed Route and Alternative Route Corridors do not intersect the predicted suitable habitat modeling for this species (Attachment 3).

The vegetation and other natural features present within the Proposed Route and Alternative Route Siting Corridors and the Woodside Substation site provide a variety of potentially suitable habitat for state-listed species to varying degrees based on species-specific life histories and/or route. Further details regarding the existing conditions and impacts on natural vegetation are provided in Section 2.3.6. Impacts on NHRs, wetlands, and waterbodies that may provide potentially suitable habitat for RTE species are provided in Section 2.3.4, Section 2.3.2, and Section 2.3.3, respectively. See Attachment 1b and Attachment 1d for supporting mapping.

Potentially suitable habitat for each species includes some or all of the following land cover types:

- Barren Land (Rock/Sand/Clay)
- Cultivated Crops
- Deciduous Forest
- Developed, Open Space
- Emergent Herbaceous Wetland
- Evergreen Forest
- Grassland/Herbaceous
- Mixed Forest
- Open Water
- Pasture/Hay
- Shrub/Scrub
- Woody Wetlands

The total acreage of potentially suitable non-forested habitat for RTE species within the Siting Corridors ranges from 27.0 to 33.8. The Woodside Substation site provides 68.9 acres of potentially suitable non-forested habitat (Table 2.3-13; Figure 2.3-3; Attachment 1b). In addition, the extent of forested habitats within the Siting Corridors ranges from 107.3 acres to 113.8 acres. The Woodside Substation site provides 2.9 acres of potentially suitable forested habitat (Table 2.3-13; Figure 2.3-3; Attachment 1b).

TABLE 2.3-13 POTENTIALLY SUITABLE HABITAT FOR STATE-LISTED SPECIES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Non-forested	27.0	33.8	68.9
Forested	113.8	107.3	2.9
Total [a]	**140.8**	**141.1**	**71.8**

Source: USGS 2024b

[a] Total may not match the sum of addends due to rounding.

Migratory Bird Treaty Act Species

Migratory birds are protected under the MBTA, as administered by the USFWS. Table 2.3-14 lists the migratory bird species that may occur within the Siting Corridors and the Woodside Substation site according to the USFWS IPaC database. In total, there are 10 species of migratory birds that have the potential to occur within the Proposed Route and Alternative Route Siting Corridors, of which 6 have the potential to occur within the Woodside Substation site. Of the 10 species, 9 are birds of conservation concern (BCC), and the bald eagle is protected under the Bald and Golden Eagle Protection Act (further discussed below).

TABLE 2.3-14 MIGRATORY BIRDS WITH POTENTIAL TO OCCUR WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE

Common Name	Scientific Name	Status	Breeding Season
Bald eagle [a]	*Haliaeetus leucocephalus*	Vulnerable [b]	September 1 to August 31
Black-billed cuckoo	*Coccyzus erythropthalmus*	BCC	May 15 to October 10
Black-capped chickadee [a]	*Poecile atricapillus practicus*	BCC	April 10 to July 31
Canada warbler	*Cardellina canadensis*	BCC	May 20 to August 10
Chimney swift [a]	*Chaetura pelagica*	BCC	March 15 to August 25
Eastern whip-poor-will	*Antrostomus vociferus*	BCC	May 1 to August 20
Prairie warbler [a]	*Setophaga discolor*	BCC	May 1 to July 31
Red-headed woodpecker [a]	*Melanerpes erythrocephalus*	BCC	May 10 to September 10
Rusty blackbird	*Euphagus carolinus*	BCC	NA [c]
Wood thrush [a]	*Hylocichla mustelina*	BCC	May 10 to August 31

Source: USFWS n.d.-b

BCC = bird of conservation concern; NA = not applicable
[a] This species also has the potential to occur at the Woodside Substation site.
[b] This is not a BCC but is protected under the Bald and Golden Eagle Protection Act.
[c] This species does not occur within the Siting Corridors for the Proposed Route or the Alternative Routes or the Woodside Substation during the breeding season, and no nesting impacts would be expected.

Seasonal presence and use of the Siting Corridor and the Woodside Substation site by avian species listed in Table 2.3-14 will vary in duration and intensity by season and species, but use is expected year-round. Potentially suitable habitats for MBTA species include the following:

- Barren Land (Rock/Sand/Clay)
- Cultivated Crops
- Deciduous Forest
- Developed, Open Space
- Emergent Herbaceous Wetland
- Evergreen Forest
- Grassland/Herbaceous
- Mixed Forest
- Open Water
- Pasture/Hay
- Shrub/Scrub
- Woody Wetlands

The total acreage of potentially suitable non-forested and forested habitat for MBTA species within the Siting Corridors and the Woodside Substation site is provided in Table 2.3-15 (Figure 2.3-3; Attachment 1b).

TABLE 2.3-15 POTENTIALLY SUITABLE HABITAT FOR STATE-LISTED SPECIES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Non-forested	27.0	33.8	68.9
Forested	113.8	107.3	2.9
Total [a]	**140.8**	**141.1**	**71.8**

Source: USGS 2024b

[a] Total may not match the sum of addends due to rounding.

Bald and Golden Eagle Protection Act

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act and MBTA. While noted on the IPaC reports, queries of publicly available databases indicate there are no known bald eagle nests within a 660-foot buffer of the Proposed Route and Alternative Route Siting Corridors or the Woodside Substation site. The lack of nest observations does not mean bald eagle nests do not exist but only that they have not been observed. The closest observed bald eagle nest is 3.9 miles east of the shared Siting Corridors for the Proposed Route and Alternative Routes (Watts and Byrd 201322).

2.3.5.2 IMPACTS

Construction and operation would result in both temporary and permanent impacts on RTE species and/or their habitats within the Proposed Route and Alternative Routes B through F ROW Corridors, as well as the ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors (Table 2.3-15; Figure 2.3-3; Attachment 1b). The terrestrial and aquatic habitats present within the ROW Corridor and ancillary facility workspaces provide potentially suitable habitat for individual species to varying degrees based upon species-specific habitat requirements and life histories. The following discussion likely overstates the potential for impacts on RTE species and/or their habitats, as not all areas discussed below provide potentially suitable habitat for all species. Further, not all potentially suitable habitat is actively, recently, or historically occupied by any particular species.

Temporary impacts on RTE species and/or their habitats, if present, could occur within the Proposed Route and Alternative Route ROW Corridors, the Woodside Substation site, and ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. Impacts on potentially suitable RTE habitat would be temporary if the existing land cover type is:

- Barren Land (Rock/Sand/Clay)
- Developed, Open Space
- Emergent Herbaceous Wetland
- Grassland/Herbaceous
- Open Water
- Pasture/Hay
- Shrub/Scrub

These habitats will be restored or allowed to regenerate with select vegetation management as required by site conditions and are expected to provide suitable habitat for the life of the MARL Project. Other temporary impacts from construction and routine maintenance activities (e.g., noise and vibration) could cause temporary displacement of more mobile species to areas outside of construction zones. Most displaced species are expected to return to the area following construction, many of which would be expected to use the newly established and revegetated herbaceous and shrub/scrub habitat during operation. Loss of less mobile species could occur as a result of ground disturbances associated with construction and routine maintenance activities.

Impacts on forested habitats would result from construction, mainly from the conversion of forested habitats to maintained ROW Corridor. The permanent conversion of forested habitat to herbaceous and shrub/scrub habitat would result in the loss of potentially suitable habitat for protected species and could potentially increase forest fragmentation in the vicinity of the Proposed Route and Alternative Route ROW Corridors. The MARL Project has been sited and designed to minimize the total amount of tree clearing to the extent greatest practicable to minimize impacts on forested habitats and associated RTE species. The MARL Project was also sited to parallel existing ROWs to avoid and minimize impacts from new forested habitat fragmentation to the greatest extent practicable (Table 2.3-5).

NEET VA will coordinate with applicable federal and state agencies and other stakeholders to determine avoidance and minimization measures, as appropriate, to minimize and prevent impacts on RTE species loss of RTE species habitats within the ROW Corridor, the Woodside Substation site, and ancillary facility workspaces. Construction and routine maintenance activities will comply with MARL Project-specific permit requirements and conditions and will be conducted under MARL Project-specific plans and procedures to avoid and minimize impacts on RTE species and/or their habitat during construction and throughout operation. Following construction, the MARL Project will result in the establishment and maintenance of natural vegetation and habitats in accordance with applicable federal, state, and local requirements that would be expected to be used by some species during the MARL Project's operational life.

Permanent impacts on potentially suitable habitat within the Woodside Substation site would occur from MARL Project construction. These habitats will be converted to industrial uses and would no longer be available to RTE species for the operational life of the Woodside Substation site.

The following subsections are organized by legal status and/or species group and provide qualitative and quantitative discussions regarding impacts on RTE species and/or their habitats.

Federally Listed Threatened and Endangered Species

Bats

Impacts on Indiana, northern long-eared, and tricolored bats are largely driven by the loss of potentially suitable forested roosting habitat that is used by individuals, if present, from April 1 to October 15. The total acreage of potentially suitable roosting habitat that would be affected by construction within the Proposed Route and Alternative Routes ROW Corridors and the Woodside Substation site is provided in Table 2.3-16 (Figure 2.3-3; Attachment 1b). These acres would be converted to herbaceous and shrub/scrub habitat following construction and no longer provide

potentially suitable roosting habitat. Temporary impacts on roosting individuals from disturbance associated with construction and routine maintenance activities could occur, if present adjacent to the ROW Corridors. Displaced individuals would be expected to return to areas adjacent to the ROW Corridors following construction.

The potentially suitable roosting habitat impacts associated with the Proposed Route and Alternative Route ROW Corridors range from 0.2 percent to 0.3 percent of the 17,749.4 acres of potentially suitable roosting habitat within the MARL Project Study Area in Virginia. The impacts on potentially suitable roosting habitat associated with the Woodside substation site represents less than 0.1 percent of the 17,749.4 acres of potentially suitable roosting habitat within the MARL Project Study Area in Virginia.

TABLE 2.3-16 POTENTIALLY SUITABLE BAT HABITAT WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Potential roosting habitat	113.8	47.6	107.3	44.4	2.9
Potential foraging habitat	140.8	59.4	141.1	58.6	71.8
Known summer maternity habitat	0.0	0.0	0.0	0.0	0.0
Hibernation/staging/swarming habitat	0.0	0.0	0.0	0.0	0.0

Source: USGS 2024b

ROW = right-of-way

Additional impacts on listed and proposed bats could occur from the temporary loss of foraging habitat within the Proposed Route and Alternative Route ROW Corridors, as well as the Woodside Substation site during construction and routine maintenance activities. The total acreage of foraging habitat that would be affected by construction within the ROW Corridors is provided in Table 2.3-16 (Figure 2.3-3; Attachment 1b). These impacts would remain until vegetation is established within disturbed areas following construction. Displaced individuals would be expected to return to the area and use the newly established and revegetated habitats for foraging and commuting following construction. Foraging habitat quality would improve as areas are revegetated. The potentially suitable foraging habitat impacts associated with the ROW Corridors for the Proposed Route and Alternative Routes each represent 0.2 percent of the 27,799.8 acres of potentially suitable foraging habitat within the MARL Project Study Area in Virginia. The impacts on potentially suitable foraging habitat associated with the Woodside Substation site represent 0.3 percent of the 27,799.8 acres of potentially suitable foraging habitat within the MARL Project Study Area in Virginia.

Impacts on potentially suitable bat habitat would also occur associated with temporary access roads and other temporary ancillary facilities outside of the Proposed Route and Alternative Route ROW Corridor (Table 2.3-17). Impacts on bat habitat associated with both temporary access roads and other temporary ancillary facility workspaces outside of the Proposed Route and Alternative

Route ROW Corridors represent 0.1 percent of the 17,749.4 acres of potentially suitable roosting habitat and less than 0.1 percent of the 27,799.8 acres of potentially suitable foraging habitat present within the MARL Project Study Area in Virginia. No impacts associated with permanent access roads are expected to occur in Virginia.

TABLE 2.3-17 POTENTIALLY SUITABLE BAT HABITAT AND KNOWN OCCURRENCES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Potential roosting habitat	0.0	0.9	8.5	0.0	0.9	7.9
Potential foraging habitat	0.0	1.8	11.6	0.0	1.8	10.8

Source: USGS 2024b

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.

The impacts on potentially suitable bat habitat associated with the Woodside Substation site represents less than 0.1 percent of the 17,749.4 acres of potentially suitable roosting habitat and 0.1 percent of the 27,799.4 acres of potentially suitable foraging habitat within the MARL Project Study Area in Virginia. Construction of the Woodside Substation site will result in a permanent loss of the existing potentially suitable roosting and foraging habitat associated with the site, as described in Table 2.3-16. While the existing habitats would be converted to industrial uses, there is abundant potentially suitable habitat in the vicinity of the Woodside Substation site.

Monarch Butterfly

Impacts on monarch butterfly are largely driven by the loss of open grassland and herbaceous habitats that meet the species' habitat requirements. The total acreage of potentially suitable monarch butterfly habitat that would be temporarily disturbed within the ROW Corridors during construction and routine maintenance activities ranges from 11.6 acres to 13.9 acres (Table 2.3-18; Figure 2.3-3; Attachment 1b). Some loss of individual larvae and/or eggs could occur, if present within the ROW Corridors. Loss of adults would not be expected given their volant nature. Following construction, the MARL Project will result in the establishment and maintenance of potentially suitable habitats within the ROW Corridors that could be used by resident and migrating monarch butterflies during operation. The potentially suitable monarch butterfly habitat impacts associated with the Proposed Route and Alternative Route ROW Corridors represent 0.1 percent and 0.2 percent, respectively, of the 8,815.8 acres of potentially suitable monarch butterfly habitat within the MARL Project Study Area in Virginia.

TABLE 2.3-18 POTENTIALLY SUITABLE MONARCH BUTTERFLY HABITAT WITHIN THE SITING CORRIDOR, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Monarch butterfly habitat	25.6	11.6	32.5	13.9	40.4

Source: USGS 2024b

ROW = right-of-way

Impacts on potentially suitable monarch butterfly habitat would also occur associated with temporary access roads and other temporary ancillary facilities outside of the Proposed Route and Alternative Route ROW Corridors (Table 2.3-19). Impacts associated with both temporary access roads and other temporary ancillary facilities represent less than 0.1 percent of the 8,815.8 acres of potentially suitable monarch butterfly habitat within the MARL Project Study Area in Virginia. No impacts associated with permanent access roads are expected to occur in Virginia.

TABLE 2.3-19 POTENTIALLY SUITABLE MONARCH BUTTERFLY HABITAT WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Monarch butterfly habitat	0.0	1.0	3.1	0.0	1.0	3.0

Source: USGS 2024b

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.

The impacts on monarch butterfly habitat associated with the Woodside Substation site represents 0.5 percent of the 8,815.8 acres of potentially suitable monarch butterfly habitat within the MARL Project Study Area in Virginia. Construction of the Woodside Substation site would result in a permanent loss of potentially suitable monarch butterfly habitat, as described in Table 2.3-18. While the existing habitats would be converted to industrial uses, there is abundant potentially suitable habitat in the vicinity of the Woodside Substation site.

Green Floater

Impacts on the green floater, if any, will be minimized and avoided through the implementation of BPMs and adherence to applicable permit conditions associated with ROW Corridor construction and maintenance. As stated previously, NEET VA will coordinate with applicable federal and state agencies and other stakeholders to determine avoidance and minimization measures, as appropriate, to minimize and prevent impacts on RTE species and their habitats. No impacts on the green floater are anticipated associated with the Woodside Substation site.

Virginia Protected Species

Impacts on Appalachian grizzled skipper and RTE species, if present, are largely driven by loss of potentially suitable habitat and direct impacts on less mobile species and/or life stage. Construction and operation could result in both temporary and permanent impacts on these species and/or their habitats. The extent of impacts on potentially suitable habitat for state-listed species, if present, that could occur within the ROW Corridors is summarized in Table 2.3-20.

Impacts would be temporary if existing land cover type is:

- Barren Land (Rock/Sand/Clay)
- Developed, Open Space
- Emergent Herbaceous Wetland
- Grassland/Herbaceous
- Open Water
- Pasture/Hay
- Shrub/Scrub

These habitats will be restored or allowed to regenerate with select vegetation management as required by site conditions. The total acreage of potentially suitable non-forested habitat that would be temporarily disturbed within the Proposed Route and Alternative Route ROW Corridors during construction and routine maintenance activities ranges from 11.8 to 14.2 acres (Table 2.3-20; Figure 2.3-3; Attachment 1b). The non-forested habitat impacts associated with the Proposed Route and Alternative Route ROW Corridors each represent 0.1 percent of the 10,050.3 acres of non-forested habitat within the MARL Project Study Area in Virginia.

Permanent impacts on forested habitats within the ROW Corridors would result from construction, mainly from the conversion of forested habitats to maintained ROW and affect species that use forested habitat. The total acreage of permanent impacts on forested habitats ranges from 44.4 to 47.6 acres within the Proposed Route and Alternative Route ROW Corridors. The forested habitat impacts associated with the Proposed Route and Alternative Route ROW Corridors each represent 0.3 percent of the 17,749.4 acres of forested habitat within the MARL Project Study.

The permanent impacts on RTE habitat associated with the Woodside Substation site represent 0.3 percent of the 27,799.8 acres of potentially suitable RTE habitat within the MARL Project Study Area in Virginia. Construction of the Woodside Substation site would result in a permanent loss of potentially suitable RTE species habitat, as described in Table 2.3-20. While the existing habitats would be converted to industrial uses, there are abundant potentially suitable habitats in the vicinity of the Woodside Substation site.

TABLE 2.3-20 POTENTIALLY SUITABLE HABITAT FOR VIRGINIA-LISTED SPECIES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Survey Corridor	ROW Corridor	Survey Corridor	ROW Corridor	
Non-forested	27.0	11.8	33.8	14.2	68.9
Forested	113.8	47.6	107.3	44.4	2.9
Total [a]	**140.8**	**59.4**	**141.1**	**58.6**	**71.8**

Source: USGS 2024b

ROW = right-of-way

[a] Totals may not match the sum of addends due to rounding.

As discussed previously, the Isaacs Creek PROW Conservation Site provides potentially suitable habitat for the Appalachian grizzled skipper. Impacts on Appalachian grizzled skipper are largely driven by the loss of potentially suitable habitats that meet the species' habitat requirements. The shared Proposed Route and Alternative Route ROW Corridors intersect 11.2 acres of the Isaacs Creek PROW Conservation Site, which represent 7 percent of the 154-acre site.

In addition to potentially suitable habitat impacts, impacts on RTE species could occur, if present within and adjacent to the ROW Corridors. Temporary impacts from construction activities (e.g., noise and vibration) could cause temporary displacement of more mobile species to areas outside of construction zones. Due to the volant nature of some of these species, direct impacts would not be expected during construction and routine maintenance. Loss of potentially suitable habitat within the Proposed Route and Alternative Route ROW Corridors would occur during construction. Displaced mobile state-listed species are expected to return to the area following construction and would be expected to use the newly established and revegetated herbaceous and shrub/scrub habitat during operation. Loss of less mobile species could occur as a result of ground disturbances associated with construction and routine maintenance activities.

Impacts on potentially suitable habitat for state-listed species would also occur associated with temporary access roads and other temporary ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridor (Table 2.3-21). Impacts on habitat associated with temporary access roads and other temporary ancillary facilities each represent 0.1 percent or less of the 10,050.3 acres of non-forested habitat within the MARL Project Study Area in Virginia. Similarly, permanent impacts from the conversion of forested habitat to non-forested habitat associated with temporary access roads and other temporary ancillary facilities associated with the Proposed Route and Alternative Routes each represent 0.1 percent or less of the 17,749.4 acres of forested habitat within the MARL Project Study Area in Virginia. No impacts associated with permanent access roads are expected to occur in Virginia.

The impacts on RTE habitat associated with the Woodside Substation site represents 0.7 percent of the 10,050.3 acres of potentially suitable non-forested RTE habitat and less than 0.1 percent of the 17,749.4 acres of forested RTE habitat within the MARL Project Study Area in Virginia.

Construction of the Woodside Substation site would result in a permanent loss of potentially suitable RTE species habitat, as described in Table 2.3-21. While the existing habitats would be converted to industrial uses, there is abundant potentially suitable habitat in the vicinity of the Woodside Substation site.

TABLE 2.3-21 POTENTIALLY SUITABLE HABITAT FOR VIRGINIA-LISTED SPECIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Non-forested	0.0	1.0	3.1	0.0	1.0	3.0
Forested	0.0	0.9	8.5	0.0	0.9	7.9
Total [b]	**0.0**	**1.8**	**11.6**	**0.0**	**1.8**	**10.8**

Source: USGS 2024b

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Total may not match the sum of addends due to rounding.

Migratory Bird Treaty Act Species

Impacts on MBTA species are largely driven by loss of potentially suitable habitat and direct impacts during the nesting season when eggs or non-volant chicks are present. Construction and operation could result in both temporary and permanent impacts on MBTA species and/or their habitats. The extent of impacts on potentially suitable habitat for MBTA species, if present, that could occur within the ROW Corridors and the Woodside Substation site is described in Table 2.3-20.

Impacts would be temporary if existing land cover type is:

- Barren Land (Rock/Sand/Clay)
- Developed, Open Space
- Emergent Herbaceous Wetland
- Grassland/Herbaceous
- Open Water
- Pasture/Hay
- Shrub/Scrub

Within the ROW Corridor, these habitats will be restored or allowed to regenerate with select vegetation management as required by site conditions. The total acreage of potentially suitable MBTA species habitat within the ROW Corridors that would be temporarily disturbed ranges from 11.8 to 14.2 during construction and routine maintenance activities (Table 2.3-20; Figure 2.3-3; Attachment 1b). The non-forested MBTA habitat impacts associated with the ROW Corridors for

the Proposed Route and Alternative Routes each represent 0.1 percent of the 10,050.3 acres of non-forested habitat within the MARL Project Study Area in Virginia.

Permanent impacts on forested habitats would result from construction, mainly from the conversion of forested habitats to maintained ROW and affect species that use forested habitat. The total acreage of permanent impacts on forested habitats ranges from 44.4 to 47.6 acres within the ROW Corridors (Table 2.3-20; Figure 2.3-3; Attachment 1b). The forested MBTA species habitat impacts associated with the ROW Corridors for the Proposed Route and Alternative Routes each represent 0.3 percent of the 17,749.4 acres of forested habitat within the MARL Project Study Area in Virginia.

Impacts on potentially suitable habitat for MBTA species would also occur associated with temporary access roads and other temporary ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors (Table 2.3-21). Impacts on non-forested habitat associated with temporary access roads and other temporary ancillary facilities each represent 0.1 percent or less of the 10,050.3 acres of non-forested habitat within the MARL Project Study Area in Virginia. Similarly, permanent impacts from the conversion of forested habitat to non-forested habitat associated with temporary access roads and other temporary ancillary facilities each represent 0.1 percent or less of the 17,749.4 acres of forested habitat within the MARL Project Study Area in Virginia. No permanent impacts associated with access roads are expected to occur in Virginia.

Construction of the Woodside Substation site would result in a permanent loss of potentially suitable MBTA species habitat, as described in Table 2.3-20. While the existing habitats would be converted to industrial uses, there is abundant potentially suitable habitat in the vicinity of the Woodside Substation site.

Bald and Golden Eagle Protection Act

As discussed above, there are no known bald eagle nests within 660 feet of the ROW Corridors for the MARL Project. If nests or individuals are identified before, during, or after construction, NEET VA will coordinate with applicable resource agencies to avoid and minimize impacts on bald eagle throughout the MARL Project's operation.

2.3.6 VEGETATION

This section describes existing vegetation resources within the Siting Corridors and ROW Corridors for the Proposed Route and Alternative Routes B through F, as well as impacts associated with the ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. The Proposed Route and Alternative Route Siting Corridors cross the Northern Shale Valleys USEPA Level IV Ecoregion (67b) of the Ridge and Valley Level III Ecoregion (67). The Woodside Substation site is located within the Northern Limestone/Dolomite Valleys (67a) Level IV ecoregion. The ecoregions described here are defined by the following criteria:

- Climate
- Elevation
- Land use

- Land form
- Potential natural vegetation
- Soil
- Structural / bedrock geology
- Surficial / quaternary geology (Woods et al. 1999)

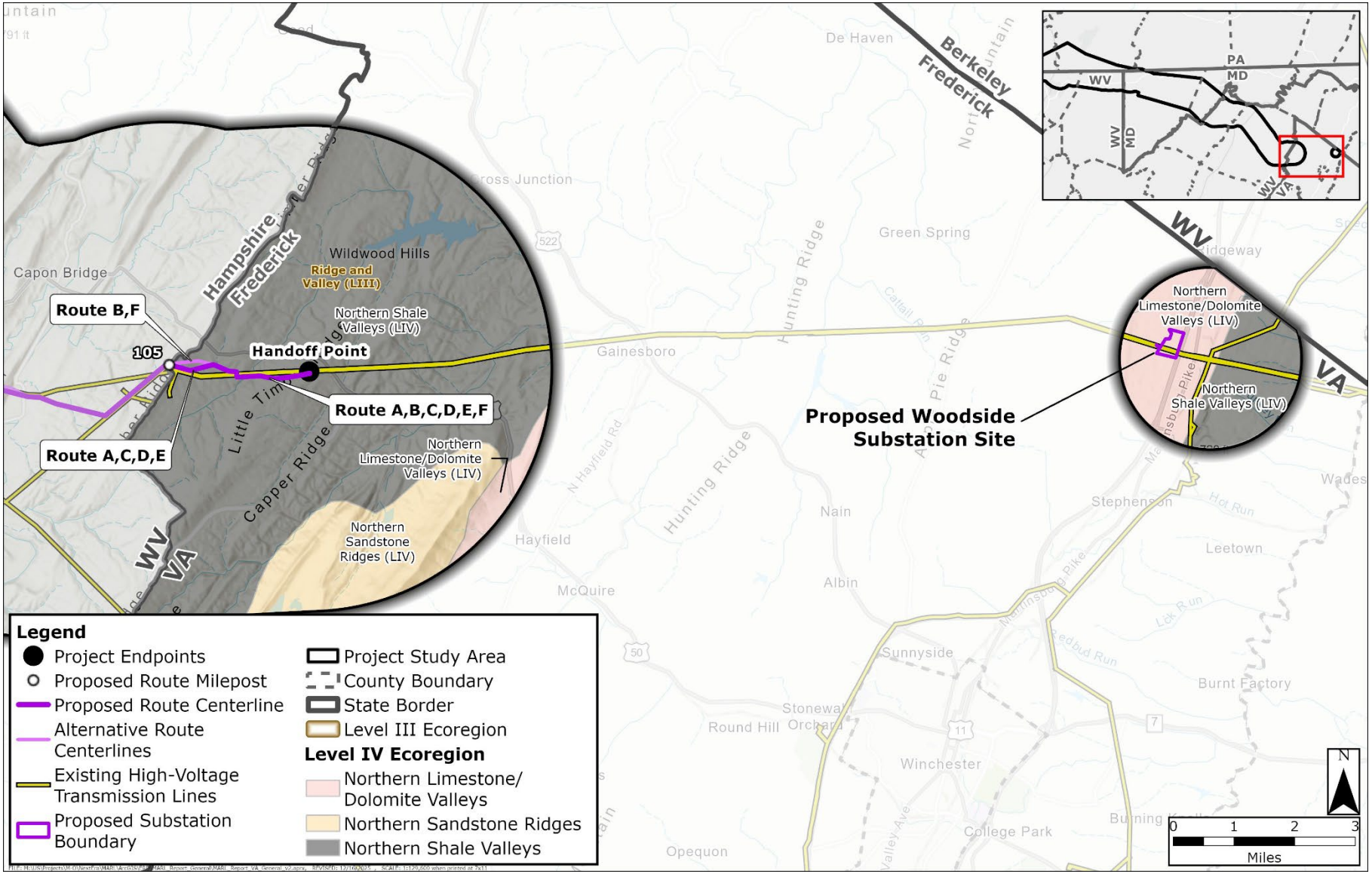
The Siting Corridors and the Woodside Substation cross one Level III Ecoregion—Ridge and Valley (67)—and two Level IV Ecoregions, as follows:

- Ridge and Valley (67)
    - Northern Limestone/Dolomite Valleys (67a)
    - Northern Shale Valleys (67b).

The following describes the Level III Ecoregion, incorporating additional information describing Level IV Ecoregions, as applicable. Figure 2.3-4 depicts the Level III and Level IV Ecoregions in Virginia.

The Ridge and Valley Level III Ecoregion (67) is found in Fredrick County. The natural vegetation communities in the northern portion of the Ridge and Valley ecoregion were historically characterized by oak-hickory-pine forest (dominated by hickory [*Carya* sp.], longleaf pine [*Pinus palustris*], shortleaf pine [*Pinus echinata*], loblolly pine [*Pinus taeda*], white oak (*Quercus alba*], and post oak [*Quercus stellata*]). Beech (*Fagus* sp.], hemlock (*Tsuga canadensis*), and white pine (*Pinus strobus),* as well as other hardwoods occurred locally (Kulcher 1964; Woods et al. 1999). Today, farming predominates in lower lying valley areas with scattered woodlands occurring in steeper terrain. The highland ridge areas of the Ridge and Valley (67) Level III Ecoregion are still dominated by the historic natural vegetation, with scattered pastures.

FIGURE 2.3-4 LEVEL III AND LEVEL IV ECOREGIONS



LIII = Level III Ecoregion; LIV = Level IV Ecoregion; MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

2.3.6.1 EXISTING CONDITIONS

The USGS' National Land Cover Database (USGS 2024b) was used to identify the land cover types within the Siting Corridors for the Proposed Route and Alternatives B through F and the Woodside Substation site (USGS 2024b). Table 2.3-22 summarizes the existing land cover types within the Siting Corridors and Woodside Substation site, and Figure 2.3-3 illustrates the land cover existing conditions. See Attachment 1b for additional land cover mapping.

Existing natural vegetation within the Siting Corridors for the Proposed and Alternative Routes includes the following land cover types:

- Deciduous Forest
- Developed, Open Space
- Emergent Herbaceous Wetland
- Evergreen Forest
- Grassland/Herbaceous
- Mixed Forest
- Pasture/Hay
- Shrub/Scrub
- Woody Wetlands

TABLE 2.3-22 LAND COVER TYPES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Land Cover Type	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Barren Land (Rock/Sand/Clay)	0.0	0.0	0.0
Cultivated Crops	1.4	1.4	28.5
Deciduous Forest	103.2	95.8	2.9
Developed, High Intensity	0.0	0.0	0.0
Developed, Low Intensity	0.2	0.2	1.1
Developed, Medium Intensity	0.1	0.1	0.0
Developed, Open Space	7.3	7.9	6.6
Emergent Herbaceous Wetlands	0.0	0.0	0.0
Evergreen Forest	1.5	1.5	0.0
Grassland/Herbaceous	0.0	0.0	0.0
Mixed Forest	9.0	10.0	0.0
Open Water	0.0	0.0	0.0
Pasture/Hay	18.4	24.6	33.8
Shrub/Scrub	0.0	0.0	0.0
Woody Wetlands	0.0	0.0	0.0
Total [a]	**141.1**	**141.4**	**72.9**

Source: USGS 2024b

[a] Total may not match the sum of addends due to rounding.

The total acreage of natural vegetation within the Proposed Route and Alternative Route Siting Corridors, as well as within the Woodside Substation site, is provided in Table 2.3-23 (Figure 2.3-3).

TABLE 2.3-23 NATURAL VEGETATION WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Native Vegetation	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Non-forested	25.6	32.5	40.4
Forested	113.8	107.3	2.9
Total [a]	**139.4**	**139.8**	**43.3**

Source: USGS 2024b

[a] Total may not match the sum of addends due to rounding.

Forest Conservation Values

The Forest Conservation Value (FCV) model is a tool designed by the Virginia Department of Forestry to strategically identify the highest priority forestland for conservation in Virginia (VDCR 2021b). The intent is to maximize the efficiency of limited resources by focusing conservation efforts on the highest quality, most productive, and most vulnerable forestland statewide. The FCV model identifies five conservation values:

- Outstanding (5)
- Very High (4)
- High (3)
- Moderate (2)
- Average (1)

FCV data were reviewed to assess the value of forest vegetation within the Proposed Route and Alternative Route Siting Corridors, as well as the Woodside Substation site. Based on review of recent aerial photography, many recently cleared areas were identified that have been ranked using the FCV model data; therefore, the model appears outdated and may not be reflective of current conditions. Table 2.3-24 summarizes the area of modeled FCV within the Siting Corridors for the Proposed Route and Alternative Routes, as well as the Woodside Substation site.

TABLE 2.3-24 AREA OF MODELED FOREST CONSERVATION VALUES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

FCV	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Outstanding	0.0	0.0	0.0
Very High	0.4	0.4	0.0
High	68.7	70.3	0.0
Moderate	46.2	39.1	0.0
Average	1.0	3.4	2.8
Total [a]	**116.2**	**113.2**	**2.8**

Source: VDCR 2013

FCV = Forest Conservation Value

[a] Total may not match the sum of addends due to rounding.

2.3.6.2 IMPACTS

Construction and operation would result in various temporary and permanent impacts on existing land cover types, including natural vegetation, within the Proposed Route and Alternative Route ROW Corridors, the Woodside Substation site, as well as the ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. Impacts on all land cover types are summarized in Table 2.3-25 and shown on Figure 2.3-3 and Attachment 1b.

TABLE 2.3-25 LAND COVER TYPES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)

Land Cover Types	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Barren Land (Rock/Sand/Clay)	0.0	0.0	0.0	0.0	0.0
Cultivated Crops	1.4	0.2	1.4	0.2	28.5
Deciduous Forest	103.2	44.3	95.8	41.3	2.9
Developed, High Intensity	0.0	0.0	0.0	0.0	0.0
Developed, Low Intensity	0.2	0.0	0.2	0.0	1.1
Developed, Medium Intensity	0.1	0.0	0.1	0.0	0.0
Developed, Open Space	7.3	3.0	7.9	3.1	6.6
Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.0
Evergreen Forest	1.5	<0.1	1.5	<0.1	0.0
Grassland/Herbaceous	0.0	0.0	0.0	0.0	0.0
Mixed Forest	9.0	3.3	10.0	3.1	0.0
Open Water	0.0	0.0	0.0	0.0	0.0
Pasture/Hay	18.4	8.6	24.6	10.8	33.8
Shrub/Scrub	0.0	0.0	0.0	0.0	0.0

Land Cover Types	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Woody Wetlands	0.0	0.0	0.0	0.0	0.0
Total [a]	**141.1**	**59.4**	**141.4**	**58.6**	**72.9**

Source: USGS 2024b
ROW = right-of-way
[a] Total may not match the sum of addends due to rounding.

Impacts on natural vegetation within the ROW Corridors (Table 2.3-26) would generally be temporary if the existing land cover type is:

- Developed, Open Space
- Emergent Herbaceous Wetland
- Grassland/Herbaceous
- Pasture/Hay
- Shrub/Scrub

The above habitats will be restored or allowed to regenerate with select vegetation management as required by site conditions.

Permanent impacts on forested vegetation would result from construction, mainly from the conversion of forested vegetation to maintained ROW. Impacts on natural vegetation would be generally permanent if the existing land cover is:

- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Woody Wetlands

Temporary impacts on non-forested vegetation associated with the Proposed Route / Alternative Routes C, D, and E and Alternative Routes B and F ROW Corridors represent 0.1 percent and 0.2 percent, respectively, of the 8,818.5 acres of non-forested natural vegetation within the MARL Project Study Area in Virginia. The Woodside Substation site includes 40.4 acres of potentially suitable non-forested vegetation that would be converted to industrial uses, which represents 0.5 percent of the 8,818.5 acres of non-forested natural vegetation within the MARL Project Study Area in Virginia.

Permanent impacts on forested vegetation associated with habitat conversion within the ROW Corridors range from 44.4 to 47.6 acres (Table 2.3-26; Figure 2.3-3; Attachment 1b). The forested vegetation impacts associated with the Proposed Route / Alternative Routes C, D, and E and Alternative Routes B and F ROW Corridors each represent 0.3 percent of the 17,749.4 acres of forested habitat within the MARL Project Study Area in Virginia. The Woodside Substation site includes 2.9 acres of potentially suitable forested habitat that would be converted to industrial uses, which represents less than 0.1 percent of the forested habitat within the MARL Project Study Area in Virginia.

TABLE 2.3-26 NATIVE VEGETATION WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)

Native Vegetation	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Non-forested	25.6	11.6	32.6	13.9	40.4
Forested	113.8	47.6	107.3	44.4	2.9
Total [a]	**139.4**	**59.2**	**139.9**	**58.4**	**43.3**

Source: USGS 2024b

ROW = right-of-way
[a] Total may not match the sum of addends due to rounding.

Impacts on land cover and natural vegetation would also occur associated with temporary access roads and other temporary ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors (Table 2.3-27 and Table 2.3-28). Impacts on non-forested vegetation associated with both temporary access roads and other temporary ancillary facilities outside of the Proposed Route / Alternative Routes C, D, and E and Alternative Routes B and F ROW Corridors each represent less than 0.1 percent of the 8,818.5 acres of non-forested vegetation present within the MARL Project Study Area in Virginia. Similarly, impacts on forested vegetation associated with temporary access roads and other temporary ancillary facilities outside of the Proposed Route/Alternative Routes C, D, and E and Alternative Routes B and F ROW Corridors each represent less than 0.1 percent of the 17,749.4 acres of forested vegetation present within the MARL Project Study Area in Virginia. No permanent access road impacts are expected to occur in Virginia.

TABLE 2.3-27 LAND COVER WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Land Cover Type	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Barren Land (Rock/Sand/Clay)	0.0	0.0	0.0	0.0	0.0	0.0
Cultivated Crops	0.0	0.0	0.0	0.0	0.0	0.0
Deciduous Forest	0.0	0.9	5.9	0.0	0.9	5.4
Developed, High Intensity	0.0	0.0	0.0	0.0	0.0	0.0
Developed, Low Intensity	0.0	< 0.1	0.0	0.0	< 0.1	0.0
Developed, Medium Intensity	0.0	0.0	0.0	0.0	0.0	0.0
Developed, Open Space	0.0	< 0.1	< 0.1	0.0	< 0.1	< 0.1

Land Cover Type	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.0	0.0
Evergreen Forest	0.0	0.0	1.4	0.0	0.0	1.4
Grassland/Herbaceous	0.0	0.0	0.0	0.0	0.0	0.0
Mixed Forest	0.0	0.0	1.1	0.0	0.0	1.0
Open Water	0.0	0.0	0.0	0.0	0.0	0.0
Pasture/Hay	0.0	0.9	3.1	0.0	1.0	3.0
Shrub/Scrub	0.0	0.0	0.0	0.0	0.0	0.0
Woody Wetlands	0.0	0.0	0.0	0.0	0.0	0.0
Total [b]	**0.0**	**1.9**	**11.6**	**0.0**	**1.9**	**10.8**

Source: USGS 2024b; Attachment 3

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Total may not match the sum of addends due to rounding.

TABLE 2.3-28 NATURAL VEGETATION WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDOR (ACRES)

Potentially Suitable Habitat	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Non-forested	0.0	1.0	3.1	0.0	1.0	3.0
Forested	0.0	0.9	8.5	0.0	0.9	7.9
Total [b]	**0.0**	**1.8**	**11.6**	**0.0**	**1.8**	**10.8**

Source: USGS 2024b

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Total may not match the sum of addends due to rounding.

Forest Conservation Values

Construction of the MARL Project within the ROW Corridor would convert existing forested vegetation to herbaceous and shrub/scrub habitat. Construction of the Woodside Substation site would convert existing vegetation to an industrial use. Table 2.3-29 summarizes the area of forested vegetation based on FCV within the Siting Corridors and ROW Corridors for the Proposed Route and Alternative Routes, as well as the Woodside Substation site. The majority of the forested vegetation within the Proposed Route and Alternative Route ROW Corridors is classified as high and moderate based on FCV modeling, and the forested vegetation within the Woodside Substation site is classified as average.

TABLE 2.3-29 AREA OF MODELED FOREST CONSERVATION VALUES WITHIN THE SITING CORRIDORS, ROW CORRIDORS, AND WOODSIDE SUBSTATION SITE (ACRES)

FCV	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Outstanding	0.0	0.0	0.0	0.0	0.0
Very High	0.4	0.0	0.4	0.0	0.0
High	68.7	28.0	70.3	30.9	0.0
Moderate	46.2	20.4	39.1	15.2	0.0
Average	1.0	0.4	3.4	1.7	2.8
Total [a]	**116.2**	**48.8**	**113.2**	**47.8**	**2.8**

Source: VDCR 2013

FCV = Forest Conservation Value; ROW = right-of-way
[a] Total may not match the sum of addends due to rounding.

Impacts on forested vegetation of varying FCVs would also occur associated with temporary access roads and temporary ancillary facilities outside of the Proposed Route and Alternative Route ROW Corridors. The area of forested vegetation within temporary ancillary facilities outside of the ROW Corridors based on FCVs is provided in Table 2.3-30.

TABLE 2.3-30 AREA OF MODELED FOREST CONSERVATION VALUES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

FCV	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Outstanding	0.0	0.0	0.0	0.0	0.0	0.0
Very High	0.0	0.0	0.0	0.0	0.0	0.0
High	0.0	0.3	1.1	0.0	0.3	0.9
Moderate	0.0	1.2	7.3	0.0	1.3	6.9
Average	0.0	< 0.1	0.0	0.0	< 0.1	0.0
Total [b]	**0.0**	**1.6**	**8.4**	**0.0**	**1.6**	**7.8**

Source: VDCR 2013

FCV = Forest Conservation Value
[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Total may not match the sum of addends due to rounding.

Permanent impacts on forested vegetation would result from construction, mainly from the conversion of forested habitats to maintained ROW and construction of the Woodside Substation site. The permanent conversion of forested habitat to herbaceous and shrub/scrub habitat or industrial use would result in the loss of potentially suitable habitat for a variety of plant and wildlife species and could potentially increase forest fragmentation associated with the ROW Corridors. The MARL Project has been designed to minimize the total amount of tree clearing to

the extent practicable and minimize impacts on wetlands and associated vegetation. The MARL Project was also designed to parallel existing ROWs, where possible, to avoid and minimize impacts from forested habitat fragmentation to the greatest extent practicable (Table 2.3-5).

NEET VA will continue to coordinate with applicable federal and state agencies and other stakeholders to determine avoidance and minimization measures, as appropriate, to minimize and prevent impacts and loss of natural vegetation and the proliferation of non-native invasive species within the MARL Project ROW Corridor and ancillary facilities workspaces. Construction and routine maintenance activities for the ROW Corridor will comply with all MARL Project-specific permit requirements and conditions and will be conducted under MARL Project-specific plans and procedures to avoid impacts on natural vegetation during construction and throughout operation. Following construction, the MARL Project will result in the establishment and maintenance of natural vegetation within the ROW Corridor and temporary ancillary facility workspaces in accordance with applicable federal, state, and local requirements.

Permanent impacts on existing vegetation within the Woodside Substation site would occur from construction of the MARL Project. While the existing vegetation would be converted to industrial uses, there is abundant natural vegetation in the vicinity of the Woodside Substation site.

2.4 VISUAL RESOURCES

The aesthetic or scenic character of a landscape refers to the overall visual qualities that give a landscape its distinct and recognizable identity. It generally captures the features (e.g., topography/terrain, vegetation, waterbodies, human development), elements (forms, lines, colors, textures), patterns and spatial relationships, and visual composition of the landscape.

This section describes the existing visual characteristics of the landscapes of the Proposed Route and Alternative Route B through F Siting Corridors, as well as the Woodside Substation site in Virginia, and the primary viewer groups and their sensitivity to landscape changes. In addition, this section describes anticipated changes (impacts) in visual characteristics, identifies sensitive visual resources, and addresses potential visibility of the MARL Project as it crosses different types of landscapes. Refer to Appendix J, Visual Impact Assessment, of the Routing Study for additional information.

2.4.1 EXISTING CONDITIONS

The Proposed Route and Alternative Route Siting Corridors enter the northern portion of Frederick County, Virginia, from Hampshire County, West Virginia. The Proposed Route and all five Alternative Routes are entirely within Frederick County, Virginia. The Proposed Route and Alternative Routes C, D, and E follow the same alignment, while Alternative Routes B and F share the same alignment. Approximately the first 0.7 mile of the Proposed Route / Alternative Routes C, D, and E differs from Alternative Routes B and F in Frederick County. Along this segment, the Proposed Route / Alternative Routes C, D, and E follow a more southerly alignment while Alternative Routes B and F follow a more northerly alignment. After this deviation, the Proposed Route and all Alternative Routes follow the same alignment to the handoff point. In addition to the Proposed and Alternative Routes, the MARL Project also includes the Woodside Substation site,

approximately 11 miles east of the handoff point.[6] The Siting Corridors cross through a rural landscape with a mix of residential properties (e.g., single family homes, large lawns) and agricultural fields that are interspersed with dense forested areas. The Proposed Route and Alternative Route Siting Corridors include existing transmission lines, along with other infrastructure (e.g., cell towers, highways, buildings and structures) that are visible from various locations in the area. The landscape area around the Woodside Substation site is a mix of rural agricultural and rural developed along I-81 north of Winchester, Virginia.

The Proposed Route and Alternative Route Siting Corridors, as well as the Woodside Substation site are located within the Appalachian Highlands in the Valley and Ridge physiographic region (NPS 2017), which is characterized by long, narrow mountain ridges with intervening valleys (Section 2.7.1, Physiographic Setting, Geology, and Groundwater). The mountain ridges form strong diagonal and horizontal lines that appear as repeating, undulating bands across the landscape. The valleys between these ridges tend to have gently rolling to flat terrain. Rivers and streams occur frequently in the valleys and add sinuous, curvilinear forms and lines to the landscape. The vegetation patterns generally follow the landform patterns with the ridges covered in dense forests and a patchwork of agricultural fields, riparian areas, and manicured lawns dotting the valley floors. The forested areas add vertical features that reinforce the elevation differences present on the landscape and help enclose views. The differences in vegetation types and patterns also create textural complexity and seasonal color dynamics that contribute to the aesthetic character of the area. In the western portion of the county, human development tends to be concentrated in the valleys where small communities and clusters of agricultural structures follow the natural alignment of the terrain. Except in more urban areas (e.g., Winchester and other areas along I-81), the built environment is generally low (single and two-story buildings), geometric, and often appears as subordinate to the dominant natural features. Roads, utility corridors, and other linear infrastructure follow the valley bottoms and occasionally cross ridges through gaps or engineered cuts. This type of infrastructure is highly visible in some areas (e.g., elevated vantage points) and tends to contrast with the landscape's natural forms and patterns.

A previous version of the Virginia Outdoors Plan included a chapter and guidance on scenic resources in the state (VDCR 2018). Under this plan, the VDCR defers to local governments for the protection and management of scenic resources; however, the VDCR works with local governments and other stakeholders on scenic resources with statewide importance through the Virginia Scenic Rivers Program and Virginia's Byways. While the latest Virginia Outdoors Plan does not specifically address scenic resources in the state (VDCR 2024), both the Scenic River and Byways Programs continue to provide protection for the scenic and other important resource values associated with designated rivers and byways. No designated Scenic Rivers or Byways are located within the ROW Corridors or the Woodside Substation site.

[6] The permitting of the Woodside Substation site is subject to the siting authority of Frederick County, and information in this section related to the substation is provided for overall context of the MARL Project in Virginia.

The Comprehensive Plan for Frederick County does not have a scenic or visual resource section (Frederick County 2021) but does recognize the scenic setting and quality within the county. The plan includes several focus areas that identify the contribution of scenic resources and quality to residents and visitors. It recognizes the natural and historic/cultural resources throughout the county, which also provide opportunities to experience the landscape and scenic resources. However, while the plan recognizes the scenic quality of the county, it does not identify specific scenic resources or vistas that have visual protections. The plan also does not have specific, established visual or scenic quality objectives related to the preservation of existing visual characteristics and the desired level or degree of change that may be allowable; therefore, Section 2.4.2, Impacts, gages potential aesthetics impacts from the MARL Project by comparing anticipated changes in visual characteristics against existing visual characteristics.

Scenic resources are one of several factors that contribute to the designation of parks, trails, and other protected areas that are used for public outdoor recreation. Scenic quality often contributes to the recreational experience for visitors to these areas. The Siting Corridors do not cross any parks, trails, or other protected areas in Virginia. Additionally, the Woodside Substation site is proposed on private property with no public outdoor recreation areas.

ERM visual resource specialists systematically categorized the MARL Project Study Area in Virginia into distinct landscape units. Each landscape unit is characterized by similar types of land cover, along with other corresponding visual traits and is intended to capture representative visual characteristics across an entire landscape area. They provide a macro-scale framework for capturing existing conditions and identifying potential changes in visual conditions from a proposed project. The landscape units are primarily delineated based on aerial imagery, topographic maps, and photographs from the MARL Project Study Area. In Frederick County, the MARL Project Study Area landscape units include Forested Ridges, Rural Developed, Rural Agricultural, and Northwood Hills/Lake Holiday areas, which are representative of the larger Valley and Ridge physiographic province. The landscape units crossed by the Siting Corridors for the Proposed Route and each of the Alternatives Routes, as well as within the Woodside Substation site, are described in Table 2.4-1 and shown on Figure 2.4-1.

Landscape characteristics are a set of attributes, qualities, or traits that make the landscape unit identifiable or unique. Landscape characteristics are described based on the specific combination of visual features in a landscape unit, including:

- Landforms: The topography/terrain features of the landscape including any waterbodies or rivers;
- Vegetation: The variety of vegetation / vegetative communities present on the landscape; and
- Built environment: The existing structures, facilities, or other built modifications on the landscape.

These visual features are described in terms of their primary forms, lines, colors, and textures. These common visual elements are used to describe landscape features across many of the established visual resource management systems, including the Federal Highway Administration visual impact assessment for highway projects (FHWA 2015), the Bureau of Land Management visual resource management system (BLM 1984), the U.S. Forest Service scenery management system (USFS 1995), and others.

Viewer groups are defined by their interaction with a landscape (e.g., residents, motorists, recreationists) and their preferences or sensitivity to changes or modifications to the landscape. The way that viewer groups perceive visual resources provides additional context for assessing a project's visual impacts. In general, viewers with a strong attachment to a landscape and/or with an expectation of scenic quality have higher sensitivity to changes on a landscape compared to viewers for which scenic resources and quality are incidental or irrelevant to their activity. Across the Proposed Route, Alternative Routes, and Woodside Substation site landscapes, there are two primary types of viewer groups:

- Area residents: These viewers live in the vicinity of the MARL Project. They are more likely to be sensitive to potential changes in landscape characteristics because they tend to value the scenic integrity of the landscape around their homes and may have more frequent and longer duration views from their residences. In addition, area residents tend to be most familiar with the area landscape and are, therefore, more perceptive of changes over time.
- Motorists, commuters, and other travelers: These viewers travel along major roads in the MARL Project Study Area (Section 2.2.10, Transportation Infrastructure) and have multiple opportunities to view the landscape. This means that their potential exposure to views of the MARL Project changes based on speed, direction of travel, and length of trip, as well as viewing angles and screening, among other factors. Due to this variability, these viewers (particularly along highspeed roadways) are typically less sensitive to changes in scenic conditions.

Sensitivity and perception of visual resource changes (i.e., impacts) tend to vary by setting and viewer group. Many factors influence viewer sensitivity and the perception of impacts. In general, users with static, direct, frequent, or longer duration views (e.g., area residents), as well as those viewers engaged in setting-dependent activities (e.g., some types of recreation, tourism), tend to have higher levels of sensitivity to change compared to others. Thus, anticipating viewer sensitivity is important in the overall evaluation of potential impacts from a proposed project on visual resources.

Table 2.4-2 lists existing landscape units and primary viewer groups for the Proposed Route and Alternative Route Site Corridors, as well as the Woodside Substation site.

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TABLE 2.4-1 LANDSCAPE UNITS CROSSED BY THE PROPOSED AND ALTERNATIVE ROUTE SITING CORRIDORS AND THE WOODSIDE SUBSTATION SITE IN VIRGINIA

Landscape Unit	Description	Scenic Characteristics		
		Landform/Water	Vegetation	Built Environment
Rural Agricultural	Dominated by agricultural fields, natural grass and shrublands, and pockets of dense forest; extend through the valleys between areas of forested mountains; small towns and other areas of low-density development are located along roadways in these valleys	Broad, gentle slopes with a rounded, horizontal profile, with most underlying terrain obscured by vegetation and built features	Open, wide, low, regular to irregular horizontal lines; strips, vertical amorphous forms, continuous patches of uniform textures and colors; dominated by tan, green, brown, and other natural hues and subject to seasonal variation	Smooth, flat, gray strips with straight to curvilinear horizontal lines; sporadic geometric forms, straight vertical, horizontal, and angular lines, multiple colors (e.g., white, gray, tan, yellow), ordered, sparse; tall, vertical geometric forms with thin, slightly undulating horizontal lines
Forested Ridges	Forested ridges follow long, narrow mountain ridges generally oriented north-to-south with native forest cover and periodic clusters of low-density development and linear infrastructure	Obscured by vegetation in most areas; underlying landform is low, long, narrow, linear, rounded; ridgelines form continuous, regular, horizontal lines across skyline	Dominated by deciduous mixed forest with interspersed evergreen species; contiguous forested areas appear as rounded to amorphous forms on the landscape; individual trees and shrubs add multi-height amorphous, round, and conical forms; soft, feathered horizontal lines and repeating vertical lines; mix of green hues with assorted browns and grays, medium to coarse textures, and seasonal variability	Low, flat, gray, smooth; tall, vertical linear and geometric forms with thin, slightly undulating horizontal lines; sporadic geometric forms with straight vertical and horizontal lines and various colors
Rural Developed	Areas of low-density development (e.g., residential and commercial buildings) primarily aligned along a travel corridor interspersed with forested areas and/or agricultural fields	Rolling to flat, narrow gentle to moderate slopes, irregular; long, soft horizontal and diagonal lines, colors and textures obscured by aboveground vegetation and structures	Low, flat, geometric bounded by tall, irregular, vertical, amorphous forms; regular, simple, soft and repeating vertical lines; mix of natural green hues with splashes of bright hues (e.g., red, pink, orange) and subject to seasonal variation; smooth to medium, patchy, discontinuous textures	Low, geometric, smooth, regular forms; bold, straight, simple, vertical and horizontal lines; multiple colors (e.g., white, gray, black, blue, yellow), smooth to medium, patchy, scattered textures

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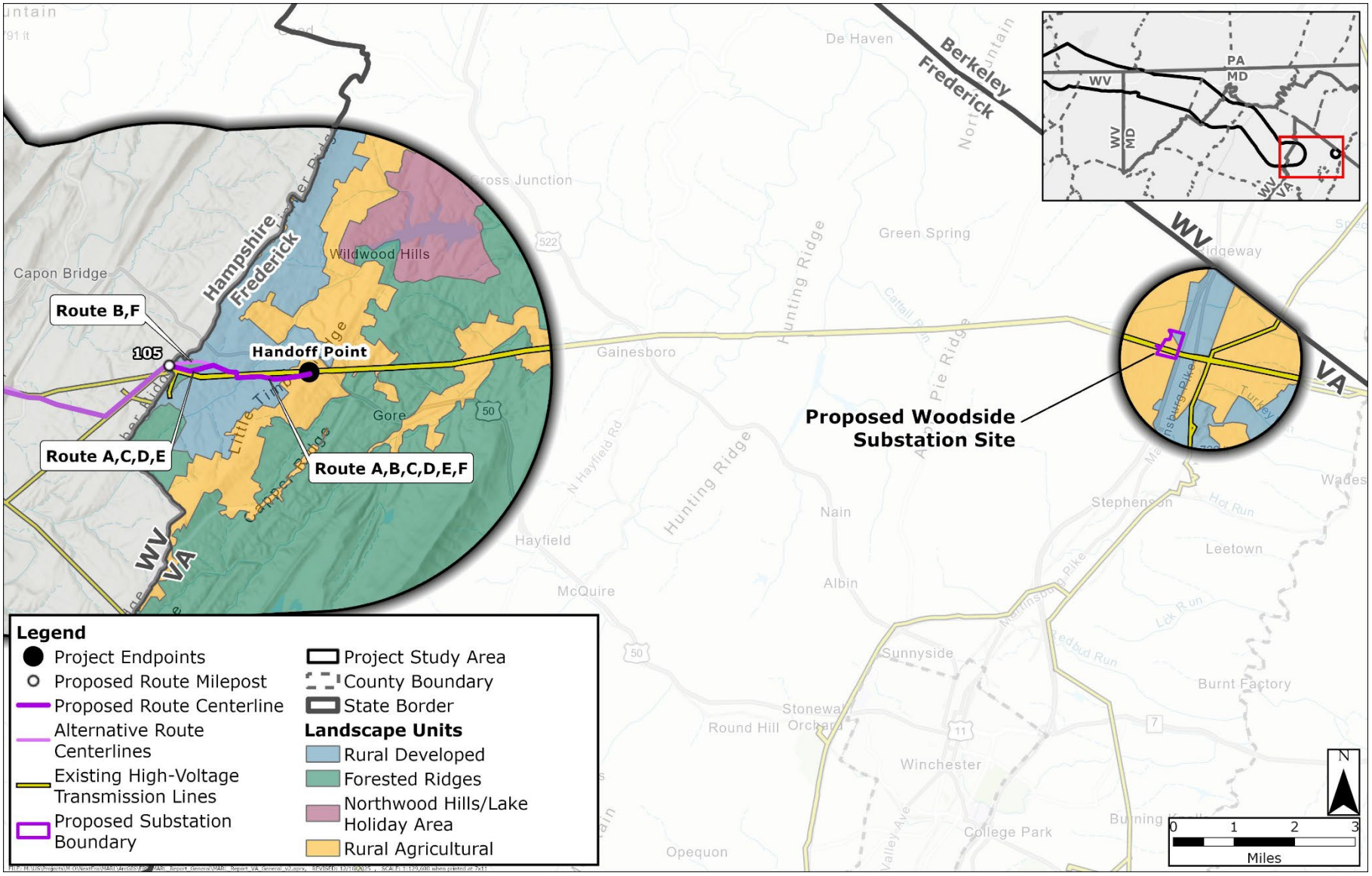
FIGURE 2.4-1 EXISTING LANDSCAPE UNITS (FREDERICK COUNTY)



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

TABLE 2.4-2 EXISTING LANDSCAPE UNITS AND VIEWER GROUPS WITHIN THE PROPOSED ROUTE AND ALTERNATIVE ROUTE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE

Landscape Units/ Primary Viewer Groups	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Landscape units	Forested Ridges Rural Developed Rural Agricultural	Forested Ridges Rural Developed Rural Agricultural	Rural Developed Rural Agricultural
Viewer groups	Area Residents Motorists	Area Residents Motorists	Area Residents Motorists

2.4.2 IMPACTS

The MARL Project involves the construction and operation of a new 500 kV transmission line and associated ROW Corridor that will cross a portion of Frederick County, as well as the Woodside Substation site. The degree to which overhead transmission lines influence and are visible on a landscape depends on a number of factors, including, but not limited to, structure height and color, existing landscape features (e.g., topography, vegetation, built environment), duration of the view, and distances from the viewer. The specific combination of these factors changes location to location, contributing to a range of potential influences and impacts for the Proposed Route, Alternative Routes, and Woodside Substation site. The existing landscape character features and characteristics were used to evaluate the degree of visual change from the MARL Project (i.e., the degree to which the MARL Project would change the existing landscape characteristics across each landscape unit). The Proposed Route, Alternative Routes, and Woodside Substation site cross various landscape types with varying degrees of visibility. Visibility of the new transmission line and substation infrastructure will be influenced by the amount of existing screening, viewing distances, and background colors and textures, among other factors; however, visibility is not considered an impact on its own. Rather, visibility, current landscape characteristics, the degree of visual change, and viewer sensitivity are all considered holistically in determining the level of potential impact. Visibility considerations, including roads, parks and other designated natural areas, and nearby residential dwellings are described by route below.

Lattice structures connected by overhead conductors will be constructed within the ROW Corridor. The lattice structures will range in height from 85 feet to 190 feet, and the average conductor span lengths will be 1,258 feet. In general, visibility of these new structures and facilities will be most pronounced at shorter distances (generally under 0.5 mile). Views of the new transmission line and changes to existing visual conditions will be greatest from within the cleared ROW Corridor, at road crossings, across open fields or other clearings, and from elevated areas. Some segments of the Proposed Route and Alternative Route ROW Corridors will cross through forested areas that generally provide a substantial amount of screening that will help limit views. While the new transmission line may also be visible at greater distances (generally over 0.5 mile), including from higher elevation areas that provide panoramic views of the regional landscape, its presence on the landscape would diminish at longer distances.

The Woodside Substation site will be constructed on two private parcels adjacent to I-81. The site will include transformers, Static Synchronous Compensator (STATCOM), capacitor banks, static poles, backbone structures, security fencing, and other support structures. The height and mass of these structures will contribute to their visibility on the landscape. Similar to the new transmission line infrastructure, the substation and corresponding changes in visual conditions will be most visible at shorter viewing distances (up to 0.5 mile). At closer distances, existing vegetation including clusters of trees along I-81 and other travel corridors, will help screen the substation. As viewing distances increase, the substation may remain prominent on the landscape due to the concentration of built structures but may appear similar to other light industrial development in the region.

Construction activities within the ROW Corridor, at temporary ancillary facility workspaces outside of the ROW Corridor (e.g., temporary access roads, wire work areas), and at the Woodside Substation site will be temporary and visible during the construction period (anticipated to be approximately 24 months). The initial construction phase will involve clearing and grading portions of the ROW Corridor, temporary ancillary facilities, and the substation site. Trees and other vegetation would be removed and potentially open previously screened areas to view. Grading activities would create exposed earth surfaces, cut slopes, and fill areas that may contrast with and be visible on the landscape. Once cleared, construction activities will progress to excavating pole foundations, assembling the transmission towers, pouring concrete, and stringing the conductors, among other activities. These activities create dynamic movement on the landscape along the ROW Corridor, at the temporary ancillary facilities, and at the substation site. The presence of machines and other equipment, material stockpiles, worker vehicles, construction support facilities, and other temporary features will create visual disruptions that will be most visible within and near the ROW Corridor and adjacent to the substation site but may also be visible from other nearby locations. In particular, the use of cranes and other tall equipment that extend above the existing tree line will potentially be visible from more distant locations. Additionally, disturbed areas will be revegetated with native species to help establish similar colors and textures as the surrounding landscape.

During operation, the new transmission line will add tall, geometric structures and long, linear lines to the landscape. The transmission structures will create a series of repetitive, dominant vertical features that will extend above existing trees canopies and add new focal points that shift the vertical structure of the landscape. The conductors will appear as multiple undulating, overhead horizontal lines spanning the areas between transmission poles. The thin conductors will be most apparent in foreground views (under 0.5 mile), in particular where they span open fields and roads with few to no screening features. In forested areas, the conductors are better absorbed into the landscape and, at greater distances (into the middle ground and background), will be harder to discern against background features and the sky. The MARL Project construction materials are not expected to result in significant glare; therefore, no visual impacts are anticipated.

The Woodside Substation site will also add tall, geometric structures and other strong rectilinear forms, bold angular lines, metallic gray colors, and rough textures to the landscape. To the extent feasible, the Woodside Substation site will use galvanized steel, concrete, and other materials that are not highly reflective. This will minimize or eliminate surface glare to help avoid visual impacts and reduce the visual prominence of structures on the landscape.

Where feasible, the Proposed Route and Alternative Route ROW Corridors were designed to maximize paralleling opportunities with existing high-voltage transmission lines in the area to the maximum extent practicable. Paralleling the ROW Corridors with these existing lines helps minimize visual impacts by repeating landscape elements that are already present and absorbing these elements more seamlessly into the existing landscape. Paralleling also helps maintain existing vegetative screening, in particular in forested areas. There is 1.0 mile of paralleling opportunities for the Proposed Route and Alternative Routes C, D, and E in Virginia. The miles of paralleling opportunities along Alternative Routes B and F are slightly less at 0.7 mile. These paralleling opportunities are also described by route below.

While the Proposed Route and Alternative Routes have factored in paralleling opportunities to help minimize visual changes and maximize the ability of the landscape to better absorb the new infrastructure, there is less of a visual benefit when adding a high-voltage transmission line next to a lower voltage line. The difference in ROW width and structure forms between different voltage lines may actually increase the presence of both routes (existing and new) on the landscape. These differences are noted by Alternative Route below.

Appendix J of the Routing Study provides a more detailed description of visual changes and impacts from specific locations near the ROW Corridors.

2.4.2.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES C, D, AND E

As the Proposed Route and Alternative Routes C, D, and E enter Virginia from West Virginia, they pass through a small area of Forested Ridges and then a Rural Developed and Rural Agricultural landscape. In the Forested Ridges landscape unit, dense vegetation and elevation changes (e.g., hills) will help screen views of the transmission line, limiting views primarily to road crossings. In contrast, open developed areas (e.g., lawns) and agricultural fields offer wider views and broader sightlines, making the MARL Project infrastructure (tall lattice towers and long, thin overhead conductors) more visually prominent and apparent from area roads, farm buildings, and residences spread throughout these areas.

The Proposed Route and Alternative Routes C, D, and E ROW Corridor crosses three tertiary roads in Frederick County (Section 2.2.10). At these crossings, the Proposed Route and Alternative Route C, D, and E would result in changes to vegetation forms and lines within the cleared ROW Corridor. Additionally, the tall, geometric transmission structures and overhead undulating horizontal lines would also be perceptible at these crossings. The duration of these views (structure visibility) would be dependent on the speed and direction of travel for motorists on these roads.

To help reduce visual impacts, portions of the Proposed Route and Alternative Route C, D, and E ROW Corridors would parallel existing high-voltage transmission lines, including 1.0 mile along an existing corridor that includes both a 138 kV and 500 kV transmission line. The MARL Project will be located adjacent to the existing transmission line infrastructure, and the MARL Project ROW Corridor will abut the existing corridor, thereby increasing the width of the cleared ROW. The MARL Project has similar lattice structures to the existing 500 kV transmission line. While the MARL Project towers could be taller (depending on final engineering design) and potentially more prominent on the landscape, they add similar forms, lines, colors, and textures to existing visual conditions. However, the existing 138 kV transmission line has short, paired H-frame wooden towers that are visually distinct from the MARL Project infrastructure.

There are no parks, outdoor recreation use areas, or other designated natural resource areas (e.g., protected trails) crossed by the Proposed Route and Alternative Routes C, D, and E.

Across Frederick County, there are four residential dwellings within 500 feet of the Proposed Route and Alternative Routes C, D, and E centerline. While this proximity does not mean that these residents will have unobstructed views of the ROW Corridor, it increases the likelihood that there may be perceivable changes in foreground (under 0.5 mile) scenic conditions from these residences.

2.4.2.2 ALTERNATIVE ROUTES B AND F

Alternative Routes B and F cross through the same landscape units as the Proposed Route and Alternative Routes C, D, and E. Similarly, dense vegetation and terrain would help screen views of the transmission line in forested areas, while lawns and agricultural fields would offer broader, more extensive views of the new infrastructure.

Across all types of landscapes, the Alternative Route B and F ROW Corridor would be most visible where it crosses roads. Similar to the Proposed Route and Alternative Routes C, D, and E, there are three tertiary road crossings in Frederick County.

The Alternative Route B and F ROW Corridor parallels the same existing high-voltage transmission lines as the Proposed Route and Alternative Route C, D, and E ROW Corridor, but over a shorter distance (0.7 mile compared to 1.0 mile).

The Alternative Route B and F ROW Corridor does not cross any parks, trails, outdoor recreation use areas, or other designated natural resource areas.

There are four residential dwellings within 500 feet of Alternative Routes B and F centerline. This is the same amount as the Proposed Route and Alternative Routes C, D, and E.

2.4.2.3 WOODSIDE SUBSTATION SITE

The Woodside Substation site is in a transition area between Rural Agricultural and Rural Developed landscape units. The substation would be most visible along I-81, other adjacent local roads, and nearby residences. Clusters of dense forest vegetation interspersed between properties and along travel corridors will help screen views of the substation. The generally flat to low rolling hills in the area also limit wider, panoramic views of the landscape including the substation.

However, lawns, agricultural fields, and existing cleared transmission line ROWs provide some areas of increased visibility, in particular at shorter viewing distances.

The Woodside Substation site is sited along an existing high-voltage transmission line ROW. The ROW includes side-by-side 500 kV and 138 kV transmission lines. These existing transmission lines add tall, vertical, geometric forms and long, thin, slightly undulating horizontal overhead lines to the landscape. The substation infrastructure will generally add similar types of industrial features to the landscape in this area. While the presence of the existing transmission infrastructure will help reduce visual impacts, the overall level of development and visual change will increase with the addition of the substation.

2.5 CULTURAL RESOURCES

A desktop review of previously recorded existing battlefields, cemeteries, archaeological sites, and aboveground architectural resources was conducted to evaluate constraints and opportunities to support the MARL Project with data obtained in June and September 2025 (ABPP n.d.; NPS 2018; NRHP 2025; VDHR 2025). This section is presented differently than those addressing other resources due to the regulatory nature of cultural resources. The cultural resources existing conditions assessment discussed in this section include archaeological resources and aboveground architectural resources within a 1-mile buffer of the route centerline and the Woodside Substation site. The potential impact assessment for the architectural resources includes those resources within a 0.5-mile buffer from the route centerline and the Woodside Substation site, whereas potential impacts for archaeological resources were considered for the ROW Corridor and within the Woodside Substation site (Attachment 1e, Cultural Resources Mapbook). For ancillary facility workspaces, potential impacts are considered to be the footprint of the ancillary facility workspace for archaeology and up to 500 feet on either side of the ancillary facility workspace (e.g., access road) or radius around the workspace for potential visual impacts.

As part of the CPCN application process, the SCC may require further assessment of the integrity of the archaeological site and evaluation of aboveground architectural resources. Such investigations will be performed during a subsequent phase of the MARL Project.

According to 36 CFR § 60.4, cultural resources eligible for listing on the National Register of Historic Places (NRHP) are defined as buildings, structures, objects, sites, and districts that have integrity and meet one or more of the significance criteria outlined below. Integrity can be broadly interpreted but generally refers to a resource's location, design, setting, materials, workmanship, feeling, and/or association through which the resource's significance is evident. Depending on the ultimate permitting needs for the MARL Project, the Virginia Department of Historic Resources (VDHR) will review or assist the federal agency in determining potential MARL Project impacts on significant cultural resources as outlined in the federal or state laws. Consideration of the below criteria evaluation will likely guide the VDHR in its determination of what constitutes a significant cultural resource. For the purposes of this ERD, MARL Project impacts are generally considered adverse when they result in the loss of a resource's integrity to the point where it may no longer be eligible for the NRHP.

The following criteria for evaluation of NRHP eligibility are outlined in 36 CFR § 60.4:

- **Criterion A (Event)**: Association with one or more events that have made a significant contribution to the broad patterns of national, state, or local history;
- **Criterion B (Person)**: Association with the lives of persons significant in the past;
- **Criterion C (Design/Construction)**: Embodiment of distinctive characteristics of a type, period, or method of construction; or representation of the work of a master; or possession of high artistic values; or representation of a significant and distinguishable entity whose components may lack individual distinction; and
- **Criterion D (Information Potential)**: Properties that yield, or are likely to yield, information important in prehistory or history.

2.5.1 EXISTING CONDITIONS

The existing conditions for the Proposed Route, Alternative Routes, and Woodside Substation site are discussed in more detail below. The Proposed Route and Alternative Routes C, D, and E are identical, while Alternative Routes B and F follow a different path. Attachment 1e shows the locations of the resources within the 1-mile buffer from the Proposed Route and Alternative Route centerlines.

In some cases, the VDHR Virginia Cultural Resources Information System (VCRIS) did not include NRHP eligibility or status information for archaeological and architectural resources; therefore, ERM has presumed their status to be Not Evaluated for the purposes of this report.

2.5.1.1 BATTLEFIELDS

The Proposed Route, Alternative Routes, or Woodside Substation site do not cross or are not within 1 mile of any recorded battlefields (ABPP n.d.).

2.5.1.2 CEMETERIES

The VCRIS dataset does not broadly include cemeteries; rather, cemeteries may be assigned site numbers in the archaeological or architecture resource datasets. Two cemeteries, noted in the following sections, are included in the VCRIS dataset. Cemeteries not previously recorded as cultural resources are addressed in Section 2.2.9, Schools, Cemeteries, and Places of Worship. There are no cemeteries within the Woodside Substation site.

2.5.1.3 ARCHAEOLOGY RESOURCES

This section presents information on previously recorded archaeological sites within the 1-mile buffer from the Proposed Route and Alternative Routes centerlines and the Woodside Substation site. Attachment 1e depicts the locations of these sites. Table 2.5-1 shows archaeological sites within the 1-mile buffer from the route centerlines of the Proposed Route, Alternative Route, and Woodside Substation site. There are ten previously recorded archaeological sites within the 1-mile buffer from the route centerlines of the Proposed Route and Alternative Route and Woodside Substation site. Of the ten sites, two have been determined potentially eligible, one has been determined not eligible, and seven have not been evaluated for inclusion on the NRHP. Archaeological sites that are within the ROW Corridors are discussed in more detail in Section 2.5.2, Impacts.

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TABLE 2.5-1 ARCHAEOLOGICAL SITES WITHIN THE 1-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE

Site Number	Site Name	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
44FK0696	NA	Pre-contact; lithic scatter	Potentially Eligible	x [a]	x [a]	
44FK0644	NA	Historic: military camp	Not Eligible			x
44FK0670	NA	Historic: military camp	Not Evaluated			x
44FK0697	NA	Historic; trash scatter	Potentially Eligible			x
44FK0709	NA	Historic; mill	Not Evaluated			x
44FK0997	Wesley Cemetery	Historic; cemetery	Not Evaluated			x
44FK1003	NA	Historic; other	Not Evaluated	x	x	
44FK1004	NA	Historic; single dwelling	Not Evaluated	x	x	
44FK1067	Clearbrook	Historic; outbuilding	Not Evaluated			x
44FK1108	L. Payne Site	Pre-contact; lithic scatter	Not Evaluated			x

Source: VDHR 2025

NA = not applicable; NRHP = National Register of Historic Places
An "x" indicates the archaeological site is within the 1-mile buffer from the Proposed Route and Alternative Route centerlines or the Woodside Substation site.
[a] The site number is located within the ROW Corridor, as discussed in Section 2.5.2.

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2.5.1.4 ABOVEGROUND ARCHITECTURAL RESOURCES

This section presents information on previously recorded aboveground architectural resources in the 1-mile buffer from the Proposed Route and Alternative Routes centerlines and Woodside Substation site. The locations of resources relevant to the Proposed Route and Alternative Route centerlines and Woodside Substation site are depicted in Attachment 1e.

Table 2.5-2 lists the number of previously recorded aboveground architectural resources within the 1-mile buffer from the Proposed Route and Alternative Route centerlines and Woodside Substation site, as well as the number of NRHP-listed and NRHP-eligible resources within the 1-mile buffer from the Proposed Route and Alternative Route centerlines and Woodside Substation site. In total, there are 81 previously recorded aboveground architectural resources within the 1-mile buffer from the Proposed Route and Alternative Route centerlines and Woodside Substation site (Table 2.5-3).

Two resources within the 1-mile buffer from the Proposed Route and Alternative Route centerlines and Woodside Substation site are NRHP-listed or NRHP-eligible and four are potentially eligible for listing. A brief description of these resources and their eligibility criteria are provided below.

TABLE 2.5-2 SUMMARY OF ARCHITECTURAL RESOURCES WITHIN THE 1-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE

Route	Architectural Resources			
	Within ROW Corridor or Woodside Substation Site	**Within 0.5-Mile Buffer from the Route Centerline or Woodside Substation Site**	**Within 1-Mile Buffer from the Route Centerline or Woodside Substation Site**	**NRHP-Listed, Eligible, or Potentially Eligible Within 1-Mile Buffer from the Route Centerline or Woodside Substation Site**
Proposed Route / Alternative Route C / Alternative Route D / Alternative Route E	0	20	30	2
Alternative Route B / Alternative Route F	0	19	30	2
Woodside Substation Site	0	15	51	4

Source: NRHP 2025; VDHR 2025

NRHP = National Register of Historic Places; ROW = right-of-way

National Register of Historic Places-Listed Architectural Resources

- Sunrise, also known as Muse House (034-0486/NRHP# 95000021), is a circa 1818 Greek Revival farmhouse with a side-gabled, standing-seam metal roof, weatherboard siding, and a stone foundation. The dwelling features multiple historic additions, and the resource includes three outbuildings. It is listed under Criterion C for its architectural significance as a dwelling that represents the evolution of a vernacular log structure to a Greek Revival farmhouse. The resource is within the 1-mile buffer of the Proposed Route and Alternative Routes centerlines (VDHR 2025).

National Register of Historic Places-Eligible and Potentially Eligible Architectural Resources

- Hollow Road (034-5024) is a gravel, single lane portion of the circa 1742 Romney Wagon Road. It was recommended eligible under Criterion A for its associations with historic transportation patterns in the region. The resource is situated within the 1-mile buffer of the Proposed Route and Alternative Routes centerlines (VDHR 2025).
- The Branson House, also known as Greenwood Farm (034-0137), is a circa 1740, stone vernacular single dwelling with a side-gabled, standing-seam metal roof and four outbuildings. It was recommended potentially eligible under Criterion C for its architectural significance as one of the oldest stone dwellings in the county. The resource is located within the 0.5-mile buffer of the Woodside Substation site (VDHR 2025).
- The Pitzer House (034-0155) is a circa 1800 vernacular dwelling with a side-gabled, standing-seam metal roof and fieldstone exterior and includes seven outbuildings. It was recommended potentially eligible under Criterion C as a well-preserved example of vernacular 19th century stone architecture that retains most of its original features. The resource is located within the 1-mile buffer of the Woodside Substation site (VDHR 2025).
- The Branson-Stephenson-Huyett-Light House, also known as Woodside (034-0731), is a circa 1840 federal style single dwelling with a gabled, standing-seam roof and weatherboard siding. The farmstead includes multiple historic and modern outbuildings. It was recommended potentially eligible for NRHP listing; however, the VDHR does not specify under what criteria. The resource is located within the 1-mile buffer of the Woodside Substation site (VDHR 2025).
- The Hugh Lupton House (034-0929) is a Queen Anne dwelling built in 1897, with a central hipped roof surrounded by cross-gables with hexagonal and rectangular slates and stretcher-bond brick cladding. It features several towers, and the resource includes five outbuildings. It was recommended potentially eligible as it is one of the only Queen Anne dwellings in the area. It is situated within the 0.5-mile buffer of the Woodside Substation site (VDHR 2025).

TABLE 2.5-3 ARCHITECTURAL RESOURCES WITHIN THE 1-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE

Resource Number	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
034-0137	Branson House/Greenwood Farm	Potentially Eligible			x [a]
034-0155	Pitzer House	Potentially Eligible			x
034-0156	Sasparilla Springs Farm	Not Eligible			x
034-0157	Northwood	Not Eligible			x
034-0169	Log house	Not Eligible	x	x	
034-0170	George Parrish House	Not Eligible	x	x	
034-0171	Biggert-Zepp House	Not Eligible	x	x	
034-0401	Anderson's Tavern	Not Eligible	x	x	
034-0482	Eaton House	Not Evaluated	x	x	
034-0483	J.R. Lewis Farm	Not Eligible	x	x	
034-0484	Anderson-Pugh House	Not Eligible	x	x	
034-0485	John Griffin House	Not Evaluated	x	x	
034-0486/ 95000021	Sunrise	Listed	x	x	
034-0730	Dangerfield-Phelps-Robinson House	Not Eligible			x
034-0731	Branson-Stephenson-Huyett-Light House	Potentially Eligible			x
034-0898	Williams House	Not Eligible	x	x	
034-0899	Raymond Whiteacre House	Not Eligible	x	x	
034-0921	Rest United Methodist Church and Cemetery	Not Eligible			x
034-0922	Schlack House	Not Eligible			x
034-0923	Vernacular dwelling	Not Eligible			x
034-0924	Vernacular dwelling	Not Evaluated			x
034-0925	Oak Grove Restaurant	Not Eligible			x
034-0926	Locust Level	Not Eligible			x
034-0927	Branson School	Not Eligible			x
034-0928	Lupton-Hodson House	Not Evaluated			x

Resource Number	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
034-0929	Hugh Lupton House	Potentially Eligible			x [a]
034-0930	Edward Joliffe House	Not Evaluated			x
034-0931	Dr. Cochran House II	Not Evaluated			x
034-0967	Pence-Butler House	Not Evaluated			x
034-0969	Purcell House	Not Eligible			x
034-0970	Sunnycroft	Not Eligible			x
034-1053	Anderson-Reese House	Not Eligible			x
034-1054	Clarke Cather House	Not Eligible			x
034-1055	Whetzel-Lord House	Not Eligible			x
034-1068	Oak Shade Farm	Not Eligible			x
034-1463	Lewis-Solenberger House	Not Evaluated			x
034-1464	Cather House	Not Evaluated			x
034-1465	Crim, Hugh, House (Current)	Not Eligible			x
034-1479	Cedar Hill Historic District	Not Evaluated			x
034-1515	Fairview Lutheran Church	Not Evaluated	x	x	
034-1517	Bethel United Methodist Church	Not Evaluated	x	x	
034-1518	E. LaFollet House	Not Evaluated	x	x	
034-1521	Cell-Richards-Anderson House	Not Eligible	x	x	
034-5014	Bridge #1011	Not Eligible	x	x	
034-5024	Hollow Road	Eligible	x	x	
034-5063	Bungalow dwelling	Not Eligible			x
034-5064	Mid-20th century dwelling	Not Eligible			x
034-5091	Commercial garage	Not Eligible	x	x	
034-5092	Minimal Traditional dwelling	Not Eligible	x	x	
034-5093	Minimal Traditional dwelling	Not Eligible	x	x	
034-5094	Craftsman Bungalow dwelling	Not Eligible	x	x	
034-5095	Vernacular dwelling	Not Eligible	x	x	
034-5096	Vernacular dwelling	Not Eligible	x	x	
034-5097	Vernacular dwelling	Not Eligible	x	x	
034-5098	Craftsman Bungalow dwelling	Not Eligible	x	x	

Resource Number	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
034-5099	Vernacular dwelling	Not Eligible	x	x	
034-5100	Vernacular dwelling	Not Eligible	x	x	
034-5101	Vernacular dwelling	Not Eligible	x	x	
034-5102	Commercial store	Not Eligible	x	x	
034-5104	Rubble fieldstone foundation	Not Eligible	x	x	
034-5138	Gambrel-roofed barn	Not Eligible			x
034-5204	McGowan House	Not Eligible			x
034-5205	Fitzwater House	Not Eligible			x
034-5206	Ranch dwelling	Not Eligible			x
034-5207	Dean House	Not Eligible			x
034-5208	Jennings House	Not Eligible			x
034-5209	Manning House	Not Eligible			x
034-5210	Manning House	Not Eligible			x
034-5211	Manning House	Not Eligible			x
034-5212	Frazier-Peyton House	Not Eligible			x
034-5213	Helsley House	Not Eligible			x
034-5214	Curry House	Not Eligible			x
034-5215	Kitts House	Not Eligible			x
034-5216	Larrick House	Not Eligible			x
034-5426	Bungalow dwelling	Not Evaluated			x
034-5478	Ranch dwelling	Not Evaluated			x
034-5479	Ranch dwelling	Not Evaluated			x
034-5480	Ranch dwelling	Not Evaluated			x
034-5481	Craftsman Bungalow dwelling	Not Evaluated			x
034-5482	Industrial Complex	Not Evaluated			x
034-5484	Farmstead	Not Evaluated			x

Source: NRHP 2025; VDHR 2025
NRHP = National Register of Historic Places
An "x" indicates the architectural site is within the 1-mile buffer from the Proposed Route and Alternative Route centerlines or the Woodside Substation site.
[a] This indicates that the resource is within the 0.5-mile buffer from the Proposed Route or Alternative Route ROW Corridor or Woodside Substation site, as discussed in Section 2.5.2.

2.5.2 IMPACTS

The following section discusses the impacts associated with the MARL Project where the potential impacts on archaeological sites and cemeteries are associated with the ROW Corridors and Woodside Substation site, and potential impacts on aboveground architecture resources are associated with the 0.5-mile buffer from the Proposed Route and Alternative Route centerlines and the Woodside Substation site (Attachment 1e). Based on prior agency consultation and guidance from the *Guidelines for Assessing Impacts of Proposed Electric Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia*, the 0.5-mile buffer is expected to be the maximum extent of consideration for potential visual impacts (VDHR 2008). Additionally, potential impacts for the Proposed Route ancillary facility workspaces were considered within the facility workspaces for archaeological sites and within a 500-foot buffer for aboveground architectural resources. Further information on potential impacts can be found in Attachment 4, Pre-Application Analysis Report.

2.5.2.1 BATTLEFIELDS

The Proposed Route, Alternative Routes, or Woodside Substation site do not cross or are not within 0.5 mile of any battlefields. Furthermore, there are no battlefields associated with ancillary facility workspaces.

2.5.2.2 CEMETERIES

There are no cemeteries within any of the Proposed Route or Alternative Route ROW Corridors or Woodside Substation site. No impacts on previously recorded cemeteries are anticipated as a result of construction or operation of the Proposed Route, Alternative Routes, or Woodside Substation site. In addition, there are no cemeteries within any of the Proposed Route ancillary facility workspaces.

2.5.2.3 ARCHAEOLOGICAL RESOURCES

There is one previously identified archaeological site (44FK0696) within the ROW Corridor for the Proposed Route and all the Alternative Routes. Site 44FK0696 is a pre-contact lithic scatter that has been recommended potentially eligible for NRHP listing; however, the VDHR has not specified under what criteria (Table 2.5-4).

There are no recorded sites within the Woodside Substation site or any of the ancillary facility workspaces.

The MARL Project archaeological resources investigation will include a field survey of Site 44FK0696 and its immediate vicinity to determine site boundary, depth, and the condition and nature of any artifact assemblage to assess information potential and applicability of all NRHP eligibility criteria. Archaeological work at this site will be executed in coordination with the VDHR. Should MARL Project construction or operation potentially affect the site location, an evaluation of site eligibility for inclusion on the NRHP will be required. Should the impact be considered an adverse effect, NEET VA will review opportunities to avoid or minimize MARL Project impacts. Should an adverse effect be unavoidable, NEET VA will coordinate treatment of an adverse effect through avoidance, minimization, or mitigation with the VDHR.

NEET VA will conduct a Phase I archaeological resources investigation of the Siting Corridor in coordination with the VDHR, as it is anticipated that any resource within the ROW Corridor could be directly affected. The investigation will concentrate efforts in areas of high potential for both pre-contact and historic period archaeological sites. Should the investigation result in the identification of archaeological resources, additional archaeological investigations (including Phase II site evaluations) may be required to assess each site's eligibility for inclusion on the NRHP. NEET VA will coordinate treatment of an adverse effect through avoidance, minimization, or mitigation with the VDHR.

TABLE 2.5-4 ARCHAEOLOGICAL RESOURCES WITHIN THE PROPOSED ROUTE AND ALTERNATIVE ROUTE ROW CORRIDORS AND THE WOODSIDE SUBSTATION SITE

Site Number	Site Name	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
44FK0696	NA	Pre-contact; lithic scatter	Potentially Eligible	x	x	

Source: VDHR 2025

NA = not applicable; NRHP = National Register of Historic Places

2.5.2.4 ABOVEGROUND ARCHITECTURAL RESOURCES

ERM conducted viewshed modeling to determine the potential distance of visual impact for architectural resources and determined that a 0.5-mile buffer from the route centerlines of the Proposed Route, Alternative Routes, and Woodside Substation site provided a sufficient distance to conduct a preliminary desktop impact assessment for the NRHP-listed and NRHP-eligible / potentially eligible architectural resources (Table 2.5-5 and Table 2.5-6). Resources that have not yet been evaluated for NRHP eligibility may require further assessment and evaluation.

Additionally, ERM conducted a desktop investigation on aboveground architectural resources within 500 feet of the Proposed Route and Alternative Routes ancillary facility workspaces (Table 2.5-7). None are listed or recommended eligible or potentially eligible for inclusion on the NRHP.

MARL Project potential impacts on NRHP-potentially eligible architectural resources are based on visual assessment findings. ERM recommends that MARL Project construction and operation could result in potential impacts on two resources within the 0.5-mile buffer from the route centerline, as detailed in Table 2.5-5 and Table 2.5-6. These impact statements are preliminary and could change when ERM conducts the field survey.

National Register of Historic Places-Potentially Eligible Architectural Resources

The Branson House (034-0137) is located approximately 1,600 feet (0.30 mile) east-to-southeast of the Woodside Substation site. The surrounding area is a mixture of rural and commercial land use, with a pharmaceutical distribution center to the southwest, an existing transmission line to the north, and trees bordering the resource. Construction of the Woodside Substation site would introduce additional modern elements to the resource's western viewshed.

The Hugh Lupton House (034-0929) is located approximately 0.38 mile south of the Woodside Substation site. The surrounding area is a mixture of rural, residential, and commercial land use, with pastureland to the north, west, and east; dwellings to the south; and a pharmaceutical distribution center to the north. Construction of the Woodside Substation site would add additional modern elements to the northern viewshed, but its visibility would be limited and in the distance.

TABLE 2.5-5 ARCHITECTURAL RESOURCES WITHIN THE 0.5-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES AND THE WOODSIDE SUBSTATION SITE

Resource Number	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
034-0137	Branson House / Greenwood Farm	Potentially Eligible			x [a]
034-0157	Northwood	Not Eligible			x
034-0169	Log house	Not Eligible	x	x	
034-0170	George Parrish House	Not Eligible	x	x	
034-0171	Biggert-Zepp House	Not Eligible	x	x	
034-0482	Eaton House	Not Evaluated	x	x	
034-0483	J.R. Lewis Farm	Not Eligible	x	x	
034-0484	Anderson-Pugh House	Not Eligible	x	x	
034-0898	Williams House	Not Eligible	x	x	
034-0924	Vernacular dwelling	Not Evaluated			x
034-0925	Oak Grove Restaurant	Not Eligible			x
034-0926	Locust Level	Not Eligible			x
034-0927	Branson School	Not Eligible			x
034-0929	Hugh Lupton House	Potentially Eligible			x [a]
034-0969	Purcell House	Not Eligible			x
034-1463	Lewis-Solenberger House	Not Evaluated			x
034-1464	Cather House	Not Evaluated			x
034-1521	Cell-Richards-Anderson House	Not Eligible	x	x	
034-5091	Commercial garage	Not Eligible	x	x	
034-5092	Minimal traditional dwelling	Not Eligible	x	x	
034-5093	Minimal traditional dwelling	Not Eligible	x	x	
034-5094	Craftsman bungalow dwelling	Not Eligible	x	x	
034-5095	Vernacular dwelling	Not Eligible	x	x	
034-5096	Vernacular dwelling	Not Eligible	x		
034-5097	Vernacular dwelling	Not Eligible	x	x	

Resource Number	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
034-5098	Craftsman bungalow dwelling	Not Eligible	x	x	
034-5099	Vernacular dwelling	Not Eligible	x	x	
034-5100	Vernacular dwelling	Not Eligible	x	x	
034-5101	Vernacular dwelling	Not Eligible	x	x	
034-5104	Rubble fieldstone foundation	Not Eligible	x	x	
034-5478	Ranch dwelling	Not Evaluated			x
034-5479	Ranch dwelling	Not Evaluated			x
034-5480	Ranch dwelling	Not Evaluated			x
034-5481	Craftsman bungalow dwelling	Not Evaluated			x
034-5482	Industrial complex	Not Evaluated			x

Source: VDHR 2025

NRHP = National Register of Historic Places
An "x" indicates the architectural resource is within the 0.5-mile buffer from the Proposed Route or Alternative Route centerlines.
[a] Affected architectural resources

TABLE 2.5-6 ELIGIBLE AND LISTED ARCHITECTURAL RESOURCES WITHIN THE 0.5-MILE BUFFER FROM THE PROPOSED ROUTE AND ALTERNATIVE ROUTE CENTERLINES BY NATIONAL REGISTER OF HISTORIC PLACES STATUS

Resource Number	Description	Eligibility	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
034-0137	Branson House / Greenwood Farm	Potentially Eligible			x
034-0929	Hugh Lupton House	Potentially Eligible			x

Source: VDHR 2025

An "x" indicates the architectural resource is within the 0.5-mile buffer from the Proposed Route or Alternative Route centerlines.

TABLE 2.5-7 ABOVEGROUND ARCHITECTURAL RESOURCES WITHIN 500 FEET OF ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS

Resource Number	Description	NRHP Status	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
			Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities
034-1521	Cell-Richards-Anderson House	Not Eligible		x	x		x	x
034-5095	House	Not Eligible		x	x		x	x
034-5100	House	Not Eligible			x			x

Source: VDHR 2025

NRHP = National Register of Historic Places

2.6 ENVIRONMENTAL JUSTICE

The purpose of conducting an environmental justice (EJ) desktop assessment is to assess if the MARL Project would result in disproportionately high and adverse environmental impacts on communities of color, linguistically isolated communities, or low-income populations and to inform equitable decision-making throughout the planning process for the MARL Project. The Commonwealth of Virginia enacted the Virginia Environmental Justice Act (VEJA) in 2021 (Va. Code § 2.2-234 through 2.2-235). The VEJA defines the Commonwealth's EJ policy as "to promote environmental justice and ensure that it is carried out throughout the Commonwealth, with a focus on environmental justice communities and fenceline communities" (Va. Code § 2.2-235), based on the following definitions (Va. Code § 2.2-234):

- "Community of color" means any geographically distinct area where the population of color, expressed as a percentage of the total population of such area, is higher than the population of color in the Commonwealth expressed as a percentage of the total population of the Commonwealth. However, if a community of color is composed primarily of one of the groups listed in the definition of "population of color," the percentage population of such group in the Commonwealth shall be used instead of the percentage population of color in the Commonwealth.
- "Environmental justice" means the fair treatment and meaningful involvement of every person, regardless of race, color, national origin, income, faith, or disability, regarding the development, implementation, or enforcement of any environmental law, regulation, or policy.
- "Environmental justice community" means any low-income community or community of color.
- "Fair treatment" means the equitable consideration of all people whereby no group of people bears a disproportionate share of any negative environmental consequence resulting from an industrial, governmental, or commercial operation, program, or policy.
- "Fenceline community" means an area that contains all or part of a low-income community or community of color and that presents an increased health risk to its residents due to its proximity to a major source of pollution.
- "Low-income community" means any census block group (CBG) in which 30 percent or more of the population is composed of people with a low income.
- "Meaningful involvement" means the requirements that 1) affected and vulnerable community residents have access and opportunities to participate in the full cycle of the decision-making process about a proposed activity that will affect their environment or health and 2) decision makers will seek out and consider such participation, allowing the views and perspectives of community residents to shape and influence the decision.
- "Population of color" means a population of individuals who identify as belonging to one or more of the following groups: Black, African American, Asian, Pacific Islander, Native American, other non-white race, mixed race, Hispanic, Latino, or linguistically isolated.

2.6.1 ENVIRONMENTAL JUSTICE METHODOLOGY

This analysis defines the CBG as the primary geographic unit for this EJ analysis (the "geographically distinct area" in the VEJA definition of "community of color"), because it is the smallest unit for which U.S. Census Bureau demographic data are available, providing information at a sub-county level. ERM collected demographic data from the U.S. Census Bureau American Community Survey, 5 Year Estimates (2019 to 2023) (U.S. Census Bureau 2024a, 2024b, 2024c) for CBGs within 10 miles of the MARL Project facilities (including the Proposed Route, Alternative Routes, and Woodside Substation). ERM also reviewed the VDEQ VA EJScreen+ Map Tool (VDEQ 2025), which includes the latest U.S. Census Bureau data.

While the Commonwealth of Virginia is the reference population (the larger population to which individual CBGs are compared to identify potential EJ receptors) for this analysis, Frederick County data are also considered in the review to assess regional demographic variations.

Based on the VEJA guidelines, EJ communities (CBGs) are identified in this report using the criteria described below:

- Racial/ethnic composition;
- The percent of a CBG's population that meets the criteria for a community of color or a population of color is greater than the Commonwealth average (e.g., a population of color greater than 41 percent, a Black or African American alone community of color greater than 18 percent);
- The percent of the population in the analysis area considered linguistically isolated (the population that does not speak English at least "very well," as reported in the U.S. Census) is greater than the Commonwealth average of 3 percent; and
- Low-income community: the CBG meets VEJA criteria for low-income population status. ERM used the VA EJScreen+ tool to make this determination.

2.6.2 EXISTING CONDITIONS

The Proposed Route and Alternative Routes all cross the same CBG and are within 10 miles of the same 17 CBGs (the EJ analysis area). This list of CBGs includes the CBG containing the Woodside Substation site. Accordingly, this section discusses the Proposed Route, Alternative Routes, and Woodside Substation together. Figure 2.6-1 shows the CBGs within the EJ analysis area, while Table 2.6-1 summarizes demographic information for the populations of these CBGs. Each CBG is identified first by the tract in which it is located, followed by its unique block group (BG) designation within that tract.

Of the 17 CBGs evaluated, 10 CBGs meet at least one of the criteria listed above and are thus identified as potential EJ populations or communities and or fenceline communities.

The Virginia portion of the MARL Project is entirely within Frederick County. As shown in Table 2.6-1, the county's population of color percentage is nearly half of the statewide percentage. Approximately 21 percent of the county's population is low-income.

Notable findings from Table 2.6-1 are summarized below:

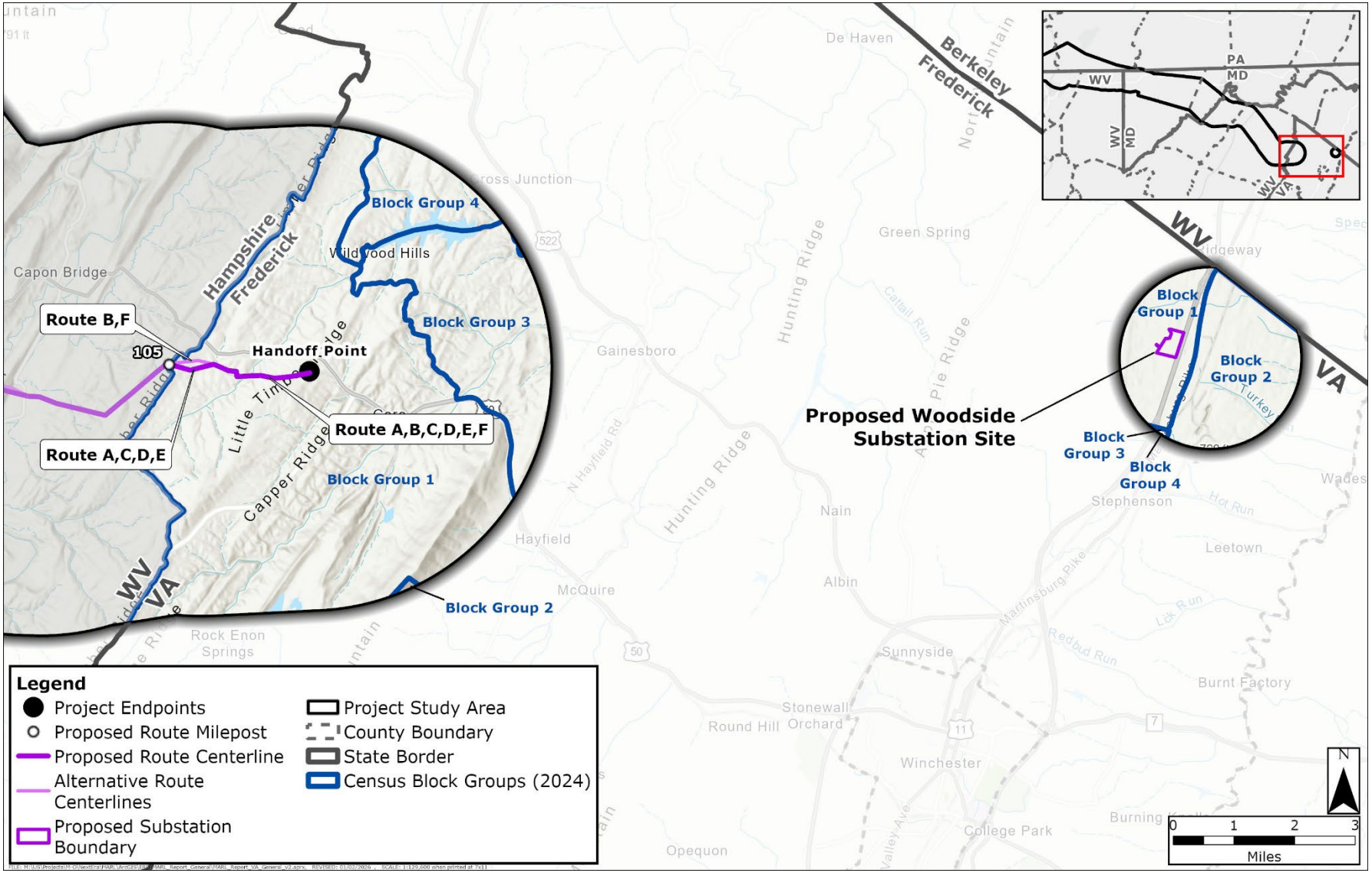
- Three CBGs have Hispanic or Latino populations higher than the state threshold of 11 percent.
- Four CBGs exceed the 4 percent state threshold for individuals identifying as two or more races.
- One CBG reports 2 percent of residents identifying as "some other race alone," surpassing the 0.5 percent state threshold.
- Two CBGs—including the CBG that contains the Woodside Substation site—exceed the threshold for American Indian or Alaska Native populations, indicating the presence of historically underrepresented groups.
- Nine CBGs surpass the low-income threshold defined by the VEJA. The CBG that includes the Proposed Route and Alternative Routes has the highest low-income concentration, 63 percent of the CBG population.

2.6.3 IMPACTS

This section provides an overview of the potential impacts associated with the MARL Project and its Alternative Routes based on the EJ criteria thresholds for race, ethnicity, income, limited English-speaking households and fenceline communities, as described in Section 2.6.1, Environmental Justice Methodology. The analysis evaluates how the MARL Project may affect surrounding communities, particularly those identified as populations of color, communities of color, low-income populations, and linguistically isolated communities.

As discussed in Section 2.6.2, Existing Conditions, 10 of the 17 CBGs in the EJ analysis area in Virginia meet at least one EJ criterion. This includes the CBG that contains the Proposed Route and Alternative Routes, which meets EJ criteria related to low-income population, as well as the CBG that contains the Woodside Substation site, which meets the EJ criteria for American Indian or Alaska Native populations and low-income populations. The presence of these communities within proximity to the MARL Project areas underscores the importance of a thorough and equitable assessment of potential environmental and health impacts and the need for meaningful public engagement throughout the development processes.

FIGURE 2.6-1 CENSUS BLOCK GROUPS WITHIN 10 MILES OF THE PROPOSED ROUTE, ALTERNATIVE ROUTES, AND WOODSIDE SUBSTATION SITE



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

TABLE 2.6-1 ENVIRONMENTAL JUSTICE INDICATORS FOR CENSUS BLOCK GROUPS WITHIN 10 MILES OF THE ROUTES

Geography	Population	Total Populations of Color [a] (%)	White Alone (%)	Black or African American Alone (%)	American Indian and Alaska Native Alone (%)	Asian Alone (%)	Native Hawaiian and Pacific Islander Alone (%)	Some Other Race Alone (%)	Two or More Races (%)	Hispanic or Latino (%)	Low-Income Population (%)	Limited English-Speaking Household (%)
Virginia	8,657,499	41	59	18	0.1	7	0.1	0.5	4	11	23	3
Frederick County	93,355	21	79	4	0	2	0	0	3	12	21	2
CT 502.00 BG 1	1,582	18	82	2	0	0	0	0	0	16	38	0
CT 502.00 BG 2	883	3	97	0	0	1	0	0	1	1	26	0
CT 502.00 BG 3	1,306	17	83	8	0	3	0	0	2	4	28	0
CT 503.00 BG 1	2,107	8	92	0	0.2	0	0	0	2	6	39	1
CT 503.00 BG 2	1,082	3	97	0	0	0	0	2	0	0	32	0
CT 503.00 BG 3	1,260	0	100	0	0	0	0	0	0	0	24	0
CT 503.00 BG 4	1,808	6	94	2	0	0	0	0	1	4	12	0
CT 504.01 BG 1	748	7	93	0	0	0	0	0	7	0	36	0
CT 504.01 BG 2	2,602	6	94	1	0	1	0	0	3	0	40	0
CT 504.01 BG 3	1,273	11	89	0	0	1	0	0	7	4	24	2
CT 504.02 BG 1 [a]	**1,929**	**11**	**89**	**5**	**0.3**	**0**	**0**	**0**	**4**	**2**	**33**	**0**
CT 504.02 BG 2 [b]	**814**	**1**	**99**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**63**	**0**
CT 505.00 BG 1	1,081	26	74	8	0	0	0	0	18	0	24	0
CT 505.00 BG 2	867	3	97	0	0	0	0	0	3	0	28	0
CT 505.00 BG 3	1,057	8	92	1	0	2	0	0	5	0	25	0
CT 505.00 BG 4	1,796	32	68	1	0	2	0	0	1	29	42	0
CT 505.00 BG 5	1,563	28	72	7	0	0	0	0	1	20	39	0

Sources: U.S. Census Bureau 2024a, 2024b

Notes:
BG = block group; CBG = census block group; CT = census tract (all CBGs are assigned to a single CT; a CT may contain more than one CBG)
[a] CT 504.02 BG 1 is the location of the Woodside Substation site and is shown in bold.
[b] The Proposed Route and Alternative Routes all cross CT 504.02 BG 2, which is shown in bold.
Gray shaded cells include reference population.
Blue shaded cells indicate populations of color including community of color is composed primarily of one of the groups listed in the VEJA definition of "population of color" or the analysis area has a greater percentage of a community of color than the state as a whole.
Yellow shaded cells indicate low-income populations.

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Within CBGs that meet EJ criteria—particularly the CBGs that contain MARL Project facilities—the direct impacts described in this ERD could potentially have disproportionately large and adverse impacts on residents, especially those who identify as a race and ethnicity other than non-Hispanic White, are linguistically isolated, and/or meet low-income criteria.

The EJScreen+ Map Tool does not specifically identify fenceline communities and also does not show any major pollution sources within the MARL Project Study Area in Virginia (VDEQ 2025). To the degree that a CBG meets the community of color or population of color criteria and contains or is adjacent to a major source of pollution not shown on EJScreen+, those communities may meet the VEJA fenceline community definition provided above. Although MARL Project construction would generate emissions from construction vehicles, the MARL Project overall would not be (and would not contribute to) a new major pollution source.

In addition to implementation of the avoidance and mitigation measures described in this ERD, NEET VA will continue outreach efforts to owners and users of lands within and near the MARL Project footprint to identify and understand potential negative environmental consequences resulting from this activity. NEET VA will develop mitigation measures to address these impacts, as appropriate.

2.7 GEOLOGICAL RESOURCES

2.7.1 PHYSIOGRAPHIC SETTING, GEOLOGY, AND GROUNDWATER

The Proposed Route and Alternative Route Siting Corridors, as well as the Woodside Substation site, are within the middle section of the Valley and Ridge physiographic province (NPS 2017) (Figure 2.7-1). The land surface elevation within the Siting Corridors starts high on Timber Ridge in western Frederick County, decreases toward the east into the Isaacs Creek valley, and then rises again to Little Timber Ridge before terminating. Elevation along the Siting Corridors ranges from approximately 1,200 feet above mean sea level (amsl) on the ridges to approximately 900 feet amsl in the valley. The Woodside Substation site is located within the Shenandoah Valley and sits on relatively flat-lying topography at approximately 650 feet amsl.

2.7.1.1 EXISTING CONDITIONS

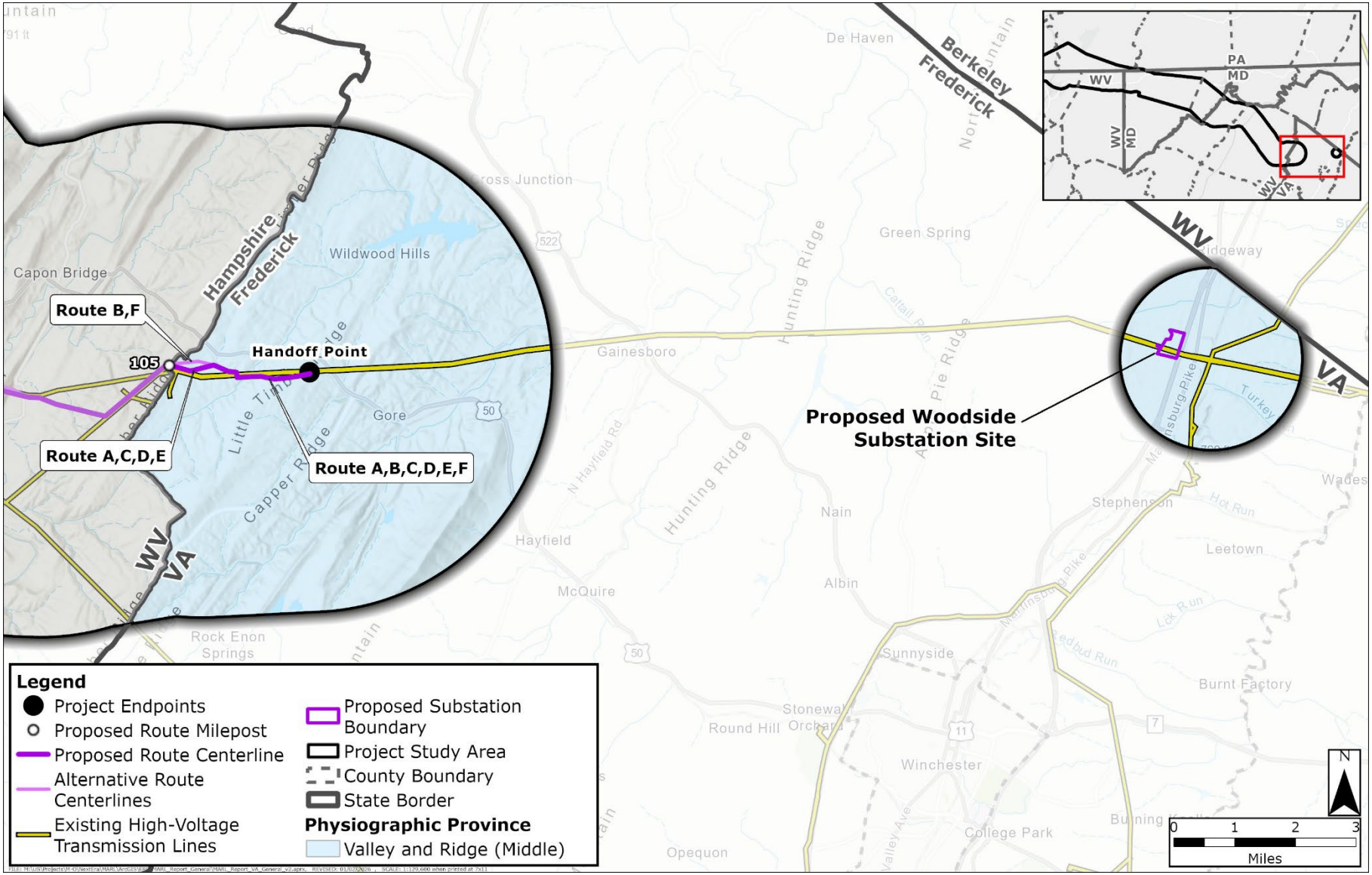
Geology

The geology within the Siting Corridors and Woodside Substation site can be generalized as repeating sections of sedimentary sandstones, siltstones, and mudstones due to the folded nature of the Valley and Ridge province.

Based on the Geologic Map of Virginia (VDE 2021), from youngest to oldest, the Siting Corridors are primarily underlain by the Foreknobs Formation (Dfk) and the Hampshire Formation (Dhs). The Woodside Substation site is underlain by the Beekmantown Group (Ob). The following is a summary of these geologic formations:

- Foreknobs Formation (Dfk): This formation is primarily sandstone and shale. It is dark-gray and greenish-gray, fine-grained, thin- to thick-bedded, lithic sandstone and interbedded greenish-gray, fissile, clay shale. Minor quartz-pebble conglomerate, thin red sandstone, and fossil shell beds are present locally. Formation thickness ranges from 0 to 2,500 feet.
- Hampshire Formation (Dhs): This formation is primarily sandstone and interbedded mudstone. It is grayish-red or greenish-or brownish-gray color, fine-grained, locally conglomeratic sandstone with planar cross-bedded to massive sandstone beds and coaly plant material. It intertongues with the underlying Foreknobs Formation at the base. Formation thickness ranges from 200 to 2,000 feet.
- Beekmantown Group (Ob): This is a sequence of carbonate rocks consisting primarily of dolomite, limestone, and chert (VDE 2021). The group includes the Pinesburg Station Dolomite, Rockdale Run Formation (limestone), and Stonehenge Limestone.

FIGURE 2.7-1 PHYSIOGRAPHIC PROVINCES IN VIRGINIA



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

Karst

There are no known karst features or is no potential for karst development (USGS n.d.), mining, or other mineral constraints within the Siting Corridors.

One possible karst depression has been identified at the Woodside Substation site (VDE n.d.-a). Sinkholes have been identified on the opposite side of I-81, approximately 320 feet east of the eastern substation footprint, and approximately 1,600 feet south of the substation footprint (VDE n.d.-b). Because of the carbonate bedrock of the Beekmantown Group located at or near the surface, there is potential for the development of karst features at the Woodside Substation site.

Groundwater

ERM reviewed publicly available water well data from the VDE (2025) and the USGS National Water Information System (USGS 2019). There are no know water wells or springs within or in close proximity to the Siting Corridors. The few water wells reported for northwestern Frederick County are installed between 45 and 130 feet below ground surface (bgs). The nearest water level data indicate the depth to groundwater is approximately 25 feet bgs.

Groundwater is of sufficient quality and quantity for domestic and public supply within Frederick County. Additionally, there are no known groundwater management areas within the Siting Corridors.

At the Woodside Substation site, in Frederick County, one water well is reported approximately 1,400 feet southwest of the site boundary, and one spring (Branson Spring) is located approximately 1,900 feet east of the site boundary. Nearby wells indicate that the depth to water varies seasonally but is generally between 15 and 55 feet bgs (USGS 2005). Groundwater in Frederick County is used for domestic and public supply. There are no known groundwater management areas in the vicinity of the Woodside Substation site.

2.7.1.2 IMPACTS

Geology

Impacts on geology within the ROW Corridors include temporary impacts from construction activities and permanent impacts resulting from installation of transmission structures. The number of structures varies by route and ranges between 12 to 13 in Virginia. Structural foundations and footers will be embedded into the ground surface. The footprint of the permanent structures is limited in nature to a small area of the tower foundations and footers and does not extend the entire length of the ROW Corridor. The average span length between towers is approximately 1,258 feet.

Structural foundation types are subject to final engineering design, geophysical surveys, and geotechnical investigations. Typical installation would be drilled piers with reinforced concrete; however, micropiles could be used in certain circumstances and other foundation types will be considered on an as-needed basis. The need for blasting is not anticipated for the MARL Project. If blasting is needed pending future engineering design and construction planning, NEET VA will prepare a blasting plan. If a Blasting Plan is determined to be needed, NEET VA will obtain the necessary state and/or local permits. Drilling, if used, may have a localized impact at structure

foundation locations, particularly if karst is present. BMPs will be implemented if karst features are identified during construction.

The Woodside Substation site is a permanent facility and would have permanent impacts on the surface and near surface geology. Impacts during construction could include drilling, coring, or other mechanical disturbances of bedrock.

Karst

Karst features are not anticipated during construction of the Proposed Route, but if encountered, NEET VA will notify the VDEQ for further guidance and conduct additional investigations, as necessary. Construction of the Woodside Substation site is within a known area susceptible to karst development. A karst investigation will be conducted prior to construction following the Karst Assessment Standard Practice (Virginia Cave Board n.d.), for review by Frederick County. A Karst Management Plan will be developed, as necessary.

Groundwater

Impacts on groundwater are not anticipated, as permanent structures will be located within the shallow subsurface and above anticipated groundwater levels. No new groundwater withdrawal wells will be installed for use during construction activities; however, NEET VA may, where necessary, use existing groundwater wells with approval from Frederick County and/or landowners. BMPs for protecting groundwater include containment for leachable materials and/or chemicals, low permeability liners for liquids retention/detention, restricting discharge, and stormwater runoff control. As noted above, NEET VA will notify the VDEQ for further guidance and conduct additional investigations, as necessary, if karst features are identified during construction of the MARL Project.

Drilling or other earth work required for installation of the structural foundations will be limited to the footprint of the transmission structures and will not cover the entire length of the ROW Corridor. Groundwater extracted from within the Siting Corridors is not anticipated to be used during construction activities. Temporary construction activities are not expected to interfere with groundwater recharge, usage, or quality. No shallow unconfined groundwater or artesian conditions are known within the ROW Corridors that will be encountered during construction activities, including drilling. If groundwater is encountered during drilling, dewatering may be required during construction as a temporary measure. Dewatering is expected to be localized to the immediate construction area. BMPs for water discharge, such as water diversion and the use of liners will be implemented, as appropriate, to minimize surface erosion. Due to the anticipated limited extent of dewatering, subsidence is not expected to affect the MARL Project or surrounding overburden.

Construction activities are not expected to affect existing water wells. If water wells are encountered during preconstruction or construction activities, the surface completion and any other aboveground appurtenances will be protected using fencing or guarding. If wells are damaged during construction, NEET VA will notify the property owner, as well as the Virginia Department of Health.

2.7.2 SOILS

This section describes existing soils within the Proposed Route and Alternative Route Siting Corridors and soil-related impacts within the ROW Corridors for the Proposed Route and Alternative Routes, as well as the Woodside Substation site in Virginia.

2.7.2.1 EXISTING CONDITIONS

ERM reviewed data available from the U.S. Department of Agriculture National Resources Conservation Service Web Soil Survey (USDA NRCS 2025) for soil map units (soil types), farmland classification, corrosiveness of concrete and steel, drainage class, and hydric rating. Attachment 1f, Soils Mapbook, shows soil types in detail.

There are 69 different soil types in the MARL Project Study Area in Virginia, and the most abundant soil types include the following:

- Weikert-Berks channery silt loams—25 to 65 percent slopes (41E);
- Weikert-Berks channery silt loams—15 to 25 percent slopes (41D);
- Gainesboro-Lehew complex, 7 to 15 percent slopes (18C);
- Gainesboro-Lehew complex—15 to 25 percent slopes (18D);
- Gainesboro-Lehew complex—25 to 65 percent slopes (18E);
- Weikert-Berks channery silt loams—8 to 15 percent slopes (41C);
- Laidig very stony fine sandy loam—25 to 65 percent slopes (25E);
- Laidig very stony fine sandy loam—15 to 25 percent slopes (25D);
- Hazleton channery sandy loam—25 to 65 percent slopes, rubbly (24E);
- Berks channery silt loam—8 to 15 percent slopes (1C/BkC); and
- Weikert-Berks very stony silt loams—25 to 65 percent slopes (42E).

All the other soil types in Virginia individually account for less than 2 percent of the MARL Project Study Area in Virginia. Several of the most abundant soils types listed above are also among the most abundant in the Siting Corridors, including 41E, 18D, and 18E.

The Woodside Substation site contains four soil types:

- Oaklet silt loam—2 to 7 percent slopes (32B);
- Frederick-Poplimento loams—2 to 7 percent slopes (14B);
- Carbo-Oaklet, very rocky silt loams—2 to 15 percent slopes (6C); and
- Frederick-Poplimento, very rocky loams—2 to 7 percent slopes (16B).

Soils can be listed as prime farmland, unique farmland, or farmland of state or local importance. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. Farmland of statewide or local importance does not meet all the criteria of prime farmland but is still recognized as valuable for agriculture. Table 2.7-1 summarizes farmland classes within the Siting Corridors for the Proposed Route and Alternative Routes, as well

as the Woodside Substation site. While there is prime farmland in the Siting Corridors and Woodside Substation site, the MARL Project is not subject to the Farmland Protection Policy Act because its permitting, development, and operation does not involve federal funding. Per guidance from the Natural Resources Conservation Service, projects without federal funding, management, or technical assistance are not subject to the Farmland Protection Policy Act.

TABLE 2.7-1 FARMLAND SOIL CLASSES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Farmland Class [a]	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
All areas are prime farmland	0.0	0.0	61.7
Farmland of statewide importance	0.0	0.0	8.4
Farmland of local importance	0.0	0.0	0.0
Not prime farmland	141.1	141.4	2.7
Total [b]	**141.1**	**141.4**	**72.9**

Source: USDA NRCS 2025

[a] Prime farmland includes the following farmland class categories: all areas are prime farmlands, farmland of statewide importance, and farmland of local importance.
[b] Totals may not match the sum of addends due to rounding.

Only 0.5 acre of the Proposed Route and Alternative Routes is considered farmland of local importance within the Siting Corridors, and no areas are categorized as prime farmland or farmland of statewide importance (Table 2.7-1). The remaining 99 percent of the Siting Corridors for the Proposed Route and Alternative Routes is not prime farmland. Slightly more than 96 percent of the Woodside Substation site is prime farmland (Table 2.7-1).

Ratings are also given for the risk of corrosion to steel and concrete, which indicates the potential for a soil to corrode steel or concrete. The rate of corrosion of steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based primarily on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Ratings for corrosion of steel and concrete are given in qualitative terms, including “high,” “moderate,” “low,” and “NA” (not applicable). Table 2.7-2 summarizes corrosion to steel within the Siting Corridors for the Proposed Route and Alternative Routes, as well as the Woodside Substation site. Table 2.7-3 summarizes corrosion to concrete within the Siting Corridors for the Proposed Route and the Alternative Routes, as well as the Woodside Substation site.

TABLE 2.7-2 RISK RATINGS FOR CORROSION TO STEEL FROM SOIL CONTACT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Risk Rating	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
High	35.8	35.8	72.9
Moderate	95.0	94.1	0.0
Low	10.2	11.2	0.0
NA	0.0	0.3	0.0
Total [a]	**141.1**	**141.4**	**72.9**

Source: USDA NRCS 2025

NA = not applicable
[a] Totals may not match the sum of addends due to rounding.

TABLE 2.7-3 RISK RATINGS FOR CORROSION TO CONCRETE FROM SOIL CONTACT WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Risk Rating	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
High	38.6	38.6	0.0
Moderate	91.1	91.2	64.5
Low	11.3	11.3	8.4
NA	0.0	0.3	0.0
Total [a]	**141.1**	**141.4**	**72.9**

Source: USDA NRCS 2025

NA = not applicable
[a] Totals may not match the sum of addends due to rounding.

Approximately 92 percent of the Siting Corridors for the Proposed Route and Alternative Routes is composed of soils that pose either a high or moderate risk of corrosion to steel (Table 2.7-2). About 92 percent of soils in the Siting Corridors also pose either a high or moderate risk of corrosion to concrete (Table 2.7-3). All of the Woodside Substation site is composed of soils that pose a high risk of corrosion to steel (Table 2.7-2), and about 88 percent of the site is composed of soils that pose a moderate risk of corrosion to concrete (Table 2.7-3).

Hydric soils are defined by the National Technical Committee for Hydric Soils as soils that are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Changes in Hydric Soils of the United States, 59 *Federal Register* 133, July 13, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation. There are no hydric soils in the Proposed Route or Alternative Route Siting Corridors, or the Woodside Substation site.

Drainage class refers to the frequency and duration of wet periods with conditions similar to those under which the soil formed. The drainage class of a soil helps determine its suitability for different types of use (e.g., agriculture, forestry, development). Table 2.7-4 summarizes drainage classification for the Siting Corridors of the Proposed Route and Alternative Routes, as well as the Woodside Substation site.

TABLE 2.7-4 SOIL DRAINAGE CLASSIFICATIONS WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Drainage Class	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Well-drained	105.2	105.3	72.9
Moderately well-drained	11.3	11.3	0.0
Somewhat excessively drained	24.5	24.5	0.0
Somewhat poorly drained	0.0	0.0	0.0
Poorly drained	0.0	0.0	0.0
Very poorly drained	0.0	0.0	0.0
NA	0.0	0.3	0.0
Total [a]	**141.1**	**141.4**	**72.9**

Source: USDA NRCS 2025

NA = not applicable

[a] Totals may not match the sum of addends due to rounding.

2.7.2.2 IMPACTS

A summary of soil impacts in the ROW Corridors for the Proposed Route, Alternative Routes, ancillary facility workspaces, and Woodside Substation site is presented below.

In general, the MARL Project would impact a limited amount of prime farmlands in the ROW Corridors for the Proposed Route / Alternative Routes C, D, and E and Alternative Routes B and F. There are no areas of prime farmland or farmland of statewide importance in the Siting and ROW Corridors. Of the 0.5 acre of farmland of local importance in the Sitting Corridors, 0.3 acre are within the ROW Corridors and would potentially be affected by the MARL Project (Table 2.7-5). There are no prime farmlands, farmlands of statewide importance, or farmland of local importance in the temporary ancillary facility workspaces outside of the ROW Corridors, as all soils are classified as not prime farmland. The Woodside Substation site contains over 70 acres of prime farmland that could be impacted by the MARL Project (Table 2.7-5).

TABLE 2.7-5 FARMLAND SOIL CLASSES WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Farmland Class [a]	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
All areas are prime farmland	0.0	0.0	0.0	0.0	61.7
Farmland of statewide importance	0.0	0.0	0.0	0.0	8.4
Farmland of local importance	0.5	0.3	0.5	0.3	0.0
Not prime farmland	140.6	59.1	140.9	58.3	2.7
Total [b]	**141.1**	**59.4**	**141.4**	**58.6**	**72.9**

Source: USDA NRCS 2025

ROW = right-of-way

[a] Prime farmland includes the following farmland class categories: all areas are prime farmlands, farmland of statewide importance, and farmland of local importance.

[b] Totals may not match the sum of addends due to rounding.

All routes pose a moderate to high risk of corrosion to steel and concrete from soils in the Siting Corridors and ROW Corridors (Table 2.7-6 and Table 2.7-8). Temporary ancillary facilities for the Proposed Route and Alternative Routes C, D, and E outside of the ROW Corridor generally pose moderate risk of corrosion to steel, if any steel use used in the temporary workspaces, while temporary ancillary facilities for Alternative Routes B or F generally pose a low risk of corrosion to steel, if any steel if used in these temporary workspaces (Table 2.7-7). Temporary ancillary facilities outside of the ROW Corridors for the Proposed Route and Alternative Routes C, D, and E generally post moderate risk of corrosion to steel, if any steel is used in the temporary workspaces, while temporary ancillary facilities for Alternative Routes B or F generally pose a low risk of corrosion to steel, if any steel is used in these temporary workspaces (Table 2.7-7). All routes' temporary ancillary facilities pose a moderate risk to concrete, if any concrete is used in these temporary workspaces (Table 2.7-9). All routes' temporary ancillary facilities pose a moderate risk to concrete, if any concrete is used in these temporary workspaces (Table 2.7-9). The Woodside Substation site would be at high risk of corrosion to steel and moderate risk of corrosion to concrete from soils (Table 2.7-6 and Table 2.7-8).

TABLE 2.7-6 RISK RATINGS FOR CORROSION TO STEEL FROM SOIL CONTACT WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Risk Rating	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
High	35.8	17.3	35.8	17.3	72.9
Moderate	95.0	37.5	94.1	36.9	0.0
Low	10.2	4.6	11.2	4.4	0.0
NA	0.0	0.0	0.3	< 0.1	0.0
Total [a]	**141.1**	**59.4**	**141.4**	**58.6**	**72.9**

Source: USDA NRCS 2025

NA = not applicable; ROW = right-of-way

[a] Totals may not match the sum of addends due to rounding.

TABLE 2.7-7 RISK RATINGS FOR CORROSION TO STEEL FROM SOIL CONTACT WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Risk Rating	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities
High	0.0	0.5	1.5	0.0	0.5	1.5
Moderate	0.0	1.4	10.1	0.0	1.4	9.3
Low	0.0	0.0	0.1	0.0	0.0	0.0
Total [a]	**0.0**	**1.9**	**11.6**	**0.0**	**1.9**	**10.8**

Source: USDA NRCS 2025

[a] Totals may not match the sum of addends due to rounding.

TABLE 2.7-8 RISK RATINGS FOR CORROSION TO CONCRETE FROM SOIL CONTACT WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Risk Rating	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
High	38.6	16.5	38.7	16.5	0.0
Moderate	91.1	36.2	91.2	35.4	64.5
Low	11.3	6.7	11.3	6.7	8.4
NA	0.0	0.0	0.3	< 0.1	0.0
Total [a]	**141.1**	**59.4**	**141.5**	**58.6**	**72.9**

Source: USDA NRCS 2025

NA = not applicable; ROW = right-of-way

[a] Totals may not match the sum of addends due to rounding.

TABLE 2.7-9 RISK RATINGS FOR CORROSION TO CONCRETE FROM SOIL CONTACT WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Risk Rating	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities
High	0.0	0.2	1.4	0.0	0.2	1.4
Moderate	0.0	1.4	10.1	0.0	1.4	9.3
Low	0.0	0.3	0.1	0.0	0.3	0.1
Total [a]	**0.0**	**1.9**	**11.6**	**0.0**	**1.9**	**10.8**

Source: USDA NRCS 2025

[a] Totals may not match the sum of addends due to rounding.

None of the soils in each of the Proposed Route and Alternative Route Siting Corridors and ROW Corridors, ancillary facility workspaces, or Woodside Substation site are hydric, and all are at least moderately well-drained (Table 2.7-10 and Table 2.7-11).

TABLE 2.7-10 SOIL DRAINAGE CLASSIFICATIONS WITHIN THE SITING AND ROW CORRIDORS AND WOODSIDE SUBSTATION SITE (ACRES)

Drainage Class	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Well-drained	105.2	42.1	105.3	41.3	72.9
Moderately well-drained	11.3	6.7	11.3	6.7	0.0
Somewhat excessively drained	24.5	10.6	24.5	10.6	0.0
Somewhat poorly drained	0.0	0.0	0.0	0.0	0.0
Poorly drained	0.0	0.0	0.0	0.0	0.0
Very poorly drained	0.0	0.0	0.0	0.0	0.0
NA	0.0	0.0	0.3	< 0.1	0.0
Total [a]	**141.1**	**59.4**	**141.4**	**58.6**	**72.9**

Source: USDA NRCS 2025

NA = not applicable; ROW = right-of-way

[a] Totals may not match the sum of addends due to rounding.

TABLE 2.7-11 SOIL DRAINAGE CLASSIFICATIONS WITHIN THE ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Drainage Class	Proposed Route / Alternative Routes C,D, and E			Alternative Routes B and F		
	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads	Temporary Access Roads	Other Temporary Ancillary Facilities
Well-drained	0.0	1.4	10.1	0.0	1.4	9.4
Moderately well-drained	0.0	0.3	0.1	0.0	0.3	0.1
Somewhat excessively drained	0.0	0.2	1.3	0.0	0.2	1.3
Somewhat poorly drained	0.0	0.0	0.0	0.0	0.0	0.0
Poorly drained	0.0	0.0	0.0	0.0	0.0	0.0
Very poorly drained	0.0	0.0	0.0	0.0	0.0	0.0
Total [a]	**0.0**	**1.9**	**11.5**	**0.0**	**1.9**	**10.8**

Source: USDA NRCS 2025

[a] Totals may not match the sum of addends due to rounding.

In the short-term, the MARL Project would result in ground-disturbing activities from vegetation clearing in the ROW Corridor, ancillary facility workspaces, and Woodside Substation site, including grading, excavation, construction of the transmission line and substation structures, and use of equipment and vehicles. These activities would result in direct disturbance of soils, loss of a small area of prime farmland, and increase the risk of immediate and long-term erosion, loss of topsoil, and compaction. The magnitude of soil impacts would depend on many factors, including existing vegetative cover, slope, and soil types. To help minimize impacts on soil resources in the ROW Corridor, ancillary facility workspaces, and Woodside Substation site, NEET VA will follow BMPs for the protection of topsoil and avoidance of degradation of farmland, including minimization of soil disturbance where possible, salvage of topsoil removed during grading activities for redistribution during the final reclamation of a site to facilitate the re-establishment of desirable vegetation, and stabilization of post-construction soil (i.e., re-vegetation).

To comply with state stormwater requirements, NEET VA will obtain coverage either under the VPDES General Permit for Discharges of Stormwater from Construction Activities (VAR10) or an individual VPDES permit. A MARL Project-specific ESC Plan and SWPPP will be developed based on the VSMH and in coordination with state and local agencies to meet applicable requirements and implement BMPs. Appropriate BMPs will be used to manage stormwater runoff including silt sock, silt fence, construction entrances, temporary matting and bridges, and erosion matting as needed. Access roads will be designed in compliance with the VSMH, which indicates that both stone and temporary timber deck mats are suitable stabilization materials for access road construction (VDEQ 2024). Per the VSMH, temporary access road materials would be removed and the area restored to pre-construction conditions (e.g., decompact subgrade, replace topsoil, seed, and

mulch) following completion of construction activities (VDEQ 2024). Dewatering, if necessary, will be discharged in accordance with the practices described in the VSMH (VDEQ 2024) and comply with applicable permit requirements. If other devices are proposed, NEET VA will obtain approval from the VDEQ prior to use. Implementation of these plans will further minimize impacts on wetlands within the ROW Corridor.

Exposure to soils that corrode steel and/or concrete may pose a risk to MARL Project infrastructure, in particular the transmission towers (steel) and footings (concrete). In areas where concrete and steel are planned for installation, NEET VA will test soils for corrosivity prior to construction. For tower locations with identified corrosivity based on soil tests, NEET VA will use industry BMPs during construction and design for soil conditions, including concrete design (e.g., type, strength, admixtures), physical barriers (e.g., sleeves, jackets, geomembranes, vaults), coatings (e.g., epoxy), sacrificial steel, and engineered soil (e.g., excavation of native soil and backfill with non-corrosive soil), among others.

During operation and maintenance of the MARL Project, impacts on soils would be minimal (assuming any construction-related impacts have been adequately addressed). There would be a limited amount of permanent reduction in prime farmland in the ROW Corridor and at the Woodside Substation site, but soil erosion or other soil-related issues caused by operation and maintenance of the transmission line and substation would be limited. NEET VA will periodically monitor the ROW Corridor and Woodside Substation site for soil concerns and address with appropriate remedies, as needed, during the operational lifespan of the MARL Project.

3. COMPARISON OF ROUTE ALTERNATIVES AND CONCLUSION

The identified Alternative Routes in the Routing Study are based on the geography of major constraints and routing opportunities in the MARL Project-specific Study Area across the four states associated with the MARL Project. The ERD's objective was to detail the environmental, cultural, and social existing conditions and potential impacts associated with the MARL Project Proposed Route and Alternative Routes for the specific state of Virginia requirements. In accordance with the *Guidelines for Transmission Line Applications* filed under Title 56 of the Va. Code (i.e., the provision that existing ROWs should be given priority for routing new transmission infrastructure), ERM assessed opportunities for paralleling and abutting to existing transmission lines. Paralleling opportunities in the Study Area specific to Virginia include the existing 138 kV and 500 kV transmission lines. Paralleling with other infrastructure were limited due to the location of the handoff point and in order to avoid residential development and conservation easements in and around the handoff point. Route alternatives south of the existing transmissions were considered; however, these options were rejected due to residential homes and conservation easements present and the amount of greenfield development that will be required. No other existing transmission lines were appropriate to consider given how the Proposed Route and Alternative Routes entered Virginia from West Virginia.

This section provides a summary of the comparison of the Proposed Route and Alternative Routes. The Woodside Substation site is not discussed, as there are no alternative sites for the substation site.

3.1 LAND USE

Impacts on land use from the MARL Project would include the placement of transmission structures on private property, clearing of trees within the ROW Corridors, visual impacts on residences within proximity of the transmission structures, and temporary road closures associated with construction at road crossings. Potential impacts on land use for the Proposed Route and Alternative Routes in Virginia are compared below.

3.1.1 LENGTHS, FOOTPRINTS, PARCELS, AND PARALLELING

Table 3.1-1 shows the route lengths and construction footprints of the Proposed Route and Alternative Routes, as well as the number of parcels crossed and paralleling lengths. The route length reflects the total linear mileage of the transmission lines, while the construction footprint represents the area required for the Proposed Route and Alternative Route ROW Corridors.

TABLE 3.1-1 ROUTE LENGTH, CONSTRUCTION FOOTPRINT, AND PARALLELING

Route Feature	Unit	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F
Centerline length	Miles	2.4	2.4
ROW Corridor	Acres	59.4	58.6
Paralleling existing transmission lines	Miles	1.0	0.7
	Percent	41.8	28.3
Greenfield portion	Miles	1.4	1.7
	Percent	58.2	71.7

ROW = right-of way

The Proposed Route and Alternative Routes have the same route length in Virginia; however, Alternative Routes B and F will have the smallest ROW Corridor construction footprint, followed by the Proposed Route and Alternative Routes C, D, and E.

While the Proposed Route and Alternative Routes C, D, and E will have a larger construction footprint, they will result in more paralleling and abutting of the existing transmission line (41.8 percent) than Alternative Routes B and F (28.3 percent). Alternative Routes B and F will result in more greenfield development than the other routes.

3.1.2 LAND OWNERSHIP, PLANNING, AND ZONING

There are no federal, state, or local public lands within the Proposed Route and Alternative Route ROW Corridors in Virginia. Furthermore, there are no conservation easements within 0.25 mile of the Siting Corridors for the Proposed Route and Alternative Routes.

The Proposed Route and Alternative Routes will be constructed entirely on private land; therefore, the MARL Project would not affect land ownership patterns. As shown in Table 3.1-2, the Proposed Route and Alternative Routes C, D, and E will cross the fewest parcels (16), whereas Alternative Routes B and F will cross the most parcels (17).

TABLE 3.1-2 LAND OWNERSHIP

Route Feature	Unit	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F
Parcels crossed	Count	16	17
Unique landowners	Count	13	14

3.1.3 LAND USE AND LAND COVER

Except for the placement of transmission structures, the MARL Project would have no direct impacts on open space, developed land, wetlands, or open water land use types. The primary impact on land use would be the conversion of forested land to herbaceous land in the maintained ROW Corridor. All of the route alternatives predominantly cross forested lands. Impacts on forests are discussed further in Section 3.2.5, Forests.

The ROW Corridors of the Proposed Route and Alternative Routes C, D, and E would primarily affect forested lands (56.7 acres) and agricultural lands (8.8 acres), while developed land affected (all of which is developed, open space) would be 3.0 acres.

The ROW Corridors of Alternative Routes B and F would primarily affect forested lands (44.4 acres) and agricultural lands (11.0 acres), while developed land affected (all of which is developed, open space) would be 3.1 acres.

3.1.4 RESOURCE PROTECTION AREAS AND RESOURCE MANAGEMENT AREAS

There are no federal, state, or local recreation resources within 0.5 mile of the Siting Corridors; therefore, recreational resources were not discussed in this ERD.

3.1.5 RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS

MARL Project construction would generate indirect impacts from noise, and operation would result in indirect visual impacts from the transmission infrastructure. In general, the construction and operation impacts of the Proposed Route and Alternative Routes C, D, and E on residences would be similar to the impacts of Alternative Routes B and F.

There are no residential dwellings within the Proposed Route and Alternative Route ROW Corridors or within 250 feet of their centerlines; the Proposed Route and Alternative Routes have four residential dwellings within 500 feet of their centerlines. As shown in Table 3.1-3, the Proposed Route and Alternative Routes have residential outbuildings and non-residential buildings within 250 and 500 feet of their centerlines.

TABLE 3.1-3 RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS

Route Feature	Unit	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F
Residential dwellings within ROW Corridor; 250 feet; 500 feet of centerline	Count	0	0
	Count	0	0
	Count	4	4
Residential outbuilding within ROW Corridor; 250 feet; 500 feet of centerline	Count	0	0
	Count	3	3
	Count	11	10
Non-residential building within ROW Corridor; 250 feet; 500 feet of centerline	Count	0	0
	Count	2	2
	Count	6	8

ROW = right-of-way

3.1.6 SCHOOLS, CEMETERIES, AND PLACES OF WORSHIP

There are no schools, cemeteries, or places of worship within 0.25 mile of the Siting Corridors for the Proposed Route and Alternative Routes; therefore, schools, cemeteries, and places of worship were not discussed in this ERD.

3.1.7 TRANSPORTATION INFRASTRUCTURE

MARL Project construction will require temporary road or lane closures and/or detours regardless of the route selected for the MARL Project. The shared ROW Corridors of Alternative Routes B and F will cross one local road not crossed by the shared ROW Corridors of the Proposed Route and Alternative Routes C, D, and E (Evelyn Lee Lane). The ROW Corridors will be similar distances from public and private airports.

3.2 NATURAL RESOURCES

The Proposed Route and Alternative Route ROW Corridors cross natural resources, including wetlands, waterbodies, floodplains, habitat with native vegetation (mainly forest), and VDCR conservation sites and ecological cores. Table 3.2-1 summarizes the natural resources potentially affected by each route.

Temporary and permanent direct impacts on natural resources would result from construction and routine maintenance activities. Temporary impacts on non-forested vegetation would occur during construction and periodically during operation of the MARL Project as part of routine maintenance activities. Areas of native vegetation would be restored or allowed to revegetate following construction. With the exception of structure pads, non-forested vegetation would return to normal functioning once vegetation is reestablished. Permanent impacts on forested habitat within the ROW Corridors would occur as a result of the conversion of forested habitats to maintained ROW. Forested land provides habitat for many species, including federally and state-listed species, such as the Indiana bat (*Myotis sodalist*), Northern long-eared bat (*Myotis septentrionalis*), Tricolored bat (*Perimyotis subflavus*), Appalachian grizzled skipper (*Pyrgus centaureae wyandot*), and other non-protected species. Conversion of forested habitat to maintained ROW would eliminate forested habitat for some listed species and bisect conservation sites and ecological cores.

TABLE 3.2-1 NATURAL RESOURCES CROSSED

Route Feature	Unit	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F
Wetlands Total	Acres	0.0	0.0
Waterbodies Total	Number	10	10
Floodplains Total	Acres	1.7	1.7
Forested Lands	Acres	113.8	107.8
VDCR - Isaacs Creek PROW Conservation Site	Acres	11.2	11.2
Ecological Cores	Acres	44.6	40.8

VDCR = Virginia Department of Conservation and Recreation

3.2.1 WETLANDS

There are no NWI-mapped PEM, PSS, or PFO wetlands within the Proposed Route and Alternative Route ROW Corridors, and no PEM, PSS, or PFO wetlands were predicted within the ROW Corridors based on Appendix H of the Routing Study.

3.2.2 WATERBODIES

All Proposed Route and Alternative Route ROW Corridors will cross the same number of waterbodies and would result in the same impacts. Furthermore, all ROW Corridors will cross 1.7 acres of one Zone A floodplain (1 percent annual flood hazard) associated with Isaacs Creek.

3.2.3 VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION CONSERVATION SITE

The portion of Issac Creek PROW Conservation Site that would be affected by construction within the ROW Corridors for any of the routes is forested. Impacts on the site would be permanent due to the conversion of forested habitat to maintained ROW Corridors. A total of 11.2 acres of forested habitat would be affected by construction of the ROW Corridors, representing 7 percent of the 154-acre site.

3.2.4 ECOLOGICAL CORES

The total acreage of ecological cores within the Proposed Route and Alternative Route ROW Corridors that would be affected during construction ranges from 40.8 acres to 44.6 acres. The same C5 ecological cores are crossed by the Proposed Route and Alternative Route ROW Corridors. The Proposed Route and Alternative Routes C, D, and E will cross the most acreage of ecological cores (44.6 acres) compared to Alternative Routes B and F (40.8 acres). While the Proposed Route and Alternative Routes C, D, and E cross more total ecological core acreage, impacts on ecological cores would not be materially or functionally different, and the overall character and quality of the ecological cores would be the same for the Proposed Route and Alternative Routes B through F.

3.2.5 FORESTS

Alternative Routes B and F encompass the fewest acres of forested land (107.3 acres), followed by the Proposed Route and Alternative Routes C, D, and E (113.8 acres). The routes cross similar acres of FCV-ranked forest. Based on review of recent aerial imagery, many recently cleared areas were identified that have been ranked using the FCV model data; therefore, the model appears outdated and may not be reflective of current conditions. Alternative Routes B and F have the least amount of FCV-ranked forested (113.2 acres), while the Proposed Route and Alternative Routes C, D, and E have the most (116.2 acres). Fragmentation of existing forests is similar across the Proposed Route and Alternative Routes.

3.3 VISUAL RESOURCES

The Proposed Route and Alternative Routes will cross through the same landscape units; however, dense vegetation and terrain will help screen views of the transmission line in forested areas, while lawns and agricultural fields will offer broader and more extensive views of the new infrastructure. Across all types of landscapes, the Proposed Route and Alternative Routes will be most visible where they cross roads (all routes cross the same number of tertiary roads).

3.4 CULTURAL RESOURCES

There are no battlefields or cemeteries within the Proposed Route or any of the Alternative Routes. There are no potentially eligible or listed architectural resources identified within 0.5 mile of the Proposed Route and Alternative Routes. There is one previously recorded archaeological site identified within the Proposed Route and Alternative Route ROW Corridors that is potentially eligible for listing on the NRHP. For these reasons, potential impacts on known cultural resources are similar for the Proposed Route and Alternative Routes. Visibility of aboveground resources would be most noticeable where the Proposed Route and Alternative Routes cross roads and where there are other open spaces.

3.5 ENVIRONMENTAL JUSTICE

Potential impacts on EJ communities crossed by the Proposed Route and Alternative Routes would be limited to temporary construction impacts (e.g., noise, dust, traffic, ground disturbance) and visual impacts. The ROW Corridors all cross the same CBG. Of the 17 CBGs in Virginia within 10 miles of the MARL Project facilities, 10 meet at least one criterion for consideration as an EJ community or population. This includes the CBG that contains the Proposed Route and Alternative Routes, which meets EJ criteria related to low-income populations.

Within CBGs that meet EJ criteria—particularly the CBGs that contain MARL Project facilities—the direct impacts described in this ERD could potentially have disproportionately large and adverse impacts on residents, especially those who identify as a race and ethnicity other than non-Hispanic White, are linguistically isolated, and/or meet low-income criteria. Because the ROW Corridors affect the same CBGs, the Proposed Route and Alternative Routes for the MARL Project would have the same impacts on EJ communities and populations.

3.6 CONCLUSIONS AND RECOMMENDATIONS

Following a comprehensive evaluation of all route alternatives and their potential impacts on the natural environment, built environment, cultural resources, social resources, and engineering feasibility, the Routing Team recommended the Proposed Route as the superior option for the MARL Project. This recommendation is supported by the Routing Study, ERD desktop analysis, stakeholder engagement, and field investigations. The Proposed Route, which extends through Virginia and three additional states, was selected because it avoids or reasonably minimizes adverse impacts to the greatest extent practicable, while also providing the highest level of engineering feasibility. As described and shown in the Routing Study (Section 4.4, Route Refinement and Route Segment Elimination, and Appendix E-4, Route Segments Mapbook), three route segments were considered but dismissed in Virginia, primarily due to their proximity to residential dwellings, additional greenfield sections, and longer route length. The goal in Virginia and the eastern portion of Hampshire County, West Virginia, was to parallel (to the extent feasible) the Mt. Storm to Doubs 500 kV transmission line and the Hampshire to Stonewall 138 kV transmission line. In Virginia, the heavily developed residential area south of the Mt. Storm to Doubs transmission line near Fletcher Road, Hollow Road, and Parishville Road, constrained potential routing options. Route segment 39 demonstrated a routing option that avoided this area of residential development; however, this segment was considered but dismissed due to its much

larger line length (4.4 miles in Virginia) and lack of paralleling existing infrastructure (0 percent paralleling). North of the existing transmission line, residential developments surrounding the Northwestern Pike and Fairview Road limited potential routing options. Route segments 38a and 38b were considered but dismissed due to their longer route length, higher proximity to residential dwellings, and additional bifurcation of residential property. These segments also received negative feedback during stakeholder engagement activities; therefore, in Virginia, the Proposed Route and Alternative Routes C, D, and E overlap with Alternative Routes B and F for 1.7 miles due to the constraints present in the Virginia portion of the MARL Project Study Area and because they more closely follow the existing transmission lines. Of these two routing options, the Proposed Route and Alternative Routes C, D, and E have a significantly higher percentage of paralleling (41.8 percent in Virginia versus 28.3 percent for Alternative Routes B and F). Alternative Routes B and F bifurcate two additional parcels, as compared to the Proposed Route and Alternative Routes C, D, and E. Additionally, Alternative Routes B and F were less favorable during landowner outreach because the greenfield section of Alternative Routes B and F west of Fletcher Road is closer to the residential development on Border Lane (approximately 800 feet closer), which could present larger visual and land use impacts on this area. East of Fletcher Road, the Proposed Route and Alternative Routes C, D, and E overlap with Alternative Routes B and F until the handoff point.

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ATTACHMENT 1 VIRGINIA ERD RESOURCE MAPBOOKS

ATTACHMENT 1A TOPOGRAPHY MAPBOOK

ATTACHMENT 1B LAND COVER MAPBOOK

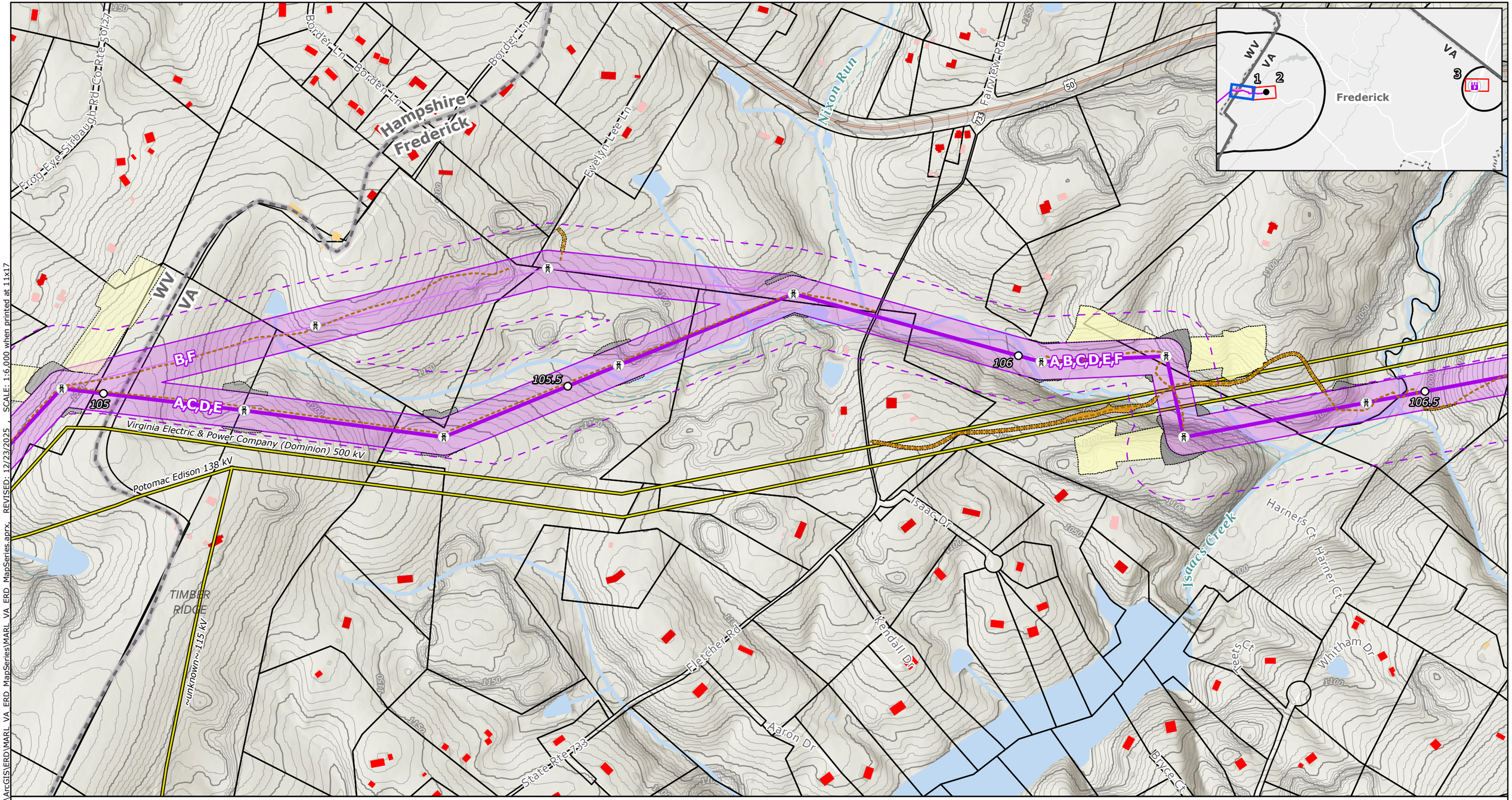
ATTACHMENT 1C WATER RESOURCES MAPBOOK

ATTACHMENT 1D SENSITIVE SPECIES MAPBOOK

ATTACHMENT 1E CULTURAL RESOURCES MAPBOOK (CONFIDENTIAL)

ATTACHMENT 1F SOILS MAPBOOK

ATTACHMENT 1A TOPOGRAPHY MAPBOOK



Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary
- Parcels

LiDAR Elevation Contours
- 5-foot contours
- 25-foot contours

Buildings Footprints
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
- Non-residential buildings

NOTES
1. The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.
2. Proposed tower locations are preliminary and subject to change
3. Ancillary facilities were only designed for the proposed route
4. LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor
5. Data source: NEET, ERM, USGS

N

0 250 500 750 1,000

US Feet

Scale: 1:6,000
1 inch equals 500 ft (when printed at 11x17)

Attachment 1a
Topography Mapbook
Page 1 of 3
MidAtlantic Resiliency Link

ERM

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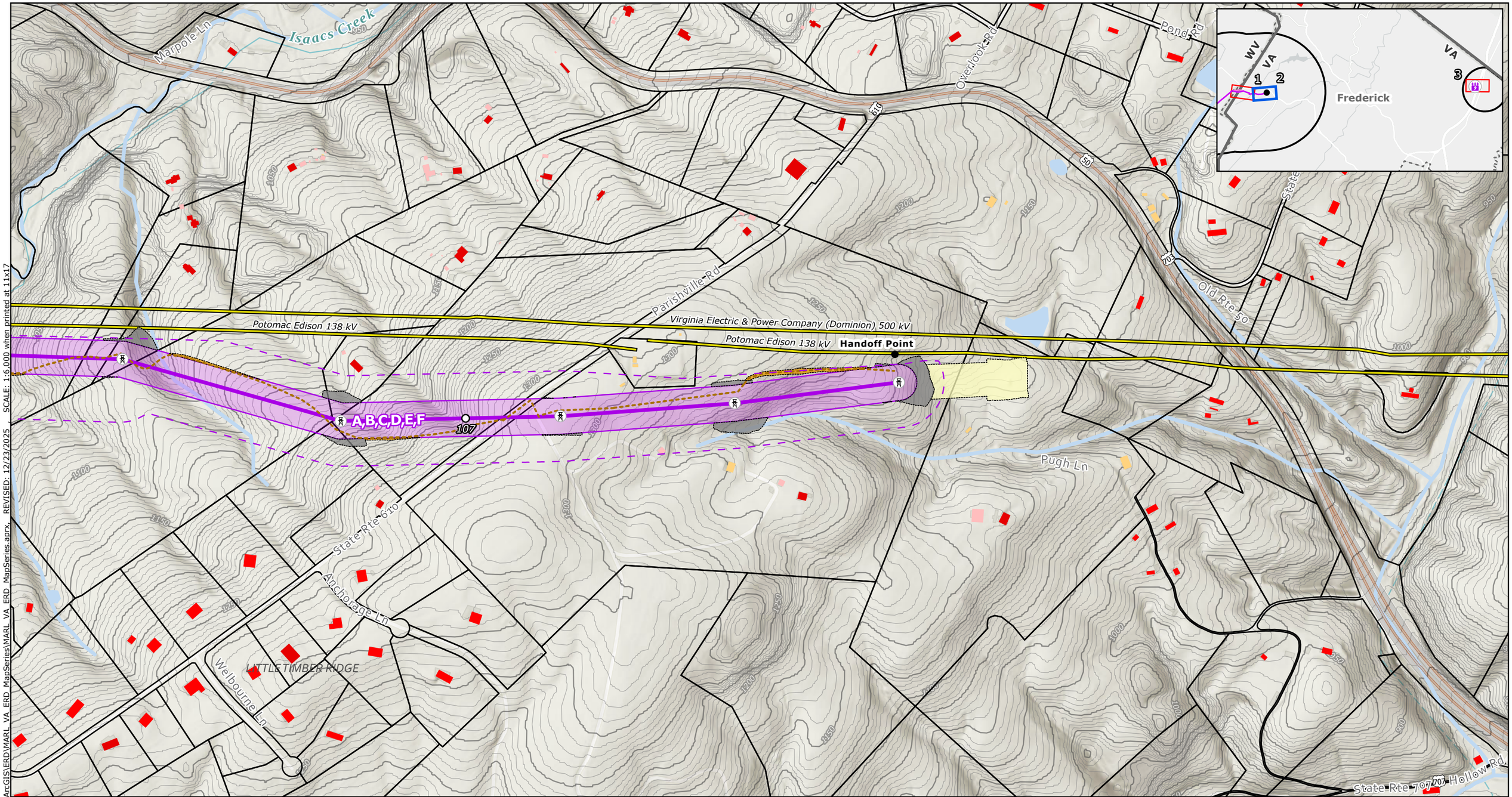

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Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary
- Parcels

LiDAR Elevation Contours
- 5-foot contours
- 25-foot contours

Buildings Footprints
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
- Non-residential buildings

NOTES
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5. *Data source: NEET, ERM, USGS*

N

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US Feet

Scale: 1:6,000
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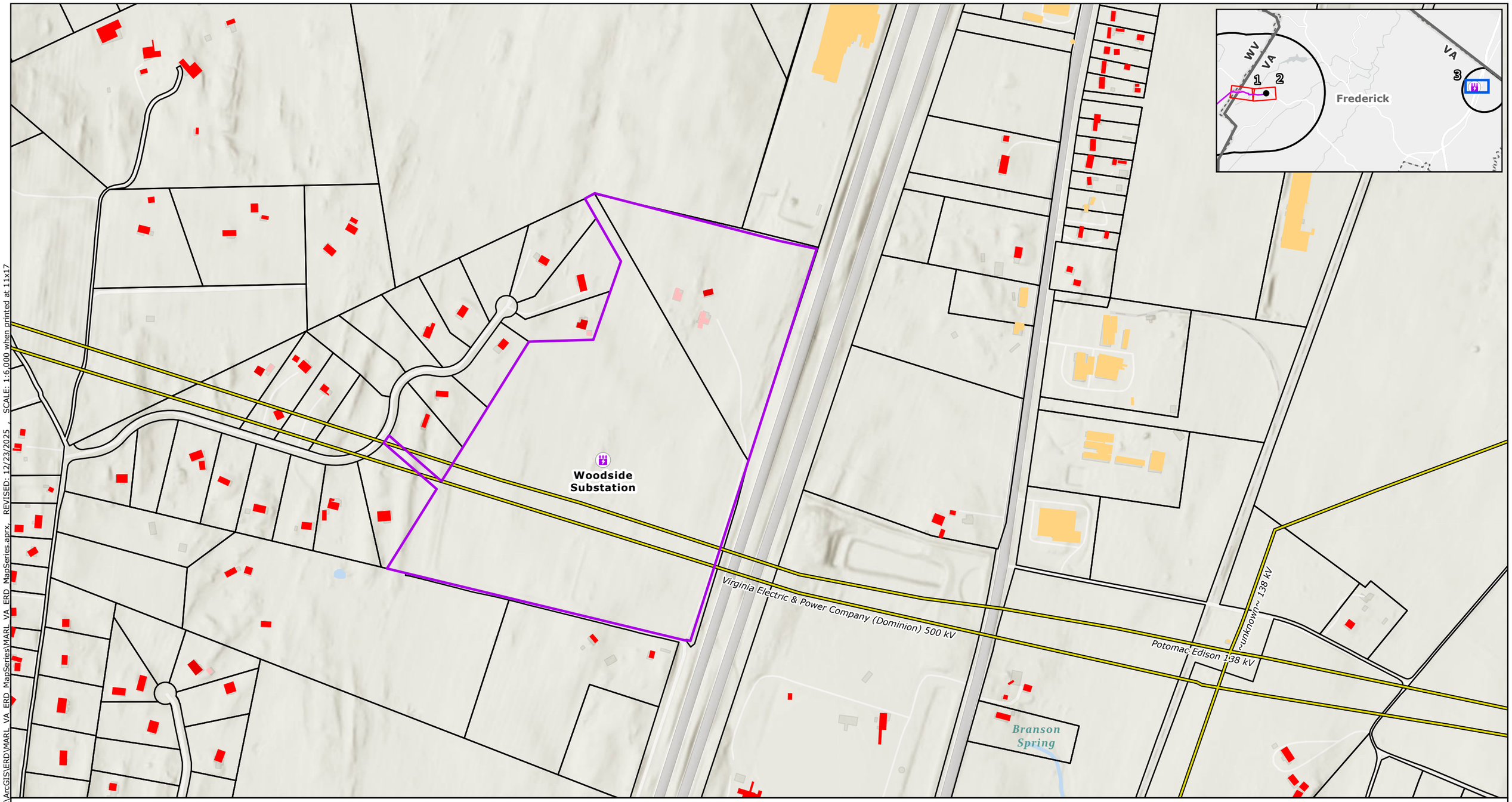
Attachment 1a
Topography Mapbook
Page 2 of 3
MidAtlantic Resiliency Link

ERM

Coordinate System: NAD 1983 UTM Zone 17N



Proposed Project Components
- Proposed Woodside Substation
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors
- Proposed Woodside Substation Site

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary
- Parcels

LiDAR Elevation Contours
- 5-foot contours
- 25-foot contours

Buildings Footprints
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
- Non-residential buildings

NOTES
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5. *Data source: NEET, ERM, USGS*

N

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US Feet

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Attachment 1a
Topography Mapbook
Page 3 of 3
MidAtlantic Resiliency Link

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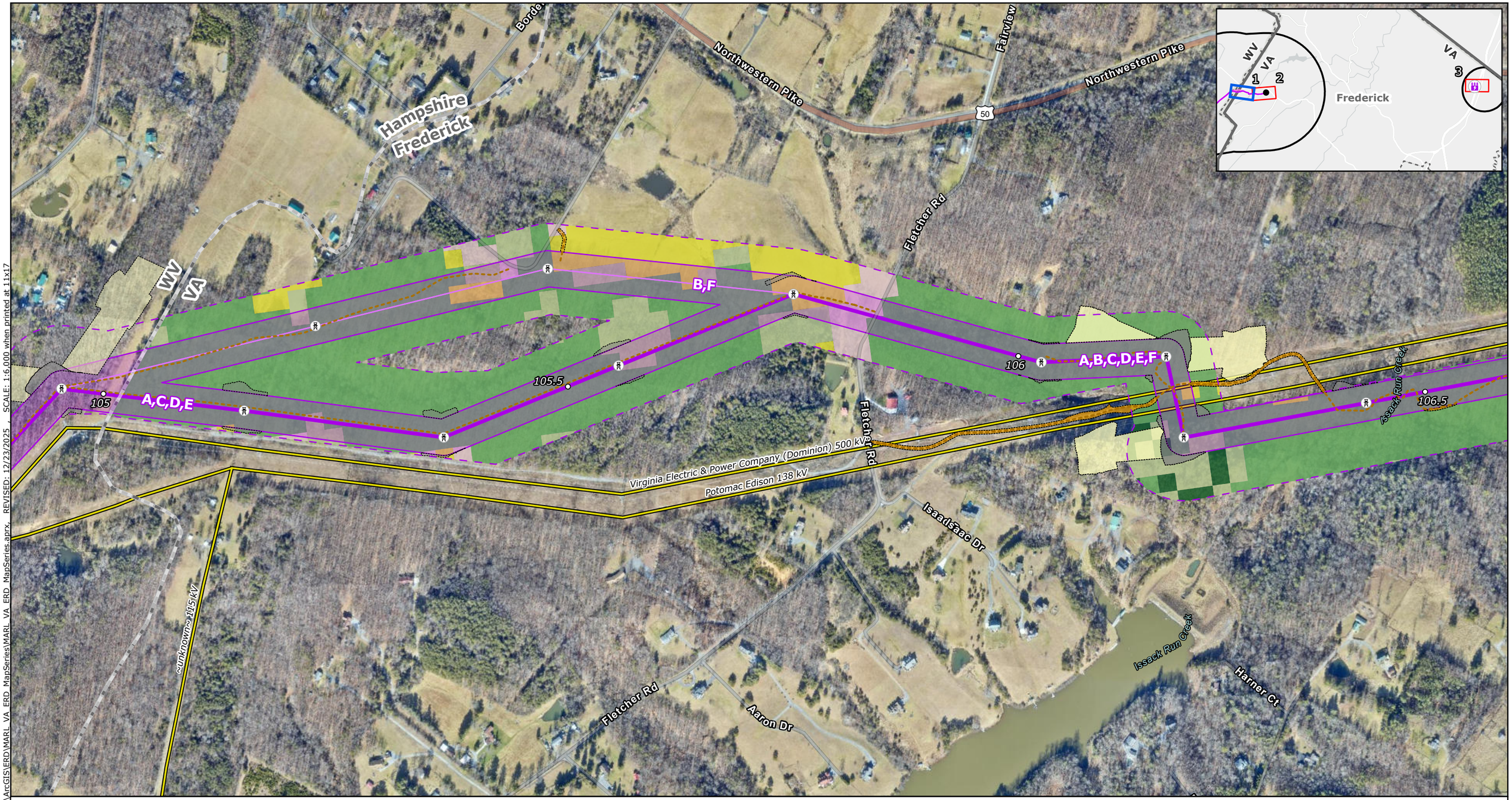
ATTACHMENT 1B LAND COVER MAPBOOK



Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Land Cover Category
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

NOTES
1. *The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.*
2. *Proposed tower locations are preliminary and subject to change*
3. *Ancillary facilities were only designed for the proposed route*
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5. *Data source: NEET, ERM, USGS NLCD 2024*

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US Feet

Scale: 1:6,000
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Attachment 1b
Land Cover Mapbook
Page 1 of 3
MidAtlantic Resiliency Link

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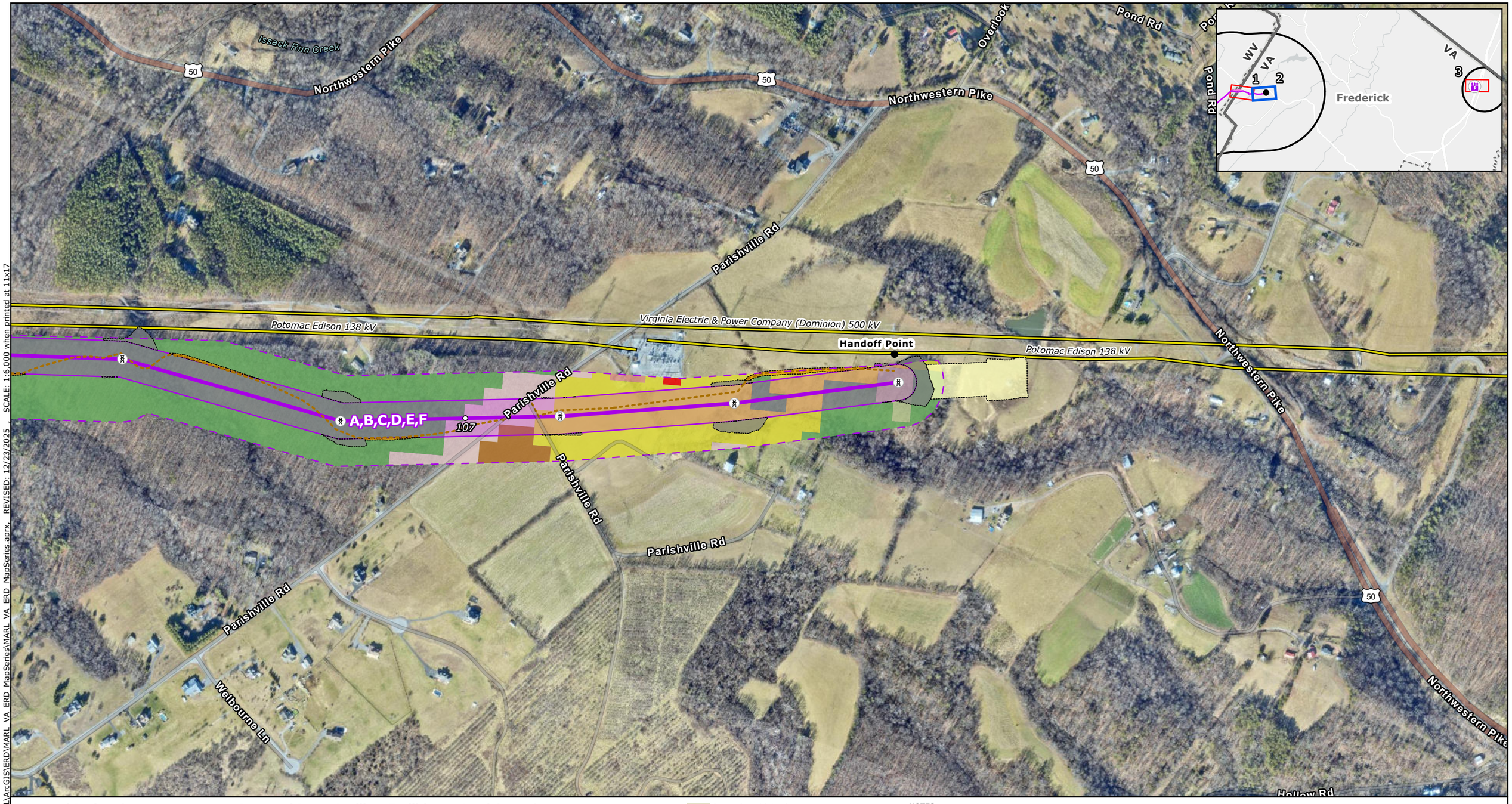

Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Land Cover Category
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
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5. *Data source: NEET, ERM, USGS NLCD 2024*

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US Feet

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Attachment 1b
Land Cover Mapbook
Page 2 of 3
MidAtlantic Resiliency Link

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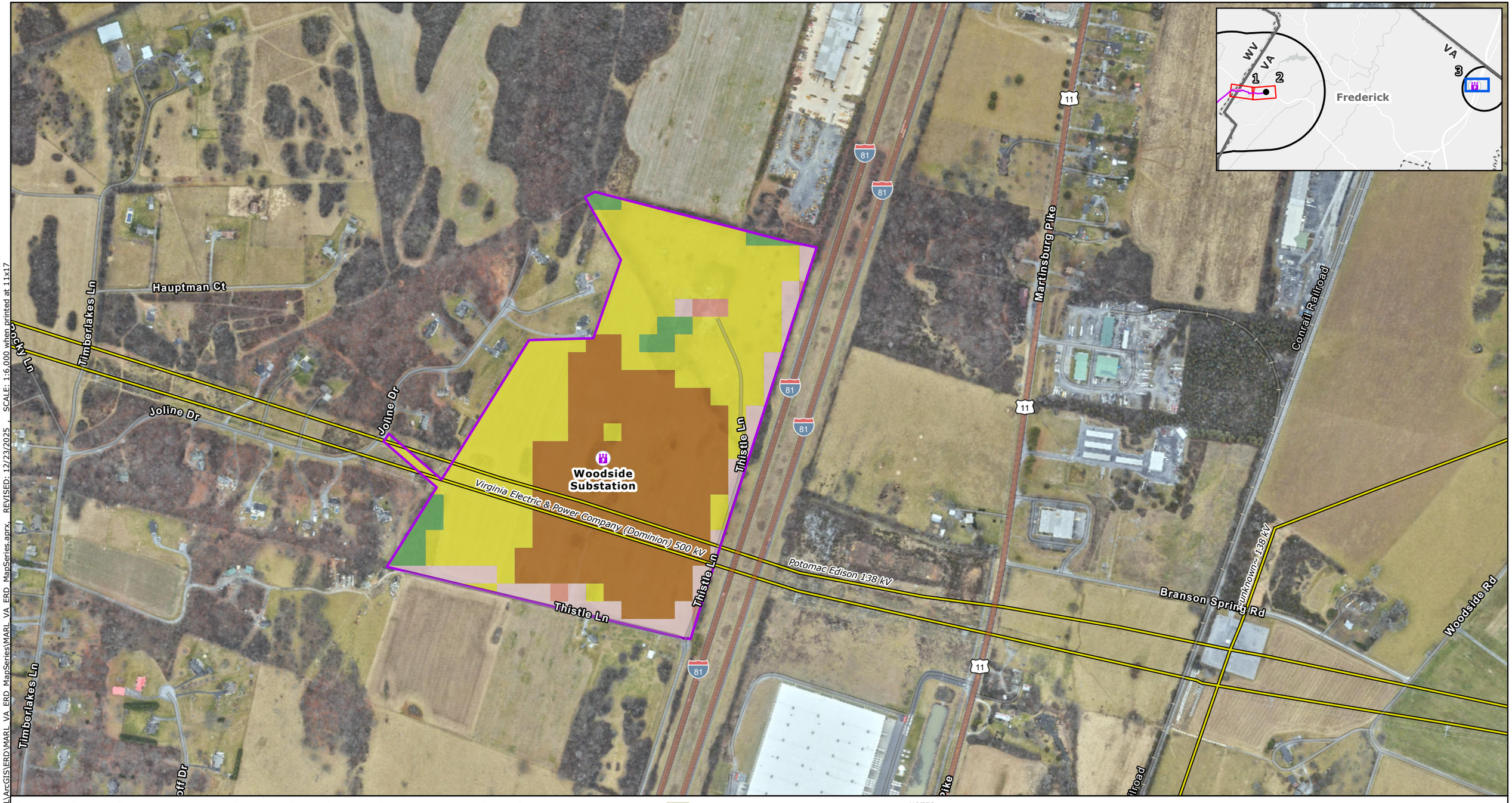

Proposed Project Components
- Proposed Woodside Substation
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors
- Proposed Woodside Substation Site

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Land Cover Category
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
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NOTES
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5. *Data source: NEET, ERM, USGS NLCD 2024*

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US Feet

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Attachment 1b
Land Cover Mapbook
Page 3 of 3
MidAtlantic Resiliency Link

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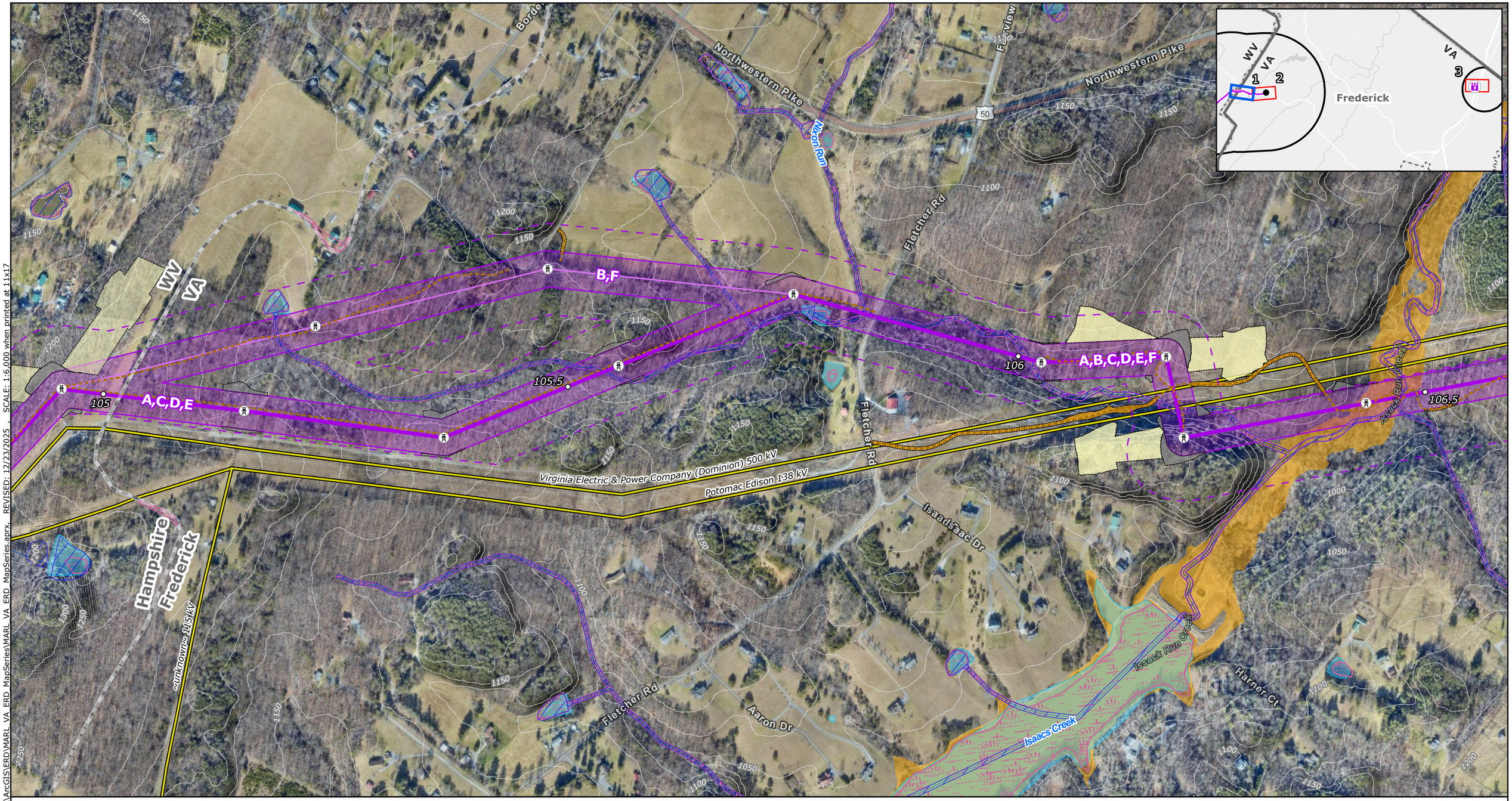
ATTACHMENT 1C WATER RESOURCES MAPBOOK



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Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Water Resources
- NHD Waterbody
- NWI Wetlands
- High Probability Modeled Wetlands
- NHD Flowline

FEMA Flood Hazard
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

NOTES
1. *The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.*
2. *Proposed tower locations are preliminary and subject to change*
2. *Ancillary facilities were only designed for the proposed route*
3. *LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor*
4. *Data source: NEET, ERM, FEMA, USGS NHD, USFWS NWI, VDEP, VDCR, VDWR*

N

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US Feet

Scale: 1:6,000
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Attachment 1c
Water Resources Mapbook
Page 1 of 3
MidAtlantic Resiliency Link

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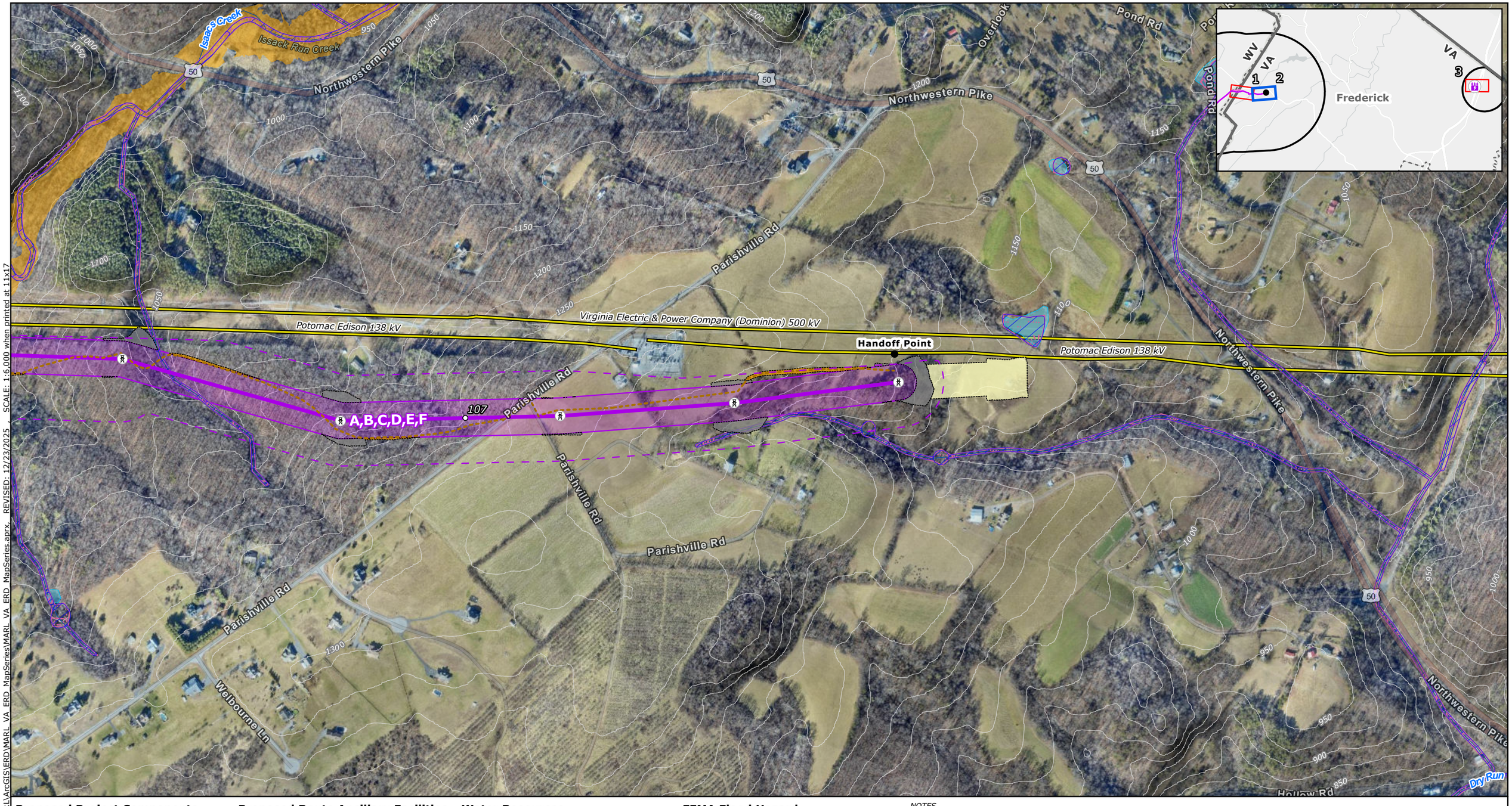
Coordinate system: NAD 1983 UTM Zone 17N



Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Water Resources
- NHD Waterbody
- NWI Wetlands
- High Probability Modeled Wetlands
- NHD Flowline

FEMA Flood Hazard
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

NOTES
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4. *Data source: NEET, ERM, FEMA, USGS NHD, USFWS NWI, VDEP, VDCR, VDWR*

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US Feet

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Attachment 1c
Water Resources Mapbook
Page 2 of 3
MidAtlantic Resiliency Link

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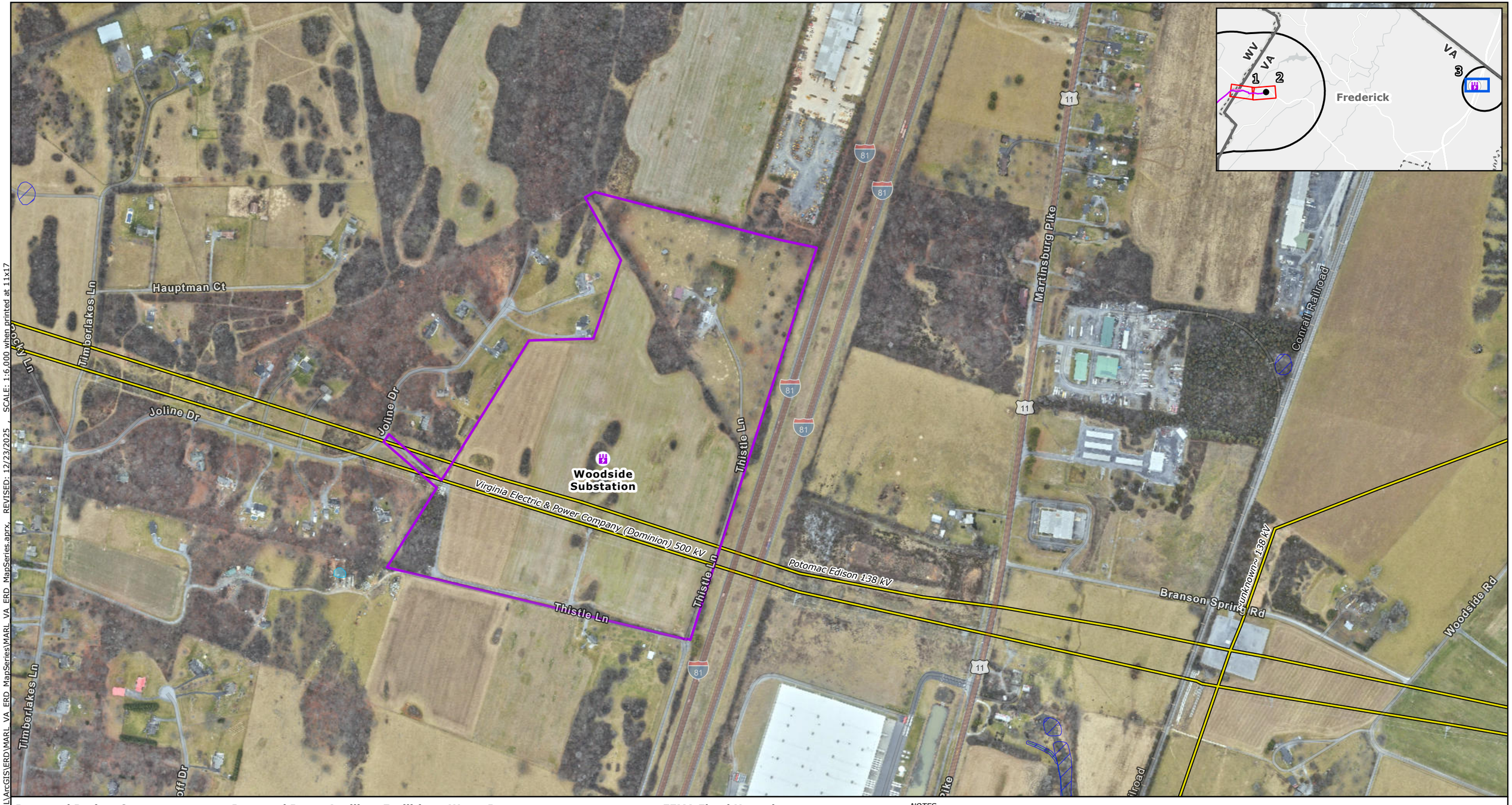

Proposed Project Components
- Proposed Woodside Substation
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors
- Proposed Woodside Substation Site

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Water Resources
- NHD Waterbody
- NWI Wetlands
- High Probability Modeled Wetlands
- NHD Flowline

FEMA Flood Hazard
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

NOTES
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4. Data source: NEET, ERM, FEMA, USGS NHD, USFWS NWI, VDEP, VDCR, VDWR

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US Feet
Scale: 1:6,000
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Attachment 1c
Water Resources Mapbook
Page 3 of 3
MidAtlantic Resiliency Link

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Coordinate system: NAD 1983 UTM Zone 17N

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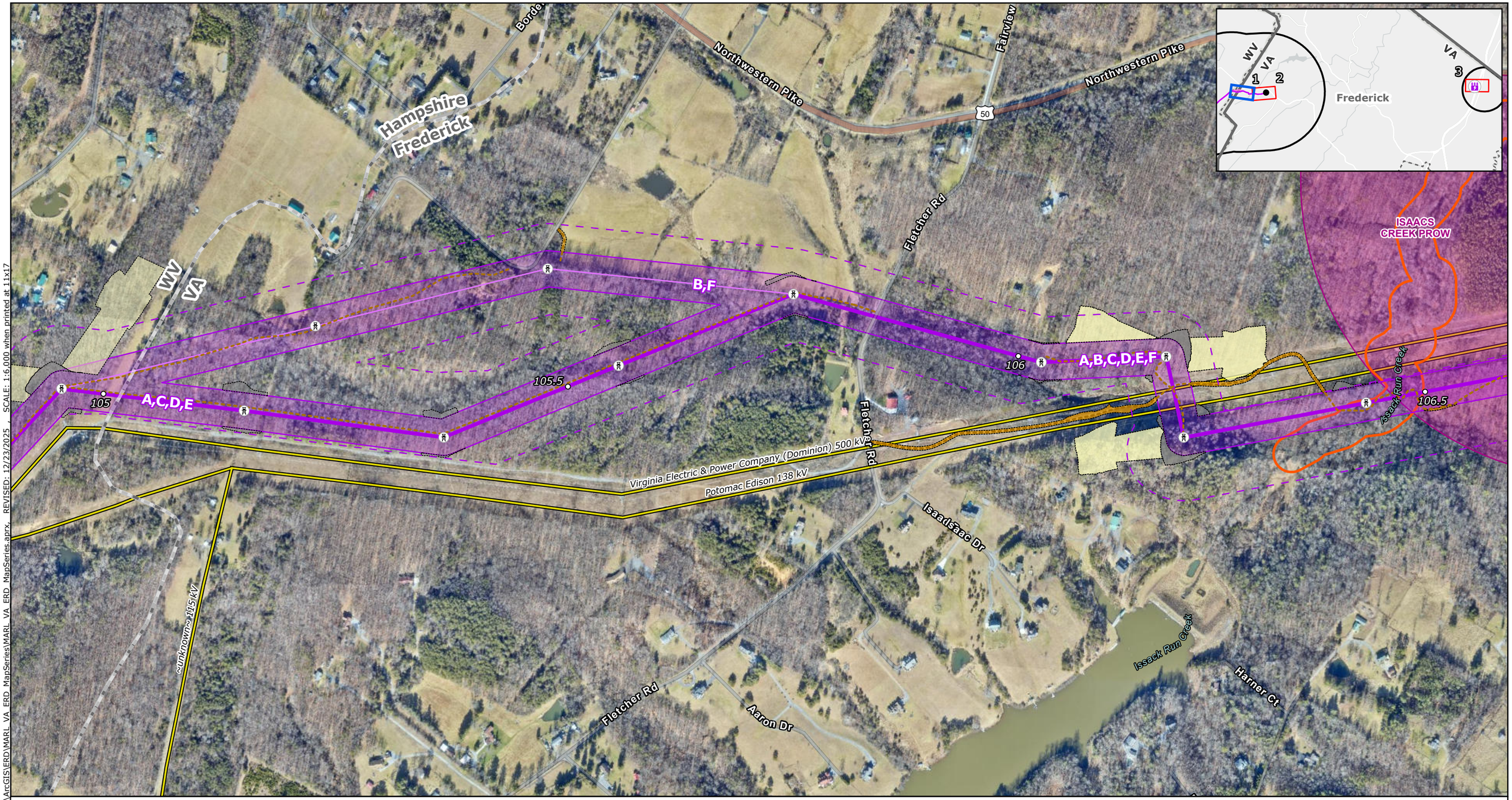
ATTACHMENT 1D SENSITIVE SPECIES AND HABITATS MAPBOOK



Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Ecological and Sensitive Species Resources
- Element Occurence Area
- Conservation Site
- Protected Areas

NOTES
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4. *LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor*
5. *Data source: NEET, ERM, USFWS, PAD-US, VA NHI, WERMS*

N

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US Feet

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Attachment 1d
Sensitive Species and Habitats Mapbook

MidAtlantic Resiliency Link

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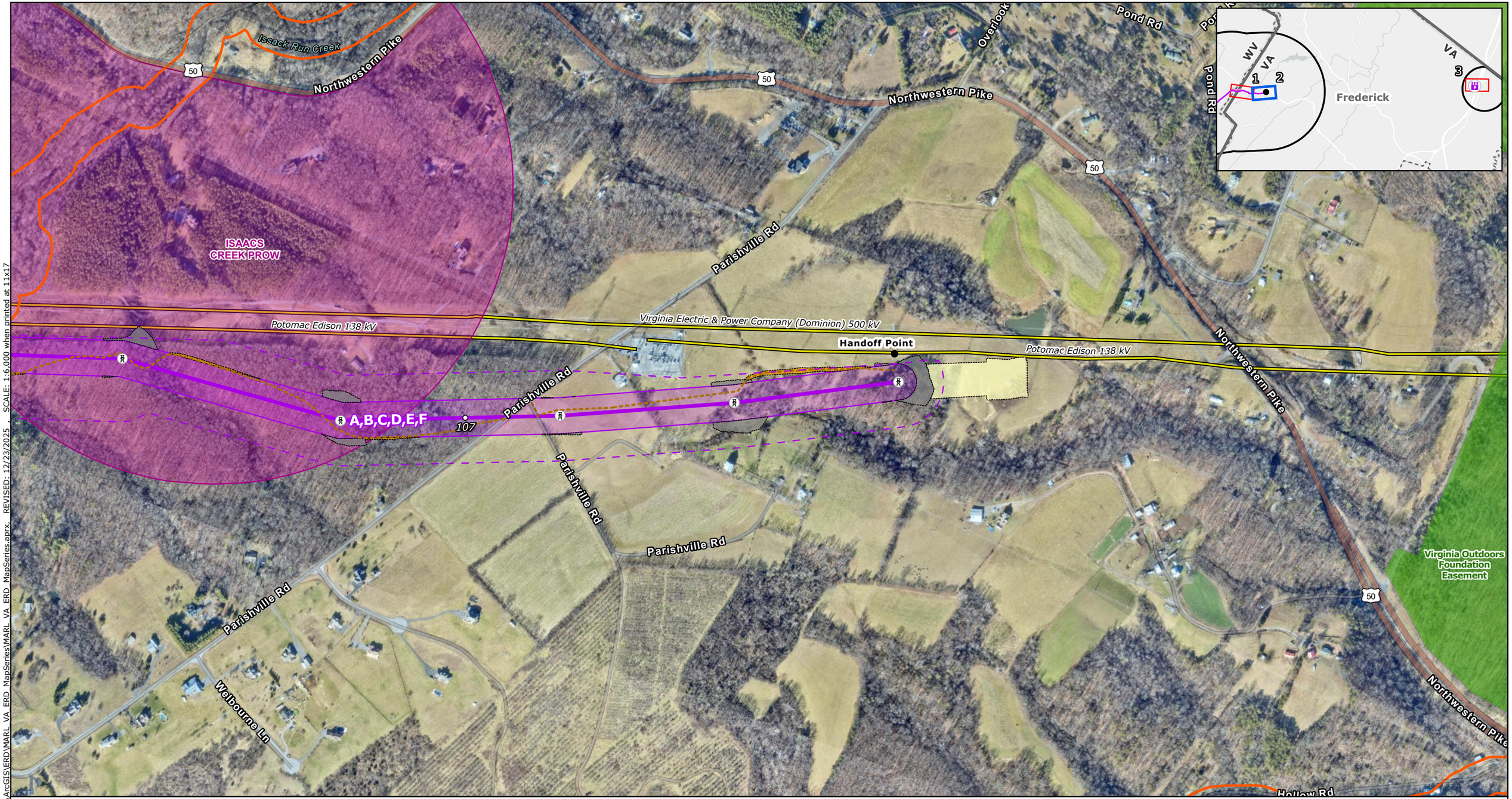

Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Ecological and Sensitive Species Resources
- Element Occurence Area
- Conservation Site
- Protected Areas

NOTES
1. *The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.*
2. *Proposed tower locations are preliminary and subject to change*
3. *Ancillary facilities were only designed for the proposed route*
4. *LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor*
5. *Data source: NEET, ERM, USFWS, PAD-US, VA NHI, WERMS*

N

0 250 500 750 1,000

US Feet

Scale: 1:6,000
1 inch equals 500 ft (when printed at 11x17)

Attachment 1d
Sensitive Species and Habitats Mapbook
Page 2 of 3
MidAtlantic Resiliency Link

ERM

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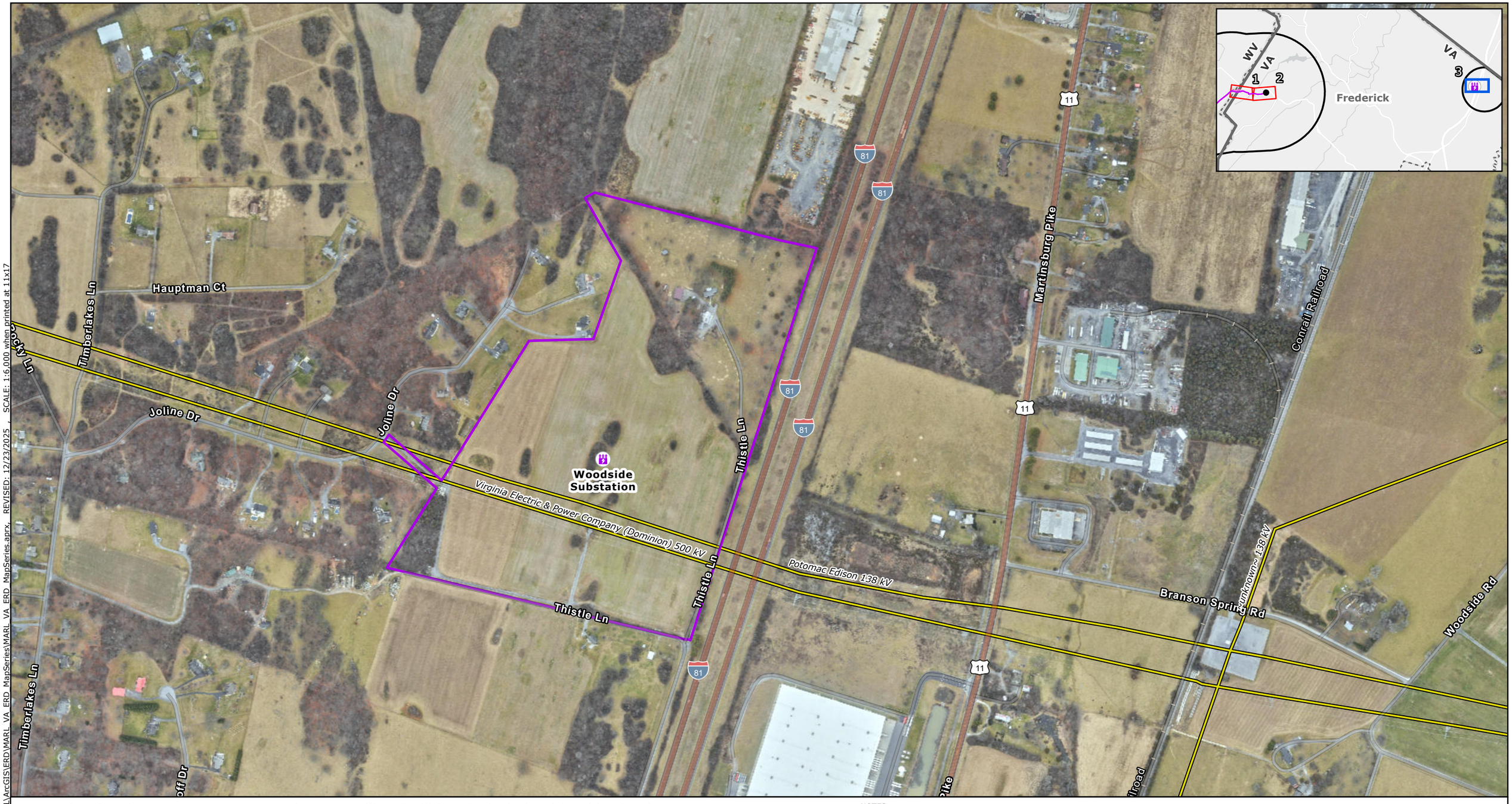
Coordinate System: NAD 1983 UTM Zone 17N



Proposed Project Components
- Proposed Woodside Substation
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors
- Proposed Woodside Substation Site

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Ecological and Sensitive Species Resources
- Element Occurence Area
- Conservation Site
- Protected Areas

NOTES
1. The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.
2. Proposed tower locations are preliminary and subject to change
3. Ancillary facilities were only designed for the proposed route
4. LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor
5. Data source: NEET, ERM, USFWS, PAD-US, VA NHI, WERMS

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US Feet

Scale: 1:6,000
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Attachment 1d
Sensitive Species and Habitats Mapbook
Page 3 of 3
MidAtlantic Resiliency Link

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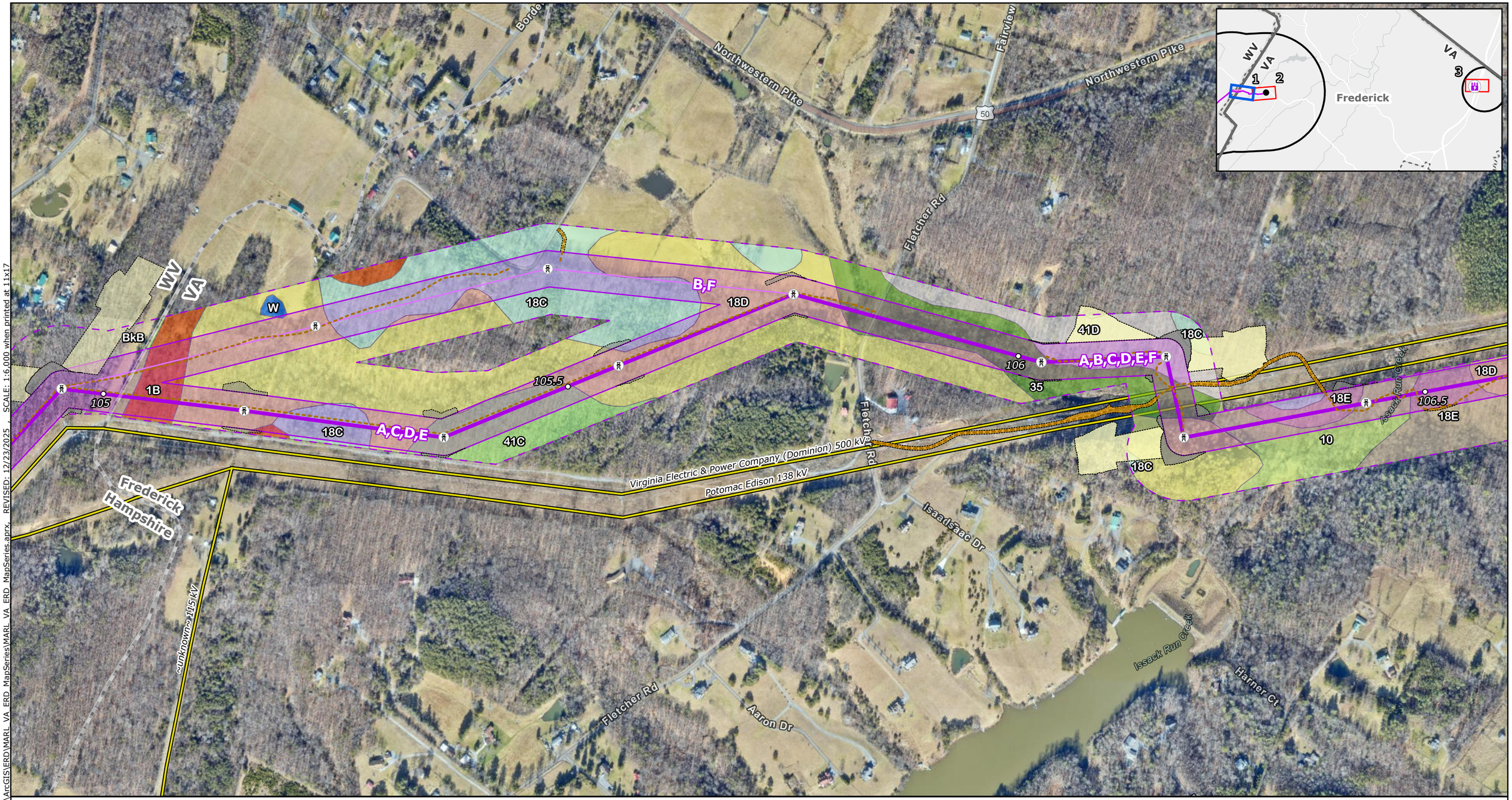
Coordinate System: NAD 1983 UTM Zone 17N

ATTACHMENT 1E CULTURAL RESOURCES MAPBOOK (CONFIDENTIAL)

ATTACHMENT 1F SOILS MAPBOOK



Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Soil Type
- 10: Craigsville cobbly sandy loam
- 18C: Gainesboro-Lehew complex, 7 to 15 percent slopes
- 18D: Gainesboro-Lehew complex, 15 to 25 percent slopes
- 18E: Gainesboro-Lehew complex, 25 to 65 percent slopes
- 1B: Berks channery silt loam, 3 to 8 percent slopes
- 35: Pagebrook silty clay loam
- 41C: Weikert-Berks channery silt loams, 8 to 15 percent slopes
- 41D: Weikert-Berks channery silt loams, 15 to 25 percent slopes
- BkB: Berks channery silt loam, 3 to 8 percent slopes
- W: Water
- Prime Farmland
- Hydric Soils

NOTES
1. *The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.*
2. *Proposed tower locations are preliminary and subject to change*
3. *Ancillary facilities were only designed for the proposed route*
4. *LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor*
5. *Data source: NEET, ERM, USDA NRCS SSURGO*

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US Feet

Scale: 1:6,000
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Attachment 1f
Soils Mapbook
Page 1 of 3
MidAtlantic Resiliency Link

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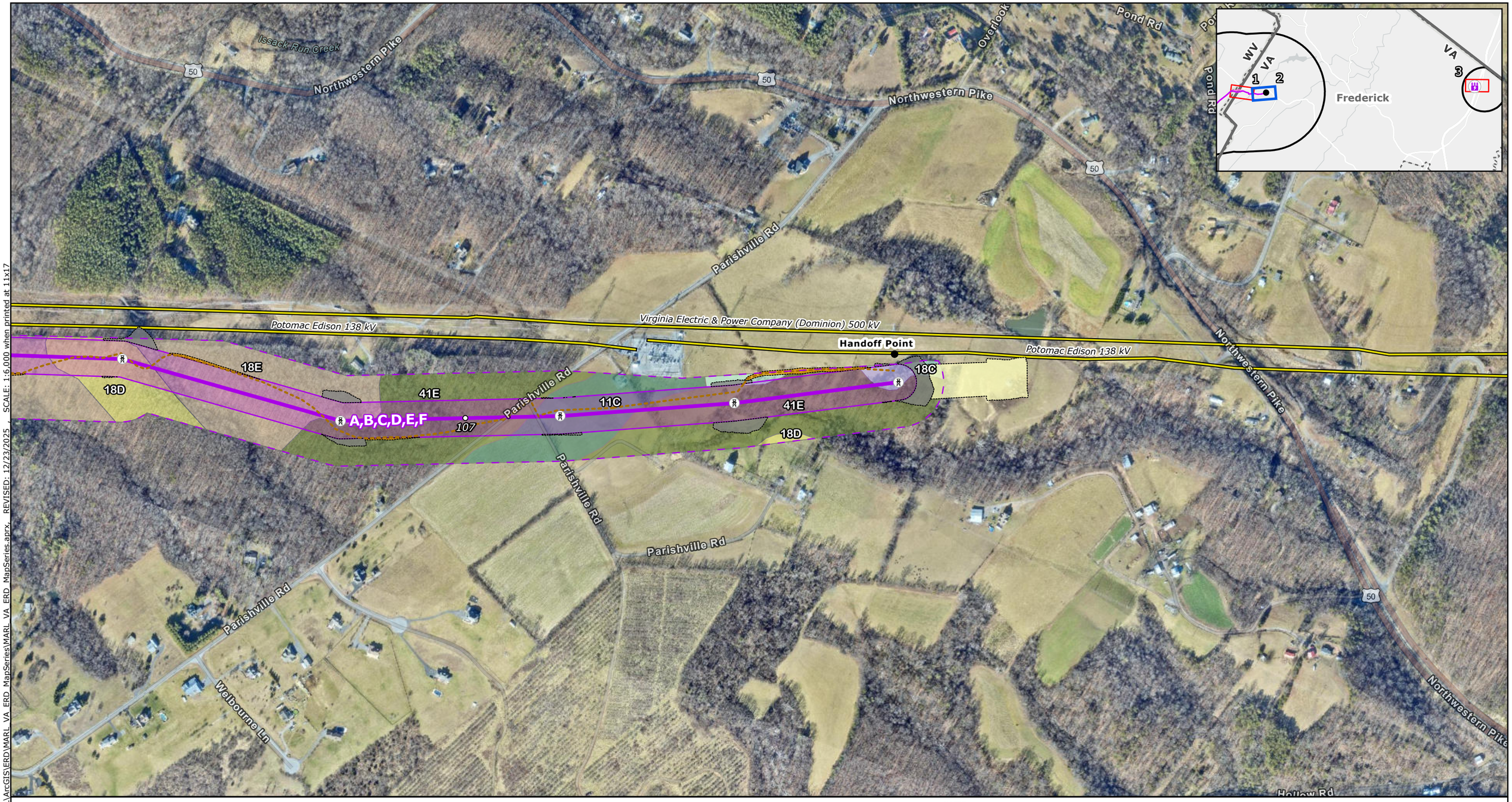

Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors

Proposed Route Ancillary
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Soil Type
- 11C: Dekalb channery loam, 7 to 15 percent slopes
- 18C: Gainesboro-Lehew complex, 7 to 15 percent slopes
- 18D: Gainesboro-Lehew complex, 15 to 25 percent slopes
- 18E: Gainesboro-Lehew complex, 25 to 65 percent slopes
- 41E: Weikert-Berks channery silt loams, 25 to 65 percent slopes
- Prime Farmland
- Hydric Soils

NOTES
1. *The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.*
2. *Proposed tower locations are preliminary and subject to change*
3. *Ancillary facilities were only designed for the proposed route*
4. *LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor*
5. *Data source: NEET, ERM, USDA NRCS SSURGO*

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Attachment 1f
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Page 2 of 3
MidAtlantic Resiliency Link

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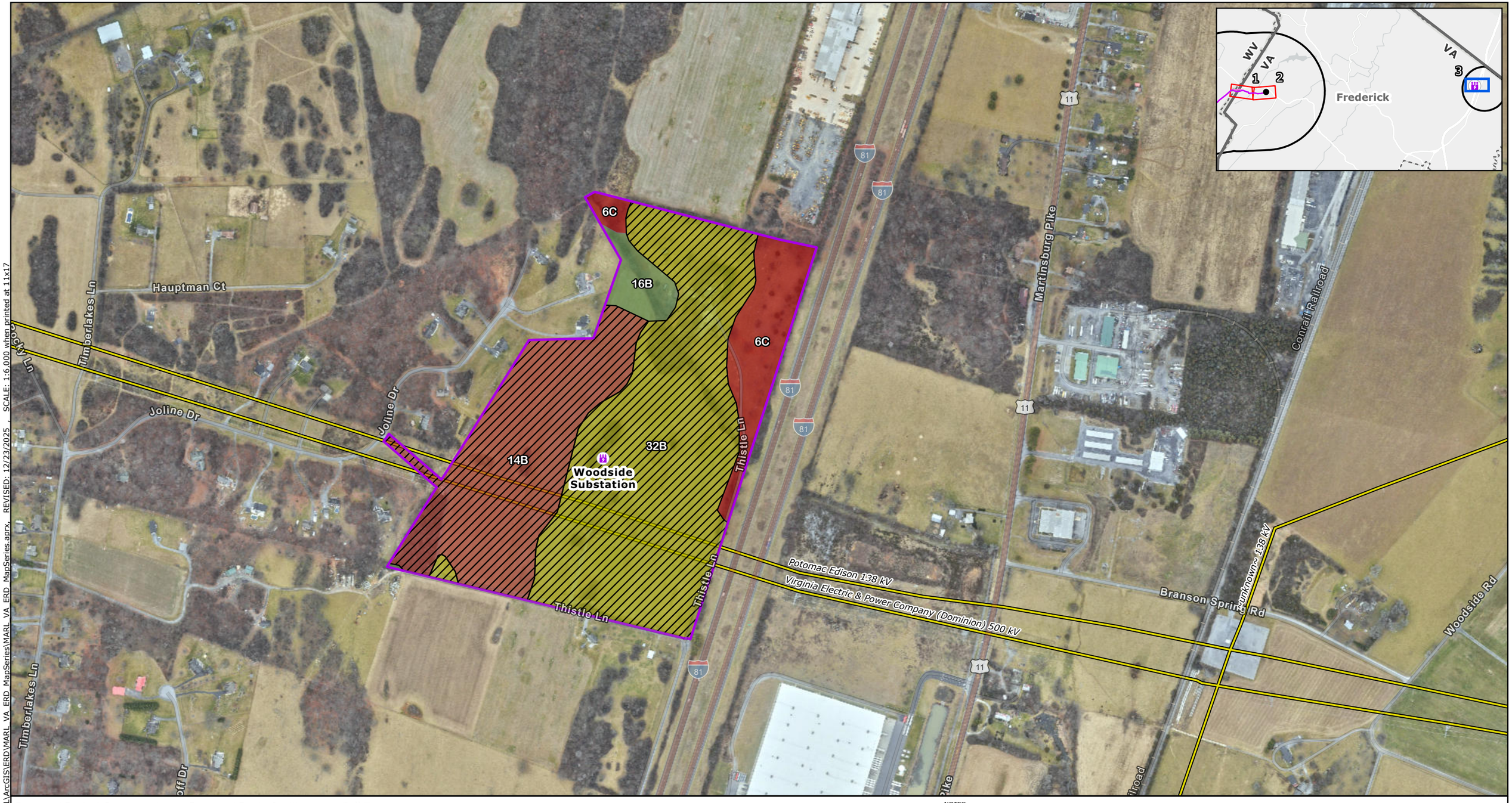

Proposed Project Components
- Proposed Woodside Substation
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Alternative Route Centerlines
- ROW Corridors
- Aerial Easement Blowout Area
- Siting Corridors
- Proposed Woodside Substation Site

Proposed Route Ancillary
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Soil Type
- 14B: Frederick-Poplimento loams, 2 to 7 percent slopes
- 16B: Frederick-Poplimento, very rocky loams, 2 to 7 percent slopes
- 32B: Oaklet silt loam, 2 to 7 percent slopes
- 6C: Carbo-Oaklet, very rocky silt loams, 2 to 15 percent slopes
- Prime Farmland
- Hydric Soils

NOTES
1. The six Alternative Routes are labeled A through F. Alternative Route A is the Proposed Route.
2. Proposed tower locations are preliminary and subject to change
3. Ancillary facilities were only designed for the proposed route
4. LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor
5. Data source: NEET, ERM, USDA NRCS SSURGO

N

0 250 500 750 1,000

US Feet

Scale: 1:6,000
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Attachment 1f
Soils Mapbook
Page 3 of 3
MidAtlantic Resiliency Link

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Coordinate System: NAD 1983 UTM Zone 17N

Attachment 2 – Virginia Wetland and Waterbody Desktop Assessment

MidAtlantic Resiliency Link Project

PREPARED FOR
NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc.

DATE
January 2026

REFERENCE
0718854



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CONTENTS

1. MARL PROJECT OVERVIEW 1

2. PROPOSED AND ALTERNATIVE ROUTES 2

2.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES C, D, AND E 2
2.2 ALTERNATIVE ROUTES B AND F 2
2.3 WOODSIDE SUBSTATION SITE 3

3. REGULATORY FRAMEWORK 4

4. DESKTOP EVALUATION METHOD 6

4.1 U.S. GEOLOGICAL SURVEY NATIONAL HYDROGRAPHY DATASET 6
4.2 TOPOGRAPHIC MAPS 6
4.3 U.S. FISH AND WILDLIFE SERVICE NATIONAL WETLANDS INVENTORY MAPPING 6
4.4 WETLAND IDENTIFICATION MODEL 7

5. EXISTING CONDITIONS 9

5.1 WETLANDS 9
5.2 WATERBODIES 9
5.3 WETLAND IDENTIFICATION MODEL 10

6. MARL PROJECT IMPACTS 11

6.1 WETLANDS 11
6.2 WATERBODIES 11
6.3 WETLAND IDENTIFICATION MODEL 16

7. REFERENCES 18

LIST OF TABLES

TABLE 5.2-1 NATIONAL HYDROGRAPHY DATASET LINEAR WATERBODIES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (LINEAR FEET) 9

TABLE 5.2-2 NATIONAL HYDROGRAPHY DATASET OPEN WATERBODIES AND NATIONAL WETLANDS INVENTORY WATERBODIES WITHIN THE SITING CORRIDORS (ACRES) 9

TABLE 5.3-1 WETLAND IDENTIFICATION MODEL HIGH PROBABILITY WETLANDS WITHIN THE SITING CORRIDORS (ACRES) 10

TABLE 6.2-1 NATIONAL HYDROGRAPHY DATASET LINEAR WATERBODIES WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (LINEAR FEET) 11

TABLE 6.2-2 NATIONAL HYDROGRAPHY DATASET LINEAR WATERBODIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (LINEAR FEET) 12

TABLE 6.2-3 NATIONAL HYDROGRAPHY DATASET OPEN WATERBODIES AND NATIONAL WETLANDS INVENTORY WATERBODIES WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (ACRES) 12

TABLE 6.2-4 NATIONAL HYDROGRAPHY DATASET OPEN WATERBODIES AND NATIONAL WETLANDS INVENTORY WATERBODIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES) 13

TABLE 6.2-5 INDIVIDUAL LINEAR WATERBODIES WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (LINEAR FEET) 15

TABLE 6.2-6 INDIVIDUAL LINEAR WATERBODIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (LINEAR FEET) 16
TABLE 6.3-1 WETLAND IDENTIFICATION MODEL HIGH PROBABILITY WETLANDS WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (ACRES) 16
TABLE 6.3-2 WETLAND IDENTIFICATION MODEL HIGH PROBABILITY WETLANDS WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES) 17

ACRONYMS AND ABBREVIATIONS

Acronym	Description
CPCN	Certificate of Public Convenience and Necessity
CWA	Clean Water Act
ERD	Environmental Review Document
NHDPlus HR	National Hydrologic Database Plus High-Resolution
I-81	Interstate 81
kV	kilovolt
MARL Project	MidAtlantic Resiliency Link Project
MHPW	modeled high probability wetlands
MP	milepost
NEET MA	NextEra Energy Transmission MidAtlantic, Inc.
NEET VA	NextEra Energy Transmission Virginia, Inc.
NHD	National Hydrography Dataset
NWI	National Wetlands Inventory
PEM	Palustrine Emergent
PFO	Palustrine Forested
PSS	Palustrine Scrub-Shrub
PUB	Palustrine Unconsolidated Bottom
ROW	right-of-way
SCC	Virginia State Corporation Commission
UNT	unnamed tributary
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAC	Virginia Administrative Code
VDEQ	Virginia Department of Environmental Quality
VMRC	Virginia Marine Resources Commission
WIM	Wetland Identification Model
WOTUS	Waters of the United States

1. MARL PROJECT OVERVIEW

Environmental Resources Management, Inc., on behalf of NextEra Energy Transmission MidAtlantic, Inc. (NEET MA) and NextEra Energy Transmission Virginia, Inc. (NEET VA), conducted a desktop wetland and waterbody assessment of publicly available information for the portion of the proposed MidAtlantic Resiliency Link Project (MARL Project) located in Virginia. The overall MARL Project consists of 107.5-mile, 500 kilovolt (kV) transmission line that will traverse portions of Pennsylvania, West Virginia, Maryland, and Virginia. The MARL Project also includes construction of the new 500/138 kV Woodside Substation site to be located in Frederick County, Virginia.

NEET MA and NEET VA will be filing four state siting applications with the relative state public utility commissions[1] and specifically one county in Virginia (Frederick County). Title 56 of the Code of Virginia (Va. Code § 56) provides the Virginia State Corporation Commission (SCC) with jurisdiction over the regulation of Virginia public utilities and public service corporations. The process begins when the developer files an application with the SCC pursuant to the Utility Facilities Act (Va. Code §§ 56-265.1 – 265.9). Generally, construction and operation of transmission lines and/or associated facilities operating at 138 kV or higher in Virginia require the issuance of a Certificate of Public Convenience and Necessity (CPCN) from the SCC.

In accordance with Virginia Department of Environmental Quality (VDEQ) and the SCC's Memorandum of Agreement, this desktop assessment was completed to identify and evaluate potential MARL Project impacts on aquatic resources (wetlands, streams, creeks, runs, and open water features) using various datasets that may indicate wetland location and type. This report is being submitted to facilitate the VDEQ Wetland Impacts Consultation.

This desktop assessment did not include field investigations for wetland and waterbody delineation within the Proposed Route and Alternative Route Siting Corridors (further discussed below), as defined in the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Environmental Laboratory 1987) and the 2012 Regional Supplement to the USACE Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0) (Environmental Laboratory 2012). Field delineation of wetlands and waterbodies within the Proposed Route and Alternative Route Siting Corridors is required to verify the accuracy and extent of aquatic resource boundaries. Formal wetland and waterbody delineation field surveys were conducted for the Woodside Substation site in early 2025, and no jurisdictional wetland or waterbody resources were identified.

Additional information regarding the aquatic resources and associated protected species potentially impacted by the MARL Project was obtained from the Virginia Department of Conservation and Recreation Natural Heritage Program and the Virginia Department of Wildlife Resources. This information is discussed in detail in Section 2.3, Natural Resources, of the Virginia Environmental Review Document (ERD). In addition, historic properties and documentation from the Virginia Department of Historic Resources, including survey recommendations, are provided in Section 2.5,Cultural Resources, of the Virginia ERD.

[1] NEET MA and NEET VA will be filing four state siting applications with the relative state public utility commissions. NEET MA is filing a Certificate of Public Convenience and Necessity (CPCN) application with the following state utility commissions: Maryland Public Service Commission and Public Service Commission of West Virginia. NEET MA is also filing a Certificate of Public Convenience and a Siting application with the Pennsylvania Public Utilities Commission. NEET VA is filing a CPCN application with the Virginia SCC.

2. PROPOSED AND ALTERNATIVE ROUTES

A detailed MARL Project overview and description is provided in Section 1, Introduction and Background, and Section 2, Environmental Setting and Impacts for the Proposed Route and Alternative Routes, of the Virginia ERD (see Figure 1.1-2, MARL Project in Virginia). A summary of the Proposed and Alternative Routes is provided below.

NEET MA and NEET VA identified six end-to-end route alternatives (the Proposed Route and Alternative Routes B through F) for the overall MARL Project. The Proposed Route and Alternative Routes B through F are located in Frederick County, Virginia, and are similar in length (i.e., 2.4 miles). The Proposed Route and Alternative Routes C, D, and E follow the same alignment in Virginia and are, therefore, discussed together throughout this report. Similarly, Alternative Routes B and F follow the same alignment as each other and are, therefore, discussed together throughout the Virginia ERD. As the Proposed Route and five Alternative Routes proceed to the Virginia border, Alternative Routes B and F diverge north of the shared alignment of the Proposed Route and Alternative Routes C, D, and E. East of milepost (MP) 105.8, all six routes follow a shared alignment for 1.6 miles to the handoff point.

2.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES C, D, AND E

The shared alignment of the Proposed Route and Alternative Routes C, D, and E enter Virginia in Frederick County at MP 105.0 (as measured on the Proposed Route). The alignment continues southeast, paralleling an existing 500 kV transmission corridor for 0.3 mile. The routes then deviate away from the existing 500 kV transmission corridor for 0.6 mile to avoid residential properties off of Fletcher Road. The Proposed Route and Alternative Routes C, D, and E then continue in a southeasterly direction until reaching the existing transmission line corridor. At this point, the routes cross the corridor perpendicularly, traversing a 500 kV transmission line and a 138 kV transmission line near MP 106.2 (as measured on the Proposed Route). Once the routes cross the transmission line corridor, they immediately head east, paralleling the transmission line corridor on the south side and crossing over Isaacs Creek at MP 106.5. Near MP 106.7 (as measured on the Proposed Route), the routes deviate away from the existing transmission lines to avoid a substation and residential development, crossing Parishville Road and terminating at the handoff point.

2.2 ALTERNATIVE ROUTES B AND F

The shared alignment of Alternative Routes B and F enter Virginia in Frederick County at MP 104.9 (as measured on Alternative Route B), less than 200 feet north of where the shared alignment of the Proposed Route and Alternative Routes C, D, and E enter Virginia. The Alternative Routes B and F alignment continues northeasterly for 0.5 mile then turns southeasterly, meeting up with the Proposed Route and Alternatives C, D, and E near MP 105.6 (as measured on Alternative Route B). Alternative Routes B and F then continue in a southeasterly direction until reaching the existing transmission line corridor. At this point, the routes cross the corridor perpendicularly, traversing a 500 kV transmission line and a 138 kV transmission line near MP 106.0 (as measured on Alternative Route B). Once the routes cross the transmission line corridors, they immediately head east, paralleling the transmission line corridors on the south side. Near MP 106.5

(as measured on Alternative Route B), the routes deviate away from the existing transmission line corridors, crossing Parishville Road and terminating at Structure 107-2 near the handoff point.

2.3 WOODSIDE SUBSTATION SITE

The proposed Woodside Substation site would be located on two parcels that total an approximately 72-acre site that is 7.1 miles north of the town of Winchester along Interstate 81 (I-81). The site is between Carter Machinery and the Fruit Hill site to the north, Ridgeway Estates subdivision to the west, Thistle Lane to the south, and I-81 to the east. The Woodside Substation site will interconnect with the existing Dominion Bismark-Doubs 500 kV transmission line, two new FirstEnergy 138 kV transmission lines that will connect the MARL Project with the nearby existing FirstEnergy Stonewall 138 kV substation, and the new FirstEnergy Gore-Doubs-Goose Creek 500 kV transmission line.

3. REGULATORY FRAMEWORK

USACE has jurisdiction over wetlands and waterbodies under Section 404 of the Clean Water Act (CWA), which regulates the discharge of dredged or fill material into Waters of the United States (WOTUS), including wetlands; and under Section 10 of the Rivers and Harbors Act of 1899, which regulates work in, over, and under navigable WOTUS. Within Virginia, the MARL Project is located entirely within the USACE Norfolk District Regulatory boundary and USACE Baltimore District Civil Works boundary.

The definition of a wetland is "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas" (40 Code of Federal Regulations § 230.3(t)). Under Section 10 of the Rivers and Harbors Act of 1899, navigable waters are defined as "those waters that are subject to the ebb and flow of the tide and/or are presently used, have been used in the past, or may be susceptible for use to transport interstate or foreign commerce."

The VDEQ Water Division, governed by the Va. Code Title 62.1, has jurisdiction over wetlands and waterbodies under Section 401 of the CWA. Nontidal wetlands and waterbodies in Virginia are also regulated under the VDEQ Virginia Water Protection Permit Program, governed by Va. Code § 62.1-44 with implementing regulations in the Virginia Administrative Code at 9 VAC 25-210. This program governs activities such as dredging, filling, excavating, and draining state waters, including wetlands, under the authority of state law and Section 401 of the federal CWA. Subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches are regulated by the Virginia Marine Resources Commission (VMRC), governed by Va. Code §§ 28.2-100 et seq., 28.2-1300 et seq., and 28.2-1400 et seq. The VMRC coordinates with the VDEQ and USACE, as needed, through a joint permit process. Local Wetlands Boards review projects affecting tidal wetlands at the local level or the VMRC will oversee the review if no local wetlands board is active.

On July 21, 2022, ephemeral features that flow only in direct response to precipitation, including ephemeral streams, swales, gullies, rills, and pools, were excluded under the Navigable Waters Protection Rule; however, these features are considered state waters under Virginia law and are regulated by the VDEQ through the Virginia Water Protection Permit Program, pursuant to the State Water Control Law and Section 401 of the CWA. On December 30, 2022, the U.S. Environmental Protection Agency (USEPA) and USACE announced the final "Revised Definition of WOTUS" rule. On January 18, 2023, the rule was published in the *Federal Register,* and the rule took effect on March 20, 2023. On May 25, 2023, the Supreme Court overruled the new WOTUS ruling and defined a wetland as "having a direct and continuous surface water connection to a WOTUS regardless of significant nexus." A WOTUS was defined as "a permanent geographical feature excluding ephemeral streams." The conforming rule, "Revised Definition of 'Waters of the United States'; Conforming," was published in the *Federal Register* and became effective on September 8, 2023. On March 24, 2025, the USEPA and USACE published a notice seeking public comment on clarifying the scope of "relatively permanent waters," defining "continuous surface connection" for wetlands, and determining when ditches should be considered jurisdictional (USEPA 2025). On November 17, 2025, USEPA and USACE announced proposed revisions to the

2023 definition of WOTUS. The proposed rule, if finalized, would "ensur[e] federal jurisdiction is focused on relatively permanent, standing or continuously flowing bodies of water…and wetlands that are connected and indistinguishable from such waterbodies." The proposed rule would further clarify the definitions of "relatively permanent" and "continuous surface connection."

Finally, the Virginia portion of the MARL Project is located in Frederick County, which is not considered Tidewater Virginia as established by Va. Code § 62.1-44.15:68. Therefore, the Coastal Zone Management Act and Chesapeake Bay Preservation Act are not applicable to the MARL Project. In addition, the MARL Project does not cross any Section 10 navigable waters in Virginia or resources under the jurisdiction of VMRC.

4. DESKTOP EVALUATION METHOD

The desktop wetland and waterbody assessment evaluated aquatic resources and impacts within a predefined, MARL Project-specific Siting Corridor for the Proposed and Alternative Routes, which is hereafter referred to as the "Siting Corridor." The Siting Corridor does not overlap the right-of-way (ROW) of existing linear features such as electrical transmission line corridors, pipelines, and roads. The Siting Corridor is nominally 600 feet wide, including the MARL Project's proposed typical 200-foot-wide ROW Corridor and approximately 150 feet on either side of that ROW Corridor. This nominal width notwithstanding, the width of the Siting Corridor varies based on the MARL Project's ROW Corridor width and proximity to existing transmission line ROWs. A detailed description of the Siting Corridor is provided in Section 2 of the Virginia ERD. For the Woodside Substation site, aquatic resources and impacts were assessed within the footprint of the substation site.

Publicly available data from the U.S. Geological Survey (USGS) National Hydrologic Database Plus High-Resolution dataset (NHDPlus HR), USGS topographic maps, and U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) were reviewed to assess the extent of wetland and waterbody features within the Proposed Route and Alternative Route Siting Corridors and the Woodside Substation site. In addition, a deep learning-based Wetland Identification Model (WIM) was used to further evaluate wetland and waterbody resources within the Proposed Route and Alternative Route Siting Corridors to supplement the desktop review of publicly available data and provide a more robust and enhanced desktop assessment. The WIM assessment did not include the Woodside Substation site; however, no jurisdictional wetland resources were identified at this site based on field wetland and waterbody delineation surveys.

4.1 U.S. GEOLOGICAL SURVEY NATIONAL HYDROGRAPHY DATASET

The USGS NHDPlus HR dataset contains features such as lakes, ponds, streams, rivers, and canals (USGS 2025) and is based on National Hydrography Dataset (NHD) data, 10-meter 3D Elevation Program data, and the complete Watershed Boundary Dataset of the United States.

4.2 TOPOGRAPHIC MAPS

Recent Environmental Systems Research Institute, Inc. world topographic maps show the topography of the area and other important landscape features such as forest cover, development, buildings, agricultural areas, streams, lakes, and wetlands (Esri et al. 2025a, 2025b).

4.3 U.S. FISH AND WILDLIFE SERVICE NATIONAL WETLANDS INVENTORY MAPPING

The NWI maps provide the boundaries and classifications of potential wetland areas as mapped by the USFWS (USFWS n.d.). The NWI data is based primarily on aerial photo interpretations with limited ground-truthing and may represent incorrect boundaries or wetland cover types and be unreliable in some areas, especially in forested landscapes where aerial photography is used as the major data source. The classifications of the majority of the NWI polygons in the Proposed Route and Alternative Route Siting Corridors appear to be accurate based on a review of the USGS NHDPlus HR dataset. The USFWS NWI characterizes wetlands based on the Cowardin classification

system, which is a system for categorizing wetlands and deepwater habitats. It classifies wetlands into five major "systems" that include Palustrine, Riverine, Lacustrine, Marine, and Estuarine, as further described below.

Palustrine wetlands are inland, nontidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation, often found in areas with standing water or saturated soil. Palustrine wetlands are further classified as Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), and Palustrine Forested (PFO) wetlands. PEM wetlands are characterized by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens) that provide at least 30 percent aerial cover. PSS wetlands are dominated by woody vegetation less than 20 feet tall that provide at least 30 percent areal coverage. PFO wetlands are dominated by woody vegetation 20 feet tall or taller with trunk diameter at breast height of 3 or more inches that provide at least 30 percent areal coverage.

Palustrine Unconsolidated Bottom (PUB) features are open waterbodies with Unconsolidated Bottom substrates (e.g., lakes and ponds). Riverine features are wetlands directly connected to a river or stream characterized by flowing water. Lacustrine features are wetlands directly associated with lakes and other bodies of standing water such as ponds or reservoirs.

Marine wetlands are wetlands subject to the ebb and flow of oceanic tides. Estuarine wetlands are wetlands partially enclosed by land but have open, partially obstructed, or sporadic access to the open ocean (FGDC 2013). The MARL Project is located outside of the Tidewater area of Virginia; therefore, there are no Marine or Estuarine resources in proximity to the MARL Project, and these resources are not further discussed in this report.

4.4 WETLAND IDENTIFICATION MODEL

As previously described, a deep learning-based model, the WIM, was used to further evaluate wetland and waterbody resources and provide a more robust and enhanced desktop assessment for the Proposed Route and Alternative Route Siting Corridors. The WIM model was trained on and predicts all wetland types collectively and does not differentiate between Cowardin classifications (e.g., Palustrine, Riverine, Lacustrine). A summary of the modeling methodology is provided below, while a detailed presentation of the methodology and output is presented in Appendix H, Wetland Identification Model Report, of the Routing Study.

The following resources were used to facilitate the WIM assessment for the Proposed Route and Alternative Route Siting Corridors:

- NHD streams/waterbodies;
- NWI / Maryland Department of Natural Resources wetlands;
- Land cover data;
- LiDAR digital elevation models; and
- National Agriculture Imagery Program multi-spectral imagery and derivative products.

Using the base datasets above, eight predictor variables were created to help the deep learning-based model identify potential wetlands by recognizing complex patterns that correspond to wetland characteristics. These predictor variables consider characteristics in the Proposed Route and Alternative Route Siting Corridors such as hydrology, topography, and geomorphology. The Maryland Department of Natural Resources wetland data was used to facilitate model training across the MARL Project Study Area in Pennsylvania, West Virginia, Maryland, and Virginia, as this dataset has greater accuracy than the NWI data and covers a substantial portion of the MARL Project Study Area.

The output of the WIM analysis is modeled high probability wetlands (MHPW) within the Proposed Route and Alternative Route Siting Corridors. The MHPW were predicted using seven out of the eight variables, excluding a soil moisture index that historically overpredicts wetlands based on nearby surface water.

5. EXISTING CONDITIONS

5.1 WETLANDS

There are no NWI-mapped PEM, PSS, or PFO wetlands within the Proposed Route and Alternative Route Siting Corridors. As stated previously, formal wetland delineation field surveys were conducted for the Woodside Substation site in early 2025, and no jurisdictional wetland resources were identified.

5.2 WATERBODIES

Table 5.2-1 summarizes the total length of NHD-mapped linear waterbodies (streams/rivers) within the Proposed Route and Alternative Route Siting Corridors. There are no NHD-mapped linear waterbodies within the Woodside Substation site. Attachment 1c, Water Resources Mapbook, of the Virginia ERD, provides detailed waterbody mapping.

TABLE 5.2-1 NATIONAL HYDROGRAPHY DATASET LINEAR WATERBODIES WITHIN THE SITING CORRIDORS AND WOODSIDE SUBSTATION SITE (LINEAR FEET)

Mapped Features	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
Stream/River—Intermittent	5,854.0	3,908.5	0.0
Stream/River—Perennial	3,663.3	3,658.9	0.0
Total NHD Linear Feet [a]	**9,517.3**	**7,567.5**	**0.0**

Source: USGS 2025

NHD = National Hydrography Dataset
[a] Totals may not match the sum of addends due to rounding.

Table 5.2-2 summarizes the total acreage of NHD-mapped open waterbodies (lakes/ponds) and NWI-mapped waterbodies within the Proposed Route and Alternative Route Siting Corridors. NWI-mapped waterbodies based on the Cowardin classification within the Proposed Route and Alternative Route Siting Corridors include both PUB and Riverine features. There are no NHD-mapped open waterbodies or NWI-mapped waterbodies within the Woodside Substation site.

TABLE 5.2-2 NATIONAL HYDROGRAPHY DATASET OPEN WATERBODIES AND NATIONAL WETLANDS INVENTORY WATERBODIES WITHIN THE SITING CORRIDORS (ACRES)

Mapped Features	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
NHD Open Waterbodies			
Lake/Pond—Intermittent	0.2	0.2	0.0
Lake/Pond—Perennial	0.0	0.3	0.0
Total NHD Acreage [a]	**0.2**	**0.5**	**0.0**

Mapped Features	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F	Woodside Substation Site
NWI Waterbodies			
PUB	0.2	0.5	0.0
Riverine [b]	4.8	4.0	0.0
Total NWI Acreage [a]	**5.1**	**4.5**	**0.0**

Source: USGS 2025; USFWS n.d.

NHD = National Hydrography Dataset; NWI = National Wetlands Inventory; PUB = Palustrine Unconsolidated Bottom

[a] Totals may not match the sum of addends due to rounding.

[b] Riverine features include Unconsolidated Bottom, Upper Perennial Riverine (R3UB), Streambed, Intermittent, Riverine (R4SB), and Unconsolidated Bottom, Unknown Perennial, Riverine (R5UB) features.

Based on the above review of NHD and NWI data, the Proposed Route and Alternative Routes B through F each have 10 single and complete centerline crossings of NHD-mapped linear waterbodies, including 7 crossings of perennial features (Isaacs Creek, 5 crossings of Nixon Run, and 1 unnamed tributary [UNT] to Nixon Run) and 3 crossings of intermittent UNTs to Isaacs Creek and Nixon Run. These linear waterbodies are also classified as riverine per NWI mapping.

In addition, 0.2 acre of one intermittent unnamed open waterbody is present within the Proposed Route and Alternative Routes C, D, and E Siting Corridors, and 0.2 acre of one intermittent unnamed open waterbody and 0.3 acre of one perennial unnamed open waterbody is present within the Alternative Routes B and F Siting Corridors. These features are classified as PUB per NWI mapping.

5.3 WETLAND IDENTIFICATION MODEL

Table 5.3-1 summarizes the total acreage of the MHPW within the Proposed Route and Alternative Route Siting Corridors. The MHPW within the Virginia portion of the Siting Corridors aligns with NWI-mapped riverine and PUB waterbodies.

TABLE 5.3-1 WETLAND IDENTIFICATION MODEL HIGH PROBABILITY WETLANDS WITHIN THE SITING CORRIDORS (ACRES)

Modeled Features	Proposed Route / Alternative Routes C, D, and E	Alternative Routes B and F
MHPW	5.1	4.5

MHPW = model high probability wetlands

6. MARL PROJECT IMPACTS

6.1 WETLANDS

There are no NWI-mapped PEM, PSS, or PFO wetlands within the Proposed Route and Alternative Route ROW Corridors, including ancillary facilities located outside of the ROW Corridors. Further, the MHPW predicted by the WIM analysis aligns with riverine and PUB features, indicating only limited, if any, PEM, PSS, and PFO resources would be impacted by construction and operation of the Proposed Route or Alternative Routes. In addition, no impacts on wetland resources are anticipated associated with construction and operation of the Woodside Substation site.

6.2 WATERBODIES

Table 6.2-1 summarizes the length of NHD-mapped linear waterbodies within the Proposed Route and Alternative Routes Siting Corridors and ROW Corridors. Impacts associated with the Proposed Route and Alternative Route ROW Corridors range from 0.7 percent to 0.8 percent of the 499,629.0 linear feet of NHD linear waterbodies present within the MARL Project Study Area in Virginia. There are no NHD-mapped linear waterbodies within the Woodside Substation site.

TABLE 6.2-1 NATIONAL HYDROGRAPHY DATASET LINEAR WATERBODIES WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (LINEAR FEET)

Mapped Features	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
Stream/River—Intermittent	5,854.0	1,609.7	3,908.5	1,105.5	0.0
Stream/River—Perennial	3,663.3	2,180.3	3,658.9	2,180.3	0.0
Total NHD Linear Feet [a]	**9,517.3**	**3,790.0**	**7,567.5**	**3,281.8**	**0.0**

Source: USGS 2025

NHD = National Hydrography Dataset; ROW = right-of-way
[a] Totals may not match the sum of addends due to rounding.

Table 6.2-2 summarizes the length of NHD-mapped linear waterbodies associated with ancillary facility workspaces located outside of the Proposed Route and Alternative Route ROW Corridors. Temporary access road impacts associated with the shared alignment of the Proposed Route and Alternative Routes and represent less than 0.1 percent of the 105,185.6 linear feet of perennial NHD linear waterbodies present within the MARL Project Study Area in Virginia. In addition, other temporary ancillary facility workspace impacts outside of the Proposed Route/Alternative Routes C, D, and E and Alternative Routes B and F ROW Corridors each represent less than 0.1 percent of the 499,629.0 linear feet of NHD-mapped linear waterbodies (both intermittent and perennial) present within the MARL Project Study Area in Virginia. There are no impacts associated with permanent access roads in Virginia.

TABLE 6.2-2 NATIONAL HYDROGRAPHY DATASET LINEAR WATERBODIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (LINEAR FEET)

Mapped Features	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
Stream/River—Intermittent	0.0	0.0	186.5	0.0	0.0	164.7
Stream/River—Perennial	0.0	27.9	68.2	0.0	27.9	68.2
Total NHD Linear Feet [b]	**0.0**	**27.9**	**254.7**	**0.0**	**27.9**	**232.9**

Source: USGS 2025

NHD = National Hydrography Dataset
[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Totals may not match the sum of addends due to rounding.

Table 6.2-3 summarizes the total acreage of NHD-mapped open waterbodies and NWI-mapped waterbodies within the Proposed Route and Alternative Route Siting Corridors and ROW Corridors. Impacts associated with the Proposed Route/Alternative Routes C, D, and E ROW Corridors and Alternative Routes B and F ROW Corridors each represent less than 0.1 percent of the 436.1 acres of NHD-mapped open waterbodies and 0.3 percent of the 603.8 acres of NWI-mapped waterbodies present within the MARL Project Study Area in Virginia. There are no NHD-mapped open waterbodies or NWI-mapped waterbodies within the Woodside Substation site.

TABLE 6.2-3 NATIONAL HYDROGRAPHY DATASET OPEN WATERBODIES AND NATIONAL WETLANDS INVENTORY WATERBODIES WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (ACRES)

Mapped Features	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
NHD Open Waterbodies					
Lake/Pond—Intermittent [a]	0.2	0.2	0.2	0.2	0.0
Lake/Pond—Perennial [a]	0.0	0.0	0.3	0.0	0.0
Total NHD Acreage [b]	**0.2**	**0.2**	**0.5**	**0.2**	**0.0**

Mapped Features	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F		Woodside Substation Site
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor	
NWI Waterbodies					
PUB	0.2	0.1	0.5	0.1	0.0
Riverine [c]	4.9	2.0	4.0	1.8	0.0
Total NWI Acreage [b]	**5.1**	**2.1**	**4.5**	**1.9**	**0.0**

Source: USGS 2025; USFWS n.d.

NHD = National Hydrography Dataset; NWI = National Wetlands Inventory; PUB = Palustrine Unconsolidated Bottom; ROW = right-of-way

[a] Acreage represents one single feature.

[b] Totals may not match the sum of addends due to rounding.

[c] Riverine features include Unconsolidated Bottom, Upper Perennial Riverine (R3UB), Streambed, Intermittent, Riverine (R4SB), and Unconsolidated Bottom, Unknown Perennial, Riverine (R5UB) features.

Table 6.2-4 summarizes the total acreage of NHD-mapped open waterbodies and NWI-mapped waterbodies associated with ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. As indicated in this table, impacts on NHD-mapped open waterbodies are limited to other temporary ancillary facility workspaces outside of the Proposed Route/Alternative Routes C, D, and E ROW Corridor. These impacts represent less than 0.1 percent of the 436.1 acres of NHD-mapped open waterbodies present within the MARL Project Study Area in Virginia. There are no permanent or temporary access road impacts on NHD-mapped open waterbodies.

TABLE 6.2-4 NATIONAL HYDROGRAPHY DATASET OPEN WATERBODIES AND NATIONAL WETLANDS INVENTORY WATERBODIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Waterbody Features	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
NHD Open Waterbodies						
Lake/Pond—Intermittent	0.0	0.0	< 0.1	0.0	0.0	0.0
Lake/Pond—Perennial	0.0	0.0	0.0	0.0	0.0	0.0
Total NHD Acreage [b]	**0.0**	**0.0**	**< 0.1**	**0.0**	**0.0**	**0.0**

Waterbody Features	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
NWI Waterbodies						
PUB	0.0	0.0	< 0.1	0.0	0.0	0.0
Riverine [c]	0.0	< 0.1	0.1	0.0	< 0.1	0.1
Total NWI Acreage [b]	**0.0**	**< 0.1**	**0.2**	**0.0**	**< 0.1**	**0.1**

Source: USGS 2025

NHD = National Hydrography Dataset; NWI = National Wetlands Inventory; PUB = Palustrine Unconsolidated Bottom

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.

[b] Totals may not match the sum of addends due to rounding.

[c] Riverine features include Unconsolidated Bottom, Upper Perennial Riverine (R3UB), Streambed, Intermittent, Riverine (R4SB), and Unconsolidated Bottom, Unknown Perennial, Riverine (R5UB) features.

Temporary access road impacts on NWI-mapped waterbodies associated with the shared alignment of the Proposed Route and Alternative Routes represent less than 0.1 percent of the 603.8 acres of NWI-mapped waterbodies present within the MARL Project Study Area in Virginia. In addition, impacts associated with other temporary ancillary facilities outside of the Proposed Route/Alternative Routes C, D, and E ROW Corridor and the Alternative Routes B and F ROW Corridor each represent less than 0.1 percent of the 603.8 acres of NWI-mapped waterbodies present within the MARL Project Study Area in Virginia. There are no permanent access road impacts on NWI-mapped waterbodies in Virginia, and there are no NWI-mapped waterbodies within the Woodside Substation site.

As previously stated, the Proposed Route and Alternative Routes B through F each have 10 single and complete centerline crossings of NHD-mapped linear waterbodies, including 7 crossings of perennial features and 3 crossings of intermittent UNTs to Isaacs Creek and Nixon Run. Table 6.2-5 summarizes the length of each individual perennial and intermittent linear waterbody within the Siting Corridors and ROW Corridors, including feature lengths present within the Siting Corridors and ROW Corridors but not crossed by a route centerline.

TABLE 6.2-5 INDIVIDUAL LINEAR WATERBODIES WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (LINEAR FEET)

USGS Name	Flow Regime	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F	
		Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor
UNT-1 to Nixon Run [a]	Intermittent	2,748.7	553.8	520.4	214.7
UNT-2 to Nixon Run [a]	Intermittent	352.6	196.9	638.9	274.8
UNT-3 to Nixon Run [b]	Intermittent	287.6	287.6	287.6	40.6
UNT-4 to Nixon Run [c]	Perennial	240.1	240.1	240.1	240.1
Nixon Run [c]	Intermittent	279.8	109.1	279.8	109.1
Nixon Run [d]	Perennial	2,318.2	1,501.6	2,318.2	1,501.6
Isaacs Creek [c]	Perennial	1,105.0	438.6	1,105.0	438.6
UNT-1 to Isaacs Creek [b]	Intermittent	398.7	70.6	398.7	70.6
UNT-2 to Isaacs Creek [c]	Intermittent	817.4	391.8	817.4	391.8
UNT-1 to Dry Run [b]	Intermittent	969.2	0.0	969.2	0.0
Total [e]		**9,517.3**	**3,790.0**	**7,575.3**	**3,281.8**

Source: USGS 2025

ROW = right-of-way; UNT = unnamed tributary; USGS = U.S. Geological Survey
[a] Total length includes one crossing each of the Proposed Route and Alternative Routes C, D, and E and Alternative Routes B and F centerlines.
[b] Feature is present within the Siting and/or ROW Corridors but not crossed by route centerlines.
[C] Total length includes one crossing of the shared Proposed Route and Alternative Routes B through F centerlines.
[d] Total length includes four crossings of the shared Proposed Route and Alternative Routes B through F centerlines.
[e] Totals may not match the sum of addends due to rounding.

Table 6.2-6 summarizes the length of each individual perennial or intermittent linear waterbody within ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. Temporary access road impacts associated with the shared alignment of the Proposed Route and Alternative Routes include one crossing of Nixon Run. In addition, Nixon Run is located within two other temporary ancillary facility workspaces outside of the shared Proposed Route and Alternative Route ROW Corridors. An intermittent UNT to Dry Run is located within a separate ancillary facility workspace, and one intermittent UNT to Nixon Run is also located within an ancillary facility workspace outside of the Proposed Route/Alternative Routes C, D, and E ROW Corridor. There are no impacts associated with permanent access roads in Virginia.

TABLE 6.2-6 INDIVIDUAL LINEAR WATERBODIES WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (LINEAR FEET)

USGS Name	Flow Regime	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
		Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
UNT-1 to Nixon Run	Intermittent	0.0	0.0	21.8	0.0	0.0	0.0
Nixon Run [b]	Perennial	0.0	27.9	68.2	0.0	27.9	68.2
UNT-1 to Dry Run	Intermittent	0.0	0.0	164.7	0.0	0.0	164.7
Total [c]		**0.0**	**27.9**	**254.7**	**0.0**	**27.9**	**232.9**

Source: USGS 2025

UNT = unnamed tributary; USGS = U.S. Geological Survey
[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.
[b] Total length of this feature includes three separate crossings of ancillary facilities outside of the ROW Corridors.
[c] Totals may not match the sum of addends due to rounding.

6.3 WETLAND IDENTIFICATION MODEL

Table 6.3-1 provides a summary of the acreage of the MHPW within the Proposed Route and Alternative Route Siting Corridors and ROW Corridors. The MHPW impacts associated with the Proposed Route and Alternative Route ROW Corridors are each 0.3 percent of the 699.1 acres of the MHPW present within the MARL Project Study Area in Virginia.

TABLE 6.3-1 WETLAND IDENTIFICATION MODEL HIGH PROBABILITY WETLANDS WITHIN THE SITING CORRIDORS AND ROW CORRIDORS (ACRES)

Wetland Features	Proposed Route / Alternative Routes C, D, and E		Alternative Routes B and F	
	Siting Corridor	ROW Corridor	Siting Corridor	ROW Corridor
MHPW [a]	5.1	2.1	4.5	1.9

MHPW = model high probability wetlands; ROW = right-of-way
[a] The MHPW in Virginia consists of riverine and PUB features.

Table 6.3-2 summarizes the acres of the MHPW within ancillary facility workspaces outside of the Proposed Route and Alternative Route ROW Corridors. The MHPW impacts associated with temporary access roads and other temporary ancillary facilities outside of the shared ROW Corridor are each less than 0.1 percent of the 699.1 acres of the MHPW present within the MARL Project Study Area in Virginia. There are no impacts associated with permanent access roads in Virginia.

TABLE 6.3-2 WETLAND IDENTIFICATION MODEL HIGH PROBABILITY WETLANDS WITHIN ANCILLARY FACILITY WORKSPACES OUTSIDE OF THE ROW CORRIDORS (ACRES)

Wetland Features	Proposed Route / Alternative Routes C, D, and E			Alternative Routes B and F		
	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities	Permanent Access Roads [a]	Temporary Access Roads	Other Temporary Ancillary Facilities
MHPW [b]	0.0	< 0.1	0.2	0.0	< 0.1	0.1

MHPW = model high probability wetlands

[a] There are no permanent access roads for the Proposed Route or Alternative Routes in Virginia.

[b] The MHPW in Virginia consists of riverine and PUB features.

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ATTACHMENT 3 VIRGINIA AGENCY CORRESPONDENCE

U.S. Fish and Wildlife Service
Virginia Ecological Field Service Office

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

In Reply Refer To: 12/16/2025 19:37:38 UTC
Project Code: 2026-0027767
Project Name: MidAtlantic Resiliency Link - VA Route A

Subject: 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 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 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:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

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 Project Code in the header of this

letter with any request for consultation or correspondence about your project that you submit to our office.

Note: IPaC has provided all available attachments because this project is in multiple field office jurisdictions.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

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

This project's location is within the jurisdiction of multiple offices. However, only one species list document will be provided for all offices. The species and critical habitats in this document reflect the aggregation of those that fall in each of the affiliated office's jurisdiction. Other offices affiliated with the project:

West Virginia Ecological Services Field Office
6263 Appalachian Highway
Davis, WV 26260-8061
(304) 866-3858

PROJECT SUMMARY

Project Code: 2026-0027767
Project Name: MidAtlantic Resiliency Link - VA Route A
Project Type: Transmission Line - New Constr - Above Ground
Project Description: Virginia Segment Route A
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.27703165,-78.38395300763999,14z



Counties: Frederick County, Virginia

ENDANGERED SPECIES ACT SPECIES

There is a total of 4 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.

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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
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered

CLAMS

NAME	STATUS
Green Floater *Lasmigona subviridis* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7541	Proposed Threatened

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

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

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

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.

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/ activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

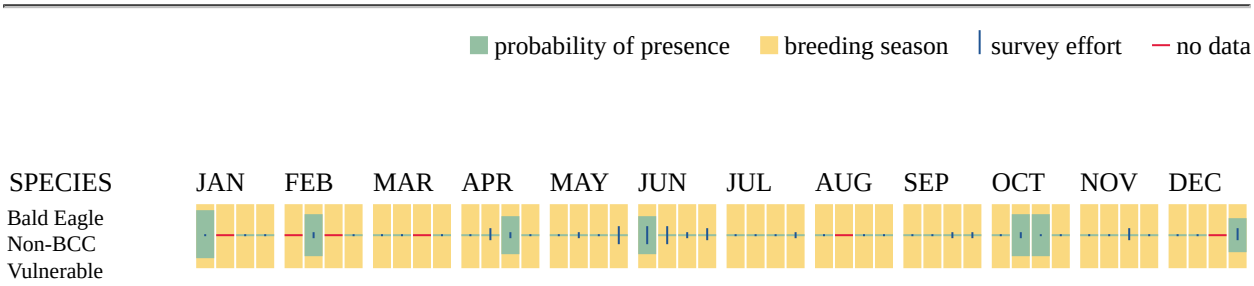
Probability of Presence (▪)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Black-capped Chickadee *Poecile atricapillus practicus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/10645	Breeds Apr 10 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10

NAME	BREEDING SEASON
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Prairie Warbler *Setophaga discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	Breeds May 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (▪)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management

- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPAC USER CONTACT INFORMATION

Agency: ERM
Name: Kathleen McDaniel
Address: 345 Woodcliff Dr 2nd floor
City: Rochester
State: NY
Zip: 14450
Email kathleen.mcdaniel@erm.com
Phone: 3153219174

Virginia Department of Conservation and Recreation

From: Hypes, Rene (DCR) <rene.hypes@dcr.virginia.gov>
Sent: Friday, April 26, 2024 3:55 PM
To: Michael Tincher <michael.tincher@erm.com>
Cc: Boyd, David (DCR) <David.Boyd@dcr.virginia.gov>
Subject: RE: Natural Heritage data - transmission line project PN 0718854

EXTERNAL MESSAGE

Hello Mr. Tincher,

Please let us know if you have any questions about the data and/or the data agreement.

I have attached the invoice for the data subscription fee. Please submit a copy of the invoice with payment to the Treasurer of Virginia, Department of Conservation and Recreation, Finance, 600 East Main Street, 24th Floor Richmond, VA 23219. Payment is due within 30 days of the invoice date. Late payment may result in the suspension of project review service for future projects.

To pay the invoice by credit card, please click here for the DCR credit card payment portal weblink or copy http://www.dcr.virginia.gov/payment-verification into your browser. It will take approximately 24 hours for the invoice to be available for payment in the online system.

Thank you.

Rene'

S. Rene' Hypes (she/her)
Project Review Coordinator
Department of Conservation and Recreation
Division of Natural Heritage
600 East Main Street, 24th Floor
Richmond, Virginia 23219
804-371-2708 (phone)
804-371-2674 (fax)
rene.hypes@dcr.virginia.gov

From: Boyd, David (DCR) <David.Boyd@dcr.virginia.gov>
Sent: Thursday, April 25, 2024 5:07 PM
To: michael.tincher@erm.com; Hypes, Rene (DCR) <rene.hypes@dcr.virginia.gov>
Subject: RE: Natural Heritage data - transmission line project PN 0718854

I'm also attaching the signed license agreement. Thanks, Dave

---

From: Boyd, David (DCR)
Sent: Thursday, April 25, 2024 5:06 PM
To: michael.tincher@erm.com; Hypes, Rene (DCR) <rene.hypes@dcr.virginia.gov>
Subject: Natural Heritage data - transmission line project PN 0718854

Mr. Tincher,

Please find the attached Tier 1 Natural Heritage data intersecting the mapped area for transmission line project "PN 0718854". Metadata is also included and is readable using ArcCatalog.

Please let us know if you have any questions or problems with the data.

Thanks! Dave

David Boyd (he/him)
Conservation Lands GIS Planner
Department of Conservation & Recreation
Main Street Centre, 24th Floor
600 East Main Street
Richmond, Virginia 23219
(804) 371-4801
David.Boyd@dcr.virginia.gov

Conserving VA's Biodiversity through
Inventory, Protection and Stewardship
www.dcr.virginia.gov/natural_heritage
Virginia Natural Heritage Program on Facebook

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From: Michael Tincher
Sent on: Monday, June 9, 2025 6:07:28 PM
To: Christine Essick; Alexandra Kenna
Subject: Fw: Natural Heritage data - transmission line project PN 0718854
Attachments: ERM Transmission Project MARL-PN 0718854 DDS_T1 2025.pdf (157.93 KB), ERM0718854.zip (34.62 KB)

From: Boyd, David (DCR) <David.Boyd@dcr.virginia.gov>
Sent: Monday, June 9, 2025 4:57:24 PM
To: Michael Tincher <michael.tincher@erm.com>
Cc: Hypes, Rene (DCR) <Rene.Hypes@dcr.virginia.gov>
Subject: RE: Natural Heritage data - transmission line project PN 0718854

You don't often get email from david.boyd@dcr.virginia.gov. Learn why this is important

EXTERNAL MESSAGE

Mr. Tincher,

Please find the attached ZIP file with your Virginia Natural Heritage GIS data for transmission line PN 0718854. It includes Natural Heritage Screening Layer data within a quarter mile of the proposed delineation. Metadata is included and readable using ArcCatalog. This update should replace your old data. I'm also attaching the finalized license agreement for your records.

Feel free to contact me with any questions.

Thanks! Dave

David Boyd
Conservation Lands GIS Planner
Natural Heritage Program
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, Virginia 23219
(804) 371-4801 | David.Boyd@dcr.virginia.gov

From: Hypes, Rene (DCR) <Rene.Hypes@dcr.virginia.gov>
Sent: Monday, June 9, 2025 11:57 AM
To: Michael Tincher <michael.tincher@erm.com>
Subject: RE: Natural Heritage data - transmission line project PN 0718854

Stefanie K. Taillon
Secretary of Natural and Historic Resources

Matthew S. Wells
Director

Andrew W. Smith
Chief Deputy Director

Frank N. Stovall
Deputy Director for Operations

Darryl Glover
Deputy Director for Dam Safety, Floodplain Management and Soil and Water Conservation

Laura Ellis
Deputy Director for Administration and Finance

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

July 3, 2025

Alexandra Kenna
Environmental Resources Management, Inc.
One Beacon Street, Fifth Floor
Boston, MA 02155

Re: MidAtlantic Resiliency Link Project

Dear Ms. Kenna:

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 in our files, the Isaacs Creek Prow Conservation Site is located within the project area, including a 100-foot buffer. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plants, animals, or natural communities designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking (B-rank) based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. The Isaacs Creek Prow Conservation Site has been assigned a B-rank of B3, which represents a site of high significance. The natural heritage resource associated with this site is:

Pyrgus centaureae wyandot	Appalachian Grizzled Skipper	G5T1T2/S1/SOC/LT

The Appalachian Grizzled Skipper is a rare butterfly subspecies which is currently experiencing population declines throughout its range. It is now rare or absent within significant portions of its entire historical range (NatureServe, 2009). In Virginia, this species typically occurs in shale barrens, pastures and powerlines on south to west facing shale slopes, always with considerable bare rock or soil, in the Ridge and Valley and the Alleghany Mountain physiographic regions (Chazal & Roble, 1998). Its habitat also consists of vegetation in clumps, abundant spring flowers, abundant larval food plants (*Potentilla canadensis*) and a source of moisture for the adults. Adults seldom occur more than about 30 meters from woods and sometimes occur in the woods before the canopy fills in. Favored nectar flowers include birds foot violet, pussy toes and *Phlox subulata*.

Threats to this species include spraying for gypsy moth, forestry activities and fire suppression. Please note that this species is currently listed as threatened by the Virginia Department of Agriculture and Consumer Services (VDACS). It is also tracked as a species of concern by the United States Fish and Wildlife Service (USFWS); however, this is not a legal designation.

Additionally, according to DCR's predicted suitable habitat modeling and review by a DCR biologist, there is a potential for the Wood Turtle (*Glyptemys insculpta*, G2G3/S2/SOC/LT) and additional occurrences of the Appalachian grizzled skipper to occur in the project area if suitable habitat exists on site.

The Wood Turtle ranges from southeastern Canada, south to the Great Lake states and New England. In Virginia, it is known from northern counties within the Potomac River drainage (NatureServe, 2009). The Wood turtle inhabits areas with clear streams with adjacent forested floodplains and nearby fields, wet meadows, and farmlands (Buhlmann et al., 2008; Mitchell, 1994). Since this species overwinters on the bottoms of creeks and streams, a primary habitat requirement is the presence of water (Mitchell, 1994).

Threats to the Wood turtle include habitat fragmentation, urbanization, and automobile or farm machinery mortality (Buhlmann et al., 2008). Please note that this species is listed as threatened by the Virginia Department of Wildlife Resources (VDWR).

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations for all streams on the property.

Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the Appalachian grizzled skipper and the wood turtle in the eastern portion of the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

DCR-Division of Natural Heritage biologists are qualified to conduct inventories for rare, threatened, and endangered species. Please contact Anne Chazal, Natural Heritage Chief Biologist, at anne.chazal@dcr.virginia.gov or 804-786-9014 to discuss availability and rates for field work

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. Survey results for the Appalachian grizzled skipper should be coordinated with DCR-DNH. Upon review of the results, if it is determined the species is present, and there is a likelihood of a negative impact on the species, DCR-DNH will recommend coordination with VDACS to ensure compliance with Virginia's Endangered Plant and Insect Species Act.

In addition, Isaacs Creek has been designated by the VDWR as a "Threatened and Endangered Species Water" for the Wood Turtle. Due to the legal status of wood turtle, DCR recommends coordination with Virginia's regulatory authority for the management and protection of this species, the VDWR, to ensure compliance with the Virginia Endangered Species Act (VA ST §§ 29.1-563 – 570).

The proposed project will impact an Ecological Core **(C5)** as identified in the Virginia Natural Landscape Assessment (https://www.dcr.virginia.gov/natural-heritage/vaconvisvnla). 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 at least 100 acres of continuous interior, natural cover 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. Interior core areas begin 100 meters inside core edges and continue to the deepest parts of cores. Cores also provide the natural, economic, and quality of life benefits of open space, recreation, thermal moderation, water quality (including drinking water recharge and protection, and erosion prevention), and air quality (including sequestration of carbon, absorption of gaseous pollutants, and production of oxygen). Cores are

ranked from C1 to C5 (C5 being the least significant) using nine prioritization criteria, including the habitats of natural heritage resources they contain.

Impacts to cores occur when their natural cover is partially or completely converted permanently to developed land uses. Habitat conversion to development causes reductions in ecosystem processes, native biodiversity, and habitat quality due to habitat loss; less viable plant and animal populations; increased predation; and increased introduction and establishment of invasive species.

DCR recommends avoidance of impacts to cores. When avoidance cannot be achieved, DCR recommends minimizing the area of impacts overall and concentrating the impacted area at the edges of cores, so that the most interior remains intact.

DCR recommends the development and implementation of an invasive species plan to be included as part of the maintenance practices for the right-of-way (ROW). The invasive species plan should include an invasive species inventory for the project area based on the current DCR Invasive Species List (https://www.dcr.virginia.gov/natural-heritage/document/nh-invasive-plant-list-2023.pdf) and methods for treating the invasives. DCR also recommends the ROW restoration and maintenance practices planned include appropriate revegetation using native species in a mix of grasses and forbs, robust monitoring and an adaptive management plan to provide guidance if initial revegetation efforts are unsuccessful or if invasive species outbreaks occur.

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 has passed before it is utilized.

A fee of $595.00 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 at https://services.dwr.virginia.gov/fwis/ or contact Lee Brann at Lee.Brann @dwr.virginia.gov.

Should you have any questions or concerns, feel free to contact me at 804-625-3979. Thank you for the opportunity to comment on this project.

Sincerely,

Nicki Gustafson
Natural Heritage Project Review Assistant

Cc: Hannah Schul, VDWR

Literature Cited

Buhlmann, K, T. Tuberville, and W. Gibbons. 2008. Turtles of the southeast. University of Georgia Press. Athens, GA. 252 pp.

Chazal, A.C. and S.M. Roble. 1998. Conservation Status Assessment for the Grizzled Skipper (*Pyrgus wyandot*) on National Forest Lands in Virginia. Natural Heritage Technical Report 98-23. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond.

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Stefanie K. Taillon
Secretary of Natural and Historic Resources

Matthew S. Wells
Director

Andrew W. Smith
Chief Deputy Director

Frank N. Stovall
Deputy Director for Operations

Darryl Glover
Deputy Director for Dam Safety, Floodplain Management and Soil and Water Conservation

Laura Ellis
Deputy Director for Administration and Finance

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

October 10, 2025

Alexandra Kenna
Environmental Resources Management, Inc.
75 Valley Stream Parkway, Suite 200
Malvern, PA 19355

Re: 500KV Transmission Line Proposed Route

Dear Ms. Kenna:

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 in our files, the Isaacs Creek Prow Conservation Site is located within the project area. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking (B-rank) based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. The Isaacs Creek Prow Conservation Site has been assigned a B-rank of B3, which represents a site of high significance. The natural heritage resource associated with this site is:

Pyrgus centaureae wyandot	Appalachian Grizzled Skipper	G5T1T2/S1/SOC/LT

The Appalachian grizzled skipper is a rare butterfly subspecies which is currently experiencing population declines throughout its range. It is now rare or absent within significant portions of its entire historical range (NatureServe, 2009). In Virginia, this species typically occurs in shale barrens, pastures and powerlines on south to west facing shale slopes, always with considerable bare rock or soil, in the Ridge and Valley and the Alleghany Mountain physiographic regions (Chazal & Roble, 1998). Its habitat also consists of vegetation in clumps, abundant spring flowers, abundant larval food plants (*Potentilla canadensis*) and a source of moisture for the adults. Adults seldom occur more than about 30 meters from woods and sometimes occur in the woods before the canopy fills in. Favored nectar flowers include birds foot violet, pussy toes and *Phlox subulata*. Surveys for the Appalachian grizzled skipper should be completed between mid-April and early May.

Threats to this species include spraying for the spongy moth, forestry activities and fire suppression. Please note that this species is currently listed as threatened by the Virginia Department of Agriculture and Consumer Services (VDACS). It is also tracked as a species of concern by the United States Fish and Wildlife Service (USFWS); however this is not a legal designation.

In addition to the documented occurrence there is potential for additional populations of the Appalachian grizzled skipper to occur within both the existing and proposed power line right-of-way (ROW). Due to the potential for this site to support populations of natural heritage resources, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

DCR-Division of Natural Heritage biologists are qualified to conduct inventories for rare, threatened, and endangered species. Please contact Anne Chazal, Natural Heritage Chief Biologist, at anne.chazal@dcr.virginia.gov or 804-786-9014 to discuss availability and rates for field work.

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. Survey results should be coordinated with DCR-DNH. Upon review of the results, if it is determined the species is present, and there is a likelihood of a negative impact on the species, DCR-DNH will recommend coordination with VDACS to ensure compliance with Virginia's Endangered Plant and Insect Species Act.

In addition, if tree removal is necessary outside of the existing ROW the proposed project will impact an Ecological Core **(C5)** as identified in the Virginia Natural Landscape Assessment (https://www.dcr.virginia.gov/natural-heritage/vaconvisvnla). 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 at least 100 acres of continuous interior, natural cover 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. Interior core areas begin 100 meters inside core edges and continue to the deepest parts of cores. Cores also provide the natural, economic, and quality of life benefits of open space, recreation, thermal moderation, water quality (including drinking water recharge and protection, and erosion prevention), and air quality (including sequestration of carbon, absorption of gaseous pollutants, and production of oxygen). Cores are ranked from C1 to C5 (C5 being the least significant) using nine prioritization criteria, including the habitats of natural heritage resources they contain.

Impacts to cores occur when their natural cover is partially or completely converted permanently to developed land uses. Habitat conversion to development causes reductions in ecosystem processes, native biodiversity, and habitat quality due to habitat loss; less viable plant and animal populations; increased predation; and increased introduction and establishment of invasive species.

DCR recommends avoidance of impacts to cores. When avoidance cannot be achieved, DCR recommends minimizing the area of impacts overall and concentrating the impacted area at the edges of cores, so that the most interior remains intact.

Furthermore, DCR recommends the development and implementation of an invasive species plan to be included as part of the maintenance practices for the ROW. The invasive species plan should include an invasive species inventory for the project area based on the current DCR Invasive Species List (https://www.dcr.virginia.gov/natural-heritage/document/nh-invasive-plant-list-2023.pdf) and methods for treating the invasives. DCR also recommends the ROW restoration and maintenance practices planned include appropriate revegetation using native species in a mix of grasses and forbs, robust monitoring and an adaptive management plan to provide guidance if initial revegetation efforts are unsuccessful or if invasive species outbreaks occur.

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 has passed before it is utilized.

A fee of $595.00 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 at https://services.dwr.virginia.gov/fwis/ or contact Susan Watson at Susan.Watson@dwr.virginia.gov. According to the information currently in our files, Isaac Creek, which has been designated by the VDWR as a "Threatened and Endangered Species Water" for the Wood Turtle is within the submitted project boundary including a 100-foot buffer. Therefore, DCR recommends coordination with Virginia's regulatory authority for the management and protection of this species, the VDWR, to ensure compliance with the Virginia Endangered Species Act **(**VA ST §§ 29.1-563 – 570).

Should you have any questions or concerns, feel free to contact me at 804-625-3979. Thank you for the opportunity to comment on this project.

Sincerely,

Nicki Gustafson
Natural Heritage Project Review Assistant

Cc: Hannah Schul, VDWR

Literature Cited

Chazal, A.C. and S.M. Roble. 1998. Conservation Status Assessment for the Grizzled Skipper (*Pyrgus wyandot*) on National Forest Lands in Virginia. Natural Heritage Technical Report 98-23. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: April 15, 2010).

From: Michael Tincher
Sent on: Sunday, November 9, 2025 9:57:00 PM
To: Alexandra Kenna; Christine Essick
Subject: Fw: Natural Heritage GIS data updates
Attachments: erm0718854.zip (39.2 KB)

From: Boyd, David (DCR) <David.Boyd@dcr.virginia.gov>
Sent: Saturday, November 8, 2025 1:07:08 PM
To: Michael Tincher <michael.tincher@erm.com>
Subject: Natural Heritage GIS data updates

You don't often get email from david.boyd@dcr.virginia.gov. Learn why this is important

EXTERNAL MESSAGE

Michael,

Please find the attached ZIP file with your Virginia Natural Heritage GIS data updates. Metadata is included and readable using ArcCatalog. This update should replace your old data.

Feel free to contact me with any questions.

Thanks! Dave

David Boyd
Conservation Lands GIS Planner
Natural Heritage Program
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, Virginia 23219
(804) 371-4801 | David.Boyd@dcr.virginia.gov





Virginia Department of Environmental Quality

From: Fowler, Keith (DEQ)
Sent on: Monday, August 19, 2024 10:00:15 AM
To: Christine Essick; Kiracofe, Brandon (DEQ); Millard, Eric (DEQ); Showman, Keith (DEQ); Rolfes, Bradley; Hall, Danielle; McCormick, Kaitlin; Liu, Lisa; Kathleen McDaniel; Alexandra Kenna
Subject: RE: NextEra Energy Transmission MidAtlantic I MidAtlantic Resiliency Link Project Introductory Meeting

Some people who received this message don't often get email from keith.fowler@deq.virginia.gov. Learn why this is important

EXTERNAL MESSAGE

Hi Christine. Below is general information related to DEQ programs we provide for projects like this that are in the DEQ Valley Region. Please review (or relay) the general information provided below and contact me with any questions you may have at any time. We are happy to assist you in any way we can to determine what environmental permits you may need and to help you understand any other requirements associated with Virginia's environmental laws and regulations. If you happen to need any environmental permits you should know that some can be processed in a matter of days or weeks, but others may take several months or more due to coordination with other agencies and public notice requirements, and we want to make sure you can get started as soon as you desire. We look forward to working with you as you proceed with this business endeavor and for many years to come.
An overview of DEQ permitting information is available from the DEQ Permits page, https://www.deq.virginia.gov/permits-2. In addition, we encourage you to refer to DEQ's Environmental Impact Reviews web site, https://www.deq.virginia.gov/our-programs/environmental-impact-review, and our Pollution Prevention / Environmental Excellence pages, https://www.deq.virginia.gov/our-programs/pollution-prevention and https://www.deq.virginia.gov/our-programs/pollution-prevention/virginia-environmental-excellence-program, for other general information. We are glad to discuss specifics for any aspects of this project with you as it relates to any DEQ programs. Please let me know if you have any questions or need any additional information regarding environmental matters.
1. Air Permitting. Facilities, equipment, or processes that emit air pollutants may require an air permit prior to construction. Installation / operation / modification / replacement of stationary or portable fuel burning equipment or other sources of air pollutants, including dust, may be subject to registration and/or air permitting requirements (https://www.deq.virginia.gov/permits/air). Some of the more ubiquitous equipment includes generators, boilers, paint booths, wood chippers/grinders, etc. For questions regarding these requirements, contact Trevor Wallace at DEQ-VRO (540-217-7185, Trevor.Wallace@deq.virginia.gov).
2. Erosion and Sediment Control and Storm Water Management. DEQ has regulatory authority for the Virginia Pollutant Discharge Elimination System (VPDES) programs related to municipal separate storm sewer systems (MS4s) and construction activities. Erosion and sediment control measures are addressed in local ordinances and State regulations. Additional information is available at https://www.deq.virginia.gov/permits/water/stormwater-construction. Non-point source pollution resulting from site development activities should be minimized by using effective erosion and sediment control practices and structures. Consideration should also be given to using permeable paving for parking areas and walkways where appropriate, and denuded areas should be promptly revegetated following construction work. If the total land disturbance exceeds 10,000 square feet, an erosion and sediment control plan will be required. Some localities also require an E&S plan for disturbances less than 10,000 square feet. A stormwater management plan may also be required. For land disturbing activities of one acre or more, permit coverage is required under the VPDES General Permit for Discharges of Storm Water from Construction Activities. The Virginia Stormwater Management Permit Authority may be DEQ or the locality. For questions regarding these requirements, contact Eric Millard at DEQ-VRO (540-217-7483, Eric.Millard@deq.virginia.gov).
3. Water Quality and Wetlands. Measures must be taken to avoid and minimize impacts to surface waters and wetlands during construction activities. The disturbance of surface waters or wetlands may require prior approval by DEQ and/or the U.S. Army Corps of Engineers, https://www.deq.virginia.gov/permits/water/wetlands-streams-vwp. The Army Corps of Engineers is the final authority for an official confirmation of whether there are federal jurisdictional wetlands or other surface waters that may be impacted by the proposed project. DEQ may confirm additional waters as jurisdictional beyond those under federal authority. Review of National Wetland Inventory maps or topographic maps for locating wetlands or streams may not be sufficient; there may need to be a site-specific review of the site by a qualified professional. Even if there will be no intentional placement of fill material in jurisdictional waters, potential water quality impacts resulting from construction site surface runoff must be minimized. This can be achieved by using appropriate Best Management Practices (BMPs). If construction activities will occur in or along any streams (perennial, intermittent, or ephemeral), open water or wetlands, the applicant should contact Eric Millard at DEQ-VRO (540-217-7483, Eric.Millard@deq.virginia.gov) to determine the need for any permits prior to commencing work that could impact surface waters or wetlands.
4. Other Site Development Considerations. Fugitive dust generated during construction should be controlled by using measures such as the prompt removal of spilled or tracked dirt or other materials from paved streets, limited application of water to suppress dust, and washing of construction vehicles and paved roadways immediately adjacent to construction sites. Do not use water for dust control to the extent that it results in runoff to surface waters or wetlands. Land clearing wastes (vegetative debris) generated during construction should be properly managed in accordance with applicable regulations and local ordinances. Shredding/chipping of vegetative debris and reuse on-site is usually recommended over open burning. Any open burning of vegetative debris must be performed in accordance with the Open Burning Regulation and coordinated with the local fire official to ensure that all local ordinances are met. A copy of DEQ's open burning regulation and related information are accessible from https://www.deq.virginia.gov/laws-regulations/air. Also, no open burning should take place in violation of the Virginia Waste Management Regulations, https://www.deq.virginia.gov/laws-regulations/land-waste. For questions regarding these requirements, contact Keith Fowler at DEQ-VRO (540-217-7480, Keith.Fowler@deq.virginia.gov).
5. Potable Water and Water Withdrawals. Installation of potable water lines and appurtenances must comply with the State's Waterworks Regulations. The Virginia Department of Health (VDH), https://www.vdh.virginia.gov/drinking-water/, administers both federal and state laws governing waterworks operation. For more information, contact the VDH's Lexington Office of Drinking Water at

(540) 463-7136, https://www.vdh.virginia.gov/drinking-water/contact-us/. Projects that propose to withdraw surface water or groundwater for production or cooling water or other activities may require prior approval by DEQ. For more information, please refer to the DEQ Water Withdrawal page at https://www.deq.virginia.gov/permits/water/water-withdrawal or contact Eric Seavey (804-754-6250, Eric.Seavey@deq.virginia.gov).

6. Wastewaters. DEQ has approval authority over wastewater discharges per the State Water Control Law and corresponding regulations. This includes discharges or land application of wastewaters generated from the washing of materials, products, or vehicles, or other practices which may be relevant to this project, including the discharge of chlorinated potable water, water contaminated by chemicals used on-site, or stormwater from certain industrial sites. DEQ also has approval authority over plans and specifications for sewage collection systems and treatment works (except drainfields and other on-site systems approved by the local health department), per the Sewage Collection and Treatment (SCAT) Regulations, http://law.lis.virginia.gov/admincode/title9/agency25/chapter790/. Any wastewaters generated by this project must be properly managed and disposed. For additional information and assistance, contact Keith Showman at DEQ-VRO (540-217-7149, Keith.Showman@deq.virginia.gov).

7. Petroleum Storage Tanks. Installation / operation / modification of tanks used for the storage of petroleum and CERCLA substances may be subject to registration and/or other regulatory requirements (https://www.deq.virginia.gov/our-programs/land-waste/petroleum-tanks). If petroleum-contaminated soils or water are encountered during excavation work, or if old petroleum tanks need to be removed or replaced, contact DEQ. For questions regarding any of this, please contact Todd Pitsenberger at DEQ-VRO (540-830-8857, Todd.Pitsenberger@deq.virginia.gov).

8. Solid and Hazardous Wastes, and Hazardous Substances. DEQ administers the Virginia Waste Management Regulations, http://law.lis.virginia.gov/admincode/title9/agency20/. All solid wastes, hazardous wastes, and hazardous materials, including construction and demolition (C&D) wastes and universal wastes (batteries, fluorescent lights, refrigerants, mercury switches, mercury thermostats, etc.), must be managed in accordance with all applicable federal, state, and local environmental regulations. The generation of hazardous wastes should be minimized and solid wastes generated at the site should be reduced at the source, reused, or recycled. DEQ encourages the management of certain organic wastes by on-site composting or reuse as animal feed or soil amendment. Also, if you encounter any improperly disposed solid or hazardous wastes, or petroleum contaminated soils, you should contact DEQ-VRO. You may wish to refer to the web link for “What’s in My Back Yard?”, https://geohub-vadeq.hub.arcgis.com/, to help you determine areas where residual contamination may be more likely. Contact Laura Stuart at DEQ-VRO (540-209-5605, Laura.Stuart@deq.virginia.gov) for any questions related to waste management / disposal, including any questions related to open burning requirements and prohibitions. Manage / dispose of any asbestos-containing materials (ACMs) in accordance with Virginia Department of Labor and Industry (DOLI) regulations. Refer to the DOLI web page, https://www.doli.virginia.gov/asbestos-faqs/, or contact Doug Wiggins at DOLI (Richard.Wiggins@doli.virginia.gov, 540-562-3580, ext. 131) for any questions related to management / disposal of ACMs.

9. Pesticides and Herbicides. DEQ recommends that herbicides or pesticides for construction or landscape maintenance, when necessary, be used in accordance with the principles of integrated pest management, and that the least toxic pesticides that are effective in controlling the target species be used. Please contact the Department of Agriculture and Consumer Services at (804) 786-3501 for more information. If applying aquatic pesticides to surface waters, the applicant must comply with the DEQ’s Pesticide General Permit, https://law.lis.virginia.gov/admincode/title9/agency25/chapter800/.

10. Natural Heritage Resources. The Virginia Department of Conservation and Recreation (DCR) Division of Natural Heritage (DNH) can search its Biotics Data System for occurrences of natural heritage resources from the area indicated on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered animal and plant species, unique or exemplary natural communities, and significant geologic communities. We recommend that the DNH be contacted at (804) 786-7951 to secure updated information on natural heritage resources before commencing the project. For additional information, refer to the DCR website, https://www.dcr.virginia.gov/natural-heritage/ereview.

11. Wildlife Resources. The Virginia Department of Wildlife Resources (DWR) exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state or federally listed endangered or threatened species. DWR determines likely impacts on fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce, or compensate for those impacts. For more information, refer to the DWR website, https://dwr.virginia.gov/wies/contact-wies/.

12. Historic and Archaeological Resources. *Section 106 of the National Historic and Preservation Act of 1966*, as amended, requires that activities that receive federal funding must consider effects to properties that are listed or eligible for listing on the National Register of Historic Places. The Department of Historic Resources (DHR) conducts reviews of projects to determine their effect on historic structures or cultural resources. If applicable, contact DHR, https://www.dhr.virginia.gov/programs/federal-state-review/. In the event that archaeological resources are encountered during construction, immediately contact the appropriate staff from https://www.dhr.virginia.gov/staff-directory/ (Review & Compliance).

13. Pollution Prevention. DEQ recommends that construction projects incorporate the principles of pollution prevention including the following recommendations:

- Consider environmental attributes when purchasing materials. For example, the extent of recycled material content and toxicity level should be considered.
- Consider contractors’ commitment to the environment when choosing contractors. Also, specifications regarding raw material selection (alternative fuels and energy sources) and construction practices can be included in contract documents and requests for proposals.
- Choose sustainable practices and materials in infrastructure and construction and design. These could include asphalt and concrete containing recycled materials and integrated pest management in landscaping.
- Integrate pollution prevention techniques into maintenance and operation activities to include source reduction (fixing leaks, energy efficient products).

Pollution prevention measures are likely to reduce potential environmental impacts and reduce costs for material purchasing and waste disposal. DEQ’s Office of Pollution of Prevention hosts a number of programs and initiatives that provide non-regulatory assistance to businesses, institutions, and communities including the Virginia Environmental Excellence Program and Virginia Green. For more information, please visit our web site at https://www.deq.virginia.gov/our-programs/pollution-prevention.

14. Energy Conservation. Any structures should be planned and designed to comply with state and federal guidelines and industry standards for energy conservation and efficiency. For example, energy efficiency of the structures can be enhanced by maximizing the

use of the following:

- thermally-efficient building shell components (roof, wall, floor, and insulation);
- high efficiency heating, ventilation, air conditioning systems; and
- high efficiency lighting systems.

The Virginia Department of Energy, https://www.virginia.gov/agencies/department-of-energy/, may be contacted for assistance in meeting this challenge.

B. Keith Fowler
Deputy Regional Director, Valley Regional Office
Virginia Department of Environmental Quality
4411 Early Road, P. O. Box 3000
Harrisonburg, VA 22801
(540) 217-7480

-----Original Appointment-----
From: Kiracofe, Brandon (DEQ) **On Behalf Of** Christine Essick
Sent: Monday, August 19, 2024 8:34 AM
To: Fowler, Keith (DEQ)
Subject: FW: NextEra Energy Transmission MidAtlantic I MidAtlantic Resiliency Link Project Introductory Meeting
When: Thursday, August 22, 2024 2:30 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

MidAtlantic Resiliency Link Project

Pre-Application Analysis Report

PREPARED FOR
NextEra Energy Transmission Virginia, Inc.

DATE
January 2026

REFERENCE
0719821



-Page Left Blank-

SIGNATURE PAGE

MidAtlantic Resiliency Link Project

Pre-Application Analysis Report

0719821



Mary Beth Derrick
Senior Architectural Historian



MacKenzie Carroll
Architectural Historian



Jeremy Mastroianni
Data Analytics and Visualization Specialist



Price Laird
Senior Archaeologist

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CONTENTS

EXECUTIVE SUMMARY 1

1. INTRODUCTION 1

1.1 OVERVIEW 2
1.1.1 Proposed Route 5
1.1.2 Alternative Route B 5
1.1.3 Alternative Route C 5
1.1.4 Alternative Route D 5
1.1.5 Alternative Route E 5
1.1.6 Alternative Route F 5
1.1.7 Woodside Substation Site 5
1.2 MANAGEMENT RECOMMENDATIONS 6

2. RECORDS REVIEW 7

2.1 DATA COLLECTION APPROACH 7
2.2 ARCHAEOLOGICAL RESOURCES 7
2.3 HISTORIC RESOURCES 9
2.3.1 Proposed Route and Alternative Routes 12
2.3.2 Woodside Substation Site 12
2.4 PREVIOUS SURVEYS 13

3. STAGE I PRE-APPLICATION ANALYSIS FINDINGS 14

3.1 METHODS OF ANALYSIS 14
3.2 STRUCTURE TYPES AND ROW WIDTHS 15
3.3 ASSESSMENT OF POTENTIAL IMPACTS 16
3.4 HISTORIC RESOURCE DESCRIPTIONS 16
3.4.1 034-0137, Branson House / Greenwood Farm 16
3.4.2 034-0486, Robert Muse House / Sunrise 17
3.4.3 034-0929, Hugh Lupton House 18
3.5 HISTORIC RESOURCE FINDINGS FOR THE ALTERNATIVE ROUTES 19
3.5.1 034-0486, Robert Muse House / Sunrise 19
3.6 HISTORIC RESOURCE FINDINGS FOR THE WOODSIDE SUBSTATION SITE 19
3.6.1 034-0137, Branson House / Greenwood Farm 19
3.6.2 034-0929, Hugh Lupton House 19
3.7 ARCHAEOLOGY FINDINGS 20
3.7.1 Proposed Route and Alternative Routes 21
3.7.2 Woodside Substation Site 21

4. CONCLUSION AND RECOMMENDATIONS 22

4.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES 23
4.2 WOODSIDE SUBSTATION SITE 23
4.3 FUTURE INVESTIGATIONS 24

5. REFERENCES 25

ATTACHMENT 1 LOCATIONS OF CONSIDERED HISTORIC RESOURCES ASSOCIATED WITH MARL PROJECT ALTERNATIVES
ATTACHMENT 2 CULTURAL RESOURCES SURVEY WITHIN 1 MILE OF MARL PROJECT
ATTACHMENT 3 TYPICAL DESIGN AND LAYOUT
ATTACHMENT 4 HISTORIC RESOURCE PHOTOS
ATTACHMENT 5 PHOTO SIMULATIONS

LIST OF TABLES

TABLE 2-1 ARCHAEOLOGICAL RESOURCES WITHIN THE ROW CORRIDOR FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 9
TABLE 2-2 HISTORIC RESOURCES IN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 12
TABLE 2-3 HISTORIC RESOURCES IN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE WOODSIDE SUBSTATION SITE 12
TABLE 2-4 CULTURAL RESOURCE SURVEYS WITHIN 1 MILE OF THE PROPOSED ROUTE, ALTERNATIVE ROUTES, AND WOODSIDE SUBSTATION SITE 13
TABLE 3-1 ARCHAEOLOGICAL RESOURCES WITHIN THE ROW CORRIDOR FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 20
TABLE 4-1 COMPARISON OF POTENTIAL MARL PROJECT IMPACTS ON HISTORIC RESOURCES FOR THE PROPOSED ROUTE, ALTERNATIVE ROUTES, AND WOODSIDE SUBSTATION SITE 22
TABLE 4-2 POTENTIAL IMPACTS ON HISTORIC RESOURCES WITHIN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 23
TABLE 4-3 POTENTIAL IMPACTS ON HISTORIC RESOURCES WITHIN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE WOODSIDE SUBSTATION SITE 23

LIST OF FIGURES

FIGURE 1-1 OVERVIEW OF THE PROPOSED ROUTE AND ALTERNATIVE ROUTES FOR THE MARL PROJECT 3
FIGURE 1-2 OVERVIEW OF THE WOODSIDE SUBSTATION SITE FOR THE MARL PROJECT 4
FIGURE 2-1 ARCHAEOLOGICAL SITES WITHIN THE ROW CORRIDOR FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 8
FIGURE 2-2 CONSIDERED HISTORIC RESOURCES ALONG AND NEAR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 10
FIGURE 2-3 CONSIDERED HISTORIC RESOURCES ALONG AND NEAR THE WOODSIDE SUBSTATION SITE 11

ACRONYMS AND ABBREVIATIONS

Acronym	Description
3D	three-dimensional
DHR	Department of Historic Resources
Dominion Energy	Virginia Electric and Power Company
ERM	Environmental Resources Management, Inc.
Guidelines	Guidelines for Assessing Impacts of Proposed Electric Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia
I-	Interstate
KOP	key observation point
kV	kilovolt
MARL Project	MidAtlantic Resiliency Link Project
MD	Maryland
NEET MA	NextEra Energy Transmission MidAtlantic, Inc.
NEET VA	NextEra Energy Transmission Virginia, Inc.
NHL	National Historic Landmark
NRHP	National Register of Historic Places
PA	Pennsylvania
PJM	PJM Interconnection LLC
ROW	right-of-way
SCC	Virginia State Corporation Commission
US	U.S. Route
VA	Virginia
VCRIS	Virginia Cultural Resources Information System
WV	West Virginia

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EXECUTIVE SUMMARY

This report presents the findings of a pre-application analysis completed by Environmental Resources Management, Inc. (ERM) on behalf of NextEra Energy Transmission MidAtlantic, Inc. (NEET MA) and NextEra Energy Transmission Virginia, Inc. (NEET VA) for the MidAtlantic Resiliency Link (MARL) Project. The MARL Project is a 107.5-mile, 500 kilovolt (kV) transmission line that will traverse portions of Pennsylvania, West Virginia, Maryland, and Virginia, as well as the new 500/138 kV Woodside Substation site in Frederick County, Virginia.[1]

PJM Interconnection LLC (PJM) has directed NEET MA and NEET VA to develop, construct, own, operate, and maintain the MARL Project to resolve significant and widespread reliability criteria violations on the Bulk Electric System that serves the PJM region,[2] due to load growth and anticipated resource retirements in the PJM region. To meet this purpose and need, the MARL Project will have the following facilities in Frederick County, Virginia:

- A new 2.4-mile, 500 kV single circuit transmission line that will interconnect with a new 500 kV transmission line to be constructed by The Potomac Edison Company (FirstEnergy); and
- A new 500/138 kV substation (Woodside Substation) that will interconnect to the new 500 kV line being constructed by FirstEnergy, as well as an existing 500 kV line owned by Virginia Electric and Power Company (Dominion Energy), and two new 138 kV transmission lines that will connect to the existing FirstEnergy Stonewall high-voltage facility.[3]

This pre-application analysis assesses and compares potential impacts on previously recorded historic and archaeological resources in relation to the Proposed Route, five Alternative Routes, and the Woodside Substation site under consideration for the MARL Project. Each Alternative Route extends for roughly 2.4 miles in Virginia. ERM conducted the analysis on behalf of NEET VA to assist in the development of a feasible project design that minimizes potential impacts on historic resources. The pre-application analysis is a required study for transmission line projects regulated by the Virginia State Corporation Commission. The study was completed in accordance with the Virginia Department of Historic Resources (DHR) Guidelines for Assessing Impacts of Proposed Electric Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia (DHR 2008) (Guidelines).

One previously recorded archaeological site is located partially within and adjacent to the Right-of-Way (ROW) Corridor for the Alternative Routes. The site is potentially eligible for the National Register of Historic Places (NRHP). The site could be affected by transmission structure placement, tree clearing, or heavy equipment traffic. A detailed evaluation of the NRHP Criteria (A-D) and

[1] NEET MA is responsible for constructing the portions of the MARL Project in Pennsylvania, West Virginia, and Maryland. NEET VA is responsible for constructing the portions of the MARL Project in Virginia, as well as the new 500/138 kV Woodside Substation in Frederick County, Virginia.
[2] The PJM region includes all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.
[3] Specifically, the Woodside Substation will connect to Dominion Energy's existing 500 kV Bismark-Doubs transmission line, two new FirstEnergy 138 kV transmission lines that will connect the Woodside Substation with the nearby existing FirstEnergy Stonewall 138 kV Substation, and to FirstEnergy's upgraded Gore-Doubs-Goose Creek 500 kV transmission line.

integrity determination of archaeological deposits at the site and impacts on the site from prior land use activities would require a field survey.

Three previously recorded aboveground historic resources (034-0137, 034-0486, and 034-0929) meeting criteria specified in the Guidelines fall within study tiers defined by the DHR for identifying aboveground historic resources along and near transmission line routes and proposed substations. Because the Proposed Route and Alternative Routes use a common alignment that passes near these resources, potential impacts would be identical regardless of the route selected. ERM recommends that the Proposed Route and Alternative Routes would have no potential impact on one resource within the 1.0-mile tier (034-0486), and the Woodside Substation site would have a minimal potential impact on two resources, both of which are within the 0.5-mile tier (034-0137 and 034-0929).

1. INTRODUCTION

This report presents the findings of a pre-application analysis completed by Environmental Resources Management, Inc. (ERM) on behalf of NextEra Energy Transmission MidAtlantic, Inc. (NEET MA) and NextEra Energy Transmission Virginia, Inc. (NEET VA) for the MidAtlantic Resiliency Link (MARL) Project. The MARL Project is a 107.5-mile, 500 kilovolt (kV) transmission line that will traverse portions of Pennsylvania, West Virginia, Maryland, and Virginia, as well as the new 500/138 kV Woodside Substation site in Frederick County, Virginia.[1]

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The pre-application analysis assesses and compares potential impacts on previously recorded historic and archaeological resources in relation to the Proposed Route, five Alternative Routes, and the Woodside Substation site for the MARL Project. Each Alternative Route extends for roughly 2.4 miles in Virginia. ERM conducted the analysis on behalf of NEET VA to assist in the development of a feasible project design that minimizes potential impacts on historic resources. The study was completed in accordance with Virginia Department of Historic Resources (DHR) Guidelines for Assessing Impacts of Proposed Electric Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia (DHR 2008) (Guidelines).

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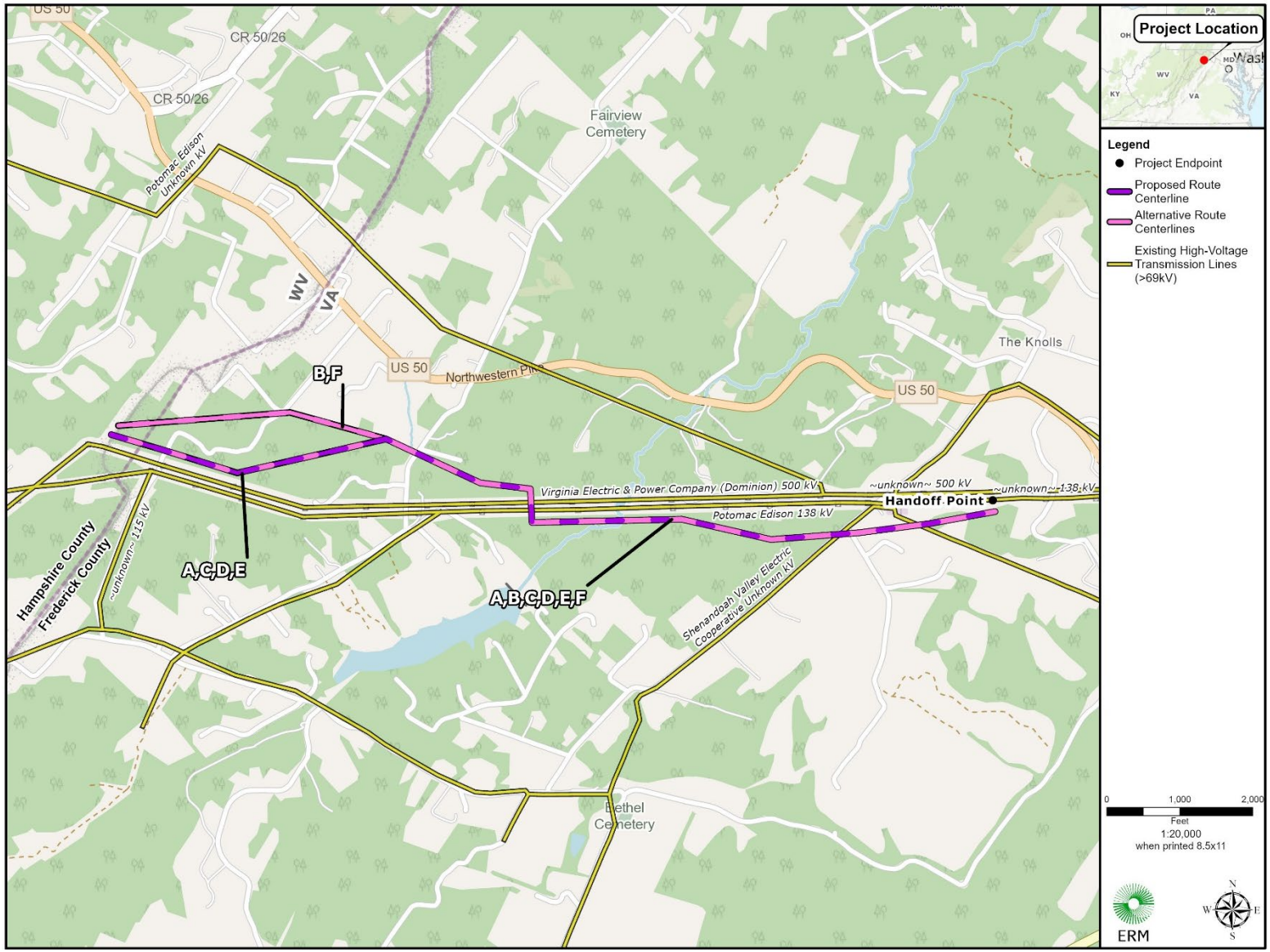
1.1 OVERVIEW

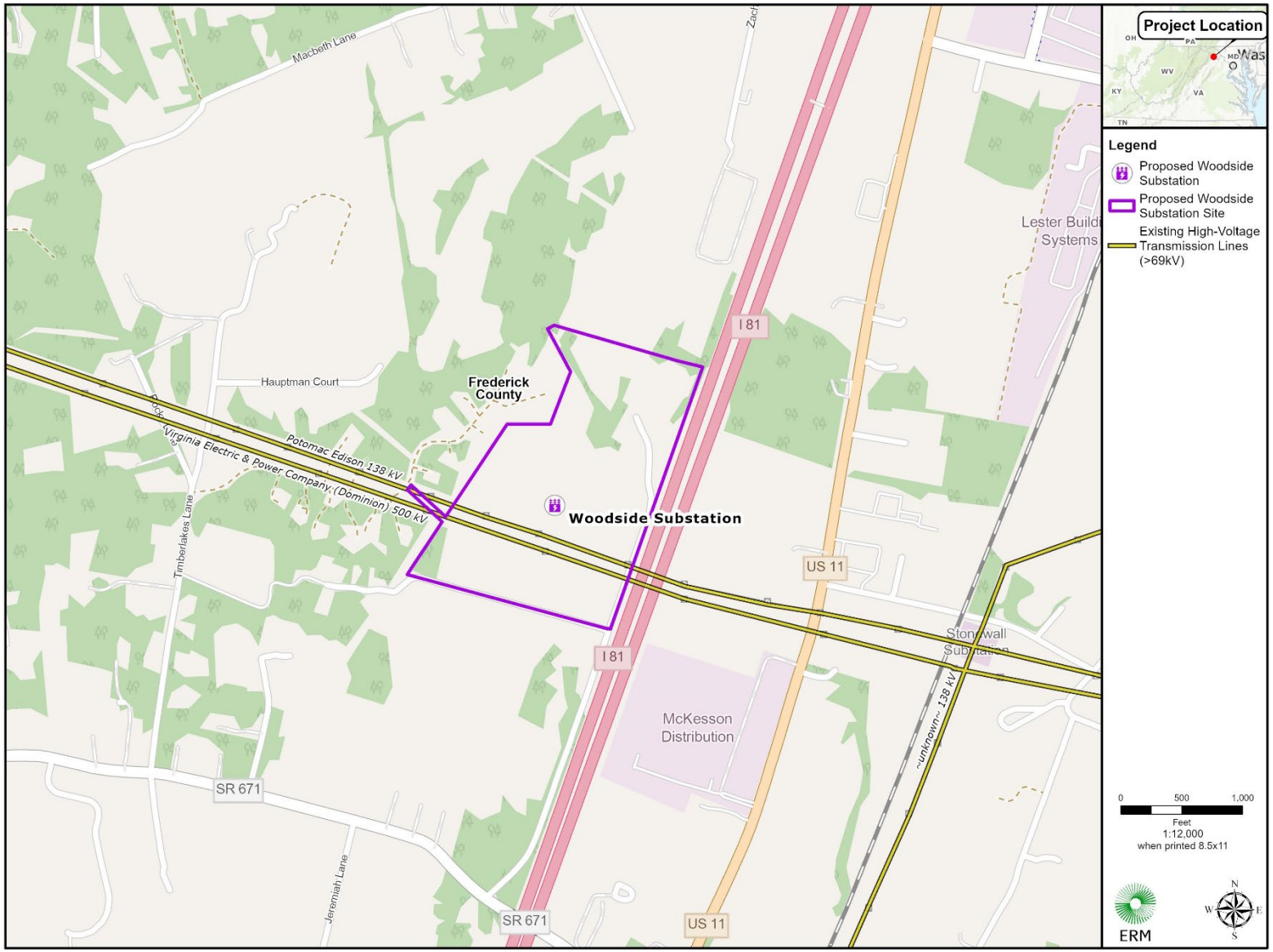
Through extensive public outreach, agency consultation, desktop study, and field investigation, ERM and NEET MA and NEET VA identified six Alternative Routes for the overall MARL Project, as well as a substation site location in Virginia. A map depicting the Proposed Route and Alternative Routes B through F is provided on Figure 1-1, and the map depicting the Woodside Substation site is provided on Figure 1-2.

FIGURE 1-1 OVERVIEW OF THE PROPOSED ROUTE AND ALTERNATIVE ROUTES FOR THE MARL PROJECT



kV = kilovolt; MD = Maryland; PA = Pennsylvania; US = U.S. Route; VA = Virginia; WV = West Virginia

FIGURE 1-2 OVERVIEW OF THE WOODSIDE SUBSTATION SITE FOR THE MARL PROJECT



I- = Interstate; kV = kilovolt; MD = Maryland; PA = Pennsylvania; SR = State Route; US = U.S. Route; VA = Virginia; WV = West Virginia

1.1.1 PROPOSED ROUTE

The Proposed Route crosses 2.4 miles through Virginia and parallels portions of the existing Mt Storm to the Doubs 500 kV transmission line. It crosses the West Virginia state line into Virginia, then parallels the northern side of the existing 500 kV transmission line until it heads northeast to cross Fletcher Road. From there, it continues southeast until it crosses the existing transmission lines—both the 500 kV and 138 kV lines. From this point, it parallels the southern side of the existing 138 kV transmission line until it diverges to the southeast and back to the northeast, crossing Parishville Road and terminating at the handoff point.

1.1.2 ALTERNATIVE ROUTE B

Alternative Route B crosses 2.4 miles through Virginia and parallels portions of the existing Mt. Storm to the Doubs 500 kV transmission line. It diverges northeast from the existing Mt. Storm to the Doubs 500 kV transmission line just outside of the West Virginia state line then turns southeast, meeting up with the Proposed Route around the crossing at Fletcher Road. From there, Alternative Route B follows the same alignment as the Proposed Route.

1.1.3 ALTERNATIVE ROUTE C

Alternative Route C is identical to the Proposed Route in Virginia.

1.1.4 ALTERNATIVE ROUTE D

Alternative Route D is identical to the Proposed Route in Virginia.

1.1.5 ALTERNATIVE ROUTE E

Alternative Route E is identical to the Proposed Route in Virginia.

1.1.6 ALTERNATIVE ROUTE F

Alternative Route F is identical to Alternative Route B in Virginia.

1.1.7 WOODSIDE SUBSTATION SITE

The Woodside Substation site will be located on two parcels that total an approximately 72-acre site, of which approximately 36 acres will be used for new permanent infrastructure including the substation, roads, and acreage within fences. As a part of temporary activities to support site development and visual screening, there may be grading and earthwork throughout the parcel. Sitting 7.1 miles north of the town of Winchester along Interstate (I-) 81, the site is situated between Carter Machinery to the north, the Ridgeway Estates Subdivision to the west, Thistle Lane to the south, and I-81 to the east.

1.2 MANAGEMENT RECOMMENDATIONS

One previously recorded archaeological site is located partially within and adjacent to the Right-of-Way (ROW) Corridor for the Proposed Route and Alternative Routes.

Three previously recorded historic resources meeting criteria specified in the Guidelines fall within study tiers defined by the DHR for identifying aboveground historic resources along and near the Proposed Route and Alternative Routes (034-0137, 034-0486, and 034-0929). ERM recommends that the Proposed Route and Alternative Routes would have no potential impact on one resource within the 1.0-mile tier (034-0486), and the Woodside Substation site would have a minimal potential impact on two resources, both of which are within the 0.5-mile tier (034-0137 and 034-0929).

2. RECORDS REVIEW

2.1 DATA COLLECTION APPROACH

ERM conducted an analysis of potential cultural resource impacts for the MARL Project in Virginia in accordance with the Guidelines. For the Proposed Route and Alternative Routes, this analysis identified and considered the following previously recorded resources:

- National Historic Landmarks (NHLs) within a 1.5-mile radius of each route;
- National Register of Historic Places (NRHP)-listed properties, NHLs, battlefields, and historic landscapes within a 1.0-mile radius of each route;
- NRHP-eligible and NRHP-listed properties, NHLs, battlefields, and historic landscapes within a 0.5-mile radius of each route; and
- All the above qualifying resources, as well as archaeological sites within the ROW Corridor for each route.

Information on the resources considered in each study tier was collected from the Virginia Cultural Resources Information System (VCRIS) (DHR 2025). In addition to the VCRIS, ERM collected information from the *Rural Landmarks Survey Report of Frederick County, Virginia* (Kalbian 1992) to identify locally significant resources within a 1.0-mile radius of the Proposed Route and Alternative Routes and the Woodside Substation site.

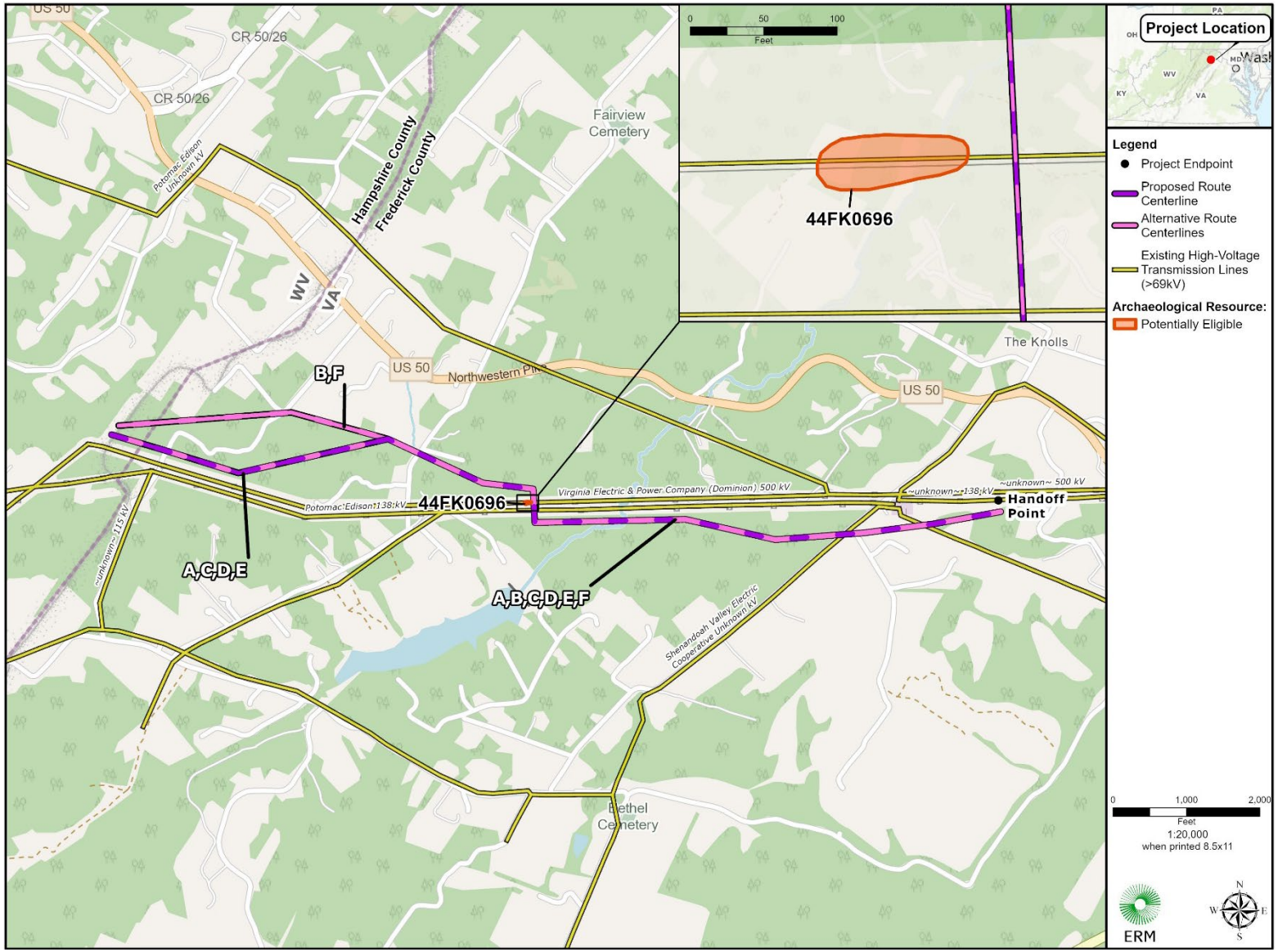
Along with the records review, ERM conducted field assessments of the considered aboveground resources along the Proposed Route and Alternative Routes in accordance with the Guidelines. Digital photographs of each historic resource and views of the proposed transmission line were taken. Photo simulations were then prepared to assess the potential for visual impacts from the new transmission infrastructure on the resources. Aerial photographs were examined for previously recorded archaeological sites under consideration, to assess the current land condition and the spatial relationship between the sites and any existing or planned transmission lines.

2.2 ARCHAEOLOGICAL RESOURCES

Archaeological site crossings were considered a constraint due to the potential for the MARL Project to affect cultural deposits in the immediate vicinity of the transmission line (e.g., due to transmission structure placement, tree clearing, or heavy equipment traffic within a site). The previously recorded archaeological site in the ROW Corridor for the Proposed Route and Alternative Routes included in the analysis is summarized in Table 2-1 and its location is depicted on Figure 2-1.

The archaeological site, 44FK0696, identified adjacent to and within the ROW Corridor for the Proposed Route and Alternative Routes is a prehistoric lithic scatter considered potentially eligible for the NRHP. No previously recorded archaeological sites were identified within the Woodside Substation site. A detailed evaluation of the NRHP Criteria (A-D)and integrity determination of archaeological deposits at 44FK0696 and impacts from prior land use activities would require a field survey. However, based on the location of the previously recorded site, and the alignment of the proposed transmission line, it is unlikely that the project would have a potential significant impact on the site.

FIGURE 2-1 ARCHAEOLOGICAL SITES WITHIN THE ROW CORRIDOR FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES



kV = kilovolt; MD = Maryland; PA = Pennsylvania; US = U.S. Route; VA = Virginia; WV = West Virginia

TABLE 2-1 ARCHAEOLOGICAL RESOURCES WITHIN THE ROW CORRIDOR FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES

Route or MARL Project Component	Greenfield or Existing/Expanded ROW?	Site Number	Description	NRHP Status
Proposed Route and Alternative Routes	Existing ROW	44FK0696	Lithic scatter (pre-contact)	Potentially eligible
Woodside Substation site	—	—	—	—

Source: DHR 2025

NRHP = National Register of Historic Places; ROW = right-of-way

2.3 HISTORIC RESOURCES

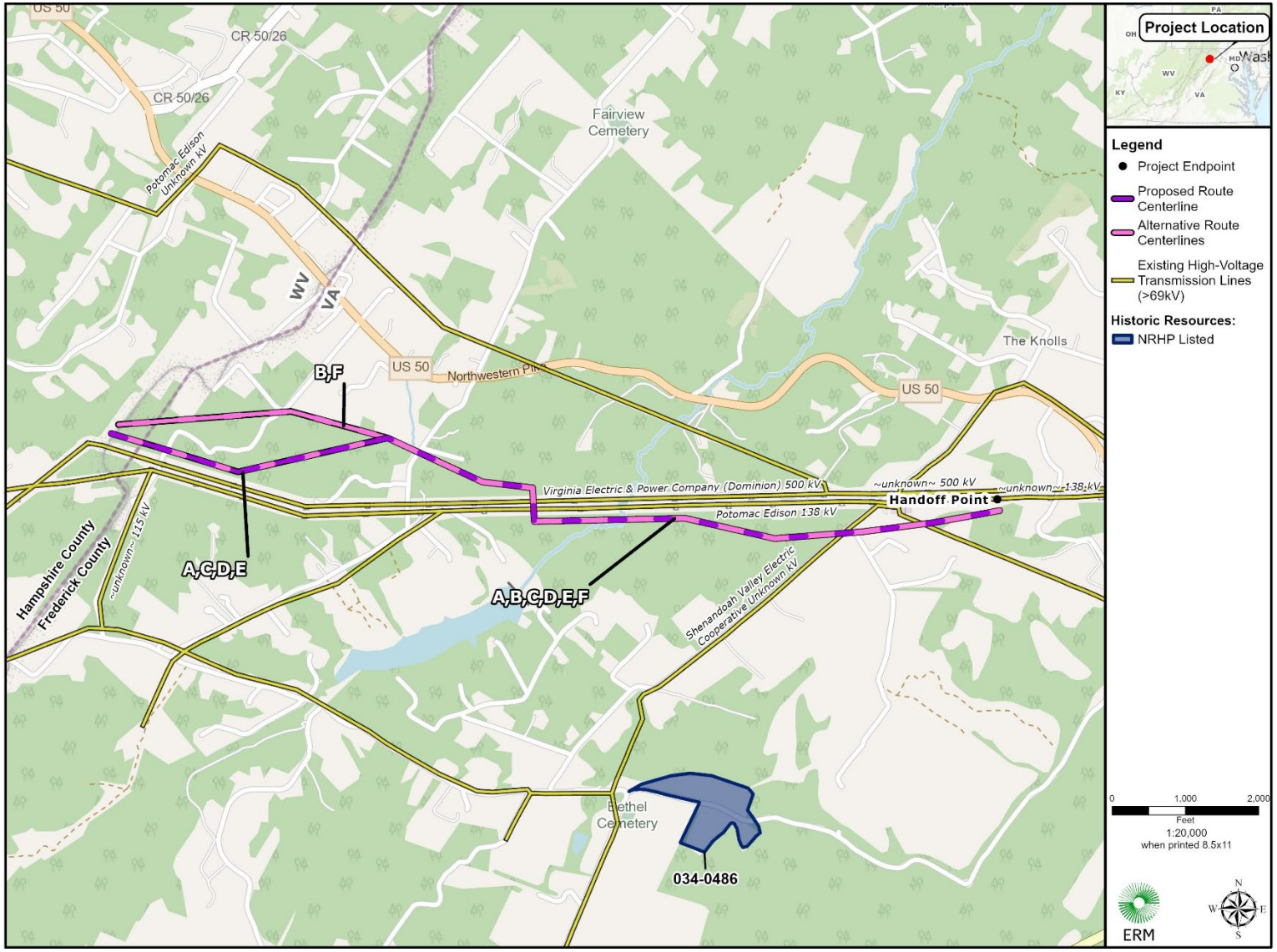
The following discussion summarizes the known aboveground historic resources in the vicinity of the Proposed Route and Alternative Routes based on the DHR's tiered study model defined in the Guidelines. The locations of the resources considered and the Alternative Routes and Woodside Substation site are shown on Figure 2-2 and Figure 2-3. Maps for the Alternative Routes and Woodside Substation site with buffers are provided in Attachment 1, Locations of Considered Historic Resources Associated with Proposed MARL Project Alternatives.

Resources within the ROW Corridor of an Alternative Route may be subject to both potential direct impacts from placement of the line across a property, as well as potential visual impacts from changes to the viewshed introduced by the new transmission line structures and conductors. Resources in the 0.5-mile study tier would likely be visually affected, unless topography, vegetation, or the built environment obscures the view to the transmission line. At viewpoints over 0.5 mile and 1.0 mile, it becomes progressively less likely that a resource will be within line-of-sight of the transmission line due to distance.

Because the Alternative Routes use common alignments where they pass the aboveground resources, potential impacts would be the same for the MARL Project regardless of the Alternative Route selected by the Virginia State Corporation Commission (SCC). The nature of the potential impacts, while estimated in this study with the assistance of photo simulations, would depend on the MARL Project final design in which the exact placement and height of transmission structures are determined. The purpose of the simulations and associated assessments in this report is to provide data on potential impacts.

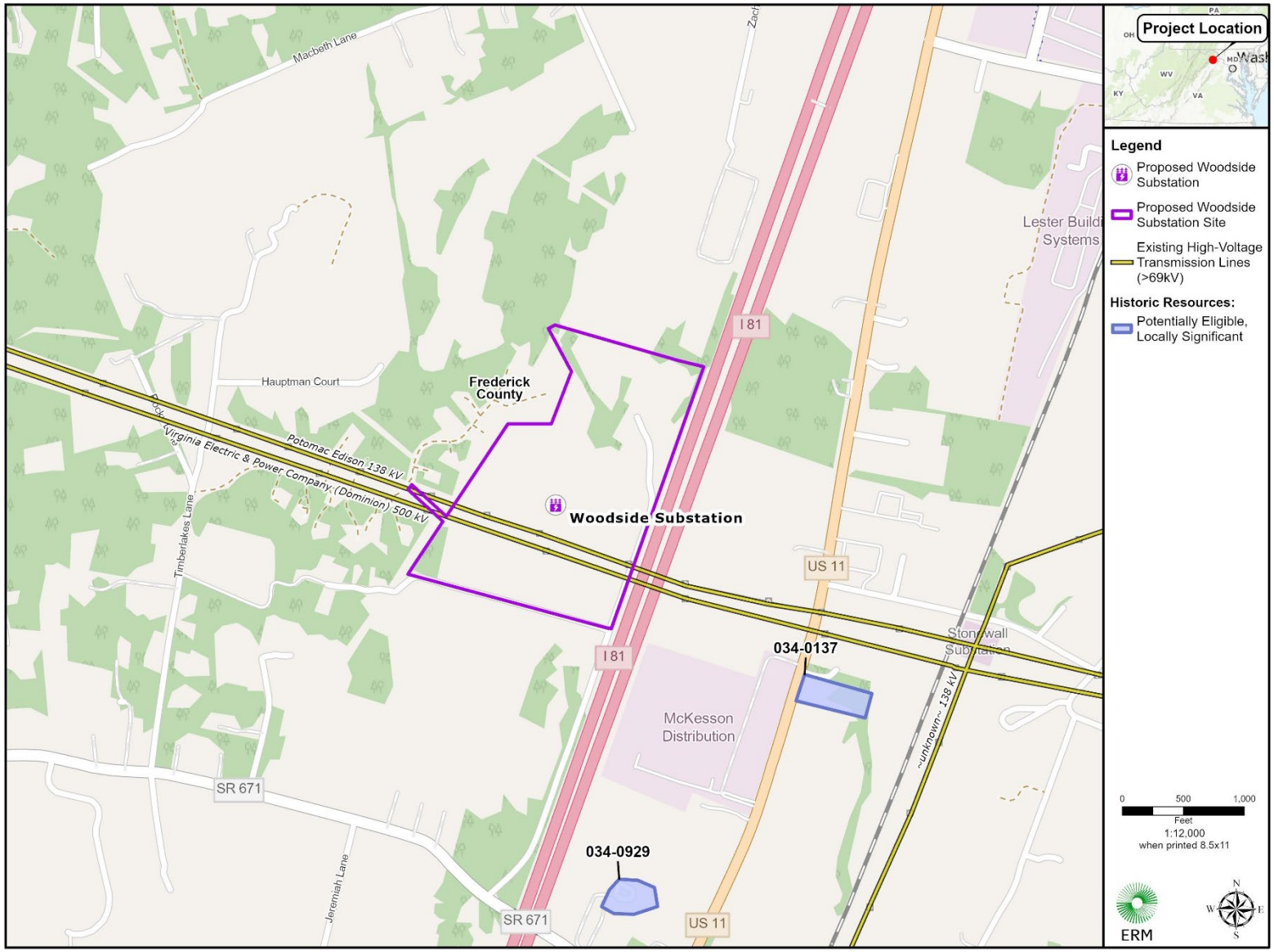
Once a route is certified by the SCC, that route will be subject to a full historic architectural survey in which additional (yet, unrecorded) historic properties could be identified and potential MARL Project impacts assessed. The survey area will be defined based on the design height of the transmission line structures, topography, tree cover, and other factors affecting line-of-sight from historic resources to the selected route.

FIGURE 2-2 CONSIDERED HISTORIC RESOURCES ALONG AND NEAR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES



kV = kilovolt; MD = Maryland; NRHP = National Register of Historic Places; PA = Pennsylvania; US = U.S. Route; VA = Virginia; WV = West Virginia

FIGURE 2-3 CONSIDERED HISTORIC RESOURCES ALONG AND NEAR THE WOODSIDE SUBSTATION SITE



I- = Interstate; kV = kilovolt; MD = Maryland; PA = Pennsylvania; SR = State Route; US = U.S. Route; VA = Virginia; WV = West Virginia

2.3.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES

The considered aboveground architectural resource (034-0486) situated within the DHR study tiers for the Proposed Route and Alternative Routes is presented in Table 2-2 and depicted on the map provided as Attachment 1, Sheet 1. The considered resource was subjected to field reconnaissance and a preliminary assessment of potential impacts, discussed in Section 3, Stage 1 Pre-Application Analysis Findings.

TABLE 2-2 HISTORIC RESOURCES IN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES

Buffer (miles)	Resource Category	Resource Number	Description
0.5 to 1.0	NRHP-listed properties	034-0486	Robert Muse House / Sunrise

Source: DHR 2025

NRHP = National Register of Historic Places

2.3.2 WOODSIDE SUBSTATION SITE

The considered aboveground architectural resources situated within the DHR study tiers for the Woodside Substation site are presented in Table 2-3 and depicted on the map provided as Attachment 1, Sheet 2. The considered resources were subjected to field reconnaissance and a preliminary assessment of potential impacts, discussed in Section 3.

TABLE 2-3 HISTORIC RESOURCES IN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE WOODSIDE SUBSTATION SITE

Buffer (miles)	Resource Category	Resource Number	Description
0.0 to 0.5	NRHP potentially eligible, locally significant	034-0137	Branson House / Greenwood Farm
		034-0929	Hugh Lupton House

Source: DHR 2025

NRHP = National Register of Historic Places

2.4 PREVIOUS SURVEYS

There have been four previous cultural resource studies reported within 1 mile of the MARL Project (Proposed Route, Alternative Routes, and Woodside Substation site). One of the surveys for a transmission line intersects the Alternative Routes at a single point. Information on these previous surveys—including DHR survey number, report title, and citation—is provided in Table 2-4. The extent of the previous survey coverage is depicted on maps provided in Attachment 2, Cultural Resources Survey within 1 Mile of MARL Project.

TABLE 2-4 CULTURAL RESOURCE SURVEYS WITHIN 1 MILE OF THE PROPOSED ROUTE, ALTERNATIVE ROUTES, AND WOODSIDE SUBSTATION SITE

DHR Survey #	Title	Citation	Alternative Routes	Woodside Substation
SH-016	Archaeological Reconnaissance Survey Report, Route 55, Shenandoah and Frederick Counties, Virginia	MacCord 1979	x	—
FK-108	Archaeological Survey of the Proposed 500 kV Transmission Line and Archaeological Evaluation of Sites 44FK0684, 44FK0685, 44FK0688, 44FK0689, and 44FK0691, Frederick, Clarke, and Loudoun Counties, Virginia	Fiedel et al. 2011	x	x
FK-083	Phase I Archaeological Survey of the Sempeles Property, Frederick County, Virginia	Kreisa and McDowell 2007	—	x
FK-154	Phase I Archaeological Survey of the Clear Brook Quarry Expansion, Frederick County, Virginia	Ezell 2011	—	x

Source: DHR 2025

DHR = Department of Historic Resources; kV = kilovolt

Note: Gray highlighted rows denote surveys that overlap portions of the route segments.

3. STAGE I PRE-APPLICATION ANALYSIS FINDINGS

3.1 METHODS OF ANALYSIS

Fieldwork for the pre-application analysis was conducted by Haley Hise and Emma Jennings under the direction of Secretary of the Interior Qualified architectural historian, Mary Beth Derrick in November 2024. The fieldwork involved photographing three resources requiring visual assessment according to the Guidelines and examining potential line-of-sight views from each resource toward the Alternative Routes or substation. For resources where property owner approval was granted for historic resource documentation, photographs were taken toward the Alternative Routes from the property at the most prominent view of the MARL Project. When permission to access such locations was not available, photographs were taken from the public ROW (typically a road) nearest to the resource facing toward the applicable Alternative Route(s) or the Woodside Substation site.

Panoramic photographs were taken from each resource, with an effort to capture the direction with the clearest, most unobstructed view toward the MARL Project. The accurate location of the photograph was captured with a mobile tablet device connected to a Trimble R1 sub-meter Global Navigation Satellite System receiver. The locations from which photographs were taken were noted as key observation points (KOPs). Site visits to the KOPs were prioritized based on their location relative to the resource, so that viewpoints east of the resource were visited in the morning and viewpoints west of the resource were visited in the afternoon. This helped make sure, where possible, that the sun was behind the photographer at the time the viewpoint photography was captured. Additionally, minor adjustments to position were made to obtain as clear a view to the site center as possible, avoiding trees, landscaping, or built obstructions. Tablets recorded the center bearing, angle of view, altitude, and camera lens height. Upon receipt of the viewpoint location information, the viewpoints were plotted onto open-source mapping from the Environmental Systems Research Institute using the Universal Transverse Mercator 18N coordinate system.

The process of taking panoramas included setting up the tripod and camera. The camera was placed on the panoramic head in a landscape orientation where its lens height was confirmed and set at 4.9 feet (a portrait camera orientation was sometimes used in situations where the viewpoint is very close to a development so that the top of the development is not cut off by the image boundaries). The tripod head and camera combination were then leveled. With the camera’s viewfinder centered on the perceived site center, exposure and focus settings were taken. These were then fixed manually on the camera so that they could not be inadvertently altered. The head was rotated 90 degrees to the left where the first frame of the 360-degree sequence was then taken. Each subsequent frame was taken using a 50 percent overlap of the previous frame until the full 360-degree sequence was captured. The camera was then removed from the tripod, and a viewpoint location photograph was captured showing the tripod in its position.

The following camera and tripod configuration was used:

- Camera body: Nikon z6ii professional specification digital Single Lens Reflex (full frame complementary metal oxide semiconductor sensor)
- Camera lens: Nikkor Auto Focus 50mm f1.8 prime
- Tripod: Ianzi Zero F38 Quick Release Travel Tripod 3131 with Level
- Panoramic head: Nodal Ninja 6 with Nadir Adapter

After the photos were complete, they were uploaded to a server to begin the simulation/ visualization process. The single-frame photographs were opened in Adobe Photoshop CC 2022 where they were checked, and any camera sensor dust spots were removed before being saved as high-resolution JPEG format images. If required, discrete color and tonal adjustments were made to each frame before they were saved. The single-frame photographs were stitched together in PTGui Pro version 12.11 professional photographic stitching software using cylindrical projection settings. The camera locations were plotted in Global Mapper version 23.1. Digital models of the transmission line structures were provided by NEET MA and NEET VA and then cleaned/textured in Autodesk 3DS Max 2021. The transmission structures along each route were rendered in Vray version 5.2 from each KOP camera location. Three-dimensional (3D) imagery was produced at the field of view using camera matching. Renderings for each route and each tower combination were then exported for use as an overlay.

Detailed, correctly dimensioned 3D computer models of the transmission structures along each route were generated using Autodesk 3DS Max 2021 and iToo RailClone. The virtual 3D model of the structures was created using real-world measurements and elevation drawings provided by NEET VA (Attachment 3, Typical Design and Layout). These were textured using Vray physically based rendering materials to simulate the weathering steel texture. The detailed, textured models were rendered to a digital image using a simulated physical camera and a sun and sky simulation lighting model in the computer software consistent with conditions within the original viewpoint photography.

Photomontages were produced by overlaying the rendered image on the photograph, using known control points and the wireline imagery showing the tower columns at the correct height and distance. Final adjustments were then made to the brightness and contrast of the rendered images to match them to the photograph. Final photomontages were prepared from each viewpoint for each route. These were then opened in Adobe Photoshop CC 2022 where minor changes were made such as placing relevant tree/building/hedge screening or telegraph wires over the proposed development renders where necessary. Finally, the final images were cropped to the proportions required for the visual simulation figures, and the visualization figures were prepared in Adobe InDesign CC 2022 and exported in a PDF.

3.2 STRUCTURE TYPES AND ROW WIDTHS

The MARL Project will be constructed in a new ROW Corridor measuring, on average, 200 feet wide. The MARL Project will require a wider ROW Corridor in some areas where additional aerial easement rights are necessary to comply with electrical standards and requirements.

NEET VA plans to use primarily lattice steel structures for the MARL Project. They will have four steel legs. Structure heights of the Alternative Routes range from 90 to 190 feet, with an average structure height dependent on selected route and preliminary conceptual design, excluding foundation reveal. Final structure heights are subject to change based on final engineering. The average distance between towers (span) will be 1,258 feet for the MARL Project, with the span between transmission structures depending on the type of structure used, as well as topography, ground elevation, and nearby constraints. A typical lattice structure is shown in Attachment 3.

3.3 ASSESSMENT OF POTENTIAL IMPACTS

The assessment of potential MARL Project impacts on resources used the visual assessment findings and categorized the severity level of potential impacts according to the following scale devised by the DHR:

- **None**: MARL Project is not visible from the resource.
- **Minimal**: Viewsheds have existing transmission lines, there would be only a minor change in height, and/or other views are partially obscured by topography or vegetation.
- **Moderate**: Viewsheds have more expansive views of the transmission line, more dramatic changes in height are proposed, and/or the overall visibility of the MARL Project would be greater.
- **Severe**: Existing viewshed contains no transmission line, the view of the MARL Project would be relatively unobstructed, the new transmission line would introduce a significant change to the setting of historic properties, and/or a dramatic change in the height of an existing transmission line would take place in close proximity to historic properties.

3.4 HISTORIC RESOURCE DESCRIPTIONS

3.4.1 034-0137, BRANSON HOUSE / GREENWOOD FARM

The Branson House / Greenwood Farm is located at 4030 Martinsburg Pike / Route 11 in Clear Brook. The resource is located on a 3-acre parcel situated on the east side of the road. The surrounding area is mostly rural, other than a modern pharmaceutical manufacturing facility across the street to the west. Cleared agricultural fields are located to the east and south, with Branson Spring running north to south, at the eastern end of the parcel boundary.

The resource includes a dwelling, stile, springhouse, and smokehouse. The Branson House / Greenwood Farm was most extensively surveyed in 1989 by Maral Kalbian and J.A.H. Perkins. They described the dwelling as a circa 1740 vernacular dwelling constructed of stone with a side-gabled, standing-seam metal roof. The dwelling was built in three phases, with the eastern portion as the one-story original block. It features an interior-end stone chimney. Two other sections were built in circa 1790 and included two three-bay additions located on the original block's west elevation. Two modern additions were built prior to 1989, including a half-story on the original block and a one-story shed-roof addition on the original block's eastern elevation. The fenestration includes fixed and double-hung six-over-six wooden windows (Kalbian and Perkins 1989). The resource was surveyed again in 2011, but no changes to the dwelling were noted at that time (Louis Berger Group 2011a). ERM surveyed the resource in November 2024

and noted no changes since the 1989 survey, but only a portion of the original block was visible from the public ROW. However, an entrance located on the south elevation was observed on the original block (Figure 1 of Attachment 4, Historic Resource Photos).

Kalbian and Perkins also noted three outbuildings: a four-step stile located in front of the house, a circa 1740 stone springhouse with an exterior-end chimney, and a circa 1740 smokehouse with a gabled, standing-seam metal roof and weatherboard siding (Kalbian and Perkins 1989). The 2011 survey noted that the stile was not visible, the springhouse was in a ruinous state, and no changes were visible to the smokehouse (Louis Berger Group 2011a). ERM did not see any outbuildings from the public ROW, but aerial views show one outbuilding to the southeast of the dwelling that is also visible in the 1947 aerial photograph (NETROnline 2025).

The Branson House / Greenwood Farm was determined eligible for the NRHP under Criterion C for its architecture in 1993 and changed to potentially eligible in 2012. ERM included the resource as locally significant for the purposes of this report, as it is one of the oldest stone dwellings in the county (Kalbian 1992). The Branson House / Greenwood Farm (034-0137) lies within the 0.5-mile study tier of the Woodside Substation site.

3.4.2 034-0486, ROBERT MUSE HOUSE / SUNRISE

The Robert Muse House, alternatively referred to as Sunrise, is located at 975 Hollow Road in Gore. The resource is situated on a 142.70-acre parcel that straddles either side of Hollow Road near its intersection with Muse Road. The surrounding area is rural with agricultural land to the west and dense vegetation surrounding the parcel boundary.

The resource includes a dwelling, road trace, two barns, and meathouse. The Robert Muse House was most extensively surveyed in 1995 by Maral Kalbian and William A. Chapin. They described the dwelling as a modified two-story Greek Revival farmhouse with a standing-seam metal side-gabled roof, weatherboard siding, and stone foundation. The original block was a log cabin constructed in 1818, and a second log wing was added in circa 1850, which connected to the original block by a central hallway. Together, this created what is now the primary (east) elevation. A two-story wing containing the kitchen was added to the west elevation in 1914. A fieldstone chimney is located on the south elevation, while a brick flue replaced another fieldstone chimney that was located on the north elevation. The primary entrance is located on the east elevation through a bi-level porch supported by Tuscan columns, leading to a six-paneled wooden door flanked by four-light sidelights. The door surround includes an entablature with wooden dentils and a stepped cornice. The second story porch entrance consists of a paneled wooden door flanked by three-paned sidelights. Kalbian and Chapin described the windows as six-over-six and double-hung. The rear wing has the same materials as the main block. The addition has a porches on the north and south elevations (Kalbian and Chapin 1995).

Kalbian and Chapin listed four contributing outbuildings and features: two barns, a meathouse, and a road trace. The unpaved road that divides the property, located just north of the house, was formerly a section of the circa 1750 Winchester-Romney Road. Across the road trace are two wooden barns. The westernmost barn is the largest of the two and was built circa 1880, while the eastern barn was built circa 1900. Both are of frame post-and-beam construction and feature gabled roofs and vertical wooden siding. A circa 1900 meathouse is located to the south of the

dwelling and features a corrugated metal gabled roof and weatherboard siding. The entrance is located on the east elevation through a batten door (Kalbian and Chapin 1995).

ERM visited the resource in November 2024, and the eastern barn and meathouse were not visible from the public ROW due to intervening vegetation. However, no changes to the dwelling, road trace, or western barn were noted since the 1995 survey (Figure 2 of Attachment 4). According to aerial photographs, it appears that no changes have occurred to the other outbuildings (GoogleEarth Pro 2025).

The Robert Muse House / Sunrise was listed on the NRHP in 1995 under Criterion C for architecture. The dwelling, outbuildings, and setting are well-maintained. The Robert Muse House / Sunrise (034-0486) lies within the 1.0-mile study tier of the Proposed Route and Alternative Routes.

3.4.3 034-0929, HUGH LUPTON HOUSE

The Hugh Lupton House is located at 2021 and 2025 Cedar Hill Road in Clear Brook. The resource is situated on the north side of the road, near the intersection of Cedar Hill Road and I-81. The resource is on two separate parcels that, when combined, are 39.15 acres. The surrounding area is rural with a few modern dwellings to the southeast.

The Hugh Lupton House consists of a dwelling, root cellar, garage, shed, meathouse, corncrib, and barn. It was surveyed in 1990 by Maral Kalbian and in 2011 by the Louis Berger Group. They described the dwelling as a two-and-a-half story Queen Anne built in 1897 with a central hipped roof surrounded by cross-gables featuring hexagonal and rectangular slates and stretcher bond brick cladding. The cornice has dentil molding, and the central hipped roof includes gabled dormers. It has several towers and includes an interior-end common bond brick chimney. The windows are wooden and one-over-one or two-over-two, arranged in single and paired configurations with segmental arches (Kalbian 1990; Louis Berger Group 2011b). ERM surveyed the resource in 2024 and could only see one tower; however, according to historic aerial imagery, there have been no major changes to the dwelling itself since 1947 (Figure 3 of Attachment 4; NETROnline 2025).

The outbuildings include a root cellar, wood-framed garage and shed, stone meathouse, wood-framed corncrib, and large bank barn (Kalbian 1990). The Louis Berger Group was not able to view any of the outbuildings from the public ROW. When ERM visited the resource in 2024, some portions of the outbuildings were visible, but most were obscured by intervening vegetation. According to historic aerial imagery, there are currently seven outbuildings, and the bank barn appears to have been demolished between 2005 and 2006. However, the limestone foundation is still extant. Two of the outbuildings were not included in the original surveys: a circa 1990 pole barn and pole shed. The root cellar, garage, shed, meathouse, and corn crib appear to have been built prior to 1947 (NETROnline 2025). The corn crib has a front-gabled metal roof and wooden siding with the only visible opening on the southeast elevation. The previously identified shed appears to be an equipment shed with a metal shed roof and wood siding. The pole barn has a gabled metal roof with a shed extension on the northeast elevation supported by wooden posts. The pole shed has a metal shed roof and is also supported by wooden posts. No other details could be seen from the public ROW.

The Hugh Lupton House was determined potentially eligible for the NRHP in 2012. ERM included the resource as locally significant for the purposes of this report, as it is one of the only Queen Anne dwellings in the area (Kalbian 1992). The Hugh Lupton House (034-0929) lies within the 0.5-mile study tier for the Woodside Substation site.

3.5 HISTORIC RESOURCE FINDINGS FOR THE ALTERNATIVE ROUTES

3.5.1 034-0486, ROBERT MUSE HOUSE / SUNRISE

The Robert Muse House / Sunrise is located 0.6 mile to the south of the Proposed Route and Alternative Routes, as they are identical in this area of the MARL Project (Figure 1 of Attachment 5, Photo Simulations). The surrounding area is a mixture of rural and residential land use, with dense vegetation and dwellings to the north and agricultural fields to the south. One photo simulation was prepared for the resource at KOP 111-CR, along Hollow Road. The resource would have no view of the Proposed Route or any of the Alternative Routes due to distance and intervening vegetation (Figure 2 of Attachment 5). Thus, ERM recommends that the Proposed Route and Alternative Routes would have **No Impact** on 034-0486, the Robert Muse House / Sunrise.

3.6 HISTORIC RESOURCE FINDINGS FOR THE WOODSIDE SUBSTATION SITE

3.6.1 034-0137, BRANSON HOUSE / GREENWOOD FARM

The Branson House / Greenwood Farm is located 0.3 mile to the east-southeast of the Woodside Substation site (Figure 3 of Attachment 5). The surrounding area is a mixture of rural and commercial land use, with a pharmaceutical distribution center to the southwest, an existing transmission line to the north, and trees bordering the resource.

One photo simulation was prepared for the resource at KOP 138-CR, along Martinsburg Pike / Route 11. This location would have a view of the Woodside Substation site (Figure 4 of Attachment 5). However, it is only visible in the distance, from the western edge of the resource. The Woodside Substation site would likely not be visible from inside the tree line of the resource, due to the lower elevation where the dwelling and outbuildings are situated. Furthermore, the existing transmission line has already diminished the resource's historic viewshed. Still, construction of the Woodside Substation site would introduce additional modern elements to the resource's western viewshed. Thus, ERM recommends that the Woodside Substation site would have a **Minimal Impact** on 034-0137, the Branson House / Greenwood Farm.

3.6.2 034-0929, HUGH LUPTON HOUSE

The Hugh Lupton House is located 0.4 mile to the south of the Woodside Substation site (Figure 5 of Attachment 5). The surrounding area is a mixture of rural, residential, and commercial land use, with pastureland to the north, west, and east, dwellings to the south, and a pharmaceutical distribution center to the north. The resource is situated between I-81 and Martinsburg Pike / Route 11.

One photo simulation was prepared for the resource at KOP 137-CR, along Cedar Hill Road. This location was chosen because it was the closest point from the public ROW to the resource. As shown in the simulation, the Woodside Substation site would be faintly visible through a grouping of trees (Figure 6 of Attachment 5). However, the view of the Woodside Substation site would be more prominent from inside the resource boundary, as there is not a large grouping of trees obscuring the view to the north, like there is from Cedar Hill Road. From inside the resource boundary, there would only be the line of trees flanking I-81 between the resource and the Woodside Substation site. However, the pharmaceutical distribution center has already introduced modern elements to the northern viewshed, which has diminished this historic viewshed. Construction of the Woodside Substation site would add additional modern elements to the northern viewshed, but its visibility would be small and in the distance. Thus, ERM recommends that the Woodside Substation site would have a **Minimal Impact** on 034-0929, the Hugh Lupton House.

3.7 ARCHAEOLOGY FINDINGS

There is one previously recorded archaeological site located partially within and adjacent to the ROW Corridor for the Proposed Route and Alternative Routes (Table 3-1). The site is potentially eligible for the NRHP.

The site that would be affected by the Proposed Route and Alternative Routes is described below. The description includes information on the eligibility of the site for listing in the NRHP, as well as an assessment of the site's condition based on desktop review. A detailed evaluation of the NRHP Criteria (A-D) and integrity determination of archaeological deposits at the site and impacts from prior land use activities would require a field survey to verify the desktop analysis. However, based on the location of the previously recorded site, and the alignment of the proposed transmission line, it is unlikely that the MARL Project would have a significant impact on the site.

TABLE 3-1 ARCHAEOLOGICAL RESOURCES WITHIN THE ROW CORRIDOR FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES

Considered Resource	Alternative Routes						Woodside Substation Site
	Proposed Route	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F	
44FK0696	x	x	x	x	x	x	—

ROW = right-of-way
"x" indicates that the resource is within the ROW Corridor or directly adjacent to the Proposed Route and Alternative Routes ROW Corridor.

3.7.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES

Resource 44FK0696 consists of a small prehistoric lithic scatter of unknown cultural affiliation (Wilson 2011). The site is located inside the Proposed Route and Alternative Routes ROW Corridor, approximately 30 feet to the west of the route centerline. The site was identified within an existing transmission line corridor during a 2011 survey. It is located on the floodplain of an unnamed tributary of Isaacs Creek, 0.3 mile east of Fletcher Road. Although initially recommended ineligible for the NRHP by the survey team, the site was later assessed as NRHP potentially eligible by the DHR. No transmission structures for the MARL Project currently are planned to be installed within the site boundary.

3.7.2 WOODSIDE SUBSTATION SITE

No previously recorded archaeological sites were identified within the Woodside Substation site.

4. CONCLUSION AND RECOMMENDATIONS

The pre-application analysis gathered information on archaeological and historic architectural resources that qualify for consideration according to the DHR Guidelines for transmission line projects. One recorded archaeological site is located partially within and adjacent to the ROW Corridor for the Proposed Route and Alternative Routes. Three aboveground historic resources fall within the DHR study tiers for the Alternative Routes and Woodside Substation site. A comparison of the number of historic resources considered and the degree of potential impact posed by the route / MARL Project component is presented in Table 4-1. The specific resources affected by the Proposed Route and Alternative Routes are covered in the subsections that follow.

TABLE 4-1 COMPARISON OF POTENTIAL MARL PROJECT IMPACTS ON HISTORIC RESOURCES FOR THE PROPOSED ROUTE, ALTERNATIVE ROUTES, AND WOODSIDE SUBSTATION SITE

Route / Project Component	Number of Considered Resources in Each Potential Impact Category				
	None	Minimal	Moderate	Severe	Total
Proposed Route	1	—	—	—	**1**
Alternative Route B	1	—	—	—	**1**
Alternative Route C	1	—	—	—	**1**
Alternative Route D	1	—	—	—	**1**
Alternative Route E	1	—	—	—	**1**
Alternative Route F	1	—	—	—	**1**
Woodside Substation site	—	2	—	—	**2**

Final assessments of potential MARL Project impacts will be dependent on completion of the identification phase of the archaeological and historic structure surveys along the route selected by the SCC followed by review of survey results by the DHR and other consulting parties. For any resources where the agencies concur in a finding of moderate or severe impact, NEET VA will propose treatments to avoid, minimize, or mitigate those potential impacts. Treatment options for archaeological sites could include selective structure placement to avoid potential direct impacts on sites, minor route adjustments to avoid crossing sites, or archaeological data recovery. Treatment options for aboveground historic resources could include detailed site documentation, historic research, and historic preservation studies; preparation of digital media or museum-type exhibits on sites for public interpretation; installation of historic markers or signs; installation of vegetative screening; or contribution to historical preservation organizations or specific preservation projects. Alternative options for mitigation could be identified through consultation with the DHR and other consulting parties.

4.1 PROPOSED ROUTE AND ALTERNATIVE ROUTES

One previously recorded historic resource meets the criteria specified in the Guidelines within the DHR study tiers for the Alternative Routes (Table 4-2). It is expected that the MARL Project would have no potential impact on the resource if any of the Alternative Routes are selected, as all are identical in the area of the resource.

TABLE 4-2 POTENTIAL IMPACTS ON HISTORIC RESOURCES WITHIN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE PROPOSED ROUTE AND ALTERNATIVE ROUTES

Buffer (miles)	Resource Category	Resource Number	Description	Potential Impact
1.0 to 1.5	NHLs	—	—	—
0.5 to 1.0	NRHP-listed properties	034-0486	Robert Muse House / Sunrise	None
0.0 to 0.5	NRHP-listed properties	—	—	—
	NRHP-eligible properties	—	—	—
	Locally significant	—	—	—
0.0 (within ROW)	NHLs, NRHP-listed and NRHP-eligible properties	—	—	—

Source: DHR 2025

NHL = National Historic Landmark; NRHP = National Register of Historic Places; ROW = right-of-way

4.2 WOODSIDE SUBSTATION SITE

Two previously recorded historic resources meet the criteria specified in the Guidelines within the DHR study tiers for the Woodside Substation site (Table 4-3). It is expected that the Woodside Substation site would have a minimal potential impact on both resources.

TABLE 4-3 POTENTIAL IMPACTS ON HISTORIC RESOURCES WITHIN THE DEPARTMENT OF HISTORIC RESOURCES STUDY TIERS FOR THE WOODSIDE SUBSTATION SITE

Buffer (miles)	Resource Category	Resource Number	Description	Potential Impact
1.0 to 1.5	NHLs	—	—	—
0.5 to 1.0	NRHP-listed properties	—	—	—
0.0 to 0.5	NRHP-listed properties	—	—	—
	NRHP-eligible properties	—	—	—
	Locally significant, NRHP potentially eligible	034-0137	Branson House / Greenwood Farm	Minimal
		034-0929	Hugh Lupton House	Minimal
0.0 (within ROW)	NHLs, NRHP-listed and NRHP-eligible properties	—	—	—

Source: DHR 2025

NHL = National Historic Landmark; NRHP = National Register of Historic Places; ROW = right-of-way

4.3 FUTURE INVESTIGATIONS

The next stage of assessing potential impacts on cultural resources will be to conduct an identification phase field survey to identify and assess resources along the route selected by the SCC for the MARL Project. Survey of the approved Alternative Route will be conducted in accordance with the following guidelines:

- Guidelines for Assessing Impacts of Proposed Electrical Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia (DHR 2008);
- Guidelines for Conducting Historic Resources Survey in Virginia (DHR 2017); and
- National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation (NPS 1995).

The survey teams will be led by individuals meeting the Secretary of the Interior's professional qualifications standards for archaeology and architectural history, respectively. Teams will traverse the length of the MARL Project centerline, revisiting previously recorded historic architectural resources and documenting unrecorded cultural resources in the survey area defined in the guidelines for the MARL Project design. The archaeological survey will adhere to DHR survey standards (DHR 2017) and entail systematic coverage of the approved route. All material culture, including artifacts and features, that could be 50 years old or older will be recorded. Sites will be delineated within the ROW Corridor, and investigations will include subsurface testing and background research sufficient to inform recommendations of potential eligibility for the NRHP under all four criteria. Each site will be fully documented with appropriate mapping, digital photography, and artifact collection/analysis. Site forms will be prepared for VCRIS submittal along with full descriptions in the technical report.

The historic architectural survey will likewise adhere to DHR standards. While the National Park Service Bulletin 15 (NPS 1995) defines a historic property as a resource that is 50 years or older, for the purposes of the MARL Project, survey will include those 45 years or older to accommodate the length of time needed to complete the permitting phase for the MARL Project. Furthermore, the survey will also record those resources that may have reached significance prior to the 50-year (45-year) age in accordance with National Park Service guidance if they are integral parts of districts or have merit to be considered eligible for the NRHP on their own. Digital photographs will be taken to record resources' overall appearance and details. Sketch maps will be drawn depicting the relationship of dwellings to outbuildings and associated landscape features. Additional information on the structures' appearance and integrity will be recorded to assist in making recommendations of NRHP eligibility. Historic maps, aerial photographs, and tax assessor data will be consulted to assist in dating the resources. Resources identified in the field effort will be reported to the DHR, VCRIS numbers will be obtained, and shapefiles and database information will be provided. Sufficient information will be collected to make recommendations for each identified historic resource regarding eligibility for listing on the NRHP and assess potential MARL Project impacts.

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ATTACHMENT 1 LOCATIONS OF CONSIDERED HISTORIC RESOURCES ASSOCIATED WITH MARL PROJECT ALTERNATIVES

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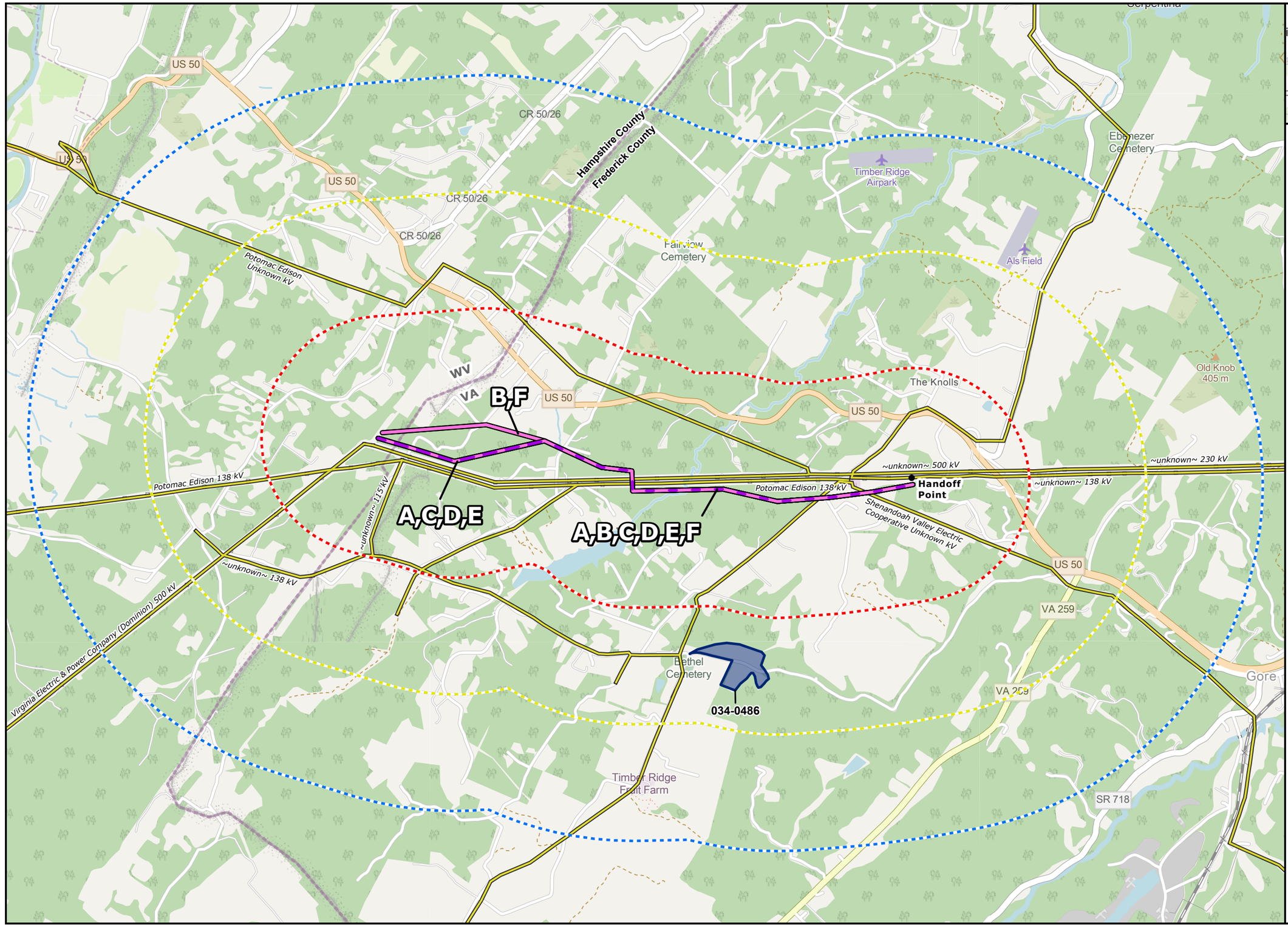

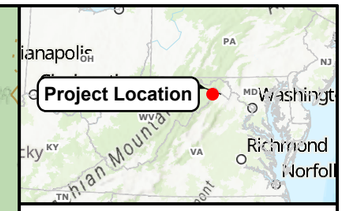

Attachment 1, Sheet 1
Locations of Considered Historic Resources Associated with the MARL Project
MidAtlantic Resiliency Link

Proposed Project Components

- Project Endpoint
- Proposed Route Centerline
- Alternative Route Centerlines
- Existing High-Voltage Transmission Lines (>69kV)
- 0.5 Mile Buffer
- 1 Mile Buffer
- 1.5 Mile Buffer

Historic Resources:

- NRHP Listed

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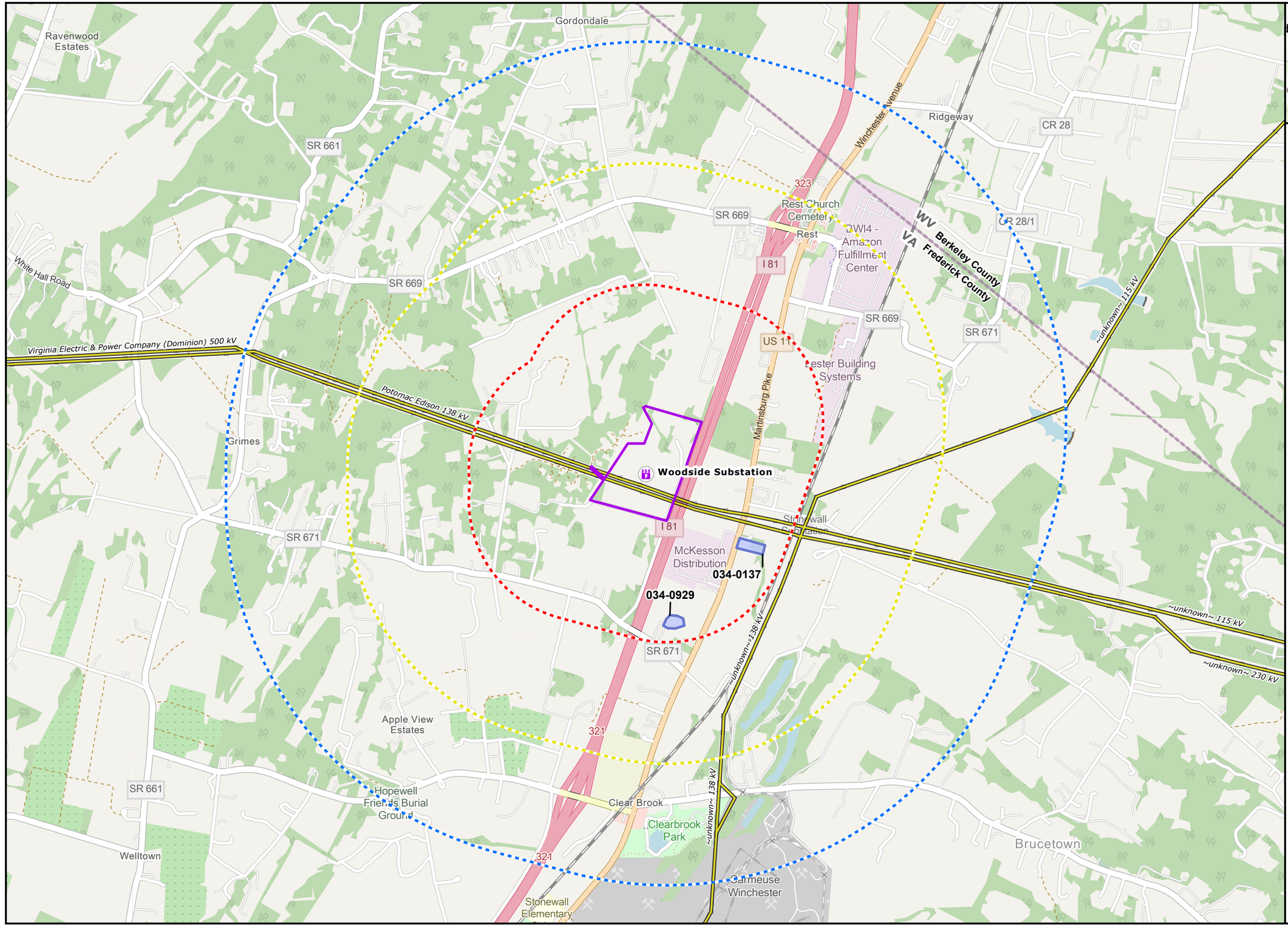

Attachment 1, Sheet 2
Locations of Considered Historic Resources Associated with the MARL Project
MidAtlantic Resiliency Link

Proposed Project Components

- Proposed Woodside Substation
- Proposed Woodside Substation Site
- Existing High-Voltage Transmission Lines (>69kV)
- 0.5 Mile Buffer
- 1 Mile Buffer
- 1.5 Mile Buffer

Historic Resources:

- Potentially Eligible, Locally Significant

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ATTACHMENT 2 CULTURAL RESOURCES SURVEY WITHIN 1 MILE OF MARL PROJECT

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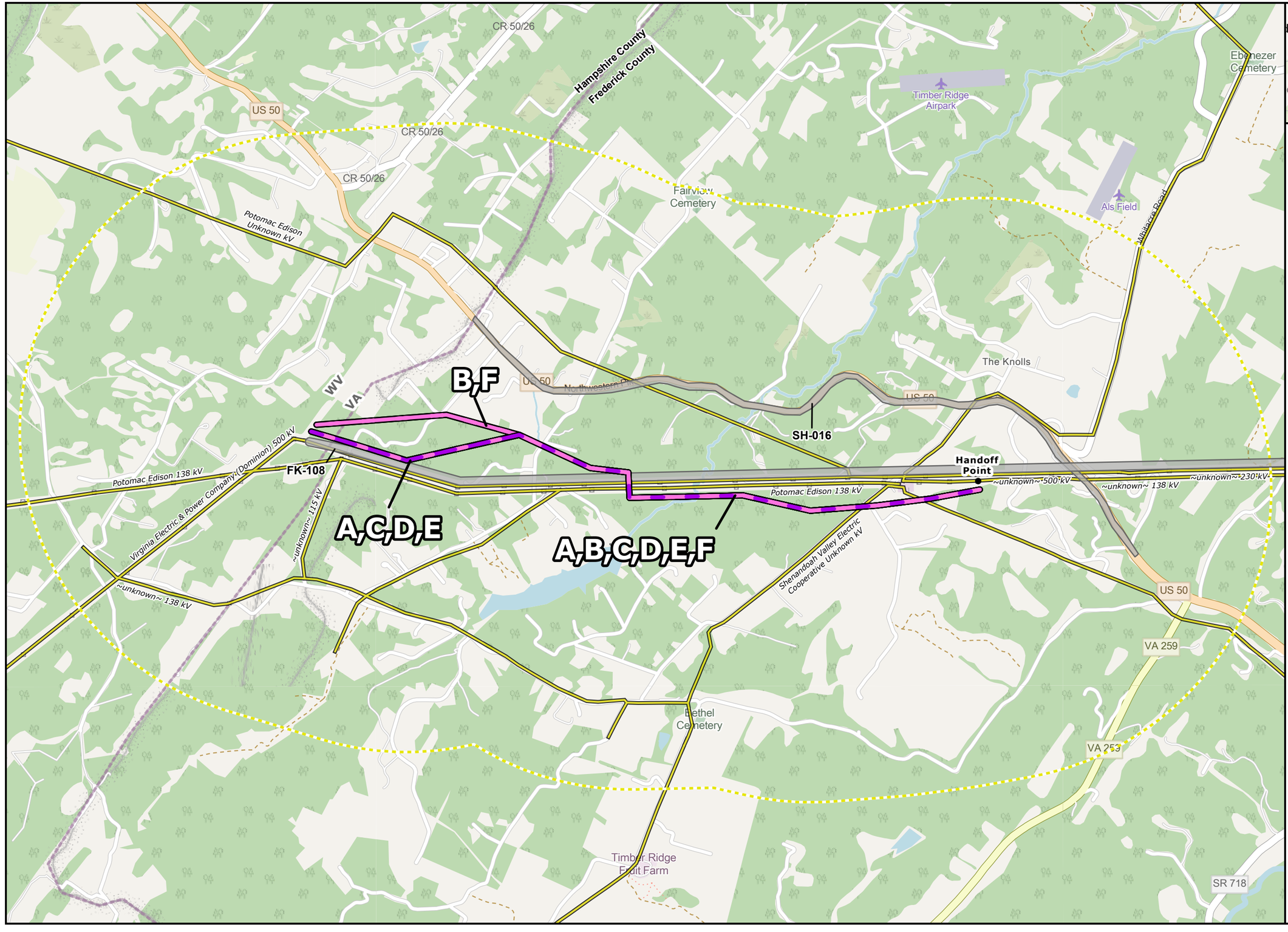

Attachment 2, Sheet 1
Cultural Resources Surveys within 1 Mile of Proposed Route and Alternative Routes
MidAtlantic Resiliency Link

Proposed Project Components

- Project Endpoint
- Proposed Route Centerline
- Alternative Route Centerlines
- Existing High-Voltage Transmission Lines (>69kV)
- Previous Surveys
- 1 Mile Buffer

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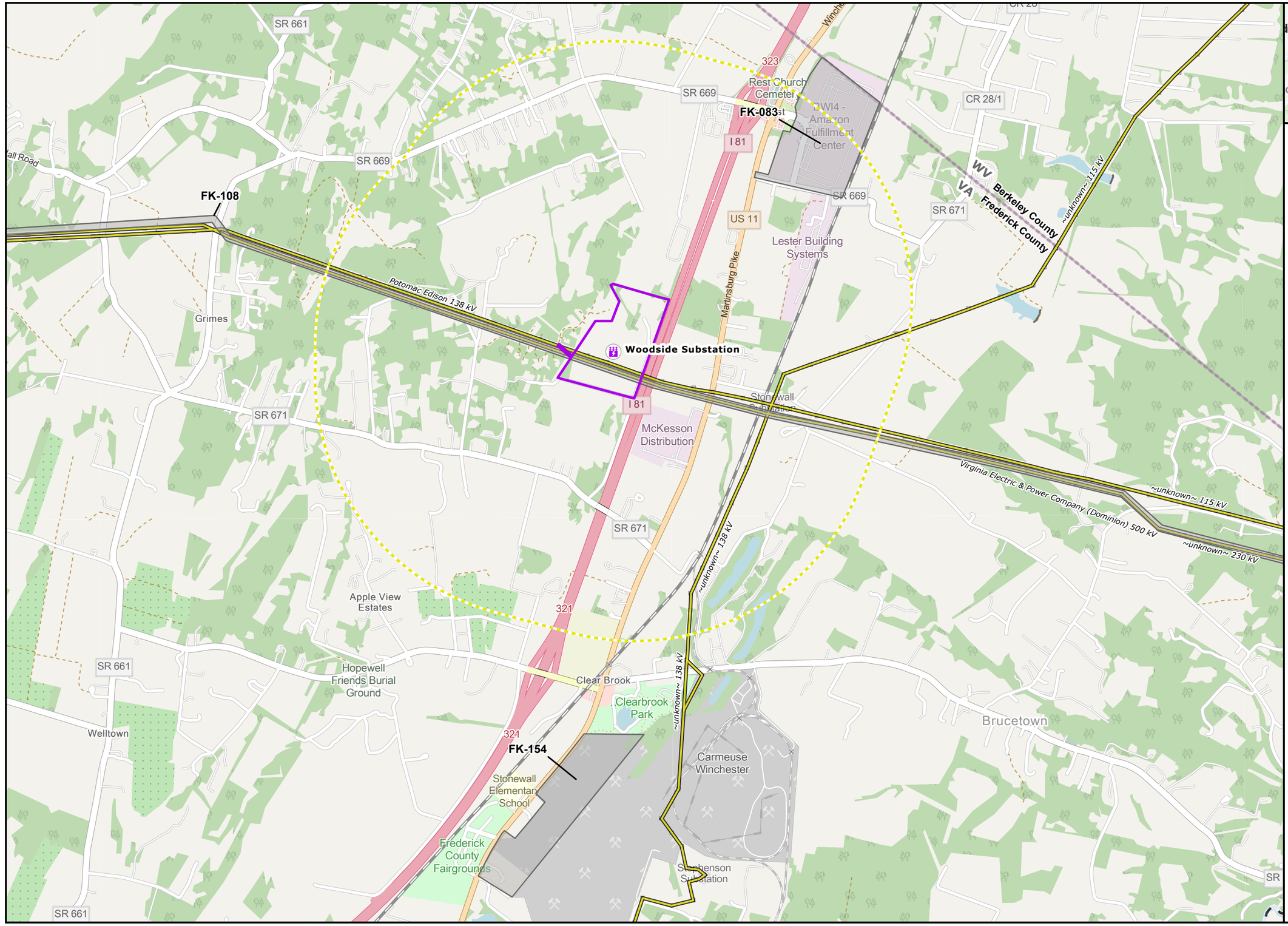

Attachment 2, Sheet 2
Cultural Resources Surveys within 1 Mile of Proposed Route and Alternative Routes
MidAtlantic Resiliency Link

Proposed Project Components

- Proposed Woodside Substation
- Proposed Woodside Substation Site
- Existing High-Voltage Transmission Lines (>69kV)
- Previous Surveys
- 1 Mile Buffer

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ATTACHMENT 3 TYPICAL DESIGN AND LAYOUT

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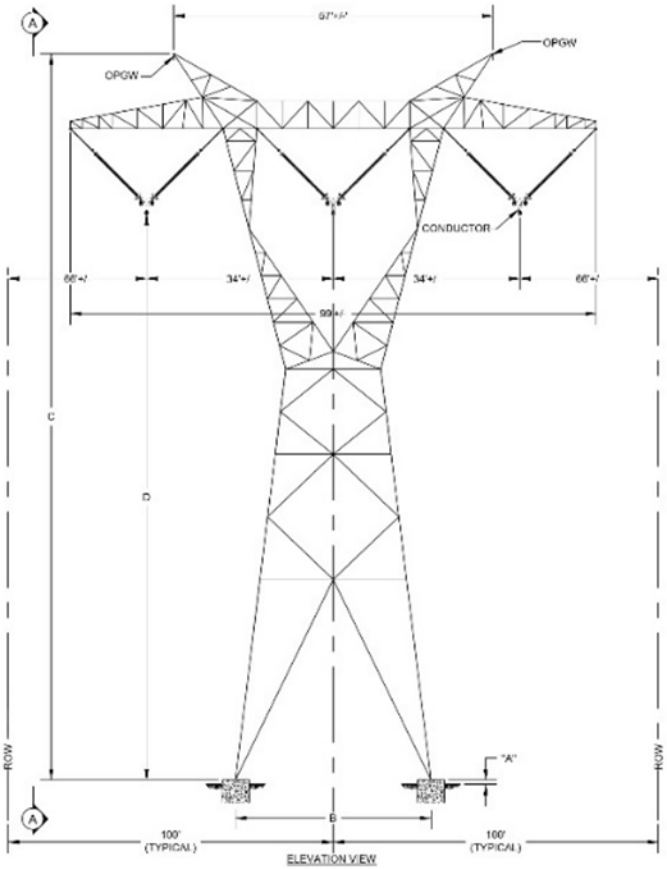
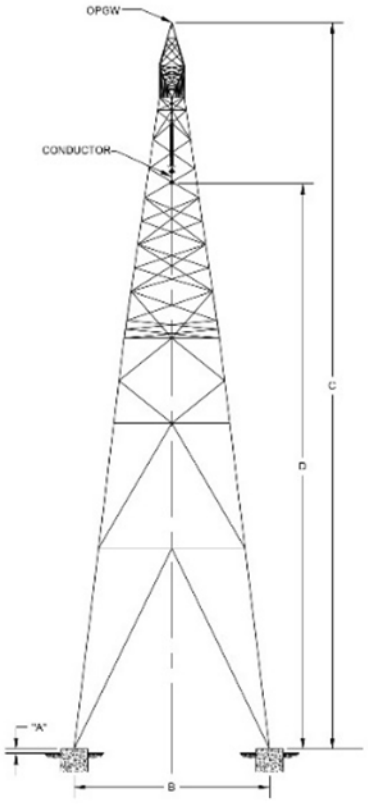
PLAN VIEW



ELEVATION VIEW



SECTION A-A

PROPOSED TANGENT TOWER 0° 3° LINE ANGLE

PRIMARY FOUNDATION TYPE: CONCRETE PIER (SEE GENERAL NOTE 2)
FOUNDATION SIZE RANGE (DIA. X EMB.): 3 FT X 15 FT - 8 FT X 60 FT +/-
FOUNDATION REVEAL RANGE (A): 1 FT - 4 FT +/-
FOUNDATION SPACING RANGE (B): 24 FT - 50 FT +/-
TOWER HEIGHT RANGE (C): 85 FT - 190 FT +/-
CONDUCTOR ATTACHMENT HEIGHT (D): 55 FT - 160 FT +/-

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ATTACHMENT 4 HISTORIC RESOURCE PHOTOS

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FIGURE 1 034-0137, BRANSON HOUSE, SOUTH ELEVATION, VIEW TO THE NORTHEAST



FIGURE 2 034-0486, ROBERT MUSE HOUSE/SUNRISE, EAST AND NORTH ELEVATIONS, VIEW TO THE SOUTHWEST



FIGURE 3 034-0929, HUGH LUPTON HOUSE, OBSCURED VIEW, VIEW TO THE NORTH



ATTACHMENT 5 PHOTO SIMULATIONS

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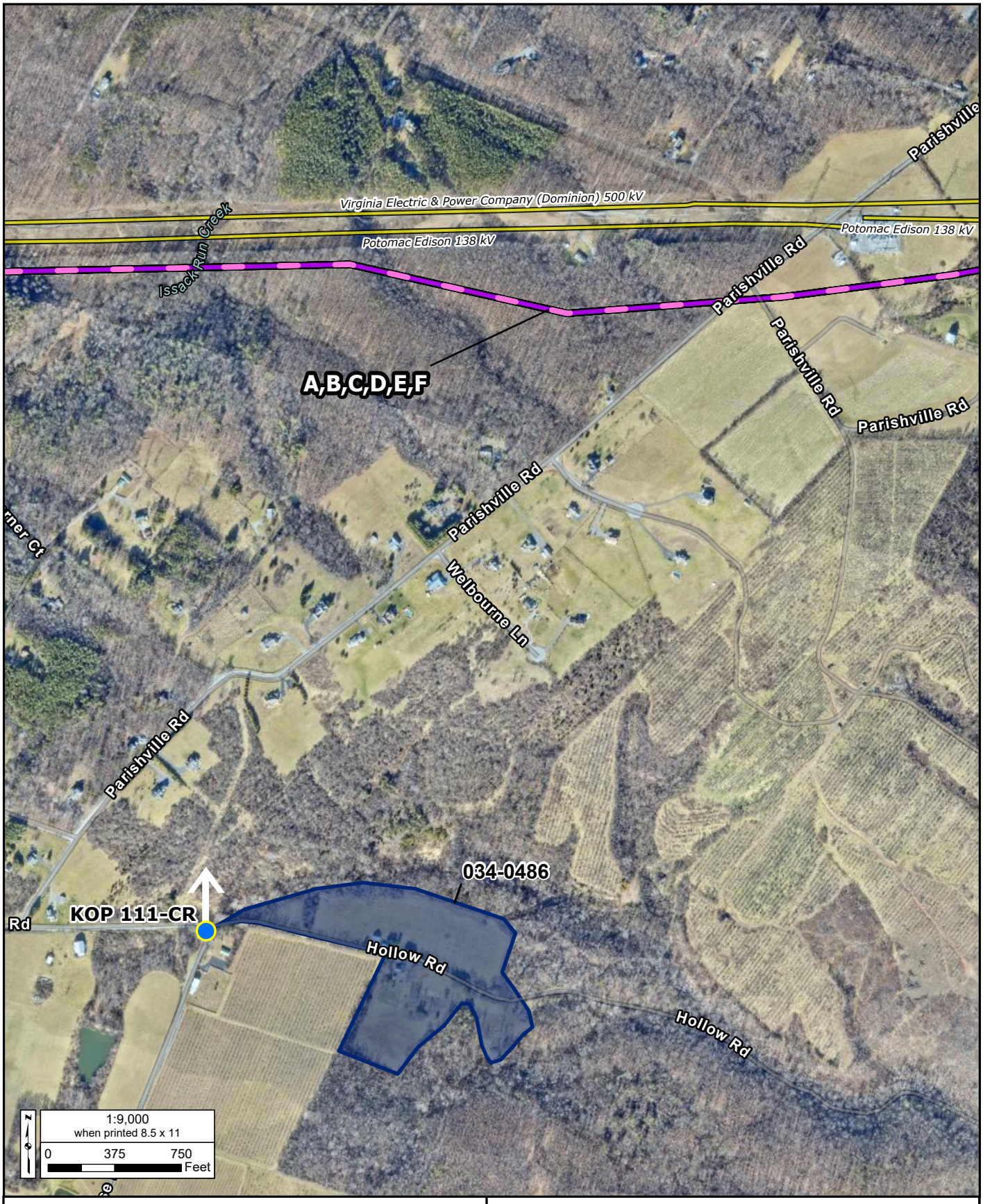

Proposed Woodside Substation
Proposed Woodside Substation Site
Proposed Route Centerline
Alternative Route Centerlines
NRHP Listed
KOP

For environmental review use only.

Attachment 5 - Figure 1
Aerial photograph depicting land use and photo view for
034-0486
MidAtlantic Resiliency Link
Frederick County, VA

ERM

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MidAtlantic Resiliency Link
NextEra Energy
Frederick County, Virginia

KOP 111

Hollow Rd at Muse Rd

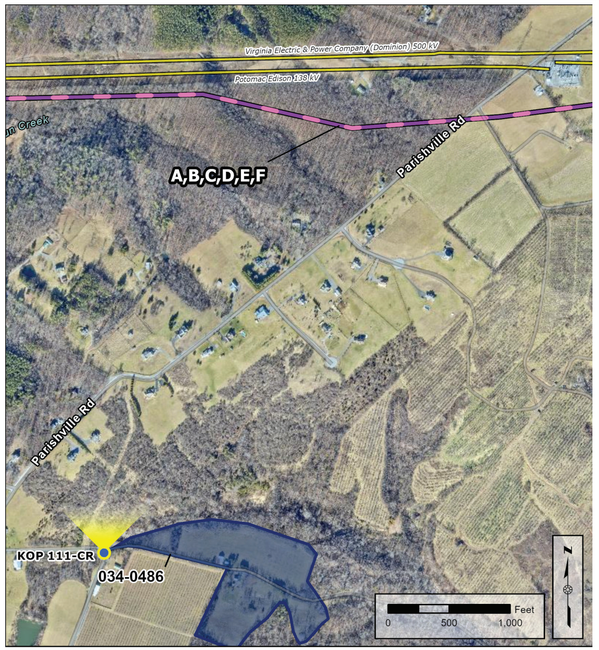
Figure 2
Route: Proposed and Alternative Routes
Date:11/18/2024
Time: 1:29 pm
Viewing Direction: North
Distance to closest feature: 0.64 miles



EXISTING CONDITIONS



PROPOSED CONDITIONS



Legend

- KOP
- Proposed Route Centerline
- Alternative Route Centerlines
- Existing High-Voltage Transmission Lines (>69kV)
- NRHP Listed

Note: Project components illustrated are based on proposed preliminary designs
The images contained on this page show the proposed project within a wider landscape context and are not representative of scale and distance when viewed from the actual view point.

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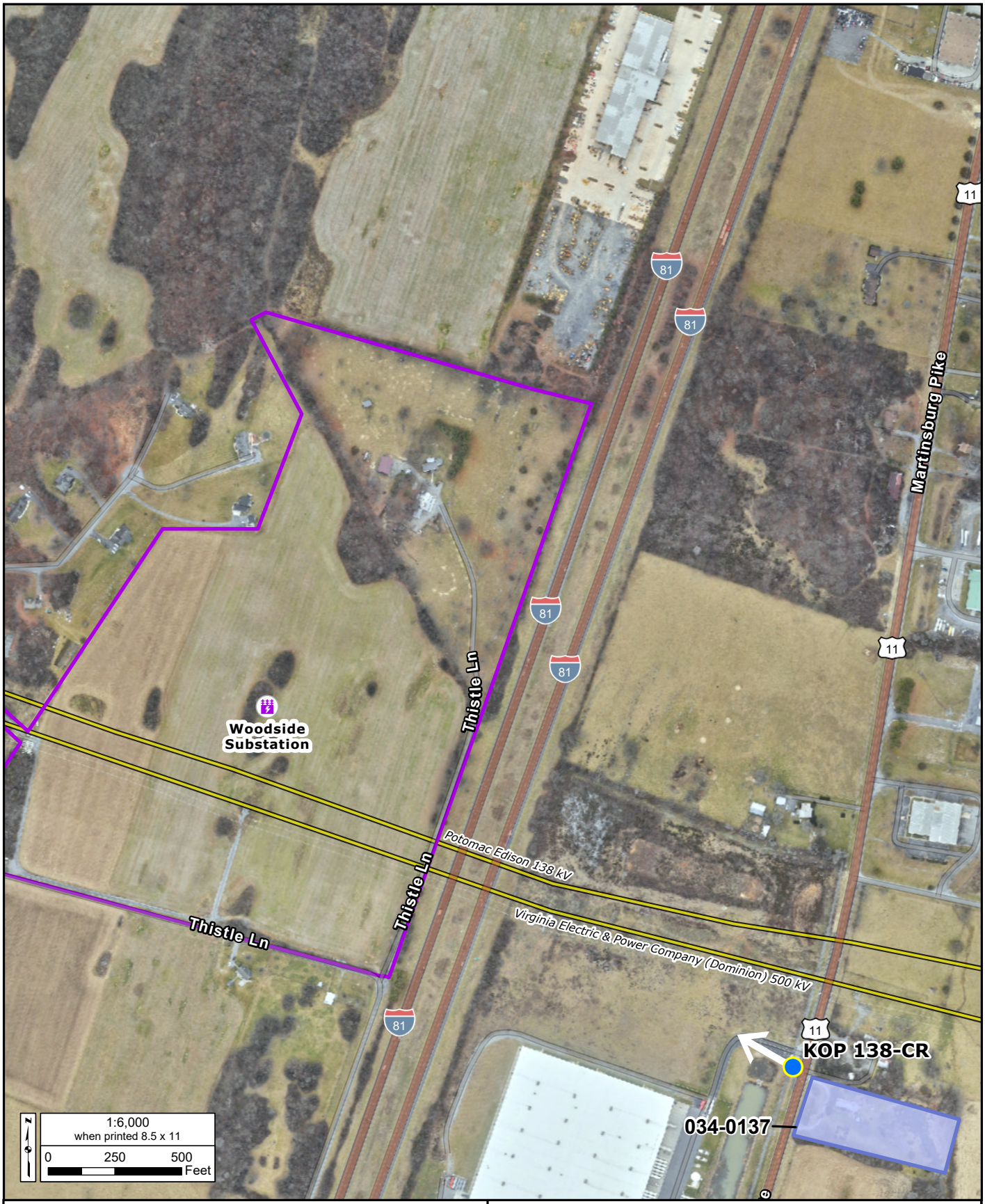

Proposed Woodside Substation

Proposed Woodside Substation Site

Potentially Eligible, Locally Significant

KOP

For environmental review use only.

Attachment 5 - Figure 3
Aerial photograph depicting land use and photo view for
034-0137
MidAtlantic Resiliency Link
Frederick County, VA

ERM

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MidAtlantic Resiliency Link
NextEra Energy
Frederick County, Virginia

KOP 138

Martinsburg Pike S of Branson Spring Rd

Figure 4
Route: Proposed Woodside Substation
Date:11/19/2024
Time: 10:56 am
Viewing Direction: Northwest
Distance to closest feature: 0.46 miles



EXISTING CONDITIONS



PROPOSED CONDITIONS



Legend

- KOP
- Proposed Woodside Substation
- Proposed Woodside Substation Site
- Existing High-Voltage Transmission Lines (>69kV)
- Potentially Eligible, Locally Significant

Note: Project components illustrated are based on proposed preliminary designs
The images contained on this page show the proposed project within a wider landscape context and are not representative of scale and distance when viewed from the actual view point.

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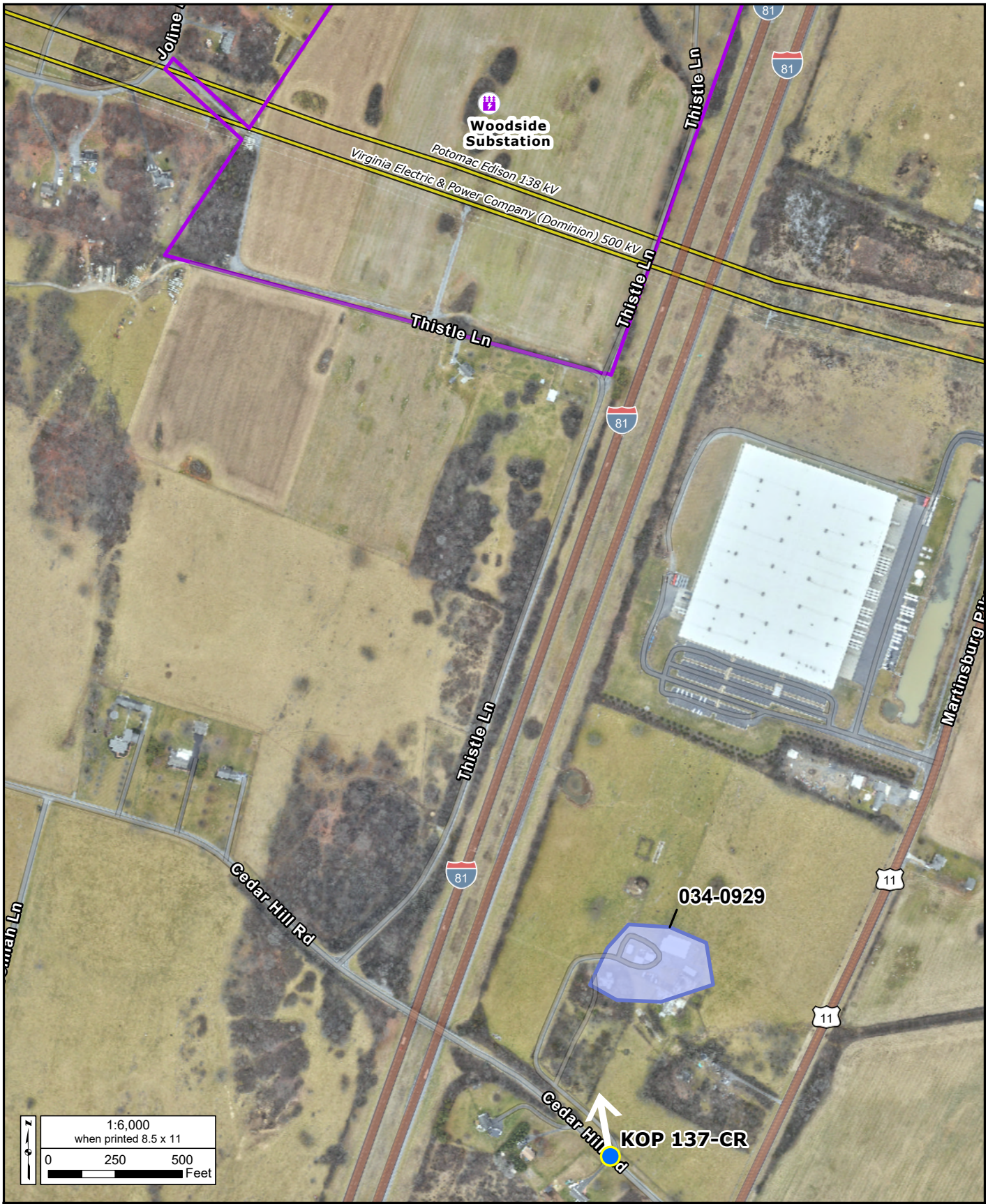

Proposed Woodside Substation

Proposed Woodside Substation Site

Potentially Eligible, Locally Significant

KOP

For environmental review use only.

Attachment 5 - Figure 5
Aerial photograph depicting land use and photo view for
034-0929
MidAtlantic Resiliency Link
Frederick County, VA

ERM

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MidAtlantic Resiliency Link
NextEra Energy
Frederick County, Virginia

KOP 137

Cedar Hill Rd SE of Thistle Ln

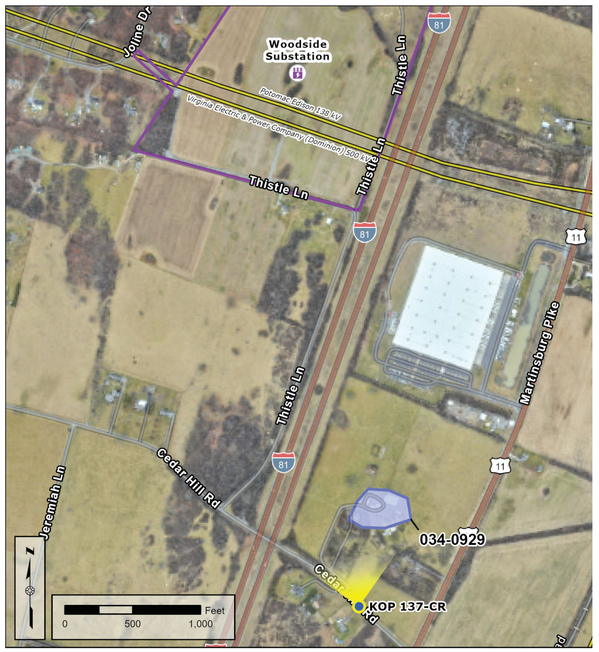
Figure 6
Route: Proposed Woodside Substation
Date:11/19/2024
Time: 2:53 pm
Viewing Direction: North
Distance to closest feature: 0.70 miles



EXISTING CONDITIONS



PROPOSED CONDITIONS



Legend

- KOP
- Proposed Woodside Substation
- Proposed Woodside Substation Site
- Existing High-Voltage Transmission Lines (>69kV)
- Potentially Eligible, Locally Significant

Note: Project components illustrated are based on proposed preliminary designs
The images contained on this page show the proposed project within a wider landscape context and are not representative of scale and distance when viewed from the actual view point.

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APPENDIX E MAPBOOKS FOR ROUTING STUDY

APPENDIX E-1 MAJOR CONSTRAINTS AND OPPORTUNITIES MAPBOOK

APPENDIX E-2 TERRAIN AND SLOPE MAPBOOK

APPENDIX E-3 PRELIMINARY DRAFT ROUTE OPTIONS MAPBOOK

APPENDIX E-4 ROUTE SEGMENTS MAPBOOK

APPENDIX E-5 PRELIMINARY DRAFT ROUTE OPTIONS AND FINAL ROUTE ALTERNATIVES MAPBOOK

APPENDIX E-6 ALTERNATIVE ROUTES MAPBOOK

APPENDIX E-7 ALTERNATIVE ROUTES

APPENDIX E-8 ALTERNATIVE ROUTES—LAND USE AND SOCIAL RESOURCES, PARALLELING, COMMUNITY AND RECREATION AND PROTECTED AREAS MAPBOOK

APPENDIX E-9 ALTERNATIVE ROUTES—LAND USE AND SOCIAL RESOURCES—CULTURAL RESOURCES MAPBOOK (CONFIDENTIAL)

APPENDIX E-10 ALTERNATIVE ROUTES—LAND USE AND SOCIAL RESOURCES—AGRICULTURAL AND LAND COVER MAPBOOK

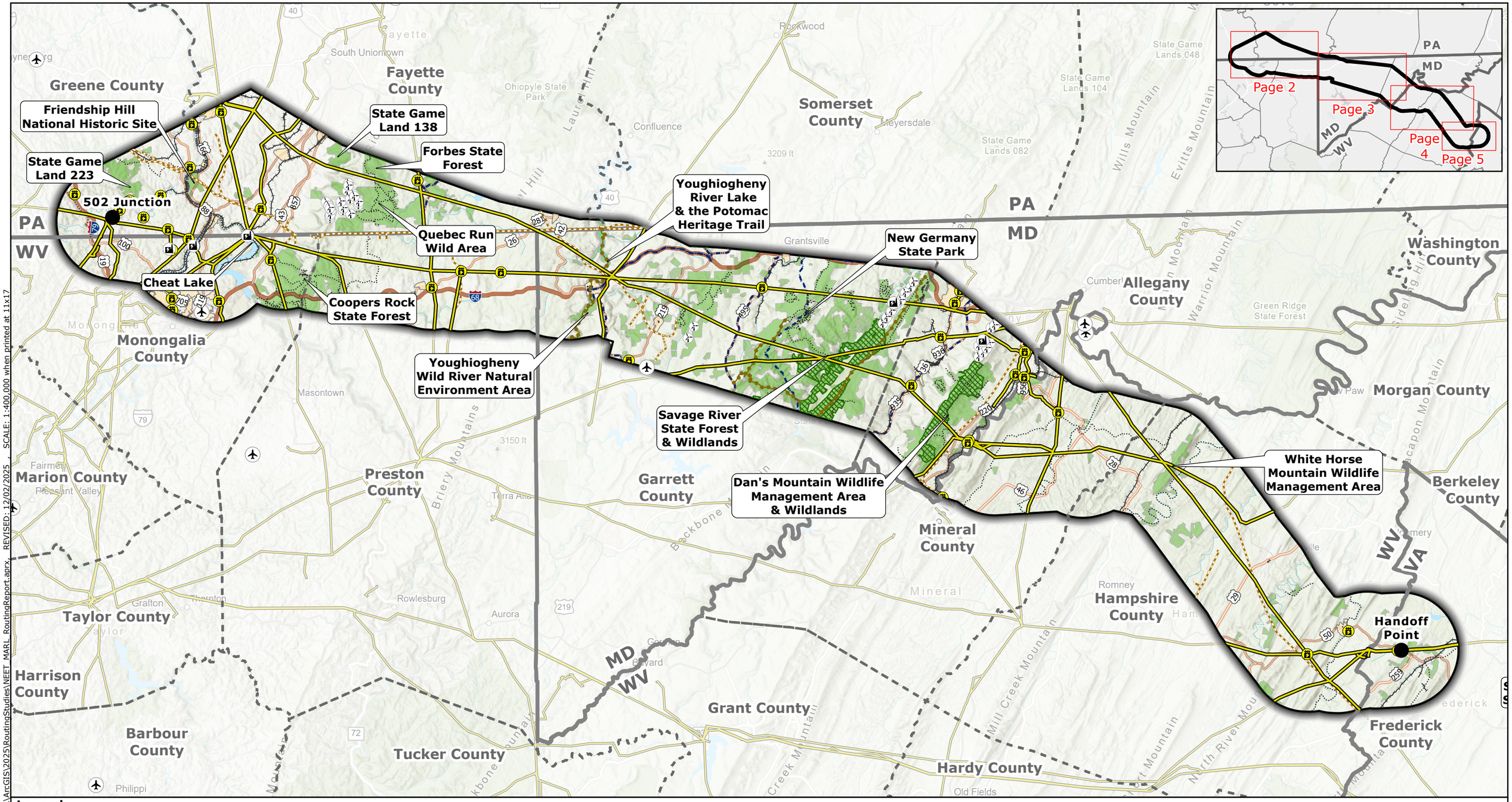
APPENDIX E-11 ALTERNATIVE ROUTES—NATURAL ENVIRONMENT—WATER RESOURCES MAPBOOK

APPENDIX E-12 ALTERNATIVE ROUTES—NATURAL ENVIRONMENT—SENSITIVE SPECIES AND HABITATS MAPBOOK (CONFIDENTIAL)

APPENDIX E-13 ALTERNATIVE ROUTES—ENGINEERING AND INFRASTRUCTURE MAPBOOK

APPENDIX E-14 THE PROPOSED ROUTE MAPBOOK

APPENDIX E-1 MAJOR CONSTRAINTS AND OPPORTUNITIES MAPBOOK


Friendship Hill National Historic Site
State Game Land 223
502 Junction
Cheat Lake
State Game Land 138
Forbes State Forest
Quebec Run Wild Area
Coopers Rock State Forest
Youghiogheny River Lake & the Potomac Heritage Trail
Youghiogheny Wild River Natural Environment Area
New Germany State Park
Savage River State Forest & Wildlands
Dan's Mountain Wildlife Management Area & Wildlands
White Horse Mountain Wildlife Management Area
Handoff Point
Page 2
Page 3
Page 4
Page 5
PA
WV
MD
VA
Greene County
Fayette County
Somerset County
Washington County
Allegany County
Morgan County
Berkeley County
Monongalia County
Marion County
Preston County
Garrett County
Mineral County
Hampshire County
Frederick County
Taylor County
Harrison County
Barbour County
Tucker County
Grant County
Hardy County
Legend
Project Endpoints
Substation
Wind Turbines
Power Plants
Public Airports
Project Study Area
County Boundary
State Border
High-Level Opportunities
Existing High-Voltage Transmission Lines (>69kV)
Railway
Major Pipelines
Interstate
U.S. / State Highway
High-Level Constraints
Potomac Heritage Trail
Hiking/Walking Trails
Scenic Byways
Protected Areas*
Maryland Wildlands
Incorporated Places
NOTES
1. *Protected Areas includes local, county, state and federal parks, conservation easements, agricultural easements, state forests, and wildlife management areas.
2. **Trout stream data was created using data from each state.
N
0 3.5 7 10.5 14
Miles
Scale: 1:400,000
1 inch equals 33,333ft (when printed at 11x17)
Appendix E-1
Major Constraints and Opportunities
Page 1 of 5
MidAtlantic Resiliency Link
ERM
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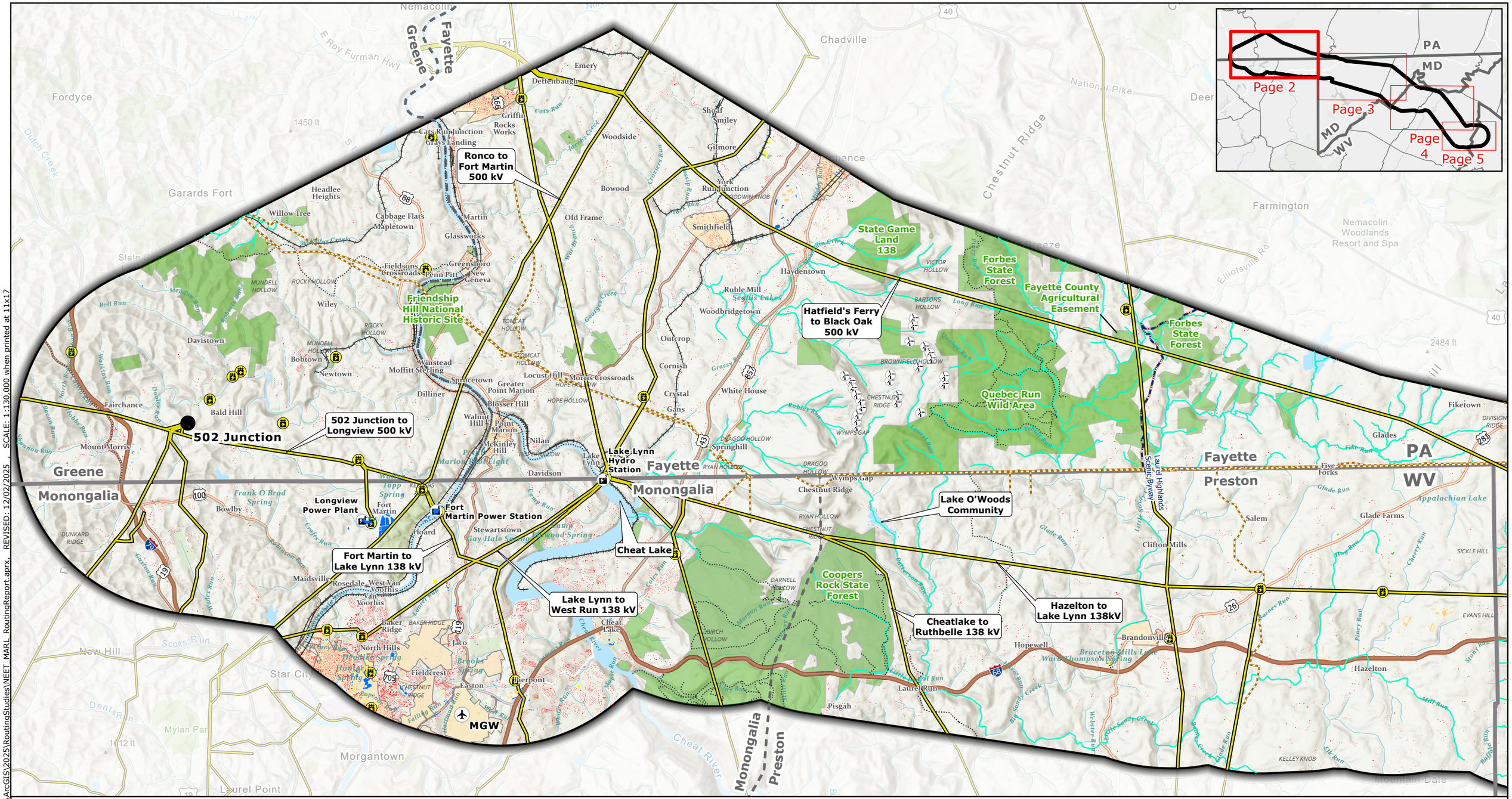

Legend

- Project Endpoints
- Substation
- Wind Turbines
- Power Plants
- Public Airports
- Project Study Area
- County Boundary
- State Border

High-Level Opportunities

- Existing High-Voltage Transmission Lines (>69kV)
- Railway
- Major Pipelines
- Interstate
- U.S. / State Highway

High-Level Constraints

- Potomac Heritage Trail
- Hiking/Walking Trails
- Scenic Byways
- Trout Streams and Coldwater Fisheries**
- Protected Areas*
- Maryland Wildlands
- Incorporated Places

Buildings Footprints

- Residential (House)
- Residential Outbuilding (Shed,Garage,Other)
- Agricultural Building
- Assembly
- Education
- Commercial/Industrial
- Other

NOTES

1. *Protected Areas includes local, county, state and federal parks, conservation easements, agricultural easements, state forests, and wildlife management areas.
2. **Trout stream data was created using data from each state.

N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-1
Major Constraints and Opportunities

Page 2 of 5

MidAtlantic Resiliency Link

ERM

Source: NAD 1983 UTM Zone 17N

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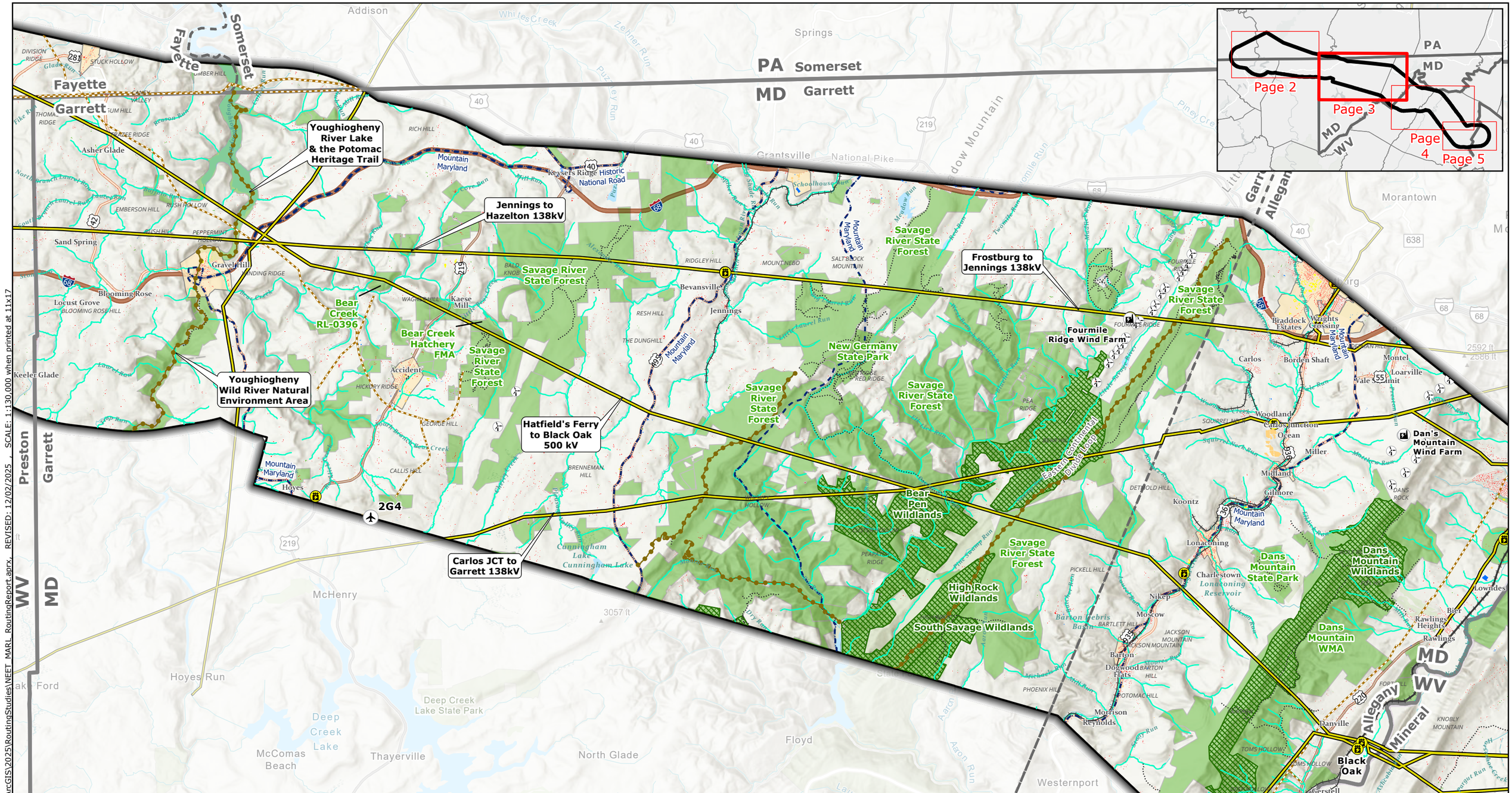

Legend

- Project Endpoints
- Substation
- Wind Turbines
- Power Plants
- Public Airports
- Project Study Area
- County Boundary
- State Border

High-Level Opportunities

- Existing High-Voltage Transmission Lines (>69kV)
- Railway
- Major Pipelines
- Interstate
- U.S. / State Highway

High-Level Constraints

- Potomac Heritage Trail
- Hiking/Walking Trails
- Scenic Byways
- Trout Streams and Coldwater Fisheries**
- Protected Areas*
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N

0 1 2 3 4
Miles
Scale: 1:130,000
1 inch equals 10,833ft (when printed at 11x17)

Appendix E-1
Major Constraints and Opportunities
Page 3 of 5
MidAtlantic Resiliency Link

ERM

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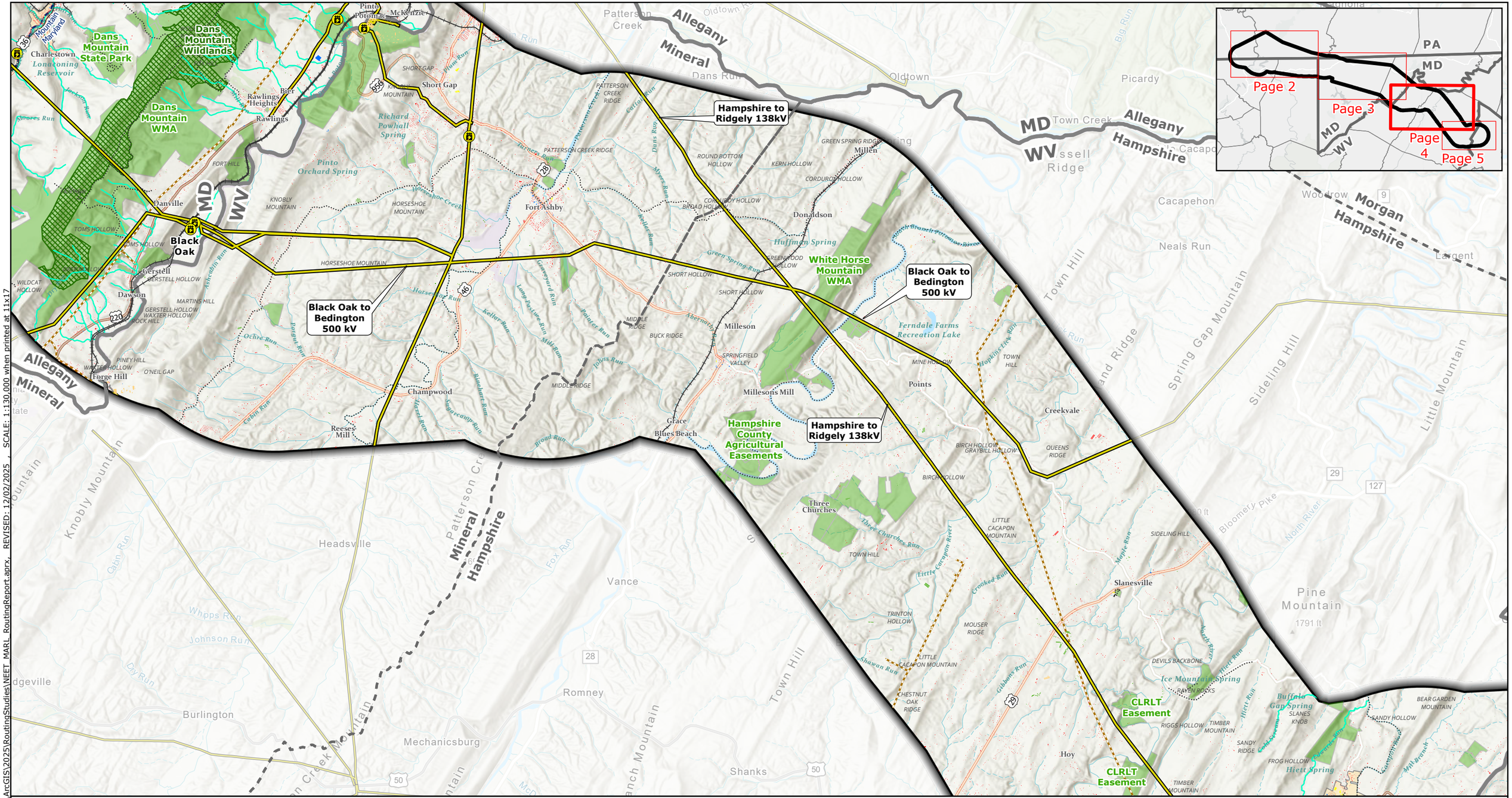

Legend

- Project Endpoints
- Substation
- Wind Turbines
- Power Plants
- Public Airports
- Project Study Area
- County Boundary
- State Border

High-Level Opportunities

- Existing High-Voltage Transmission Lines (>69kV)
- Railway
- Major Pipelines
- Interstate
- U.S. / State Highway

High-Level Constraints

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- Hiking/Walking Trails
- Scenic Byways
- Trout Streams and Coldwater Fisheries**
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NOTES

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*2. **Trout stream data was created using data from each state.*

N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-1
Major Constraints and Opportunities

Page 4 of 5

MidAtlantic Resiliency Link

ERM

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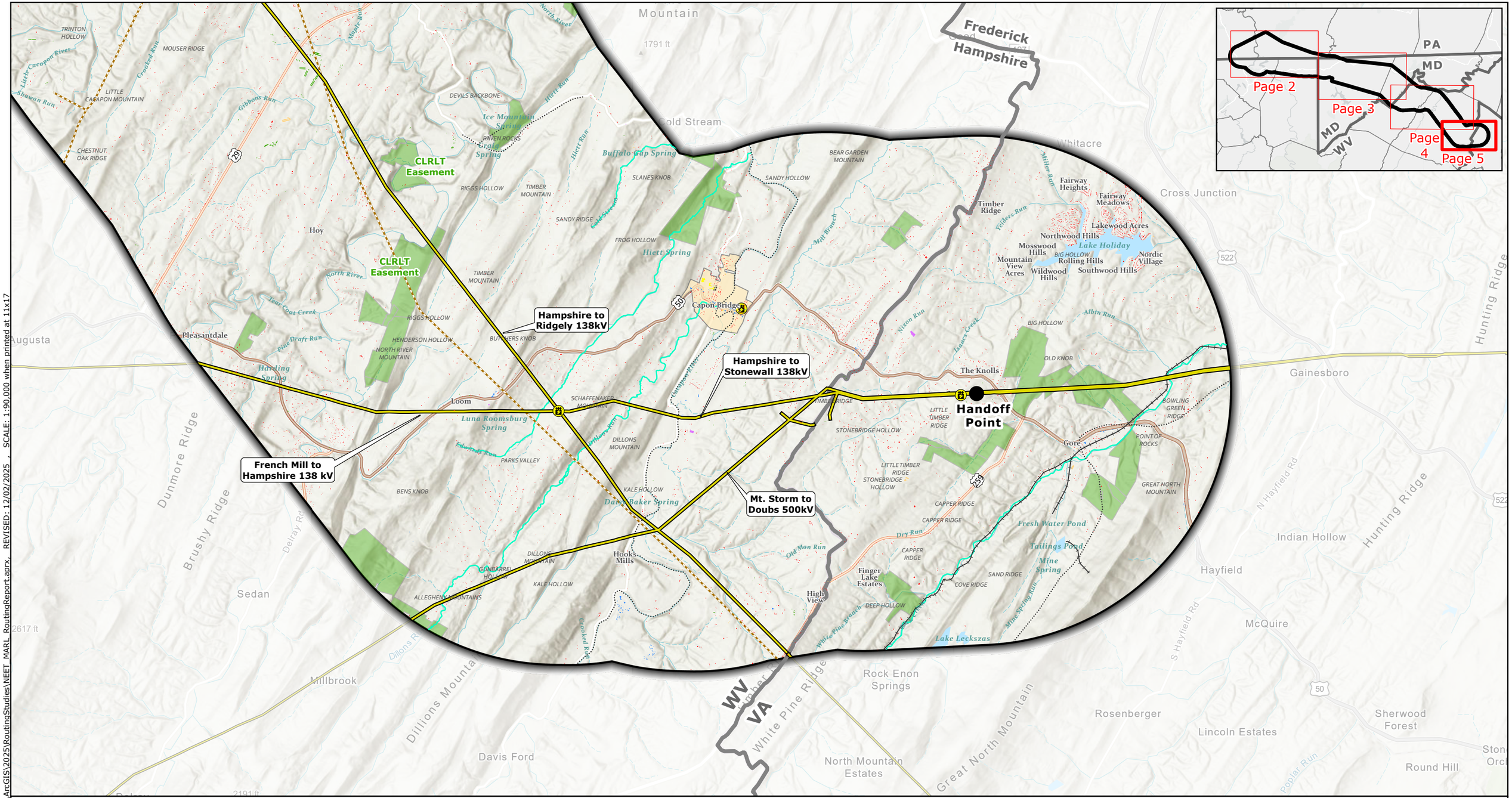

Legend

- Project Endpoints
- Substation
- Wind Turbines
- Power Plants
- Public Airports
- Project Study Area
- County Boundary
- State Border

High-Level Opportunities

- Existing High-Voltage Transmission Lines (>69kV)
- Railway
- Major Pipelines
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- U.S. / State Highway

High-Level Constraints

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- Hiking/Walking Trails
- Scenic Byways
- Trout Streams and Coldwater Fisheries**
- Protected Areas*
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Buildings Footprints

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- Residential Outbuilding (Shed,Garage,Other)
- Agricultural Building
- Assembly
- Education
- Commercial/Industrial
- Other

NOTES

1. *Protected Areas includes local, county, state and federal parks, conservation easements, agricultural easements, state forests, and wildlife management areas.
2. **Trout stream data was created using data from each state.

N

0 0.8 1.6 2.4 3.2

Miles

Scale: 1:90,000
1 inch equals 7,500ft (when printed at 11x17)

Appendix E-1
Major Constraints and Opportunities

Page 5 of 5

MidAtlantic Resiliency Link

ERM

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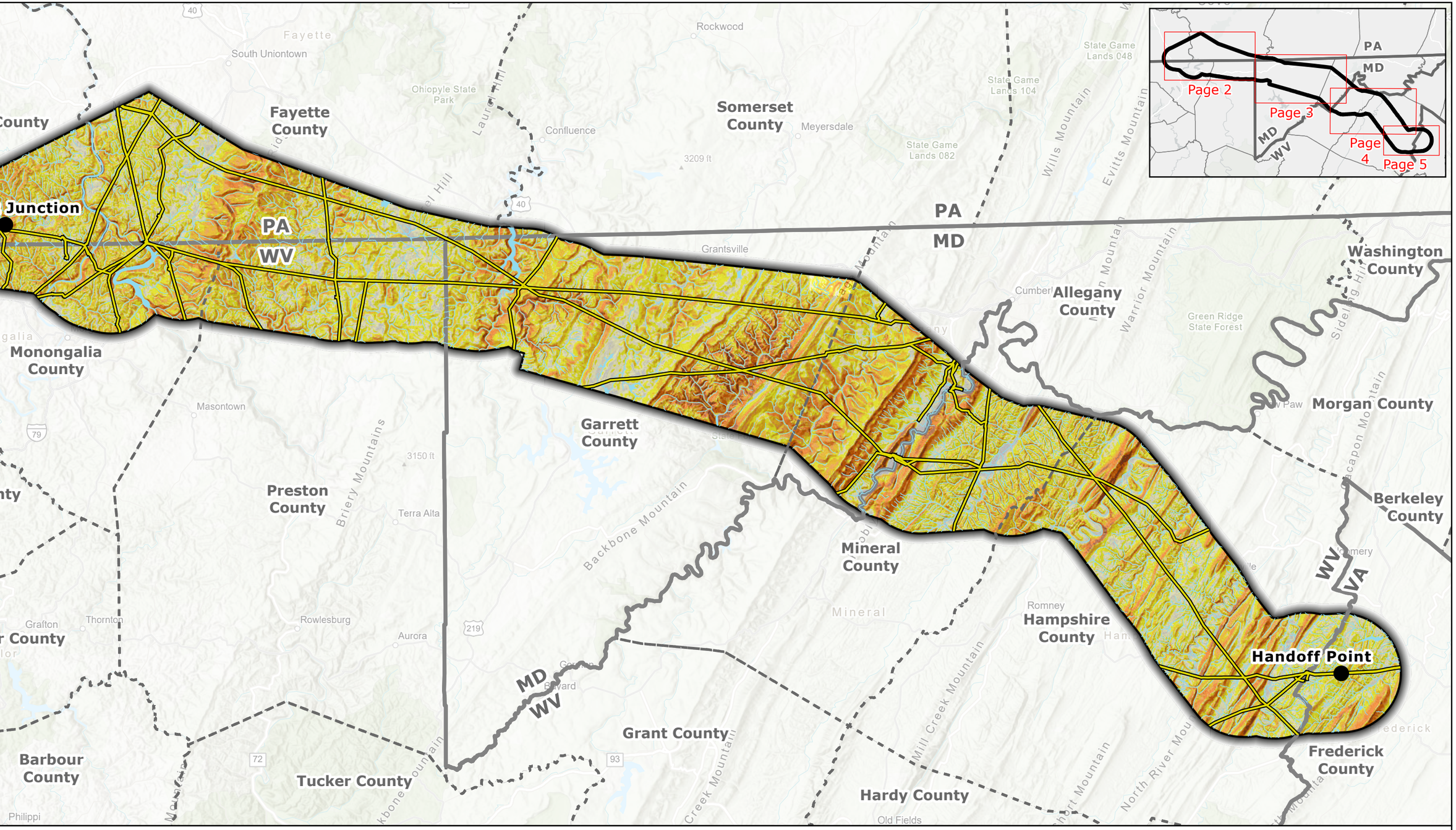
Source: NAD 1983 UTM Zone 17N

APPENDIX E-2 TERRAIN AND SLOPE MAPBOOK



Legend

- Project Endpoints
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border
- Stream/River (USGS NHD)
- Waterbody/Area (USGS NHD)

Terrain - Slope Map

- Flat (0°)
- Nearly level (1°)
- Gently level (2°)
- Gently sloping (3° - 5°)
- Strongly sloping (6° - 10°)
- Gently steep (11° - 15°)
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

NOTES
1. Terrain and Slope information derived from ESRI and publicly available LiDAR data

N

0 3.5 7 10.5 14
Miles

Scale: 1:400,000
1 inch equals 33,333ft (when printed at 11x17)

Appendix E-2
Terrain and Slope
Page 1 of 5
MidAtlantic Resiliency Link

ERM

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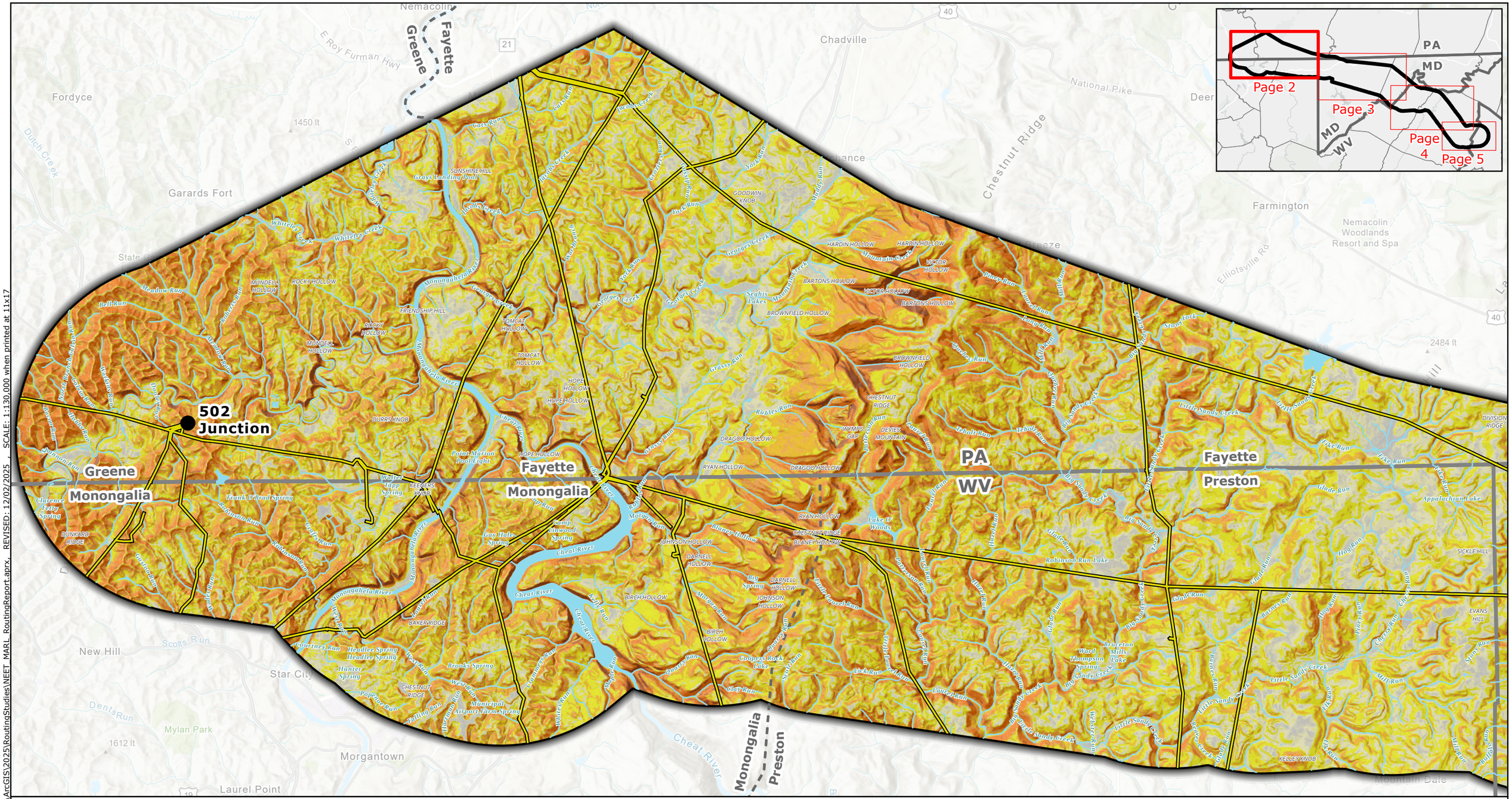

Legend

- Project Endpoints
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border
- Stream/River (USGS NHD)
- Waterbody/Area (USGS NHD)

Terrain - Slope Map

- Flat (0°)
- Nearly level (1°)
- Gently level (2°)
- Gently sloping (3° - 5°)
- Strongly sloping (6° - 10°)
- Gently steep (11° - 15°)
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

NOTES
1. Terrain and Slope information derived from ESRI and publicly available LiDAR data

N

0 1 2 3 4
Miles

Scale: 1:130,000
1 inch equals 10,833ft (when printed at 11x17)

Appendix E-2
Terrain and Slope
Page 2 of 5
MidAtlantic Resiliency Link

ERM

Source: NAD 1983 UTM Zone 17N

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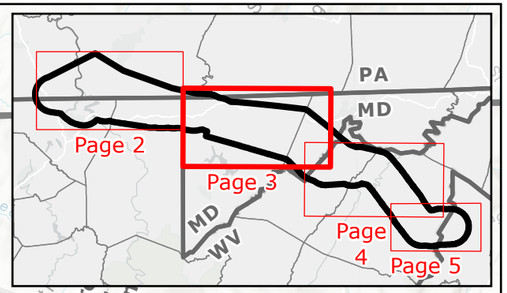

Legend

- Project Endpoints
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border
- Stream/River (USGS NHD)
- Waterbody/Area (USGS NHD)

Terrain - Slope Map

- Flat (0°)
- Nearly level (1°)
- Gently level (2°)
- Gently sloping (3° - 5°)
- Strongly sloping (6° - 10°)
- Gently steep (11° - 15°)
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

NOTES
1. Terrain and Slope information derived from ESRI and publicly available LiDAR data

N

0 1 2 3 4
Miles
Scale: 1:130,000
1 inch equals 10,833ft (when printed at 11x17)

Appendix E-2
Terrain and Slope
Page 3 of 5
MidAtlantic Resiliency Link

ERM

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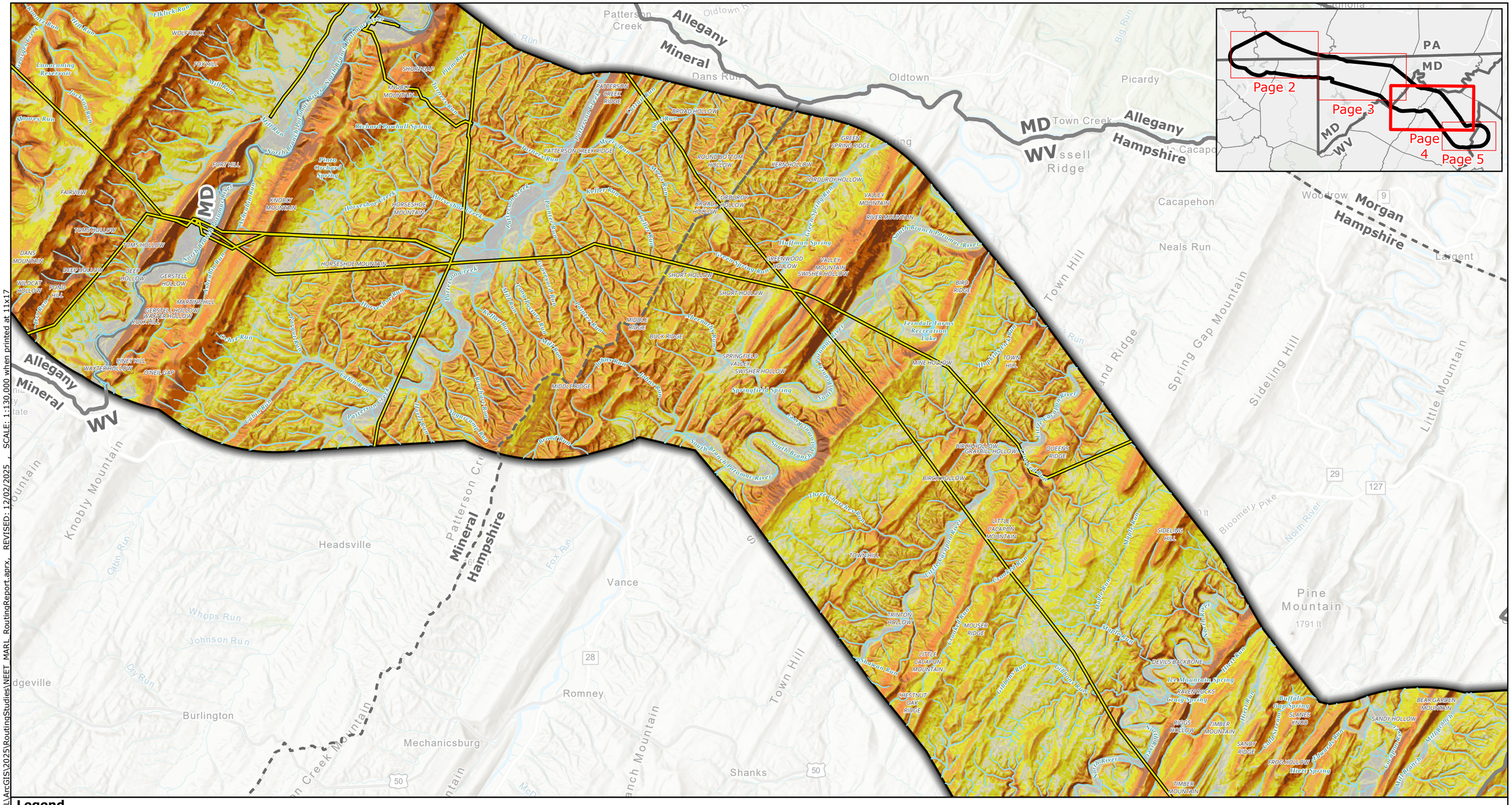

Legend

- Project Endpoints
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border
- Stream/River (USGS NHD)
- Waterbody/Area (USGS NHD)

Terrain - Slope Map

- Flat (0°)
- Nearly level (1°)
- Gently level (2°)
- Gently sloping (3° - 5°)
- Strongly sloping (6° - 10°)
- Gently steep (11° - 15°)
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

NOTES

1. Terrain and Slope information derived from ESRI and publicly available LiDAR data

N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-2
Terrain and Slope
Page 4 of 5
MidAtlantic Resiliency Link

ERM

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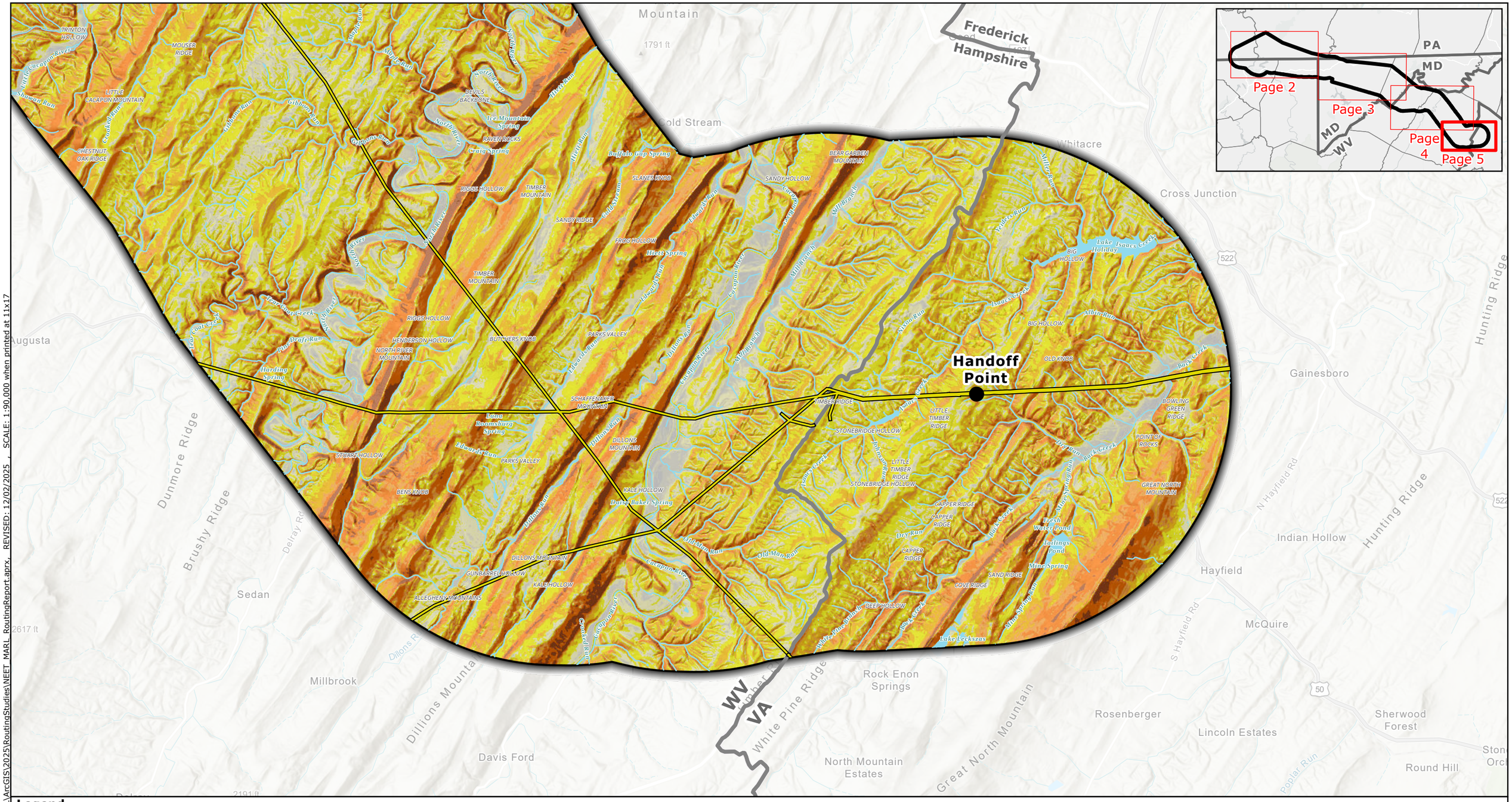


Legend

- Project Endpoints
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border
- Stream/River (USGS NHD)
- Waterbody/Area (USGS NHD)

Terrain - Slope Map

- Flat (0°)
- Nearly level (1°)
- Gently level (2°)
- Gently sloping (3° - 5°)
- Strongly sloping (6° - 10°)
- Gently steep (11° - 15°)
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

NOTES
1. Terrain and Slope information derived from ESRI and publicly available LiDAR data

N

0 0.8 1.6 2.4 3.2
Miles

Scale: 1:90,000
1 inch equals 7,500ft (when printed at 11x17)

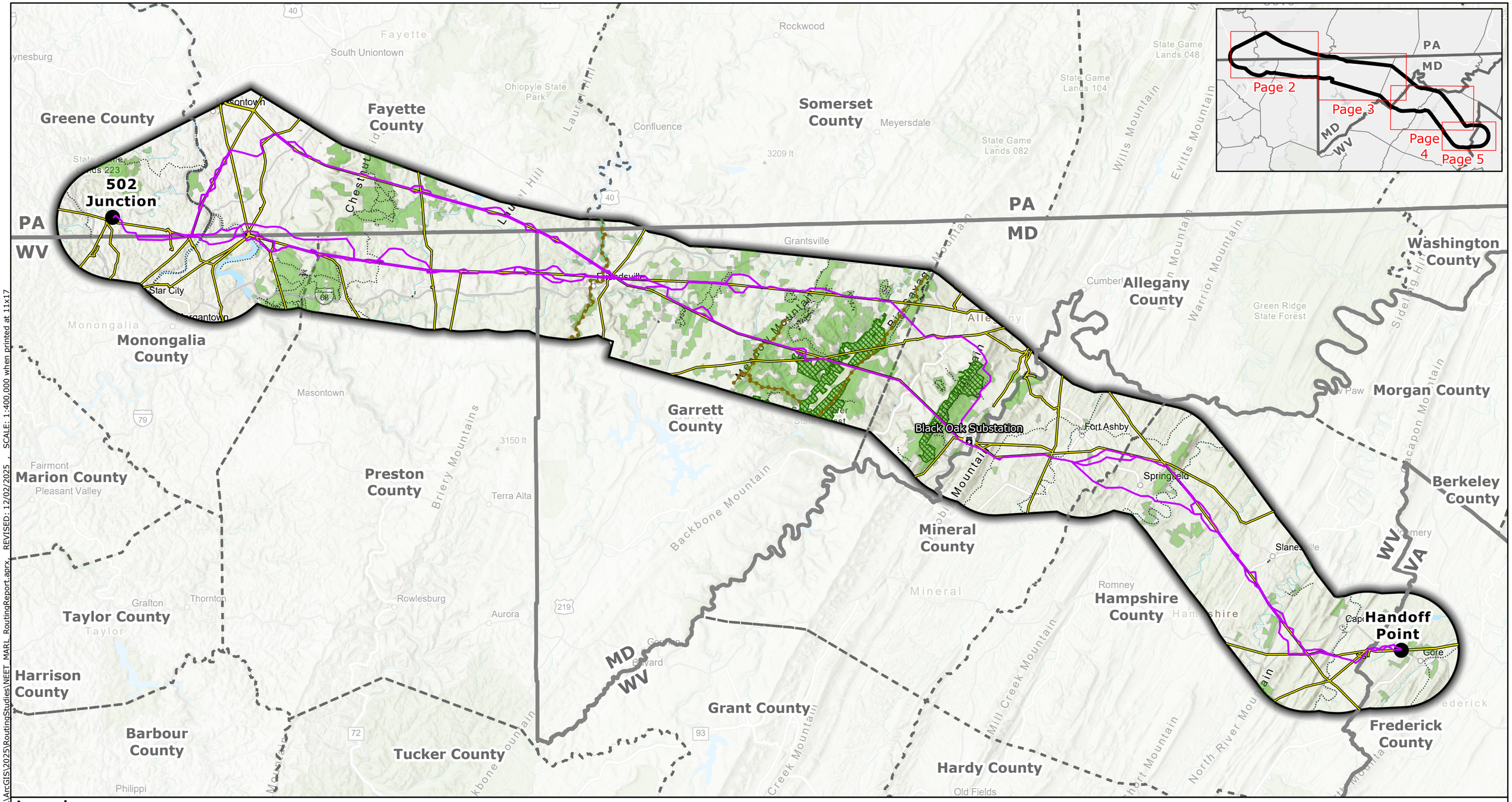
Appendix E-2
Terrain and Slope
Page 5 of 5
MidAtlantic Resiliency Link

ERM

FILE: M:\US\Projects\M-O\NextEra\MARL\ArcGIS\2025\RoutingStudies\NEET MARL RoutingReport.aprx, REVISED: 12/02/2025 , SCALE: 1:90,000 when printed at 11x17

Source: NAD 1983 UTM Zone 17N

APPENDIX E-3 PRELIMINARY DRAFT ROUTE OPTIONS MAPBOOK



Legend

- Project Endpoints
- Black Oak Substation
- Preliminary Draft Route Options Presented at Open Houses
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border
- Hiking/Walking Trails
- Potomac Heritage Trail
- Protected Areas*
- Maryland Wildlands

NOTES

*1. *Protected Areas includes local, county, state and federal parks, conservation easements, agricultural easements, state forests, and wildlife management areas.*

N

0 3.5 7 10.5 14

Miles

Scale: 1:400,000

1 inch equals 33,333ft (when printed at 11x17)

Appendix E-3
Preliminary Draft Route Options
Page 1 of 5
MidAtlantic Resiliency Link

ERM

Source: NAD 1983 UTM Zone 17N

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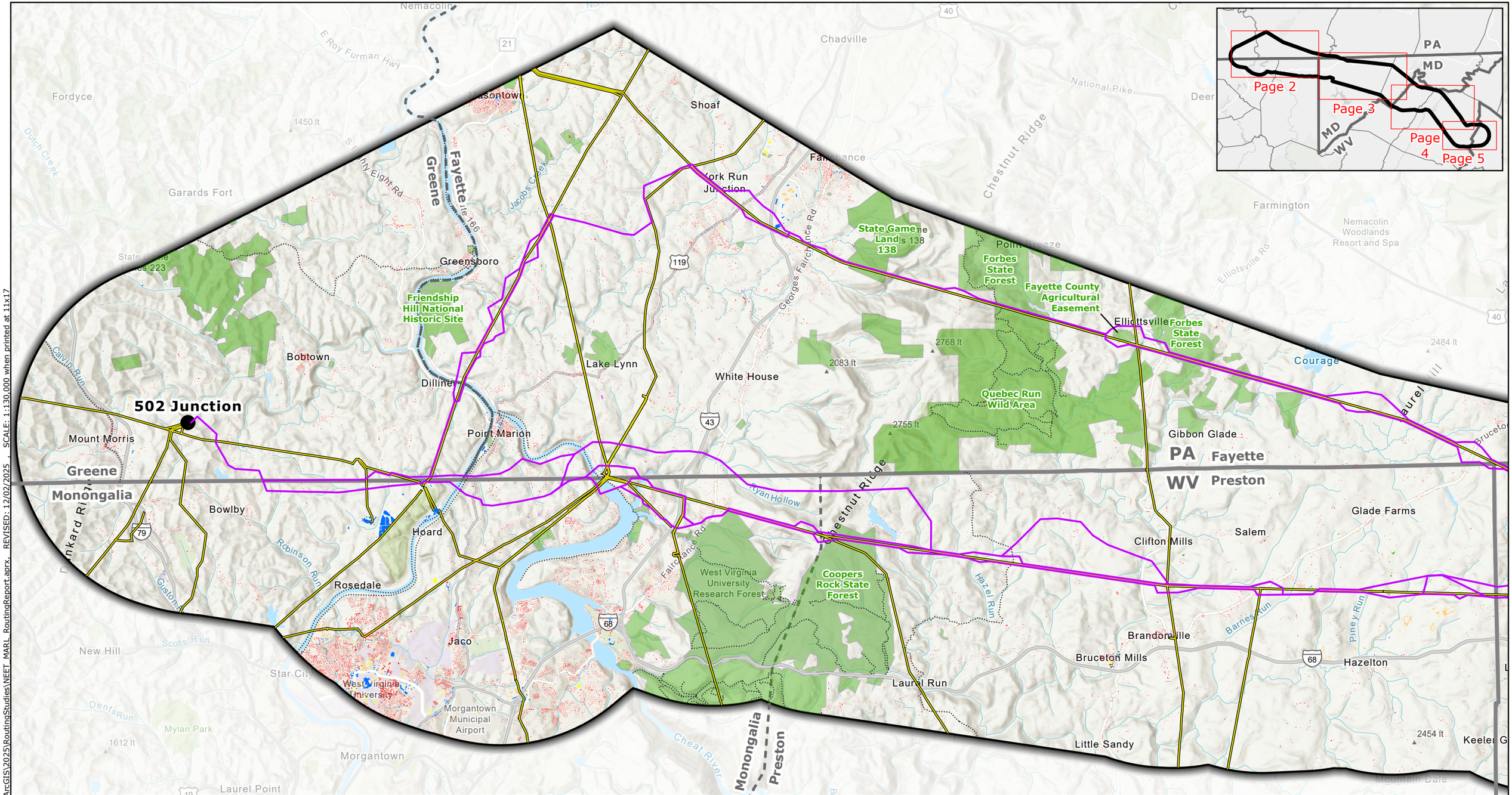

Legend

- Project Endpoints
- Black Oak Substation
- Preliminary Draft Route Options Presented at Open Houses
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border
- Hiking/Walking Trails
- Potomac Heritage Trail
- Protected Areas*
- Maryland Wildlands

Buildings Footprints

- Residential (House)
- Residential Outbuilding (Shed,Garage,Other)
- Agricultural Building
- Assembly
- Education
- Commercial/Industrial
- Other

NOTES

*1. *Protected Areas includes local, county, state and federal parks, conservation easements, agricultural easements, state forests, and wildlife management areas.*

N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-3
Preliminary Draft Route Options
Page 2 of 5
MidAtlantic Resiliency Link

ERM

Source: NAD 1983 UTM Zone 17N

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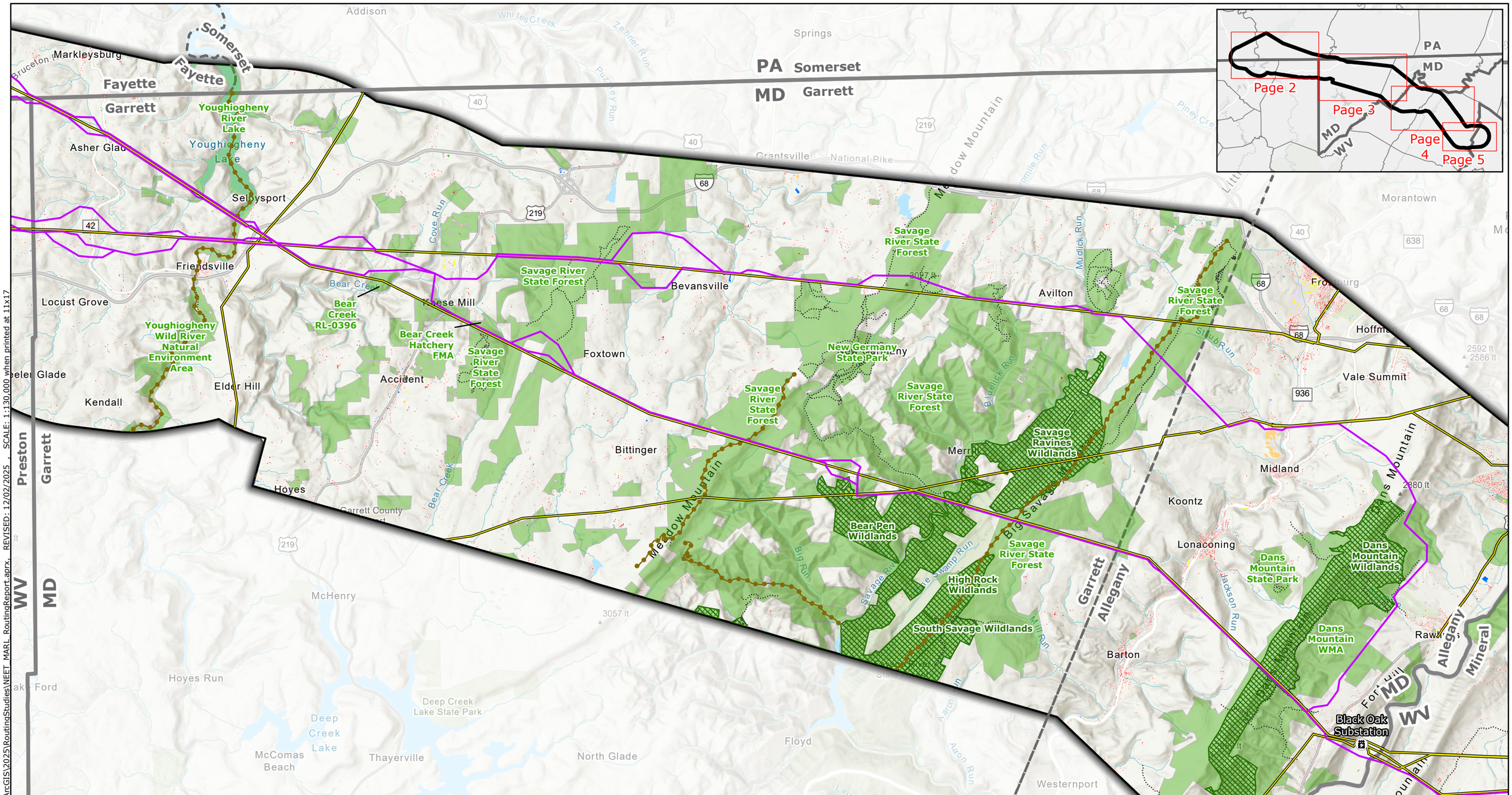

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N

0 1 2 3 4

Miles

Scale: 1:130,000

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Appendix E-3
Preliminary Draft Route Options
Page 3 of 5
MidAtlantic Resiliency Link

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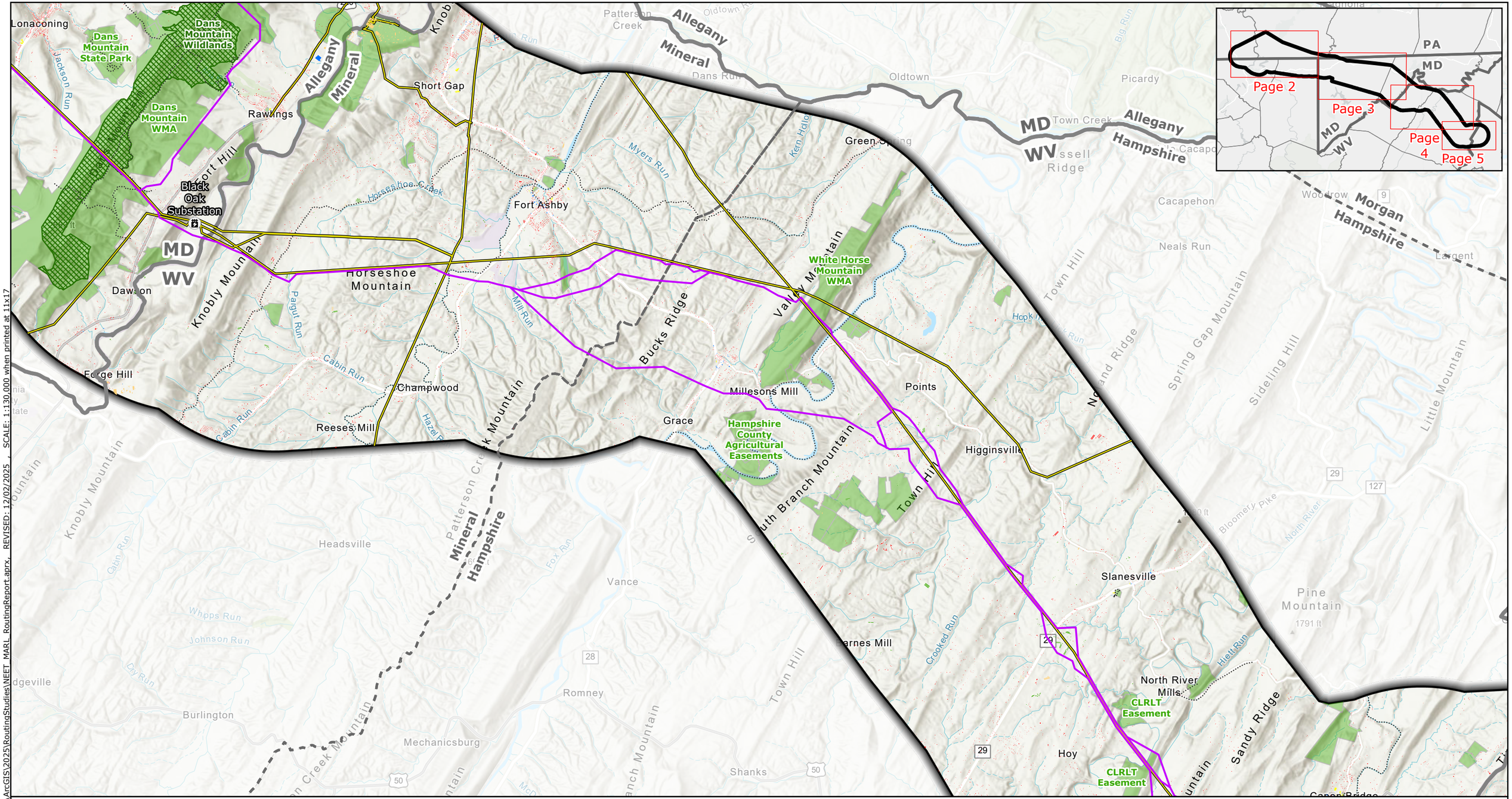

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Miles

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Appendix E-3
Preliminary Draft Route Options
Page 4 of 5
MidAtlantic Resiliency Link

ERM

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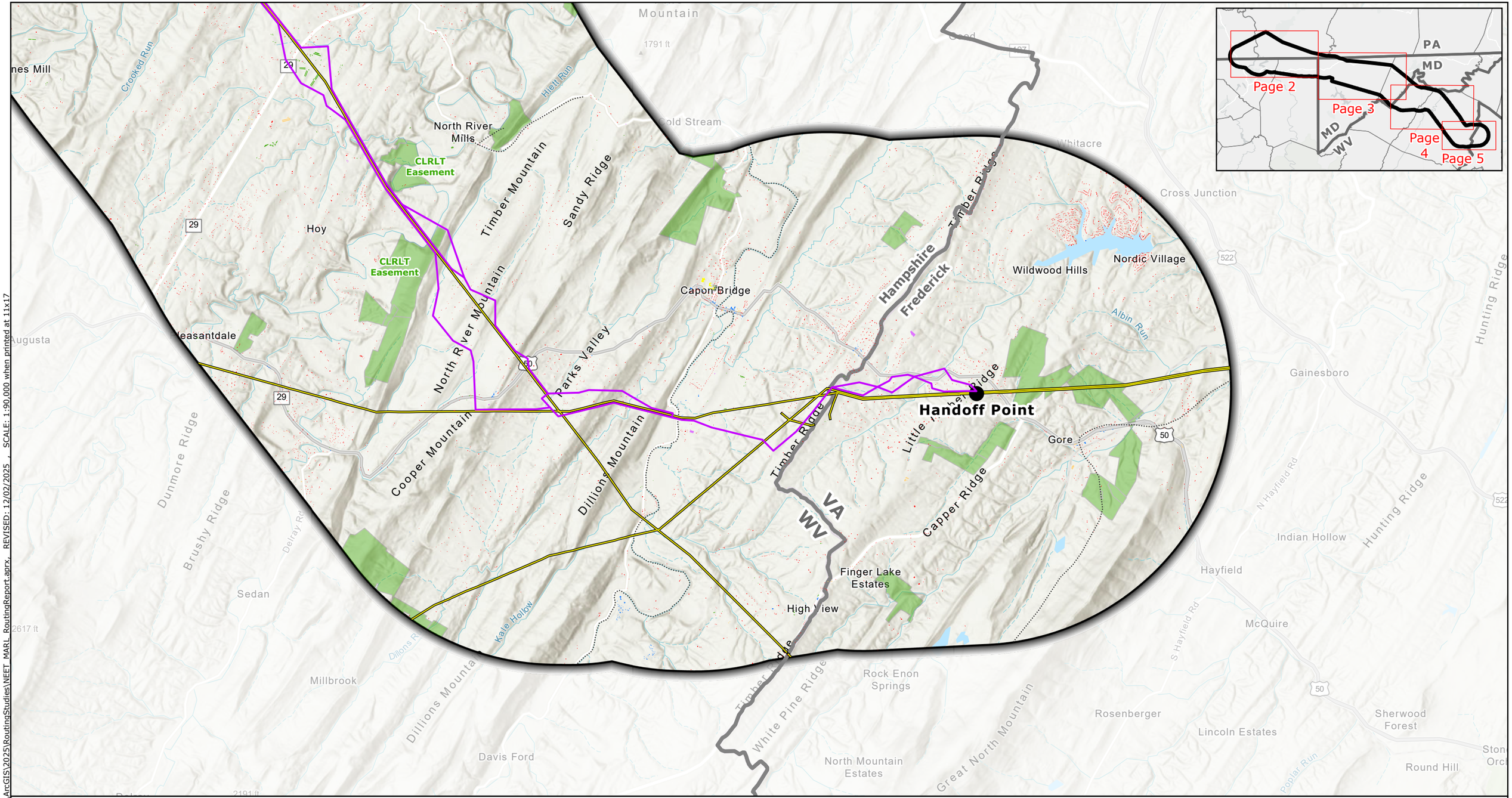

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N

0 0.8 1.6 2.4 3.2

Miles

Scale: 1:90,000

1 inch equals 7,500ft (when printed at 11x17)

Appendix E-3
Preliminary Draft Route Options
Page 5 of 5
MidAtlantic Resiliency Link

ERM

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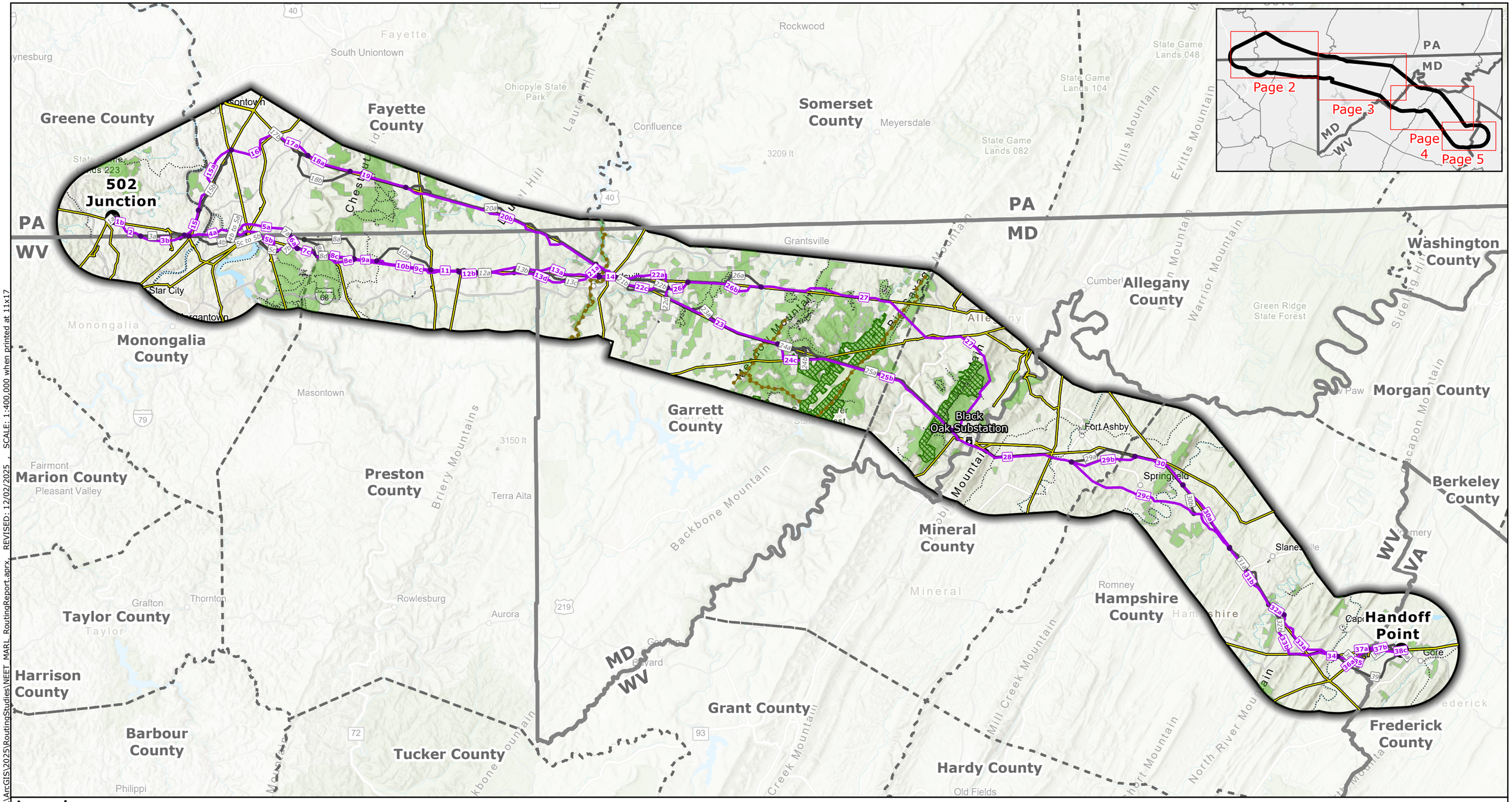
Source: NAD 1983 UTM Zone 17N

APPENDIX E-4 ROUTE SEGMENTS MAPBOOK



Legend

- Project Endpoints
- Black Oak Substation
- Final Route Segment
- Route Segment Considered but Dismissed
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NOTES
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N

0 3.5 7 10.5 14

Miles

Scale: 1:400,000
1 inch equals 33,333ft (when printed at 11x17)

Appendix E-4
Route Segments
Page 1 of 5
MidAtlantic Resiliency Link

ERM

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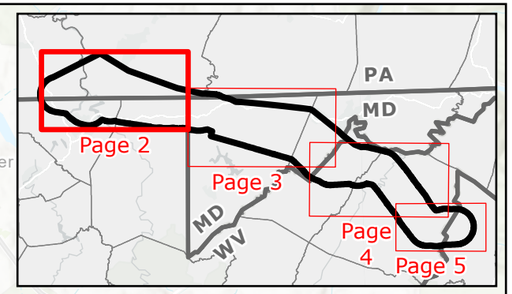

Legend

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- Other

NOTES

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N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-4
Route Segments
Page 2 of 5
MidAtlantic Resiliency Link

ERM

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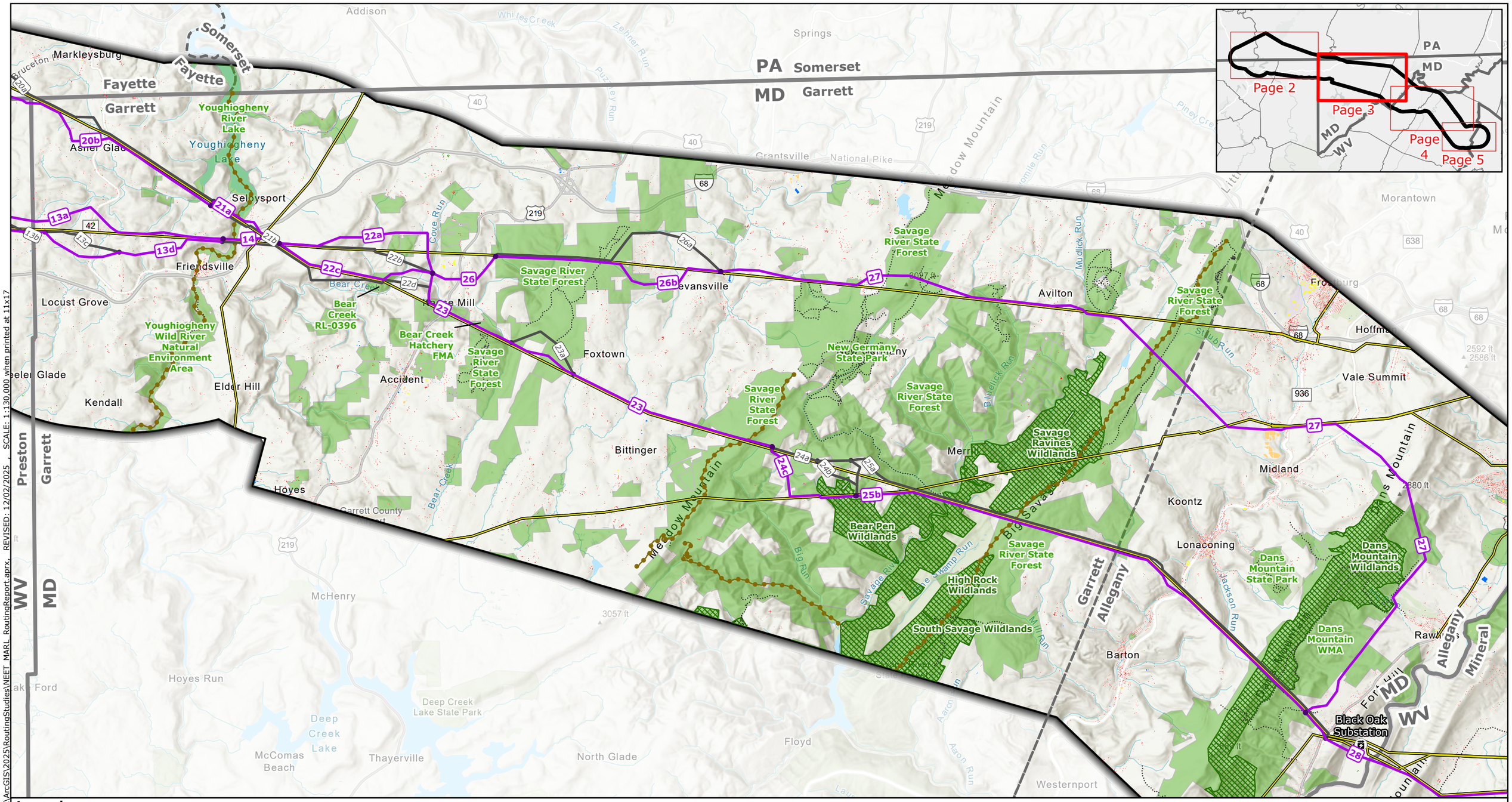

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N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-4
Route Segments
Page 3 of 5
MidAtlantic Resiliency Link

ERM

Coordinate system: NAD 1983 UTM Zone 17N

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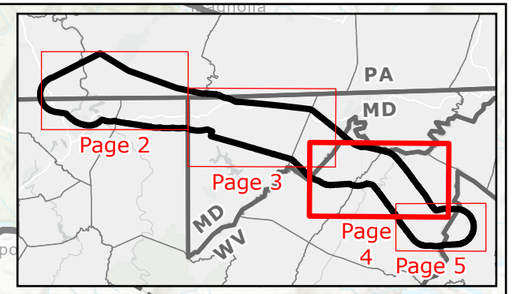

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0 1 2 3 4

Miles

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1 inch equals 10,833ft (when printed at 11x17)

Appendix E-4
Route Segments
Page 4 of 5
MidAtlantic Resiliency Link

ERM

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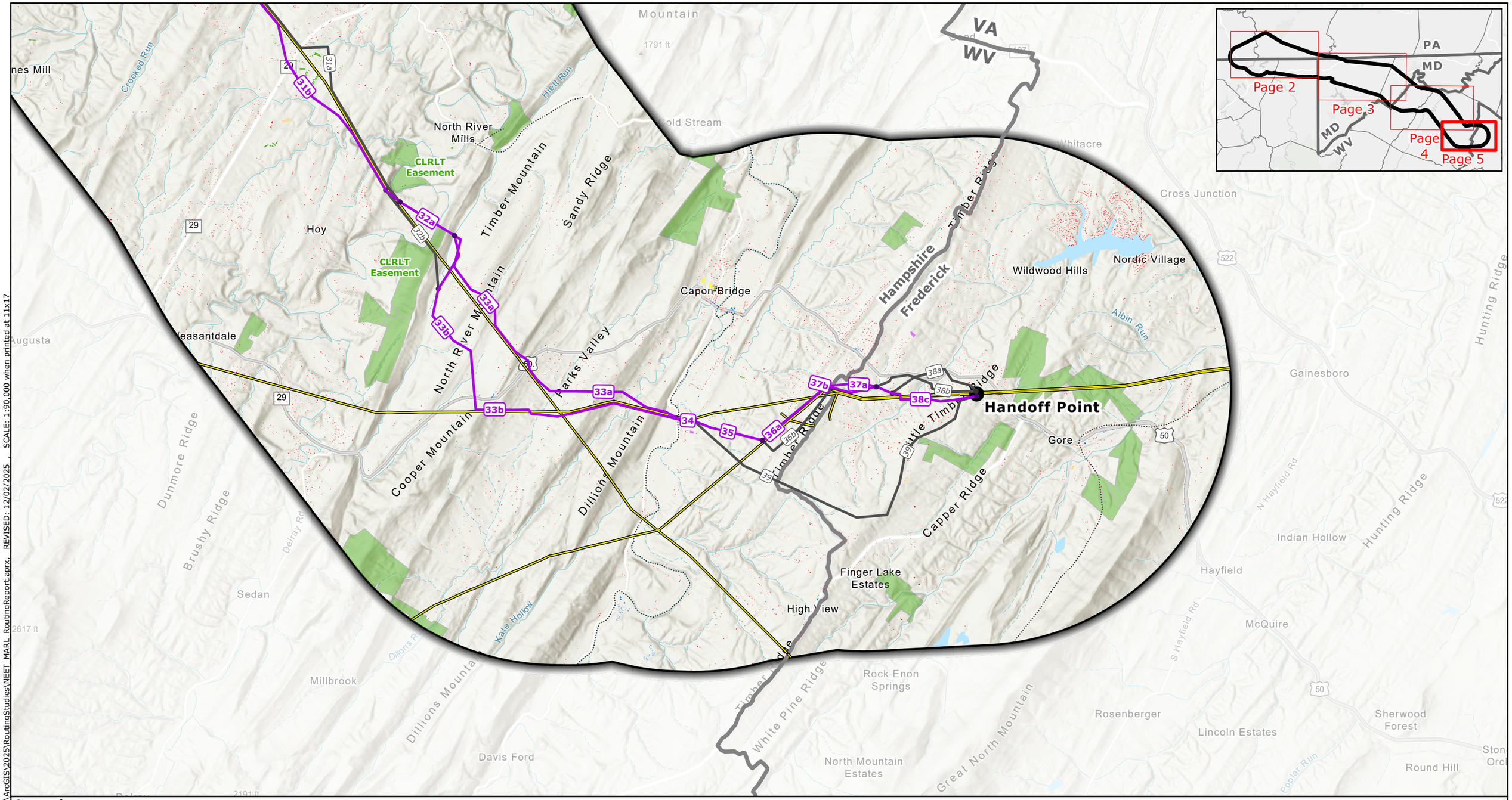

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N

0 0.8 1.6 2.4 3.2

Miles

Scale: 1:90,000

1 inch equals 7,500ft (when printed at 11x17)

Appendix E-4
Route Segments
Page 5 of 5
MidAtlantic Resiliency Link

ERM

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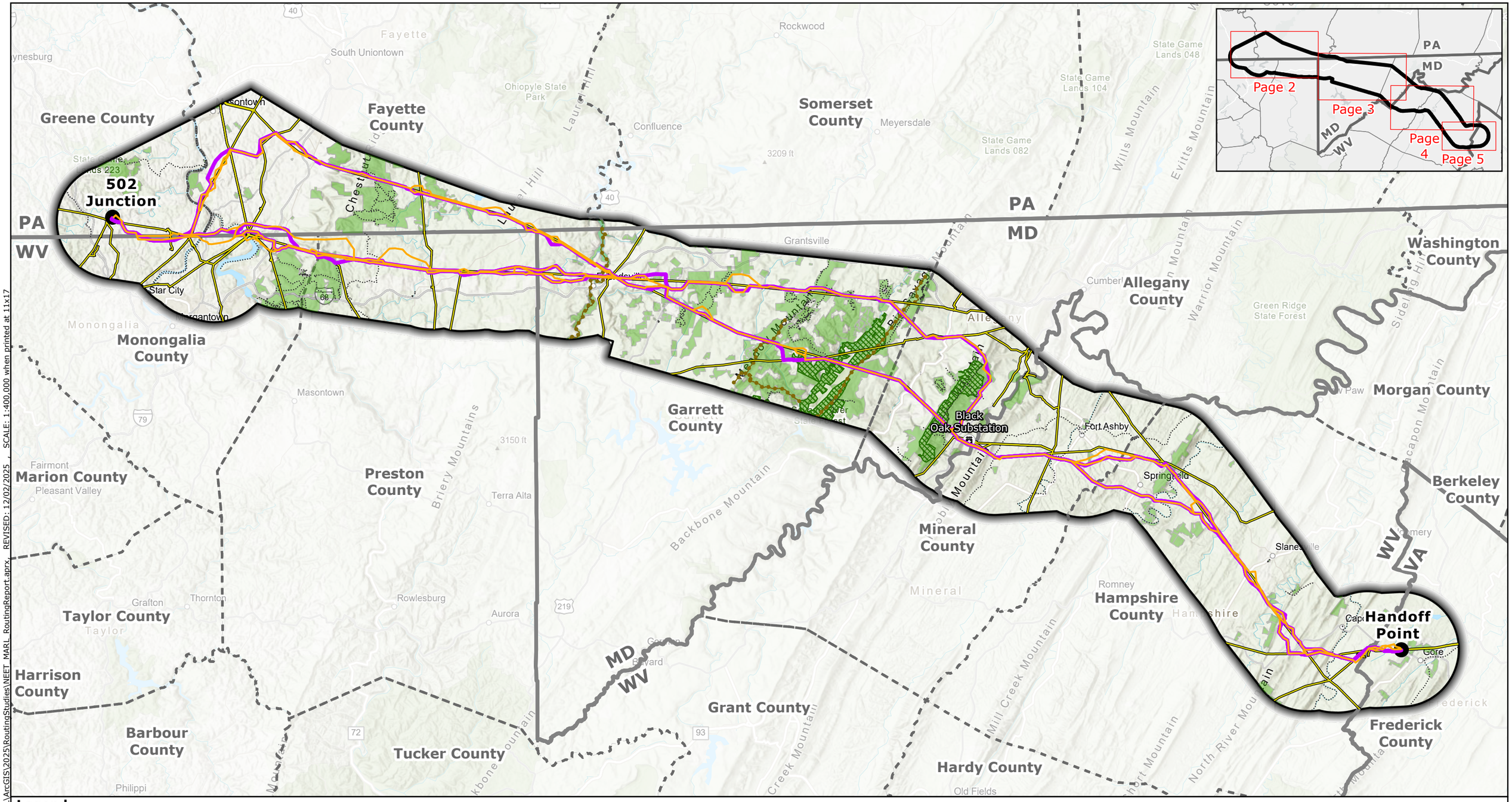
Coordinate system: NAD 1983 UTM Zone 17N

APPENDIX E-5 PRELIMINARY DRAFT ROUTE OPTIONS AND FINAL ROUTE ALTERNATIVES MAPBOOK



Legend

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N

0 3.5 7 10.5 14

Miles

Scale: 1:400,000

1 inch equals 33,333ft (when printed at 11x17)

Appendix E-5
Preliminary Draft Route Options and Final Route Alternatives

Page 1 of 5

MidAtlantic Resiliency Link

ERM

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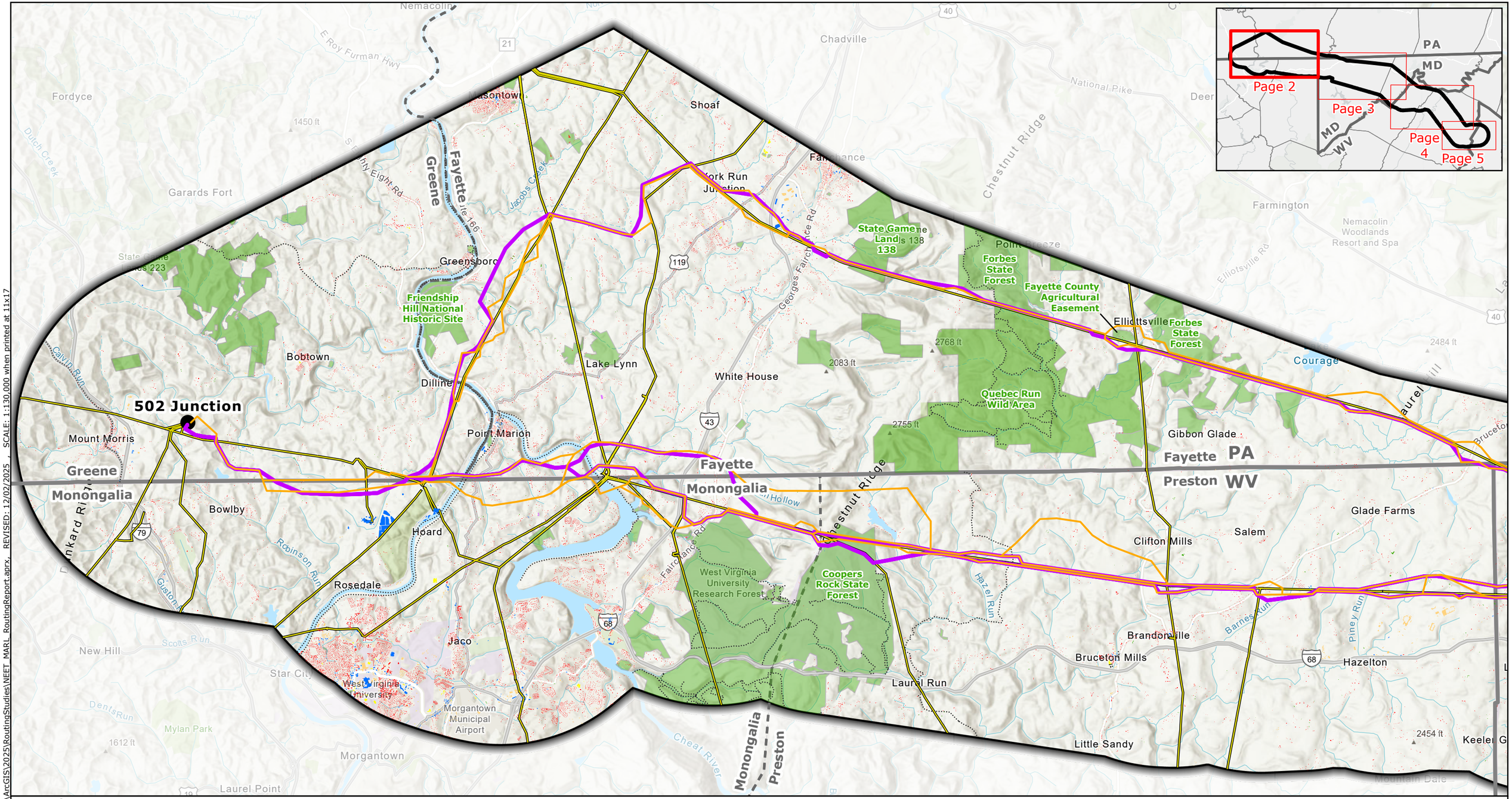

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N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-5
Preliminary Draft Route Options and Final Route Alternatives
Page 2 of 5
MidAtlantic Resiliency Link

ERM

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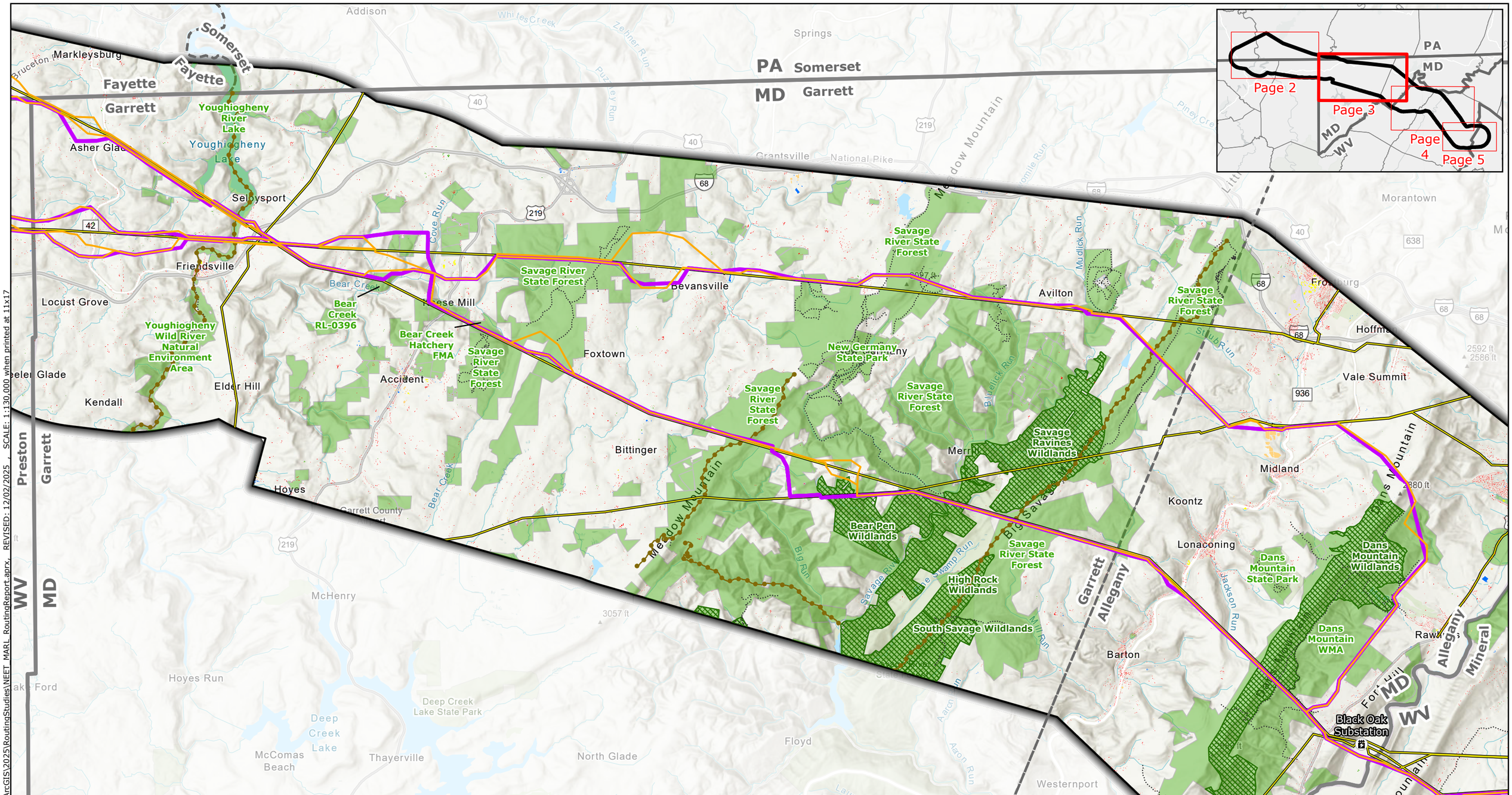

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Page 3 of 5
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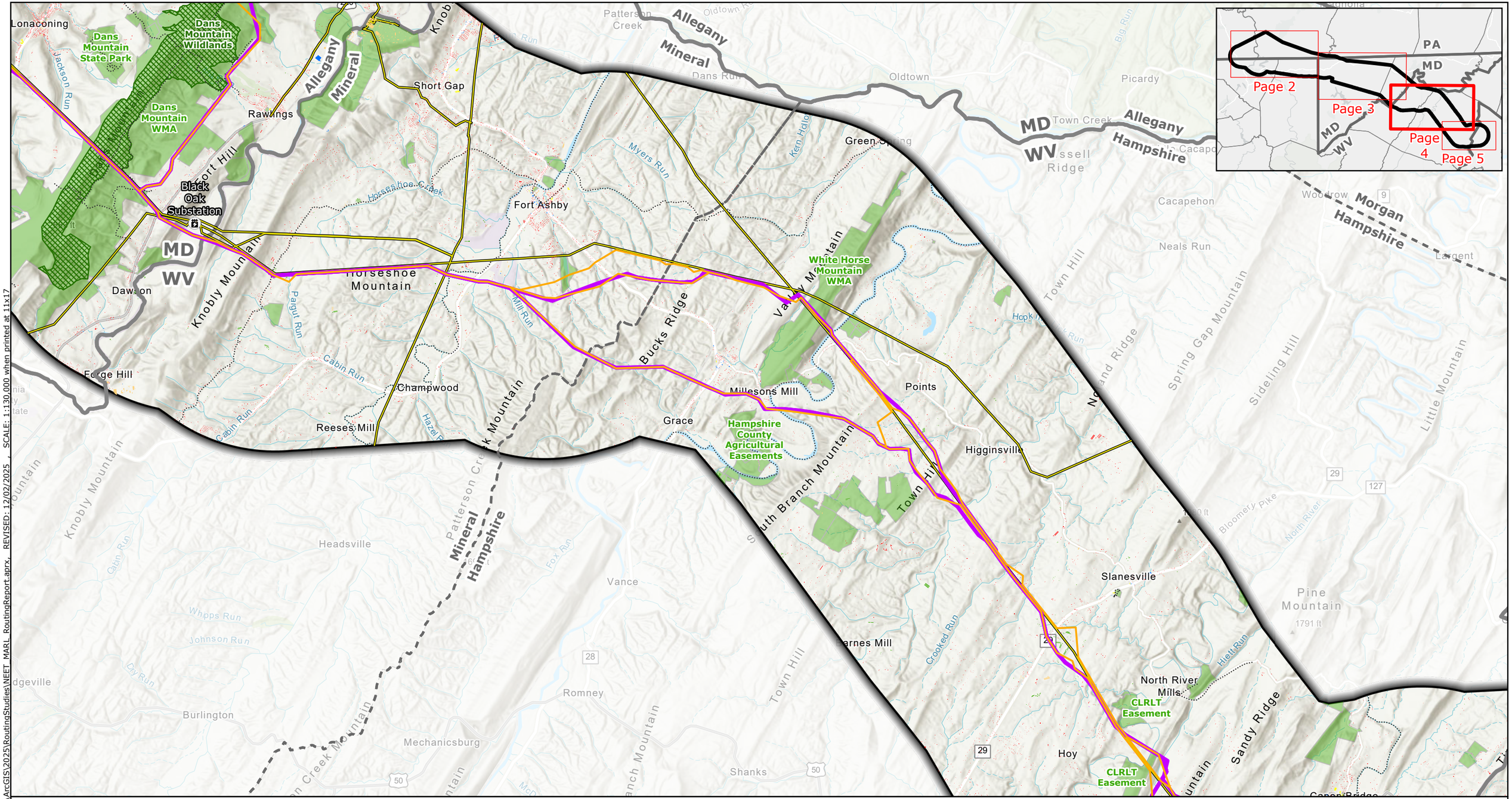

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Miles

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Appendix E-5
Preliminary Draft Route Options and Final Route Alternatives
Page 4 of 5
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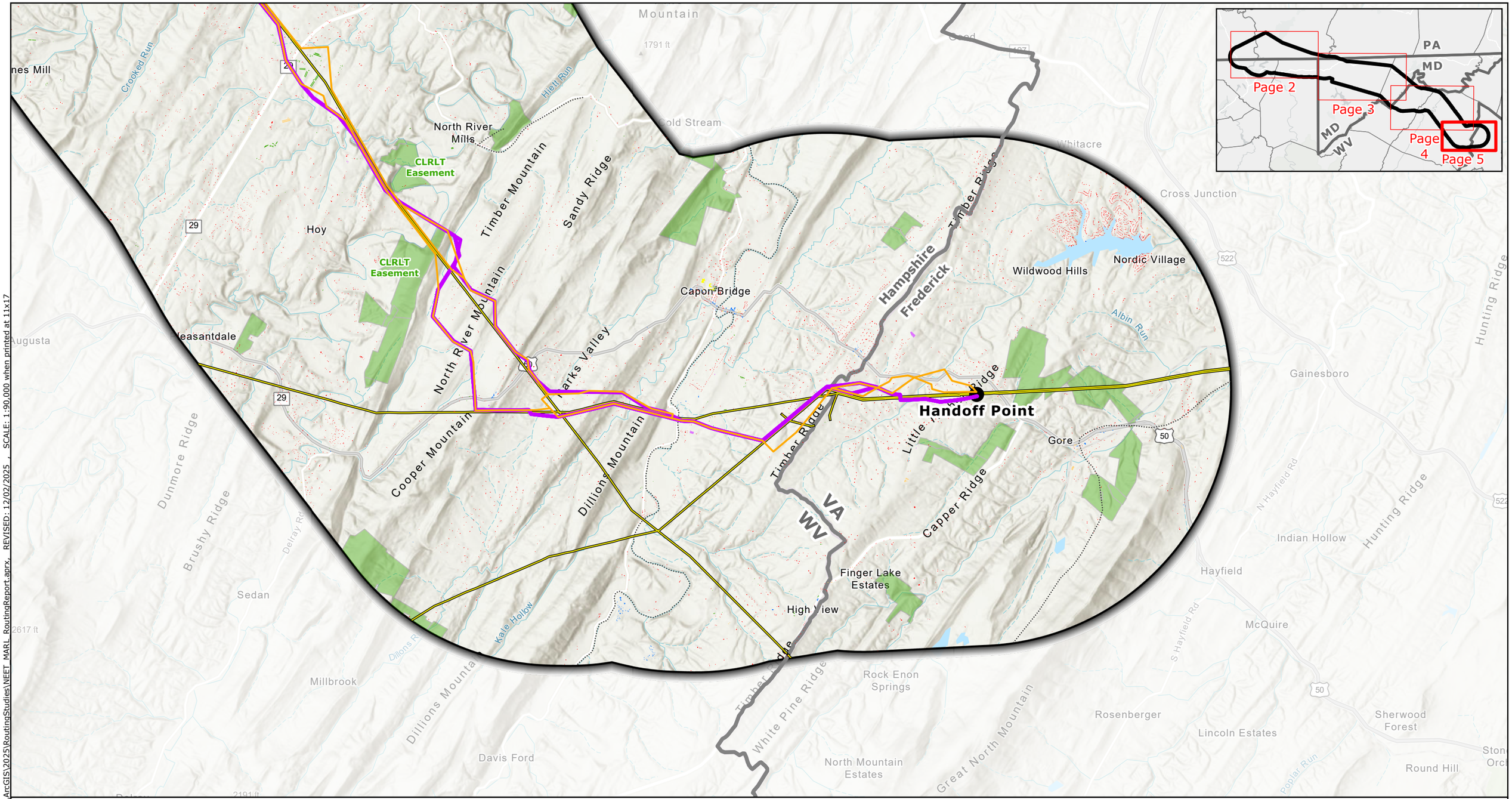

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N

0 0.8 1.6 2.4 3.2

Miles

Scale: 1:90,000

1 inch equals 7,500ft (when printed at 11x17)

Appendix E-5
Preliminary Draft Route Options and Final Route Alternatives

Page 5 of 5

MidAtlantic Resiliency Link

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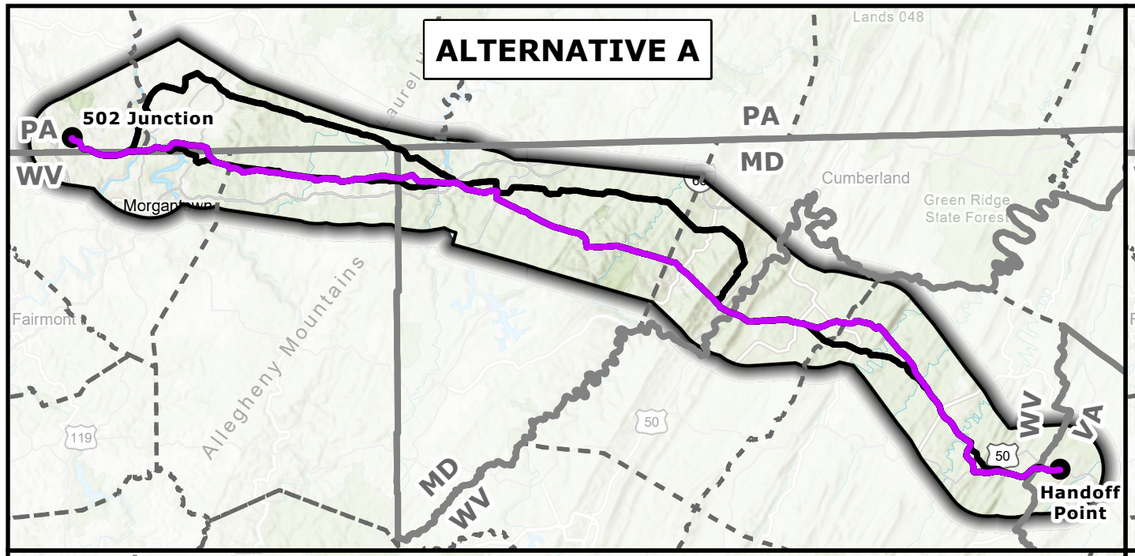
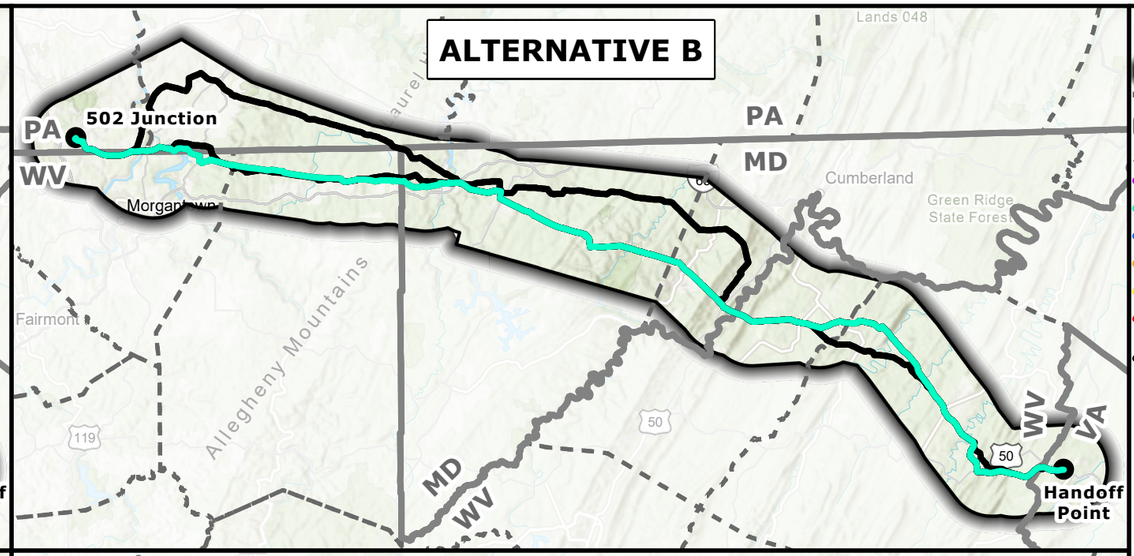
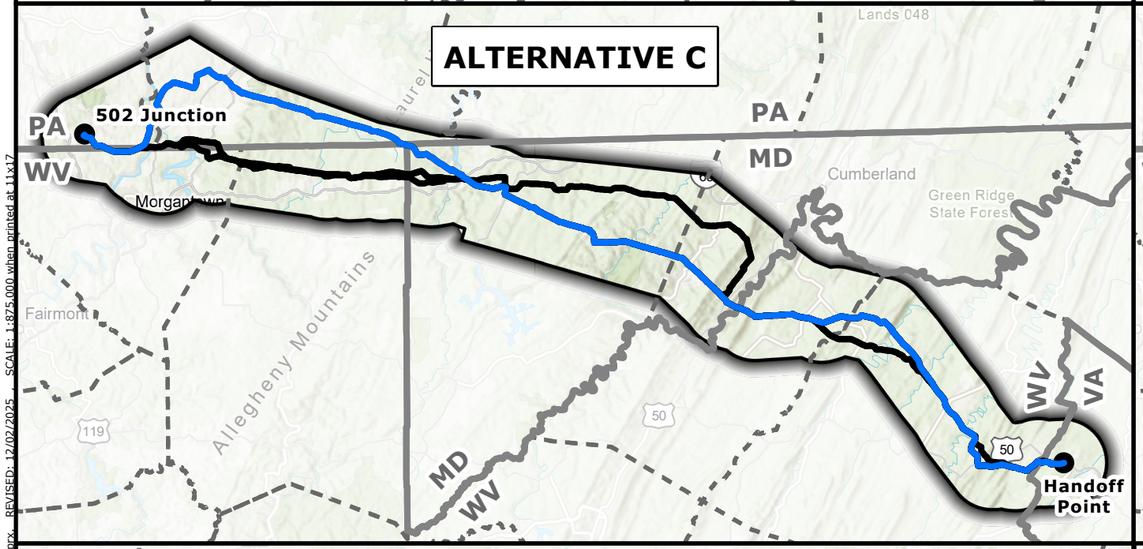
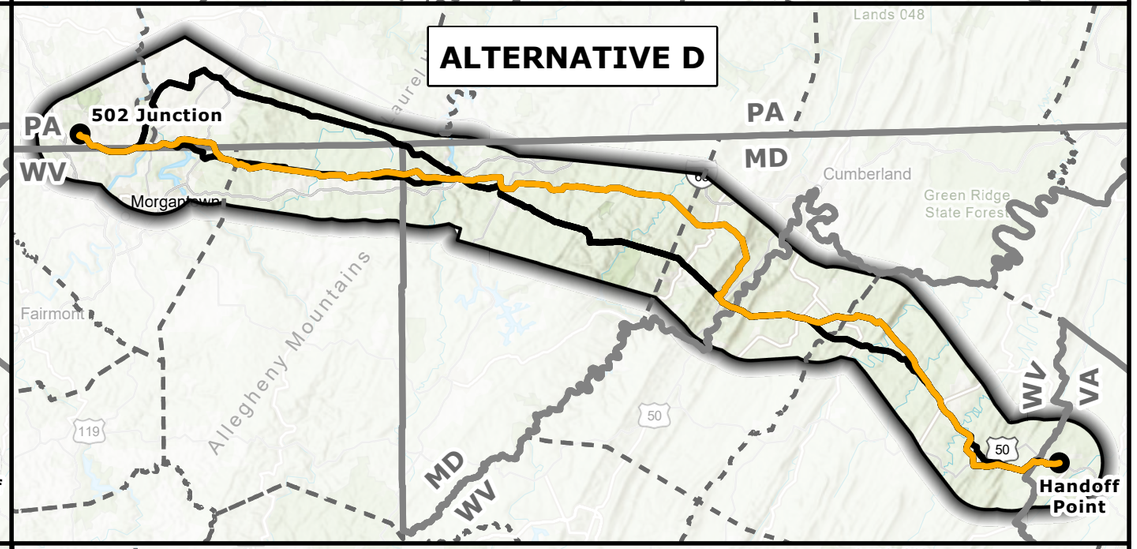
Source: NAD 1983 UTM Zone 17N

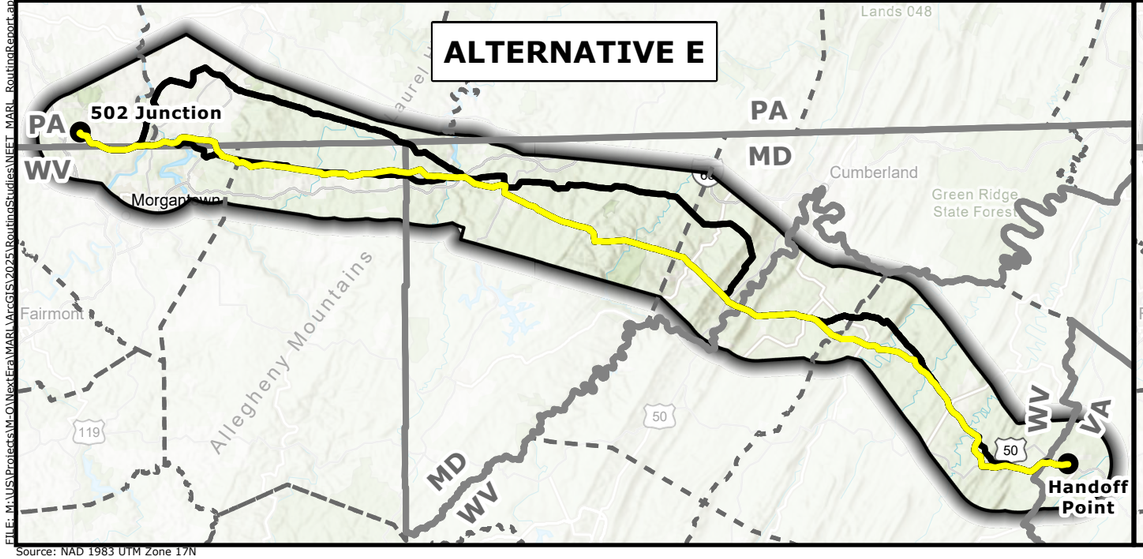
APPENDIX E-6 ALTERNATIVE ROUTES MAPBOOK

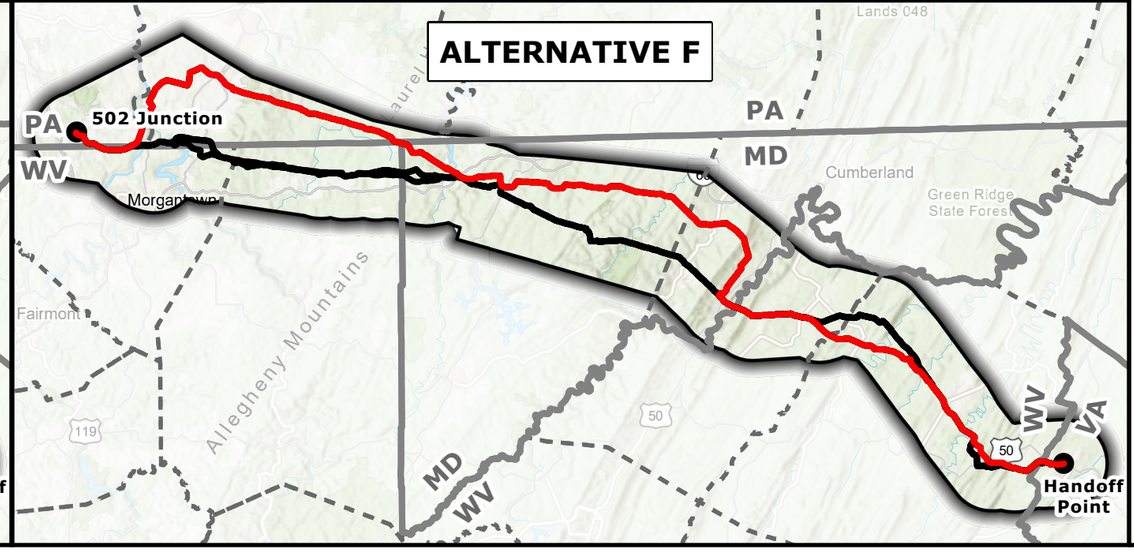












Legend

- Project Endpoints
- Project Study Area
- County Boundary
- State Border

Alternative Routes

- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Alternative E
- Alternative F
- Other alternatives not shown on each map

N

0 5 10 15 20 25

Miles

Scale: 1:875,000
1 inch equals 72,917ft (when printed at 11x17)

Appendix E-6
Alternative Routes
MidAtlantic
Resiliency Link

ERM

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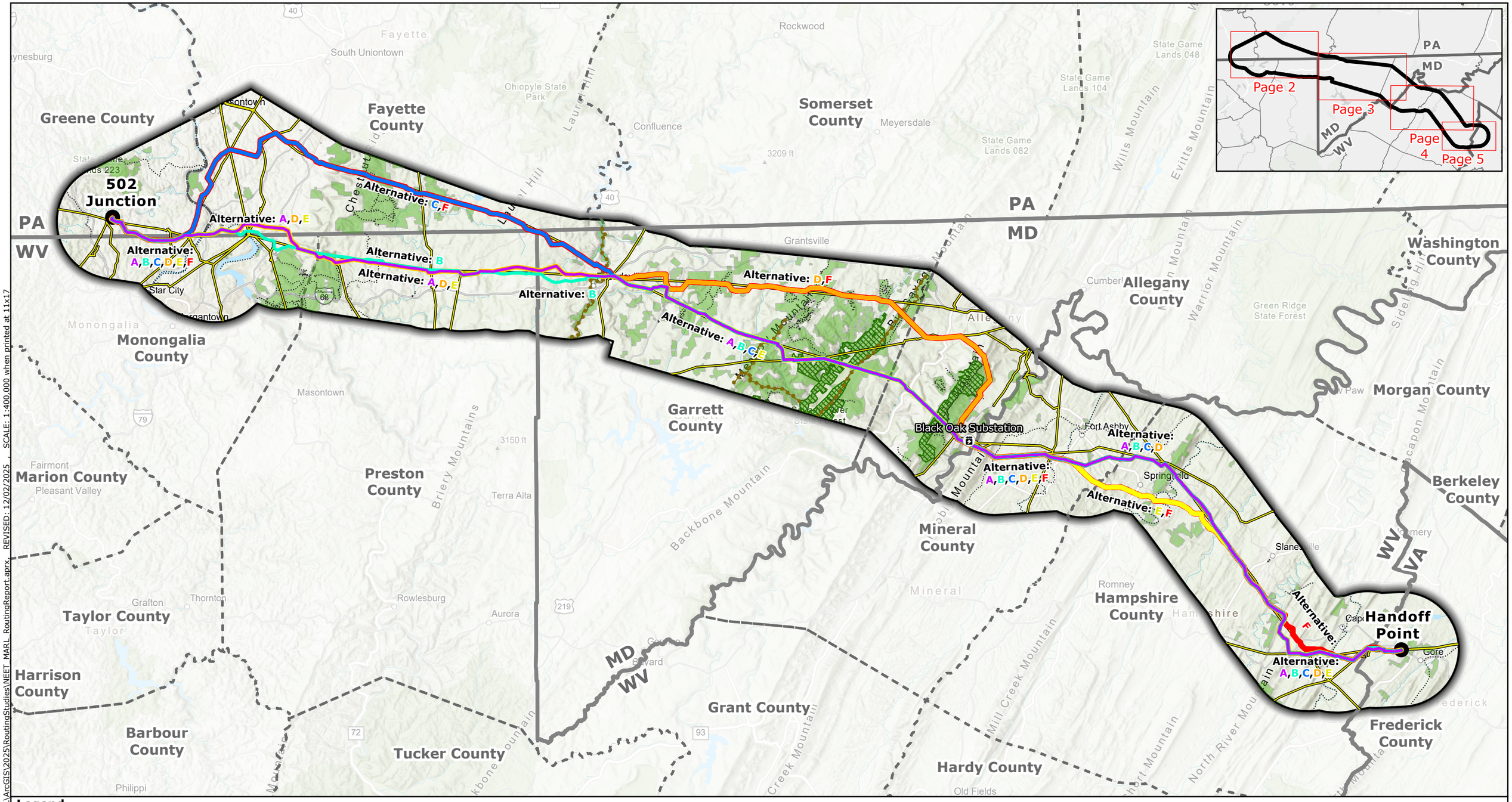
Source: NAD 1983 UTM Zone 17N

APPENDIX E-7 ALTERNATIVE ROUTES



Legend

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- Black Oak Substation
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- Project Study Area
- County Boundary
- State Border

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- Alternative B
- Alternative C
- Alternative D
- Alternative E
- Alternative F

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- Maryland Wildlands

NOTES

1. *Protected Areas includes local, county, state and federal parks, conservation easements, agricultural easements, state forests, and wildlife management areas.

N

0 3.5 7 10.5 14

Miles

Scale: 1:400,000
1 inch equals 33,333ft (when printed at 11x17)

Appendix E-7
Alternative Routes
Page 1 of 5
MidAtlantic Resiliency Link

ERM

FILE: M:\US\Projects\M-O\NextEra\MARL\ArcGIS\2025\RoutingStudies\NEET_MARL_RoutingReport.aprx, REVISED: 12/02/2025 , SCALE: 1:400,000 when printed at 11x17

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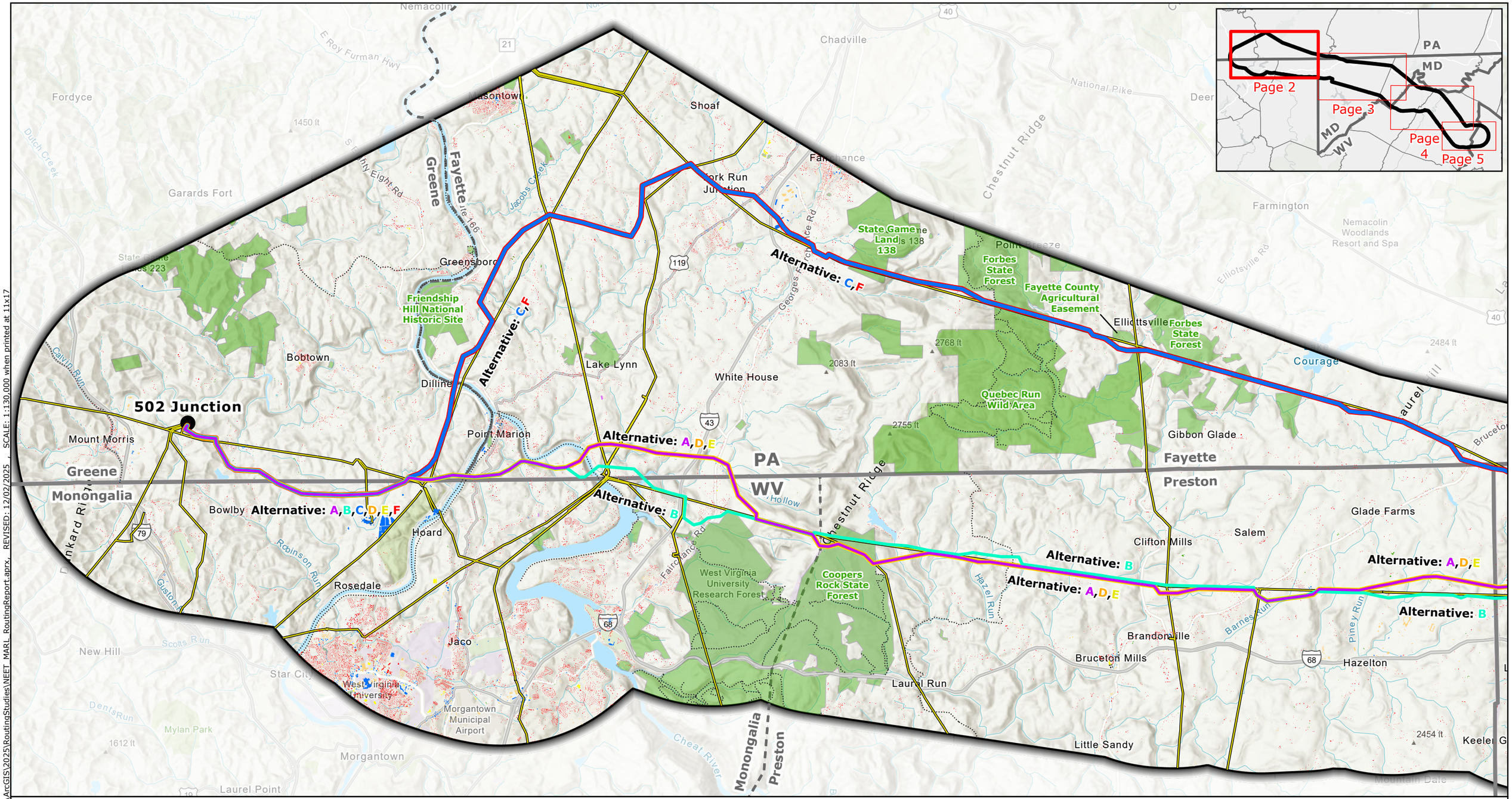

Legend

- Project Endpoints
- Black Oak Substation
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border

Alternative Routes:

- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Alternative E
- Alternative F

- Hiking/Walking Trails
- Potomac Heritage Trail
- Protected Areas*
- Maryland Wildlands

Buildings Footprints

- Residential (House)
- Residential Outbuilding (Shed,Garage,Other)
- Agricultural Building
- Assembly
- Education
- Commercial/Industrial
- Other

NOTES

1. *Protected Areas includes local, county, state and federal parks, conservation easements, agricultural easements, state forests, and wildlife management areas.

N

0 1 2 3 4

Miles

Scale: 1:130,000

1 inch equals 10,833ft (when printed at 11x17)

Appendix E-7
Alternative Routes
Page 2 of 5
MidAtlantic Resiliency Link

ERM

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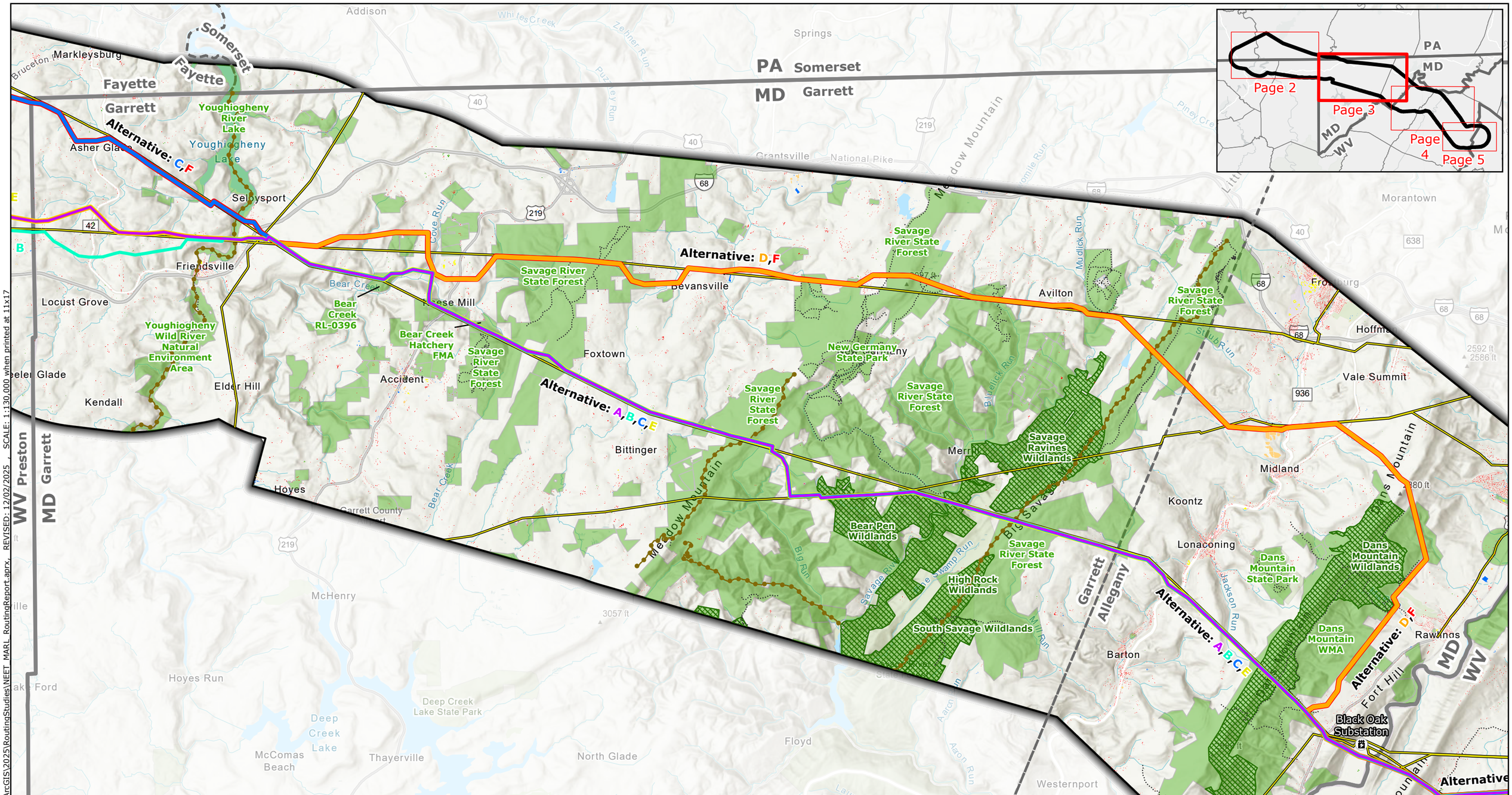

Legend

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N

0 1 2 3 4

Miles

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Appendix E-7
Alternative Routes
Page 3 of 5
MidAtlantic Resiliency Link

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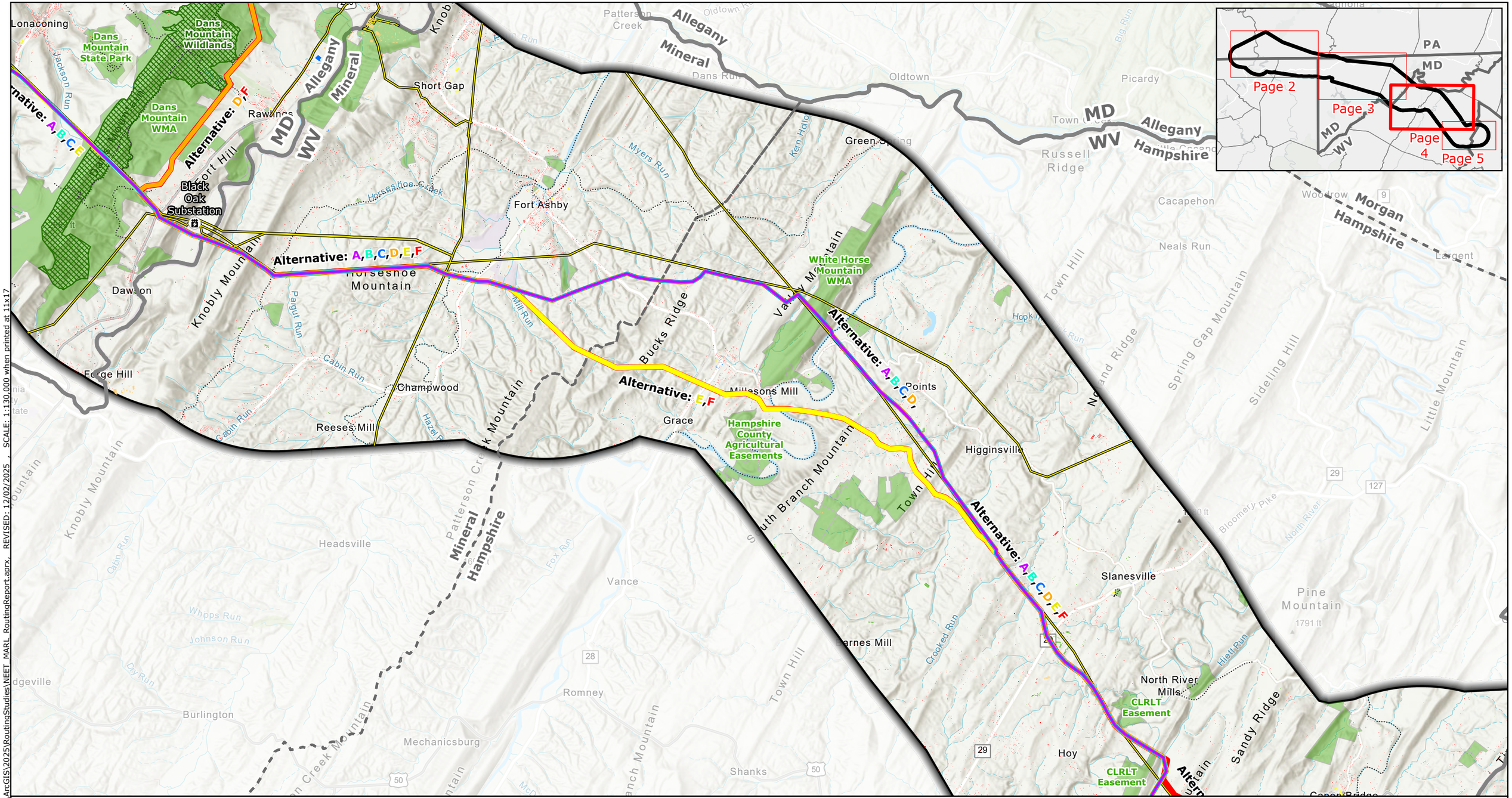

Legend

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0 1 2 3 4

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Appendix E-7
Alternative Routes
Page 4 of 5
MidAtlantic Resiliency Link

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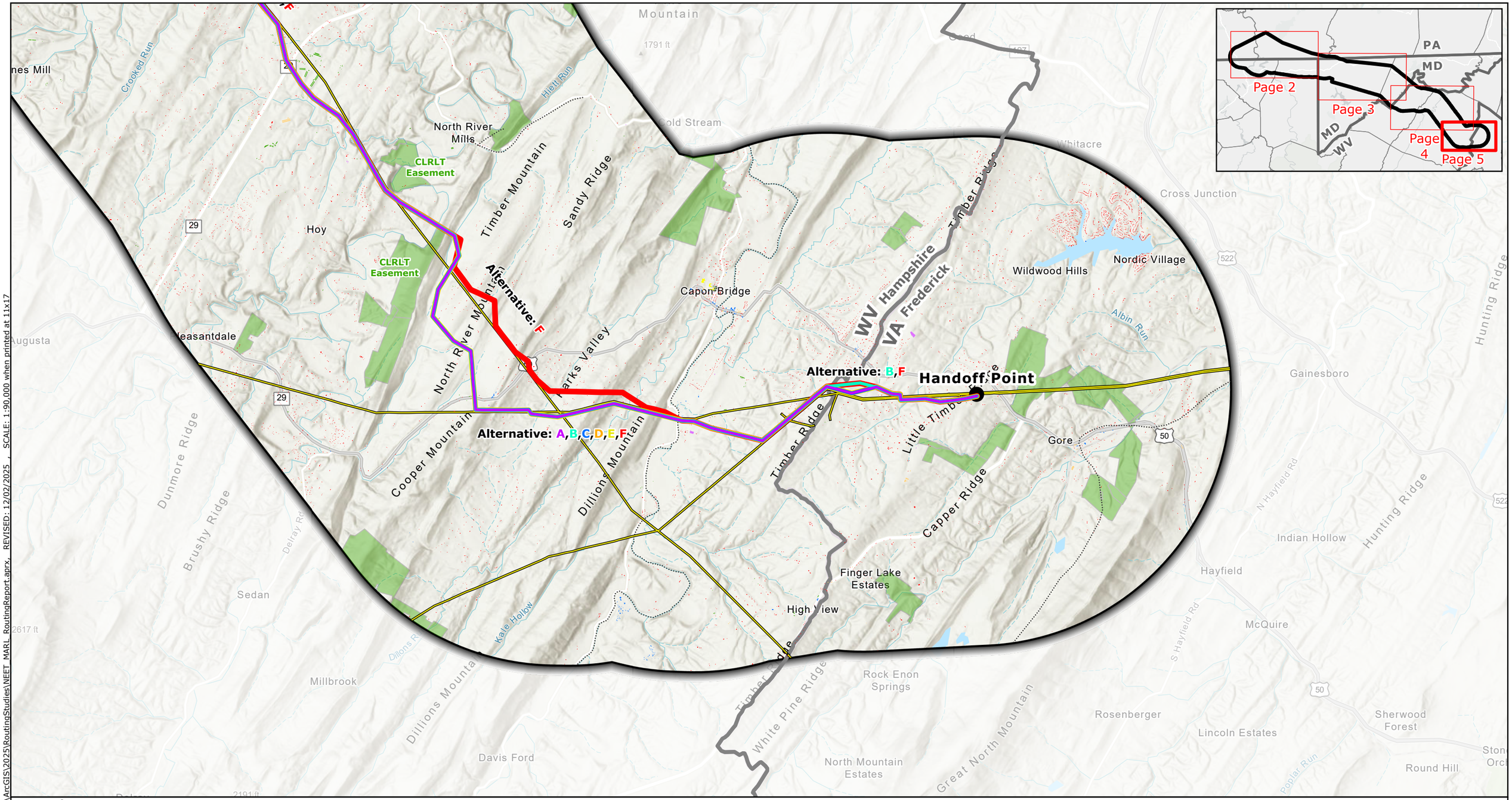

Legend

- Project Endpoints
- Black Oak Substation
- Existing High-Voltage Transmission Lines (>69kV)
- Project Study Area
- County Boundary
- State Border

Alternative Routes:

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- Commercial/Industrial
- Other

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N

0 0.8 1.6 2.4 3.2

Miles

Scale: 1:90,000
1 inch equals 7,500ft (when printed at 11x17)

Appendix E-7
Alternative Routes
Page 5 of 5
MidAtlantic Resiliency Link

ERM

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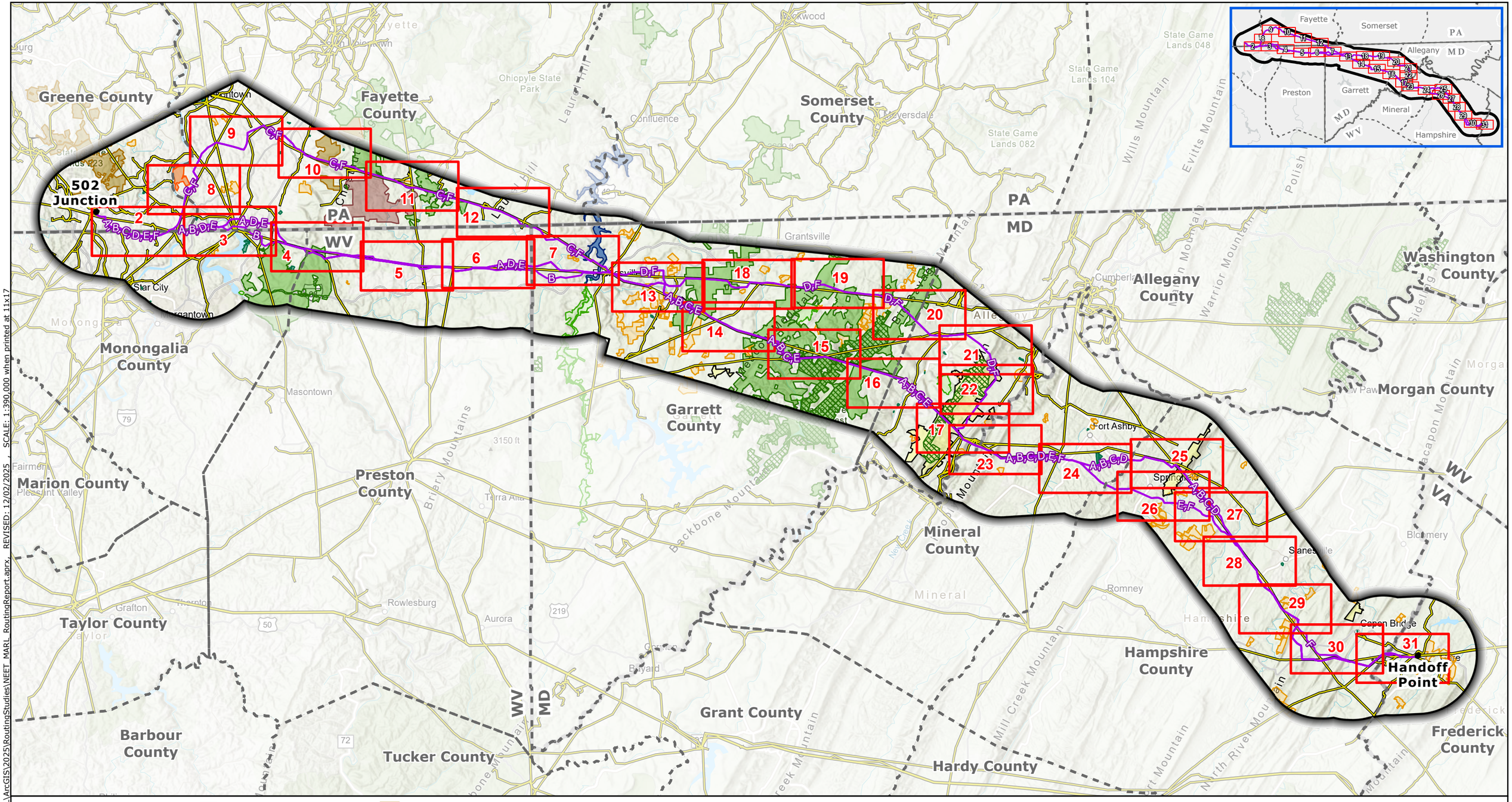
Source: NAD 1983 UTM Zone 17N

APPENDIX E-8 ALTERNATIVE ROUTES—LAND USE AND SOCIAL RESOURCES, PARALLELING, COMMUNITY AND RECREATION AND PROTECTED AREAS MAPBOOK



Proposed Project Components
- Project Endpoints
- Alternative Routes
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- Map Index Page
- State Border

Protected Areas
- State Forests
- State Parks*
- Fisheries / Wildlife Management Area
- Pennsylvania State Wilderness Area
- Pennsylvania State Game Lands
- Maryland Wildlands
- National Historic Site
- USACE Recreation Area
- Conservation Easements**
- Local Park

NOTES
1. Proposed tower locations are preliminary and subject to change
2. Data source: NEET, ERM, HIFLD, USGS, PAD-US, REXTAG, PAD-US, NCED, MDNR, MDiMAP, PASDA, WVDEP, VADCR
**Includes Youghiogheny River Natural Environment Area (NEA) managed by the Maryland Park Service*
***Includes privately owned conservation easements and fee-owned conservation lands held by nonprofit organizations*

N

0 4 8 12 16
Miles

Scale: 1:390,000
1 inch equals 32,500 ft (when printed at 11x17)

Appendix E-8
Alternative Routes
Land Use and Social Resources Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM

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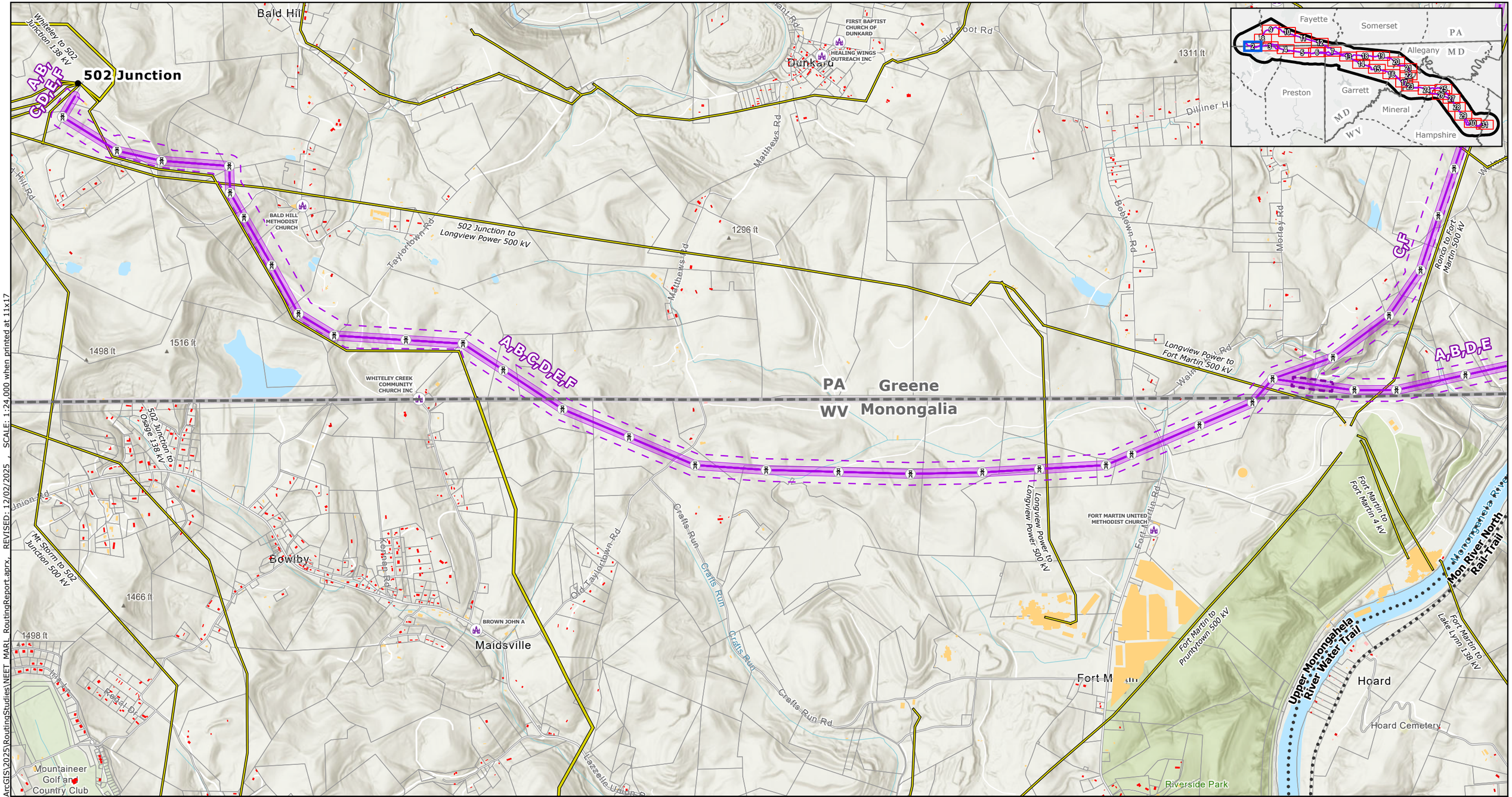

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Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Protected Areas
- State Forests
- State Parks*
- Fisheries / Wildlife Management Area
- Pennsylvania State Wilderness Area
- Pennsylvania State Game Lands
- Maryland Wildlands
- National Historic Site
- USACE Recreation Area
- Conservation Easements**
- Local Park

Community and Recreational Resources
- Place of Worship
- Childcare Center
- School
- Potomac Heritage Trail
- Hiking/Walking Trails
- Scenic Byways

Buildings Footprints
- Parcels
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
- Non-residential buildings

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N

0 0.25 0.5 0.75 1
Miles

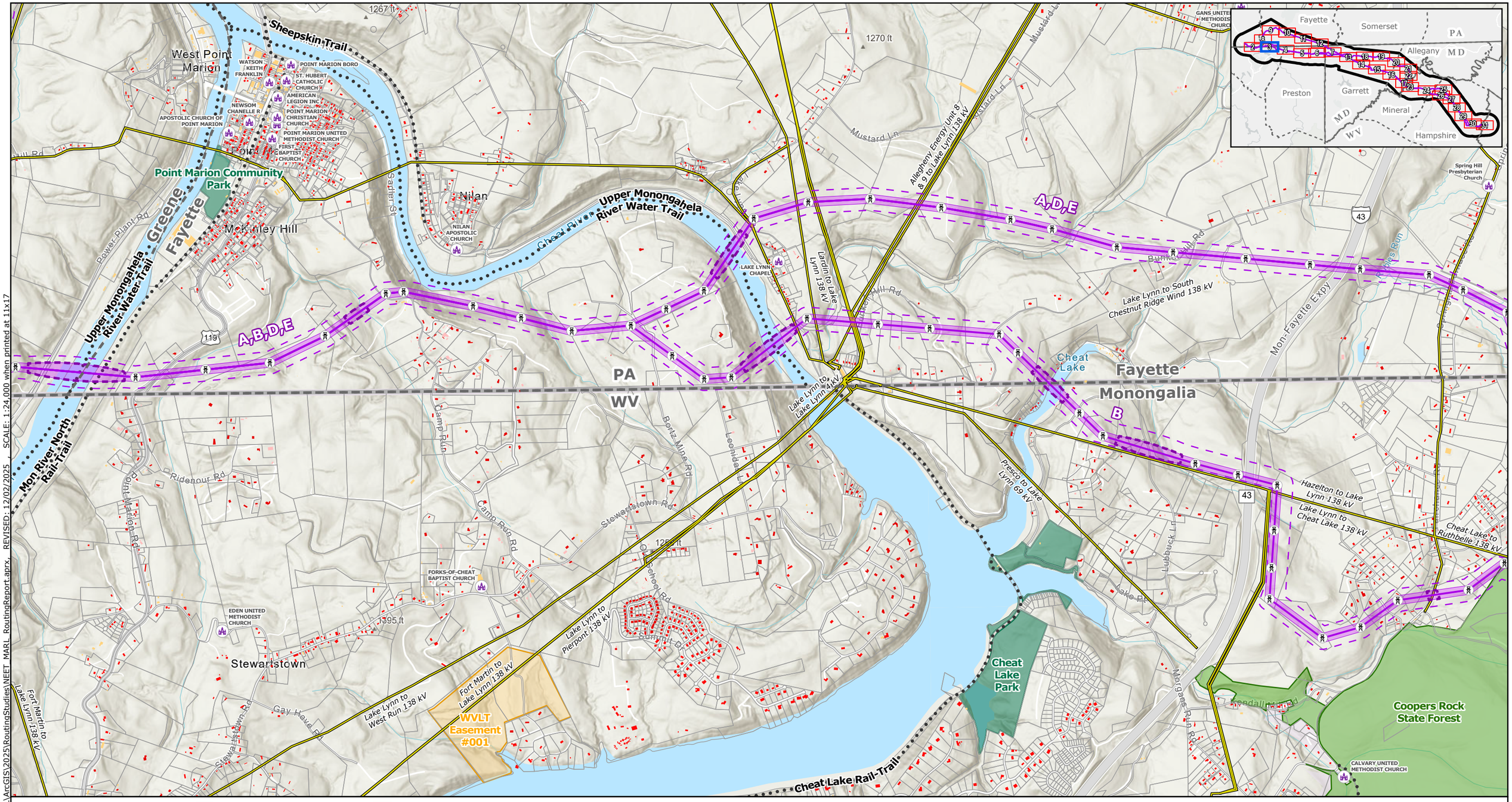
Scale: 1:24,000
1 inch equals 2,000 ft (when printed at 11x17)

Coordinate System: NAD 1983 UTM Zone 17N

Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM



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- Aerial Easement Blowout Areas
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N

0 0.25 0.5 0.75 1
Miles

Scale: 1:24,000
1 inch equals 2,000 ft (when printed at 11x17)

Appendix E-8
Alternative Routes
Land Use and Social Resources Paralleling, Community and Recreation, and Protected Areas
Page 3 of 31
MidAtlantic Resiliency Link

ERM

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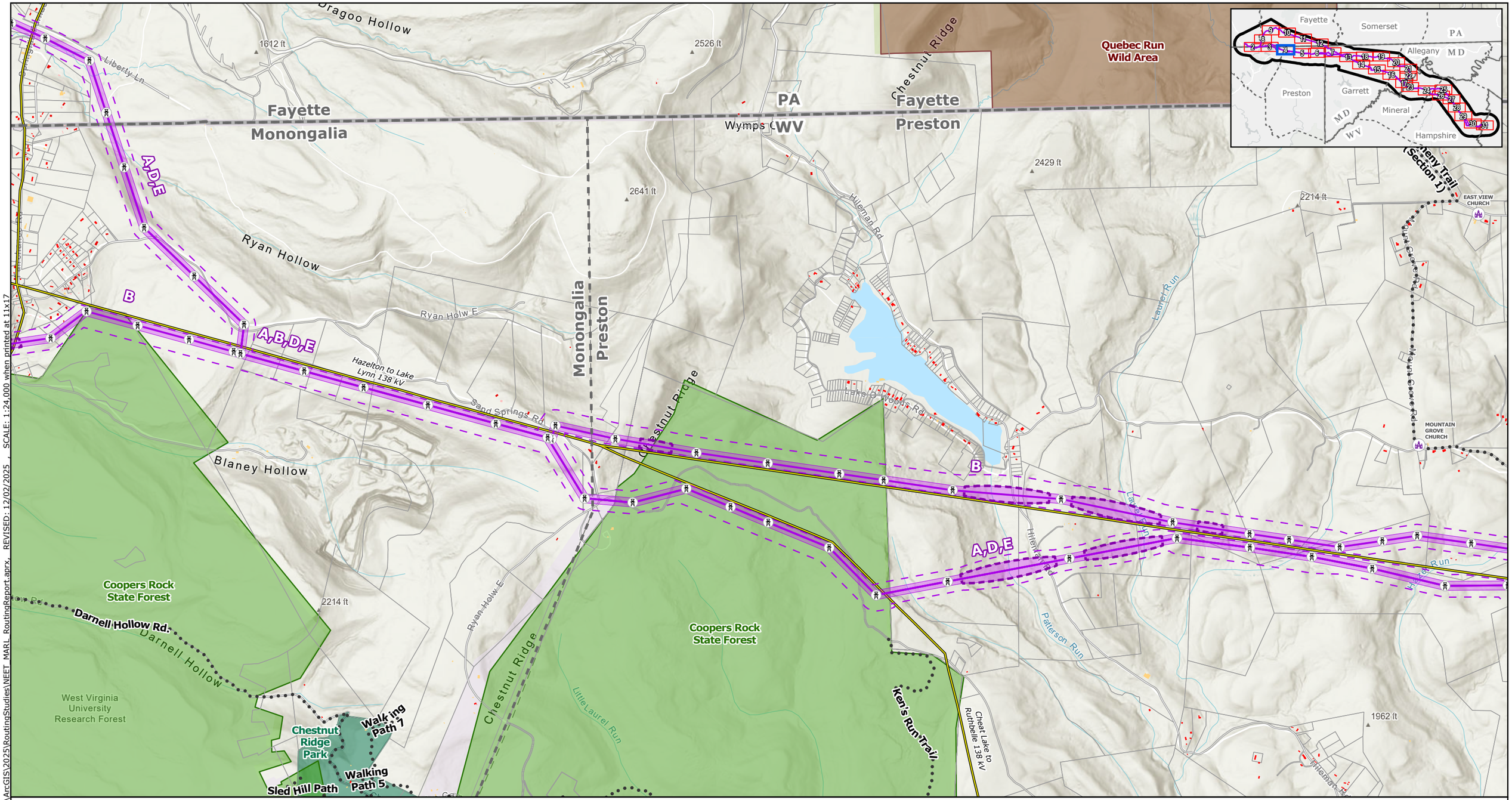

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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

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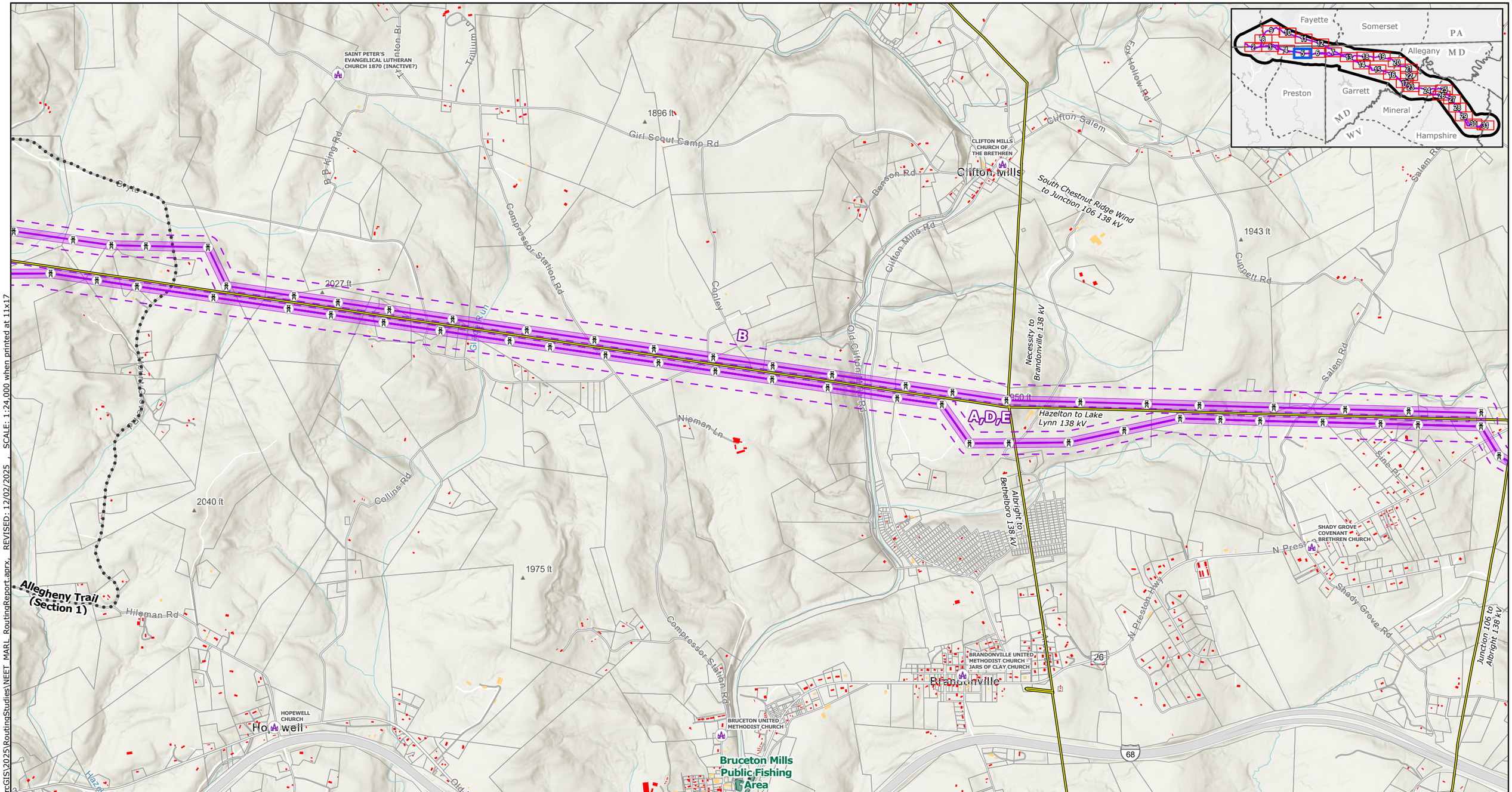

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N

0 0.25 0.5 0.75 1
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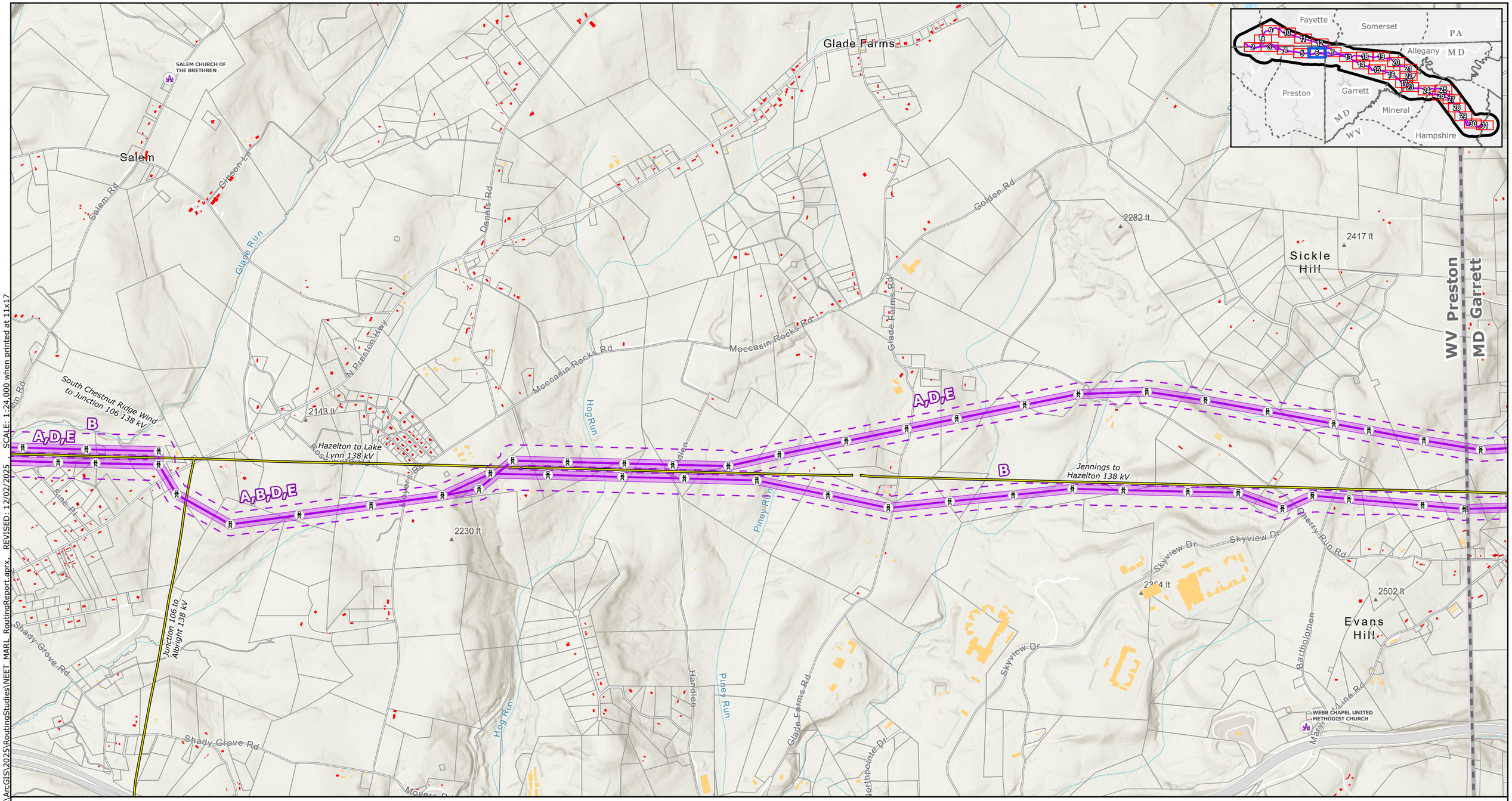

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N

0 0.25 0.5 0.75 1
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Alternative Routes
Land Use and Social Resources Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

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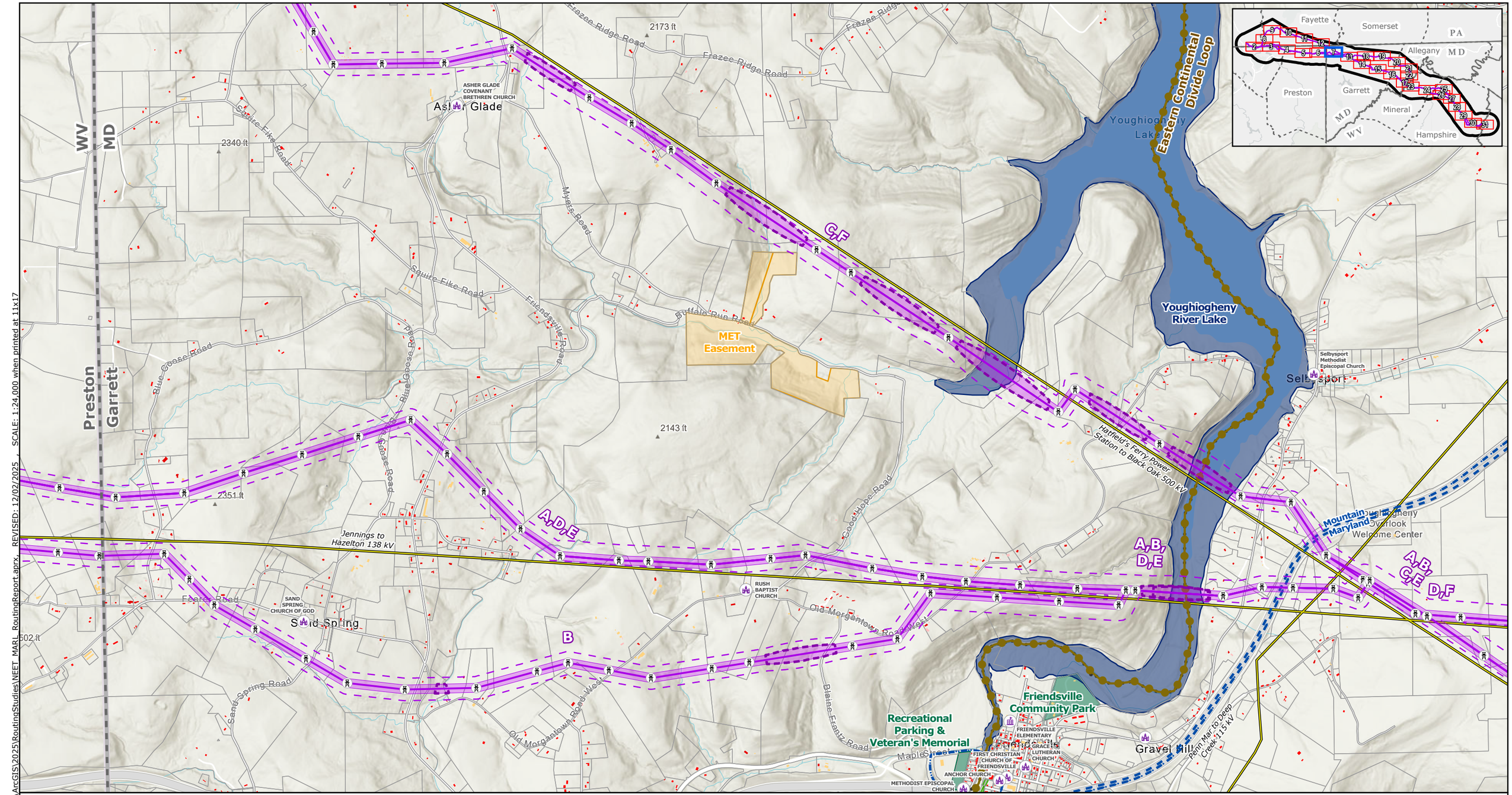

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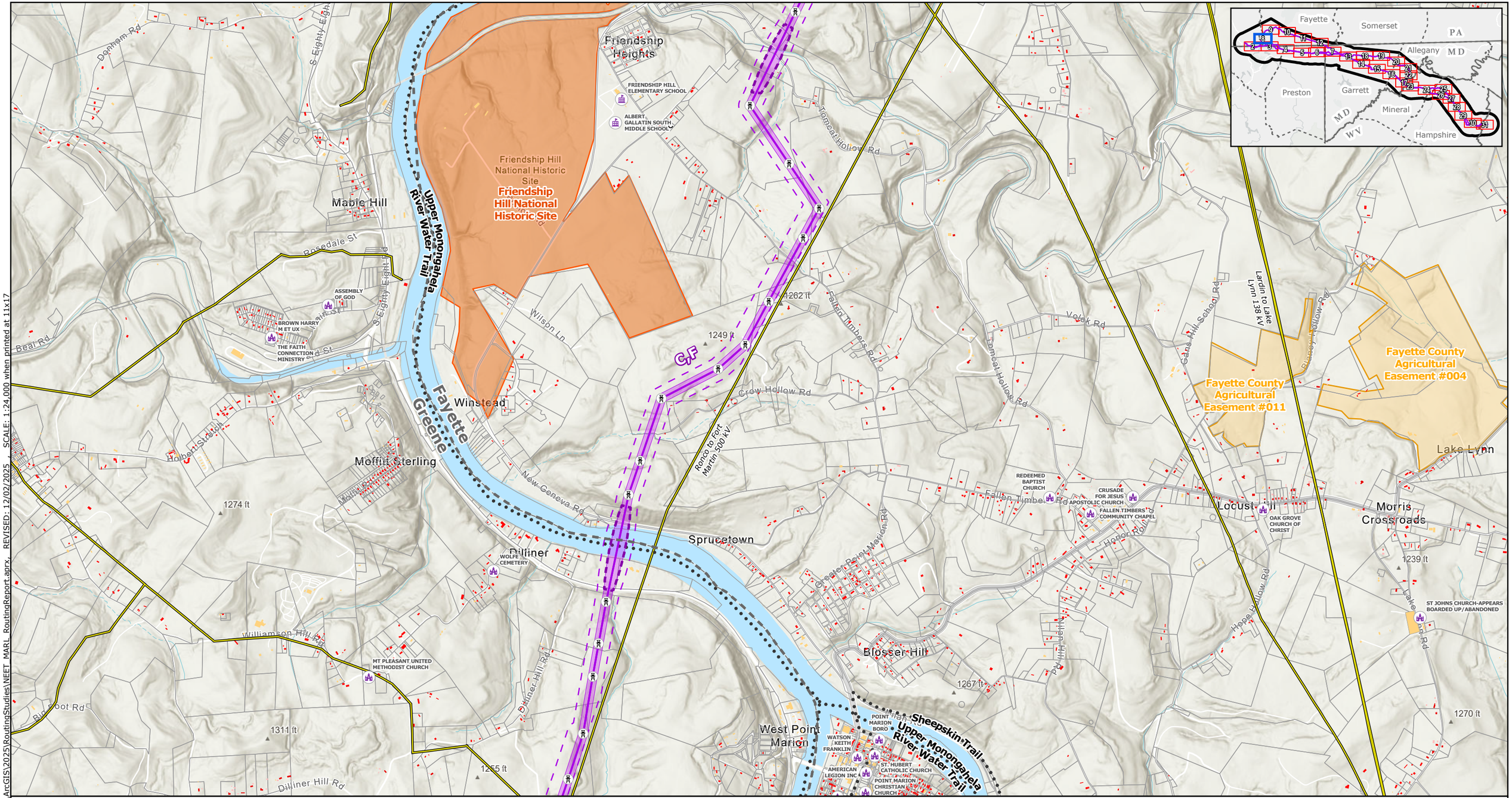

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N

0 0.25 0.5 0.75 1

Miles

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Coordinate System: NAD 1983 UTM Zone 17N

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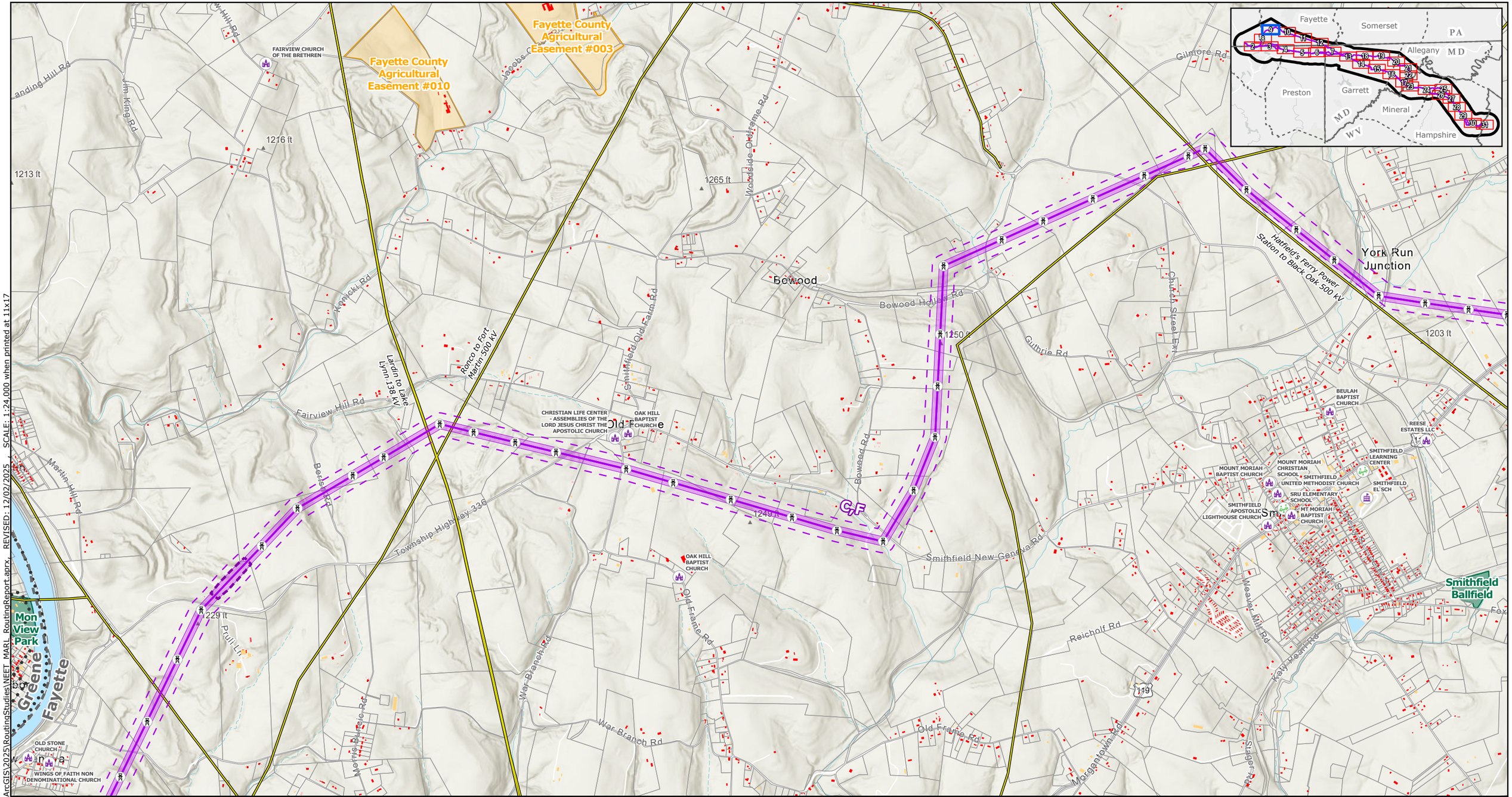
Alternative Routes
Land Use and Social Resources Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM



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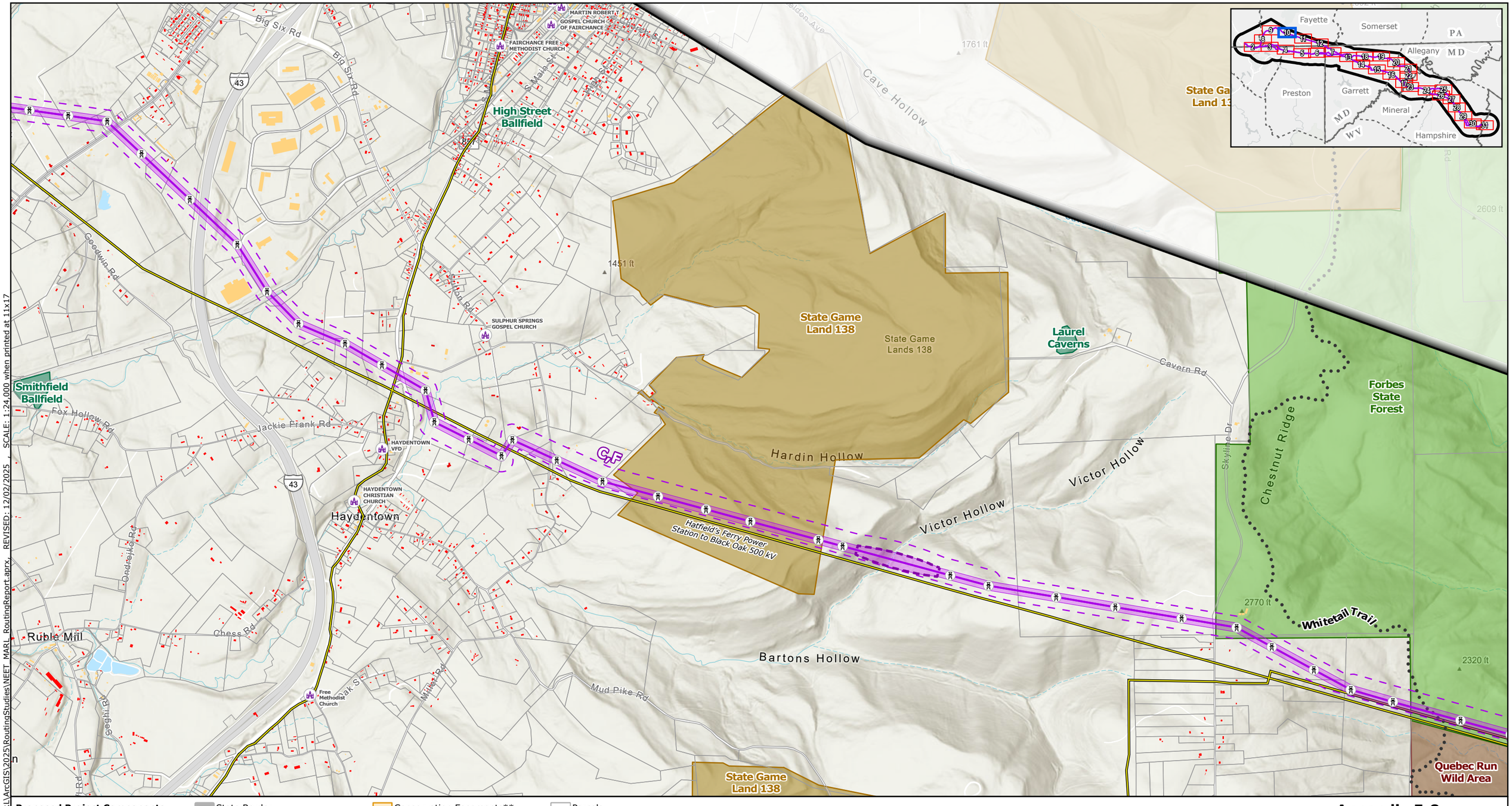
Coordinate System: NAD 1983 UTM Zone 17N

Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM



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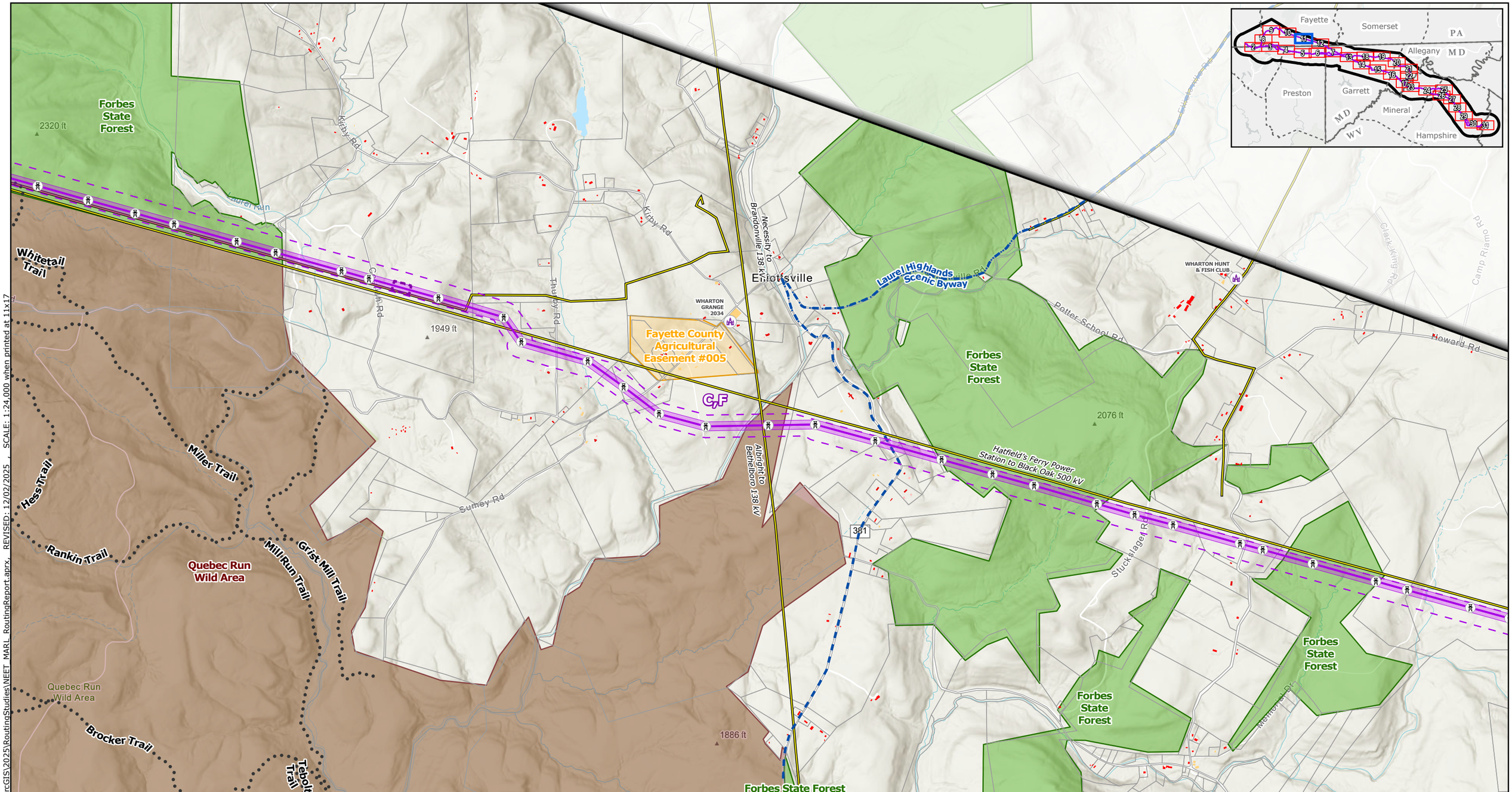

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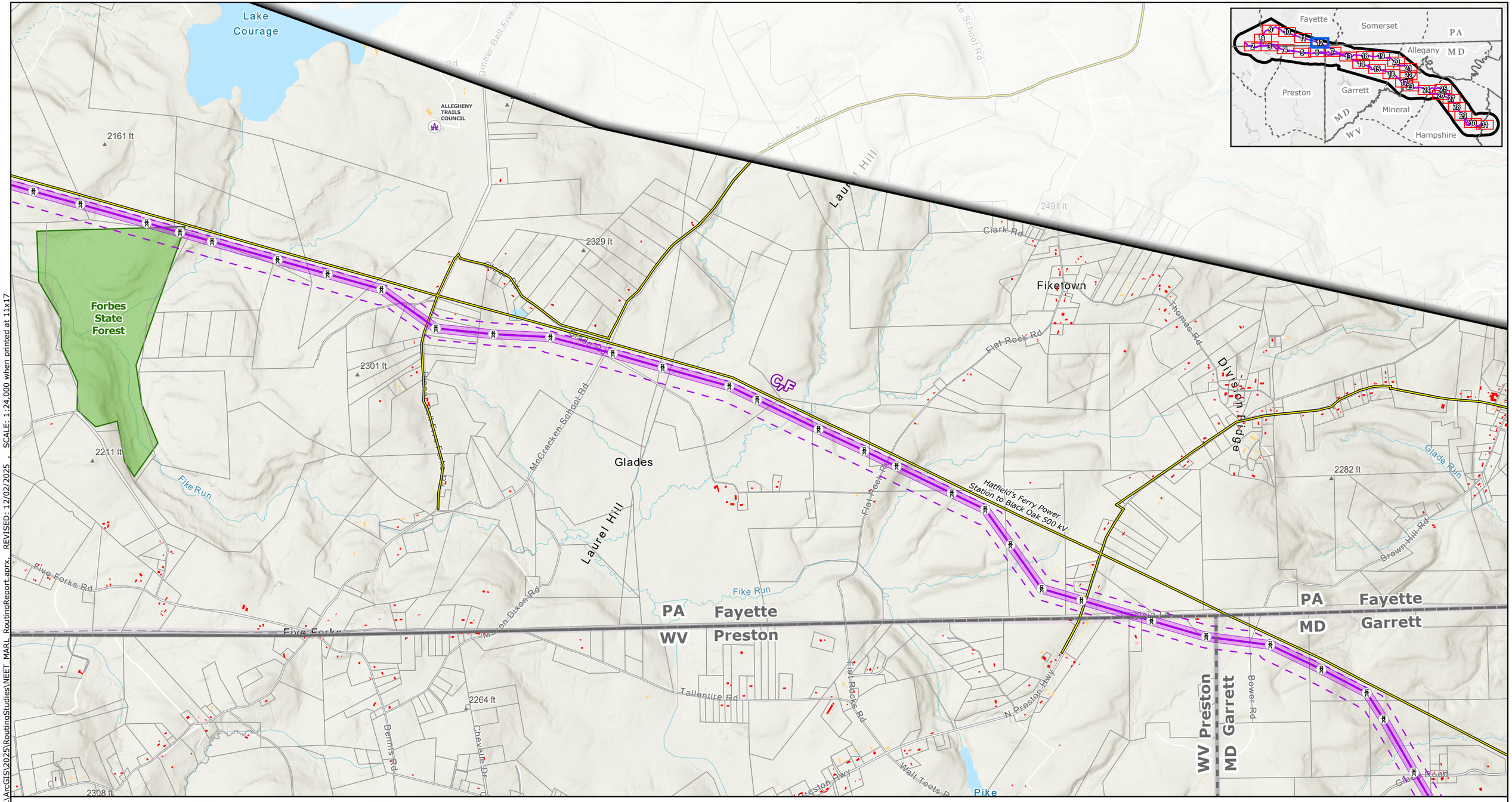

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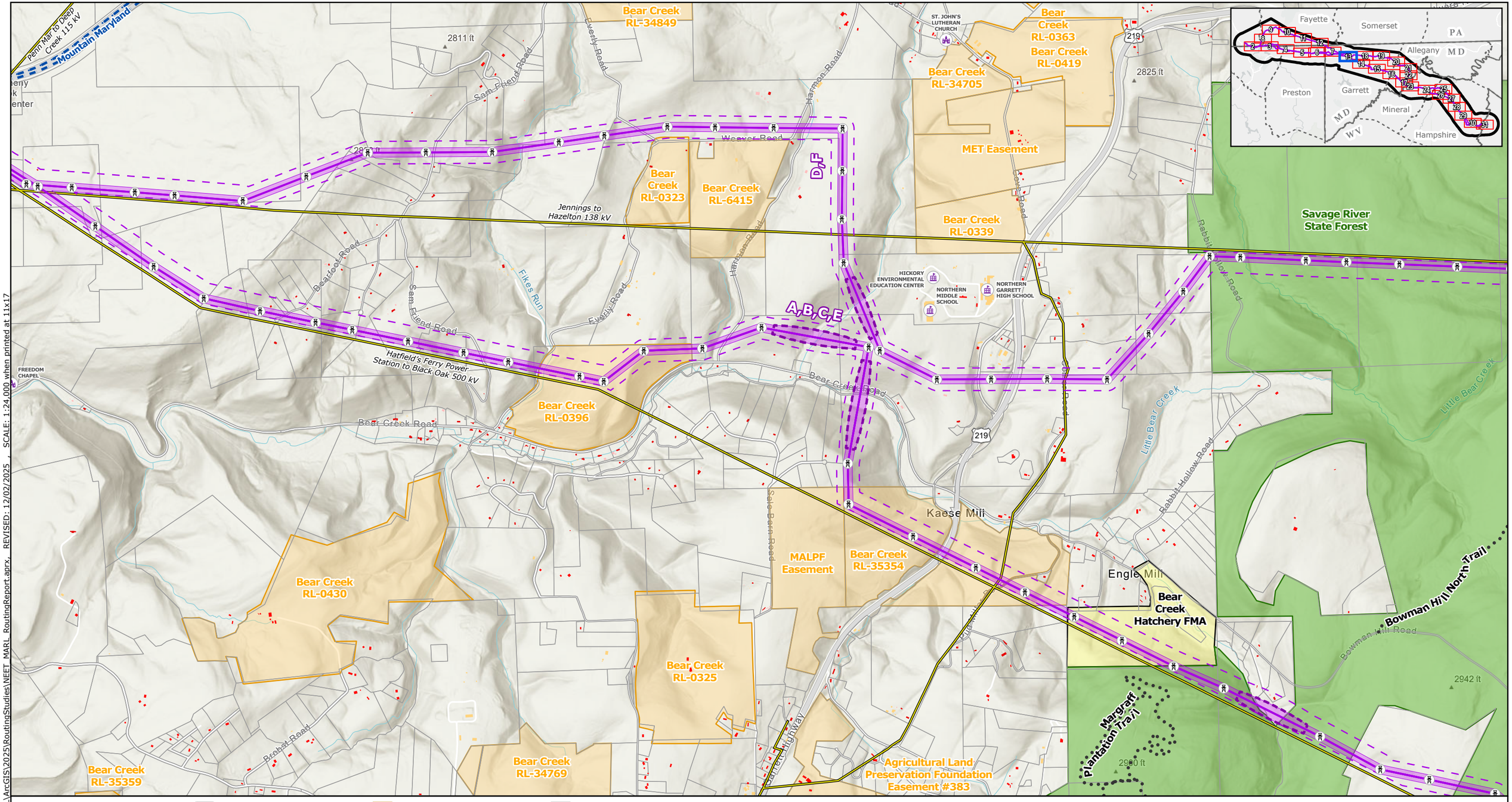

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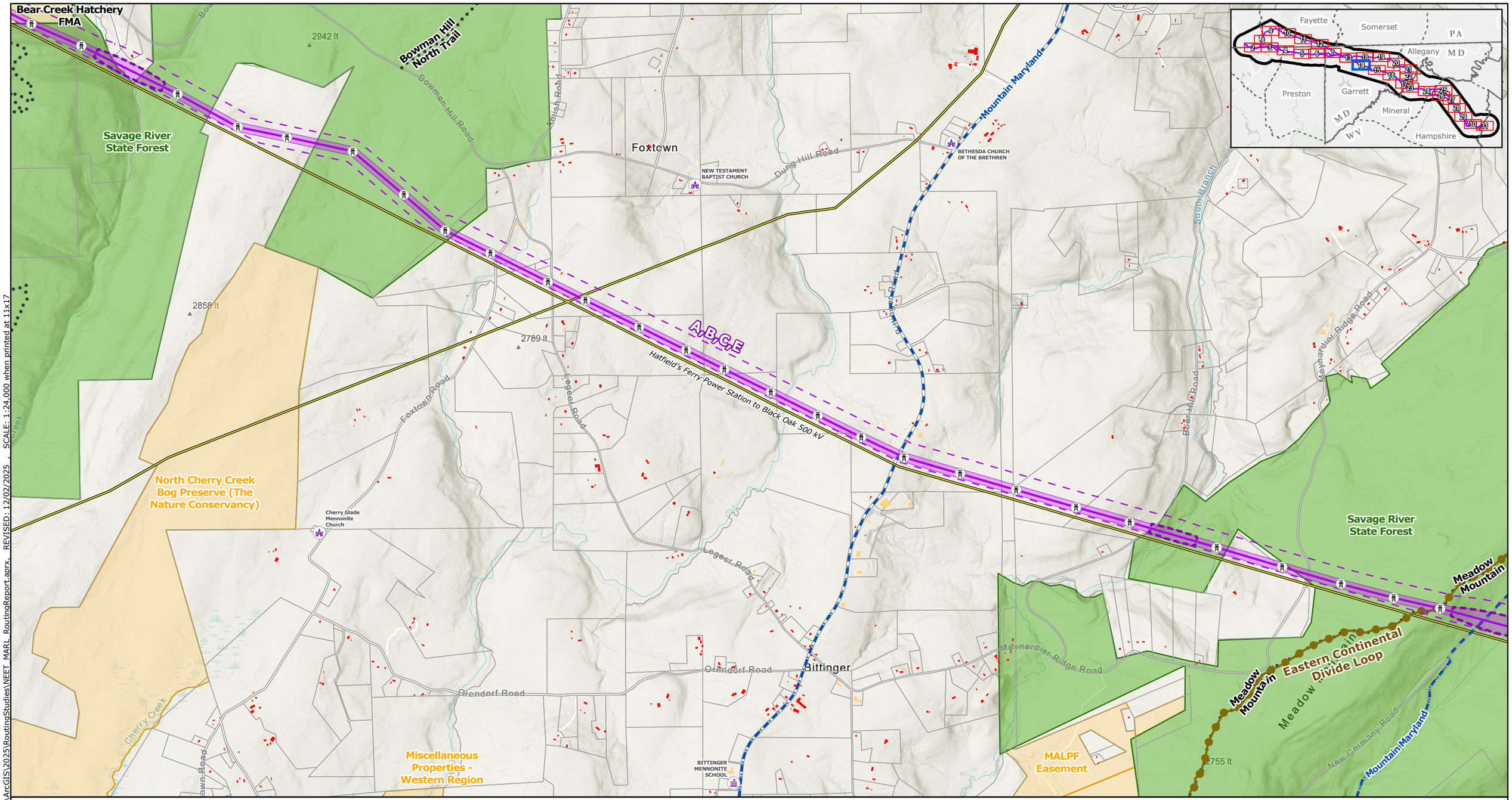

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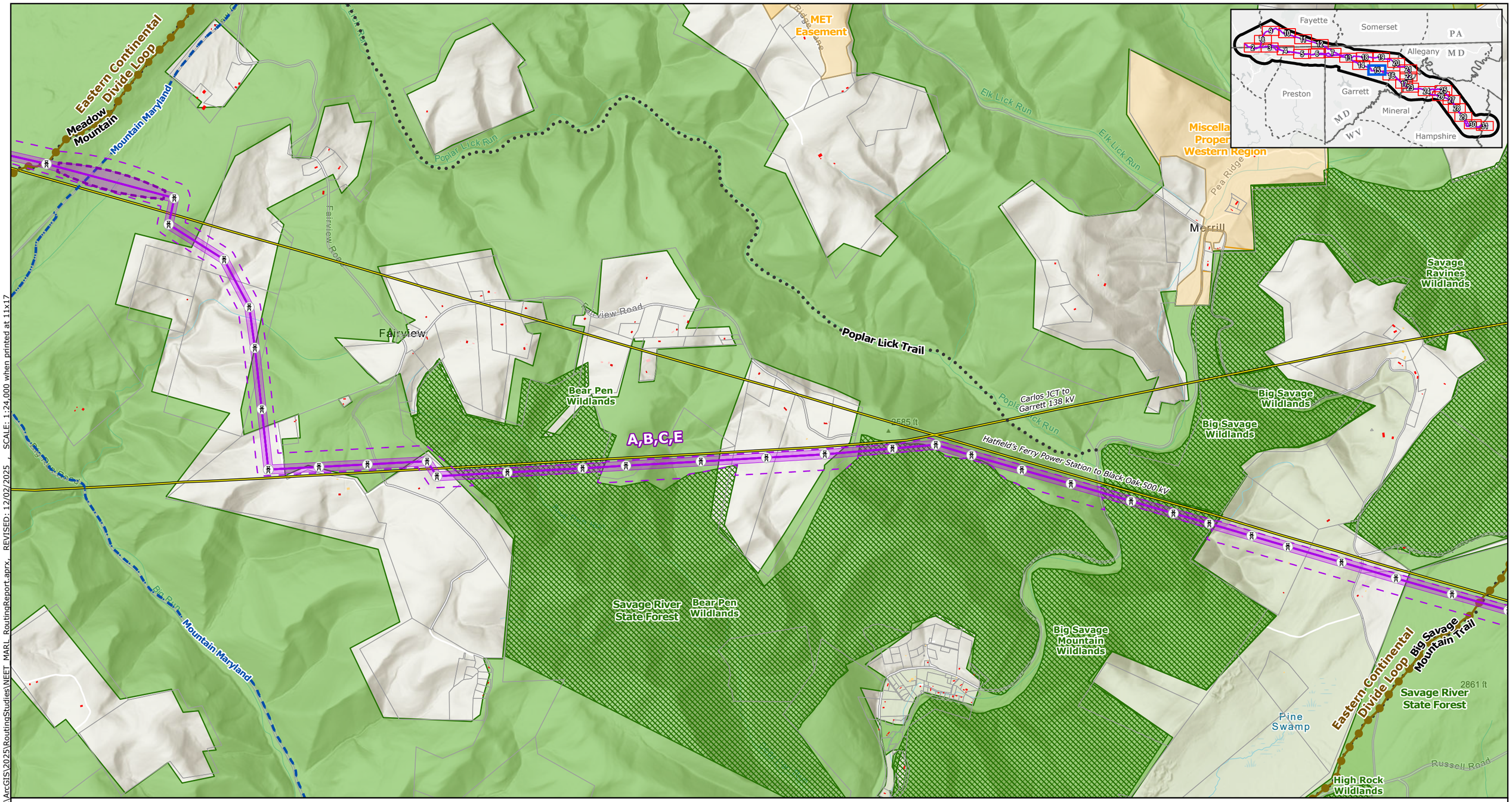

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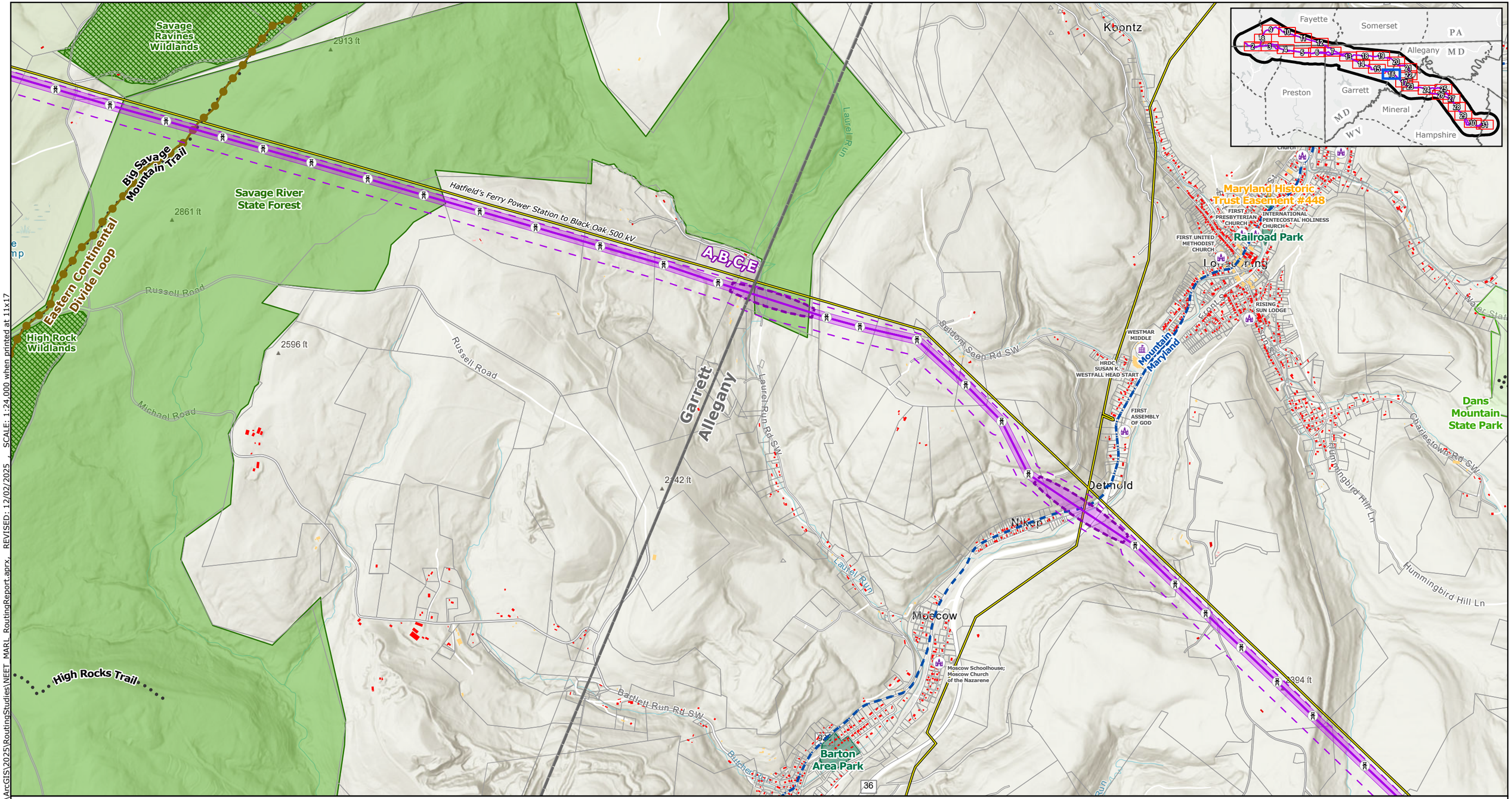

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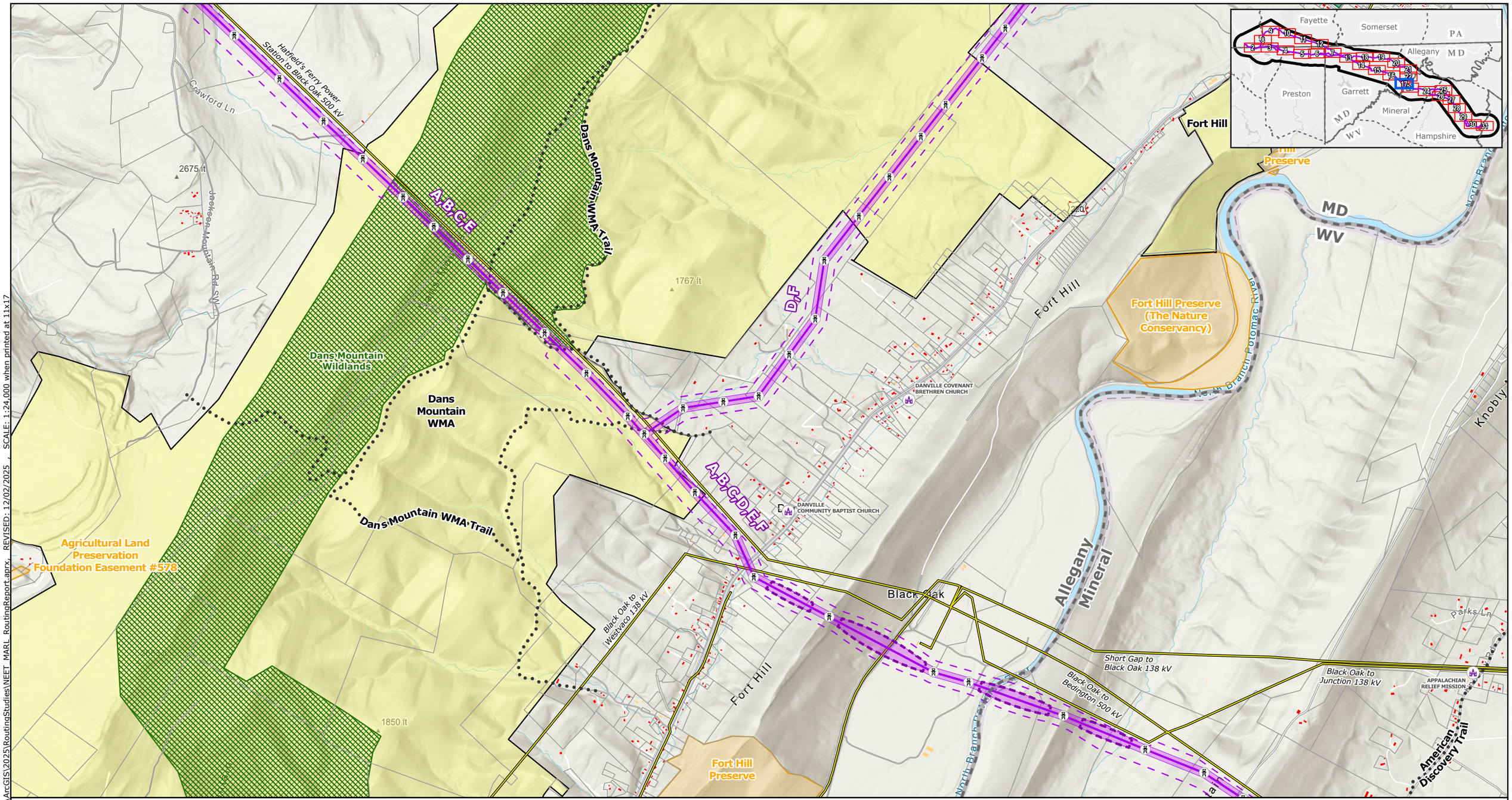

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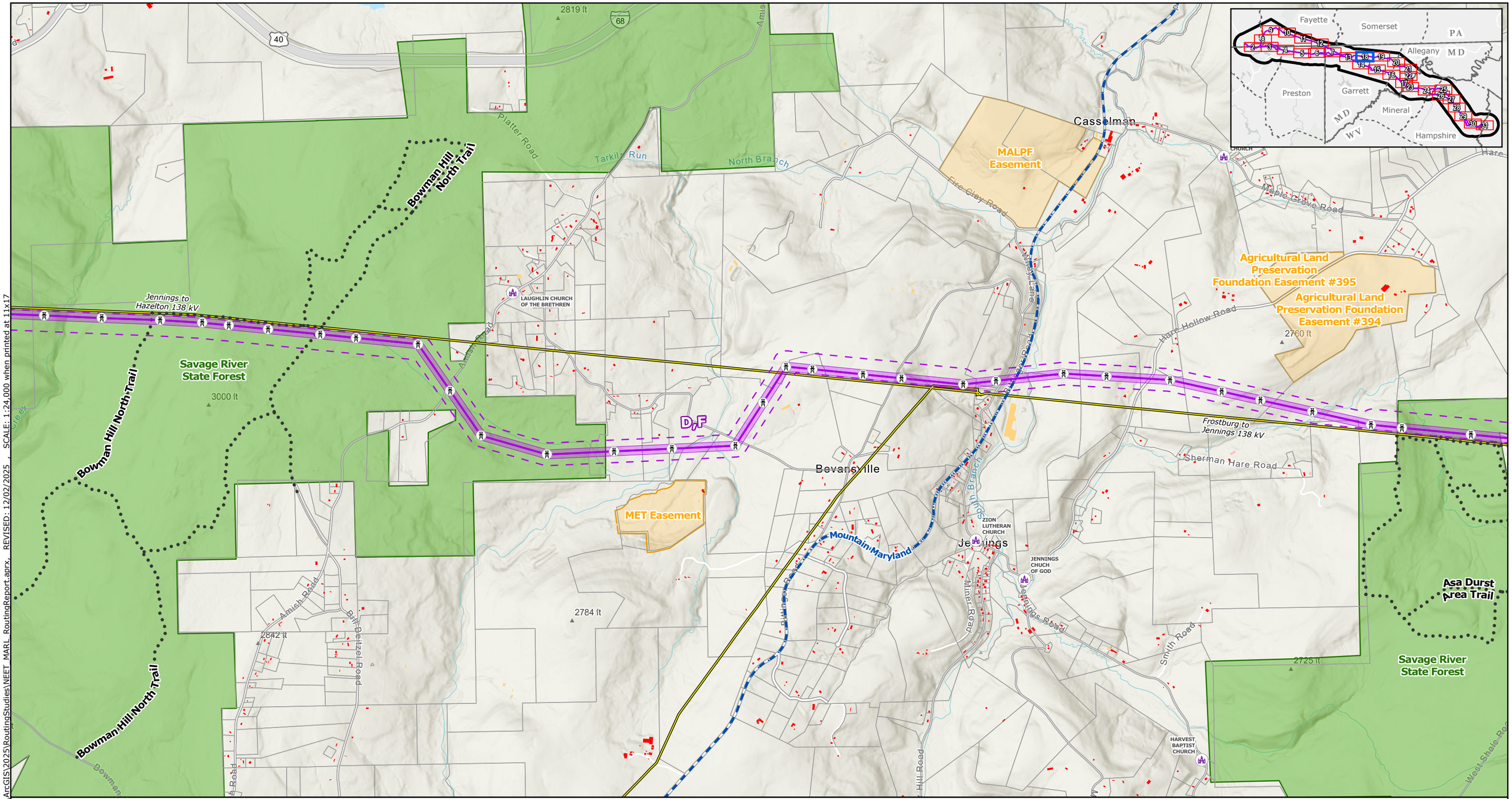

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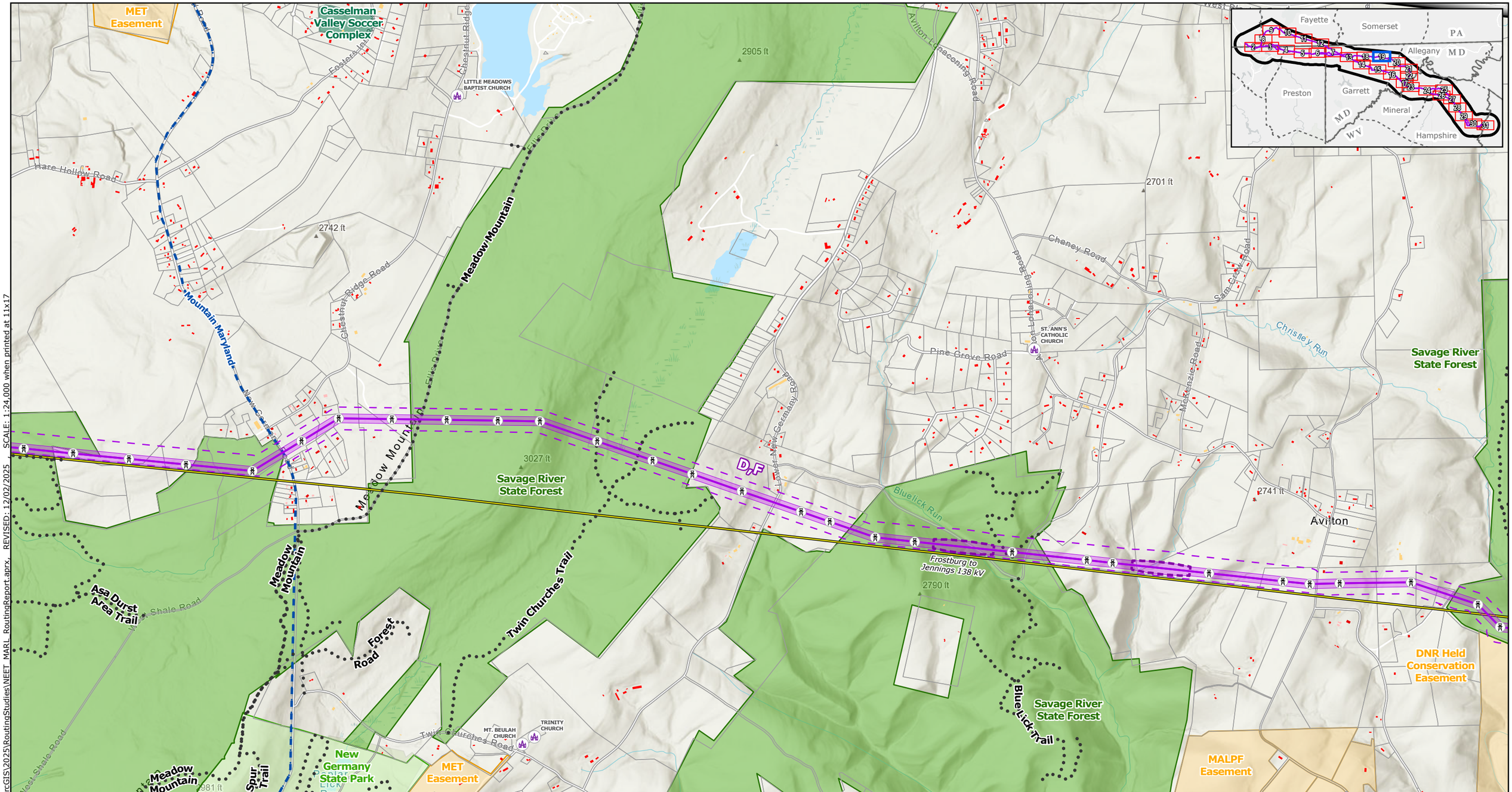

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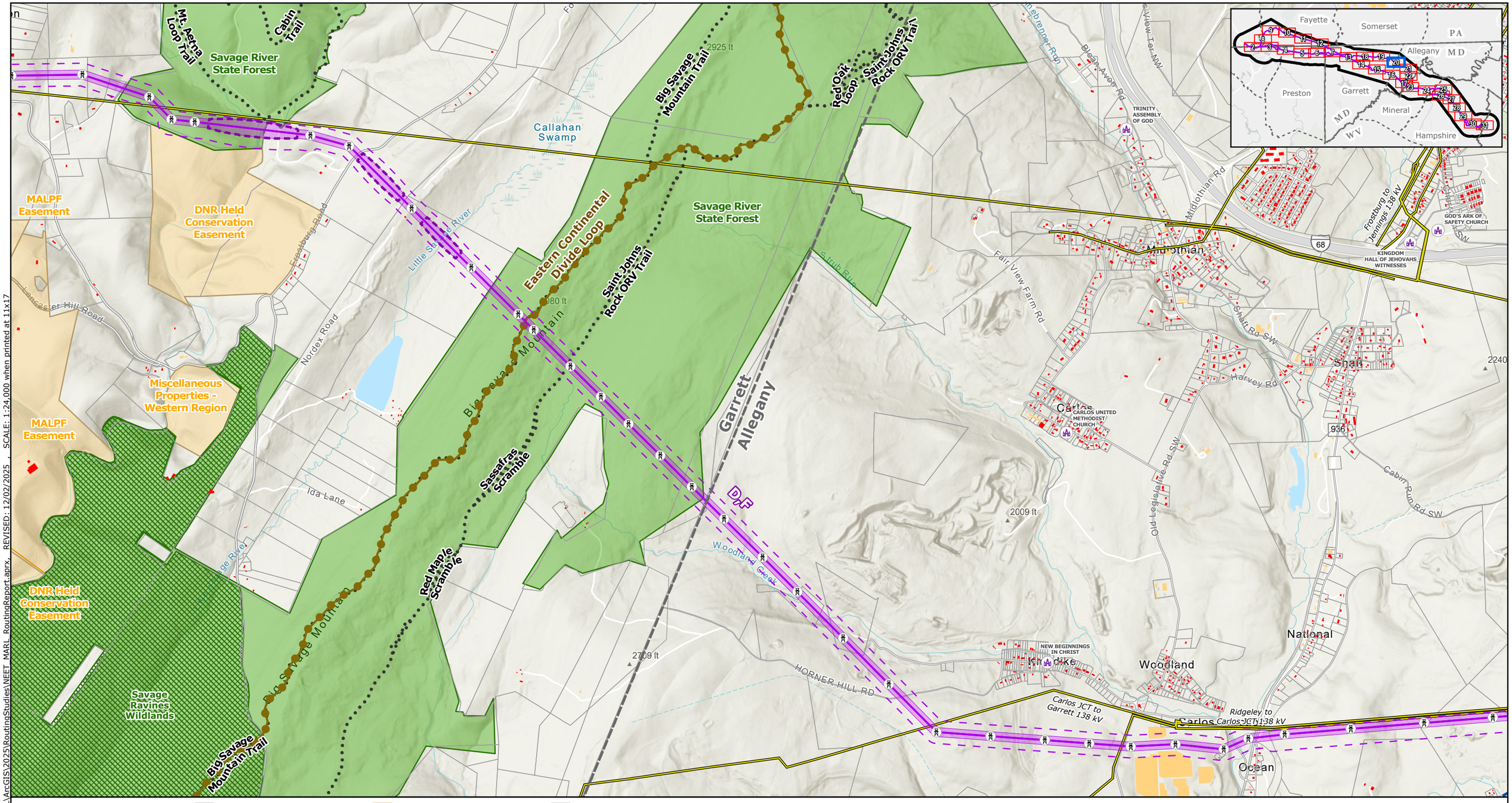

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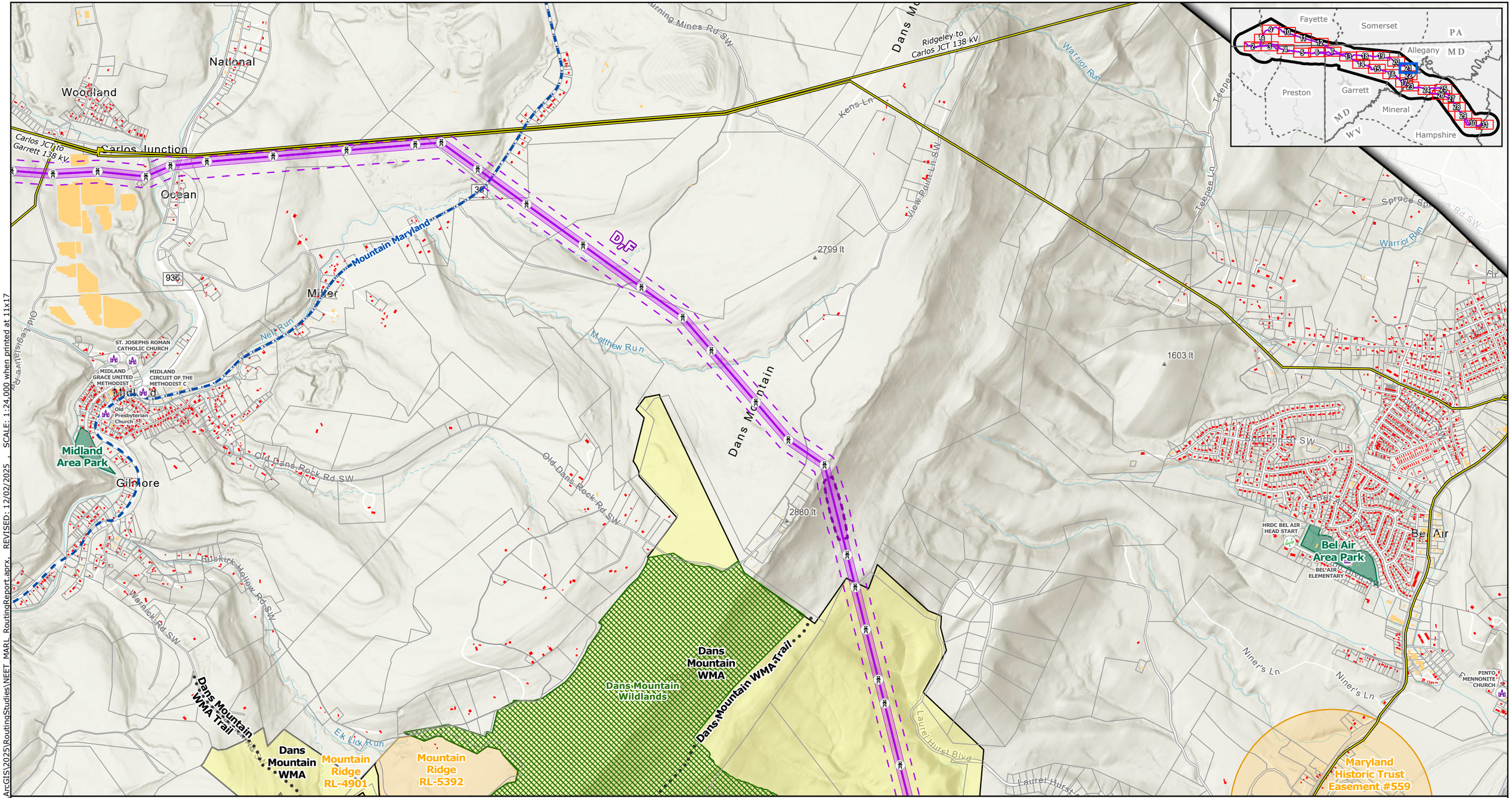

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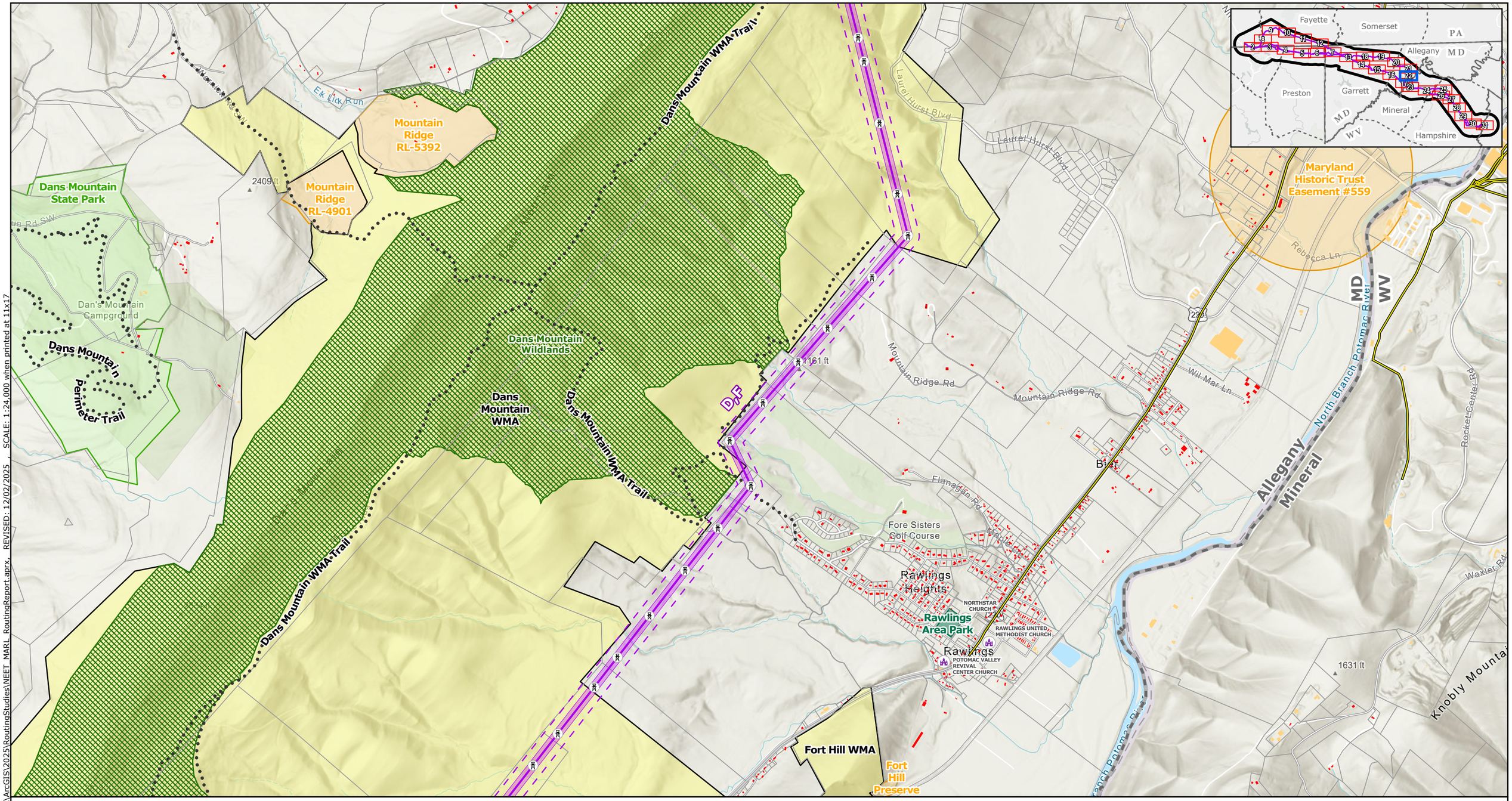
1 inch equals 2,000 ft (when printed at 11x17)

Coordinate System: NAD 1983 UTM Zone 17N

Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM



Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Protected Areas
- State Forests
- State Parks*
- Fisheries / Wildlife Management Area
- Pennsylvania State Wilderness Area
- Pennsylvania State Game Lands
- Maryland Wildlands
- National Historic Site
- USACE Recreation Area
- Conservation Easements**
- Local Park

Community and Recreational Resources
- Place of Worship
- Childcare Center
- School
- Potomac Heritage Trail
- Hiking/Walking Trails
- Scenic Byways

- Parcels

Buildings Footprints
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
- Non-residential buildings

NOTES
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N

0 0.25 0.5 0.75 1
Miles

Scale: 1:24,000
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Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas
Page 22 of 31
MidAtlantic Resiliency Link

ERM

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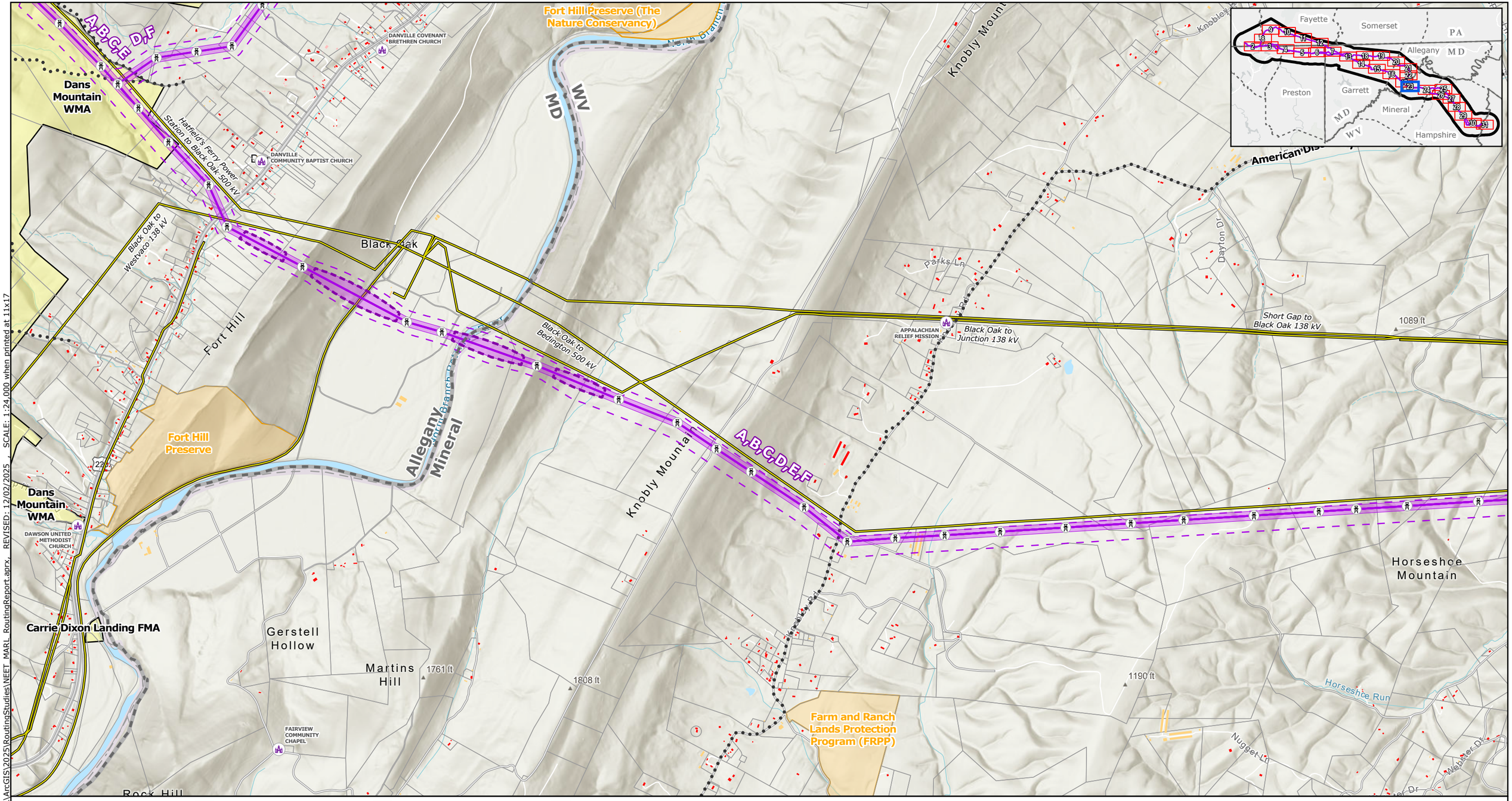

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Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
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Protected Areas
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- Local Park

Community and Recreational Resources
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- Childcare Center
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- Hiking/Walking Trails
- Scenic Byways

- Parcels

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N

0 0.25 0.5 0.75 1
Miles

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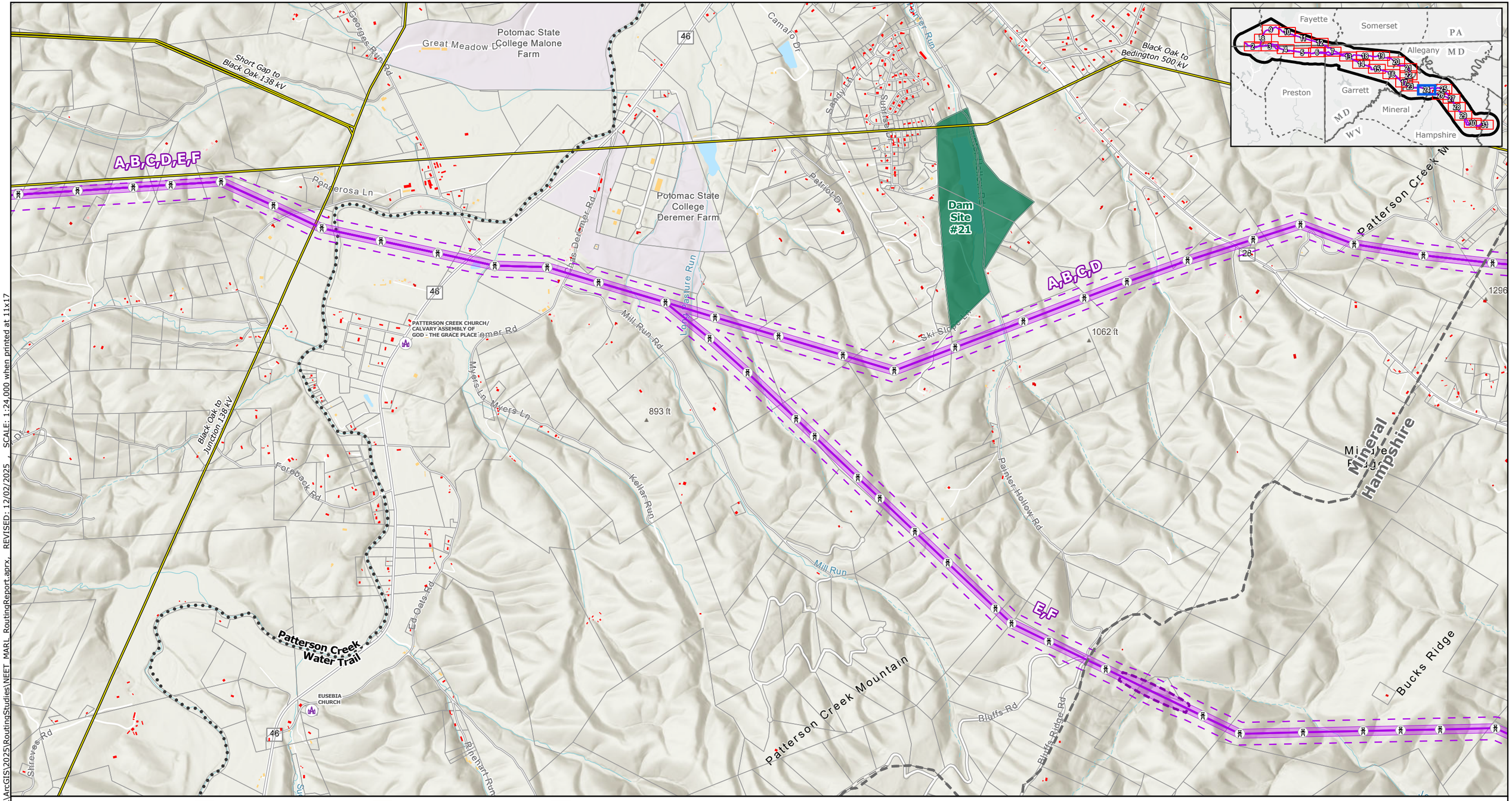
Coordinate System: NAD 1983 UTM Zone 17N

Appendix E-8
Alternative Routes
Land Use and Social Resources Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM



Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Protected Areas
- State Forests
- State Parks*
- Fisheries / Wildlife Management Area
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- Pennsylvania State Game Lands
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- Local Park

Community and Recreational Resources
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- Scenic Byways

- Parcels

Buildings Footprints
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
- Non-residential buildings

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N

0 0.25 0.5 0.75 1

Miles

Scale: 1:24,000
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Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

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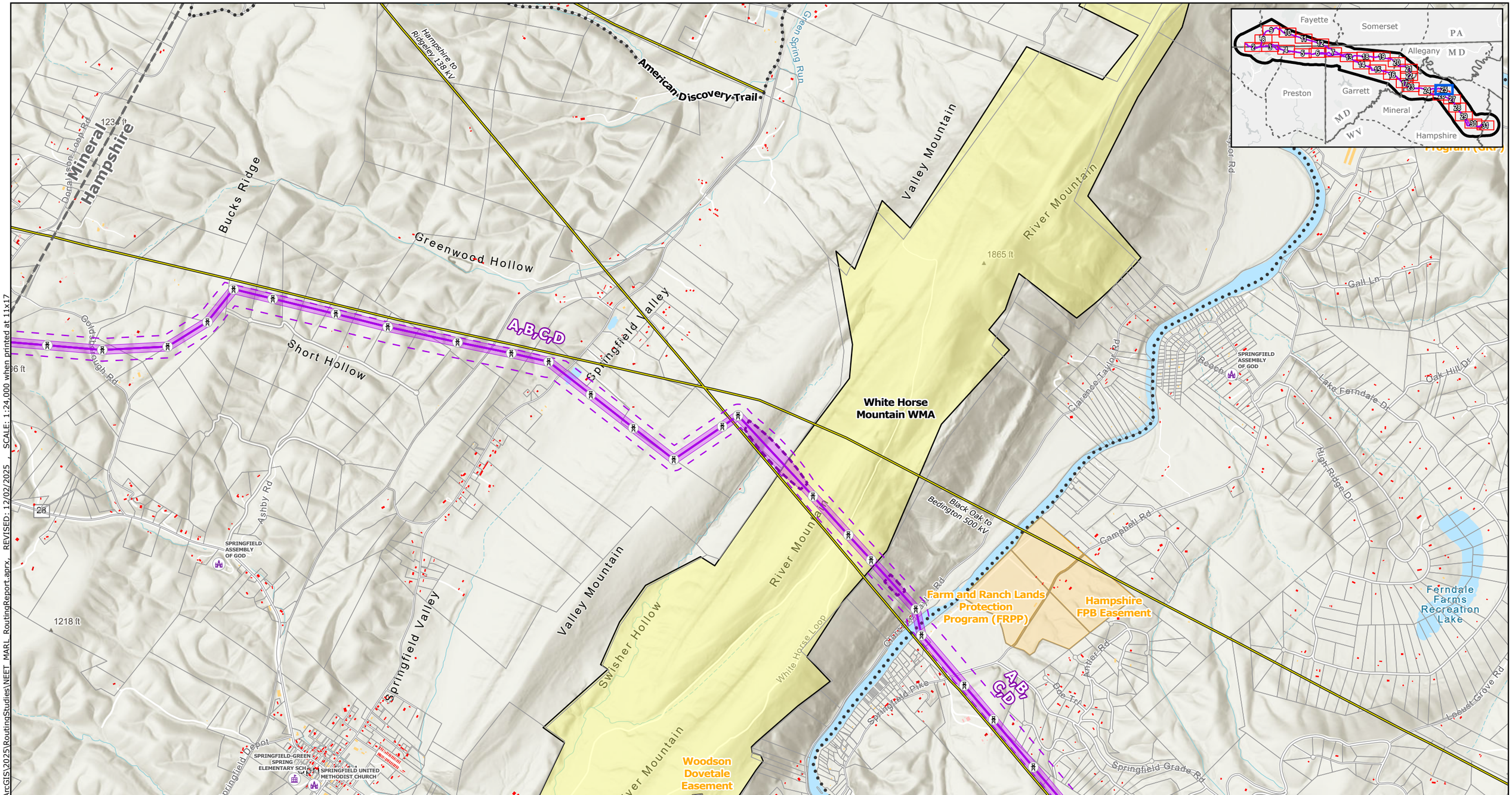

Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Protected Areas
- State Forests
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- Conservation Easements**
- Local Park

Community and Recreational Resources
- Place of Worship
- Childcare Center
- School
- Potomac Heritage Trail
- Hiking/Walking Trails
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Buildings Footprints
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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

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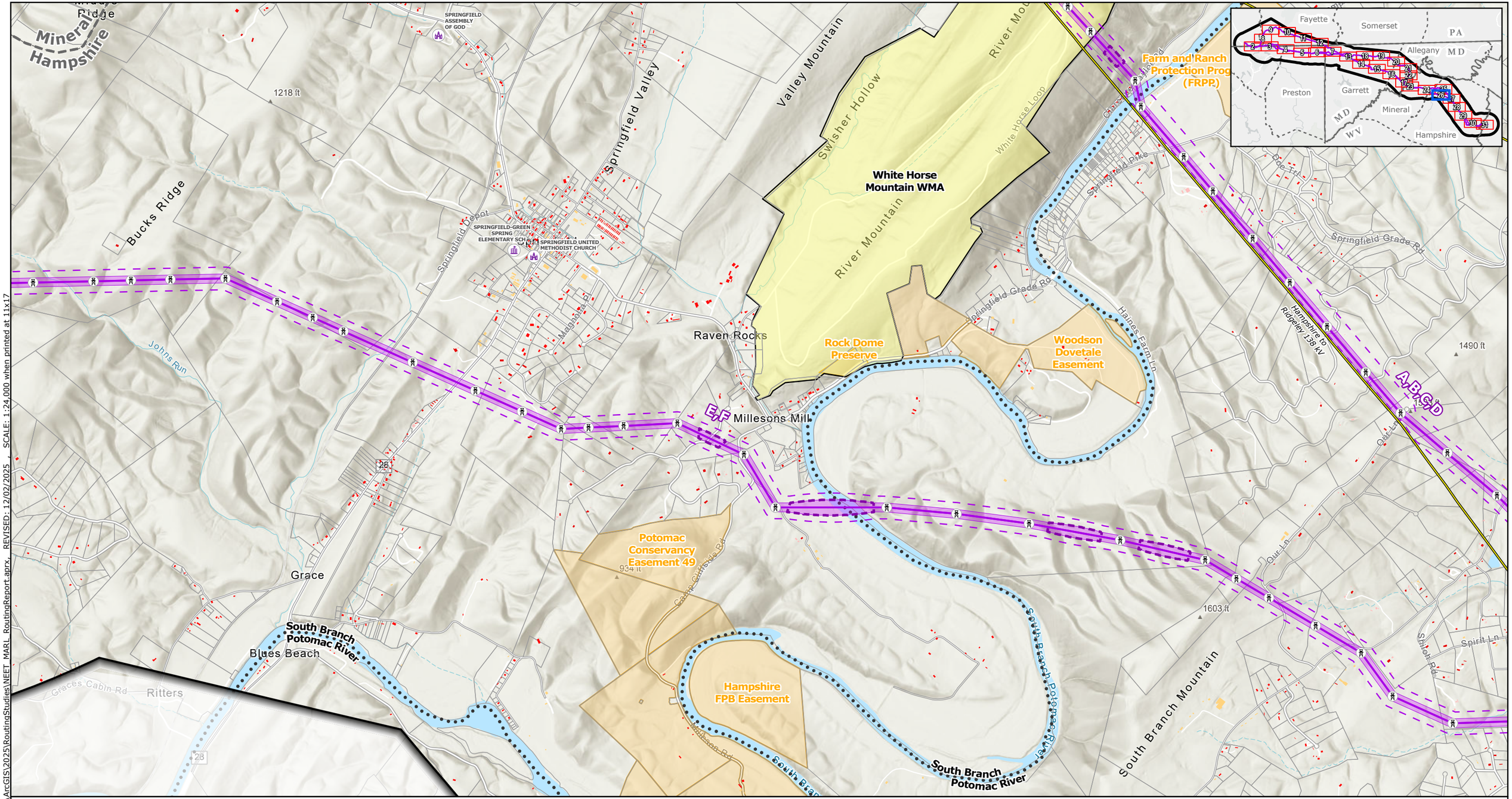

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Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
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- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
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Miles

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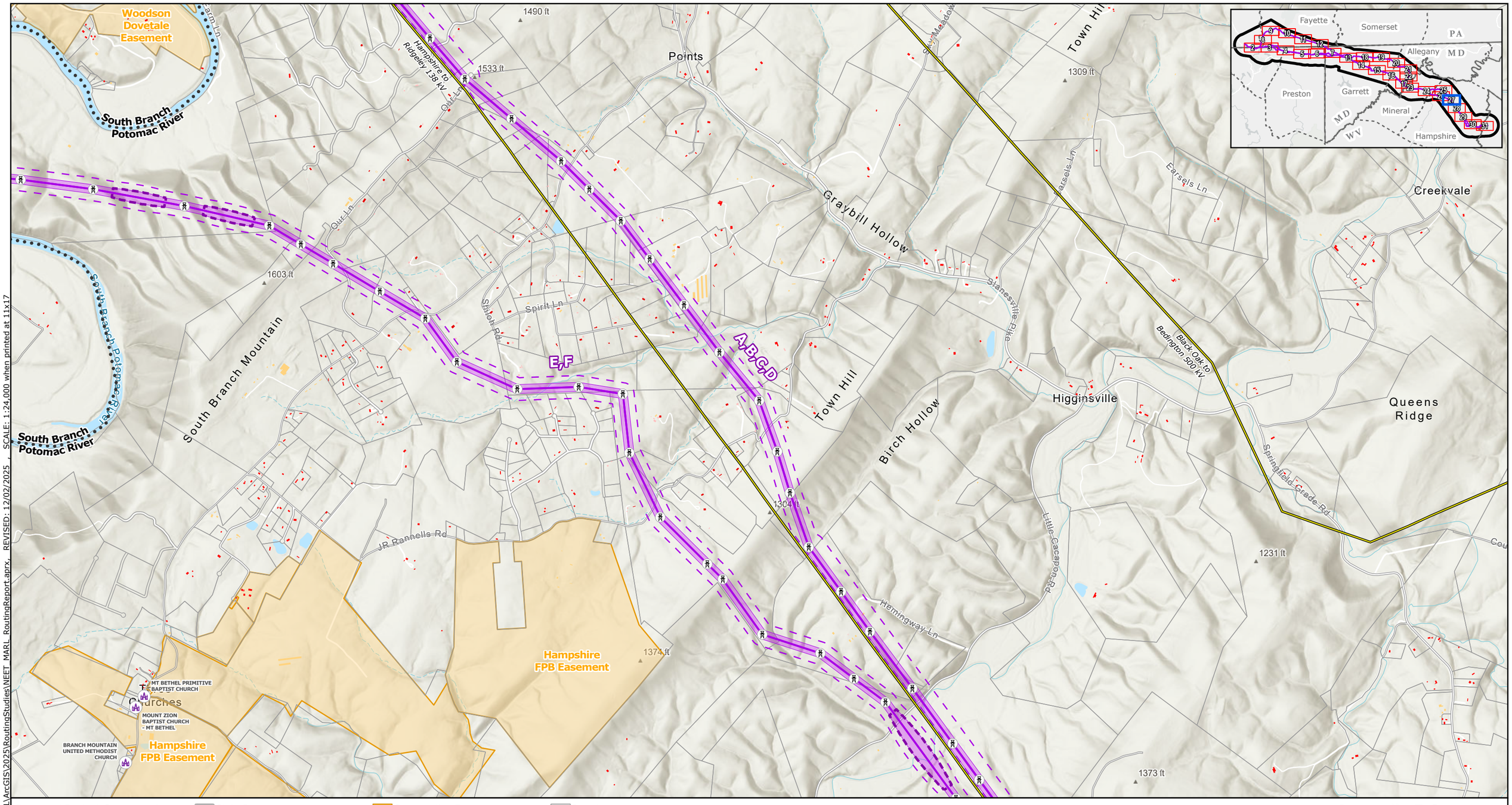
Appendix E-8
Alternative Routes
Land Use and Social Resources Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM



Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
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Base Data
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0 0.25 0.5 0.75 1
Miles

Scale: 1:24,000
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Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas
Page 27 of 31
MidAtlantic Resiliency Link

ERM

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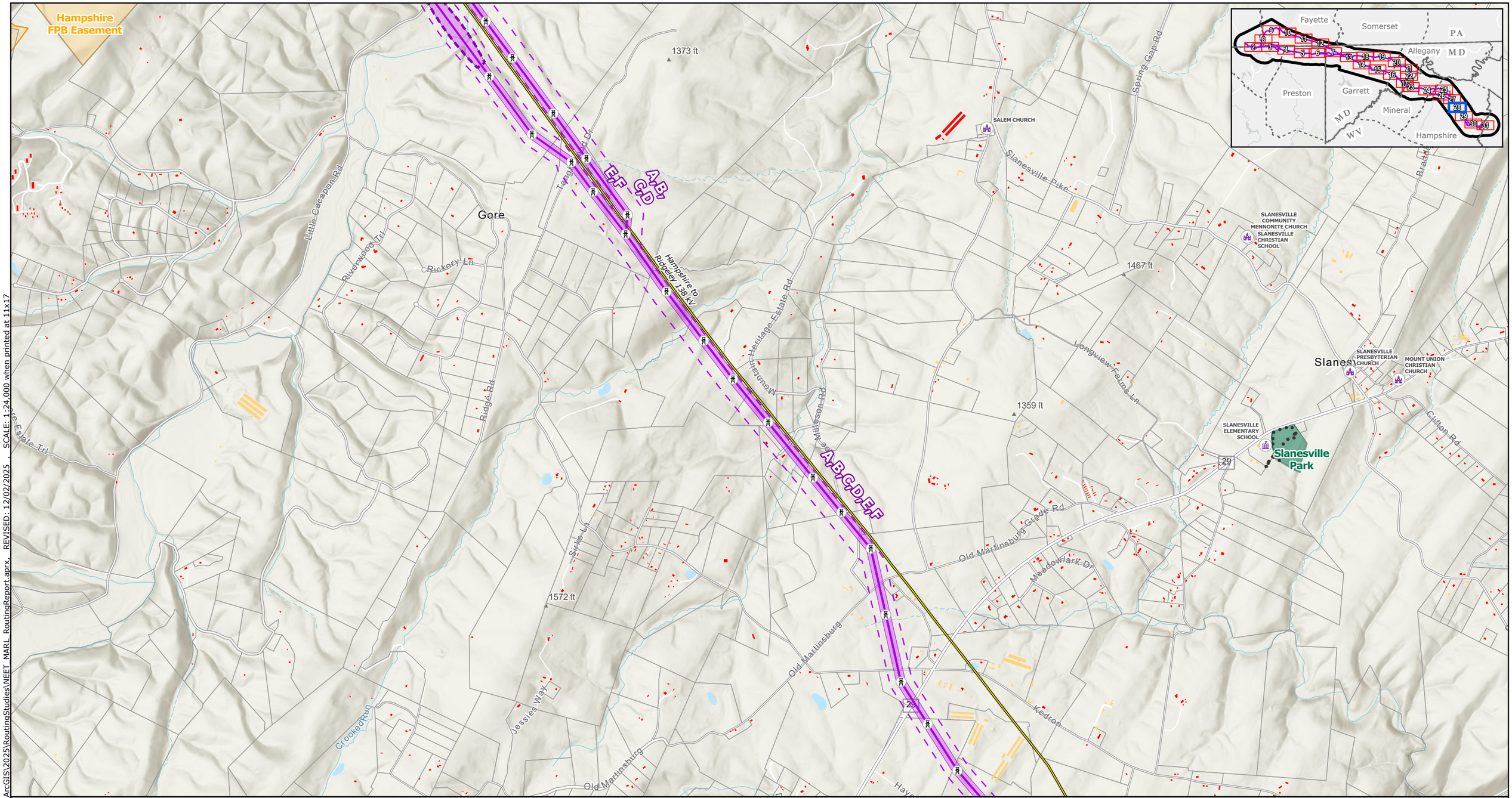

Proposed Project Components
- Project Endpoints
- Towers
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- ROW Corridors
- Aerial Easement Blowout Areas
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Base Data
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0 0.25 0.5 0.75 1
Miles

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Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas
Page 28 of 31
MidAtlantic Resiliency Link

ERM

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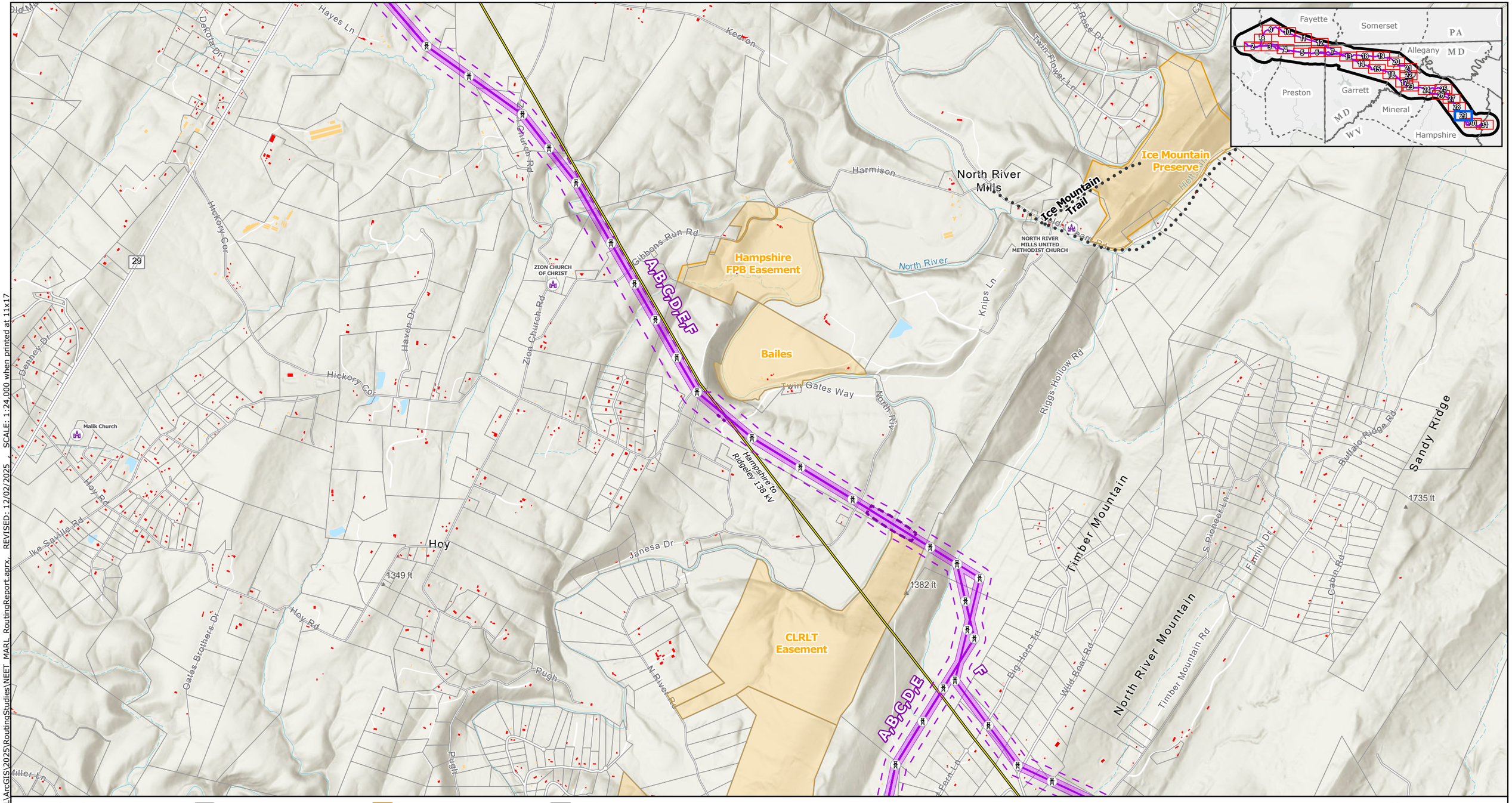

Proposed Project Components
- Project Endpoints
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- Project Study Area

Base Data
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Community and Recreational Resources
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- Childcare Center
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Buildings Footprints
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0 0.25 0.5 0.75 1
Miles

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Appendix E-8
Alternative Routes
Land Use and Social Resources Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM

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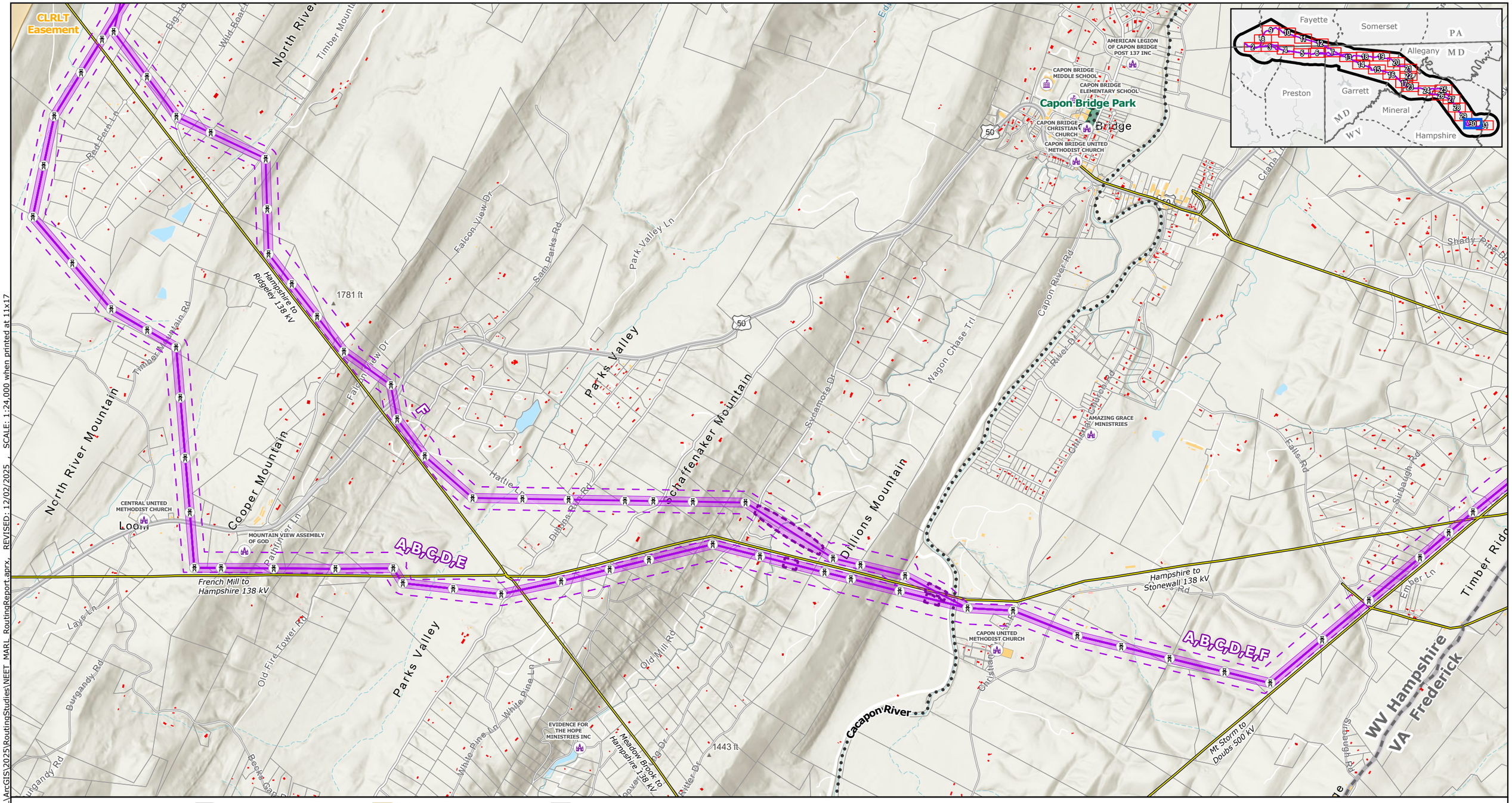

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- Project Study Area

Base Data
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Community and Recreational Resources
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- School
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- Hiking/Walking Trails
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N

0 0.25 0.5 0.75 1

Miles

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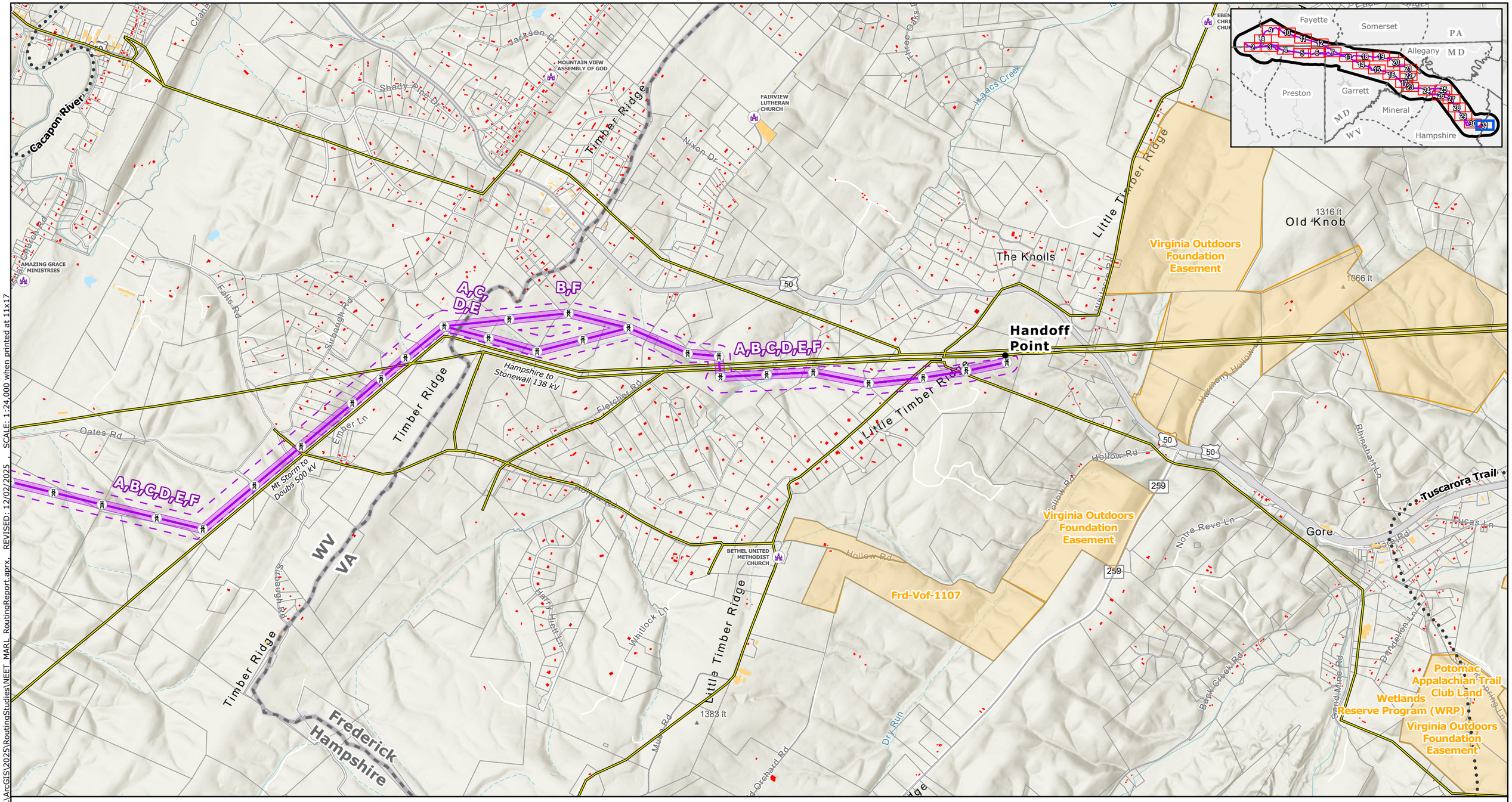
Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM



Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Protected Areas
- State Forests
- State Parks*
- Fisheries / Wildlife Management Area
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- Pennsylvania State Game Lands
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Community and Recreational Resources
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- Scenic Byways

Buildings Footprints
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
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- Parcels

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N

0 0.25 0.5 0.75 1

Miles

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Appendix E-8
Alternative Routes
Land Use and Social Resources
Paralleling, Community and Recreation, and Protected Areas

MidAtlantic Resiliency Link

ERM

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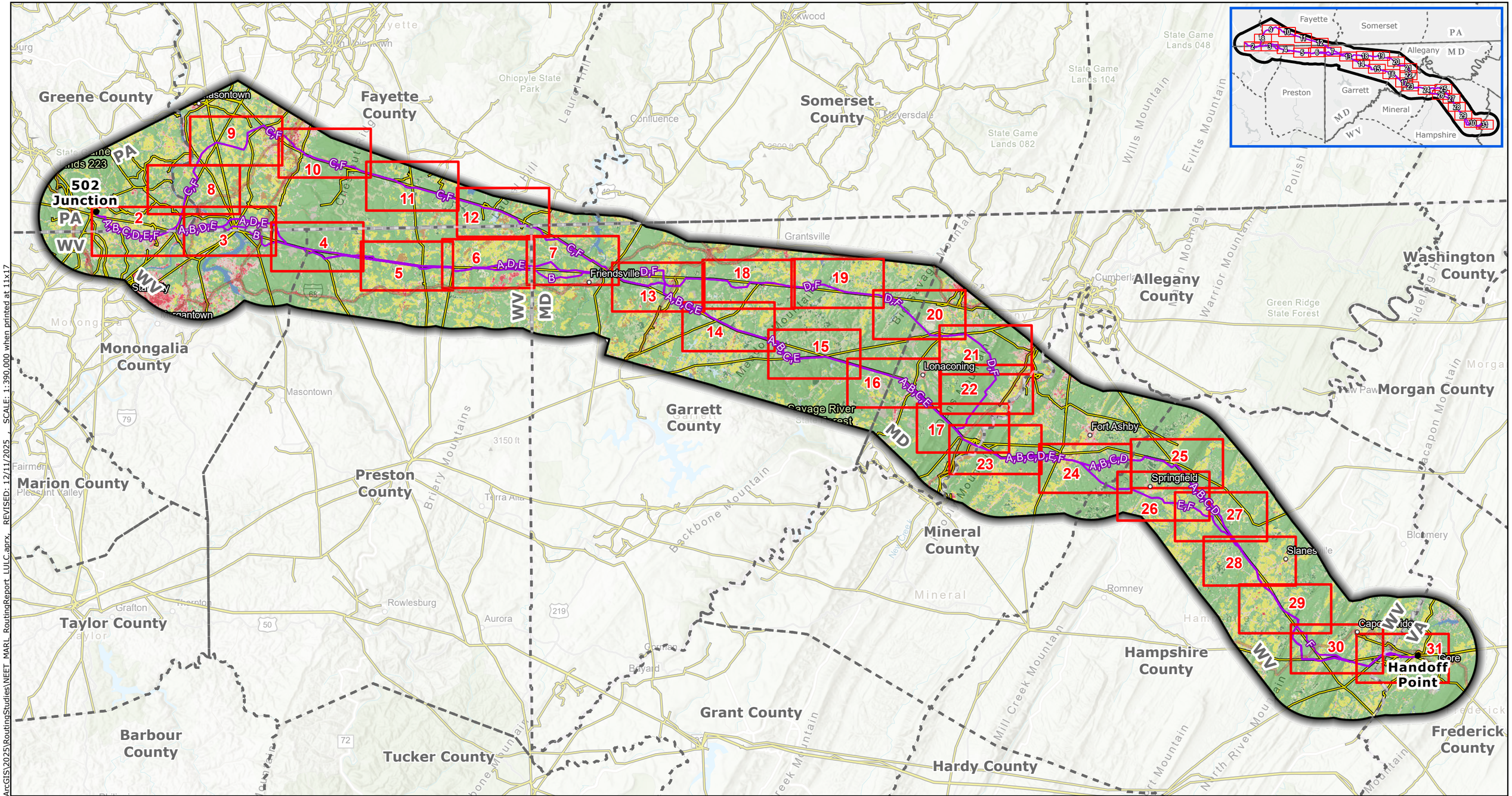
Coordinate System: NAD 1983 UTM Zone 17N

APPENDIX E-9 ALTERNATIVE ROUTES—LAND USE AND SOCIAL RESOURCES—CULTURAL RESOURCES MAPBOOK (CONFIDENTIAL)

APPENDIX E-10 ALTERNATIVE ROUTES—LAND USE AND SOCIAL RESOURCES—AGRICULTURAL AND LAND COVER MAPBOOK



Proposed Project Components
- Project Endpoints
- Alternative Routes
- Project Study Area
- Map Index Page

Base Data
- Existing High-Voltage Transmission Lines
- State Border
- County Boundary

NLCD Land Cover (2024)
- Open Water
- Perennial Snow/Ice
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Dwarf Scrub
- Shrub/Scrub
- Grassland/Herbaceous
- Sedge/Herbaceous
- Lichens
- Moss
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

NOTES
1. *Proposed tower locations are preliminary and subject to change*
2. *Data source: NEET, ERM, USGS, NLCD 2024*

N

0 4 8 12 16
Miles

Scale: 1:390,000
1 inch equals 32,500 ft (when printed at 11x17)

Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover

MidAtlantic Resiliency Link

ERM

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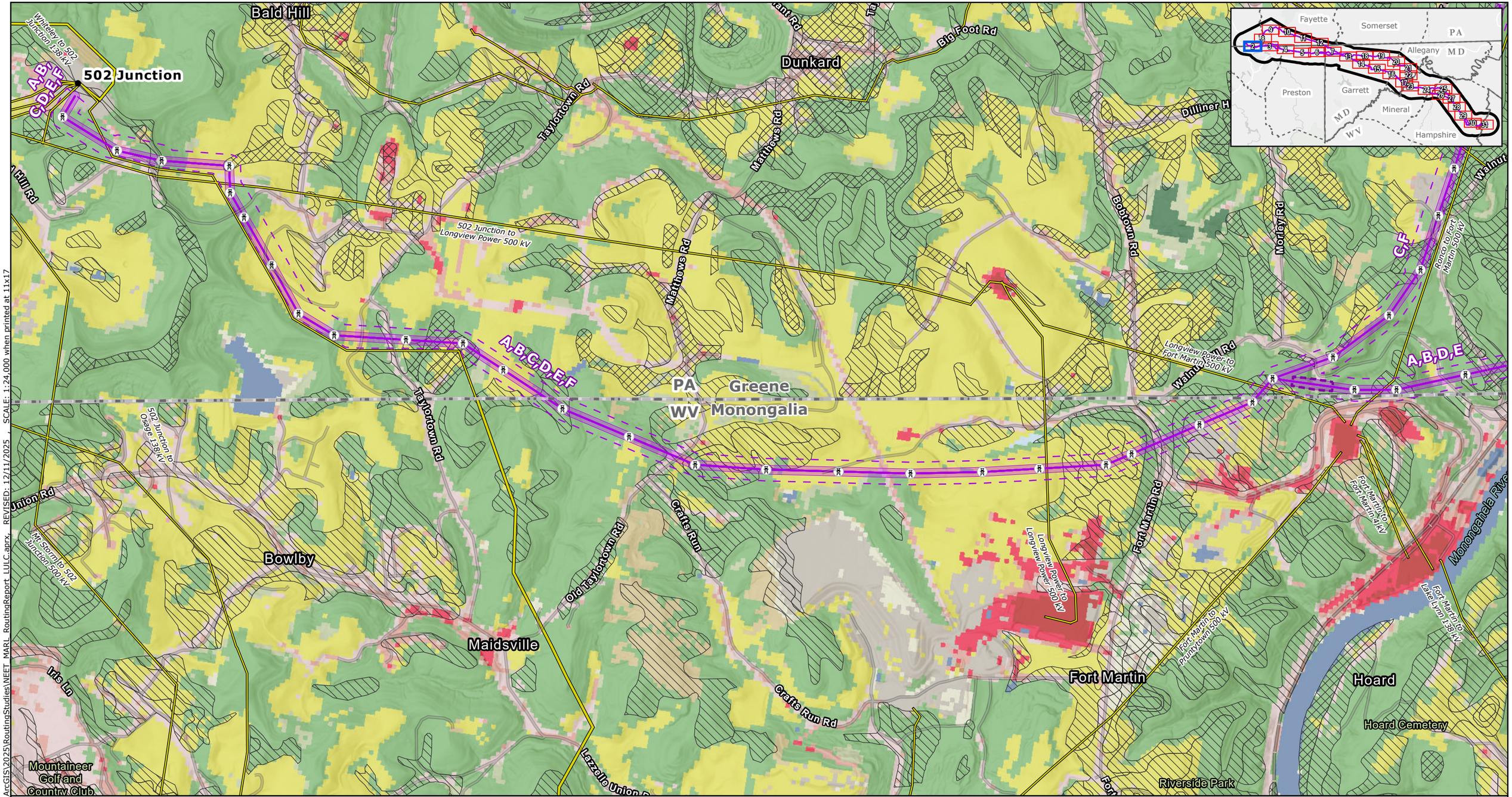

Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- State Border
- County Boundary

Farmland Class
- Prime Farmland
- Farmland of Statewide Importance
- Farmland of Local Importance

NLCD Land Cover (2024)
- Open Water
- Perennial Snow/Ice
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Dwarf Scrub
- Shrub/Scrub
- Grassland/Herbaceous
- Sedge/Herbaceous
- Lichens
- Moss
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
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NOTES
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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover

MidAtlantic Resiliency Link

ERM

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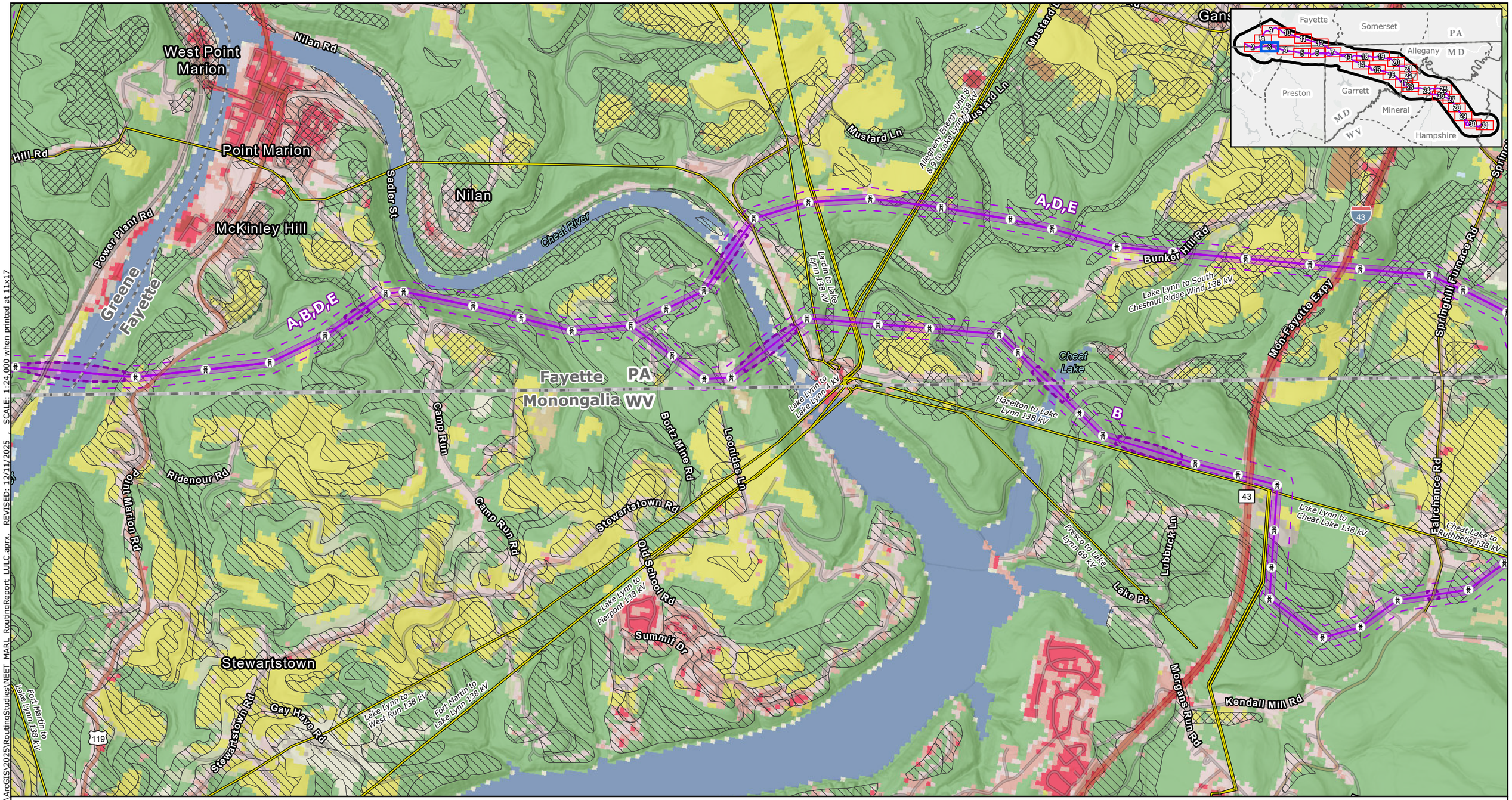
Coordinate System: NAD 1983 UTM Zone 17N



Proposed Project Components
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- Siting Corridors
- Project Study Area

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- Farmland of Statewide Importance
- Farmland of Local Importance

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- Developed Medium Intensity
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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover
Page 3 of 31
MidAtlantic Resiliency Link

ERM

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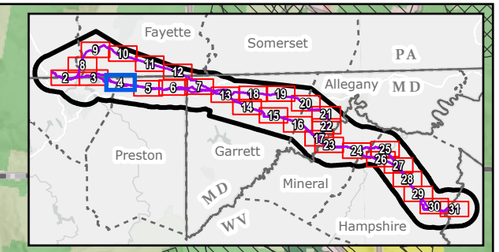

Springhill Furnace
Liberty Ln
Fayette
Monongalia
PA
WV
Wyn Gap
Fayette
Preston
Hileman Rd
Mount Grove Rd
Fairchance Rd
A,D,E
B
A,B,D,E
Ryan Holw E
Monongalia
Preston
Lake O Woods
Lake O Woods Rd
Hazelton to Lake Lynn 138 kV
Sand Springs Rd
Blaney Hollow Rd
B
A,D,E
Hileman Rd
Ryan Holw E
low Rd
Darnell Hollow Rd
West Virginia University Research Forest
Cheat Lake to Ruthbelle 138 kV
Hileman R

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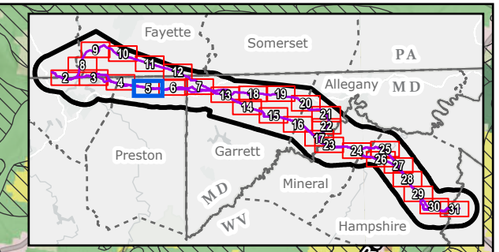

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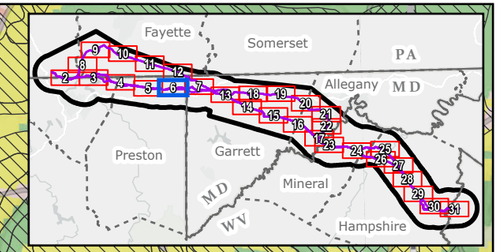

Salem
Salem Rd
Gipson Ln
Dennis Rd
Glade Farms
Golden Rd
Glade Farms Rd
N Preston Hwy
Moccasin Rocks Rd
Moccasin Rocks Rd
WV Preston
MD Garrett
South Chestnut Ridge Wind to Junction 106 138 kV
A,D,E
B
26
Rosenberg Rd
Hazelton to Lake Lynn 138 kV
Moyers Rd
Handlen
A,D,E
B
Jennings to Hazelton 138 kV
A,B,D,E
Sine Pl
Skyview Dr
Skyview Dr
Cherry Run Rd
Junction 106 to Albright 138 kV
Shady Grove Rd
Handlen
Glade Farms Rd
Skyview Dr
Bartholomew
Maryland Line Rd
Shady Grove Rd
Moyers Rd

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Agricultural and Land Cover
Page 6 of 31
MidAtlantic Resiliency Link

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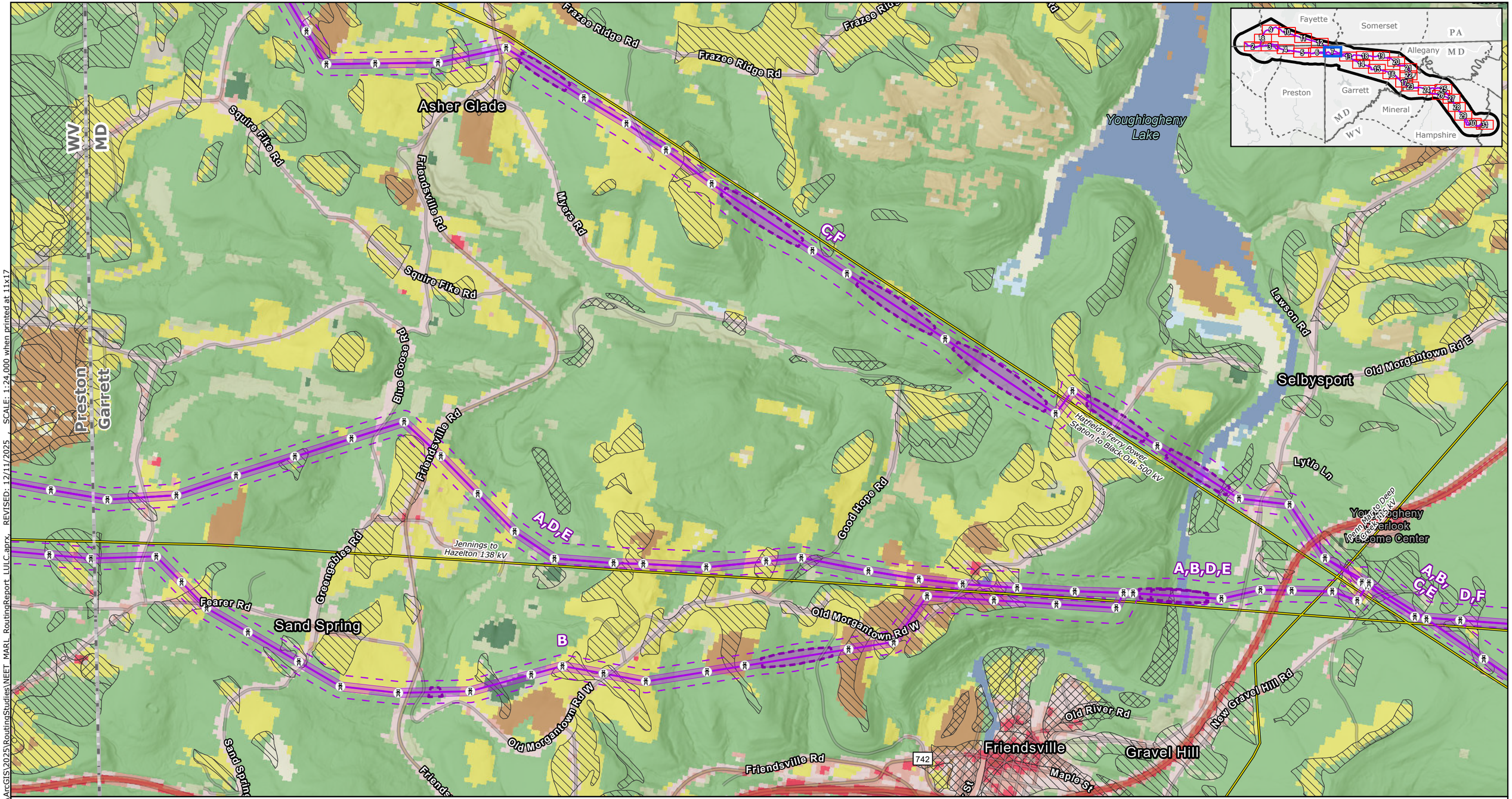

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Page 7 of 31
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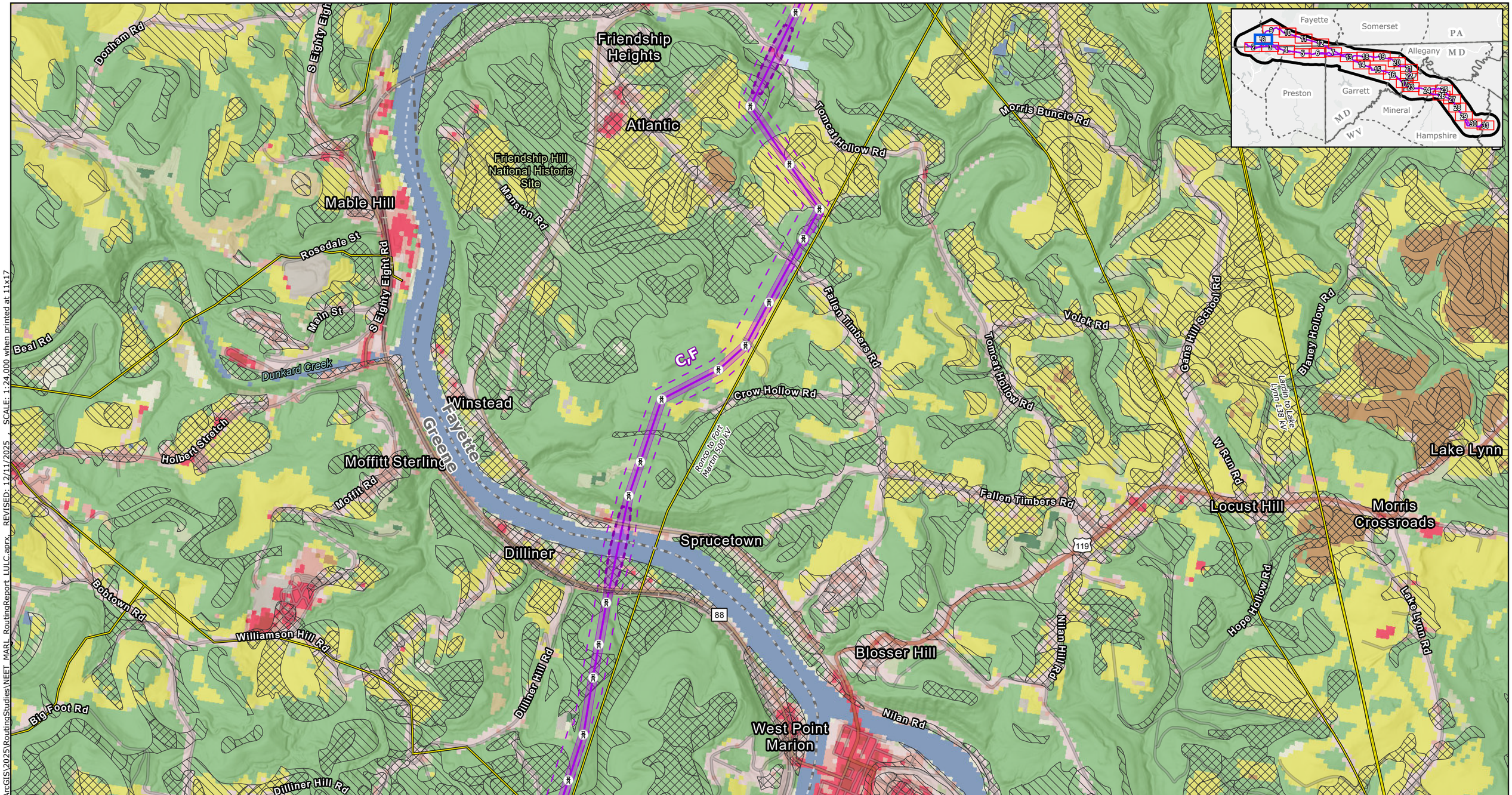

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Page 8 of 31
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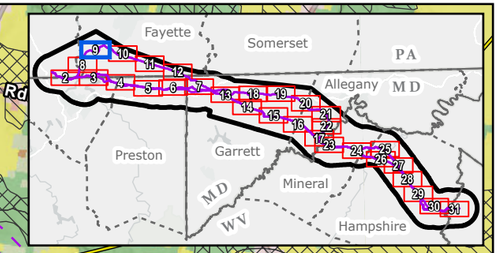

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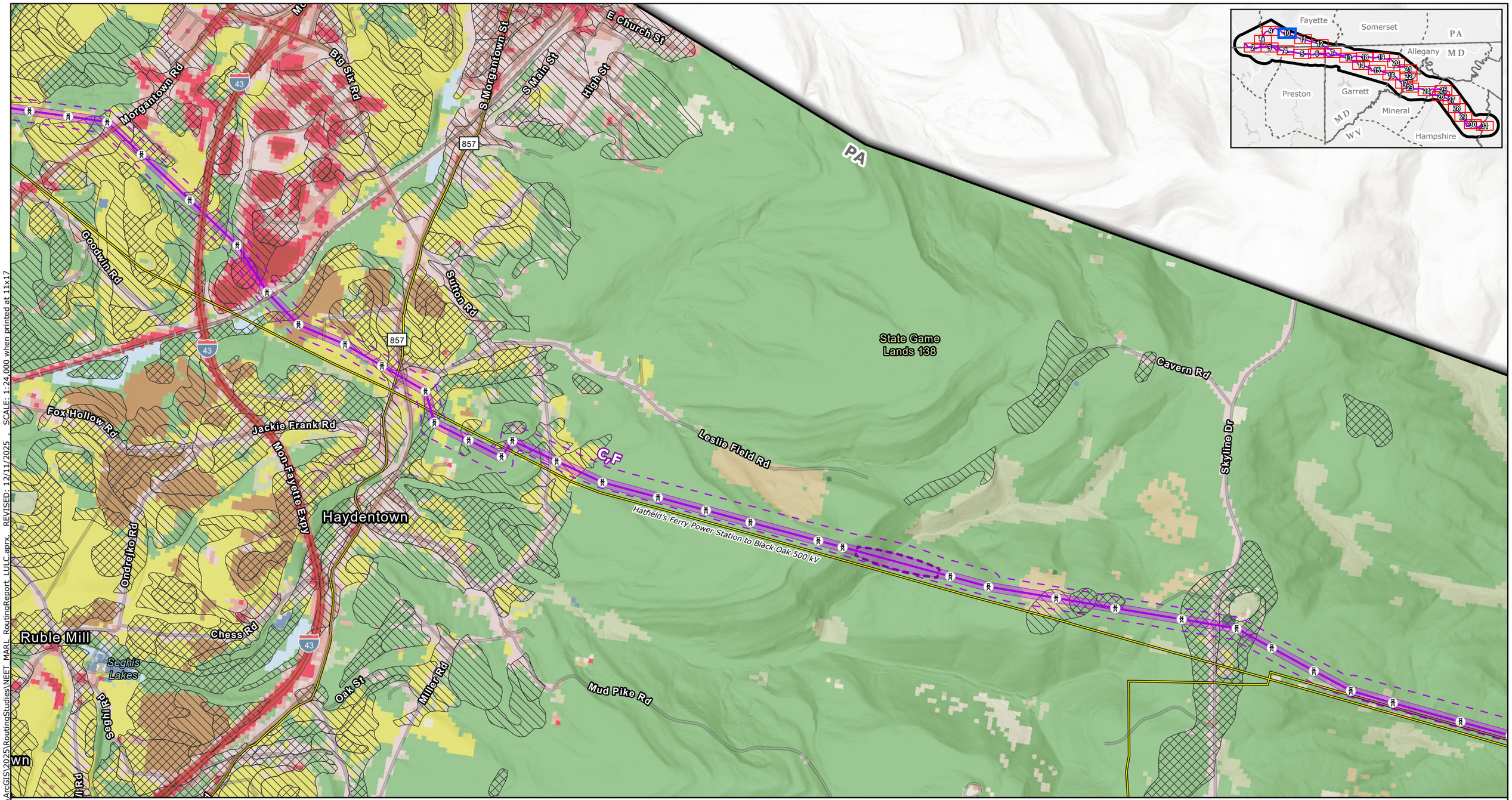

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Page 10 of 31
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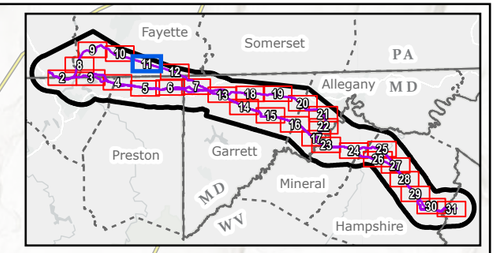

Kirby Rd
Kirby Rd
Cornish Rd
Thurby Rd
Elliottsville
Elliotsville Rd
Potter School Rd
381
Howard Rd
PA
Quebec Rd
C/F
Albright to Bethelboro 138 kV
Necessity to Brandonville 138 kV
Hatfield's Ferry Power Station to Black Oak 500 kV
Gibson Glade Rd
Sumey Rd
Stucksteger Rd
381
Memorial Dr
Quebec Run Wild Area

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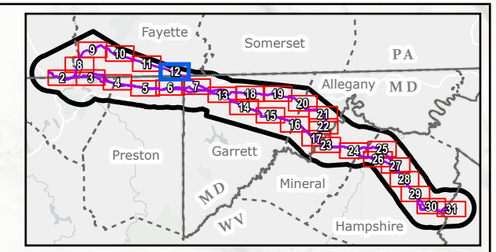

Lake Courage
PA
Clark Rd
Glade Rd
Glade Rd
Fiketown
Thomas Rd
Flat Rock Rd
C,F
Maust Rd
Dinner Bell Five Forks Rd
McCracken School Rd
Glades
Flat Rock Rd
281
Bruceton Rd
Hatfield's Ferry Power Station to Black Oak 500 kV
Brown Hill Rd
Five Forks Rd
Mason Dixon Rd
Five Forks
PA
WV
Fayette
Preston
Virginia Ln
PA
MD
Fayette
Garrett
Tallentire Rd
Flat Rocks Rd
N Preston Hwy
WV Preston
MD Garrett
Bower Rd
Dennis Rd
Chevelle Dr
Preston Hwy
Glade Rd

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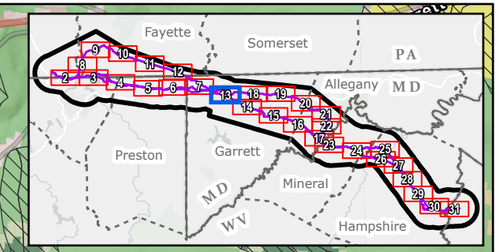

Penn Mar to Deep Creek 115 kV
Sam Friend Rd
Everly Rd
Harmon Rd
Garrett Hwy
Weaver Rd
D,F
Cove Rd
Jennings to Hazelton 138 kV
Harmon Rd
Bearfoot Rd
Everly Rd
A,B,C,E
Garrett Hwy
Collier Rd
Bear Creek Rd
Bear Creek Rd
Hatfield's Ferry Power Station to Black Oak 500 kV
Sale Barn Rd
Kaese Mill
Rabbit Hollow Rd
Garrett Hwy
Pud Miller Rd
Engle Mill
Bowman Hill Rd
Brobst Rd
Oak Hill Ln
Brobst Rd
Garrett Hwy

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Page 13 of 31
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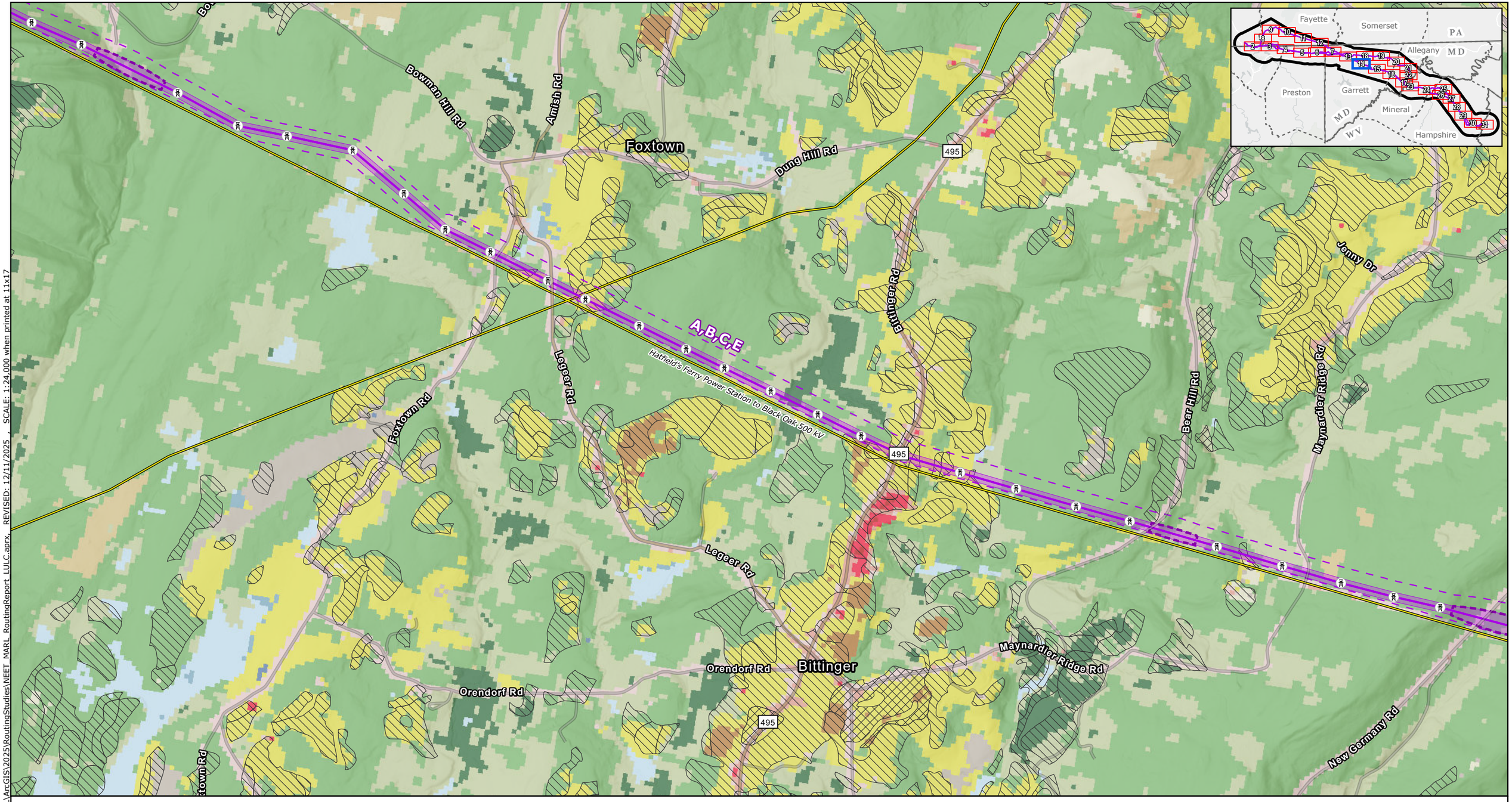

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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover

MidAtlantic Resiliency Link

ERM

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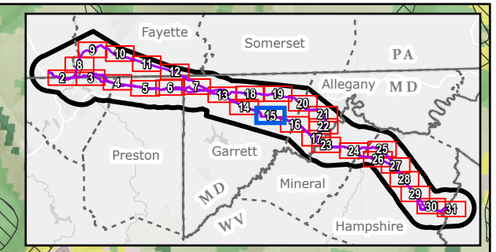

Fairview Rd
Fairview
Fairview Rd
Merrill
Hatfield's Ferry Power Station to Black Oak 500 kV
Carlos JCT to Garrett 138 kV
A,B,C,E
Big Run Rd
Westernport Rd
Swamp Rd
Pine Swamp
Russell Rd

Proposed Project Components
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Page 15 of 31
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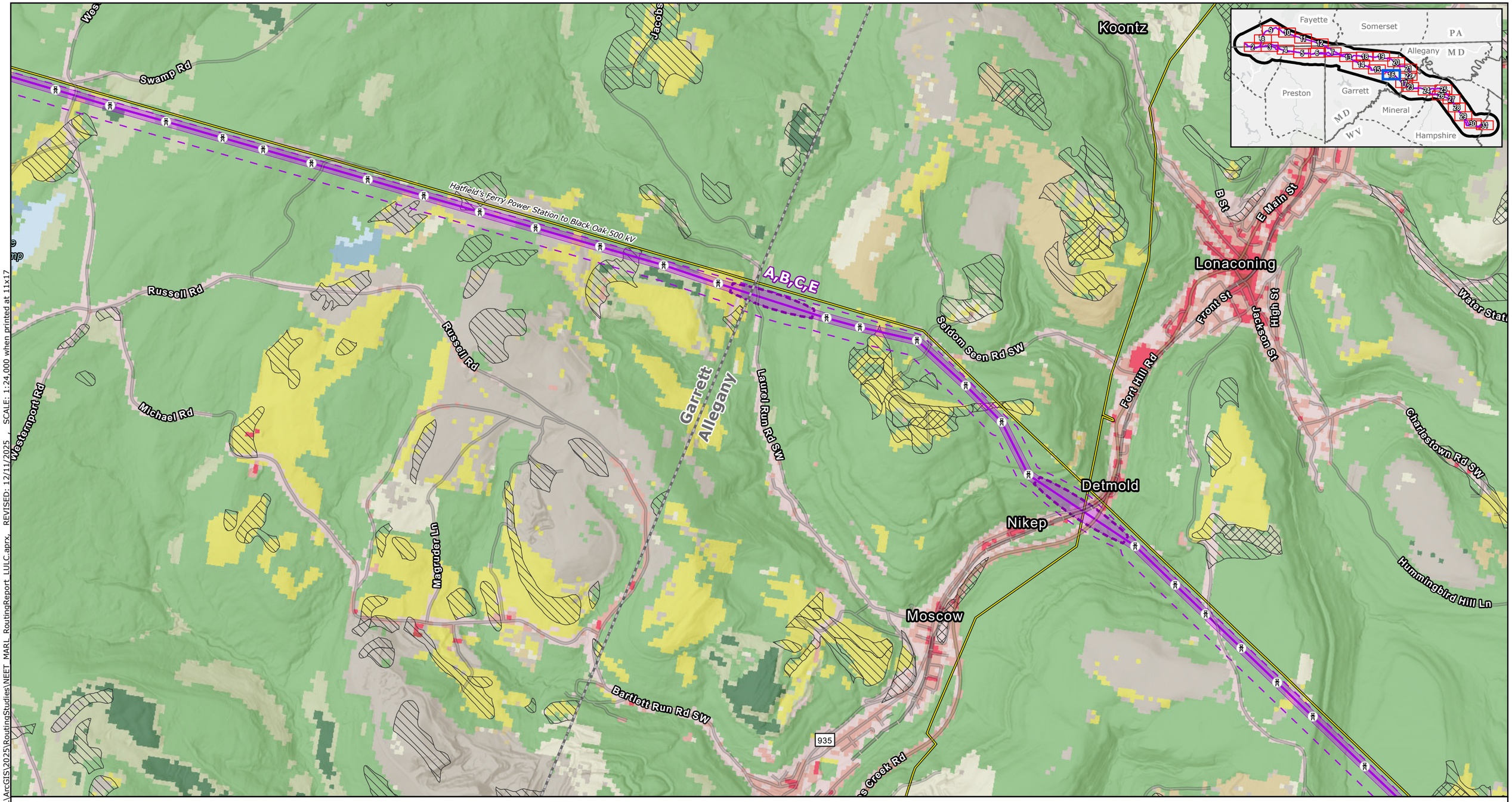

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Page 16 of 31
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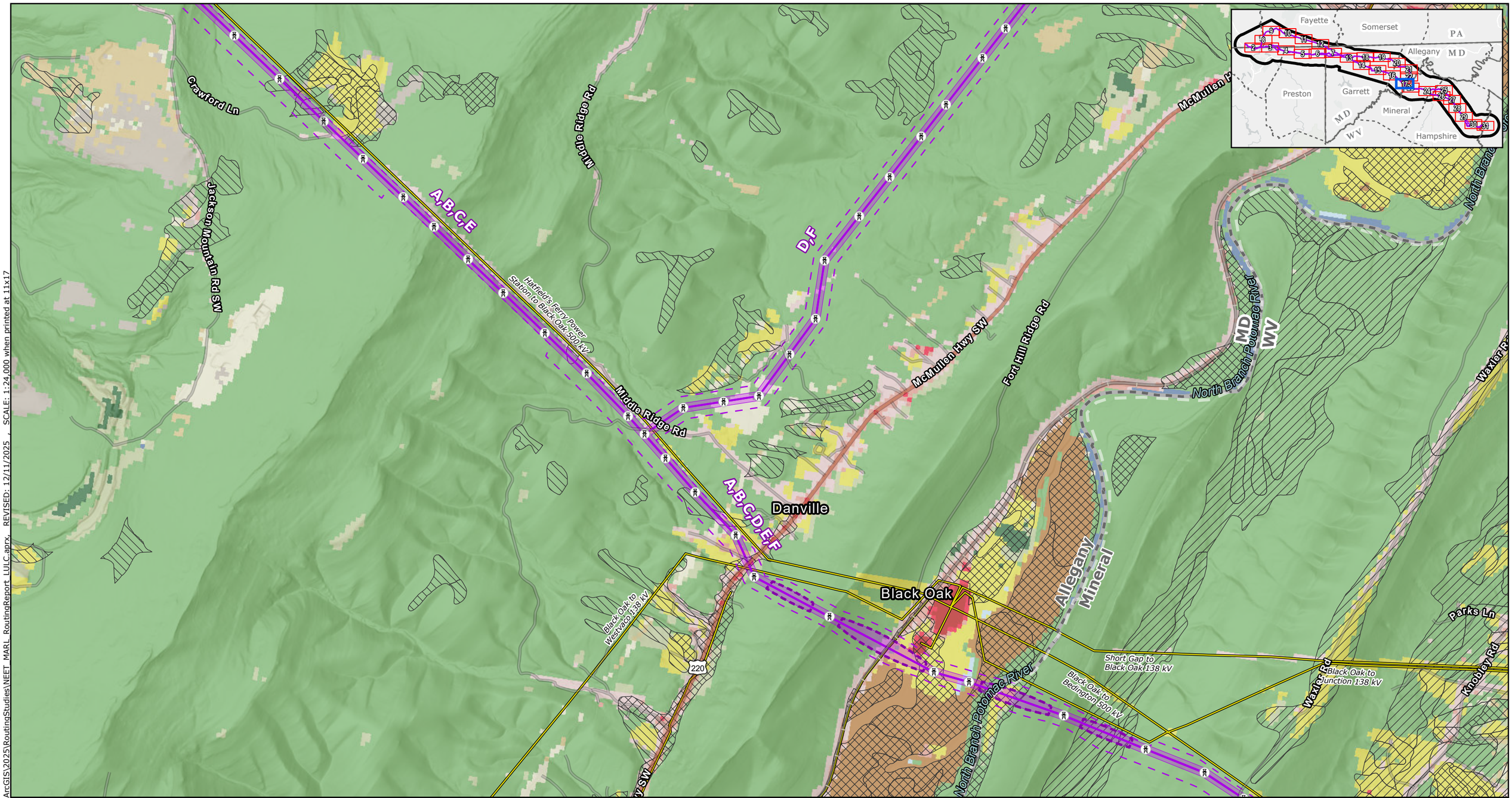

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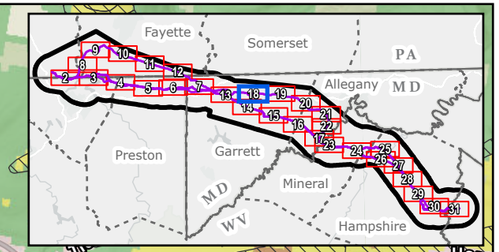

Casselman
Platter Rd
Fire Clay Rd
Maple Grove Rd
Hare Hollow Rd
Amish Rd
Bittinger Rd
Jennings to Hazelton 138 kV
Frostburg to Jennings 138 kV
Sherman Hare Rd
D/F
Bevansville
Jennings
Miller Rd
Miner Rd
Jennings Rd
Smith Rd
Bill Beitzel Rd
Bowman H
W Shale Rd

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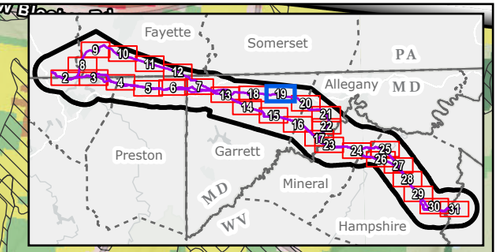

Fosters Inn Rd
Chestnut Ridge
Ellis Dr
Avilton Rd
Hare Hollow Rd
Salt Block Mountain Rd
Chestnut Ridge Rd
Ellis Dr
Chaney Rd
Sam Grow Rd
Avilton Connection Rd
Pine Grove Rd
McKenzie Rd
New Germany Rd
Lower New Germany Rd
D, P
Frostburg to Jennings 138 kV
Avilton
W Shale Rd
W Shale Rd
Twin Churches Rd
Poplar Lick Run
Pearridge Rd

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Page 19 of 31
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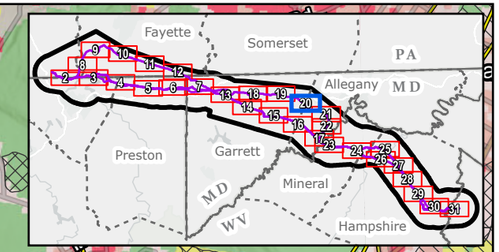

Callahan Swamp
Blean Avon Rd
View Ter NW
Midlothian Rd
Frostburg to Jennings 138 kV
68
Midlothian
Fair View Farm Rd
Shaft Rd SW
Shaft
Harvey Rd
Carlos
Frostburg Rd
Nordex Rd
Nordex Rd
Avilton Lonaconing Rd
Avilton Lonaconing Rd
Ida Ln
Garrett
Allegany
D
F
Old Legislative Rd SW
Cabin Run Rd SW
National
Klondike
Woodland
HORNER HILL RD
Carlos JCT to Garrett 138 kV
Ridgeley to Carlos JCT 138 kV
Carlos
Ocean

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Page 20 of 31
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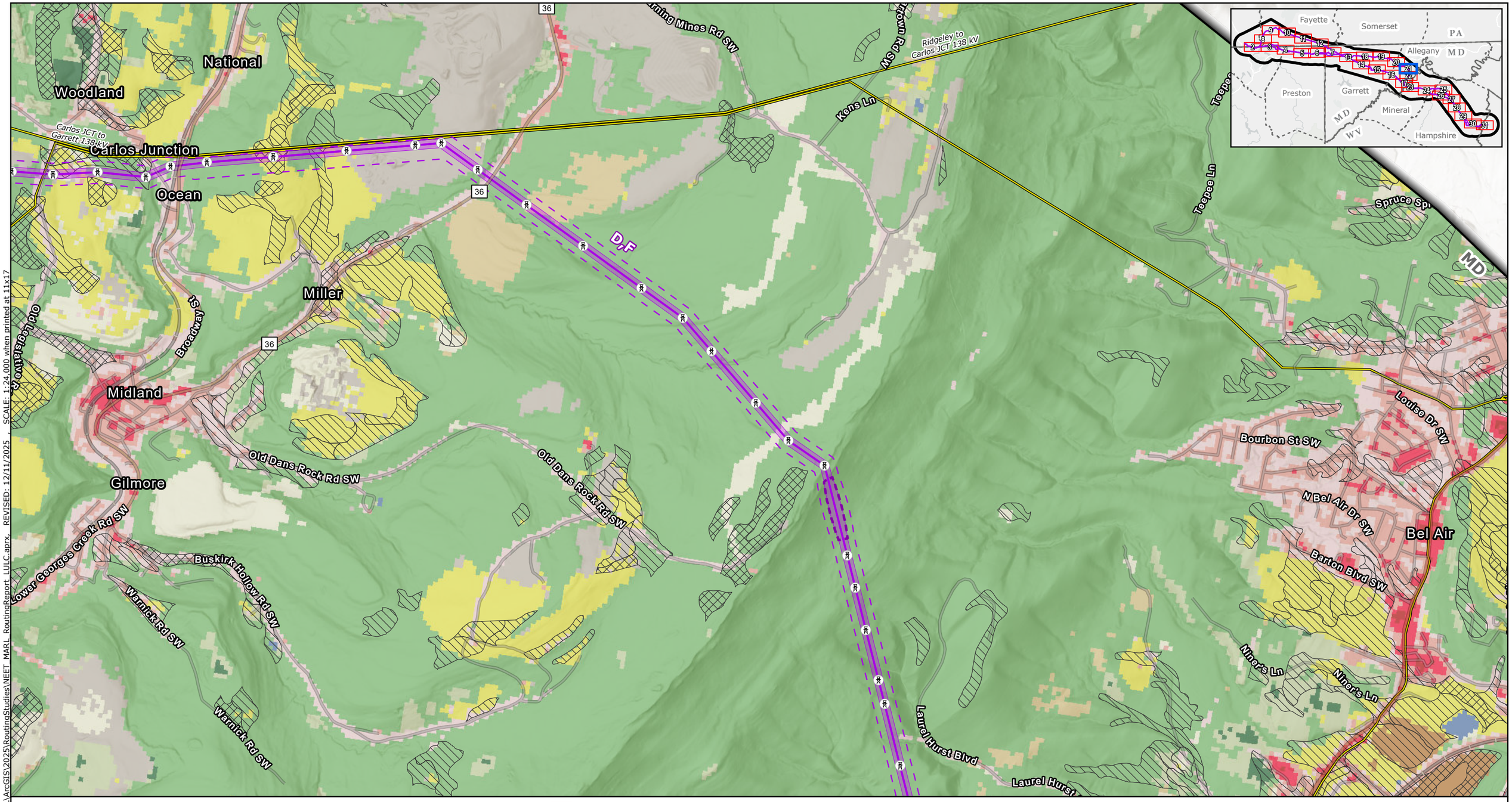

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Page 21 of 31
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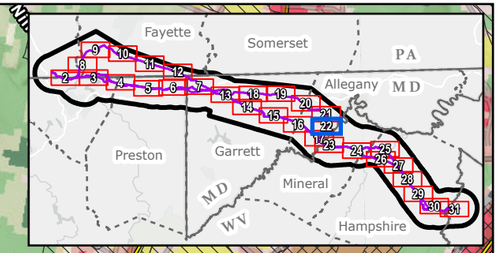

Warnick Rd SW
Laurel Hurst Blvd
Laurel Hurst Blvd
Barton Park Dr
Rebecca Ln
956
Dan's Mountain Campground
McMullen Hwy SW
MD
WV
Mountain Ridge Rd
Mountain Ridge Rd
D,F
Rocket Center Rd
Bier
Flanagan Rd
Fore Sisters Golf Course
Allegany
Mineral
956
Middle Ridge Rd
Rawlings Heights
220
Waxler Rd
Rawlings
McMullen Hwy SW
Waxler Rd
Middle Ridge Rd

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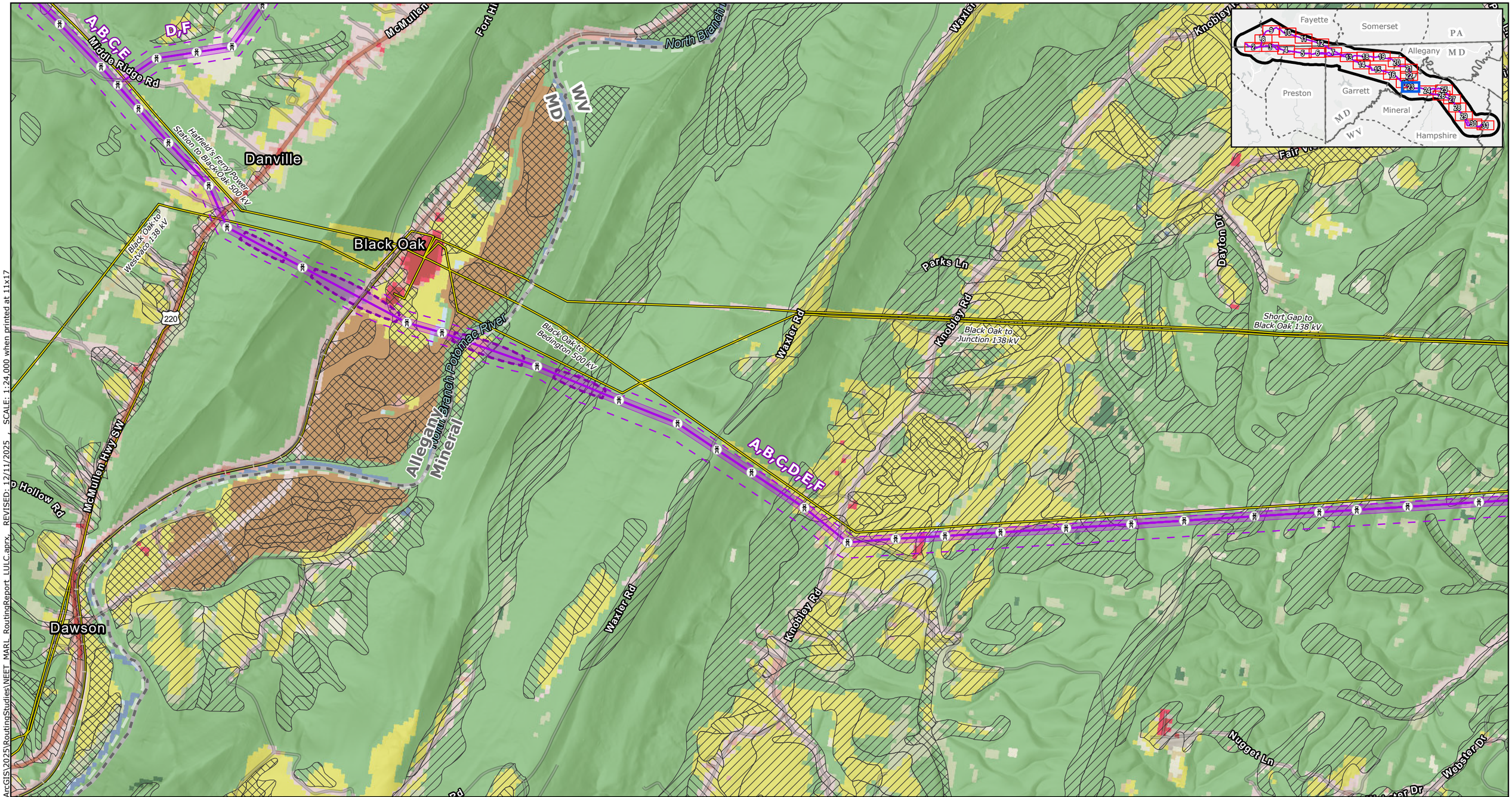

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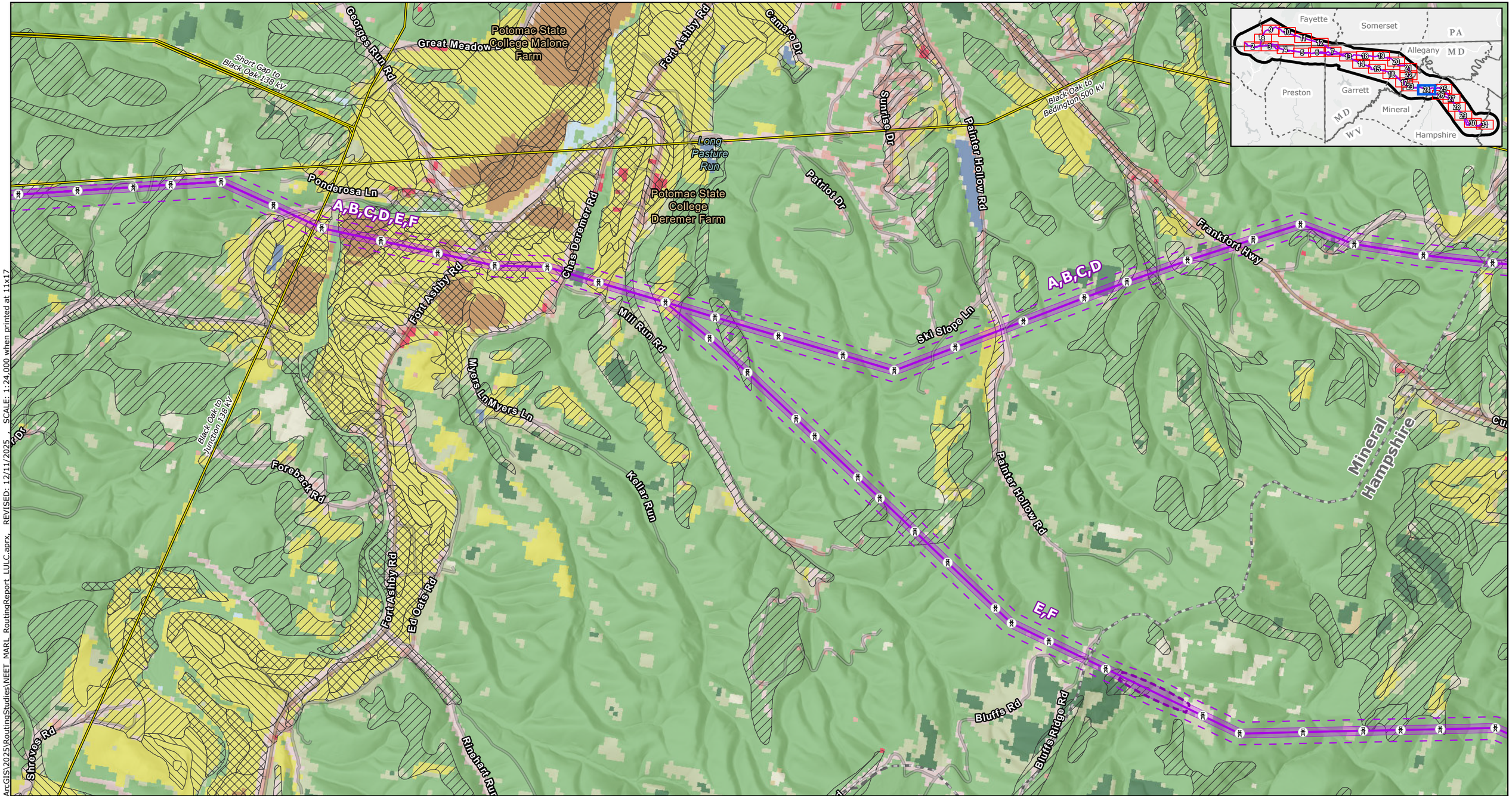

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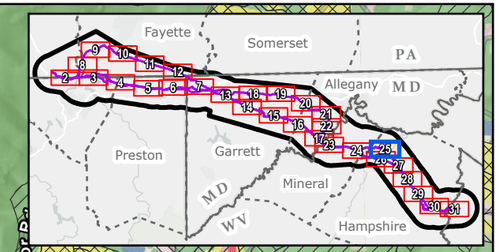

Donaldson Loop Rd
Mineral
Hampshire
Millerwood Ln
Greenspring Valley Rd
Goldsborough Rd
A,B,C,D
Campbell Rd
Gall Ln
Clarence Taylor Rd
Beach Rd
Lake Ferndale Dr
Oak Hill Dr
High Ridge Dr
Black Oak to Bedington 500 kV
Campbell Rd
Ferndale Farms Recreation Lake
Lake Ferndale Dr
Ashby Rd
Milleson
28
White Horse Rdg
White Horse Loop
White Horse Rdg
Clarence Taylor Rd
Hampshire to Ridgeley 138 kV
Springfield Pike
Antler Rd
A,B,C,D
Albino Dr
Locust Grove Rd
Springfield

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ERM

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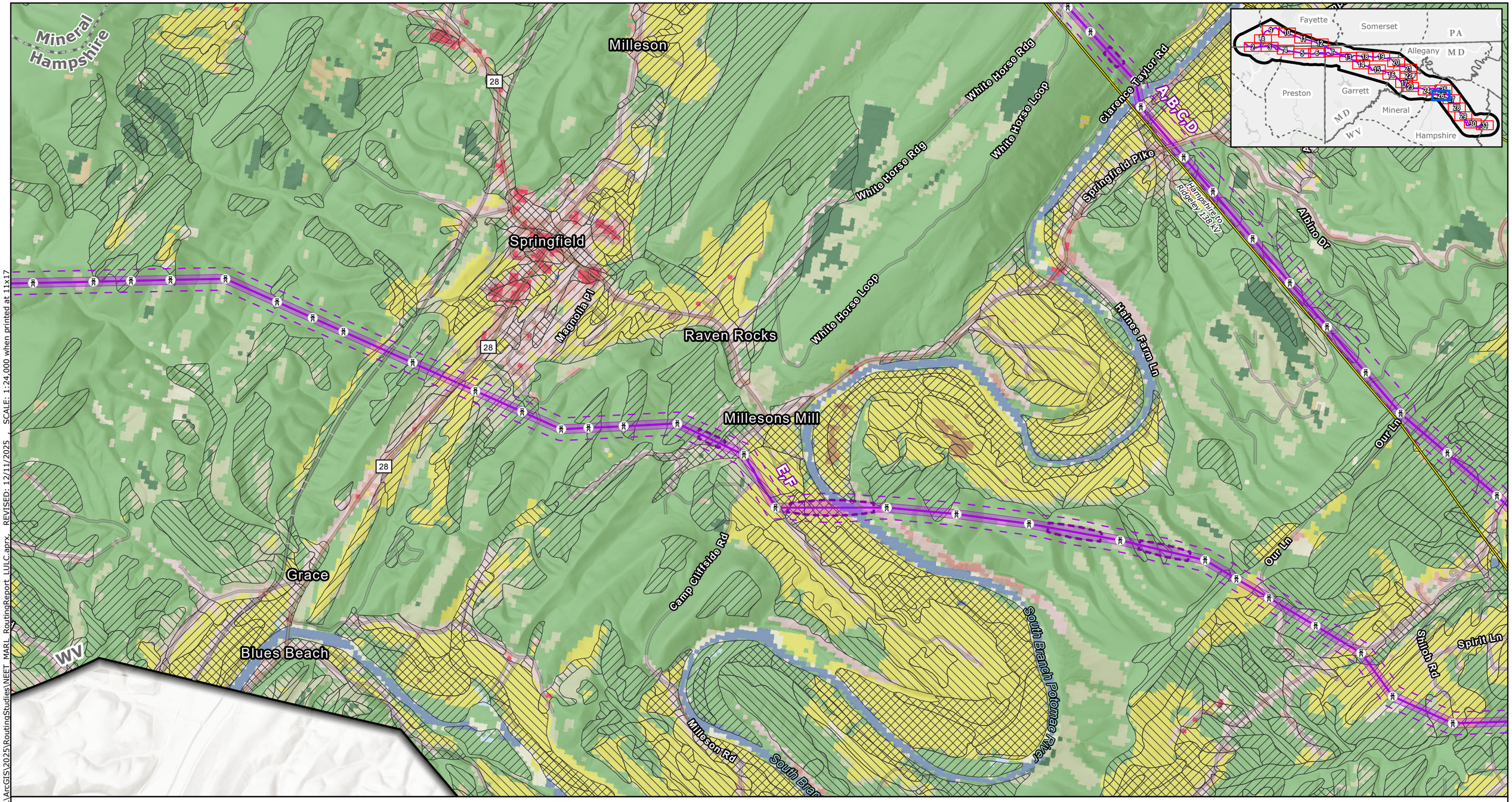

Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- State Border
- County Boundary

Farmland Class
- Prime Farmland
- Farmland of Statewide Importance
- Farmland of Local Importance

NLCD Land Cover (2024)
- Open Water
- Perennial Snow/Ice
- Developed Open Space
- Developed Low Intensity
- Developed Medium Intensity
- Developed High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Dwarf Scrub
- Shrub/Scrub
- Grassland/Herbaceous
- Sedge/Herbaceous
- Lichens
- Moss
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

NOTES
1. *Proposed tower locations are preliminary and subject to change*
2. *Data source: NEET, ERM, USGS, NLCD 2024*

N

0 0.25 0.5 0.75 1
Miles

Scale: 1:24,000
1 inch equals 2,000 ft (when printed at 11x17)

Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover
Page 26 of 31
MidAtlantic Resiliency Link

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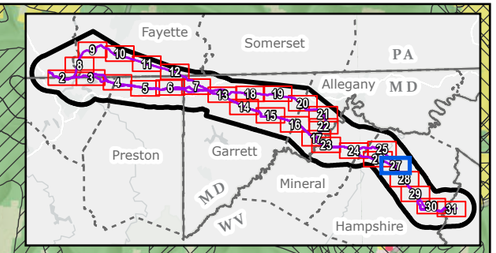

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N

0 0.25 0.5 0.75 1

Miles

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Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover

MidAtlantic Resiliency Link

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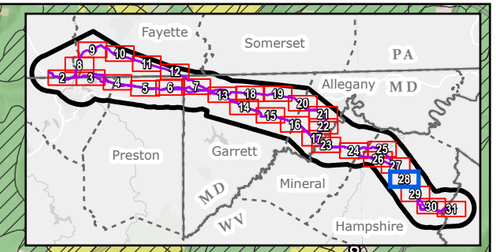

Three Churches Holw
Little Cacapon Rd
Riverwood Trl
Gore
Tanglewood Dr
County Route 3/5
Spring Gap Rd
Slanesville Pike
Braddo
E,F
A,B,C,D
Ridge Rd
Milleson Rd
A,B,C,D,E,F
Longview Farms Ln
Slanesville
Clifton Rd
Bloomery Pike
Sirks Ln
Old Martinsburg
Hampshire to Ridgeley 138 kV
Kedron
Jessies Way
Old Martinsburg
Hayf
apon Rd
o Estate Trl

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Agricultural and Land Cover
Page 28 of 31
MidAtlantic Resiliency Link

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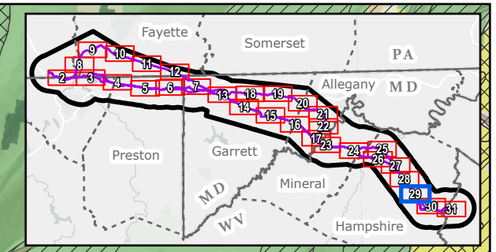

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Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover
Page 29 of 31
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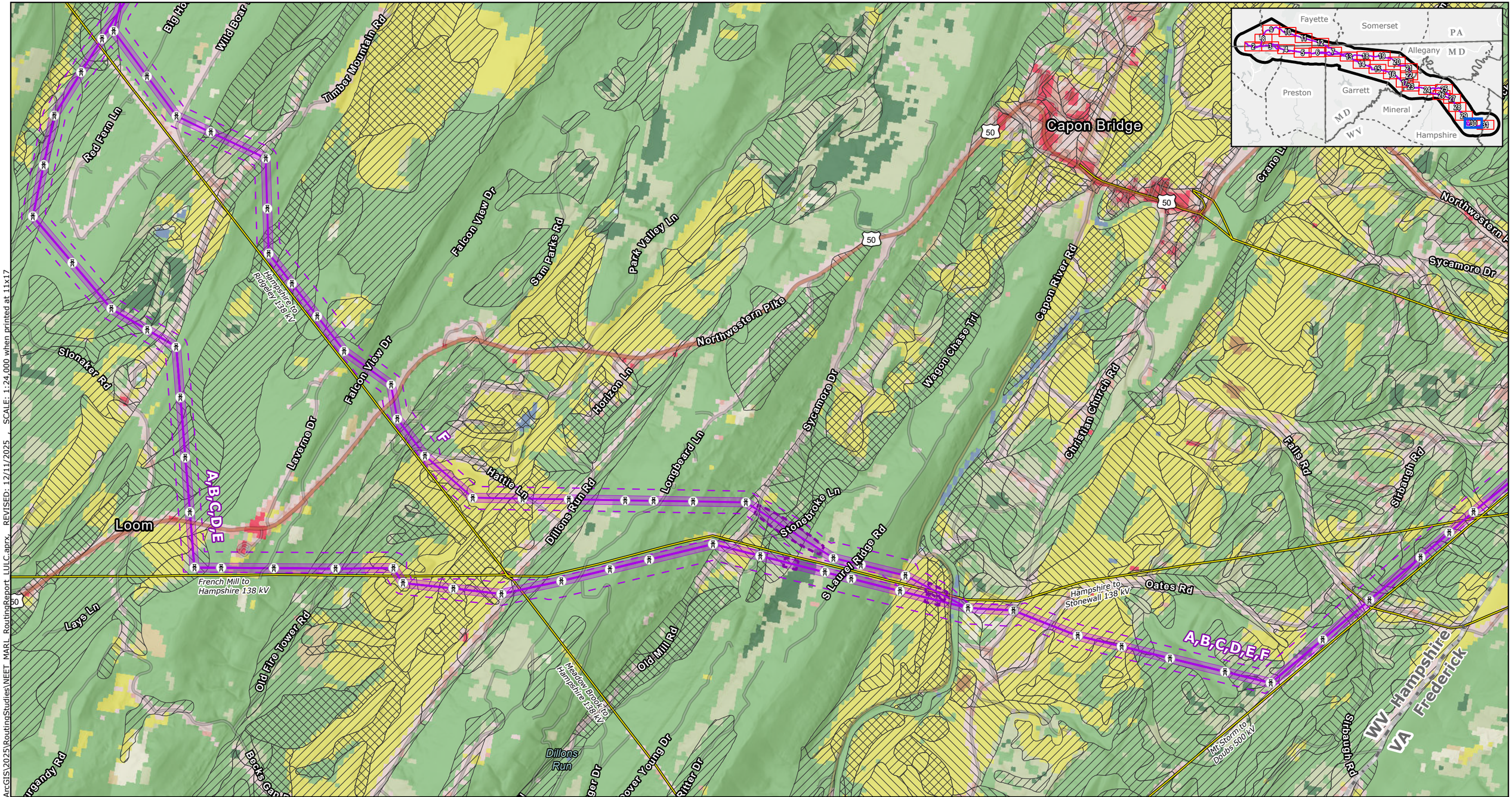

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Miles

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Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover
Page 30 of 31
MidAtlantic Resiliency Link

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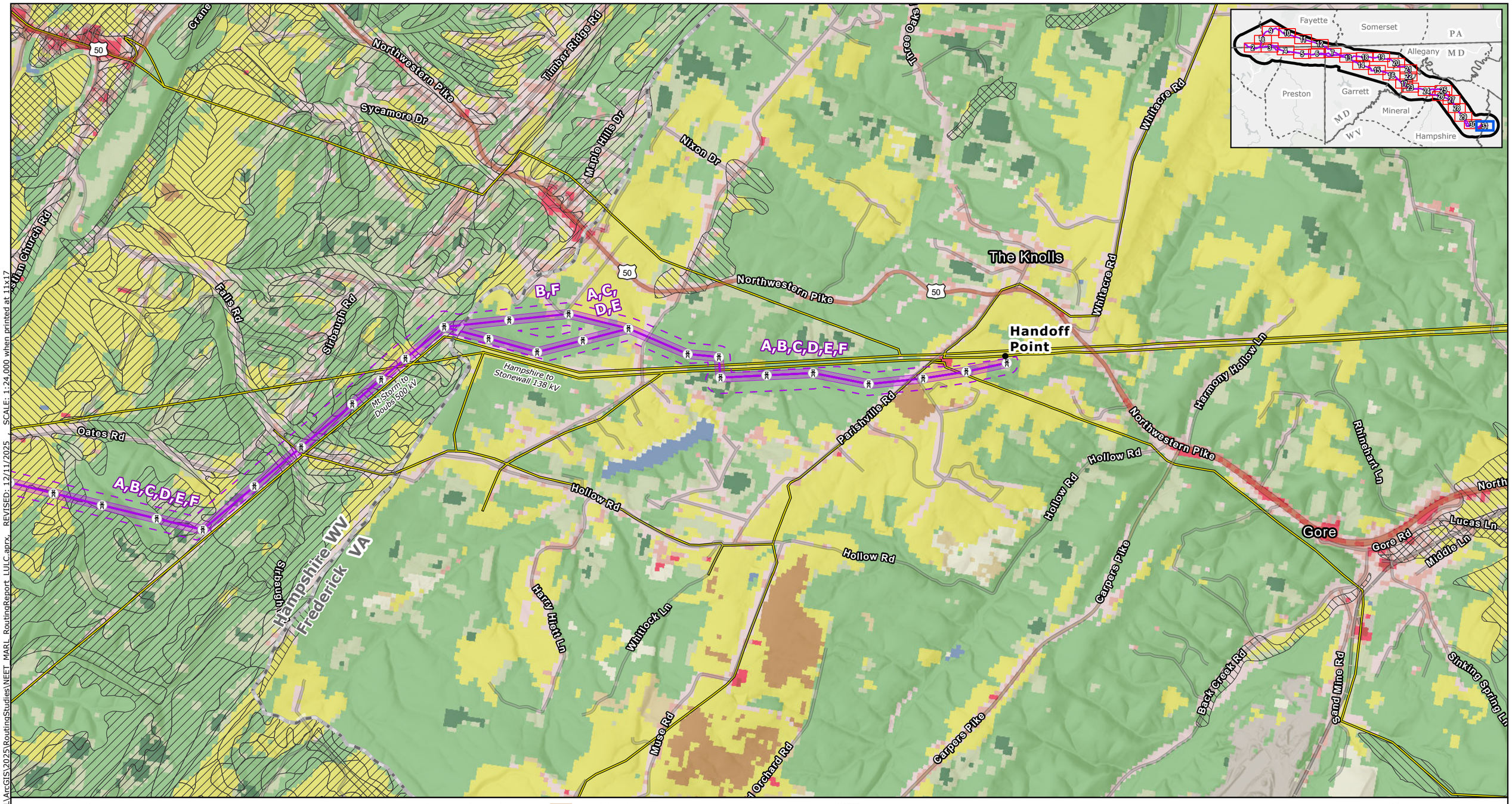

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0 0.25 0.5 0.75 1
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Appendix E-10
Alternative Routes
Land Use and Social Resources
Agricultural and Land Cover

MidAtlantic Resiliency Link

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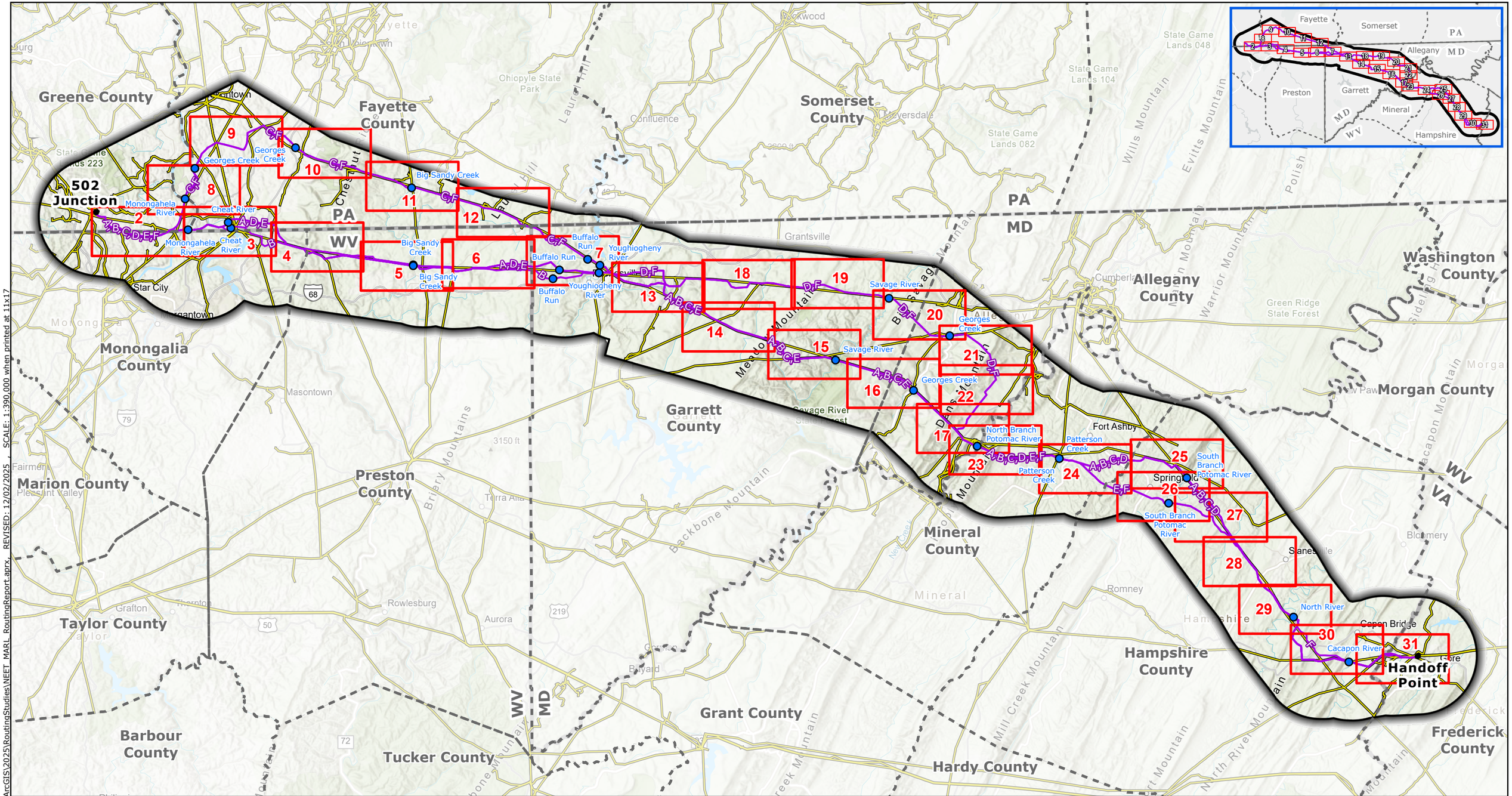
APPENDIX E-11 ALTERNATIVE ROUTES—NATURAL ENVIRONMENT—WATER RESOURCES MAPBOOK



Proposed Project Components
- Project Endpoints
- Alternative Routes
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- Map Index Page
- State Border
- Large Waterbody Crossings

NOTES
1. *Proposed tower locations are preliminary and subject to change*
2. *Data source: NEET, ERM, USGS, USFWS, REXTAG, MDNR, MDiMAP, PASDA, WVDEP, VADCR*

N

0 4 8 12 16
Miles

Scale: 1:390,000
1 inch equals 32,500 ft (when printed at 11x17)

Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 1 of 31
MidAtlantic Resiliency Link

ERM

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Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Water Resources
- Stream/River - Intermittent(NHD)
- Stream/River - Perennial (NHD)
- Trout Streams and Coldwater Fisheries (all states)
- NHD Waterbody
- NWI Wetlands (All Types)
- Modeled High Probability Wetlands

FEMA Flood Hazard
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

NOTES
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2. *Data source: NEET, ERM, USGS, USFWS, REXTAG, MDNR, MDiMAP, PASDA, WVDEP, VADCR*

N

0 0.25 0.5 0.75 1
Miles

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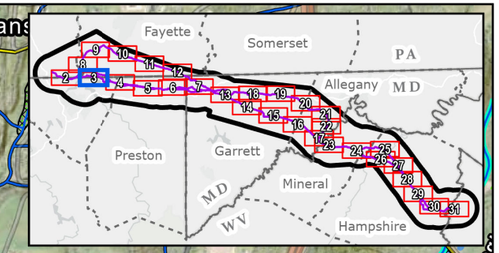
Coordinate System: NAD 1983 UTM Zone 17N

Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 2 of 31
MidAtlantic Resiliency Link

ERM



West Point Marion
Nilan Rd
Monongahela River (Section 10 Navigable Waters)
Point Marion
Hill Rd
Power Plant Rd
Monongahela River
Greene
Fayette
McKinley Hill
Sadler St
Nilan
Cheat River (Section 10 Navigable Waters)
Lardin to Lake Lynn 138 kV
Mustard Ln
Allegheny Energy Unit 6 & 9 to Lake Lynn 138 kV
A,D,E
Grassy Run
Bunker Hill Rd
Lake Lynn to South Chestnut Ridge Wind 138 kV
Rubles Run
Springhill Furnace Rd
Ryan Hollow Run
Mon-Fayette Expy
Camp Run
A,B,D,E
Fayette
Monongalia
PA
WV
Cheat Lake
Rubles Run
B
Lake Lynn to Cheat Lake 138 kV
Hazelton to Lake Lynn 138 kV
Fairchance Rd
Cheat Lake to Ruthbelle 138 kV
Point Marion Rd
Ridenour Rd
Camp Run
Camp Run Rd
Stewartstown Rd
Bortz Mine Rd
Leonidas Ln
Lake Lynn to Lake Lynn 138 kV
Cheat River (Section 10 Navigable Waters)
Presco to Lake Lynn 69 kV
Lubbuck Ln
Lake Pt
Morgan Run
Old School Rd
Lake Lynn to Pierpont 138 kV
Summit Dr
Stewartstown
Stewartstown Rd
Gay Have Rd
Lake Lynn to West Run 138 kV
Fort Martin to Lake Lynn 138 kV
Fort Martin to Lake Lynn 138 kV
119
Cheat River
Morgans Run Rd
Kendall Mill Rd
Blaney Hollow
43

Proposed Project Components
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- ROW Corridors
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Water Resources
- Stream/River - Intermittent(NHD)
- Stream/River - Perennial (NHD)
- Trout Streams and Coldwater Fisheries (all states)
- NHD Waterbody
- NWI Wetlands (All Types)
- Modeled High Probability Wetlands

FEMA Flood Hazard
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

NOTES
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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 3 of 31
MidAtlantic Resiliency Link

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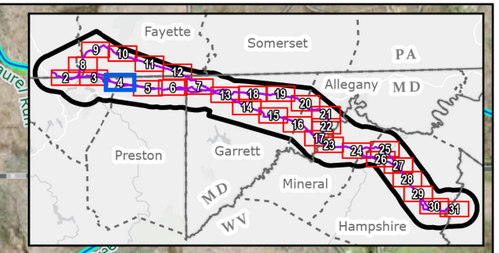

Springhill Furnace
Liberty Ln
Ryan Hollow Run
Dragoo Hollow Run
Patterson Run
Laurel Run
Fayette
Monongalia
PA
WV
Gap
Fayette
Preston
Monongalia
Preston
Hileman Rd
Laurel Run/Big Sandy Creek
Mount Grove Rd
Hazel Run
Fairchance Rd
A,D,E
B
A,B,D,E
Ryan Holw E
Hazelton to Lake Lynn 138 kV
Lake O Woods
Patterson Run
Lake O Woods Rd
Sand Springs Rd
B
Blaney Hollow Rd
Blaney Hollow
Hileman Rd
A,D,E
Hazel Run
low Rd
Darnell Hollow Rd
Ryan Holw E
West Virginia University Research Forest
Little Laurel Run
Little Laurel Creek
Cheat Lake to Ruthbelle 138 kV
Patterson Run
Hazel Run
Hileman R

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Page 4 of 31
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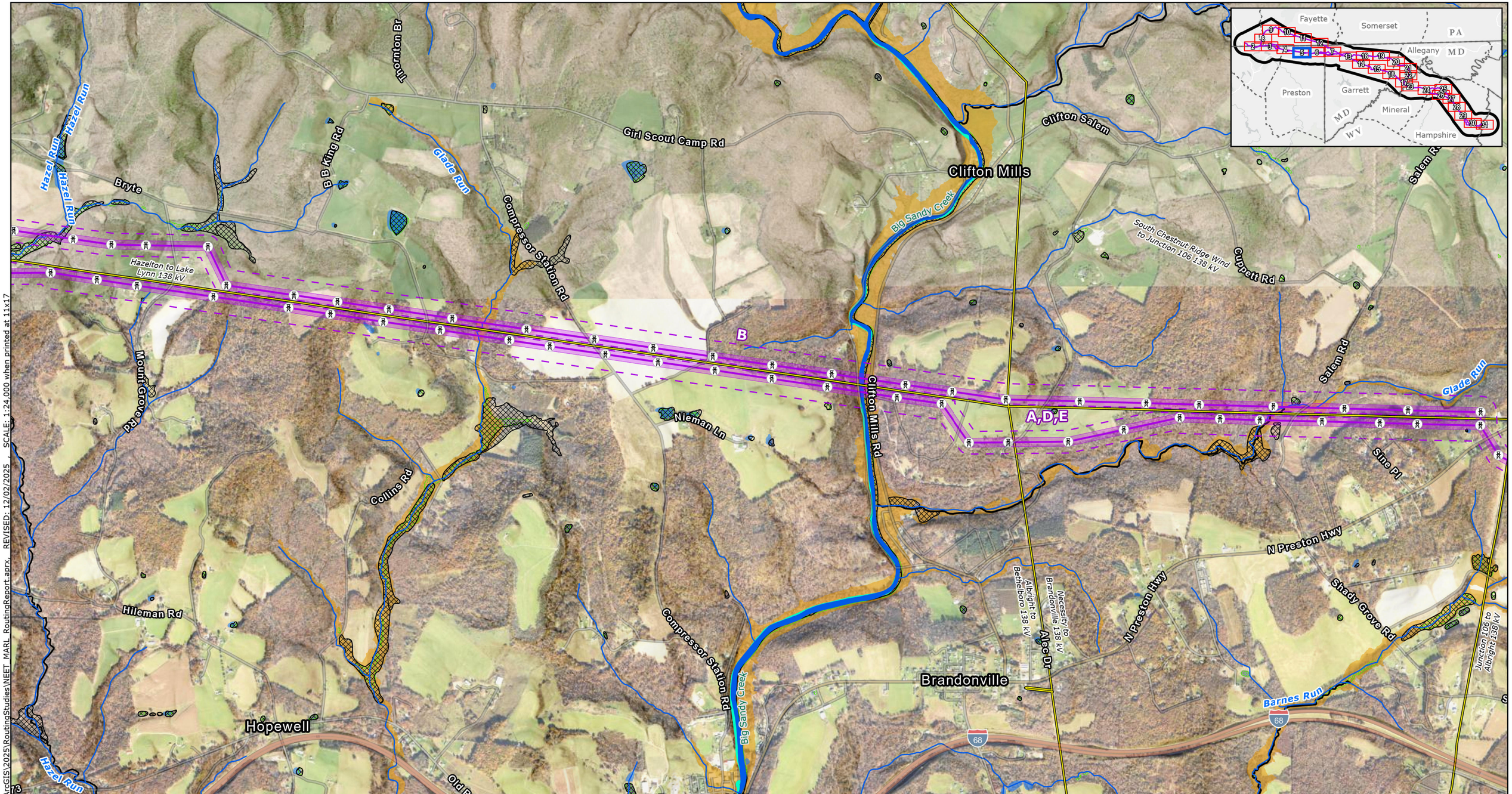

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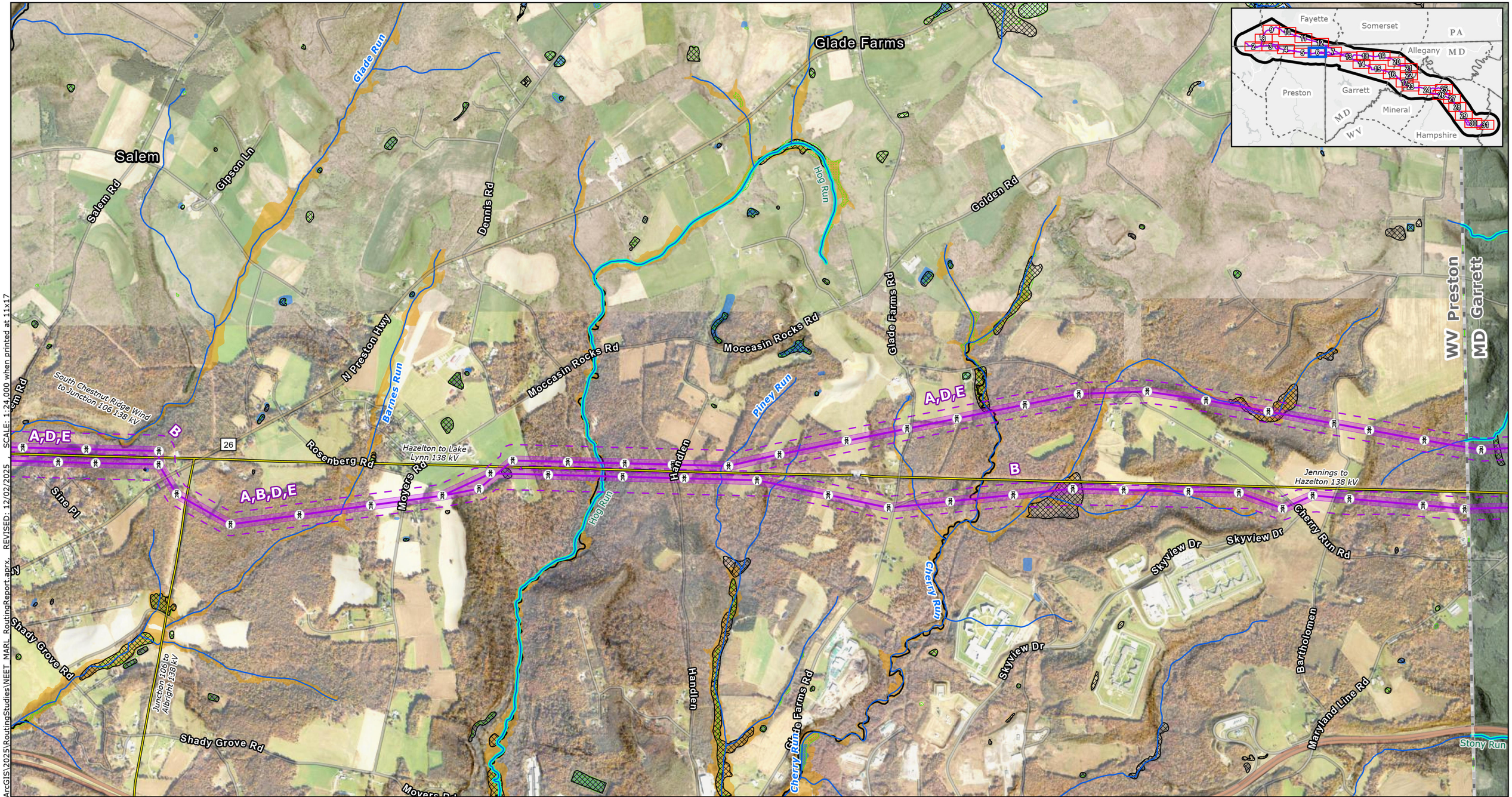

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Page 6 of 31
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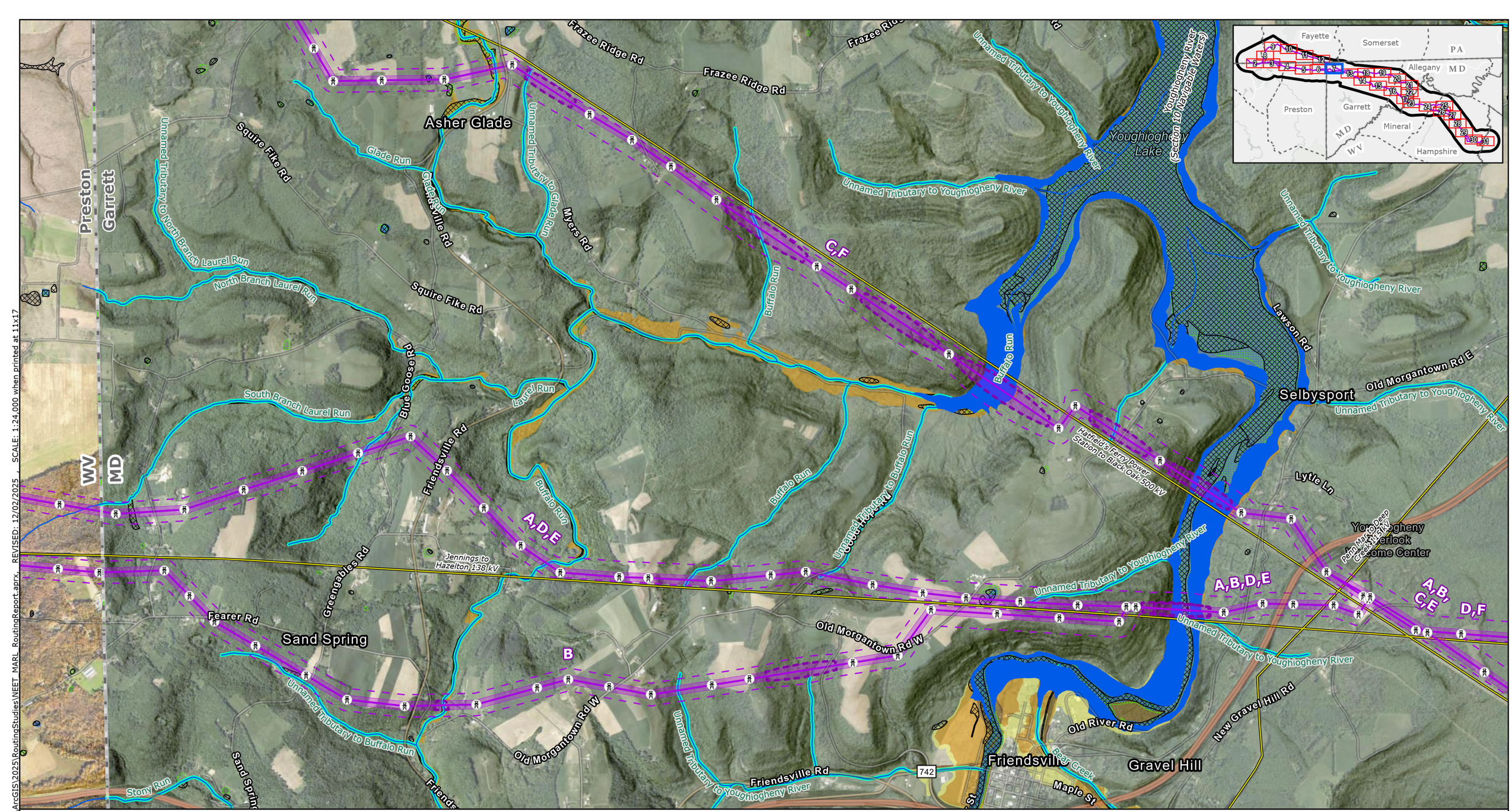

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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 7 of 31
MidAtlantic Resiliency Link

ERM

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- Alternative Routes
- ROW Corridors
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- Existing High-Voltage Transmission Lines
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Water Resources
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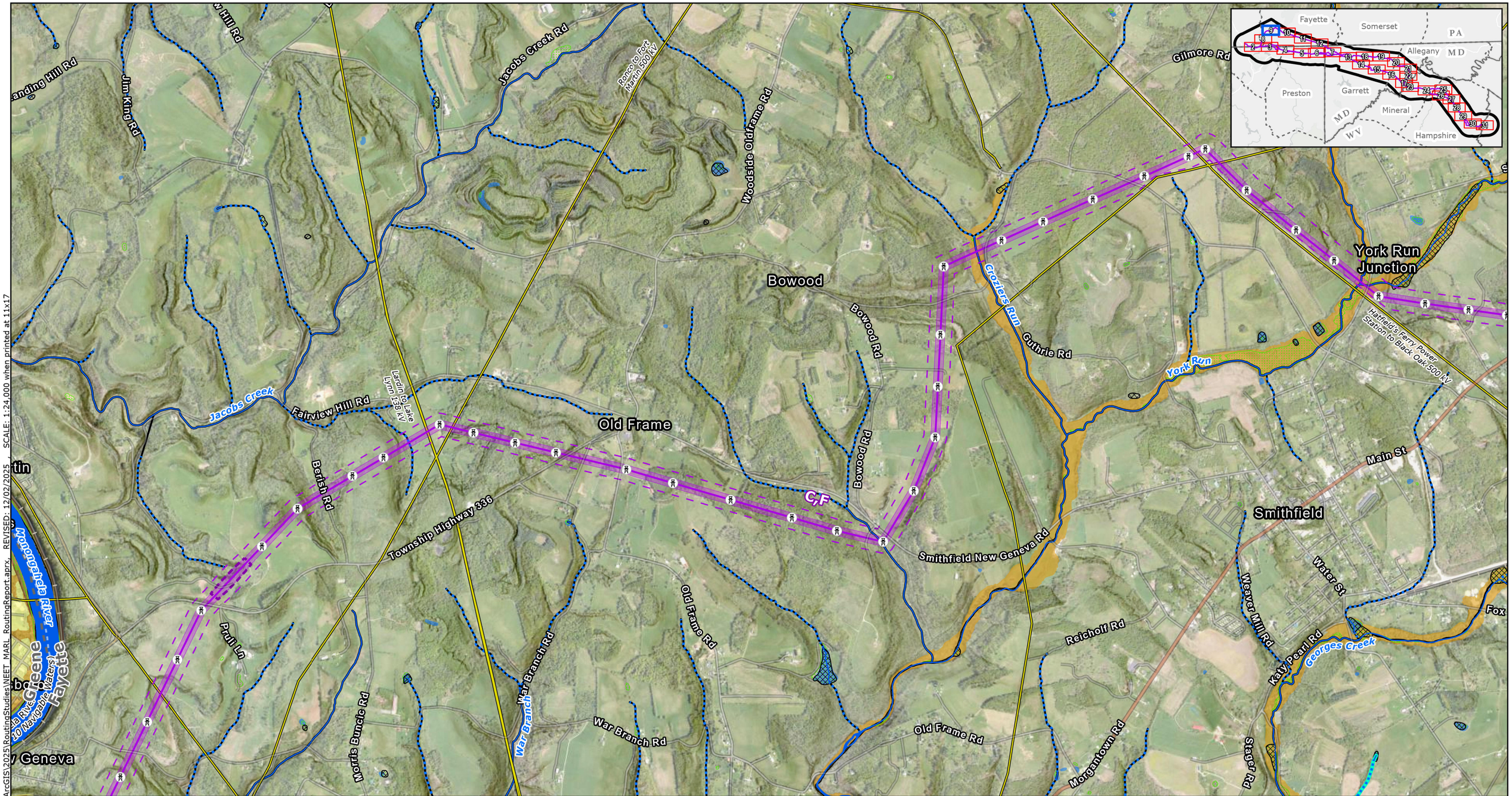

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Water Resources
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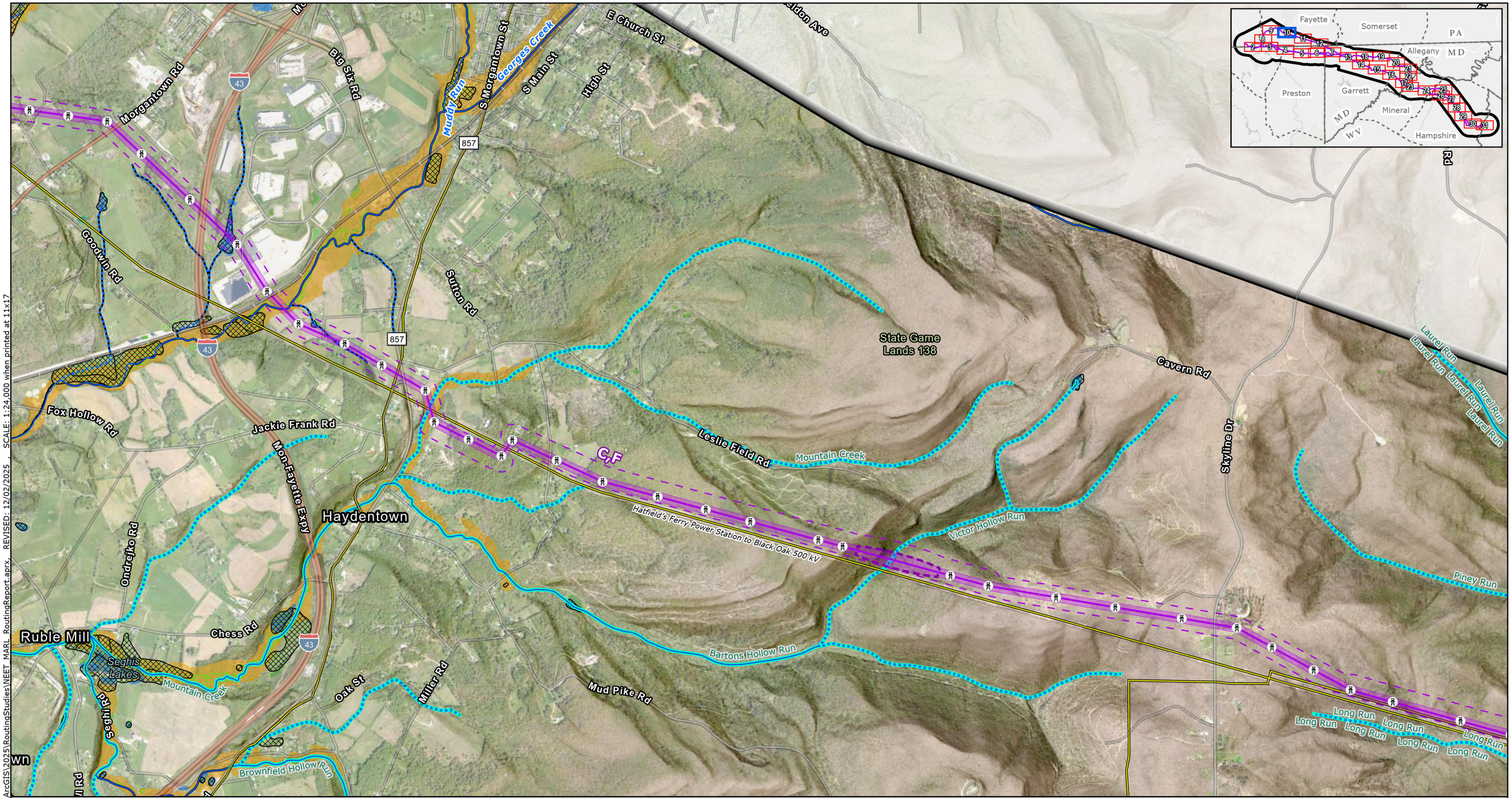

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Appendix E-11
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Natural Environment
Water Resources
Page 10 of 31
MidAtlantic Resiliency Link

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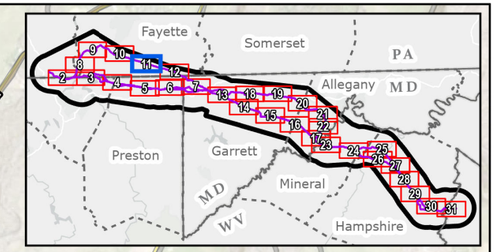

Laurel Run
Piney Run
Laurel Run
Laurel Run
Laurel Run
Laurel Run
Laurel Run
Laurel Run
Laurel Run
Long Run
Long Run
Long Run
Long Run
Long Run
Mill Run
Kirby Rd
Kirby Rd
Thurby Rd
Cornish Rd
Big Sandy Creek
Elliottsville
Necessity to Brandonville 138 kV
Albright to Bethelboro 138 kV
Elliotsville Rd
Stony Fork
Potter School Rd
Clark King Rd
Camp Riamo Rd
Howard Rd
Gibbon Glade Rd
Stucksager Rd
Memorial Dr
Little Sandy Creek
Quebec Rd
Sumey Rd
C,F
Hatfield's Ferry Power Station to Black Oak 500 kV
381
381
Quebec Run
UNT to Quebec Run (RM 2.01)
Quebec Run Wild Area
Big Sandy Creek

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- Project Endpoints
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- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
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Appendix E-11
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Natural Environment
Water Resources
Page 11 of 31
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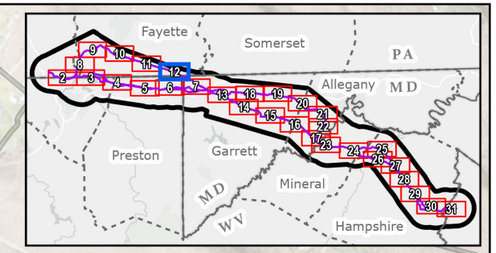

Lake Courage
Heritage Rd
Dinner Bell Five Forks Rd
Clover Top Rd
McCracken School Rd
Clark Rd
Fiketown
Glade Rd
Little Sandy Creek
Maust Rd
Flat Rock Rd
Thomas Rd
C,F
Glades
Bruceton Rd
281
Glade Run
Hatfield's Ferry Power Station to Black Oak 500 kV
Brown Hill Rd
Fike Run
Five Forks Rd
Mason Dixon Rd
Five Forks
Fayette
Preston
Virginia Ln
Fayette
Garrett
Tallentire Rd
Flat Rocks Rd
N Preston Hwy
Bower Rd
Preston
Garrett
Dennis Rd
Chevelle Dr
Preston Hwy
Glade Run
Glade Rd

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Natural Environment
Water Resources
Page 12 of 31
MidAtlantic Resiliency Link

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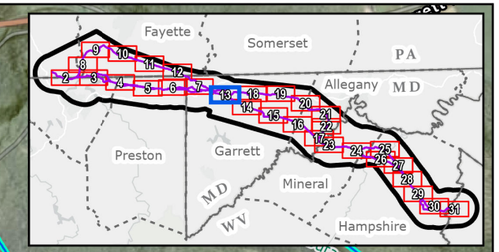

Penn Mar to Deep Creek 115 kV
Sam Friend Rd
Everly Rd
Fikes Run
Harmon Rd
Cove Run
Garrett Hwy
Weaver Rd
Unnamed Tributary to Bear Creek
Jennings to Hazelton 138 kV
D,F
Cove Rd
Unnamed Tributary to Little Bear Creek
Bearfoot Rd
Everly Rd
Unnamed Tributary to Bear Creek
A,B,C,E
Garrett Hwy
Collier Rd
Bear Creek Rd
Bear Creek
Hatfield's Ferry Power Station to Black Oak 500 kV
Sale Barn Rd
Unnamed Tributary to Bear Creek
Kaese Mill
Rabbit Hollow Rd
Little Bear Creek
Bear Creek
Unnamed Tributary to Bear Creek
Brobst Rd
Unnamed Tributary to Bear Creek
Garrett Hwy
Engle Mill
Pud Miller Rd
Bowman Hill Rd
Oak Hill Ln
Brobst Rd
Unnamed Tributary to Bear Creek
Garrett Hwy
Bear Creek
Bear Creek
Unnamed Tributary to Little Bear Creek

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Natural Environment
Water Resources
Page 13 of 31
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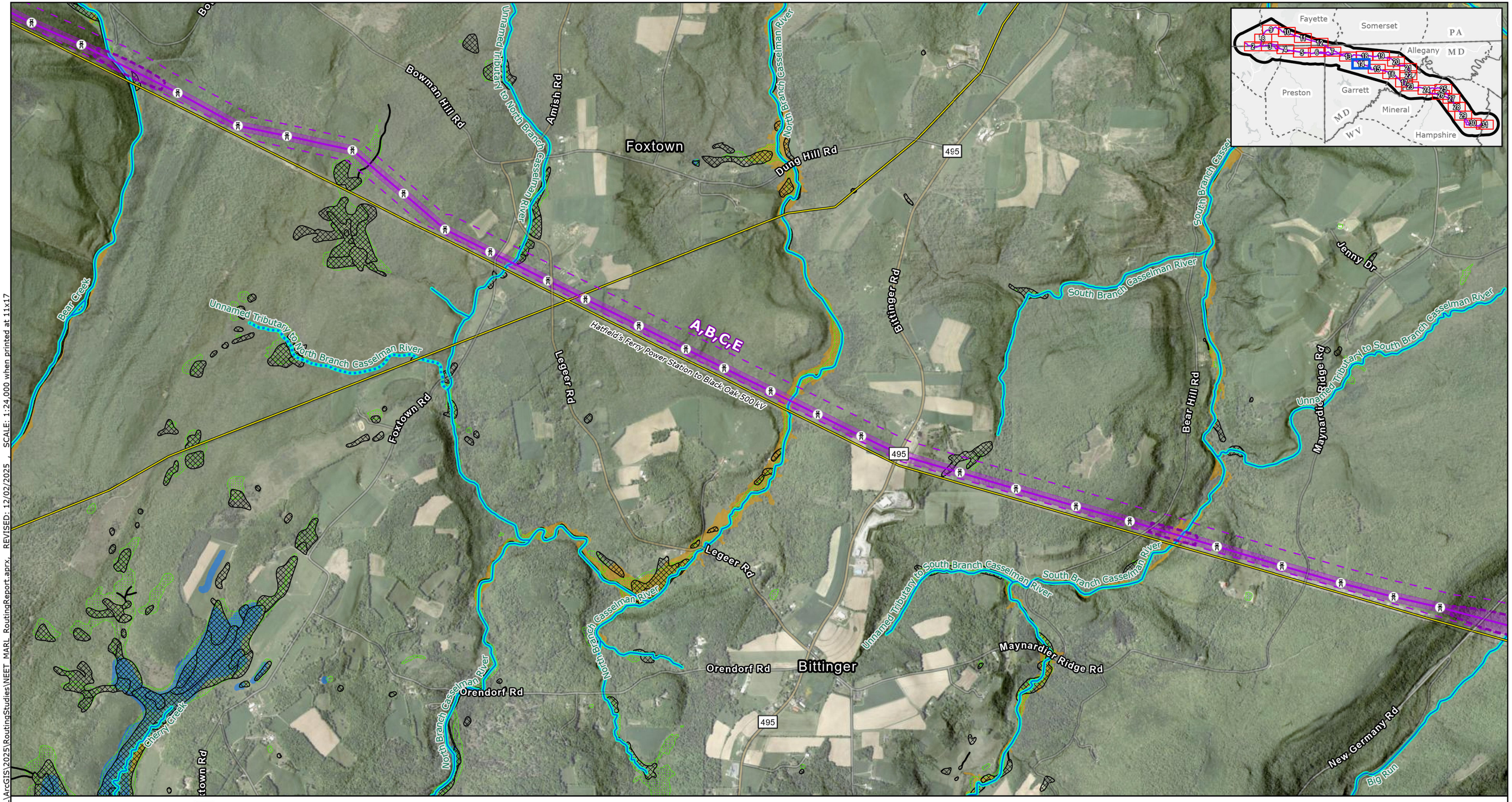

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Natural Environment
Water Resources
Page 14 of 31
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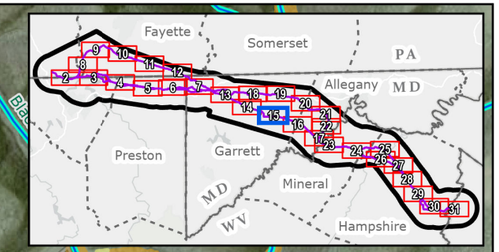

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Natural Environment
Water Resources
Page 15 of 31
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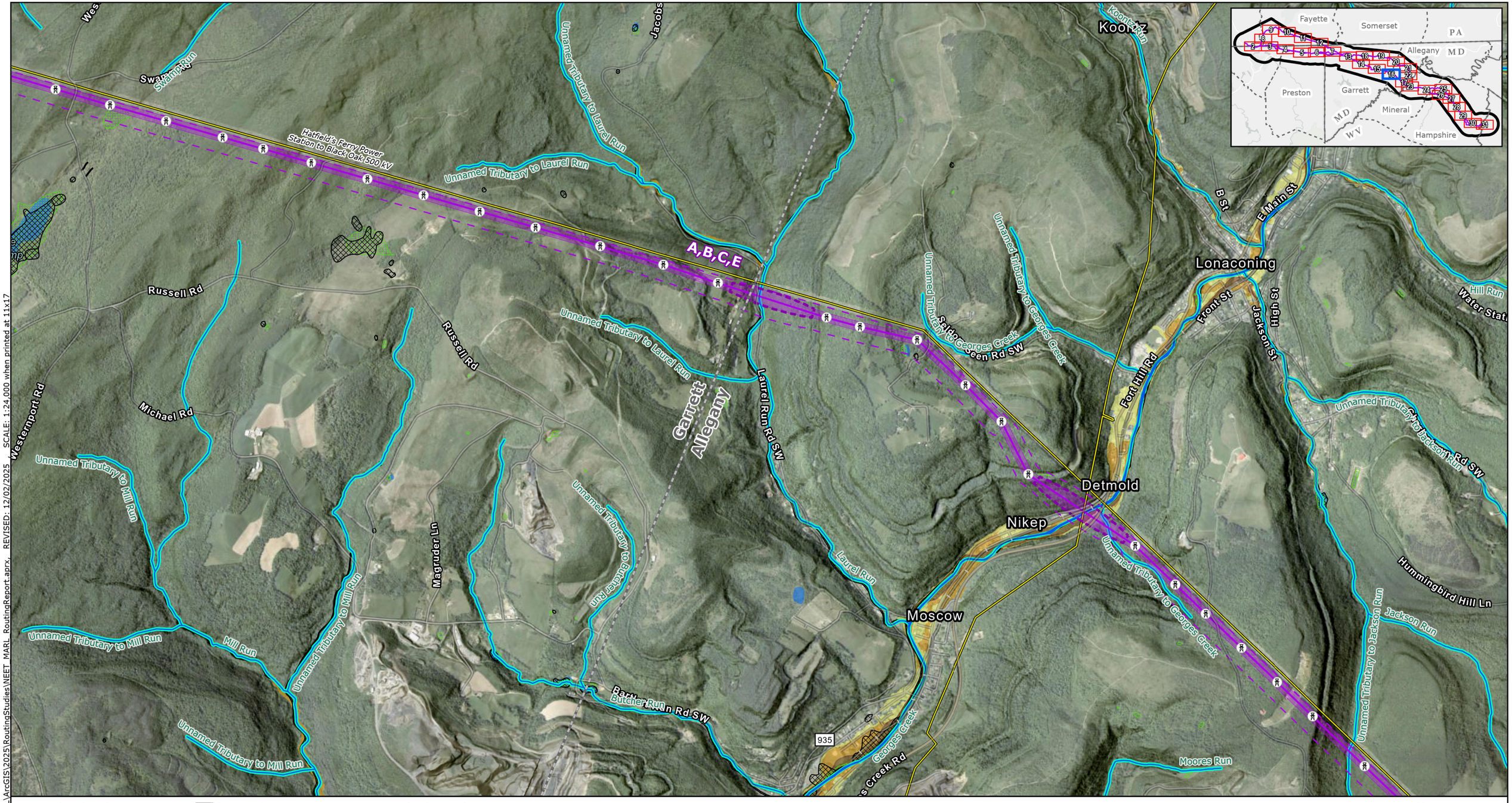

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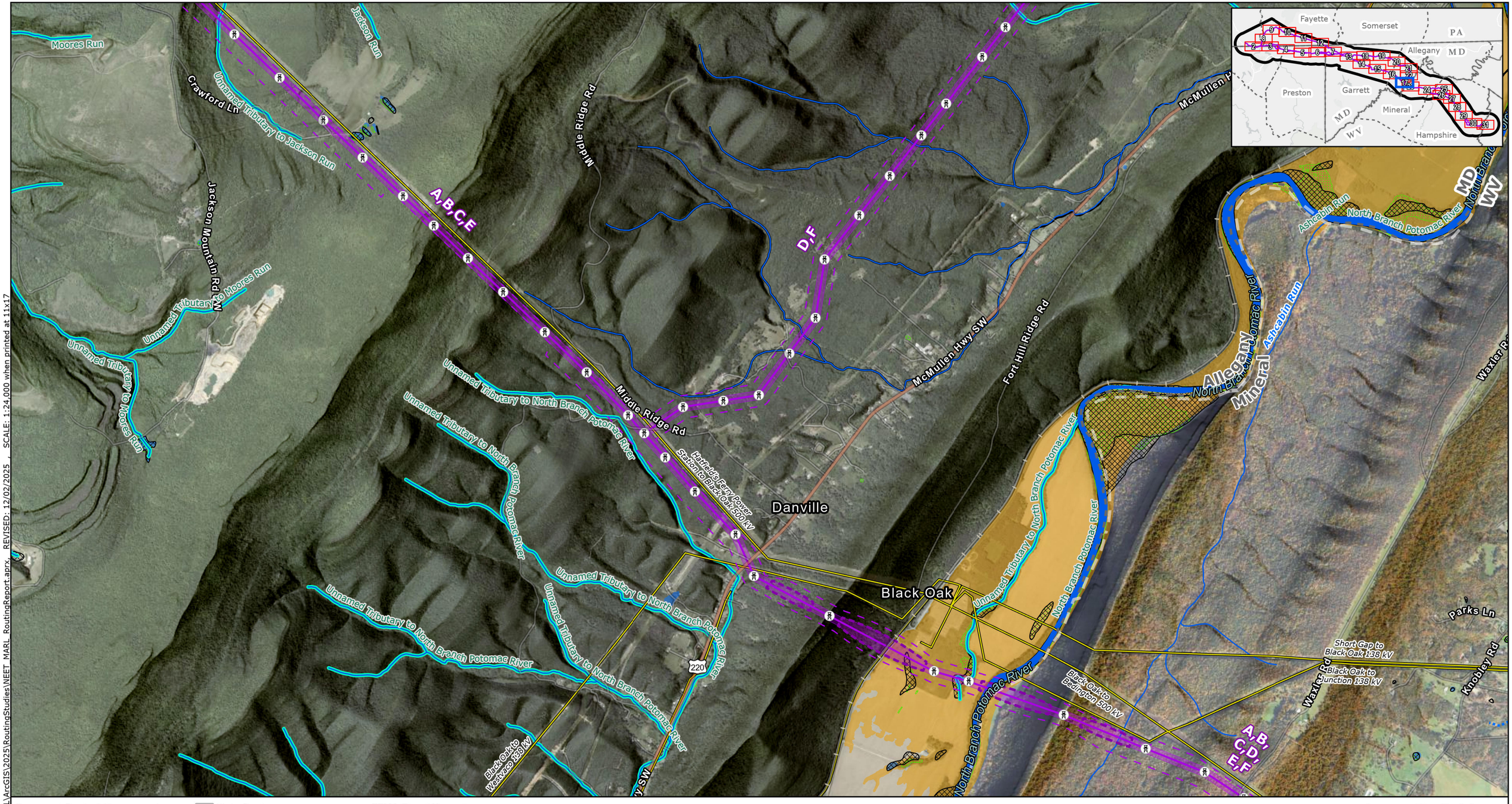

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Natural Environment
Water Resources
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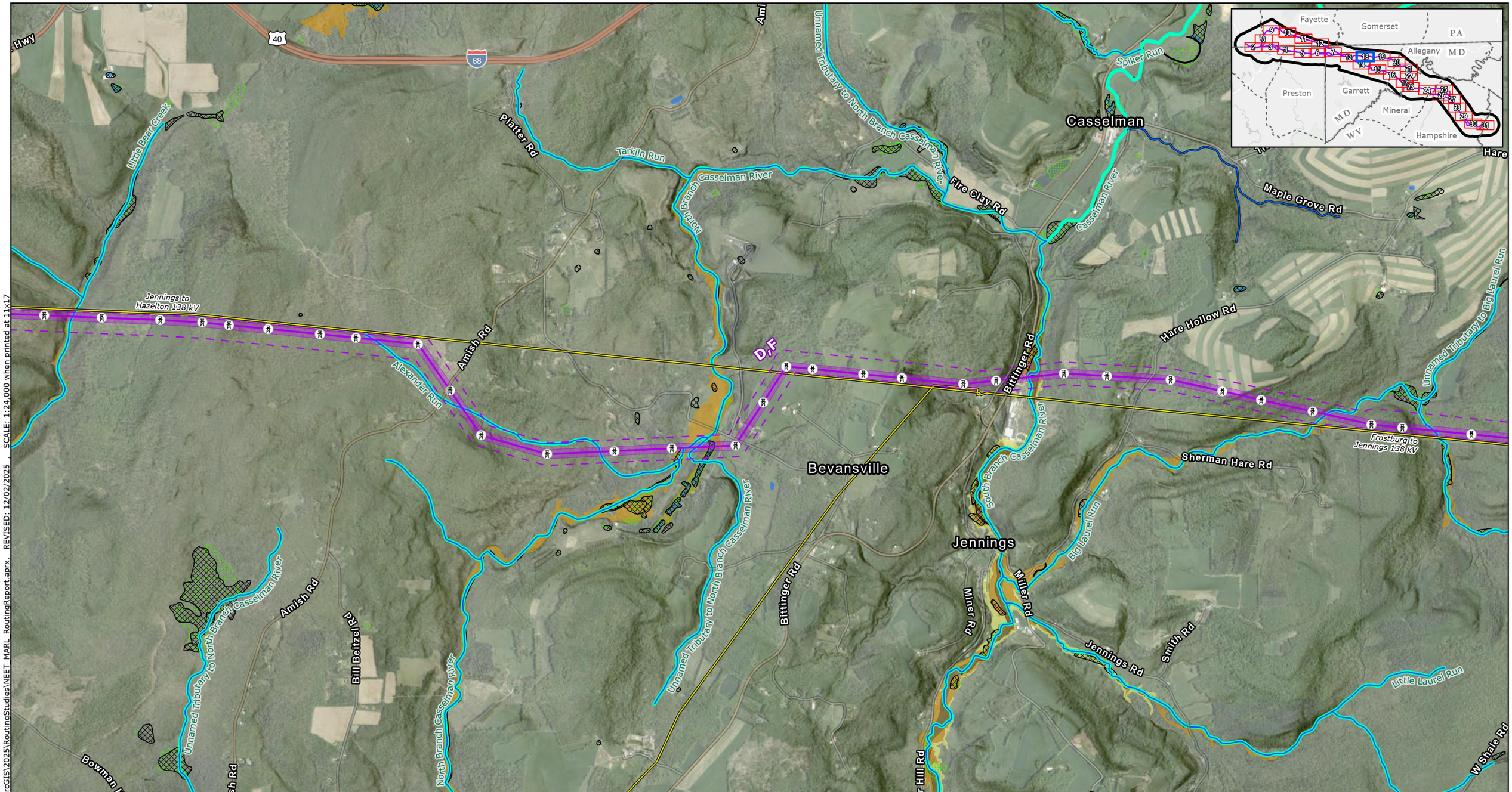

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Natural Environment
Water Resources
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Natural Environment
Water Resources
Page 19 of 31
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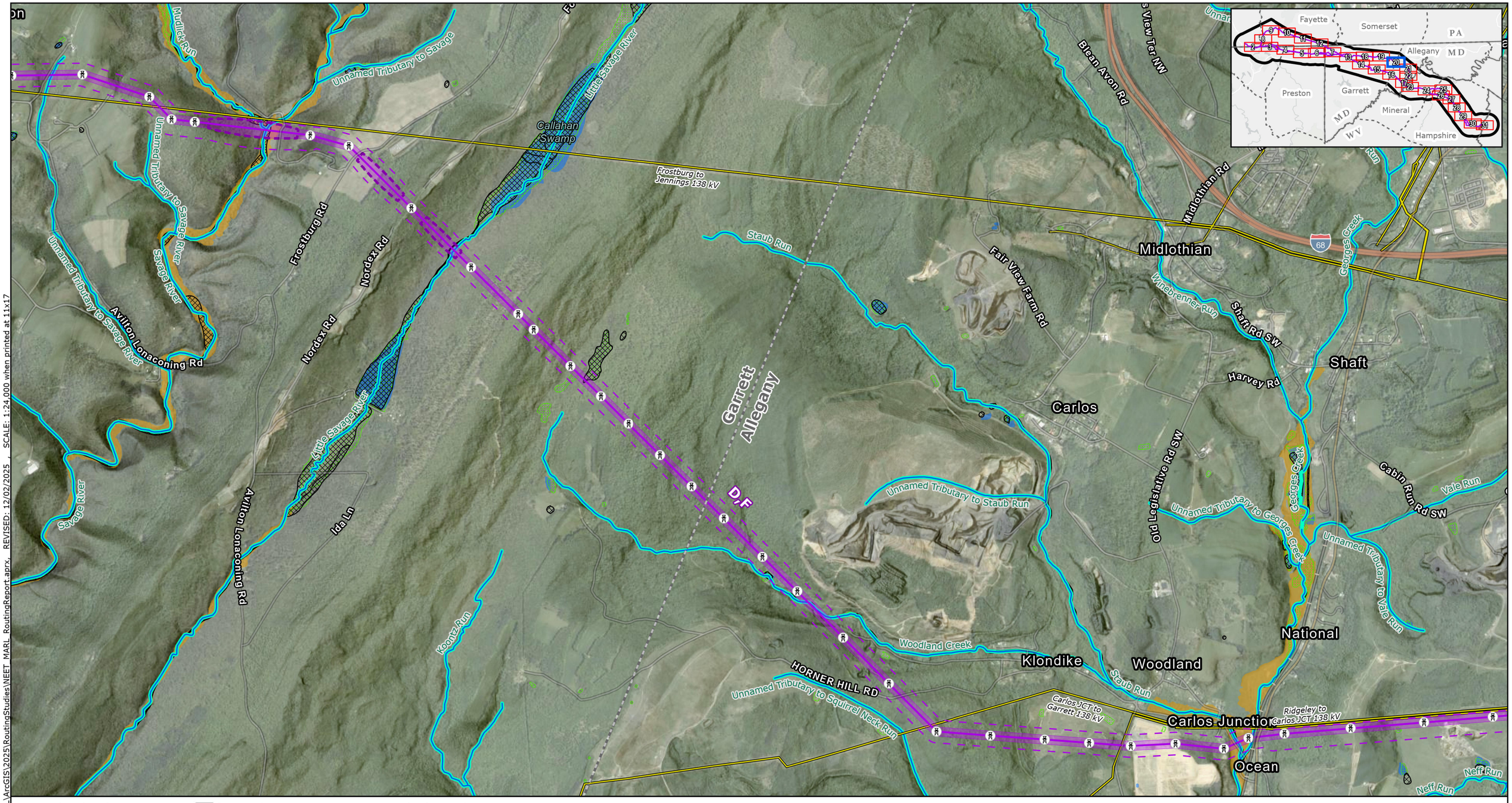

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Natural Environment
Water Resources
Page 20 of 31
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- Regulatory Floodway
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N

0 0.25 0.5 0.75 1
Miles

Scale: 1:24,000
1 inch equals 2,000 ft (when printed at 11x17)

Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 21 of 31
MidAtlantic Resiliency Link

ERM

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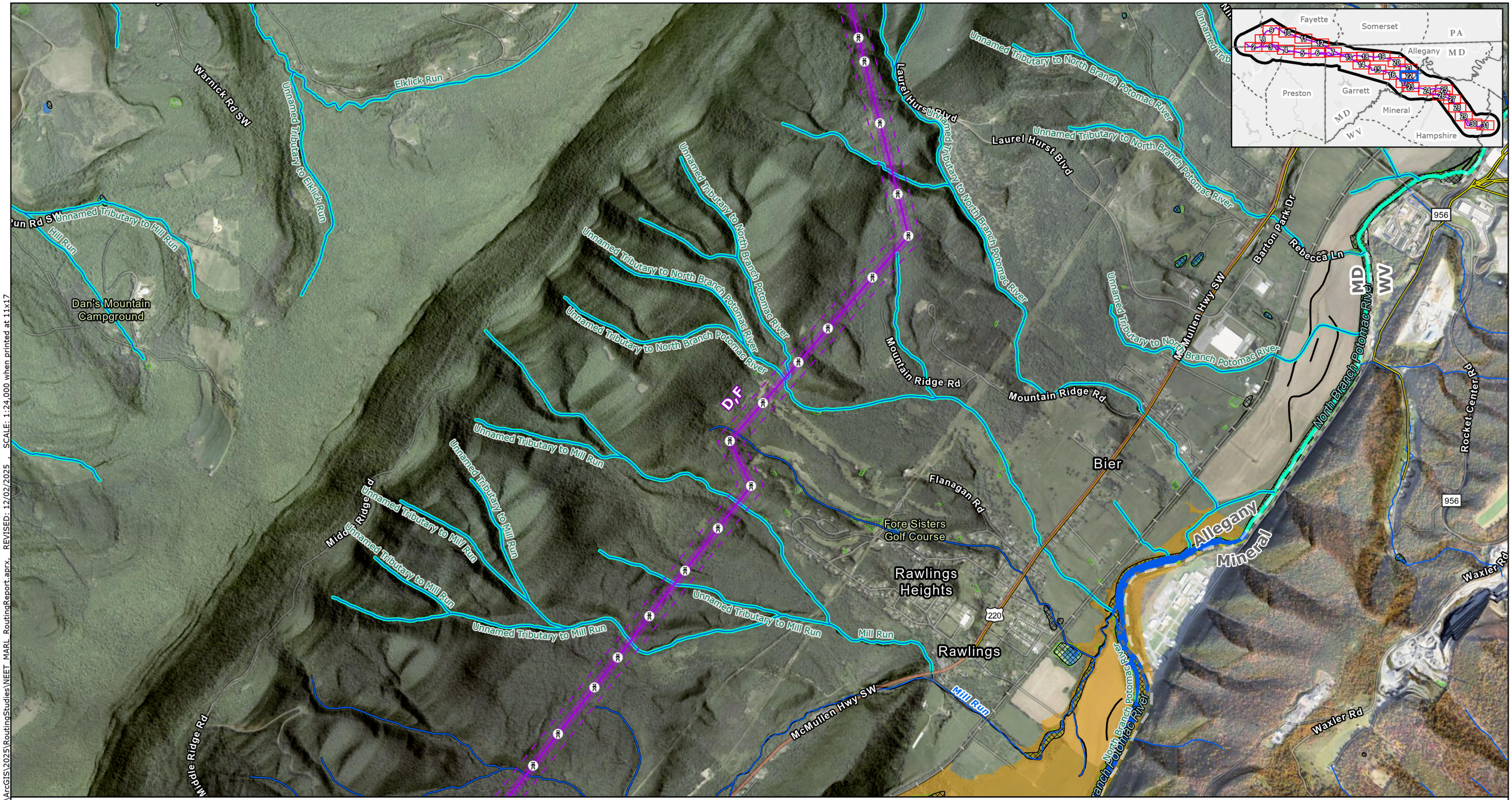

Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Water Resources
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Alternative Routes
Natural Environment
Water Resources
Page 22 of 31
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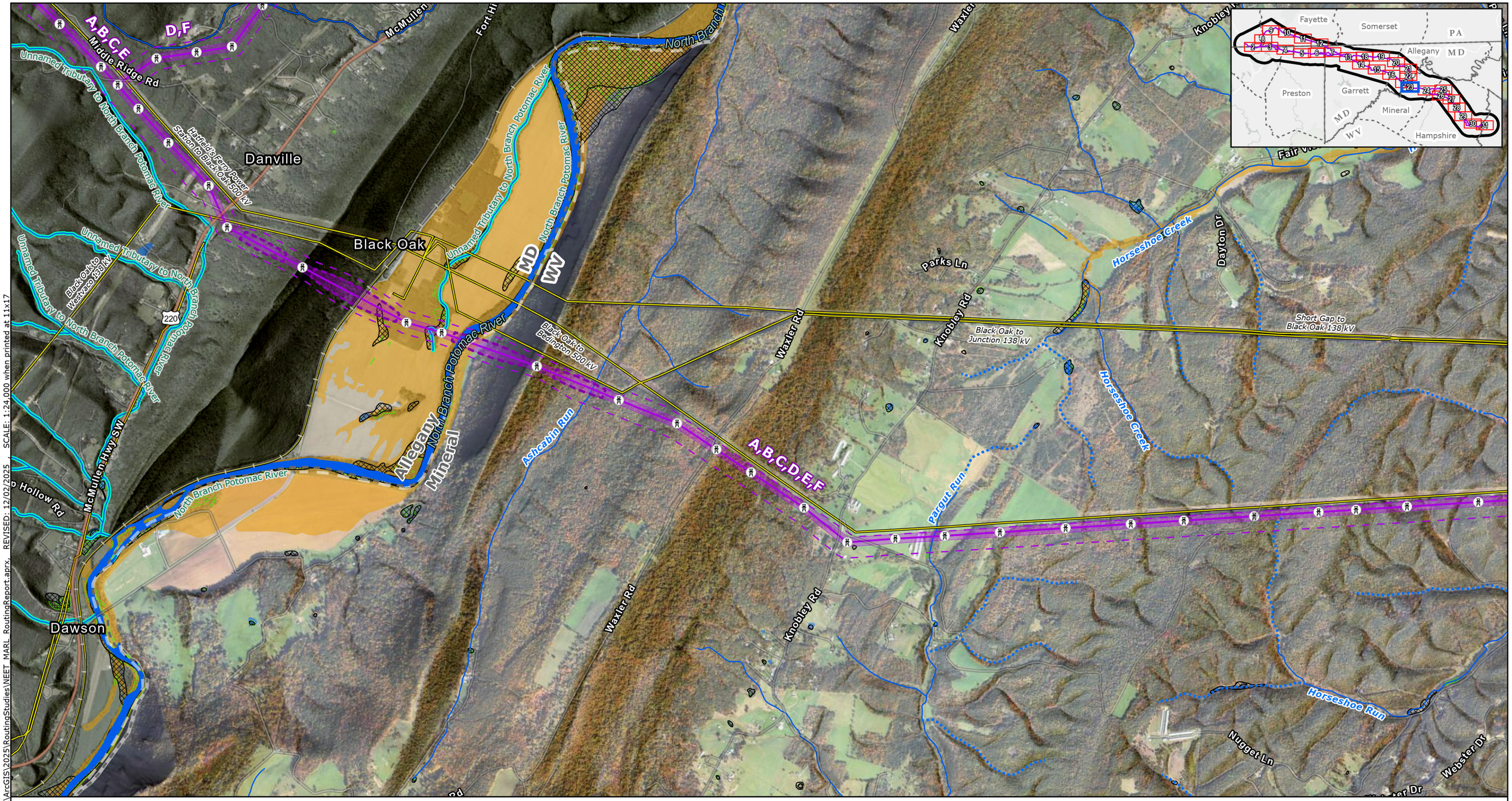

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Proposed Project Components
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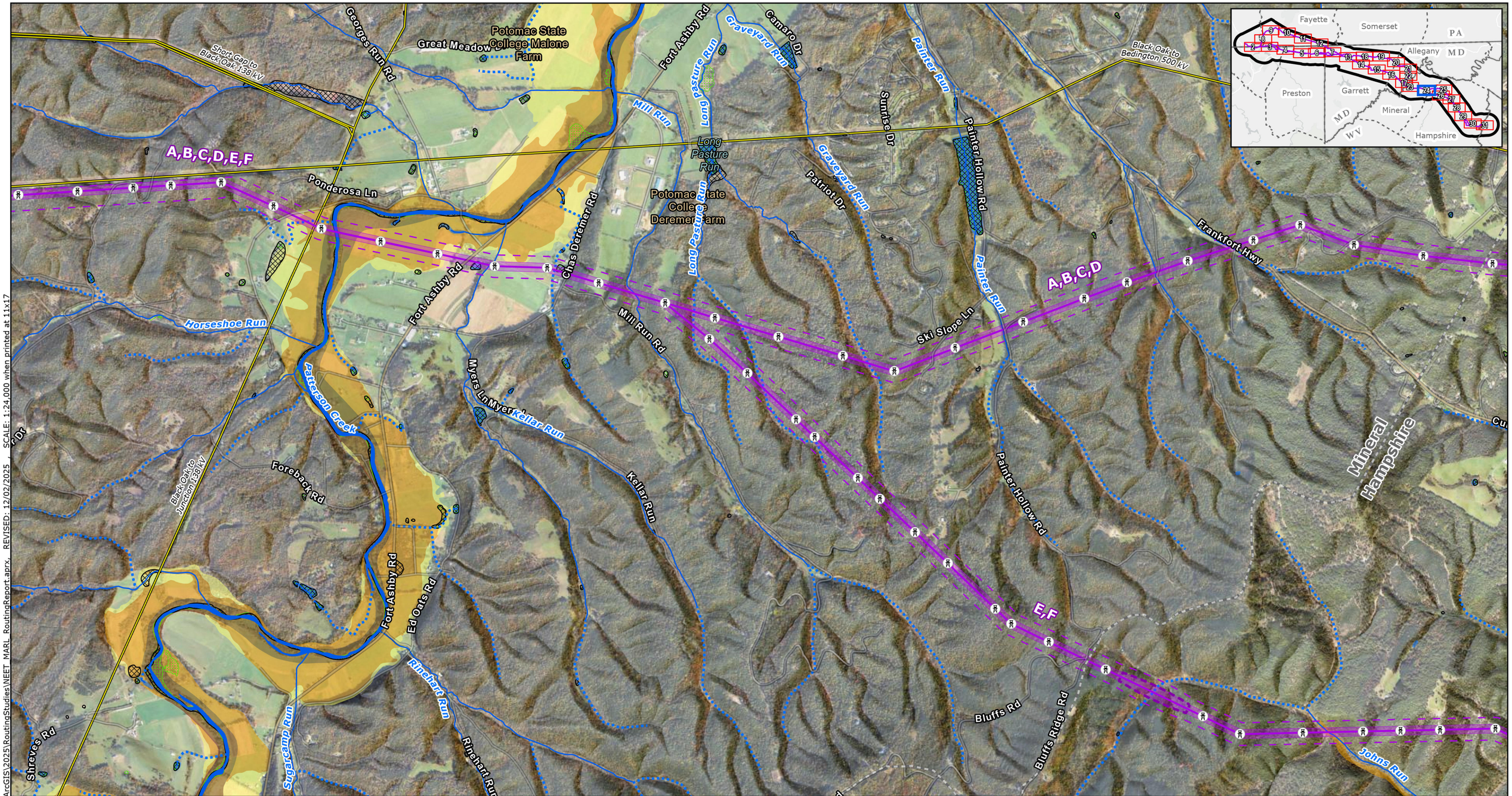
Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 23 of 31
MidAtlantic Resiliency Link

ERM



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Miles

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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 24 of 31
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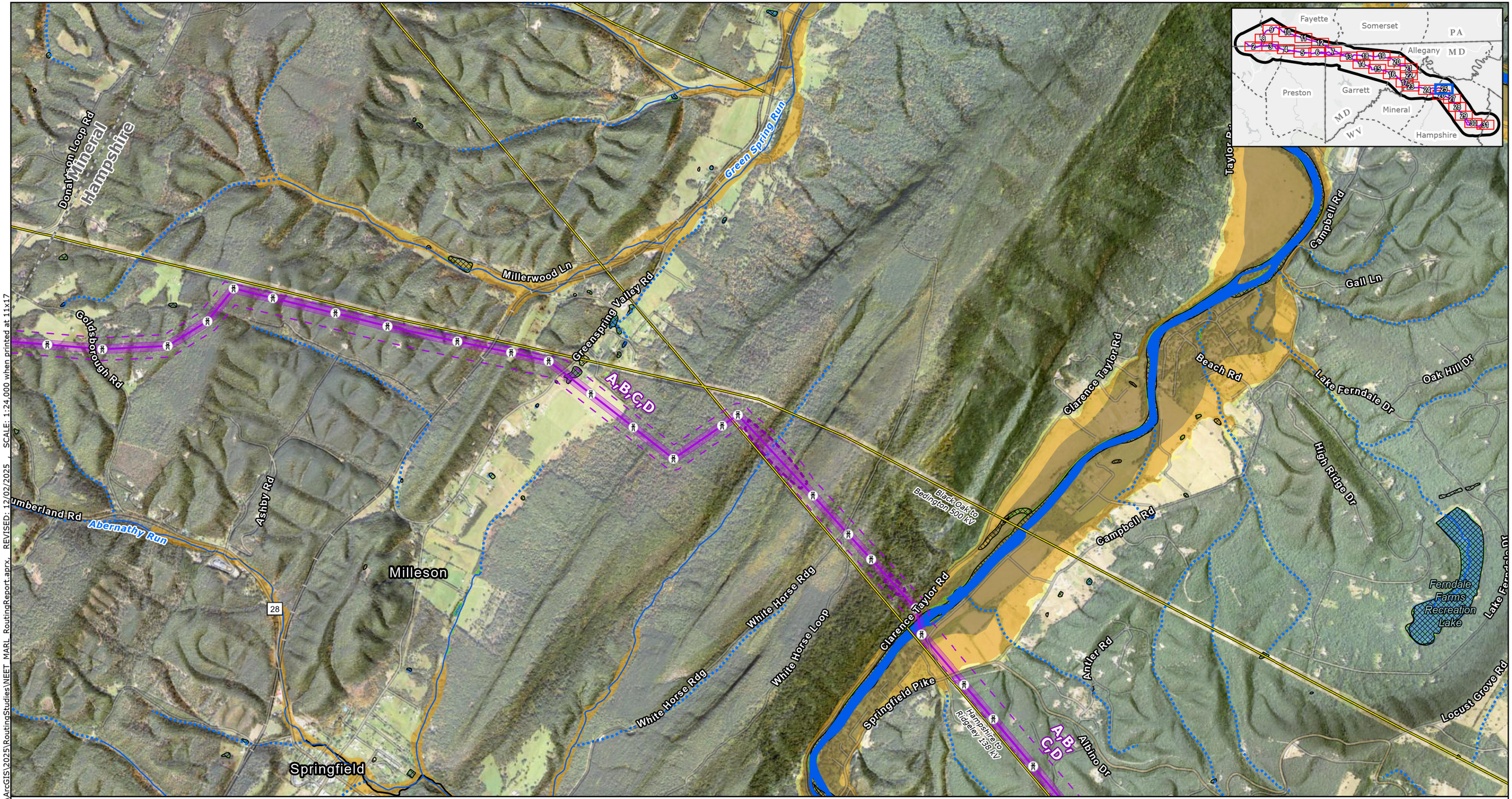

Proposed Project Components
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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 25 of 31
MidAtlantic Resiliency Link

ERM

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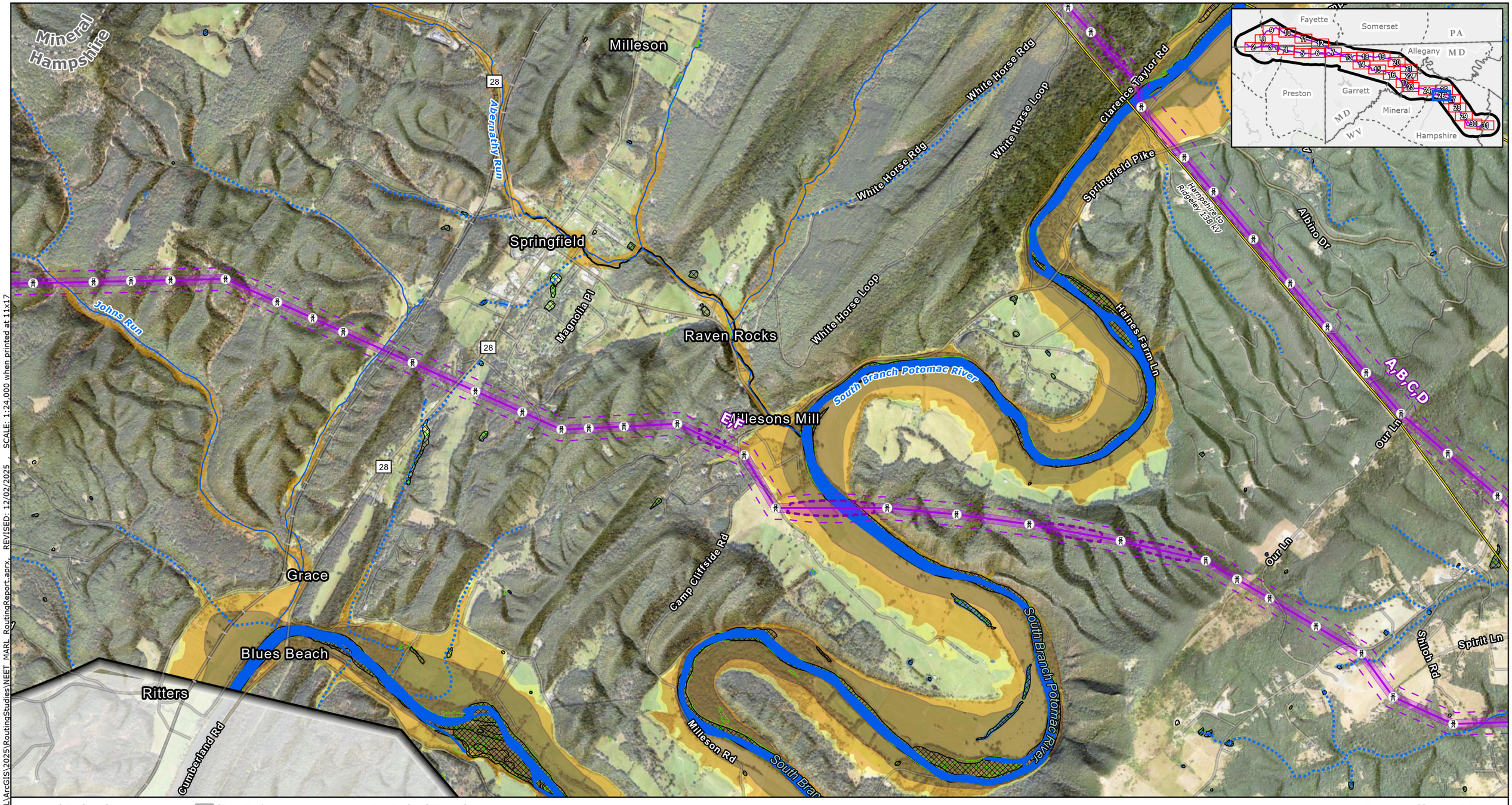

Proposed Project Components
- Project Endpoints
- Towers
- Alternative Routes
- ROW Corridors
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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 26 of 31
MidAtlantic Resiliency Link

ERM

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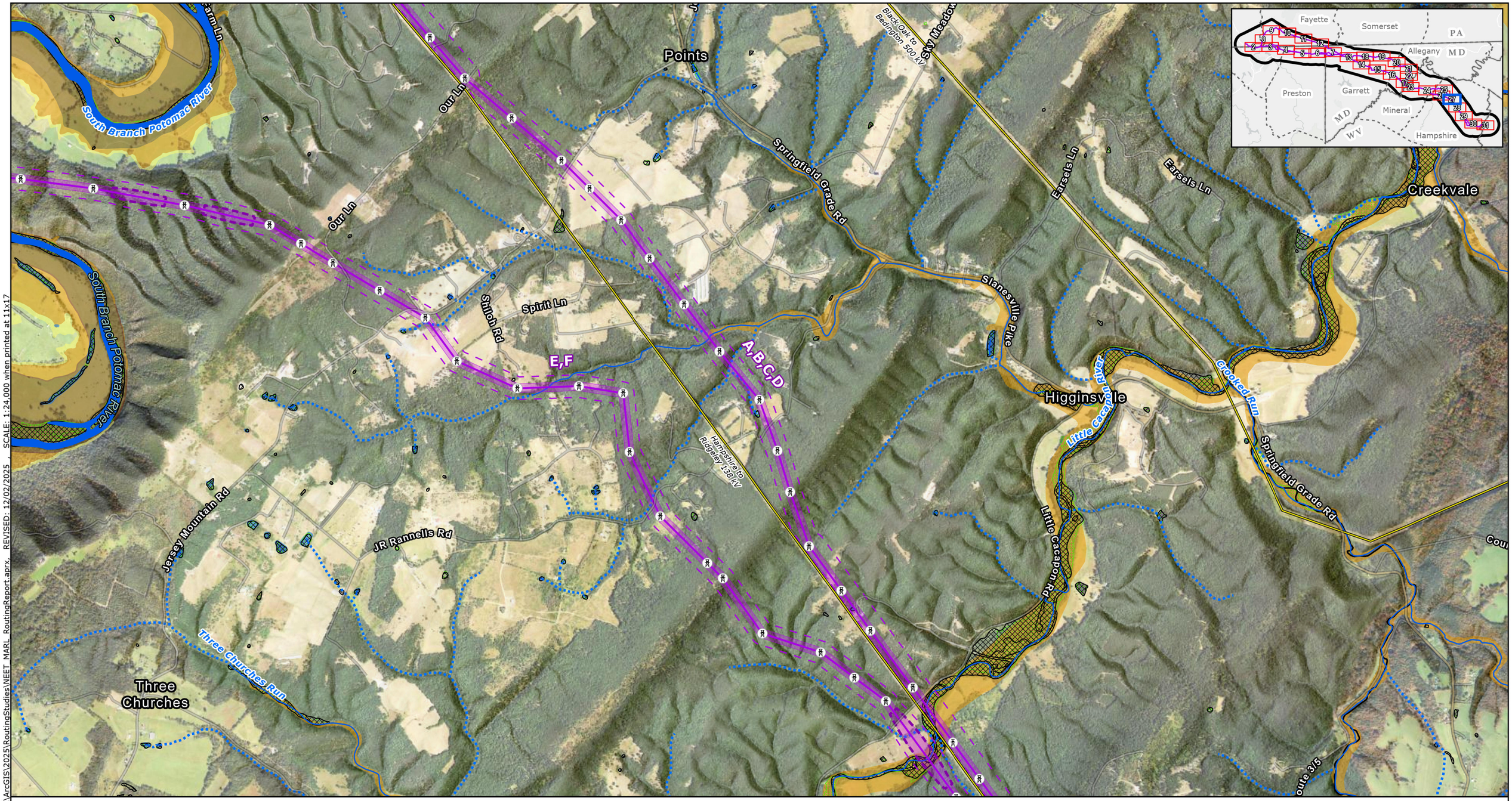

Proposed Project Components
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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 27 of 31
MidAtlantic Resiliency Link

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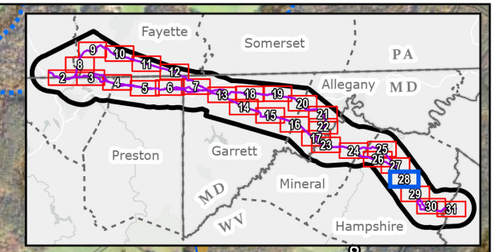

Gore

Slanesville

Three Churches Run

Three Churches Holw

Little Cacapon River

Little Cacapon Rd

Riverwood Trl

Ridge Rd

Tanglewood Dr

County Route 3/5

Spring Gap Rd

Slanesville Pike

Longview Farms Ln

Maple Run

Bloomery Pike

Clifton Rd

Millesons Rd

Sirks Ln

Crooked Run

Jessies Way

Old Martinsburg

Hampshire to Ridgeley 138 kV

Kedron

E,F

A,B, C,D

A,B,C,D,E,F

Proposed Project Components
- Project Endpoints
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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 28 of 31
MidAtlantic Resiliency Link

ERM

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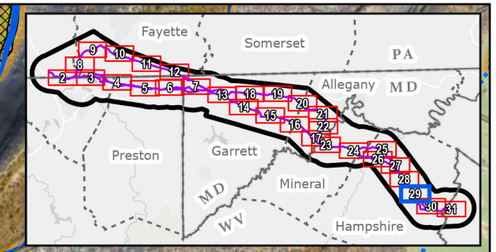

Gibbons Run
Dakota Dr
Hayes Ln
Bloomery Pike
Hickory Cor
Zion Church Rd
Kedron
Maple Run
Twin Flower Ln
Rose Dr
Harmison
North River Mills
Cold Stream Rd
A,B,C,D,E,F
Knips Ln
Ruth Bailes Ln
Riggs Hollow Rd
Buffalo Ridge Rd
Haven Dr
Denney Dr
Hickory Cor
29
29
Hoy Rd
Ike Saville Rd
Hoy
Janesa Dr
Hampshire to Ridgeley 138 kV
S Pioneer Ln
Family Dr
Cabin Rd
Cold Stream
N River Rd
Big Horn Trl
Wild Boar Rd
Timber Mountain Rd
A,B,C,D,E
Fern Ln
Pugh
iller Ln

Proposed Project Components
- Project Endpoints
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Appendix E-11
Alternative Routes
Natural Environment
Water Resources
Page 29 of 31
MidAtlantic Resiliency Link

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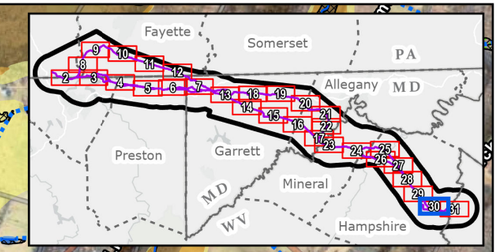

Capon Bridge
Red Fern Ln
Big Ho
Wild Boar
Timber Mountain Rd
Falcon View Dr
Sam Parks Rd
Park Valley Ln
Edwards Run
50
Hampshire to Ridgeley 138 kV
Northwestern Pike
Slonaker Rd
Laverne Dr
Falcon View Dr
Horizon Ln
Longbeard Ln
Hattie Ln
Dillons Run Rd
Sycamore Dr
Dillons Run
Stonebroke Ln
Wagon Chase Trl
Capon River Rd
Mill Branch
Christian Church Rd
Crane L
Northwestern
Sycamore Dr
Falls Rd
Sirbaugh Rd
A,B,C,D,E
F
Loom
French Mill to Hampshire 138 kV
Lays Ln
Old Fire Tower Rd
Edwards Run
Becks Ga
Meadow Brook to Hampshire 138 kV
Dillons Run
Old Mill Rd
Dover Young Dr
Ritter Dr
S Laurel Ridge Rd
Hampshire to Stonewall 138 kV
Pates Rd
A,B,C,D,E,F
Cacapon River
Mt Storm to Doubs 500 kV
WV Hampshire
VA Frederick

Proposed Project Components
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Appendix E-11
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Natural Environment
Water Resources
Page 30 of 31
MidAtlantic Resiliency Link

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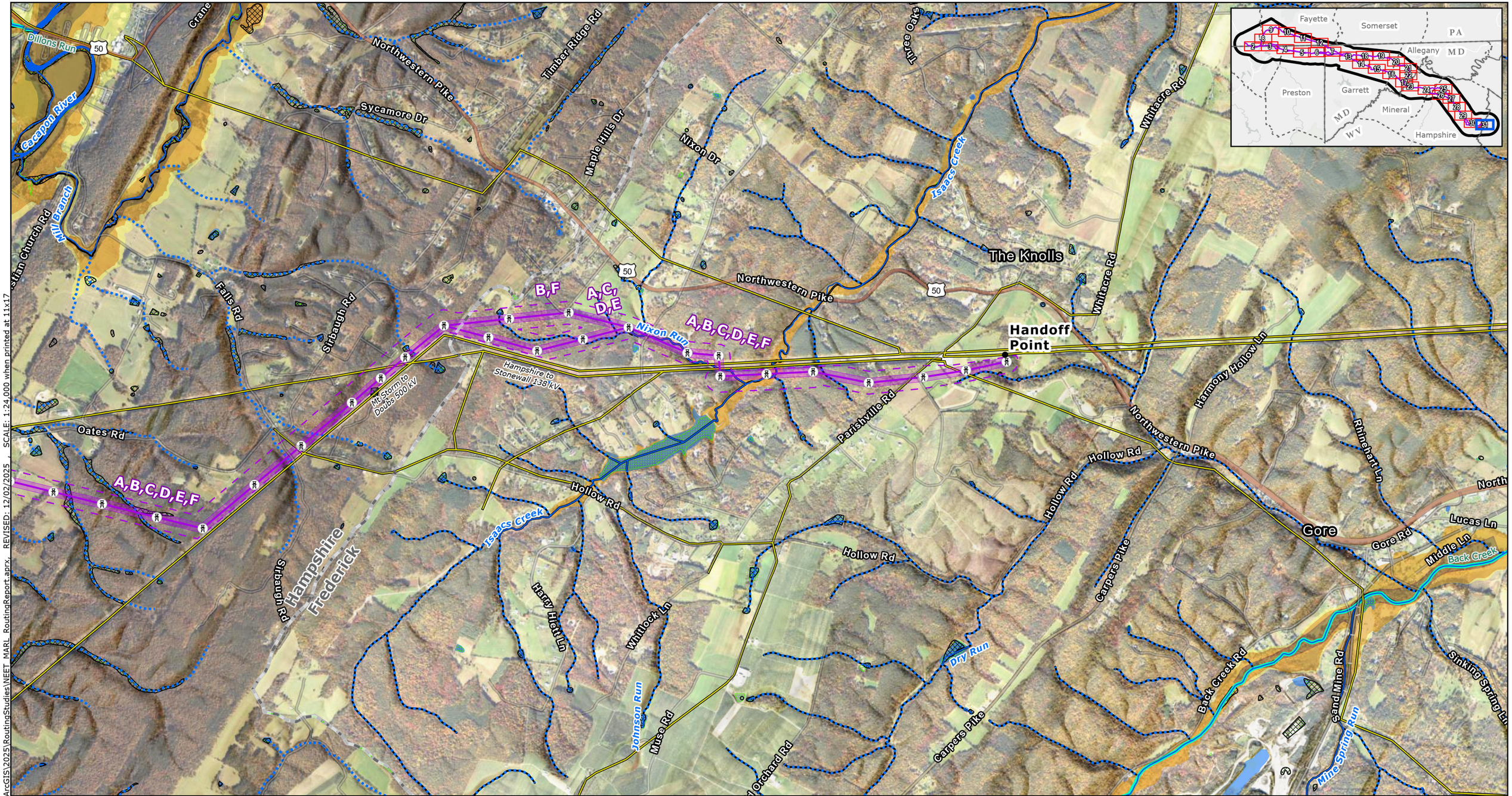

Proposed Project Components
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Alternative Routes
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Water Resources
Page 31 of 31
MidAtlantic Resiliency Link

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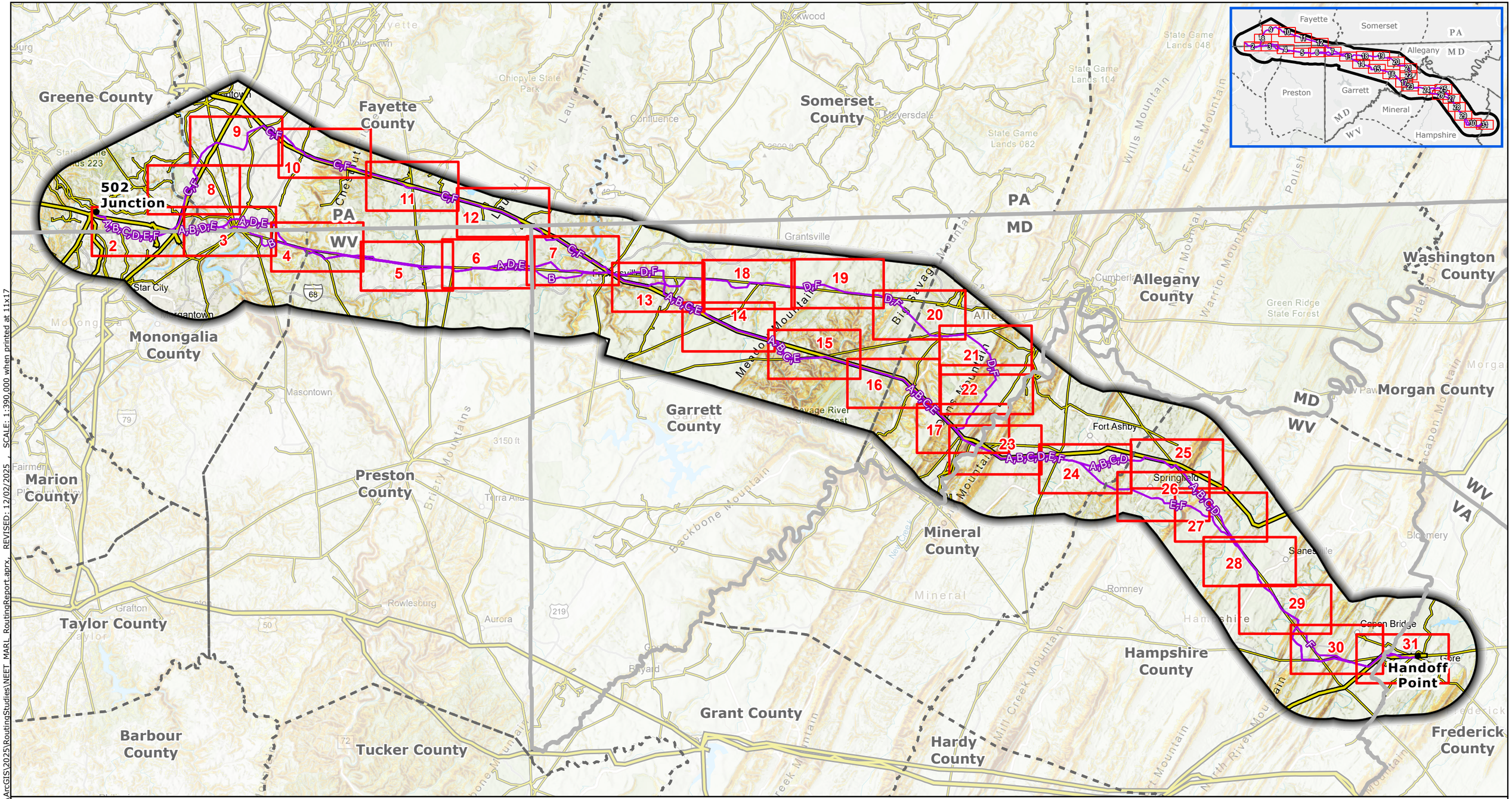
APPENDIX E-12 ALTERNATIVE ROUTES—NATURAL ENVIRONMENT—SENSITIVE SPECIES AND HABITATS MAPBOOK (CONFIDENTIAL)

APPENDIX E-13 ALTERNATIVE ROUTES—ENGINEERING AND INFRASTRUCTURE MAPBOOK



Proposed Project Components
- Project Endpoints
- Alternative Routes
- Project Study Area

Base Data
- County Boundary
- State Border
- Map Index Page

- Existing 500 kV High-Voltage Transmission Lines
- Existing High-Voltage Transmission Lines (<500 kV)

Terrain - Slope Map
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

NOTES
1. *Proposed tower locations are preliminary and subject to change*
2. *Data source: NEET, ERM, USGS, REXTAG*

N

0 4 8 12 16
Miles

Scale: 1:390,000
1 inch equals 32,500 ft (when printed at 11x17)

Appendix E-13
Alternative Routes Engineering and Infrastructure
Page 1 of 31
MidAtlantic Resiliency Link

ERM

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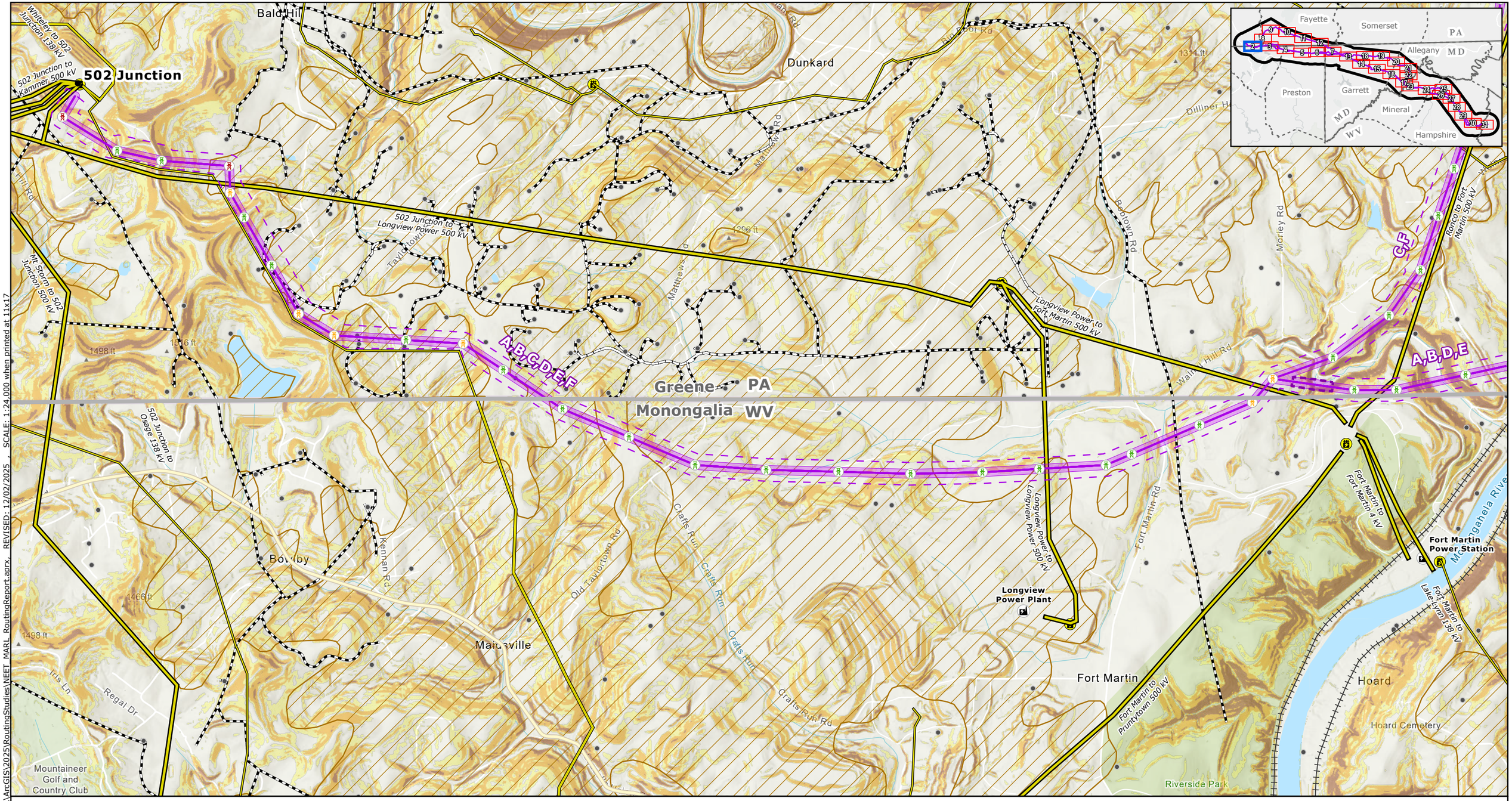

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Proposed Project Components
- Project Endpoints
- ROW Corridors
- Alternative Routes
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- County Boundary
- State Border

Engineering and Infrastructure
- Airports
- Wind Turbines
- Substation
- Power Plants
- Oil and Gas Wells
- Natural Gas Distribution
- Natural Gas Gathering Pipeline
- Natural Gas Transmission Pipeline
- Existing 500 kV High-Voltage Transmission Lines
- Existing High-Voltage Transmission Lines (<500 kV)
- Railway
- Primary Road
- Secondary Road
- Geologic Karst Features
- Structures with Turn Angles 0-20 degrees
- Structures with Turn Angles 20-30 degrees
- Structures with Turn Angles >30 degrees

Terrain - Slope Map
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

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N

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Miles

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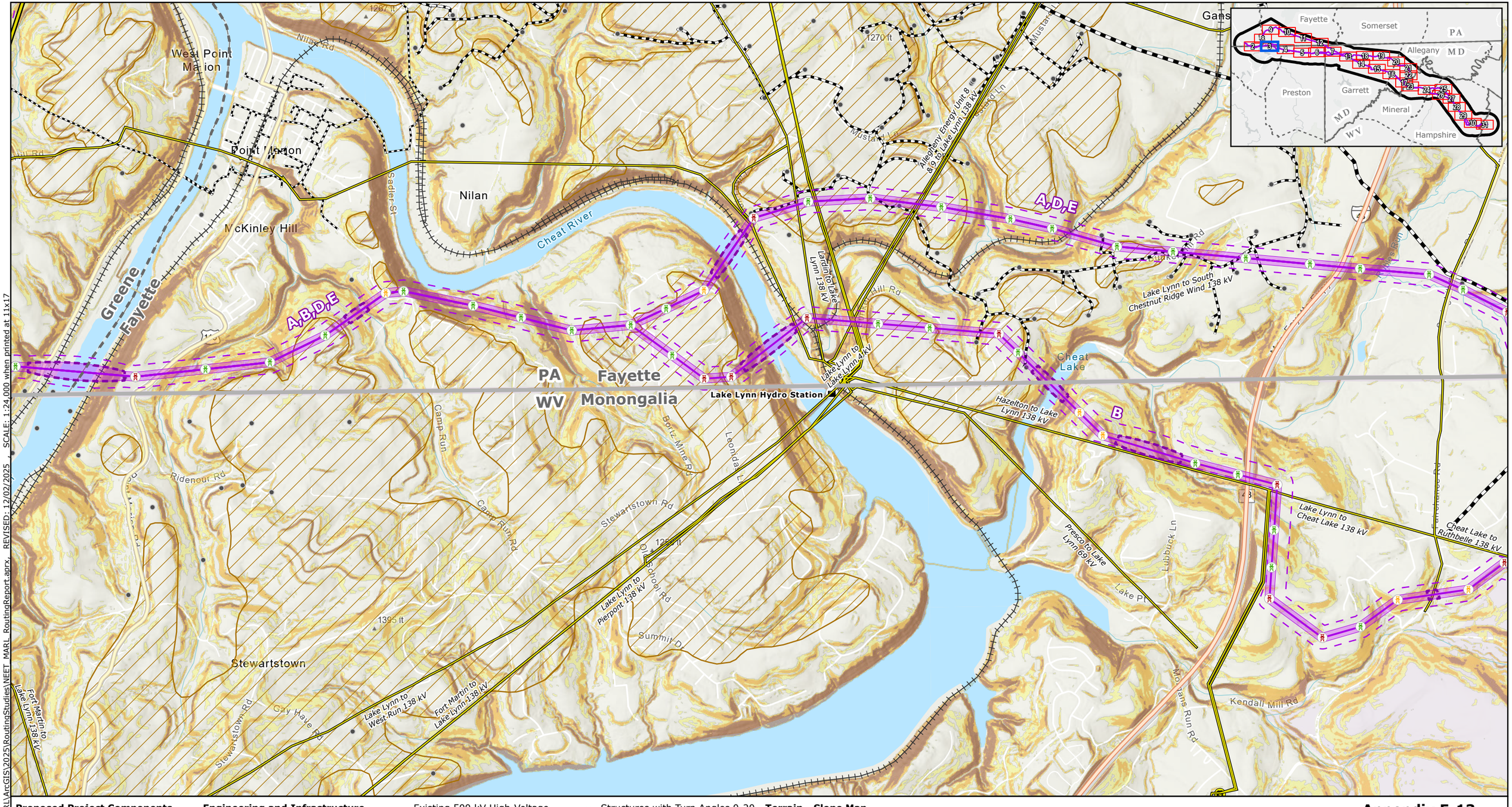
Appendix E-13
Alternative Routes
Engineering and Infrastructure

MidAtlantic Resiliency Link

ERM



Proposed Project Components
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- ROW Corridors
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- Aerial Easement Blowout Areas
- Siting Corridors
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Base Data
- County Boundary
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Engineering and Infrastructure
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- Wind Turbines
- Substation
- Power Plants
- Oil and Gas Wells
- Natural Gas Distribution
- Natural Gas Gathering Pipeline
- Natural Gas Transmission Pipeline
- Existing 500 kV High-Voltage Transmission Lines
- Existing High-Voltage Transmission Lines (<500 kV)
- Railway
- Primary Road
- Secondary Road
- Geologic Karst Features
- Structures with Turn Angles 0-20 degrees
- Structures with Turn Angles 20-30 degrees
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Terrain - Slope Map
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N

0 0.25 0.5 0.75 1
Miles

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Appendix E-13
Alternative Routes Engineering and Infrastructure
Page 3 of 31
MidAtlantic Resiliency Link

ERM

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Proposed Project Components
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- Alternative Routes
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- Siting Corridors
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Base Data
- County Boundary
- State Border

Engineering and Infrastructure
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Appendix E-13
Alternative Routes Engineering and Infrastructure
Page 4 of 31
MidAtlantic Resiliency Link

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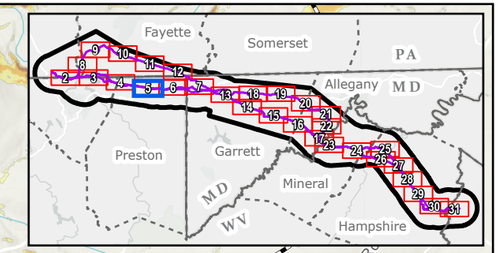

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Appendix E-13
Alternative Routes
Engineering and Infrastructure
Page 5 of 31
MidAtlantic Resiliency Link

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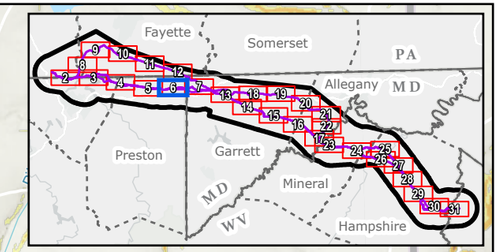

Salem
Salem Rd
Gipson Ln
Glade Run
Dennis Rd
Golden Rd
2282 ft
2417 ft
Sickle Hill
Moccasin Rocks Rd
Glade Farms Rd
WV Preston
MD Garrett
South Chestnut Ridge Wind to Junction 106 138 kV
A,D,E
B
2143 ft
Hazelton to Lake Lynn 138 kV
A,B,D,E
Sine Pl
Rosenberg Rd
Mowers Rd
HogRun
Handlen
Piney Run
2230 ft
Jennings to Hazelton 138 kV
Cherry Run Rd
Skyview Dr
2354 ft
2502 ft
Junction 106 to Albright 138 kV
Shady Grove Rd
Hog Run
Northpointe Dr
Bartholomew
Evans Hill
Maryland Line Rd

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- ROW Corridors
- Alternative Routes
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- County Boundary
- State Border

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Appendix E-13
Alternative Routes Engineering and Infrastructure
Page 6 of 31
MidAtlantic Resiliency Link

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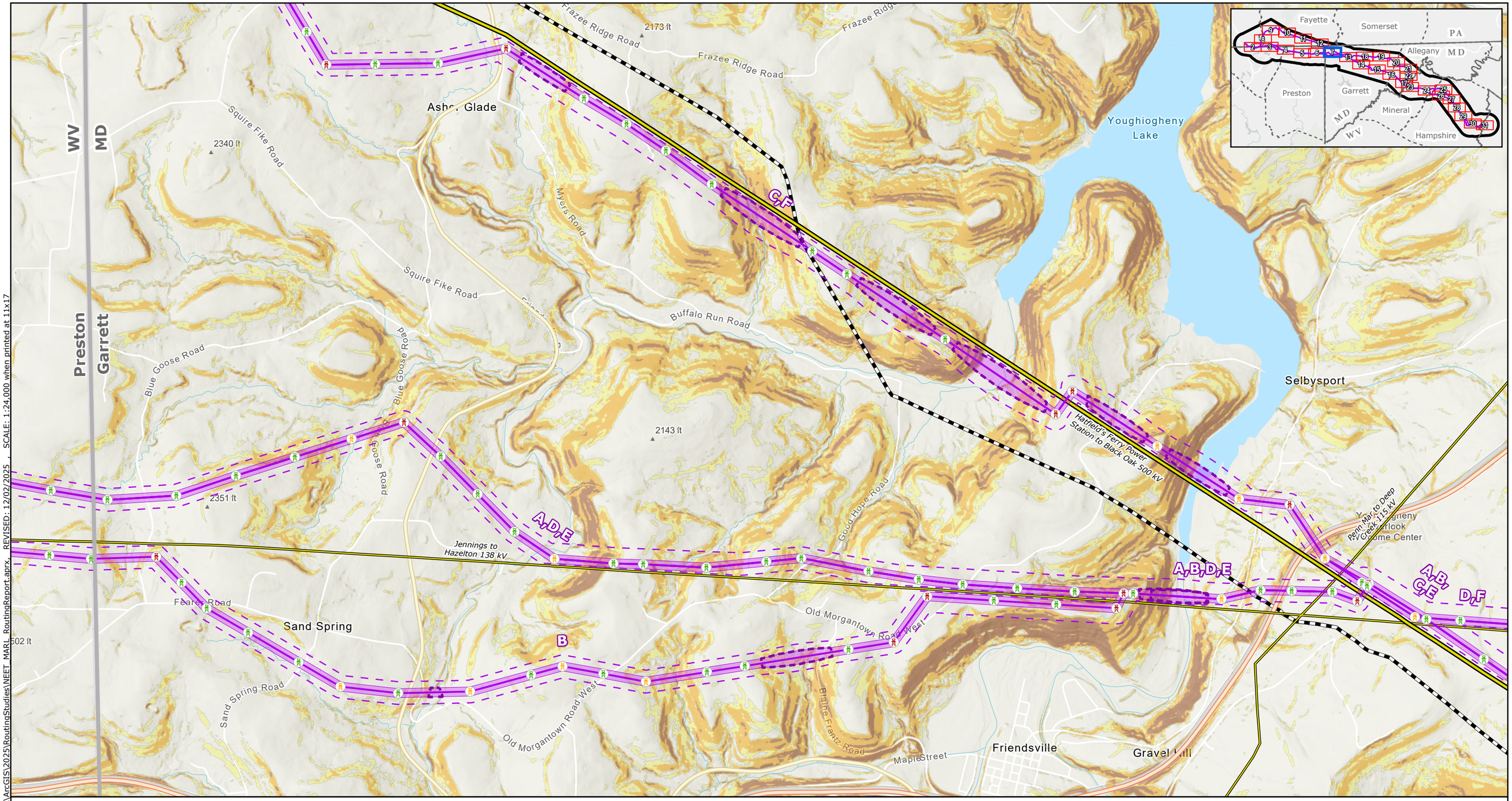

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- ROW Corridors
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Appendix E-13
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Page 7 of 31
MidAtlantic Resiliency Link

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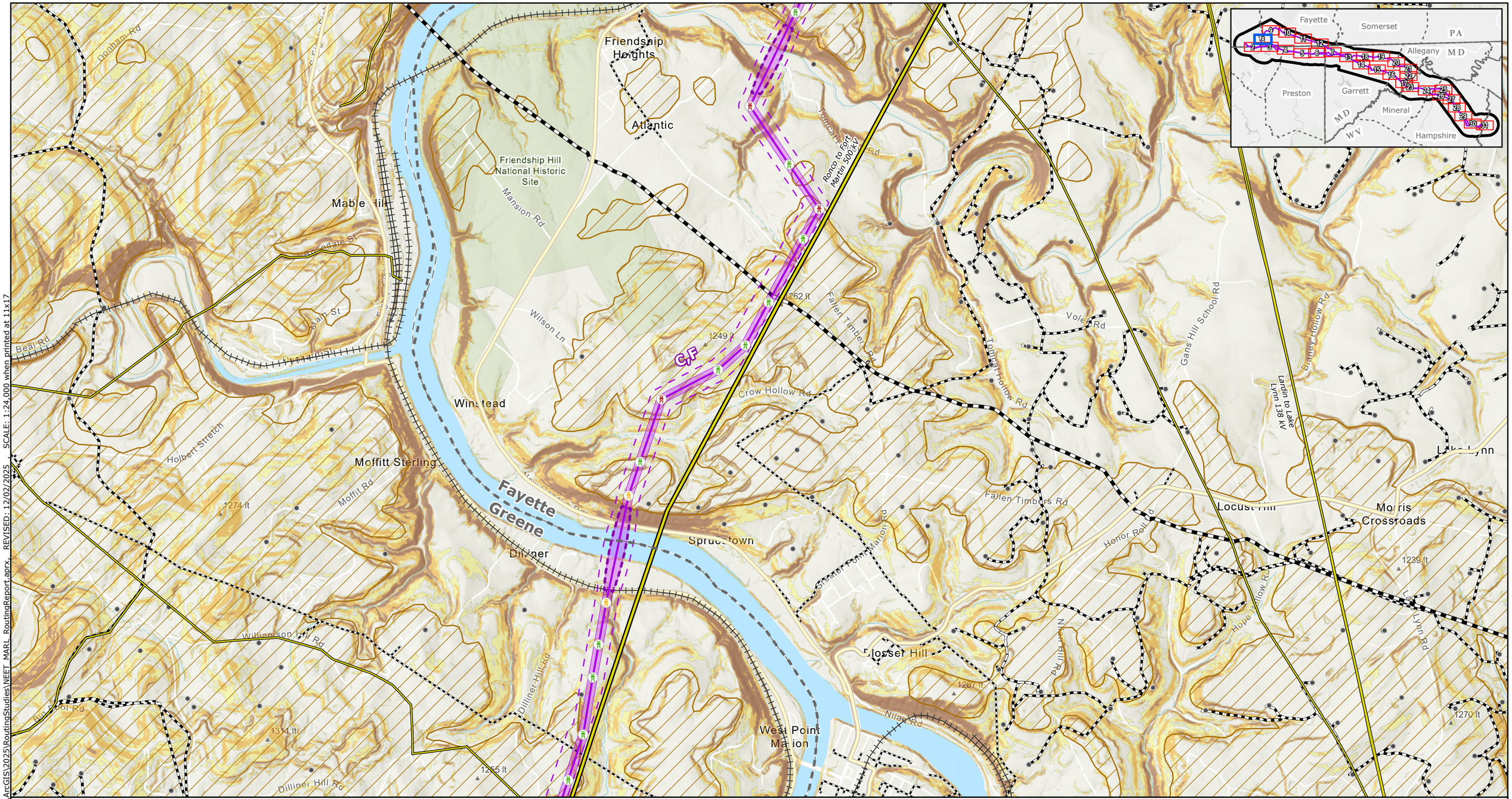

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- ROW Corridors
- Alternative Routes
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- County Boundary
- State Border

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Appendix E-13
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Page 8 of 31
MidAtlantic Resiliency Link

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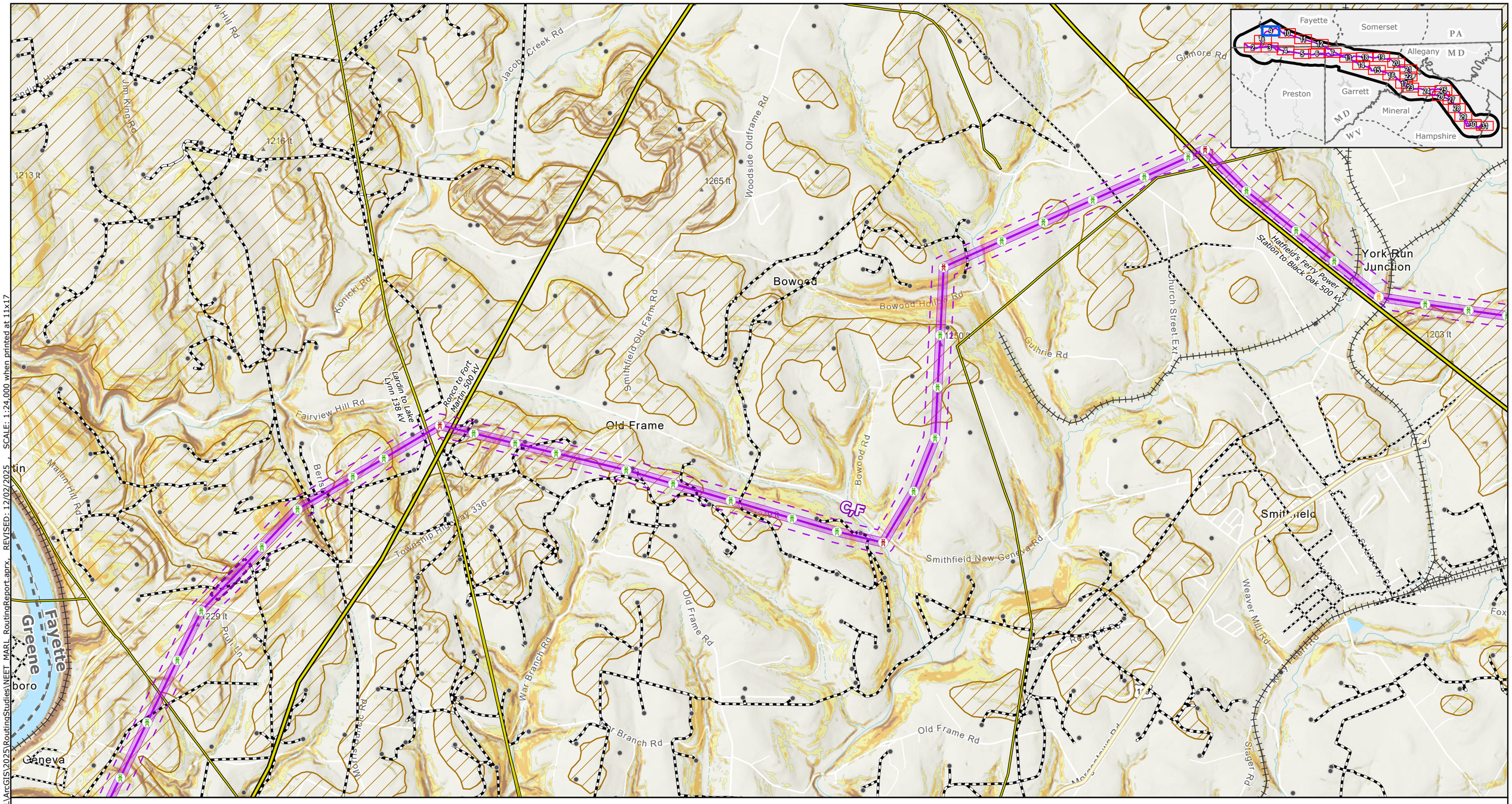

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Appendix E-13
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Page 9 of 31
MidAtlantic Resiliency Link

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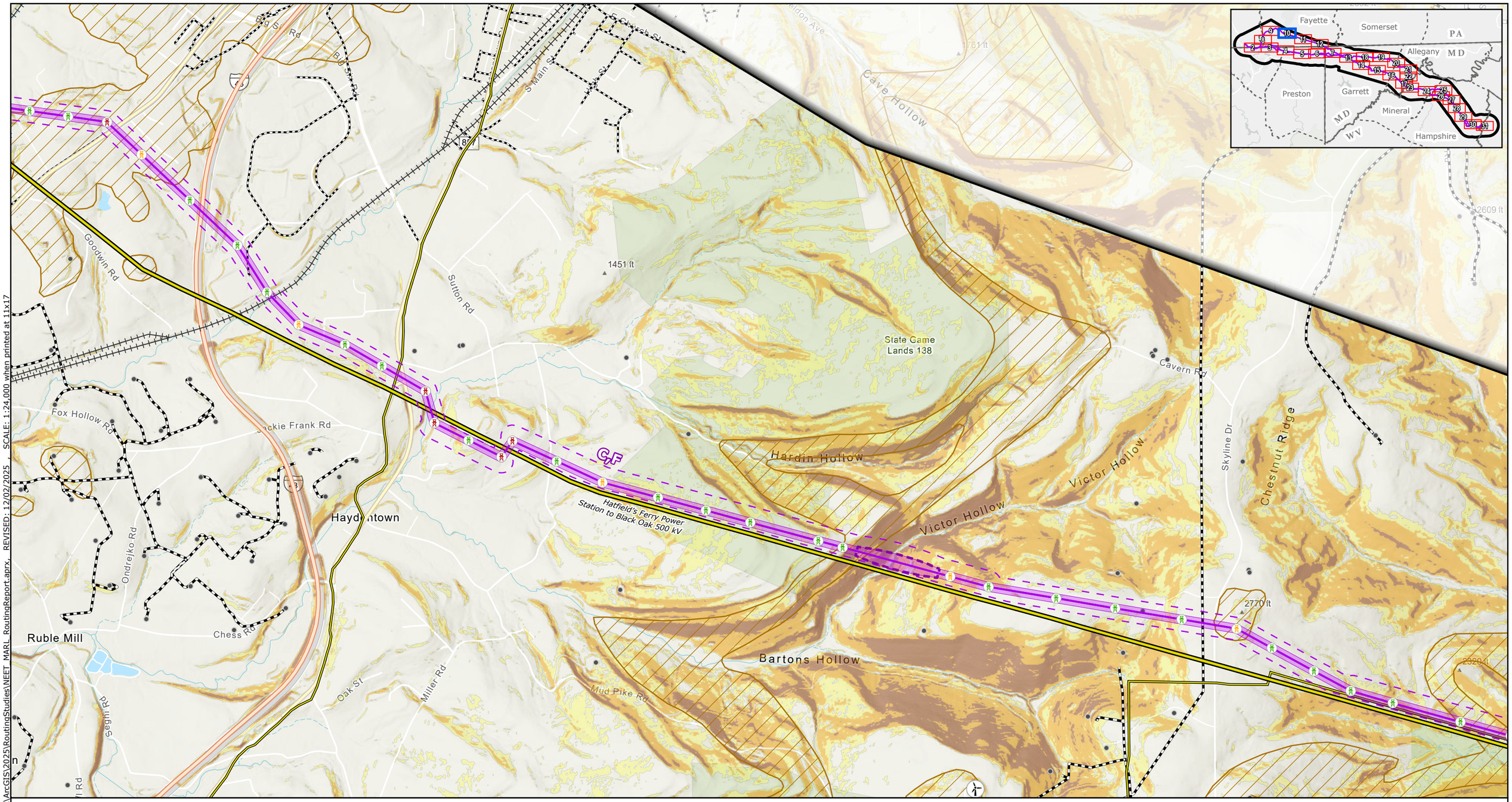

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Page 10 of 31
MidAtlantic Resiliency Link

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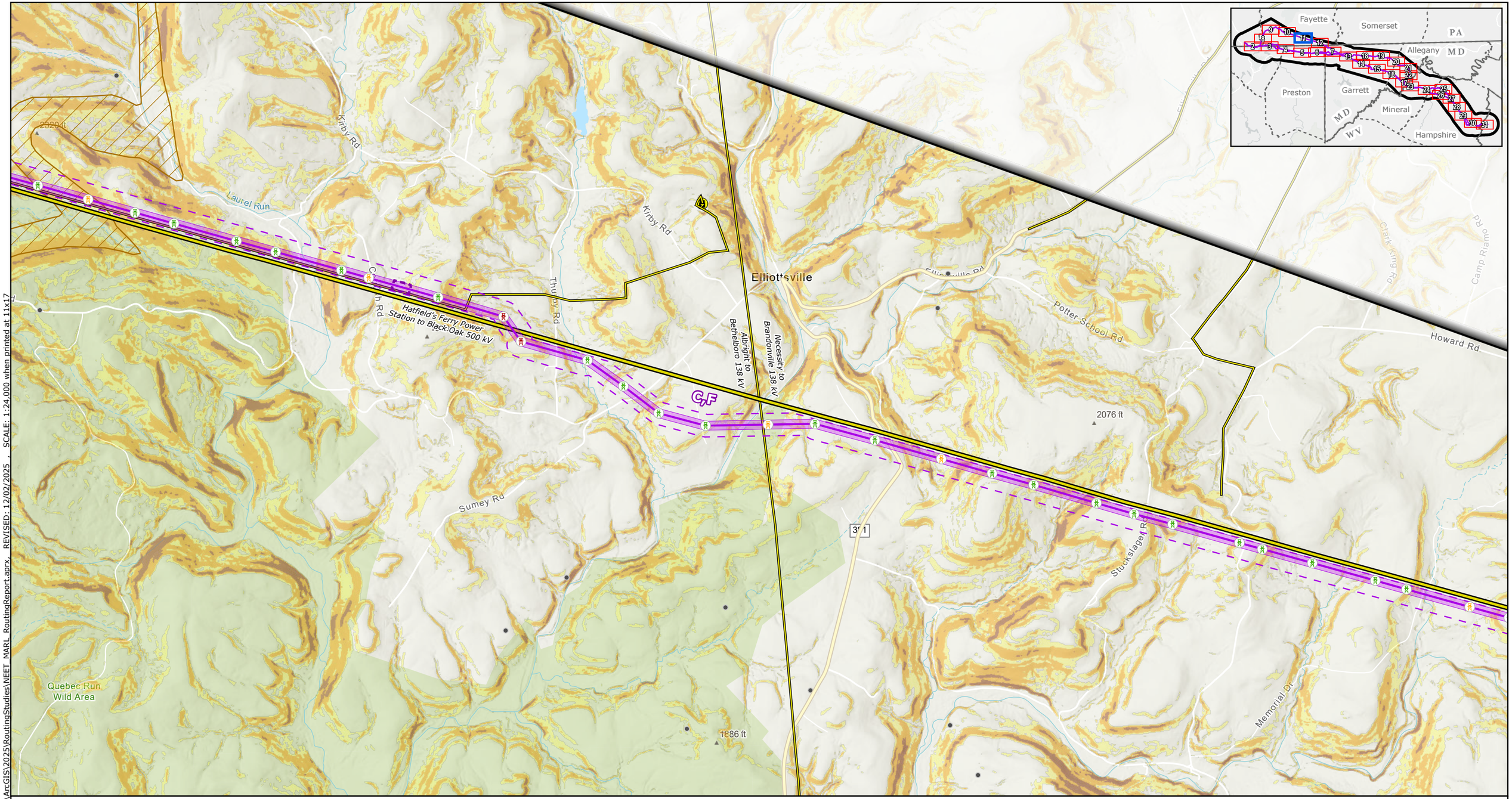

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Appendix E-13
Alternative Routes
Engineering and Infrastructure
Page 11 of 31
MidAtlantic Resiliency Link

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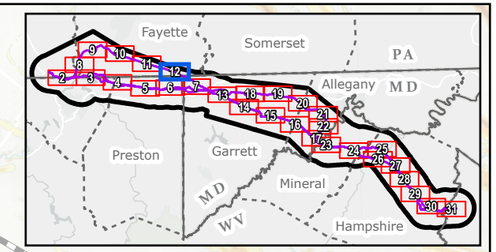

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Page 12 of 31
MidAtlantic Resiliency Link

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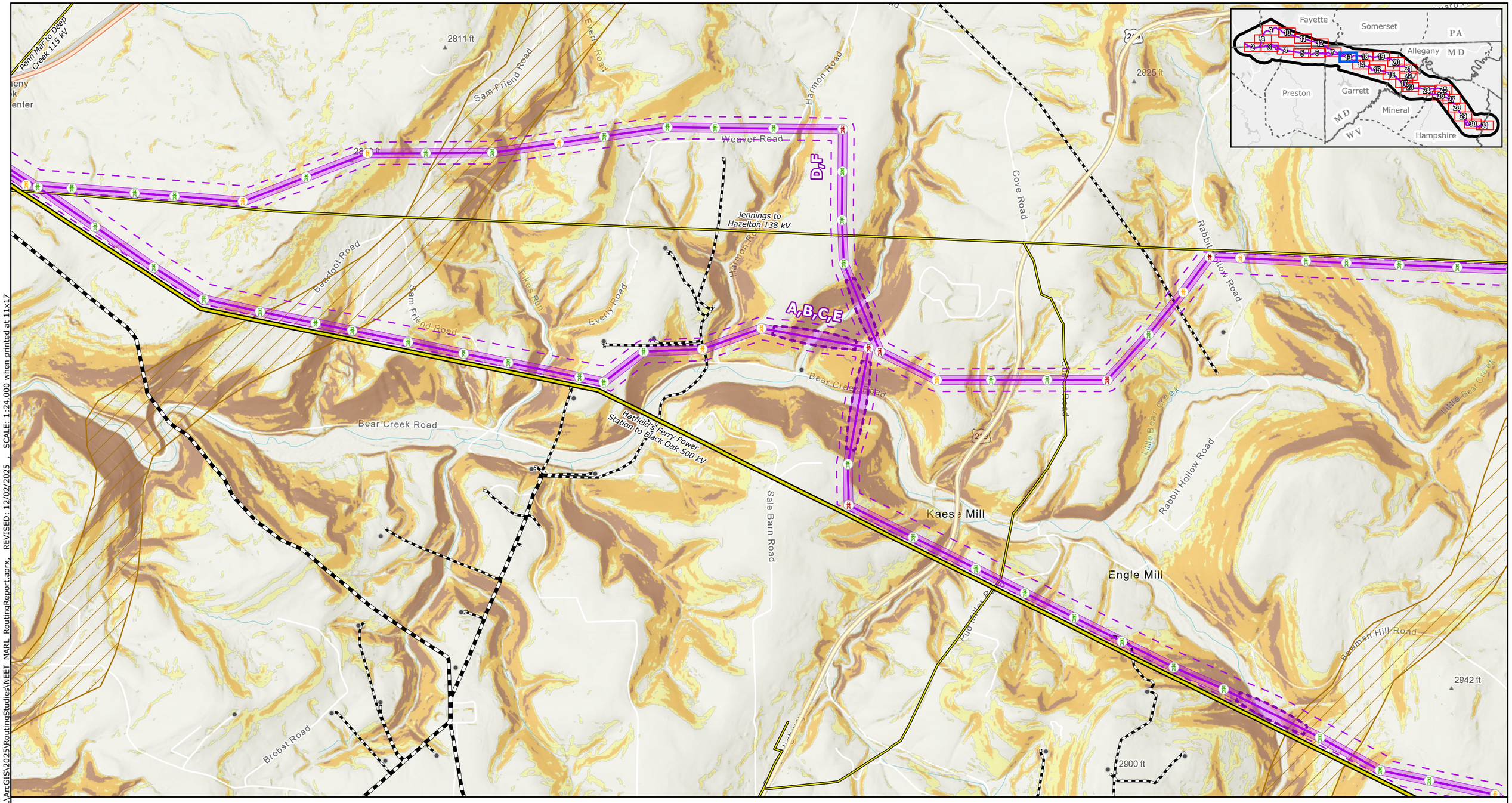

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- ROW Corridors
- Alternative Routes
- Aerial Easement Blowout Areas
- Siting Corridors
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Base Data
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- State Border

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Page 13 of 31
MidAtlantic Resiliency Link

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Appendix E-13
Alternative Routes
Engineering and Infrastructure
Page 14 of 31
MidAtlantic Resiliency Link

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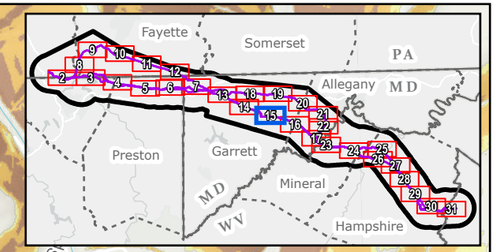

Fairview
Merrill
Fairview Road
Poplar Lick Run
Elk Lick Run
Pea Ridge Lane
Hatfield's Ferry Power Station to Black Oak 500 kV
Carlos JCT to Garrett 138 kV
A,B,C,E
Westernport Road
Swamp Road
Big Run Road
Bear Pen Run
Big Run
2861 ft
Pine Swamp
Russell Road

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Appendix E-13
Alternative Routes Engineering and Infrastructure
Page 15 of 31
MidAtlantic Resiliency Link

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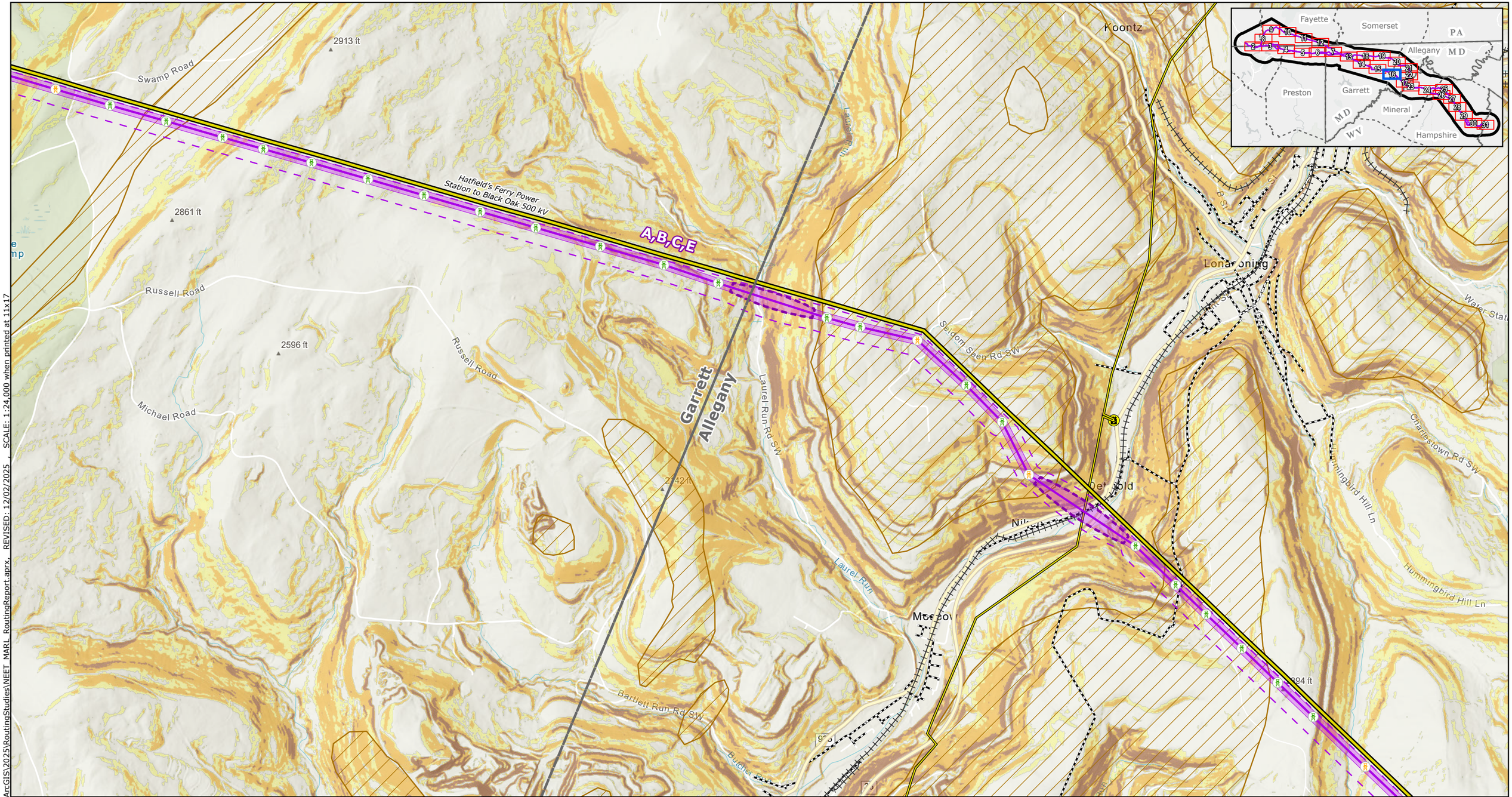

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Appendix E-13
Alternative Routes Engineering and Infrastructure
Page 16 of 31
MidAtlantic Resiliency Link

ERM

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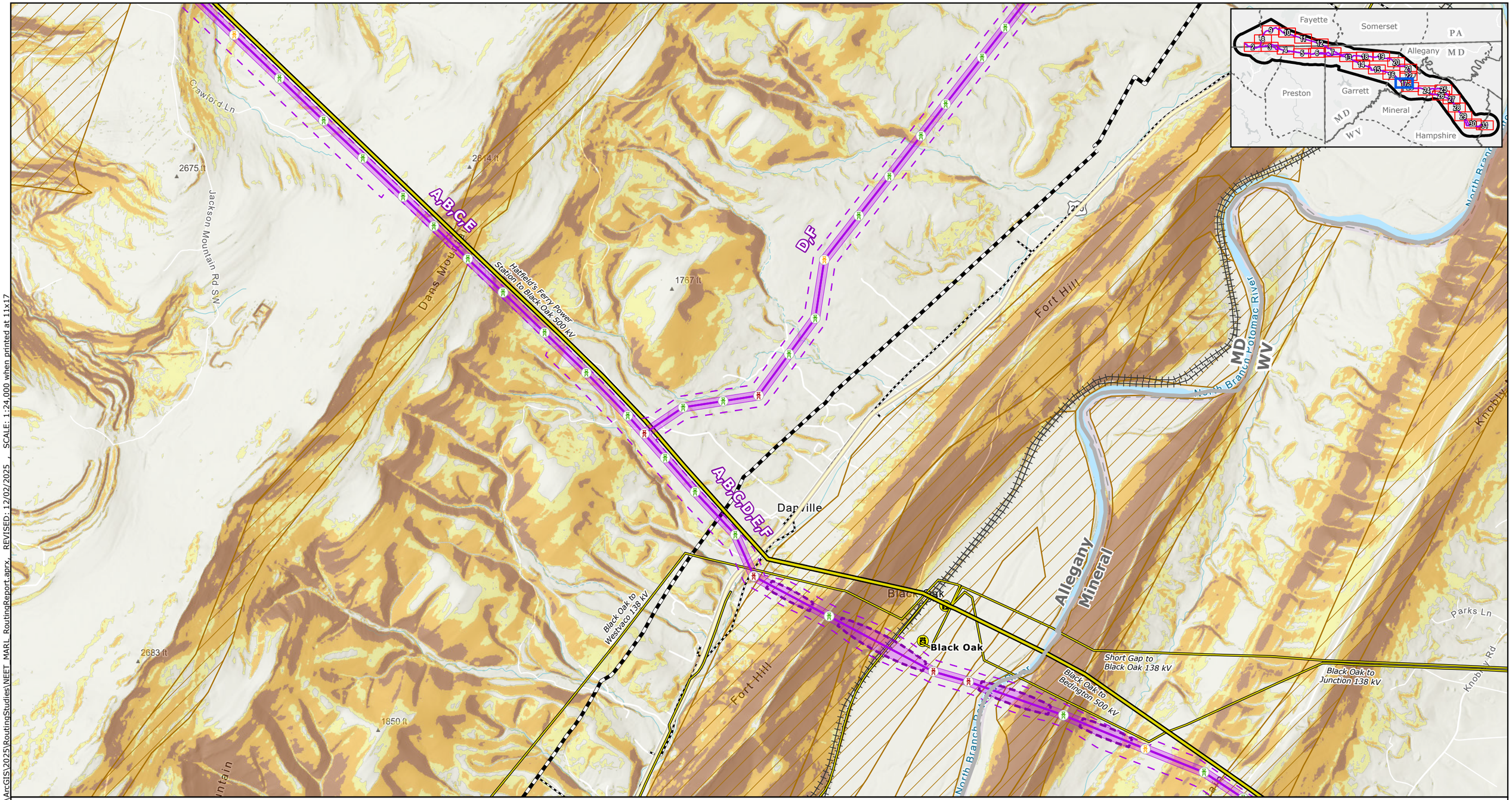

Proposed Project Components
- Project Endpoints
- ROW Corridors
- Alternative Routes
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- County Boundary
- State Border

Engineering and Infrastructure
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- Wind Turbines
- Substation
- Power Plants
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N

0 0.25 0.5 0.75 1
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Appendix E-13
Alternative Routes Engineering and Infrastructure

MidAtlantic Resiliency Link

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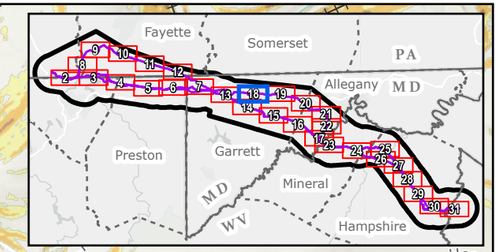

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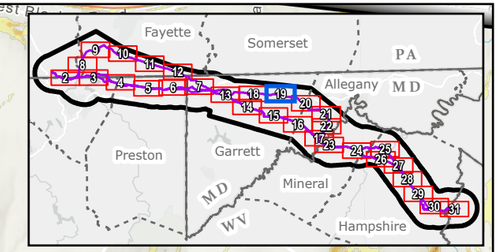

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Appendix E-13
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Page 19 of 31
MidAtlantic Resiliency Link

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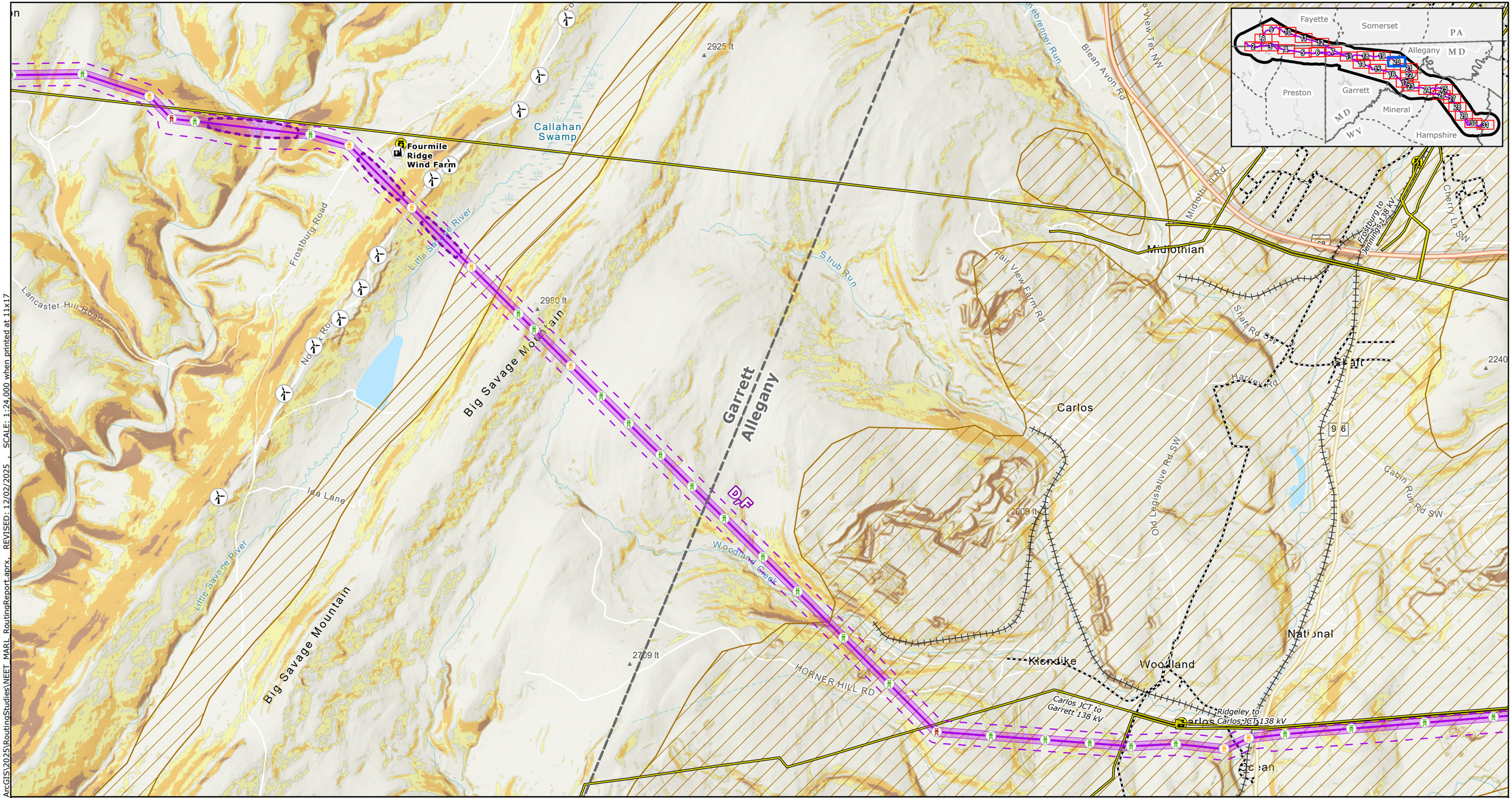

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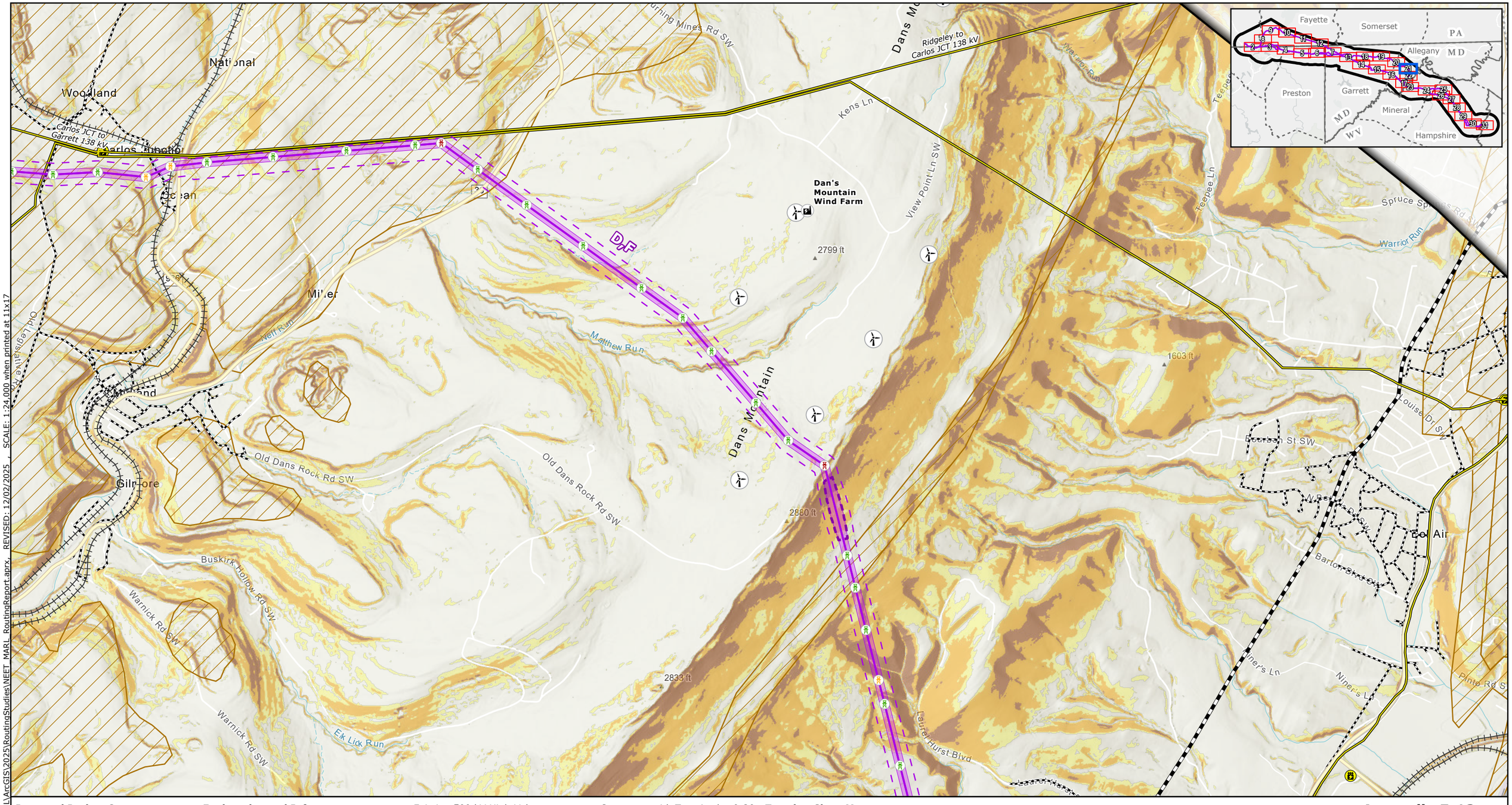

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Page 21 of 31
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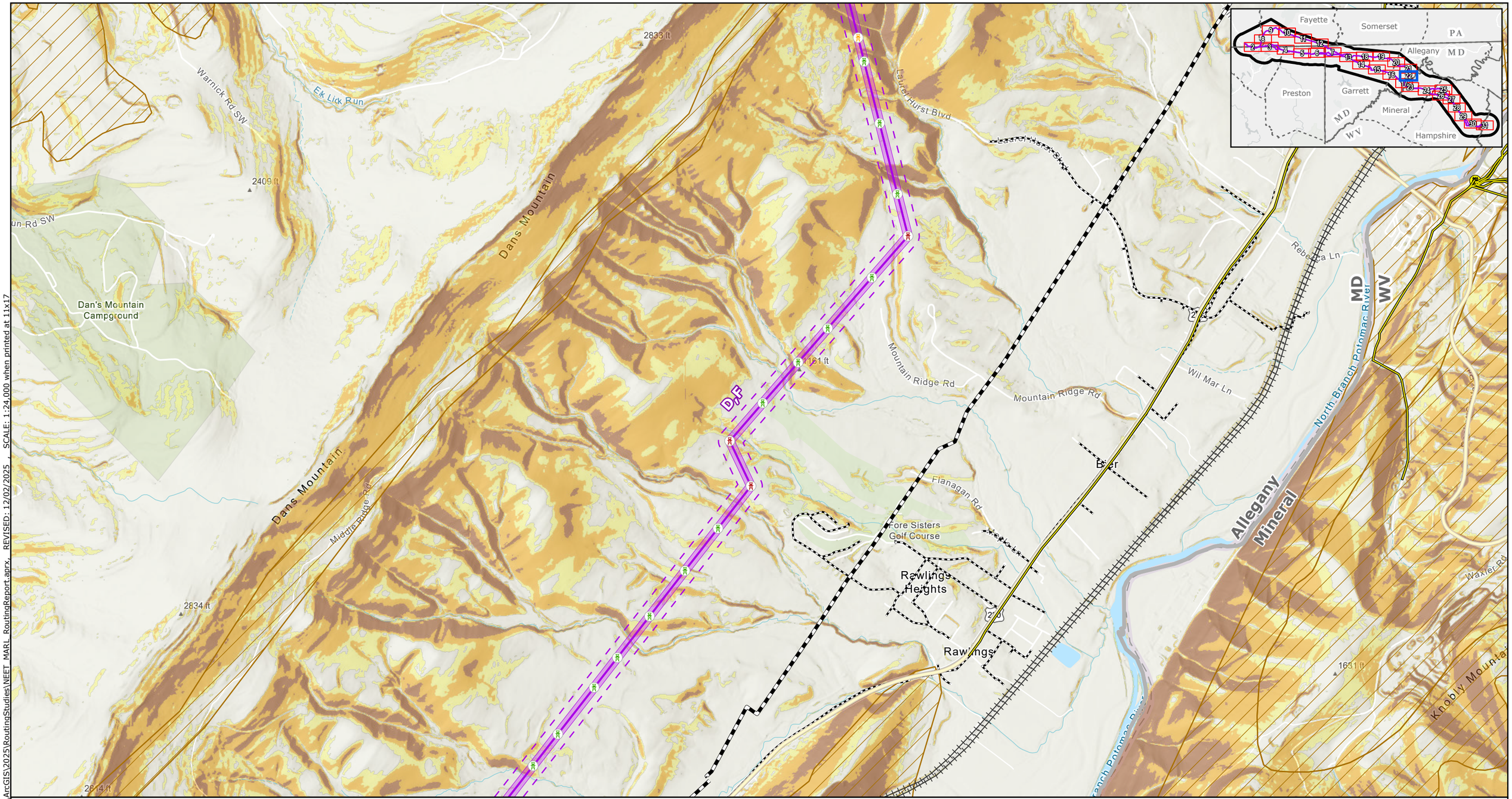

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Page 22 of 31
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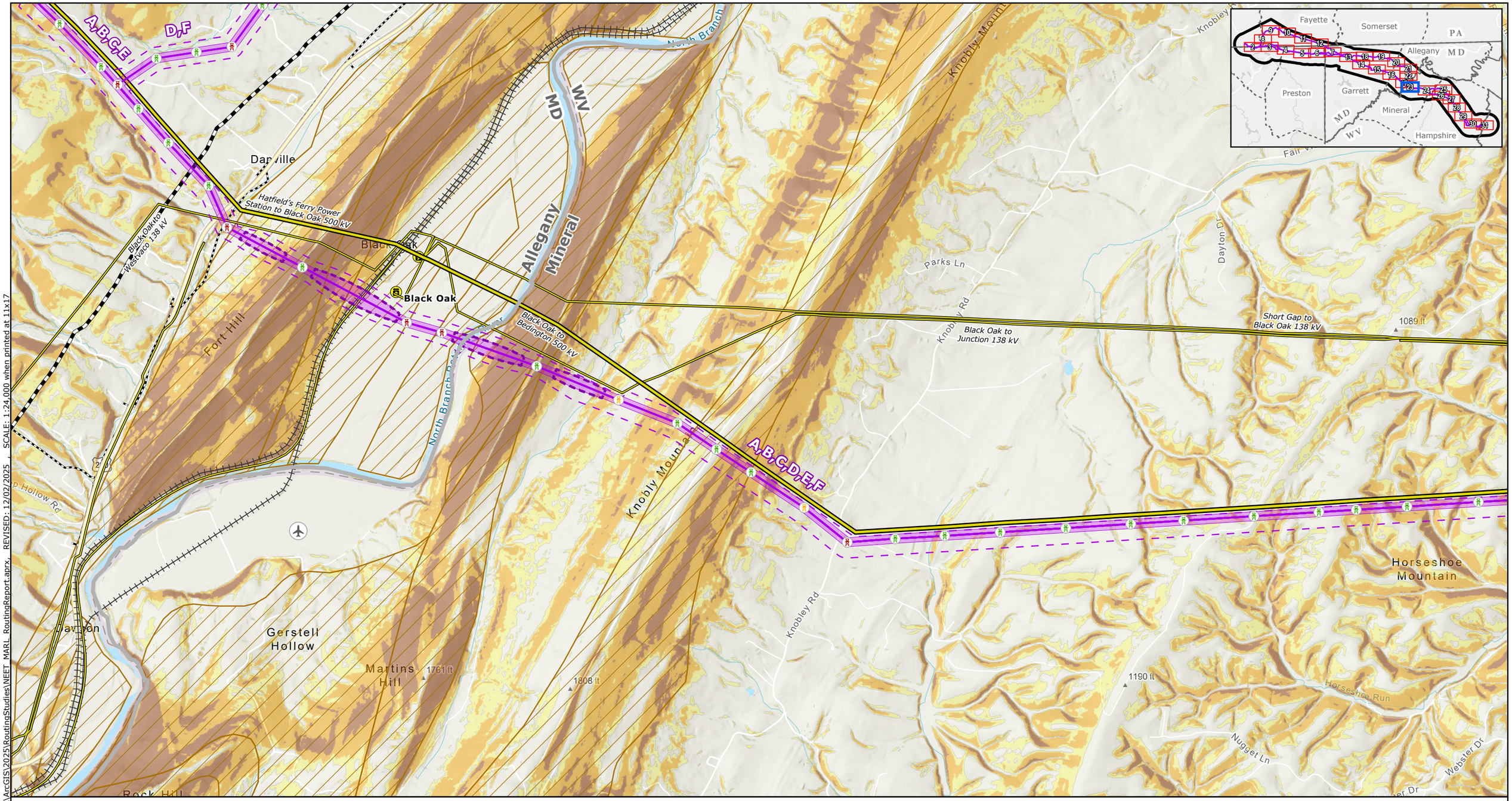

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Page 23 of 31
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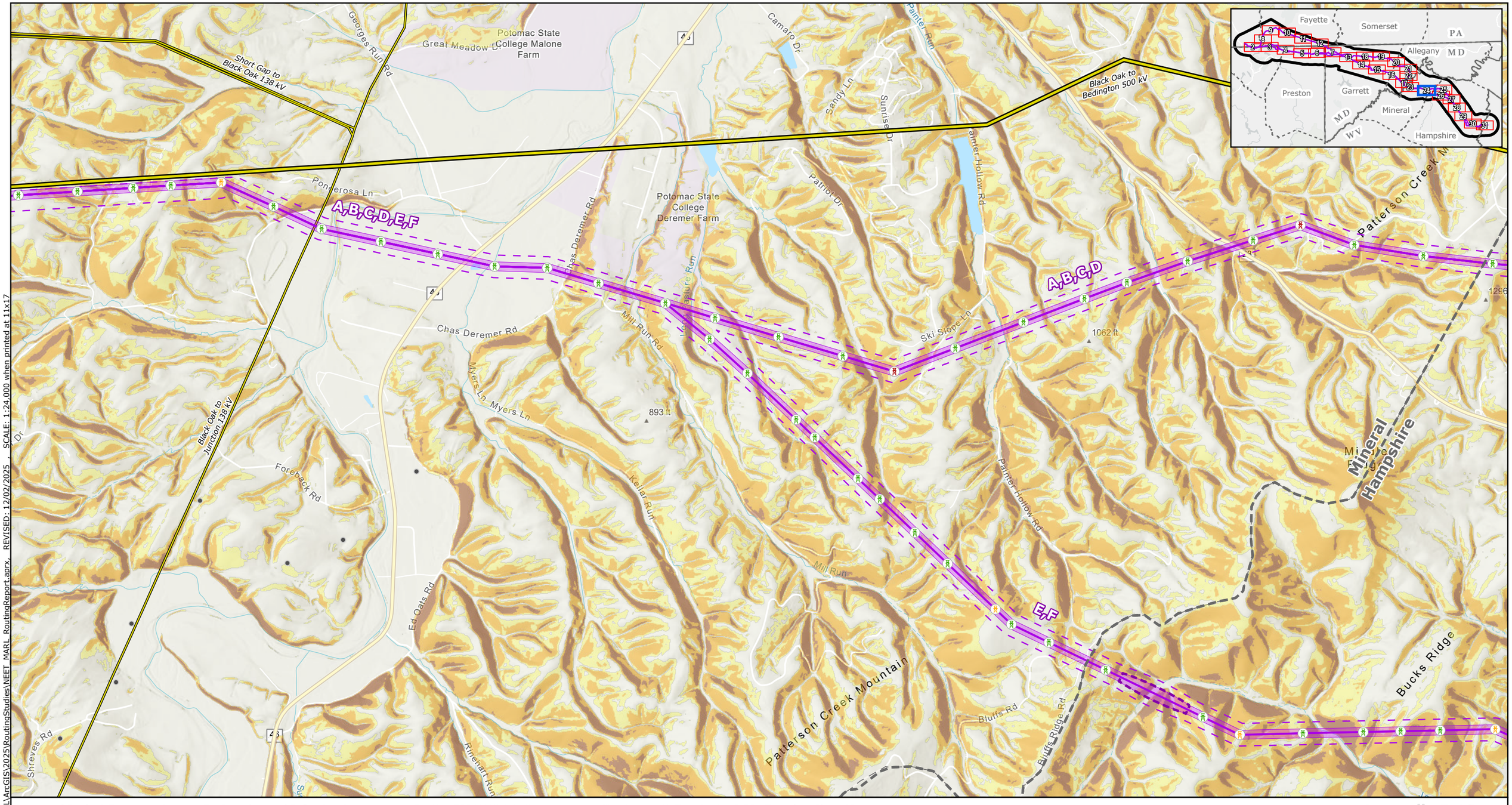

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Engineering and Infrastructure
Page 25 of 31
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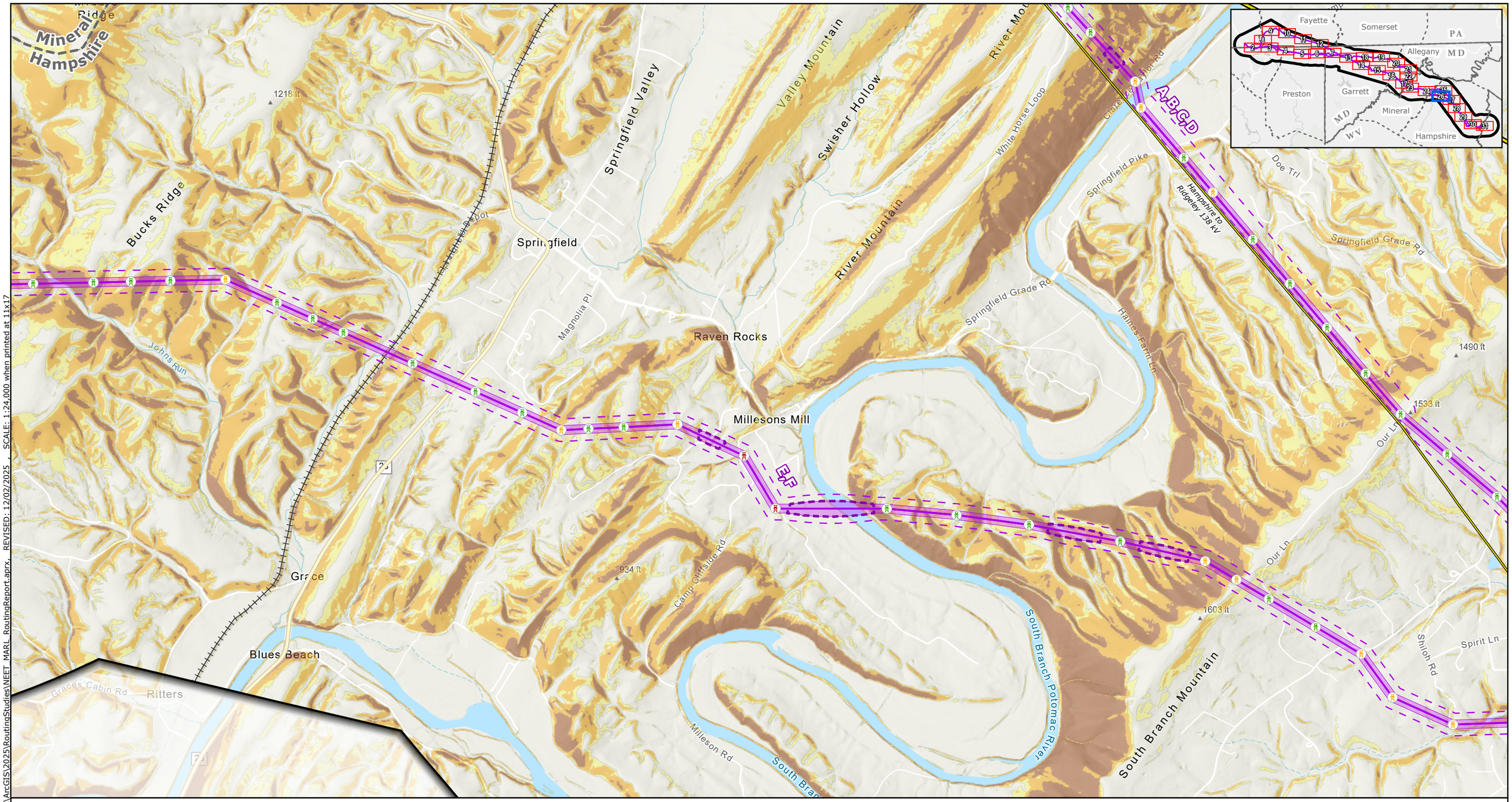

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Appendix E-13
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Engineering and Infrastructure
Page 26 of 31
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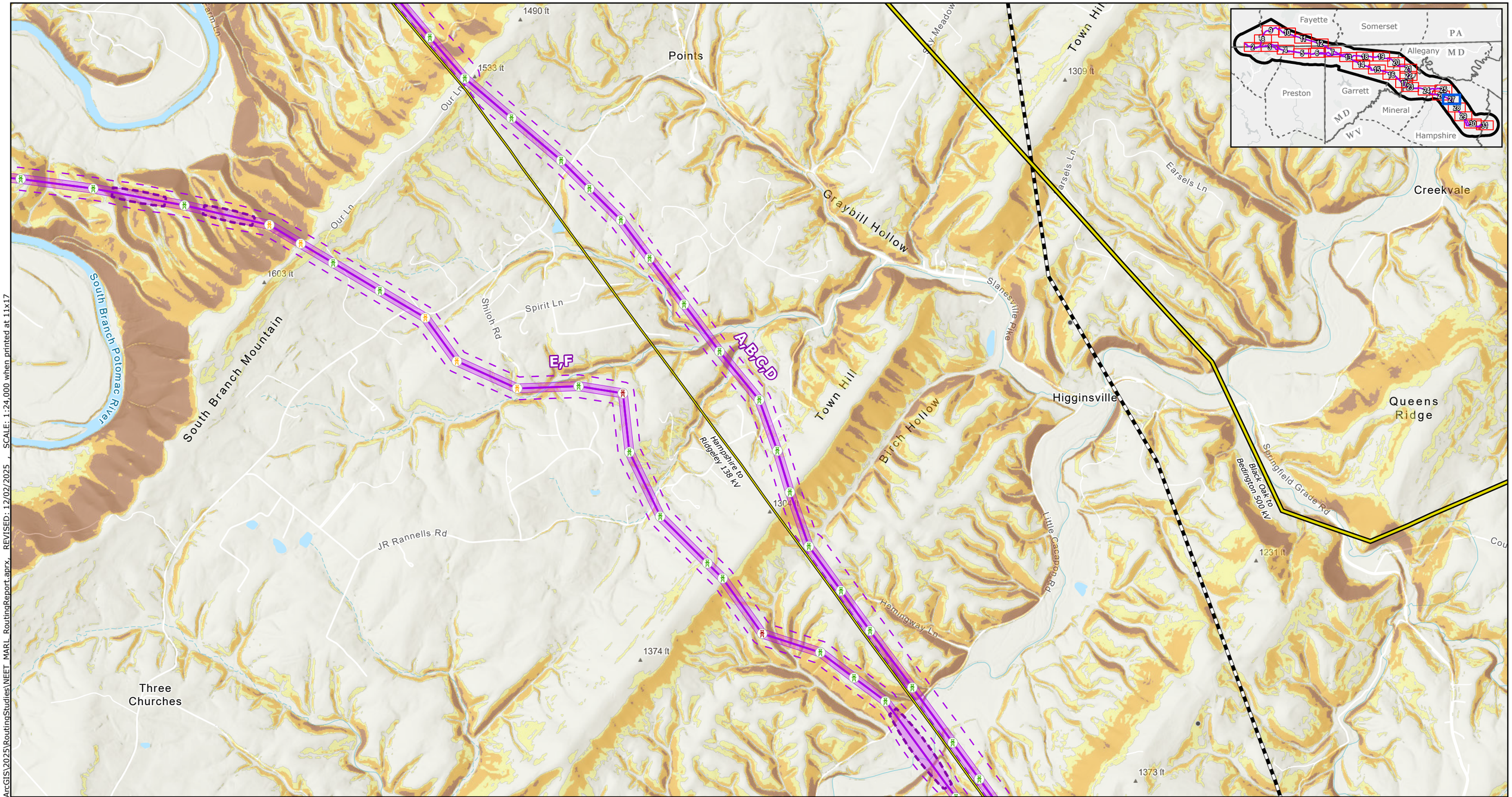

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Page 27 of 31
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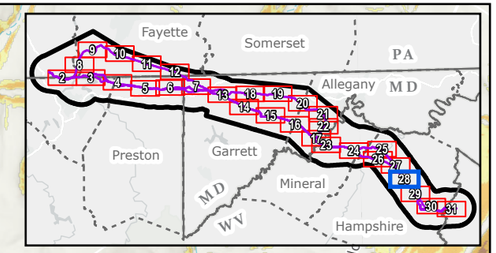

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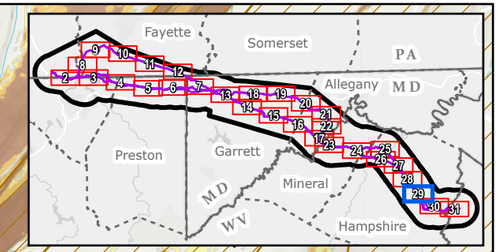

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Appendix E-13
Alternative Routes Engineering and Infrastructure
Page 30 of 31
MidAtlantic Resiliency Link

ERM

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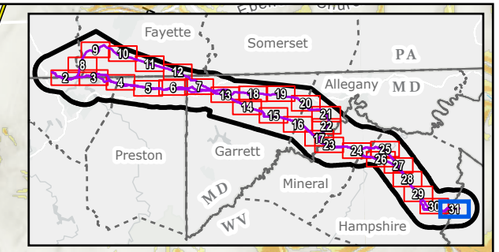
Coordinate System: NAD 1983 UTM Zone 17N



Proposed Project Components
- Project Endpoints
- ROW Corridors
- Alternative Routes
- Aerial Easement Blowout Areas
- Siting Corridors
- Project Study Area

Base Data
- County Boundary
- State Border

Engineering and Infrastructure
- Airports
- Wind Turbines
- Substation
- Power Plants
- Oil and Gas Wells
- Natural Gas Distribution
- Natural Gas Gathering Pipeline
- Natural Gas Transmission Pipeline
- Existing 500 kV High-Voltage Transmission Lines
- Existing High-Voltage Transmission Lines (<500 kV)
- Railway
- Primary Road
- Secondary Road
- Geologic Karst Features
- Structures with Turn Angles 0-20 degrees
- Structures with Turn Angles 20-30 degrees
- Structures with Turn Angles >30 degrees

Terrain - Slope Map
- Moderately Steep (16° - 20°)
- Steep (21° - 30°)
- Very steep (31° - 90°)

NOTES
1. *Proposed tower locations are preliminary and subject to change*
2. *Data source: NEET, ERM, USGS, REXTAG*

N

0 0.25 0.5 0.75 1
Miles

Scale: 1:24,000
1 inch equals 2,000 ft (when printed at 11x17)

Appendix E-13
Alternative Routes
Engineering and Infrastructure
Page 31 of 31
MidAtlantic Resiliency Link

ERM

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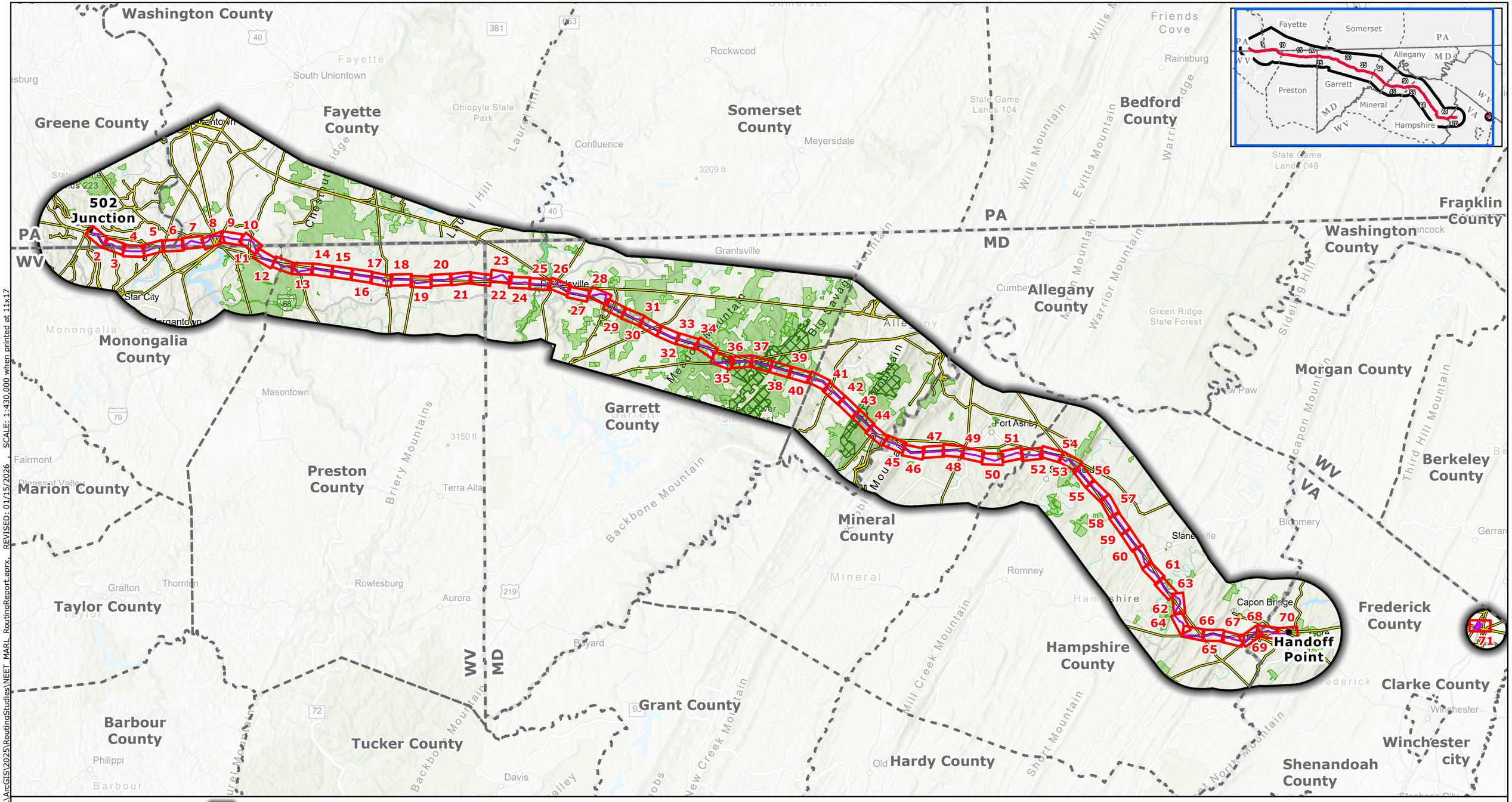
APPENDIX E-14 THE PROPOSED ROUTE MAPBOOK



Project Components
- Project Endpoints
- Proposed Route Centerline
- Proposed Substation Boundary
- Project Study Area

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border
- Map Index Page

Protected Areas
- Protected Lands*
- Maryland Wildlands

NOTES
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N

0 3.5 7 10.5 14
Miles

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1 inch equals 35,833 ft (when printed at 11x17)

Appendix E-14
Proposed Route
Page 1 of 71
MidAtlantic Resiliency Link

ERM

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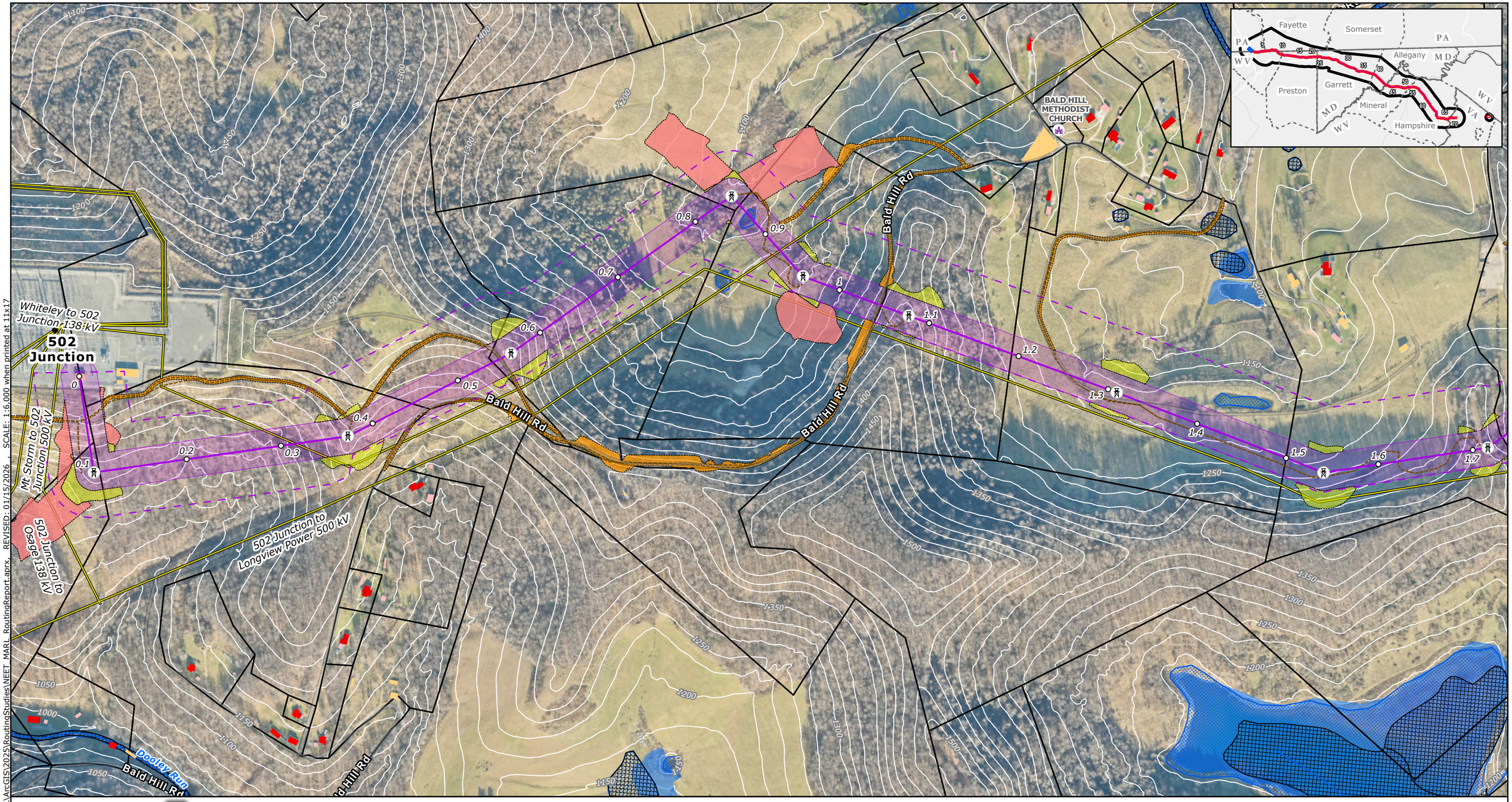

Project Components
- Project Endpoints
- Towers
- Milepost
- Proposed Route Centerline
- Proposed Route ROW Corridor
- Aerial Easement Blowout Areas
- Siting Corridor
- Proposed Substation Boundary
- Project Study Area

Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

LiDAR Elevation Contours
- 25-foot contours

Base Data
- Existing High-Voltage Transmission Lines
- County Boundary
- State Border

Protected Areas
- Protected Lands*
- Maryland Wildlands

Community Resources
- Hiking/Walking Trails
- Potomac Heritage Trail
- Scenic Byways
- Place of Worship
- Childcare Center
- School

Water Resources
- Stream/River - Intermittent(NHD)
- Stream/River - Perennial (NHD)
- Trout Streams and Coldwater Fisheries (all states)
- Riparian Habitat Exclusion Zone
- NWI Wetlands (All Types)
- Modeled High Probability Wetlands
- NHD Waterbody

FEMA Flood Hazard
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Parcels

Buildings Footprints
- Residential Dwelling
- Residential Outbuilding (Shed,Garage,Other)
- Non-residential buildings

NOTES
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N

0 0.05 0.1 0.15 0.2
Miles

Scale: 1:6,000
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Appendix E-14
Proposed Route
Page 2 of 71
MidAtlantic Resiliency Link

ERM

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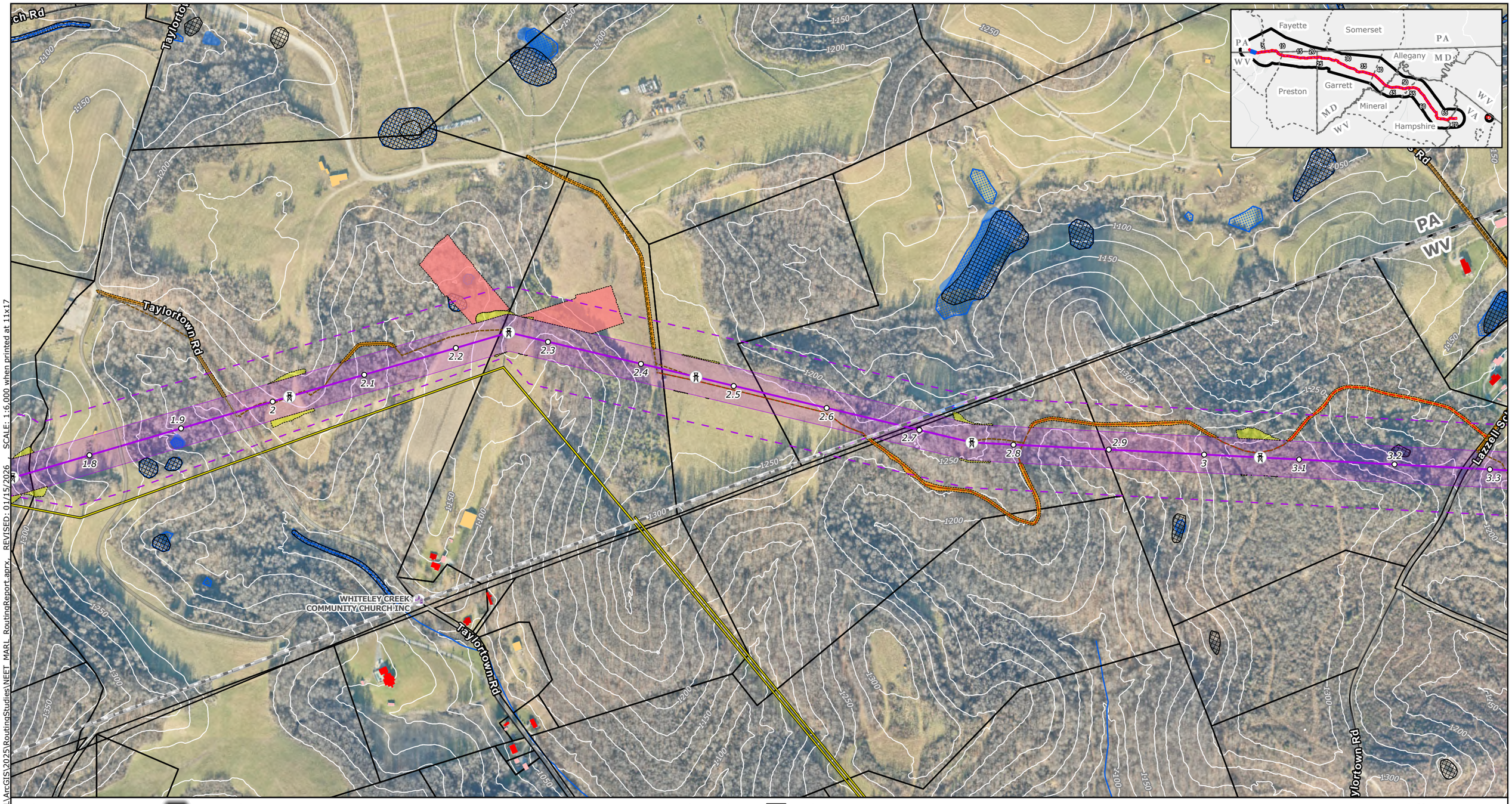

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Proposed Route
Page 3 of 71
MidAtlantic Resiliency Link

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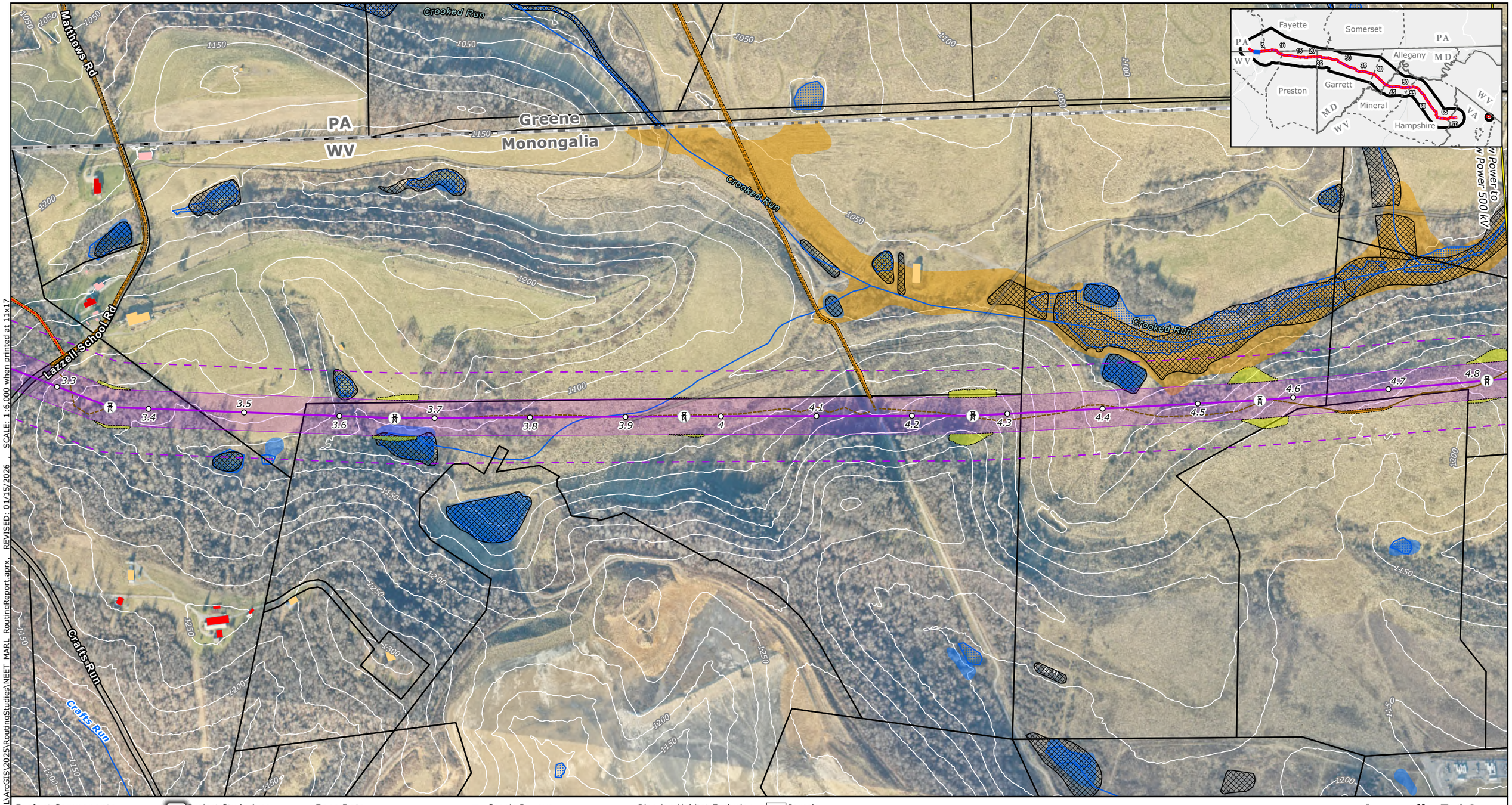

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N

0 0.05 0.1 0.15 0.2
Miles

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Appendix E-14
Proposed Route
Page 4 of 71
MidAtlantic Resiliency Link

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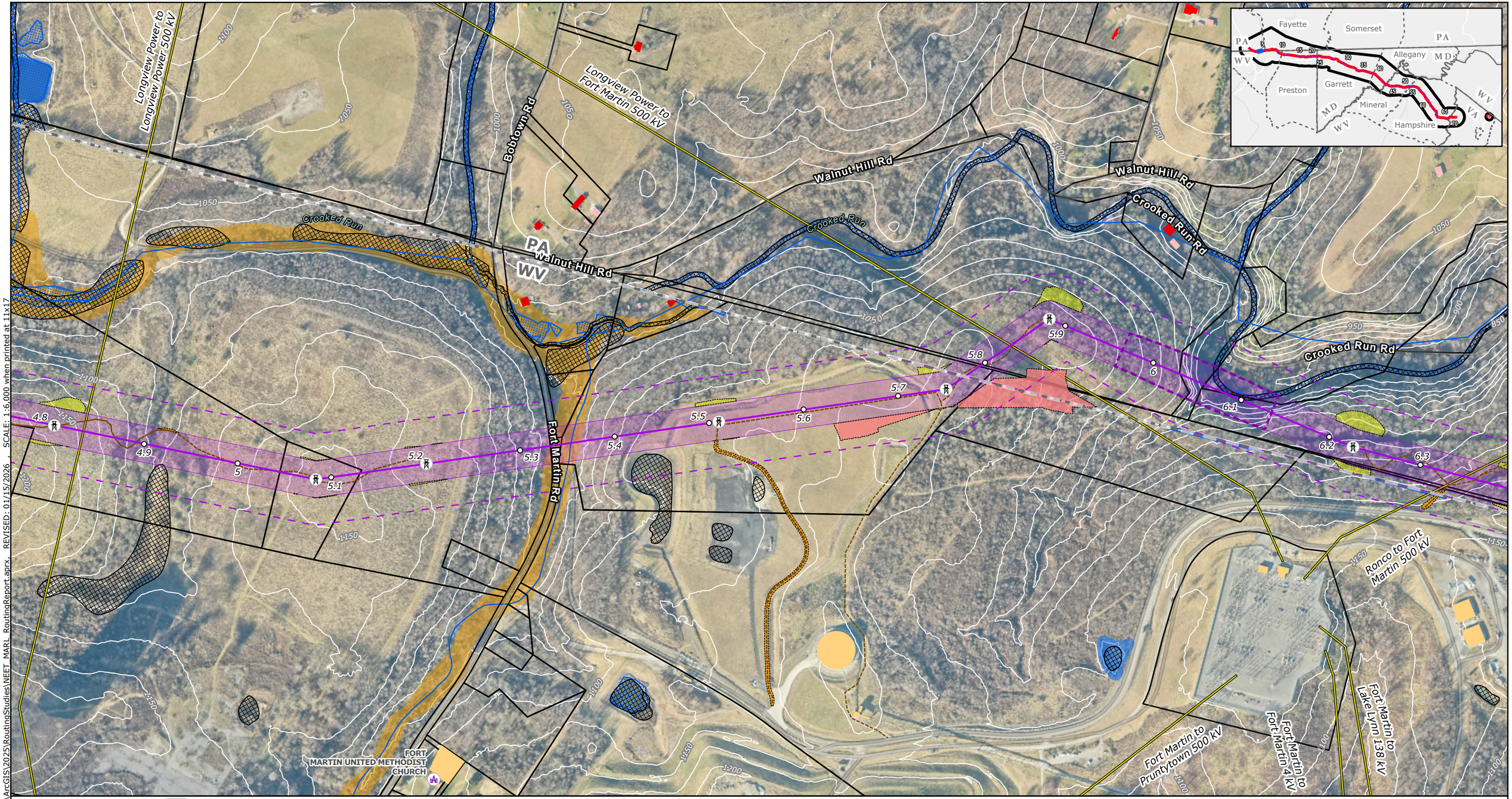

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N

0 0.05 0.1 0.15 0.2
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Appendix E-14
Proposed Route
Page 5 of 71
MidAtlantic Resiliency Link

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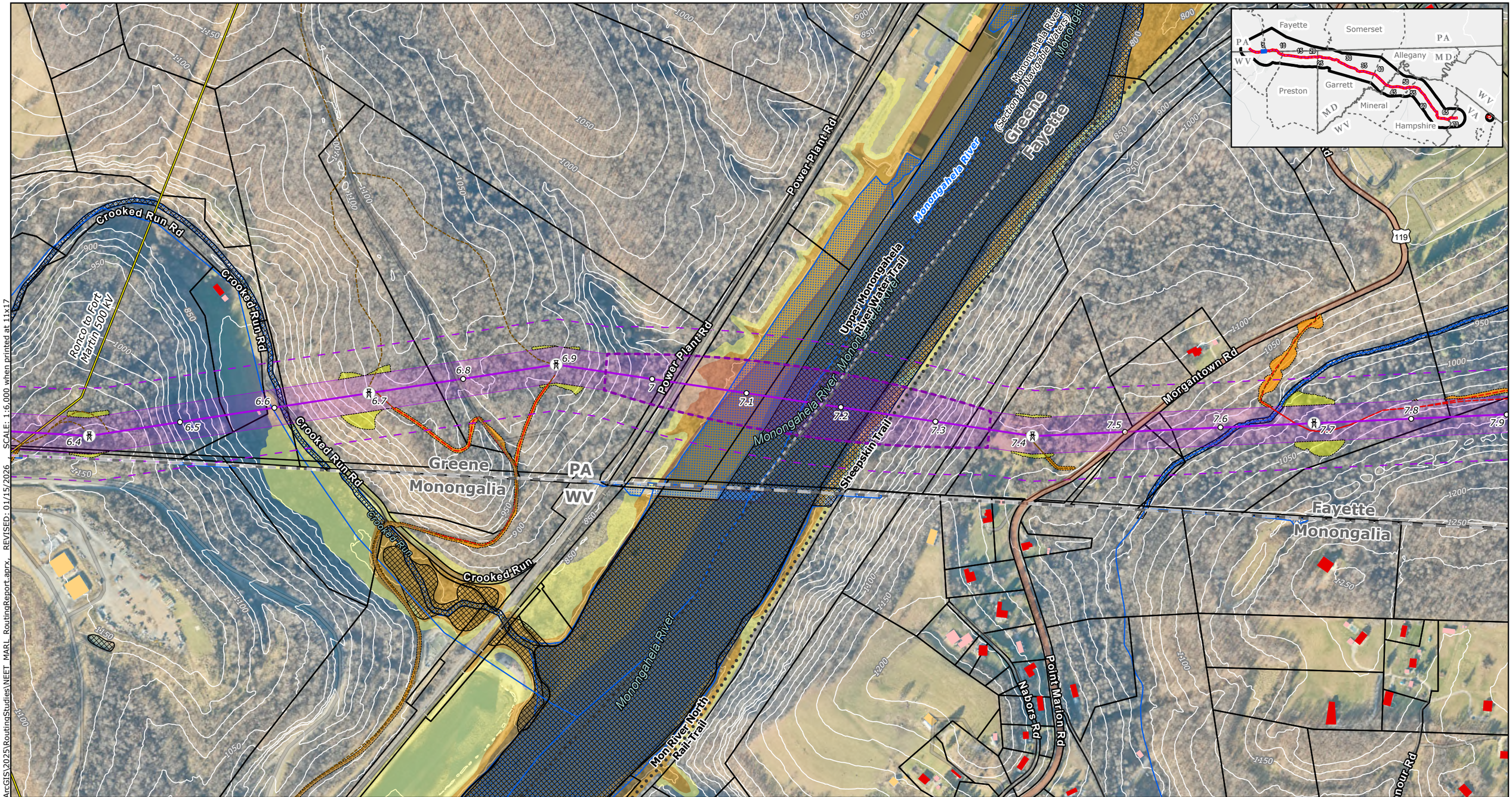

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N

0 0.05 0.1 0.15 0.2
Miles

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Appendix E-14
Proposed Route
Page 6 of 71
MidAtlantic Resiliency Link

ERM

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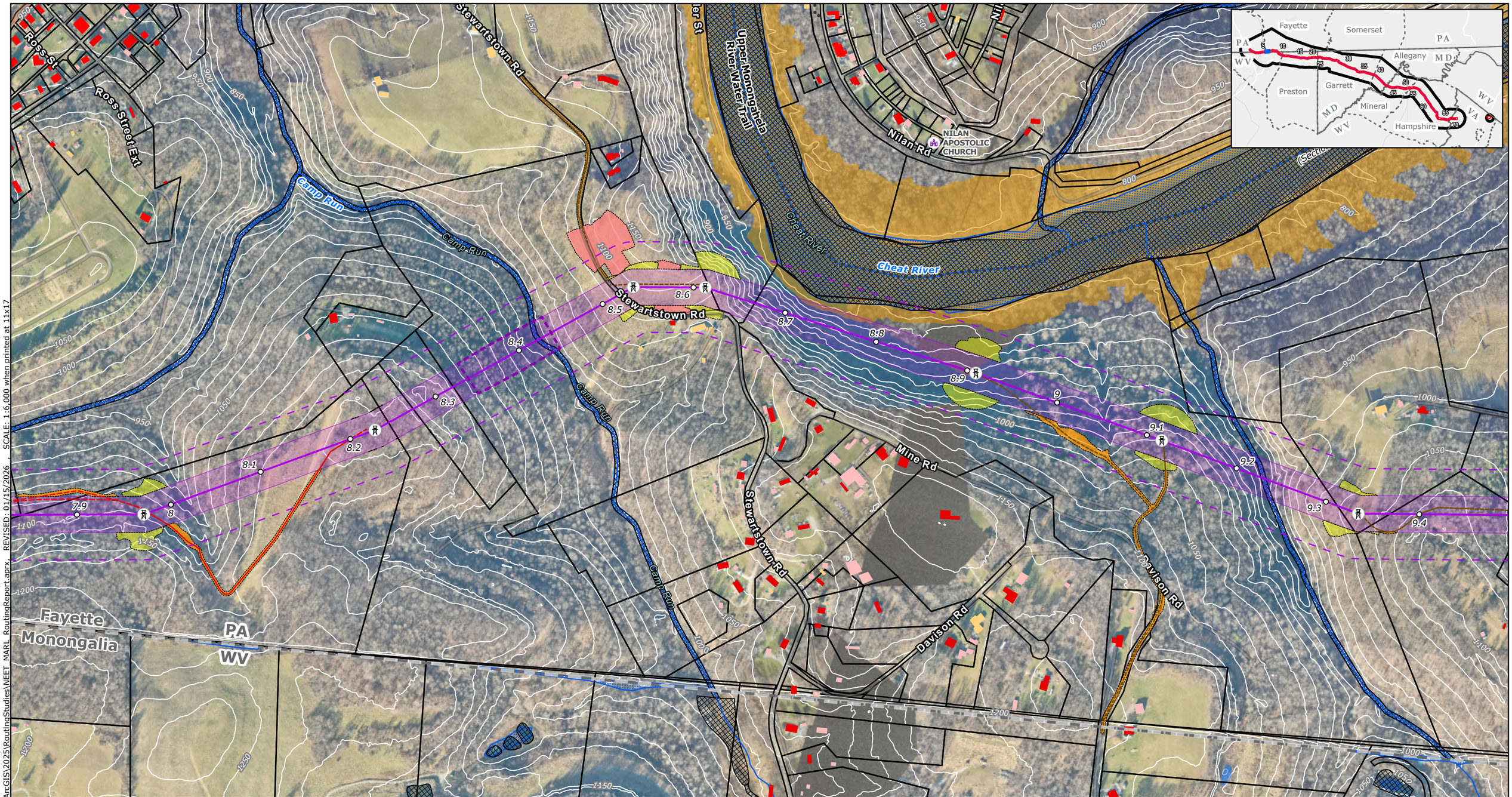

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Project Components
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N

0 0.05 0.1 0.15 0.2

Miles

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Appendix E-14
Proposed Route
Page 7 of 71
MidAtlantic Resiliency Link

ERM

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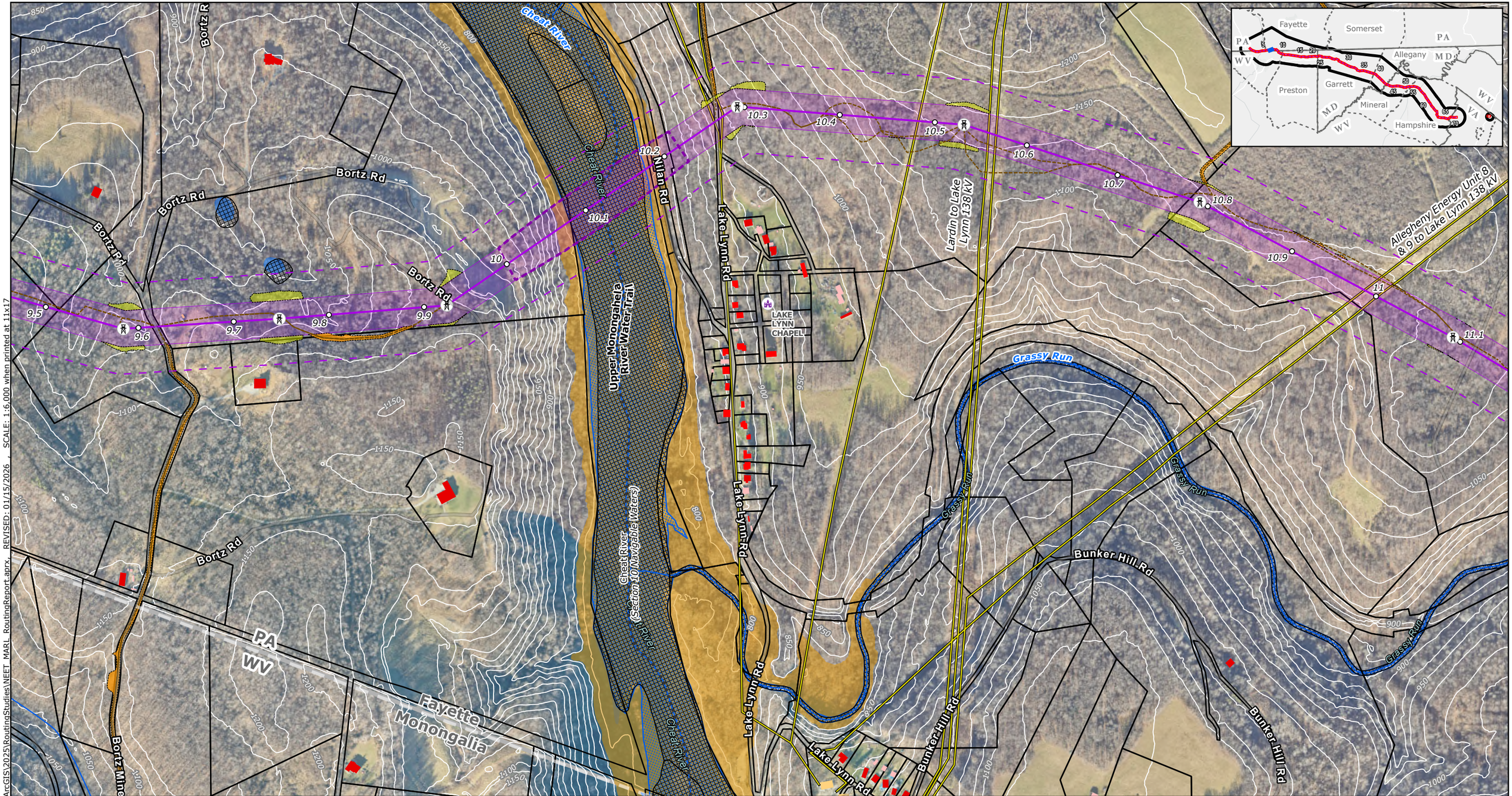

Project Components
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LiDAR Elevation Contours
- 25-foot contours

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N

0 0.05 0.1 0.15 0.2
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Appendix E-14
Proposed Route
Page 8 of 71
MidAtlantic Resiliency Link

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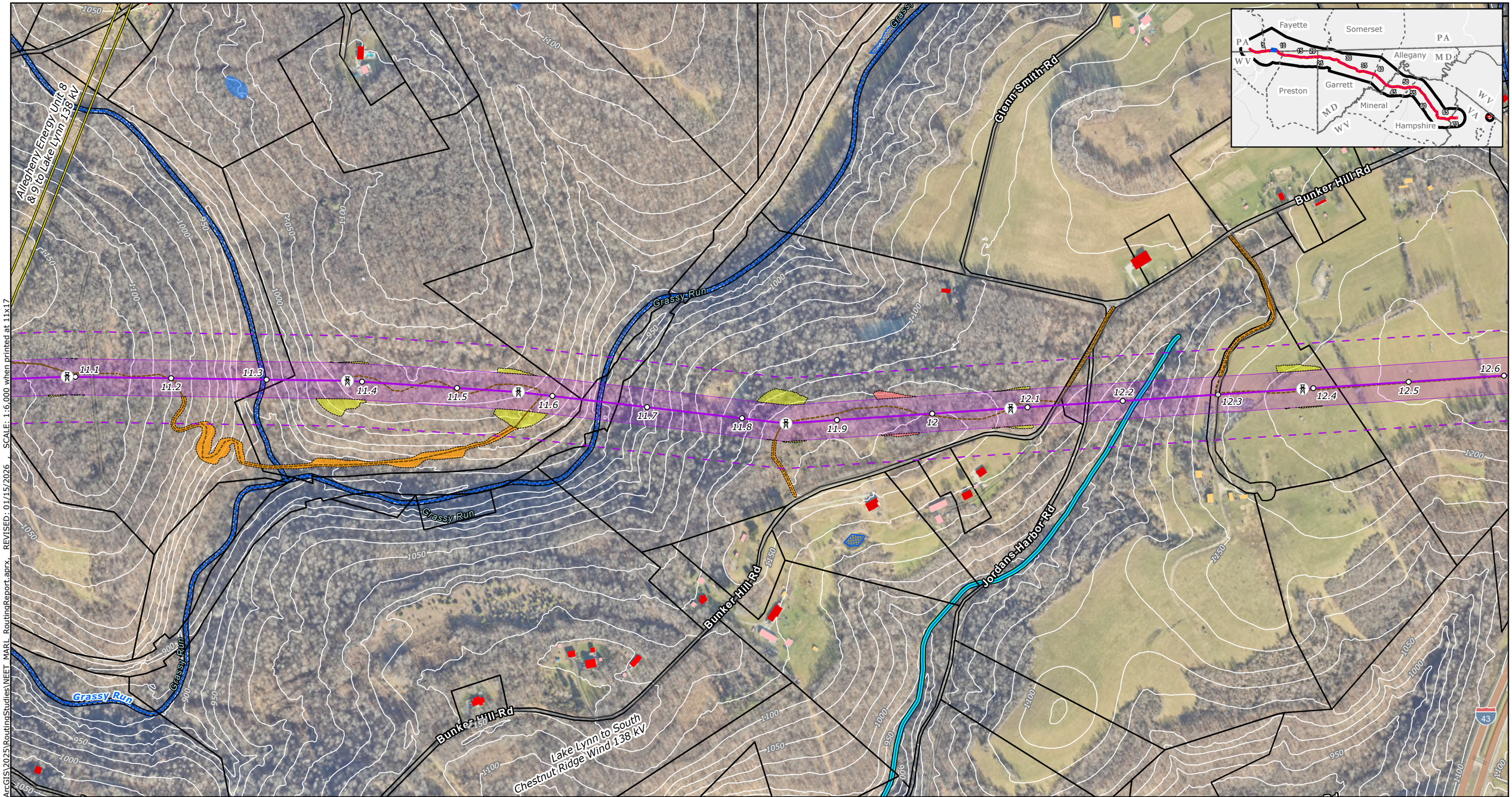

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Page 9 of 71
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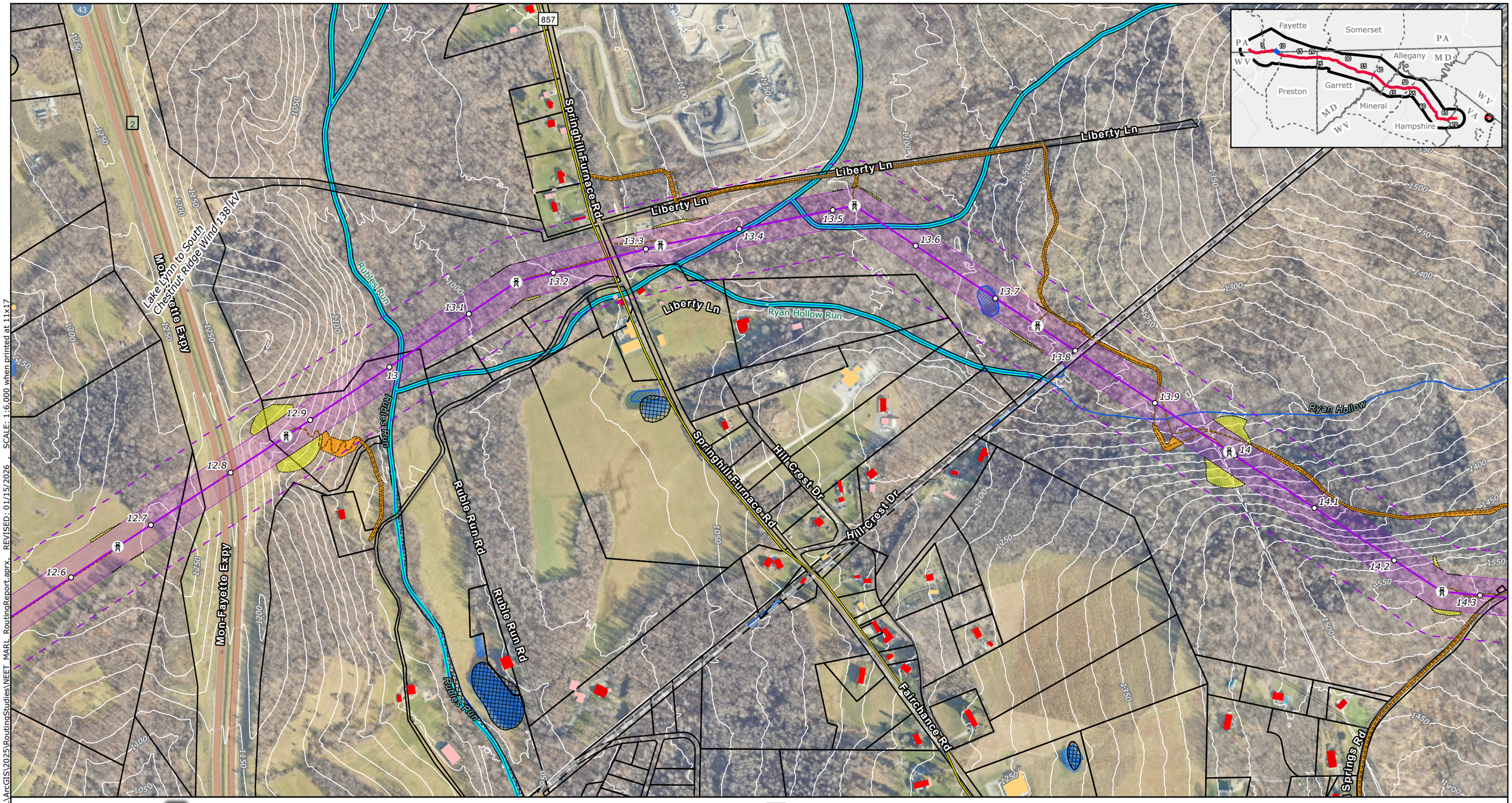

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N

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Miles

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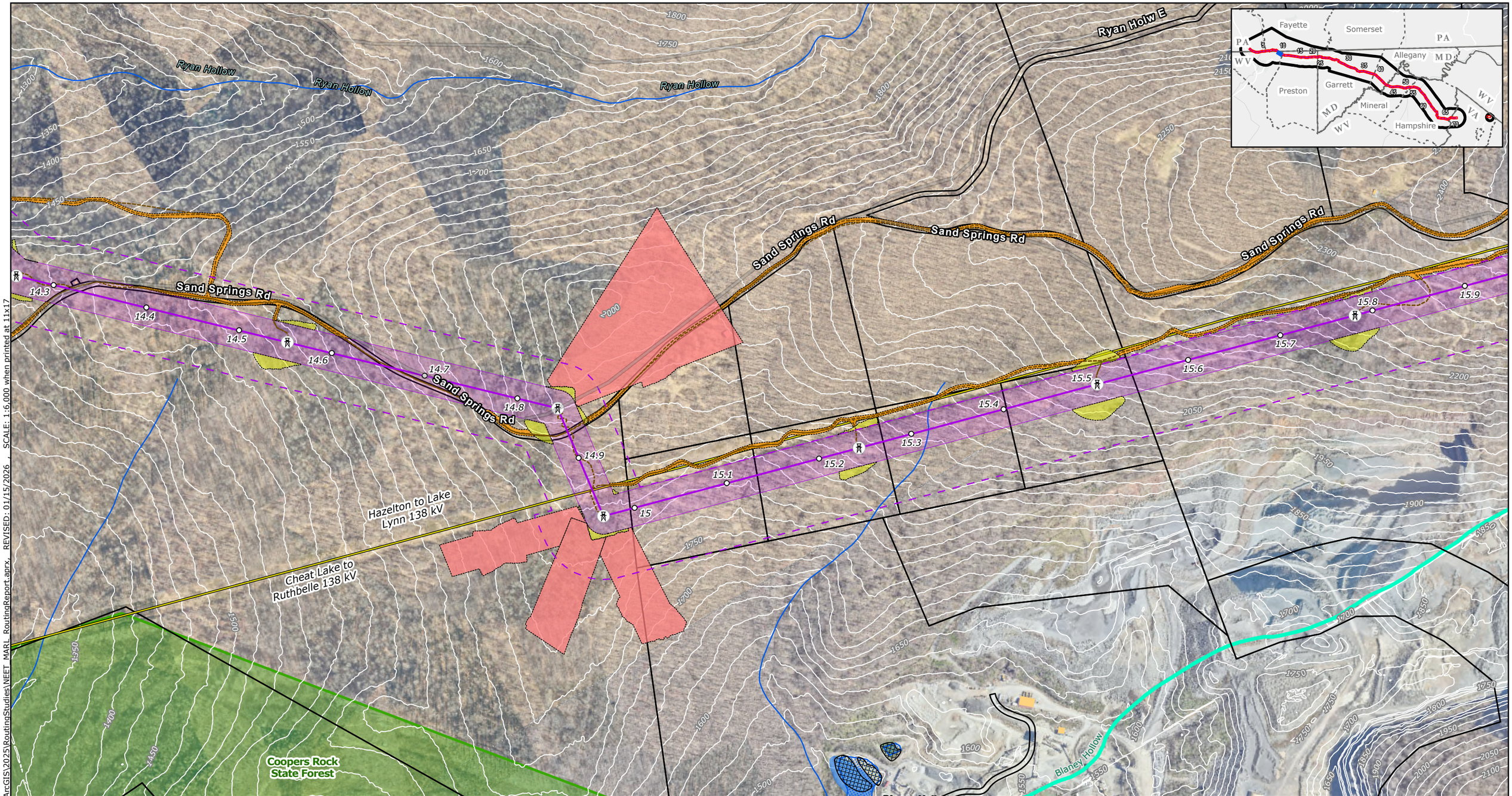
Appendix E-14
Proposed Route

MidAtlantic Resiliency Link

ERM



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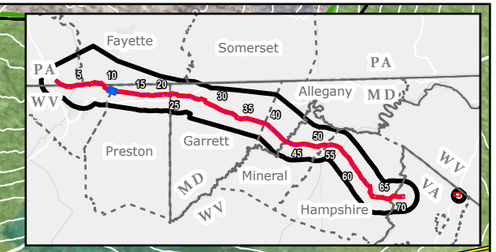

Hazelton to Lake Lynn 138 kV

Sand Springs Rd

Cheat Lake to Ruthbelle 138 kV

Coopers Rock State Forest

Blaney Hollow

Little Laurel Creek

16 16.1 16.2 16.3 16.4 16.5 16.6 16.7 16.8 16.9 17 17.1 17.2 17.3 17.4 17.5

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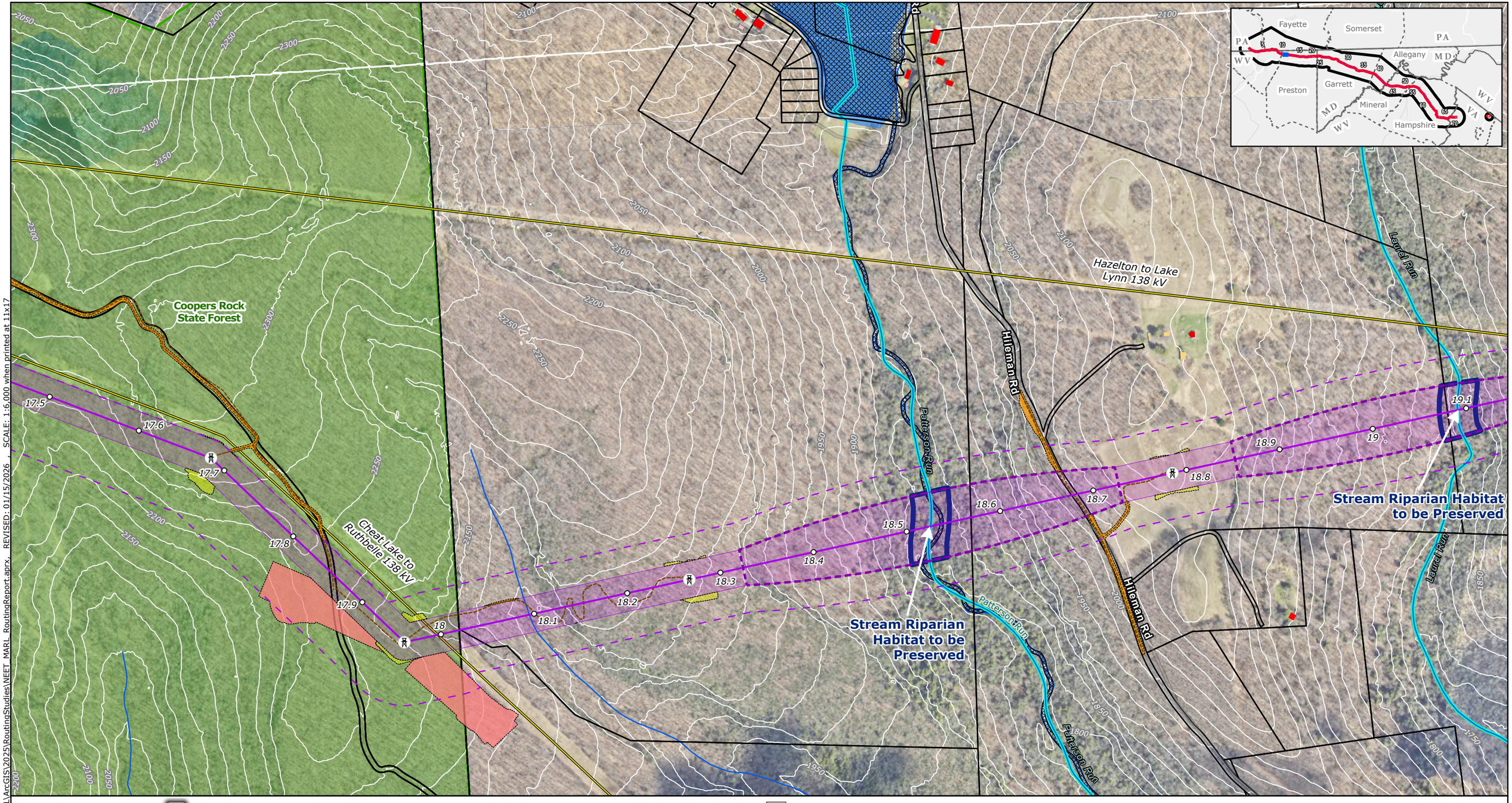

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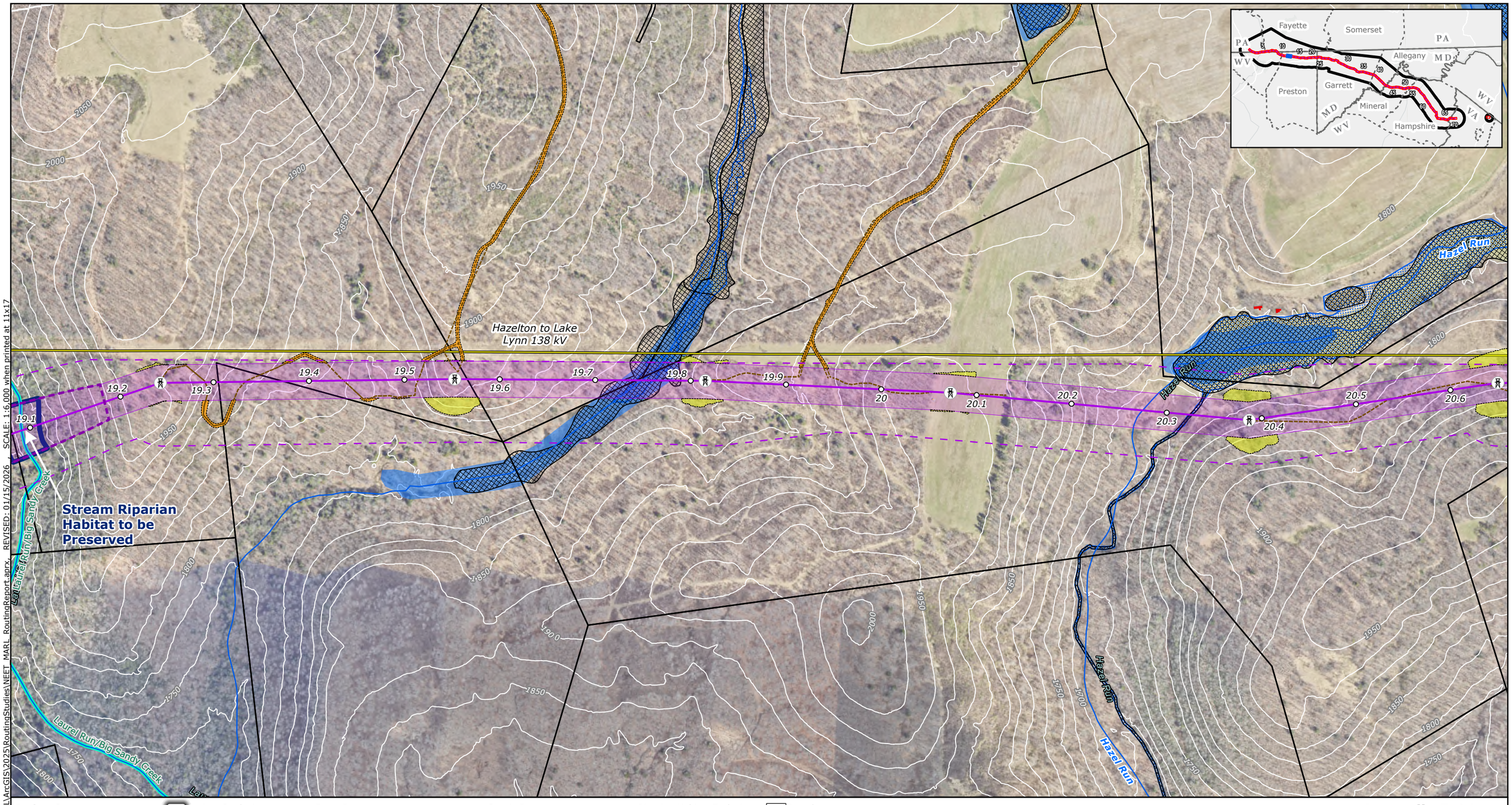

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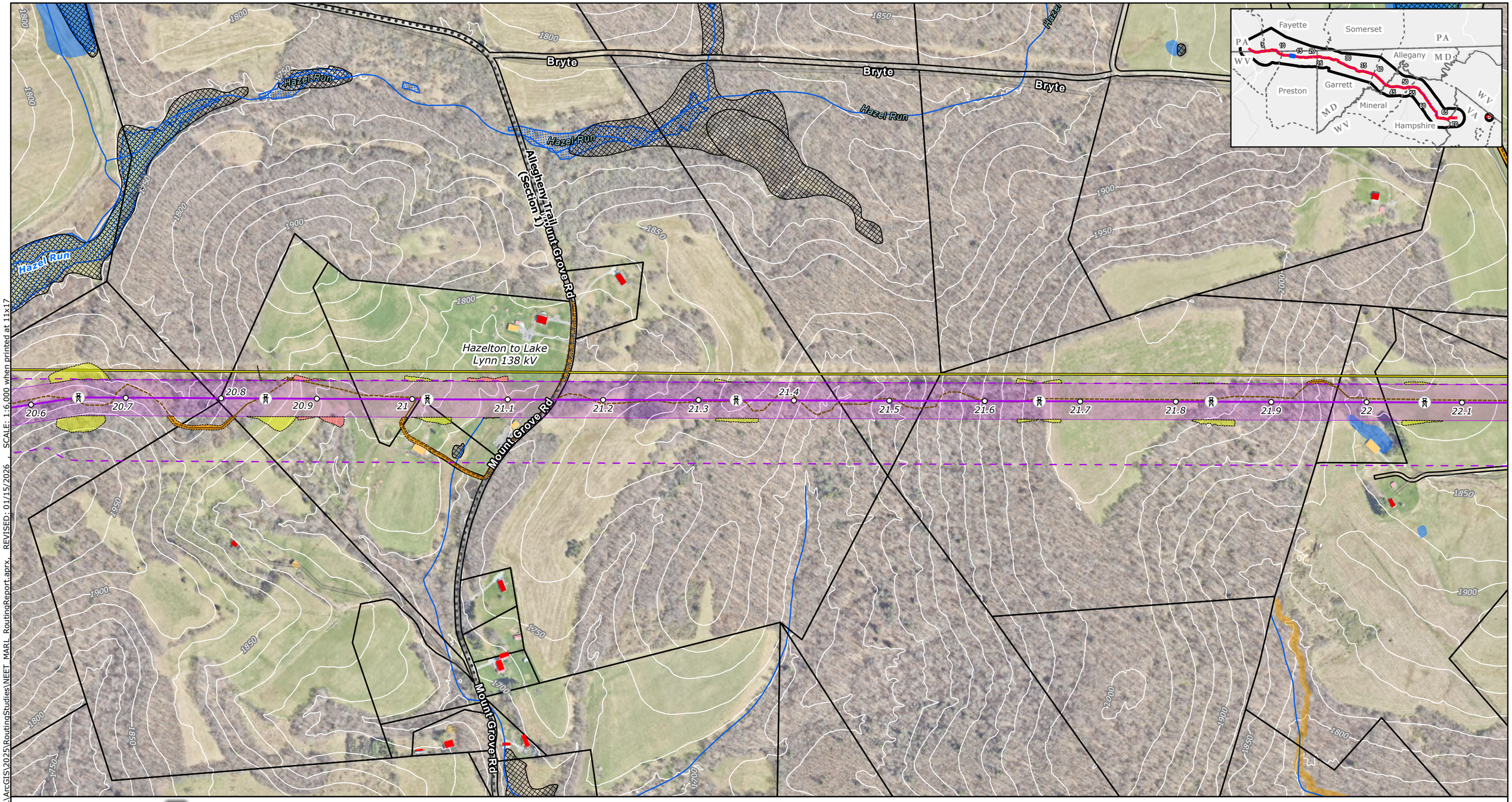

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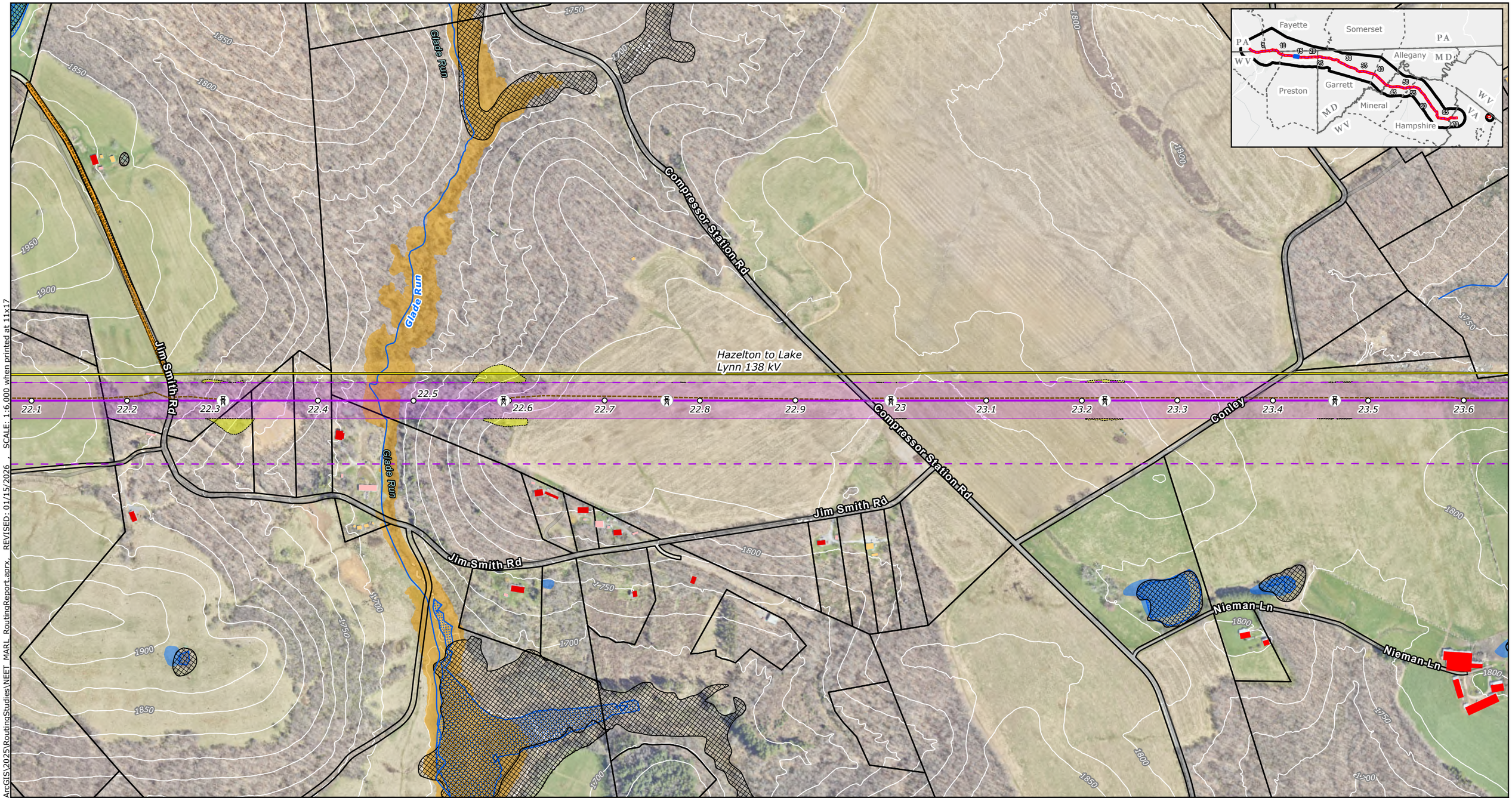

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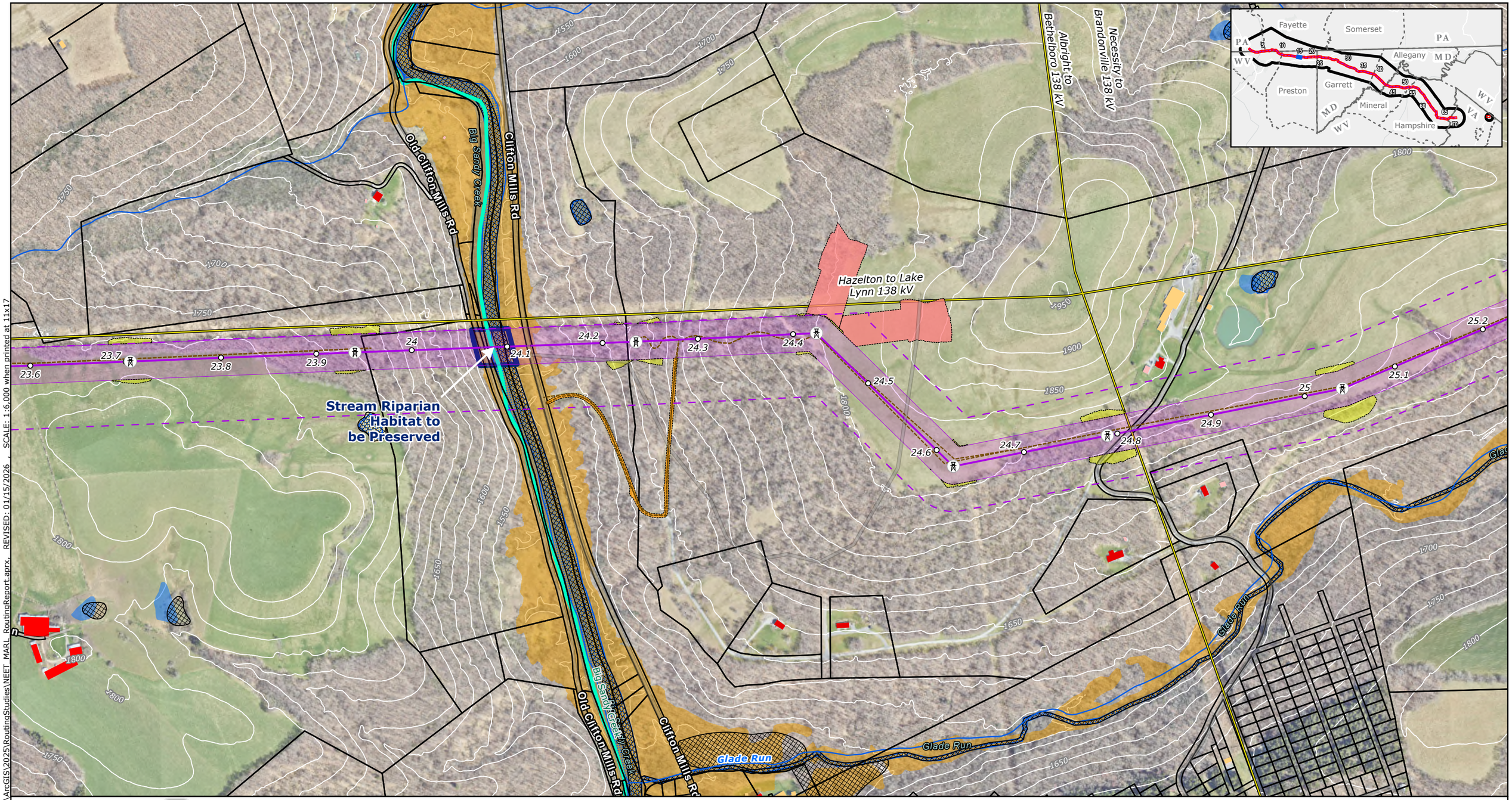

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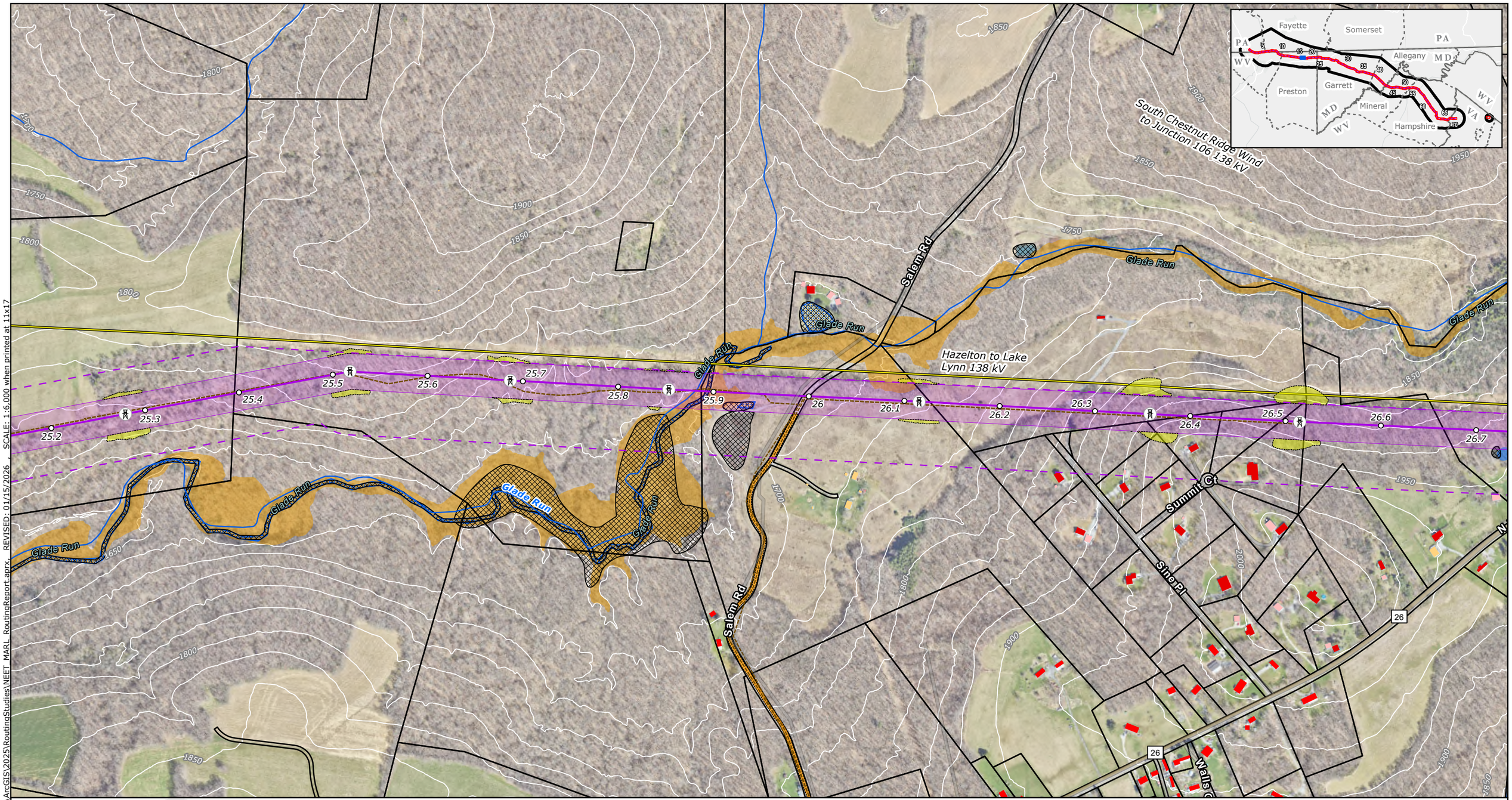

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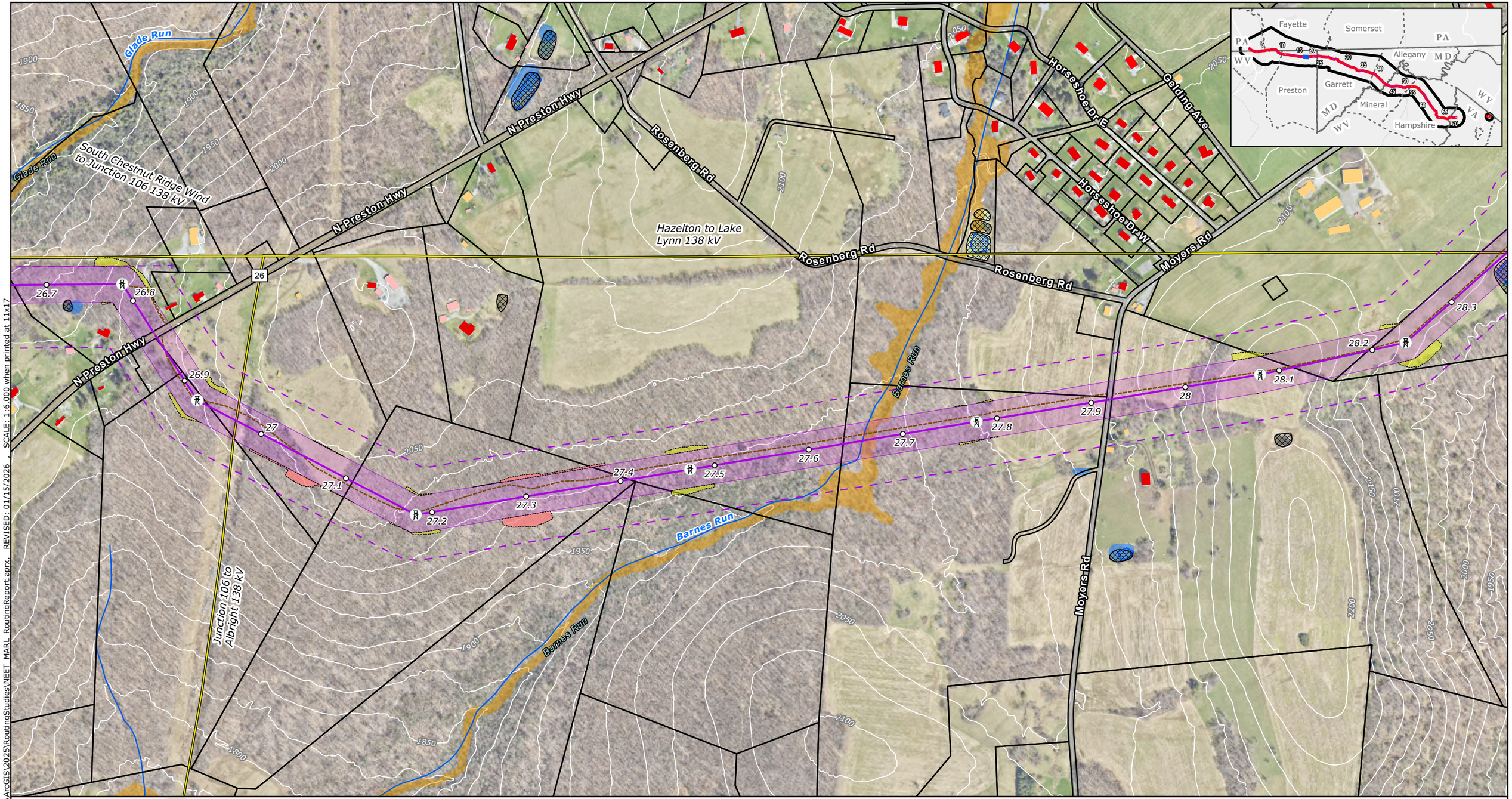

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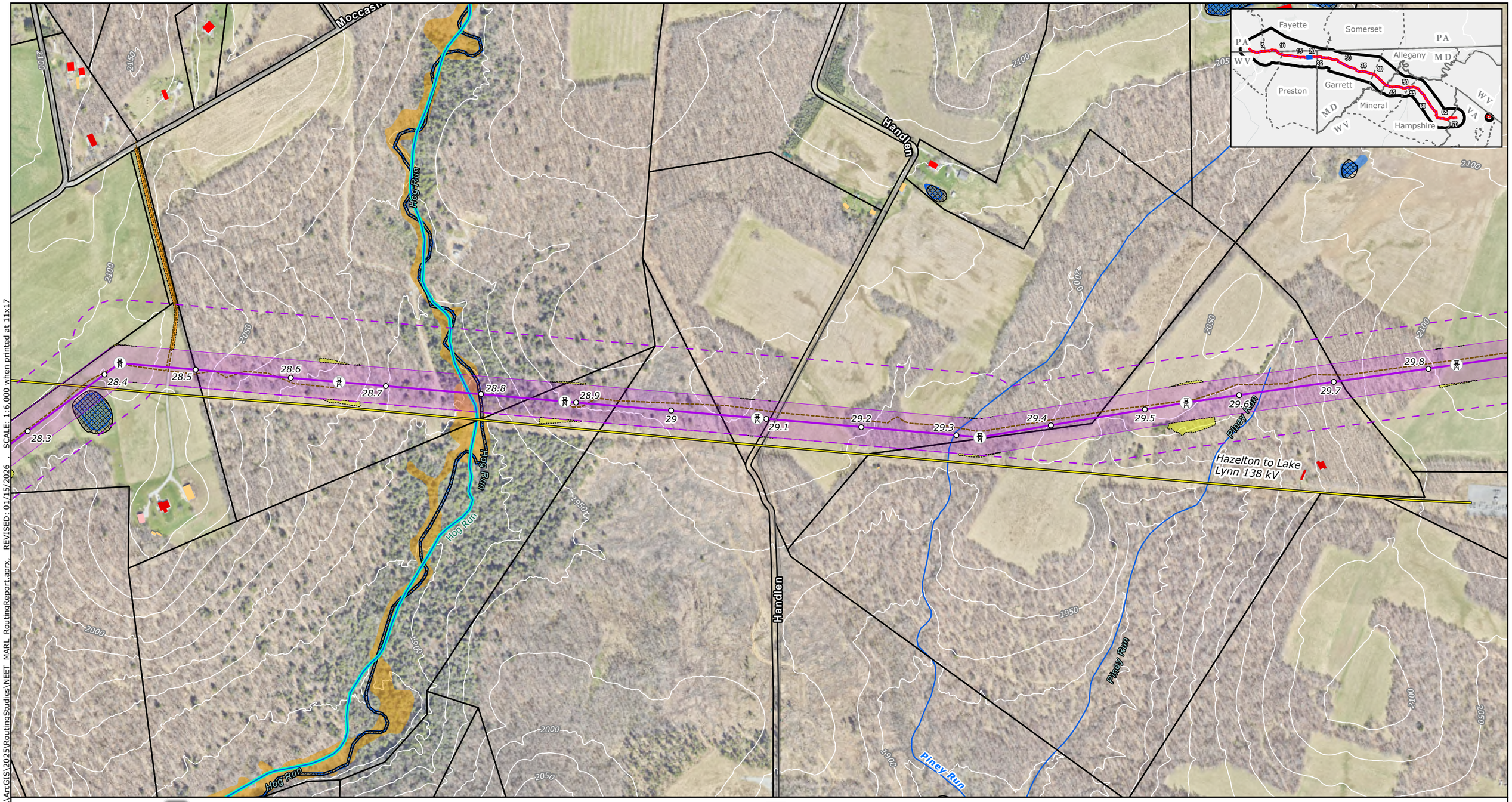

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Page 20 of 71
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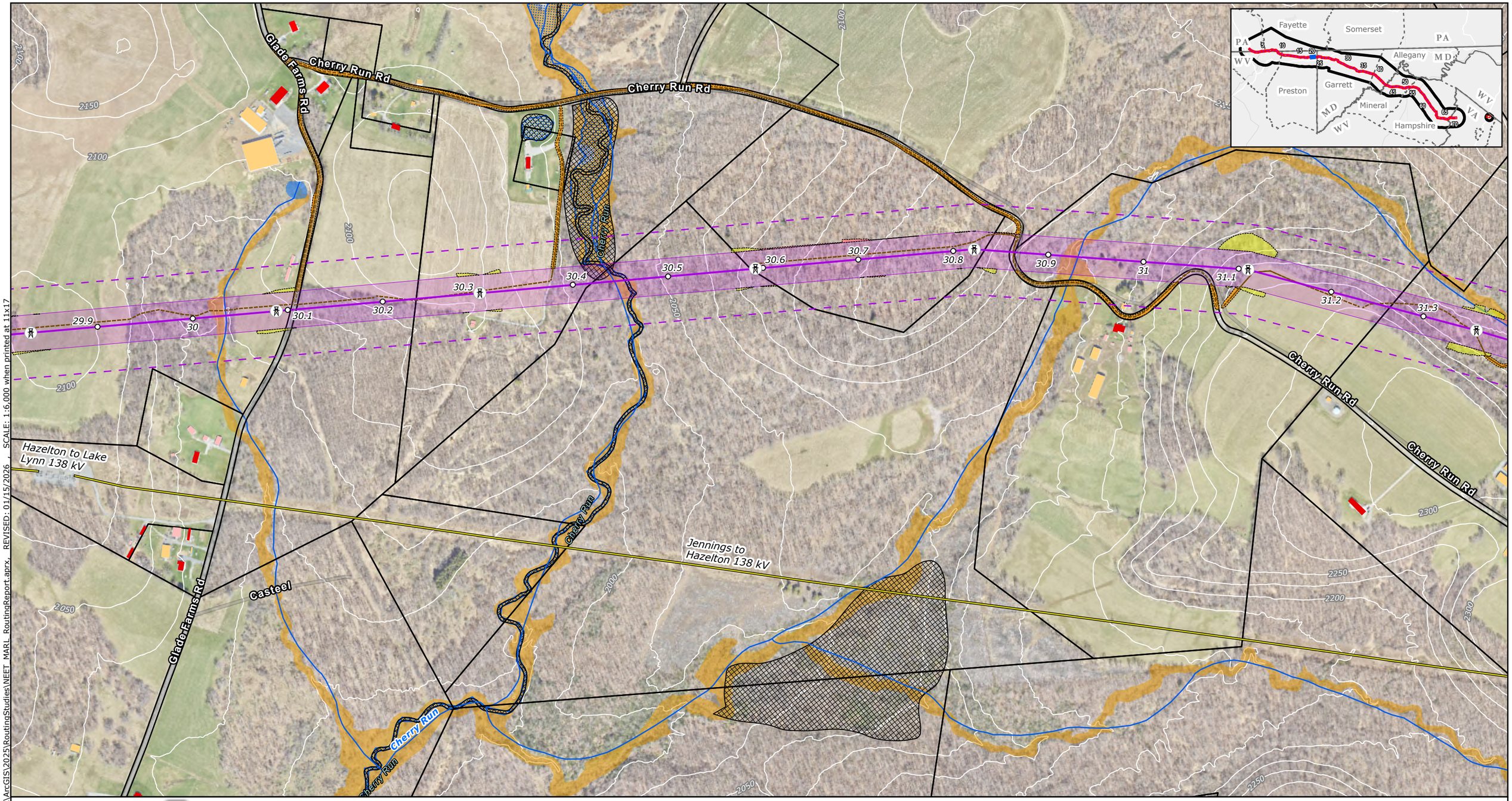

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- Towers
- Milepost
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- Proposed Route ROW Corridor
- Aerial Easement Blowout Areas
- Siting Corridor
- Proposed Substation Boundary
- Project Study Area

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- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

LiDAR Elevation Contours
- 25-foot contours

Base Data
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- County Boundary
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- Maryland Wildlands

Community Resources
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- Potomac Heritage Trail
- Scenic Byways
- Place of Worship
- Childcare Center
- School

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Appendix E-14
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Page 21 of 71
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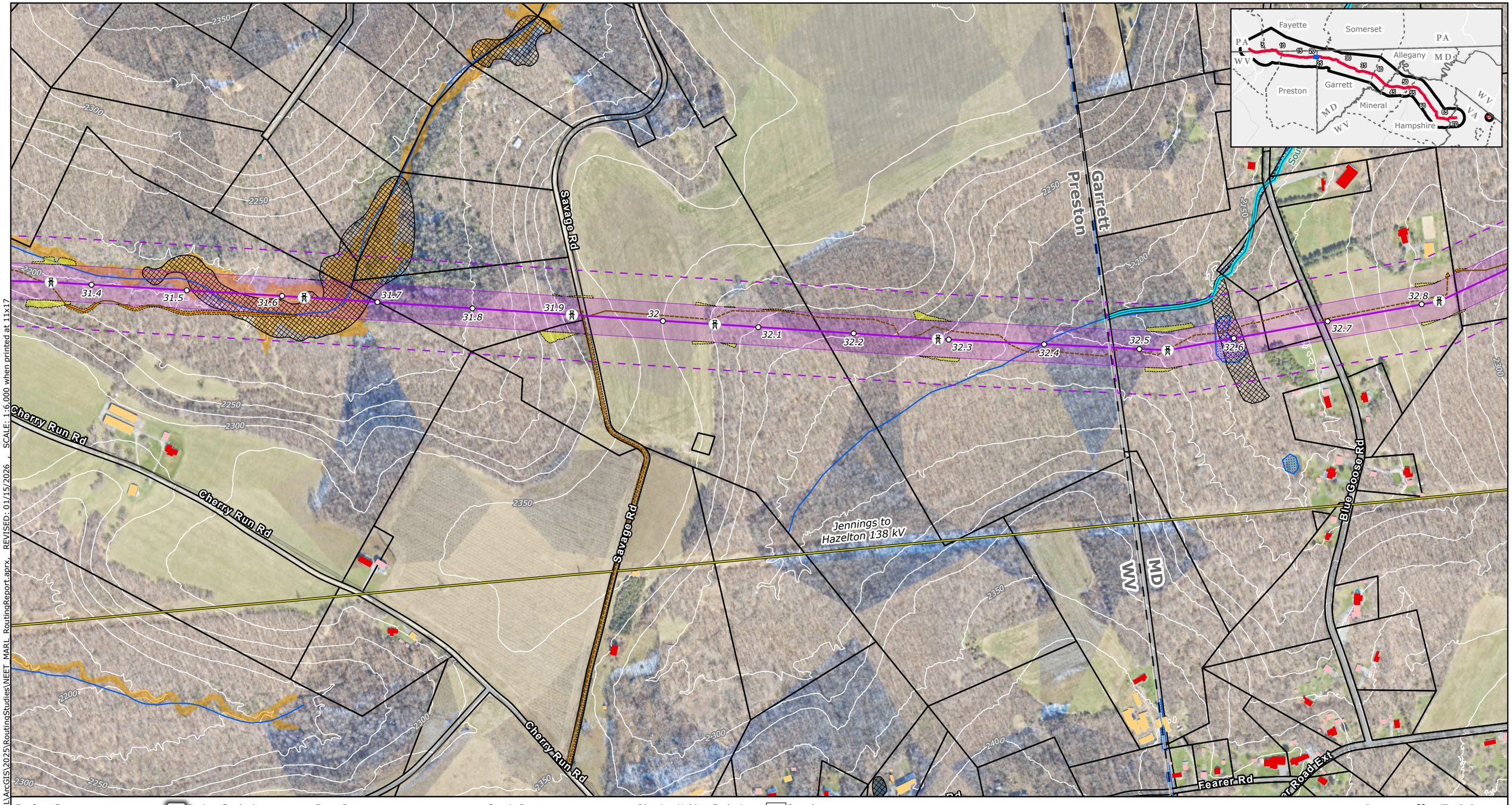

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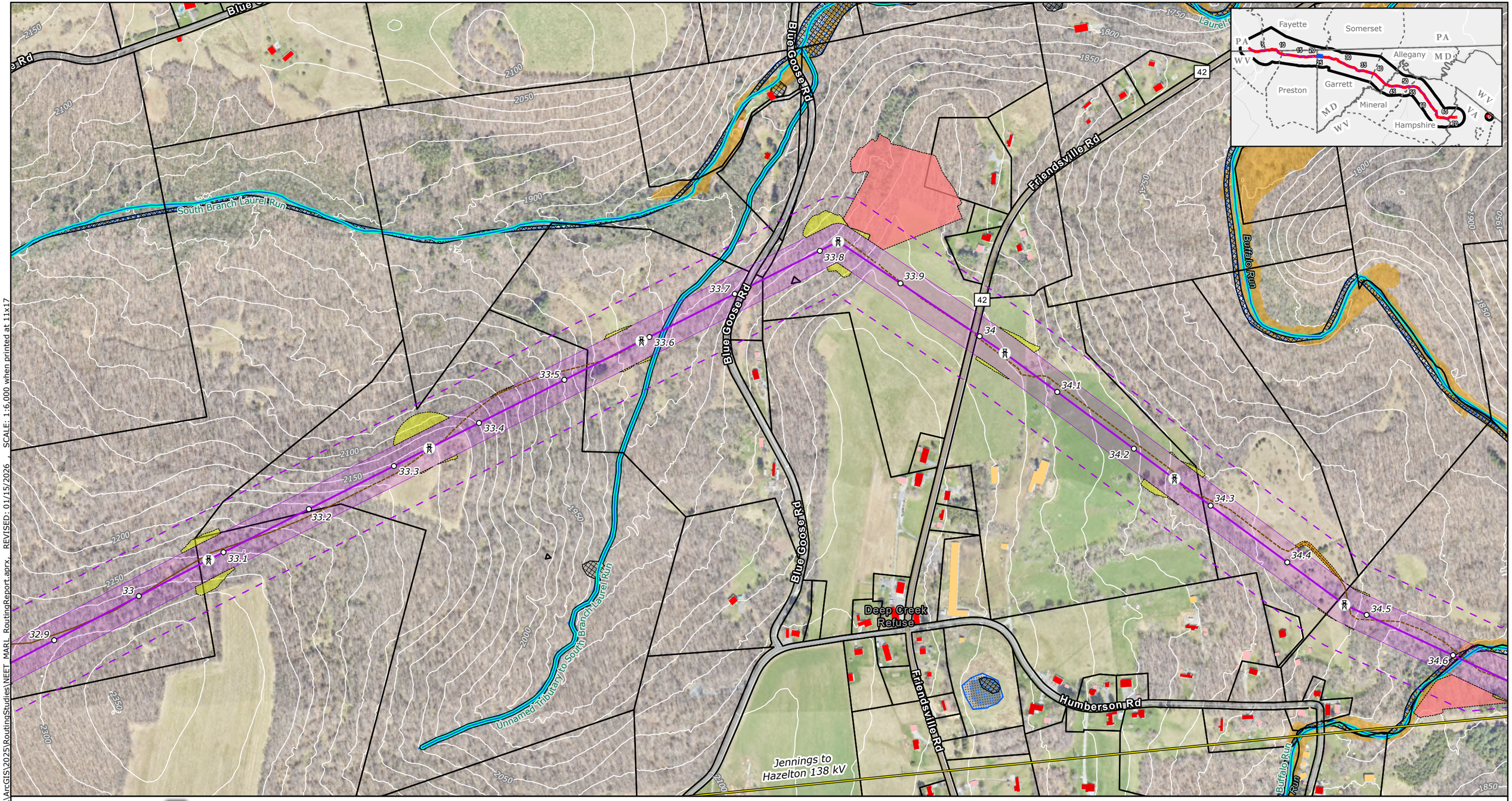

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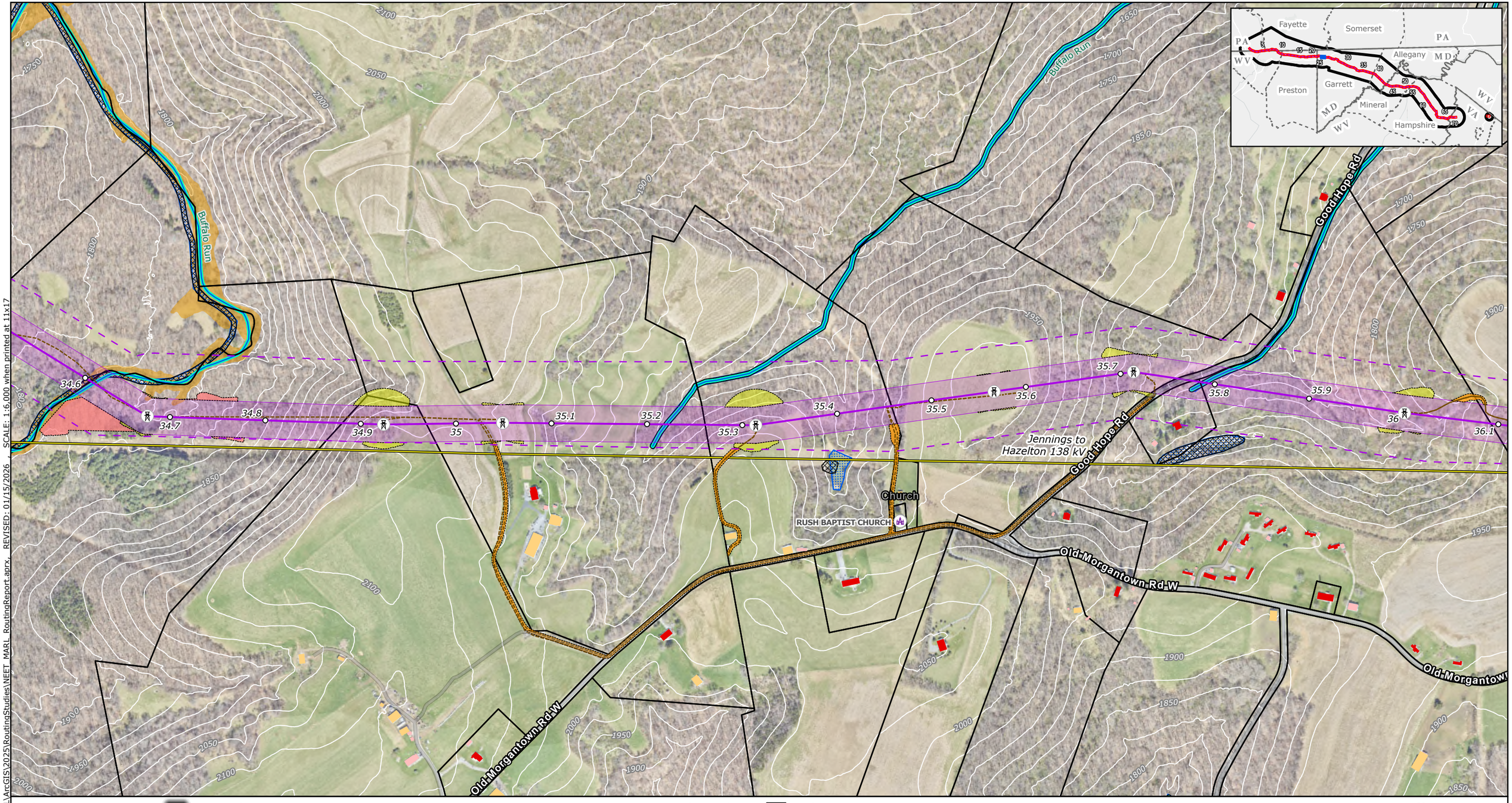

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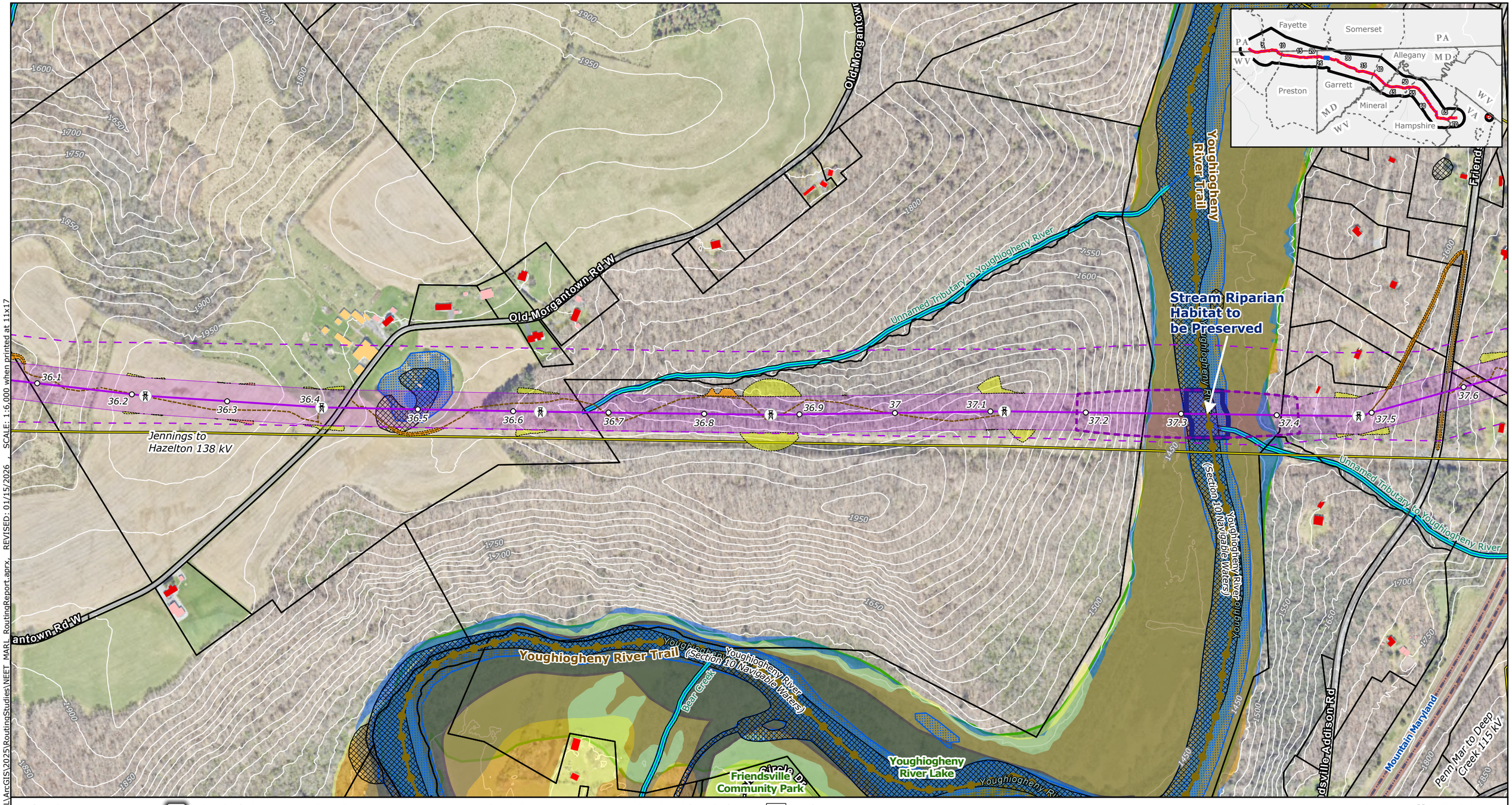

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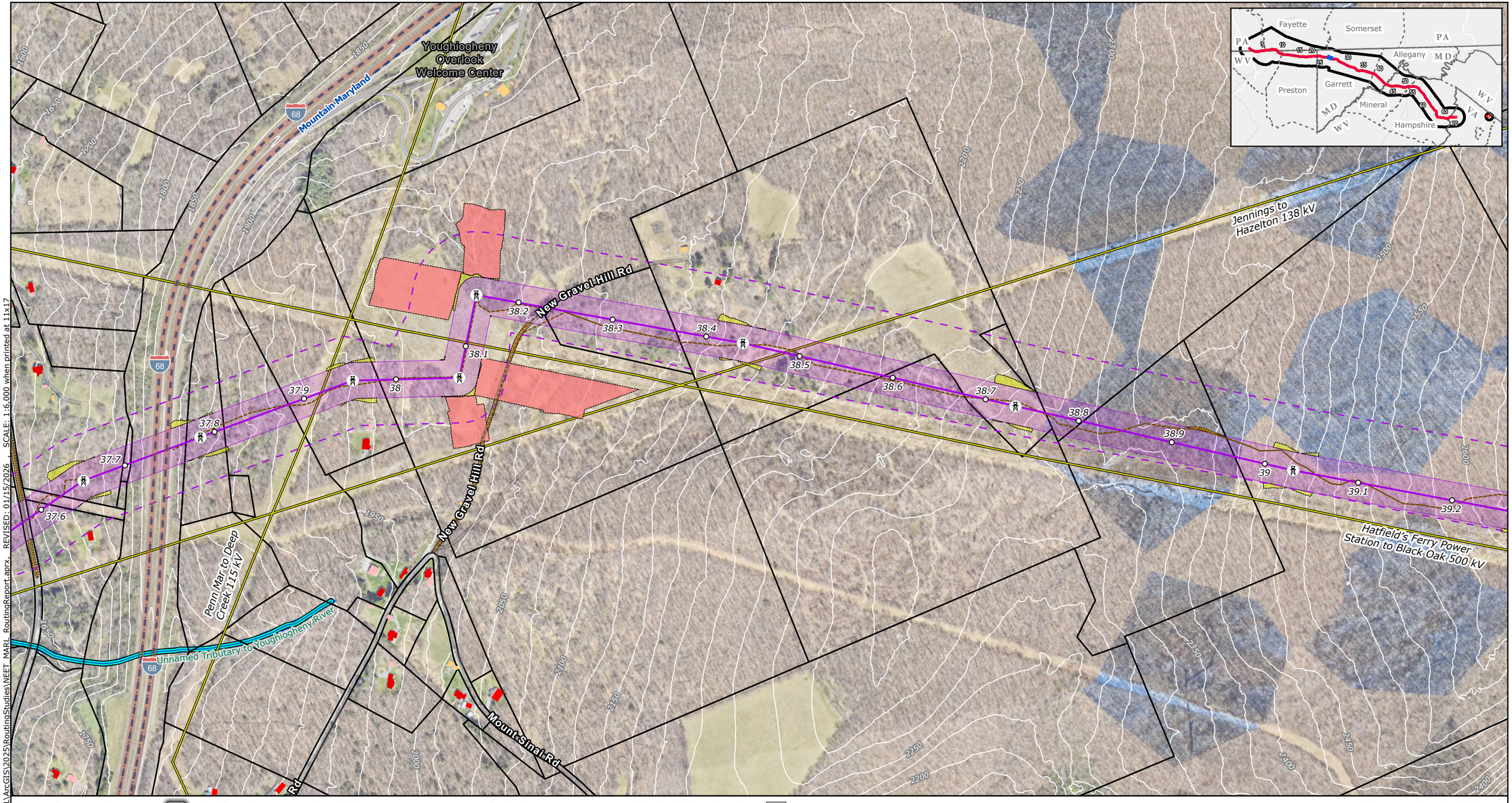

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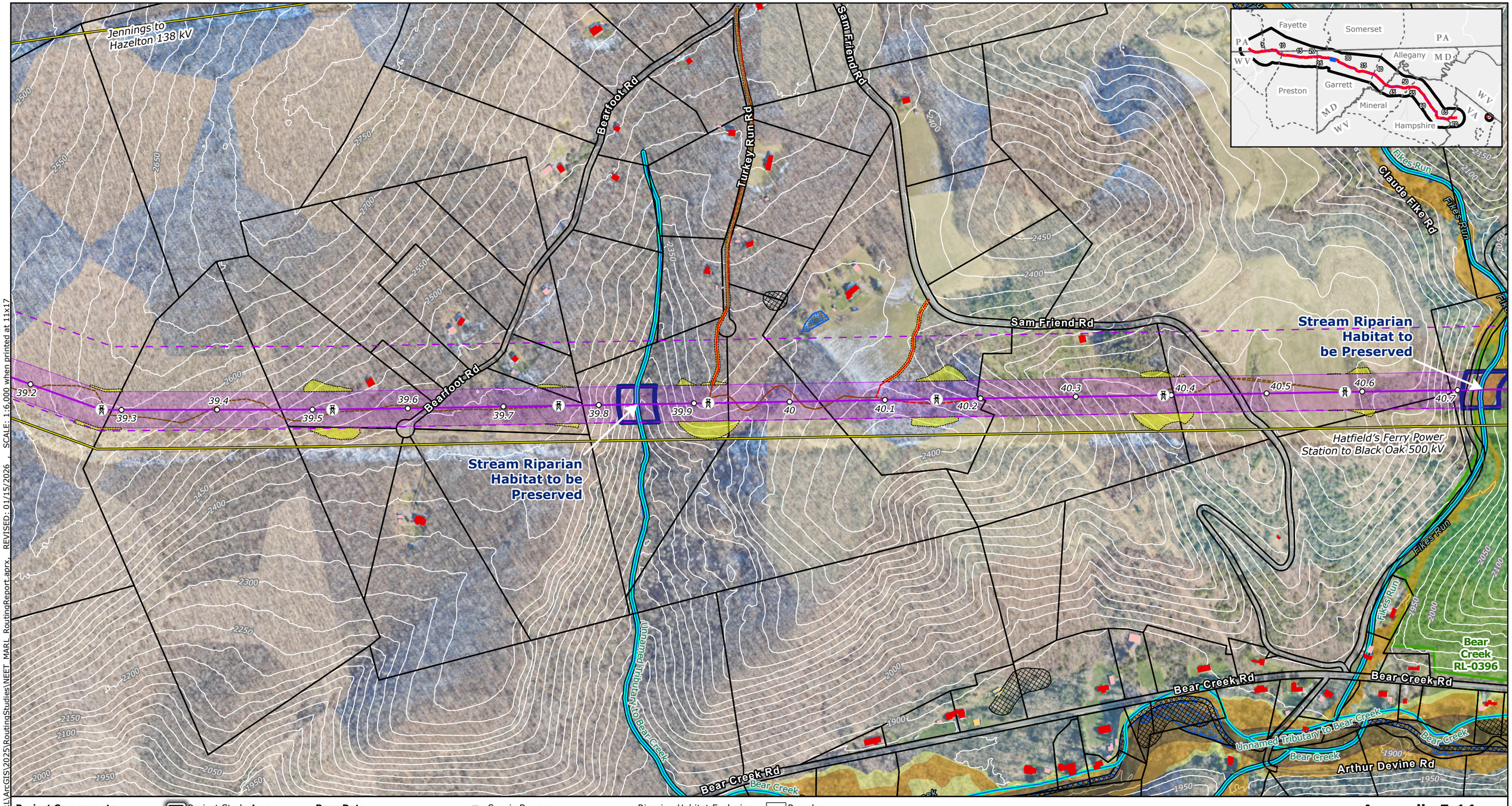

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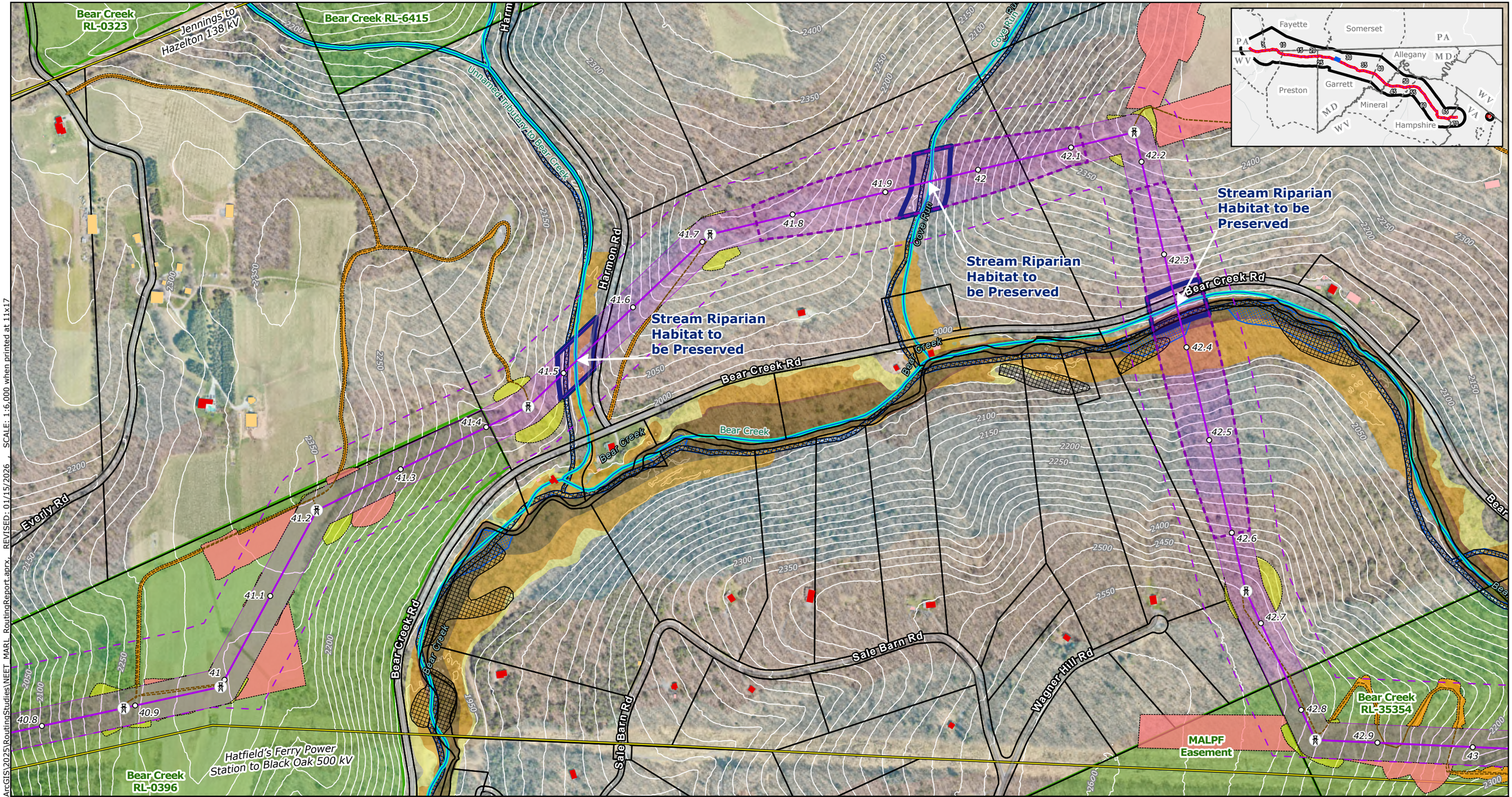

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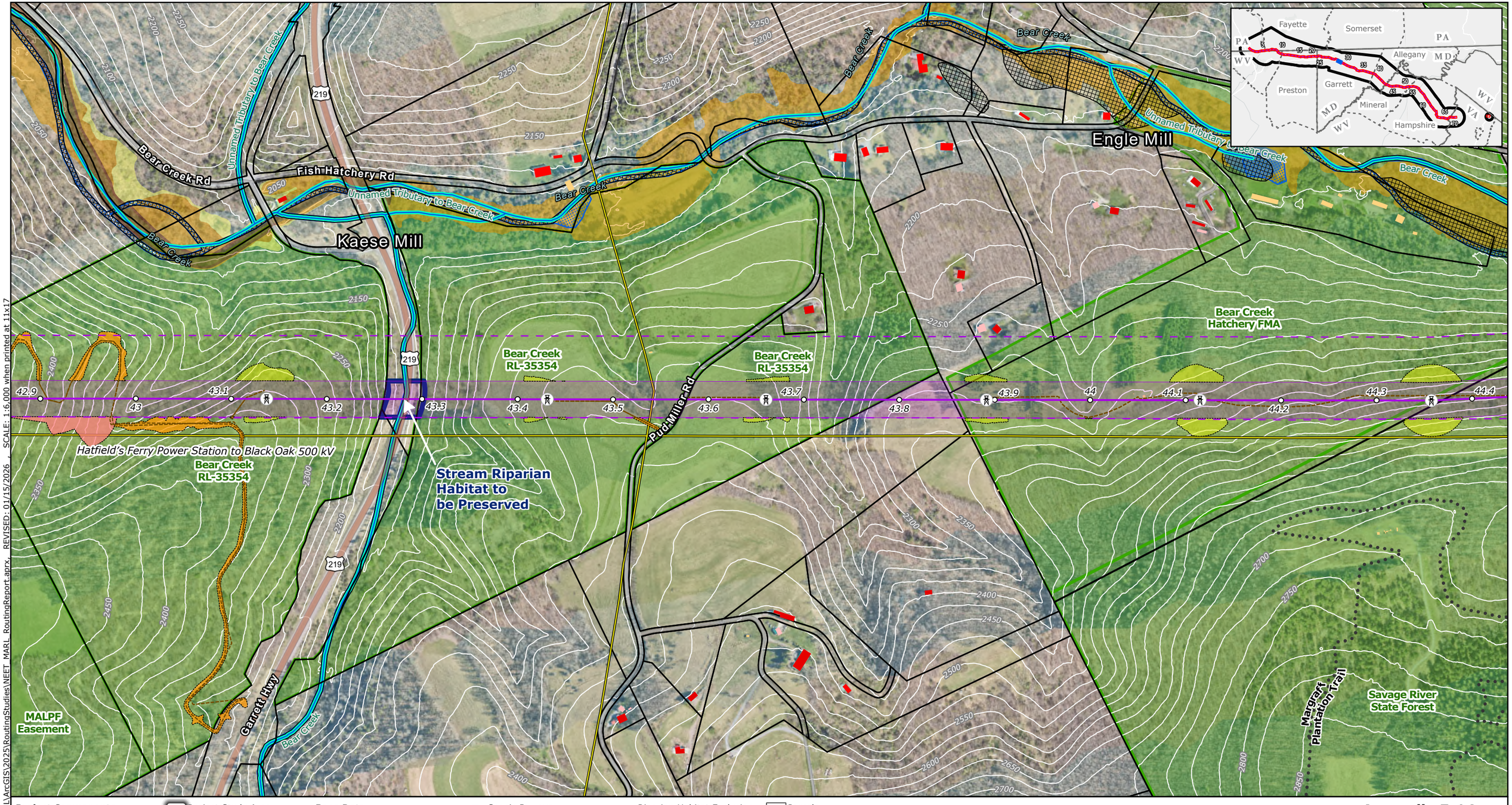

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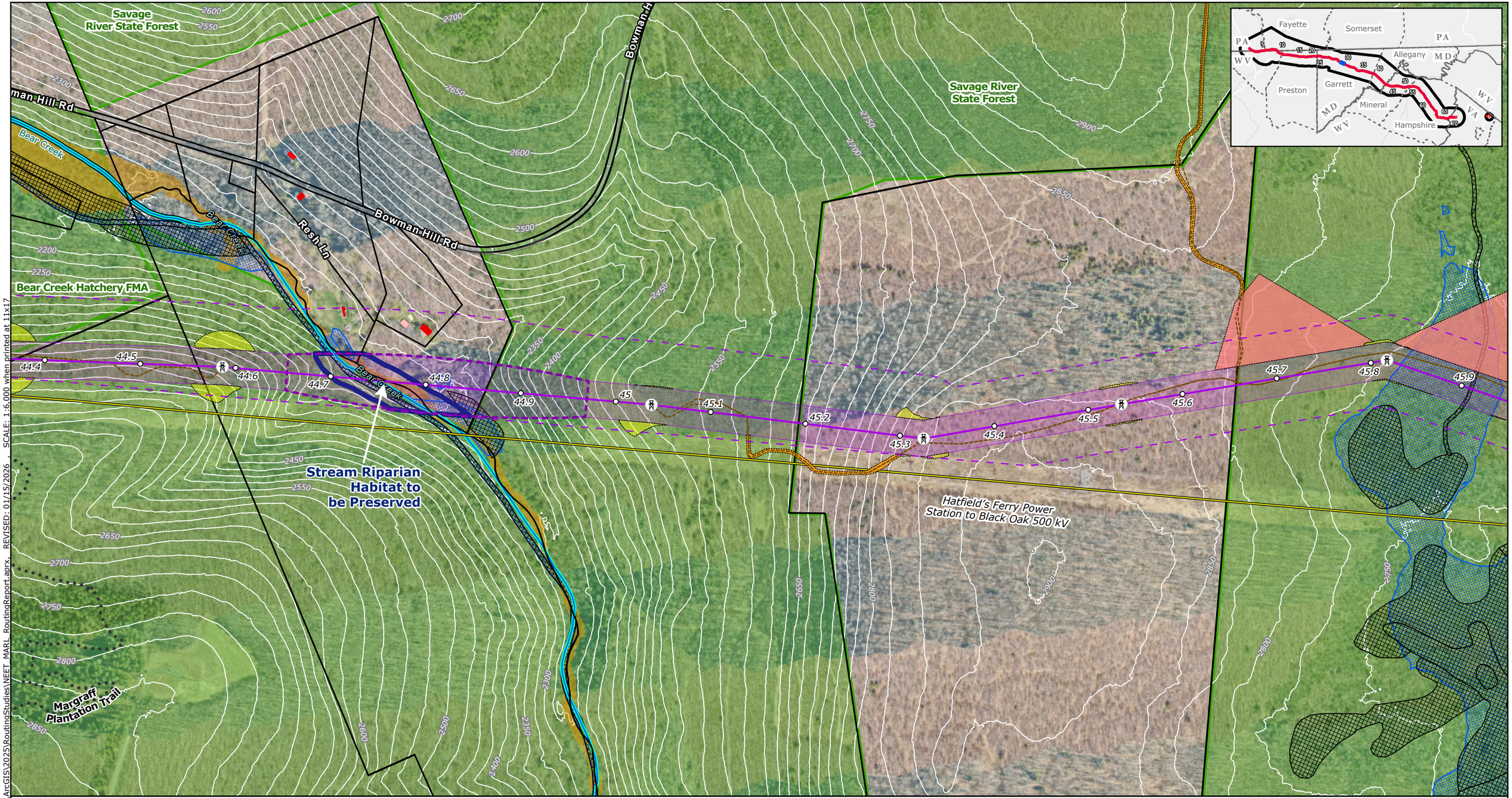

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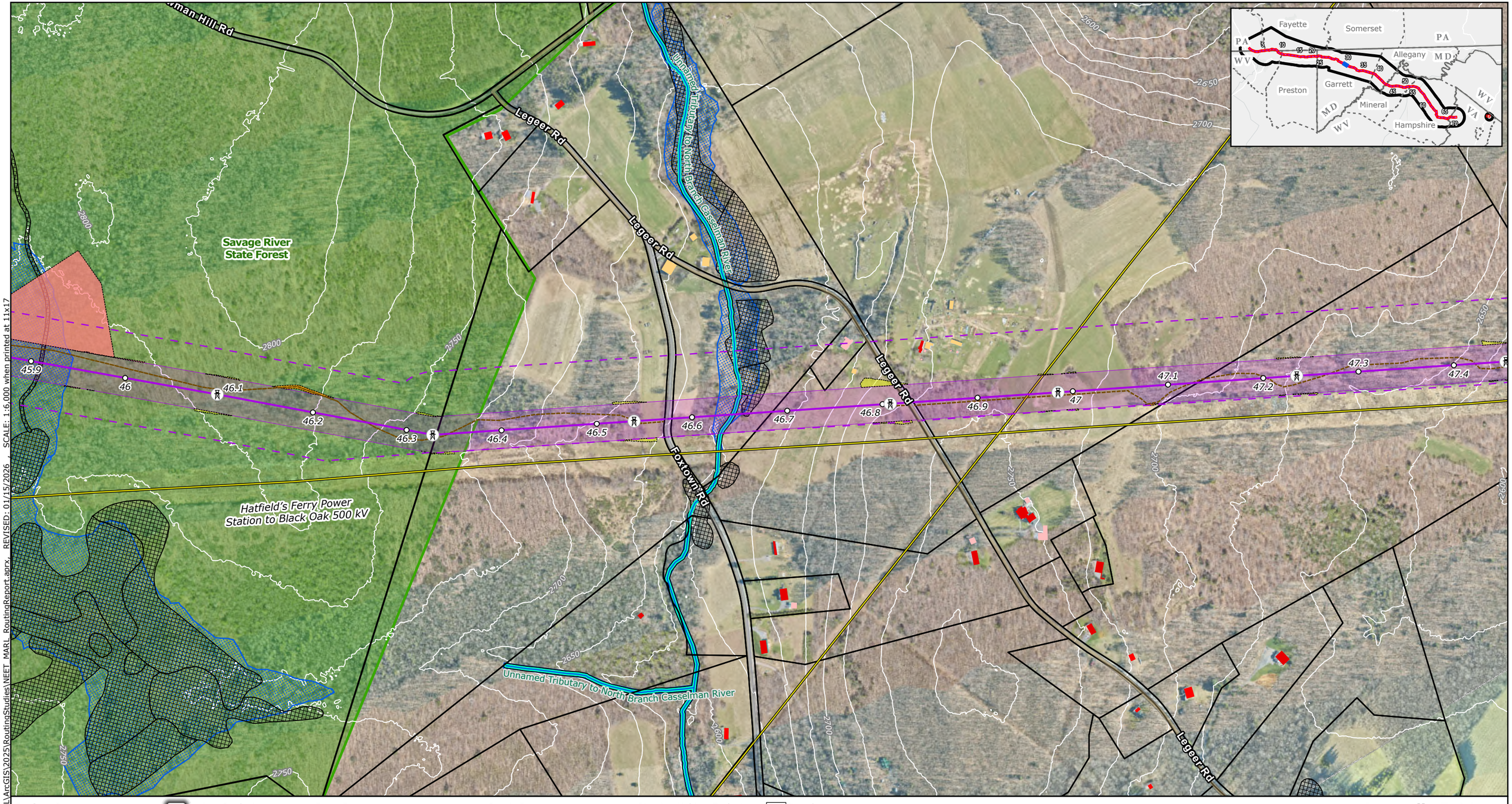

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Appendix E-14
Proposed Route
Page 31 of 71
MidAtlantic Resiliency Link

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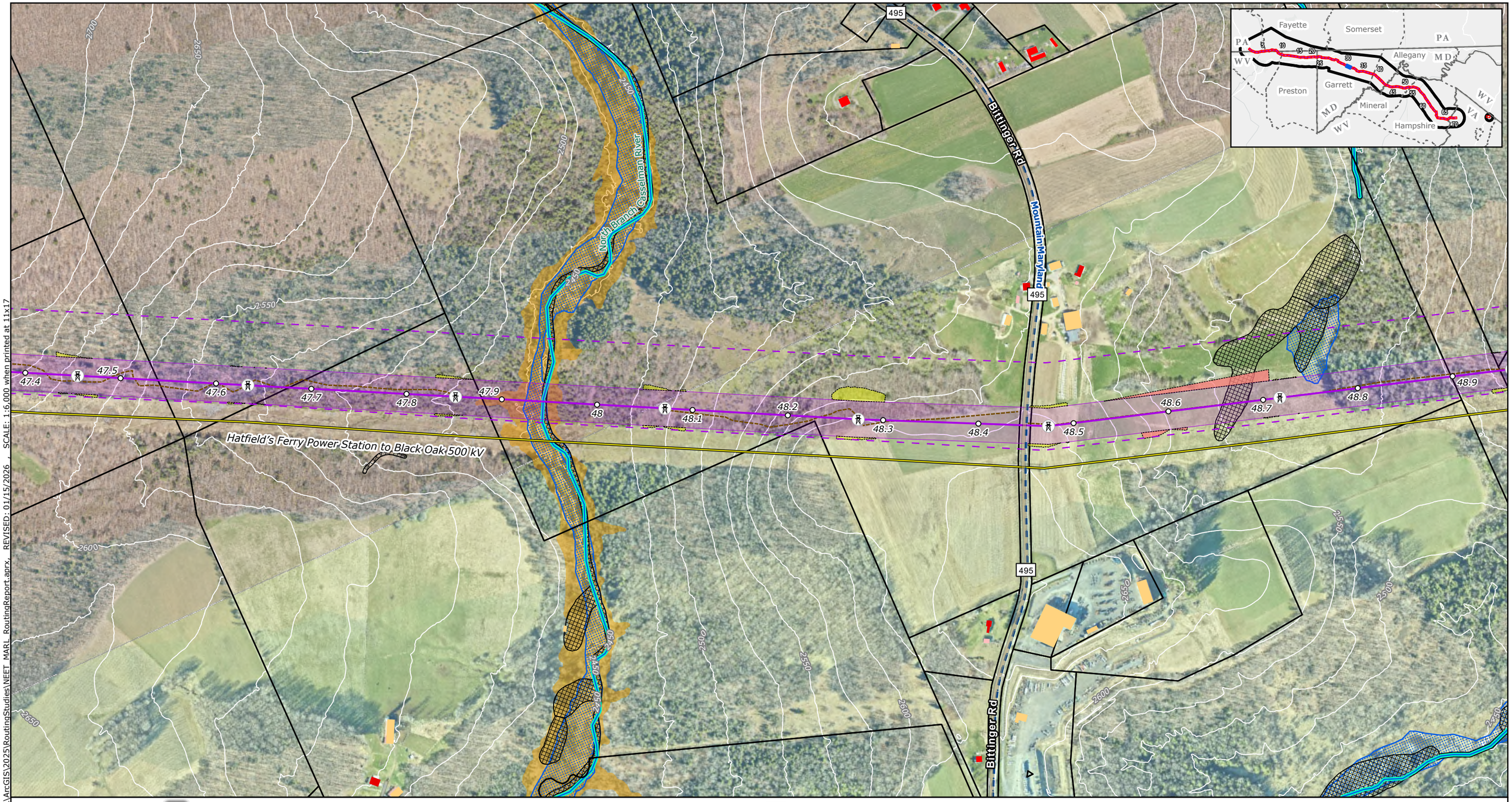

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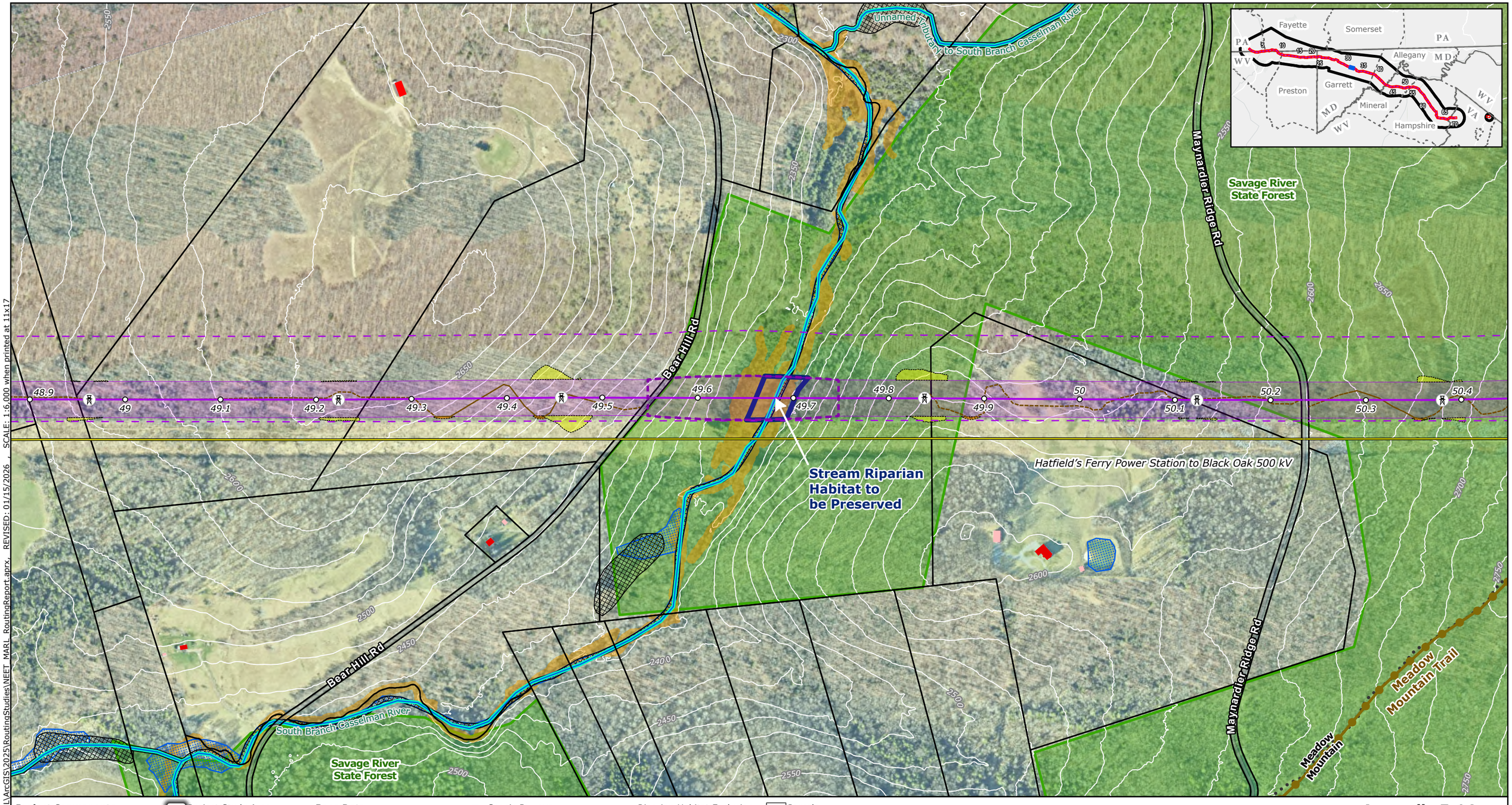

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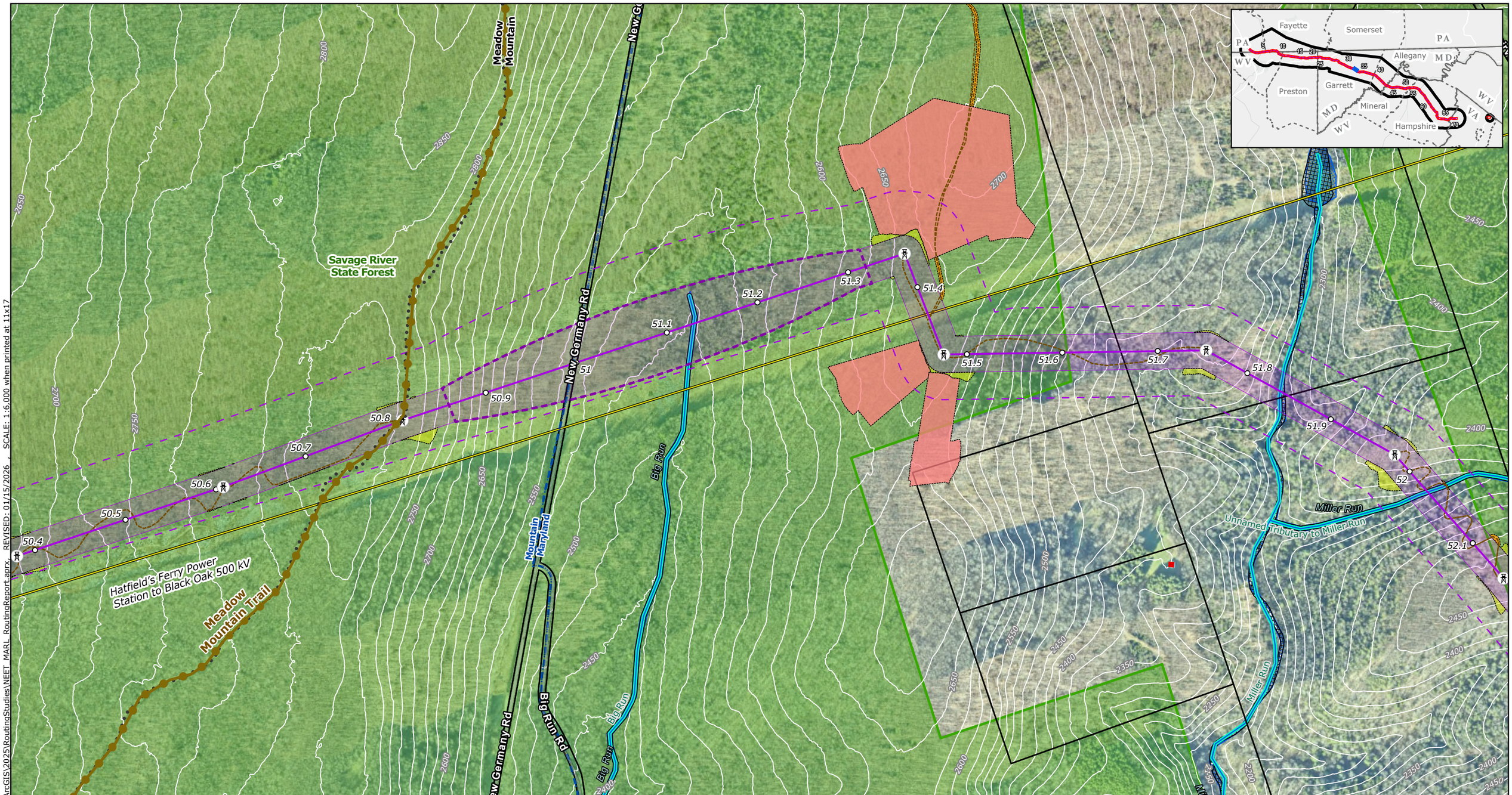

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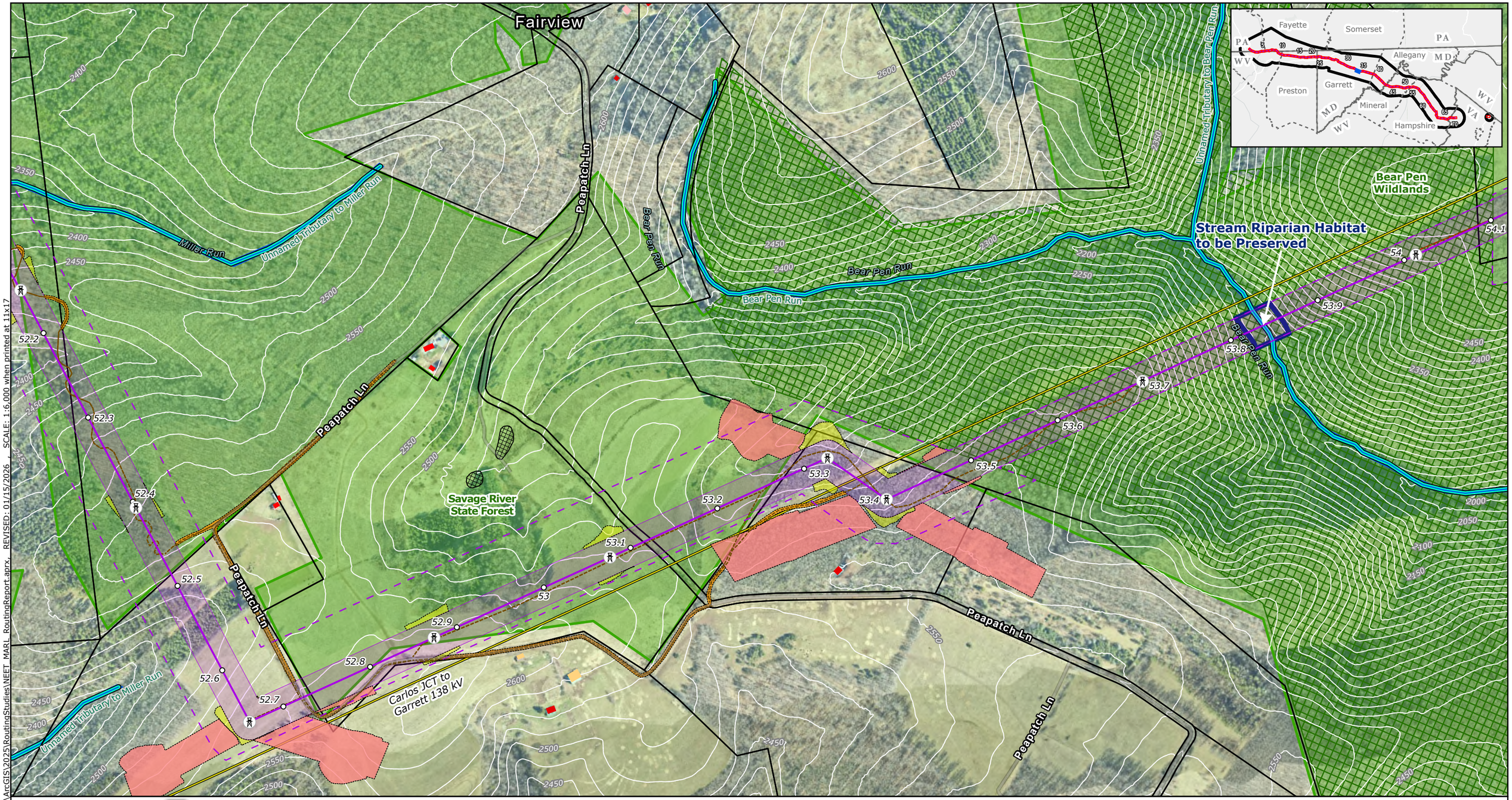

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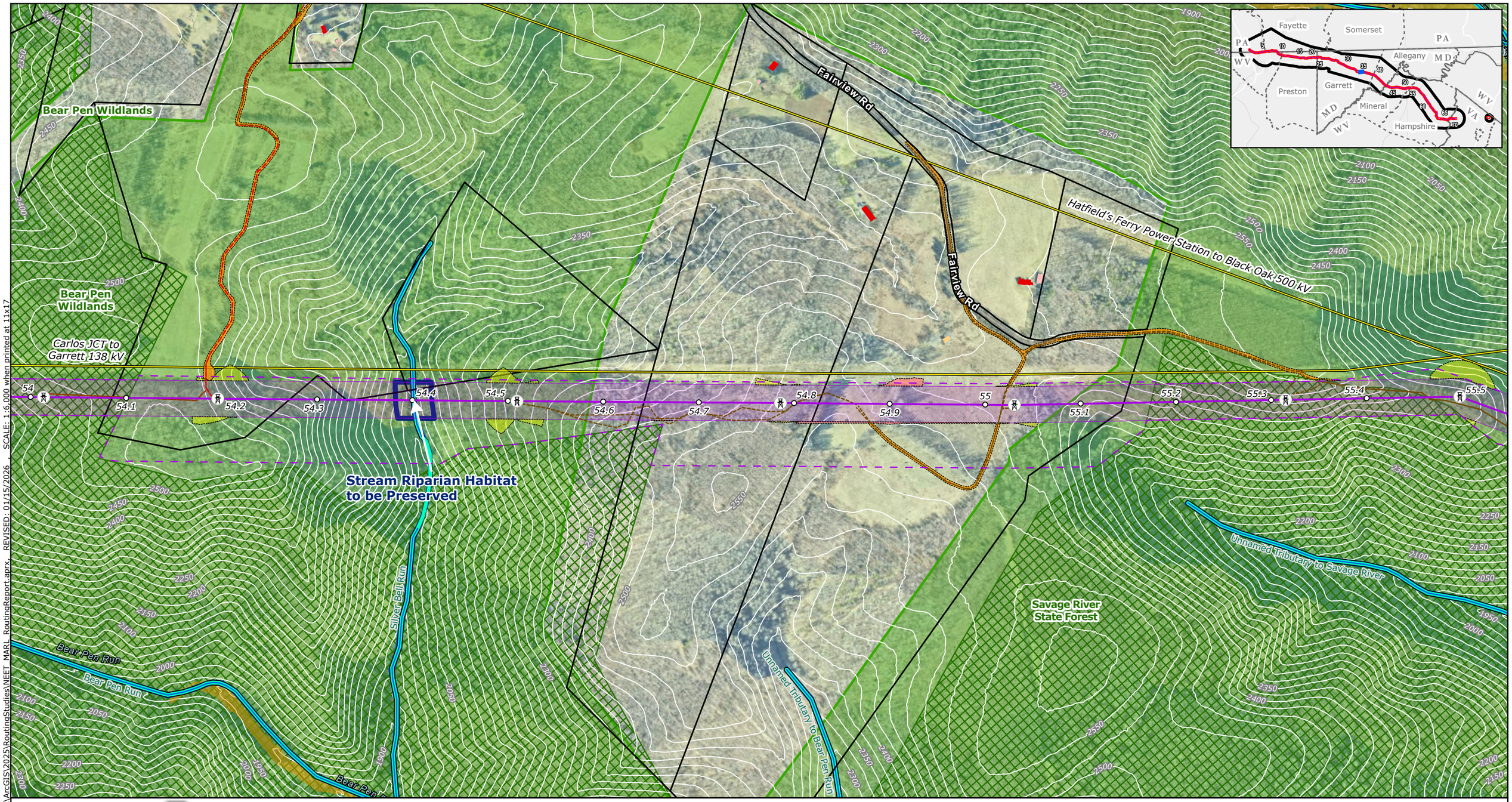

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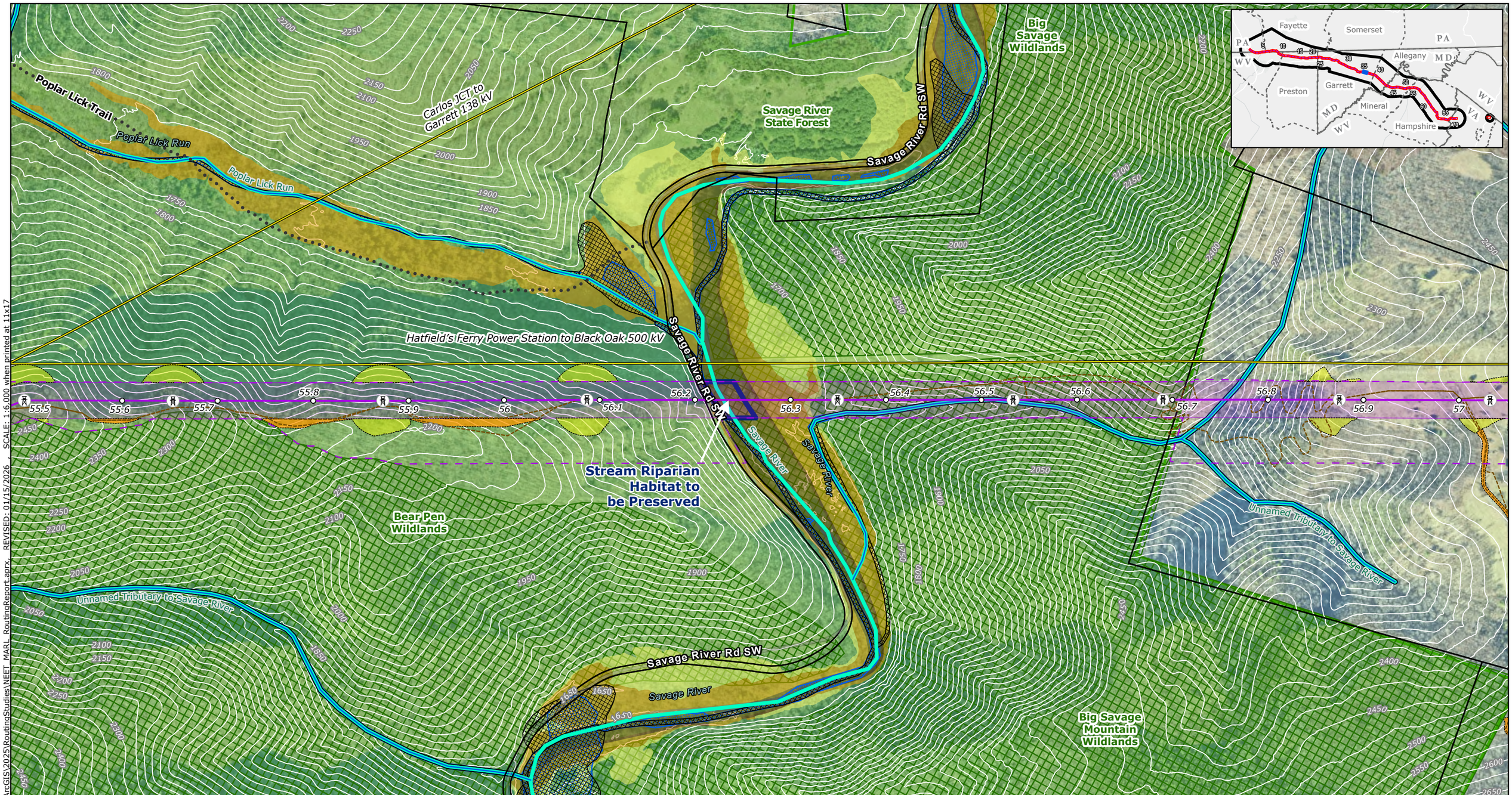

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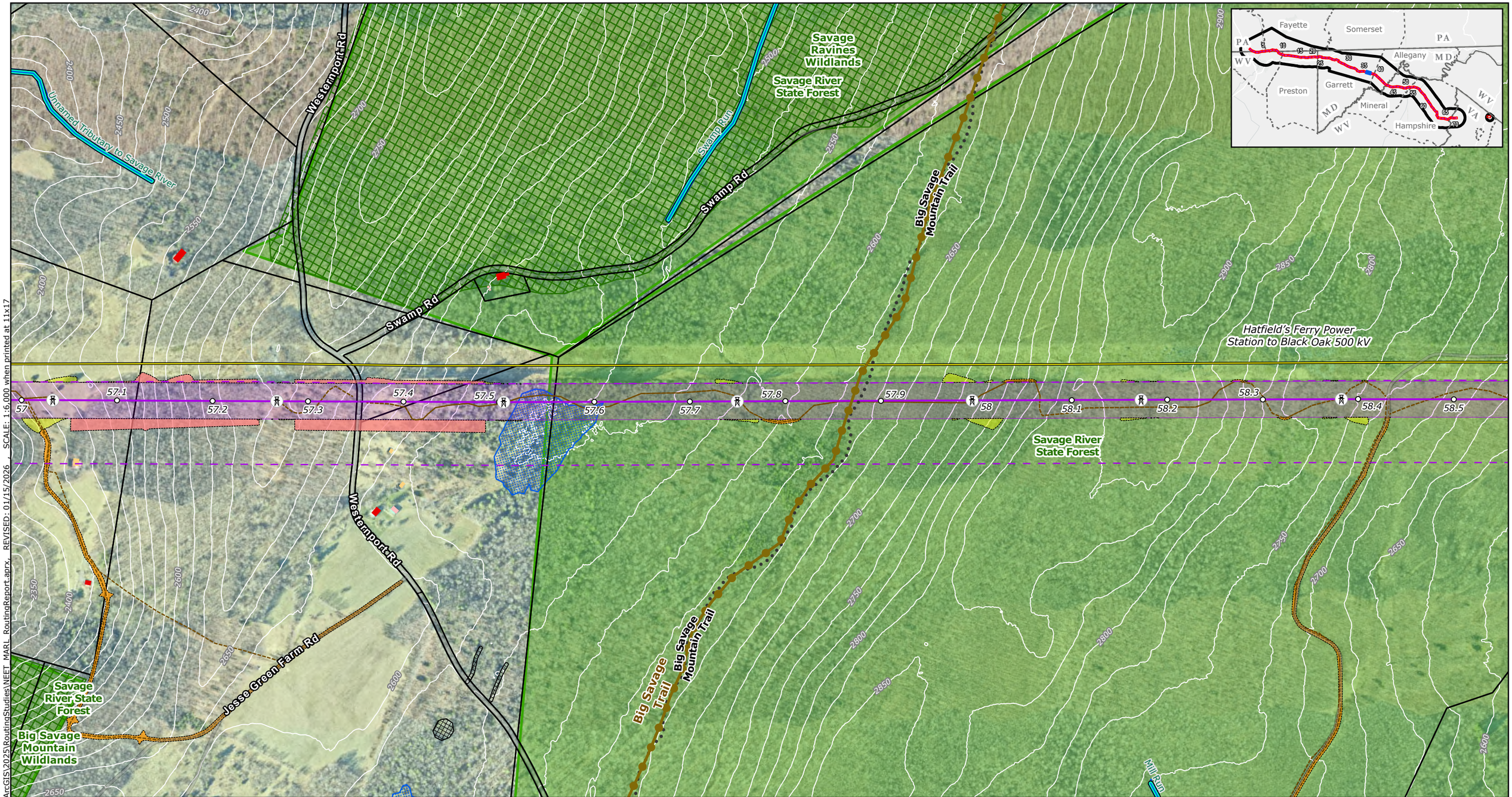

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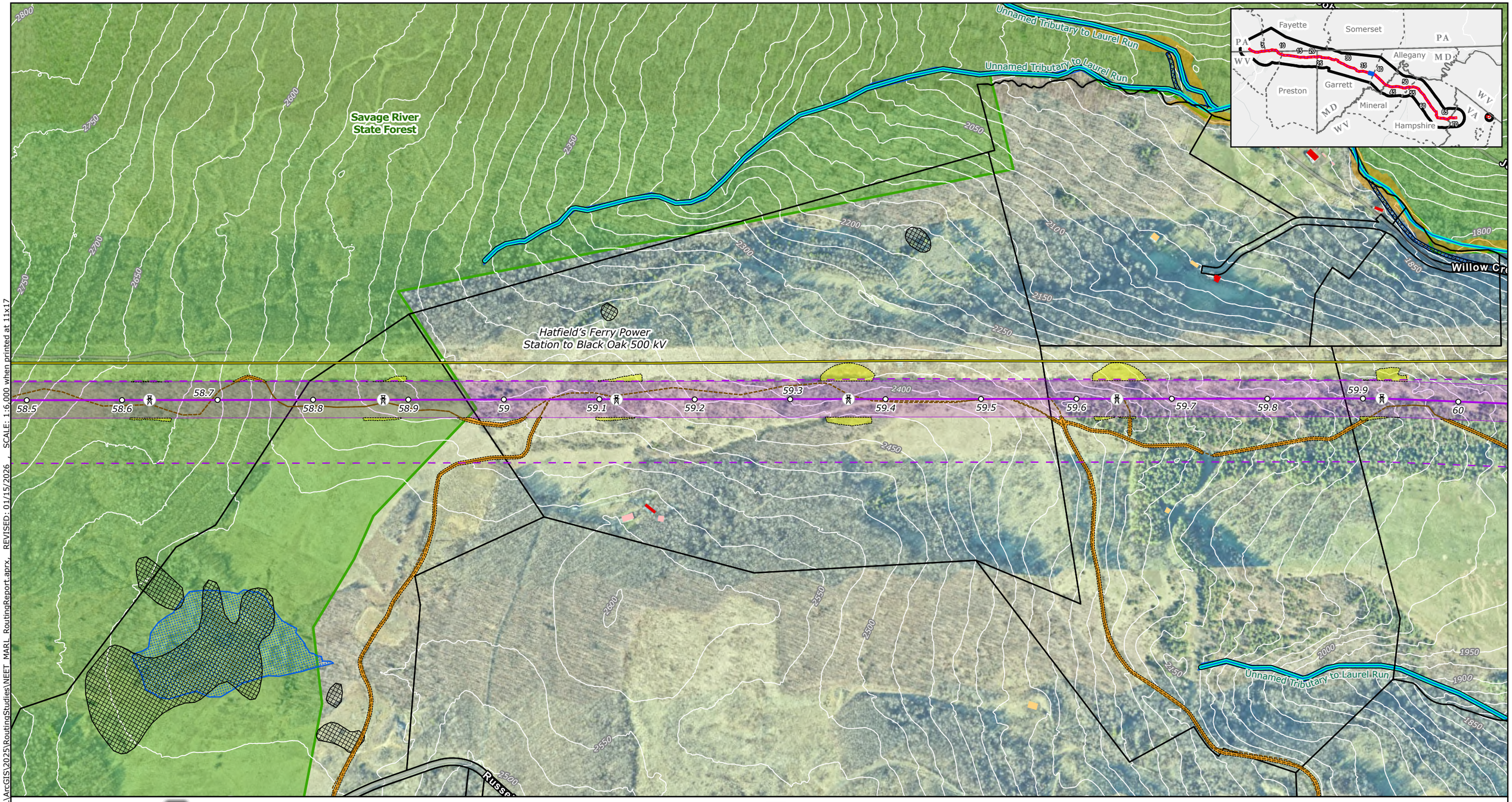

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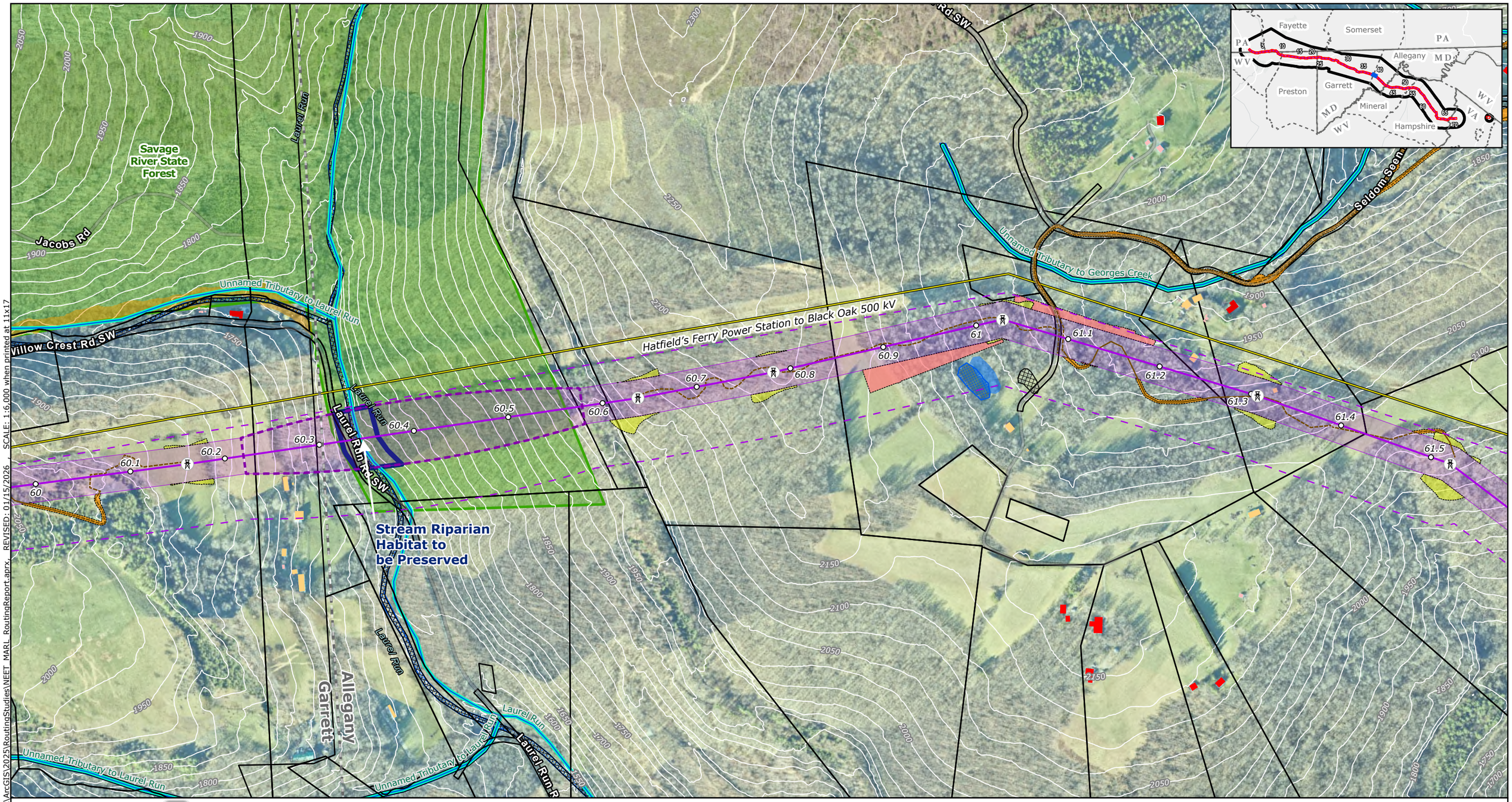

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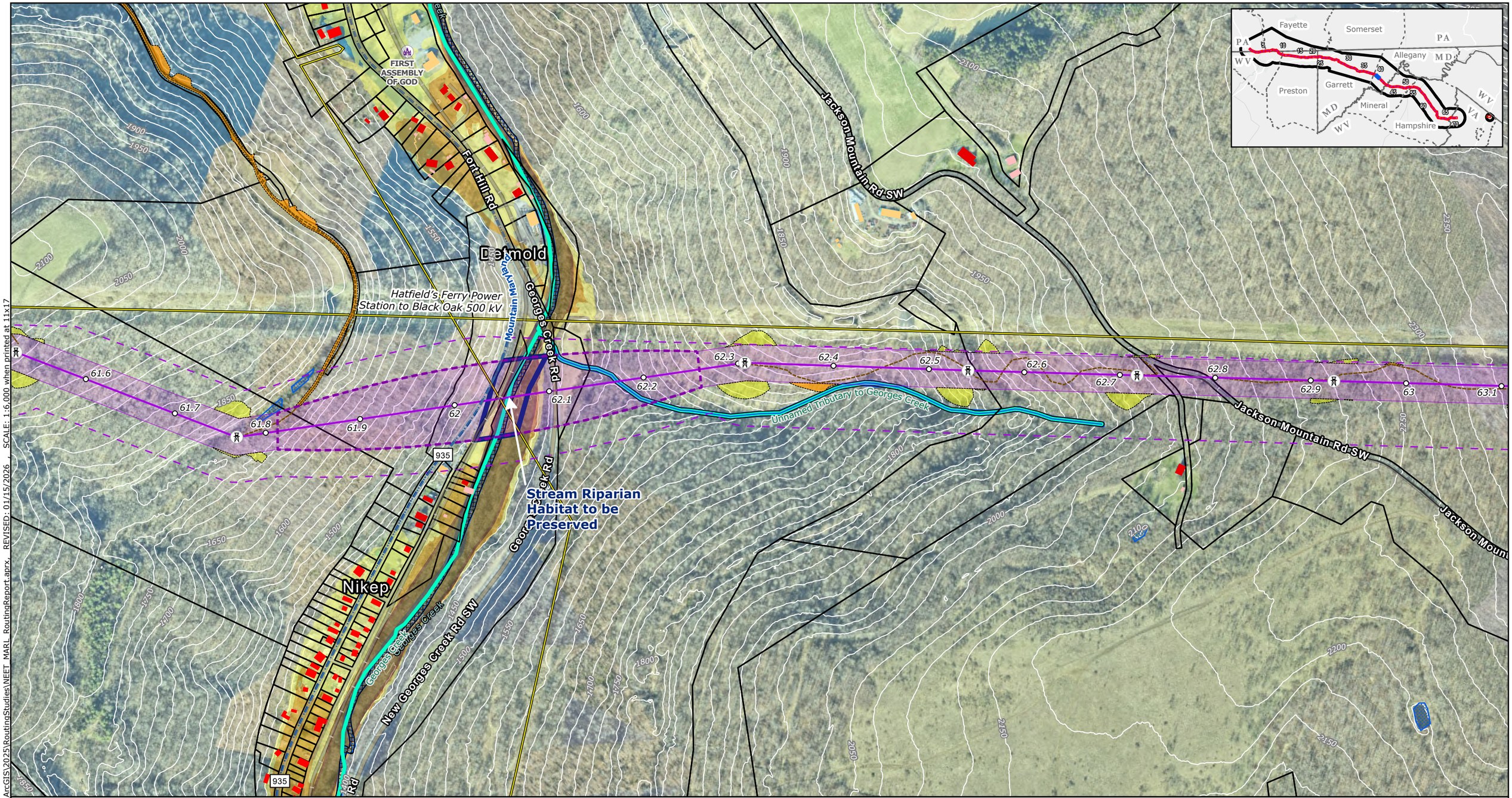

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N

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Miles

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Appendix E-14
Proposed Route
Page 41 of 71
MidAtlantic Resiliency Link

ERM

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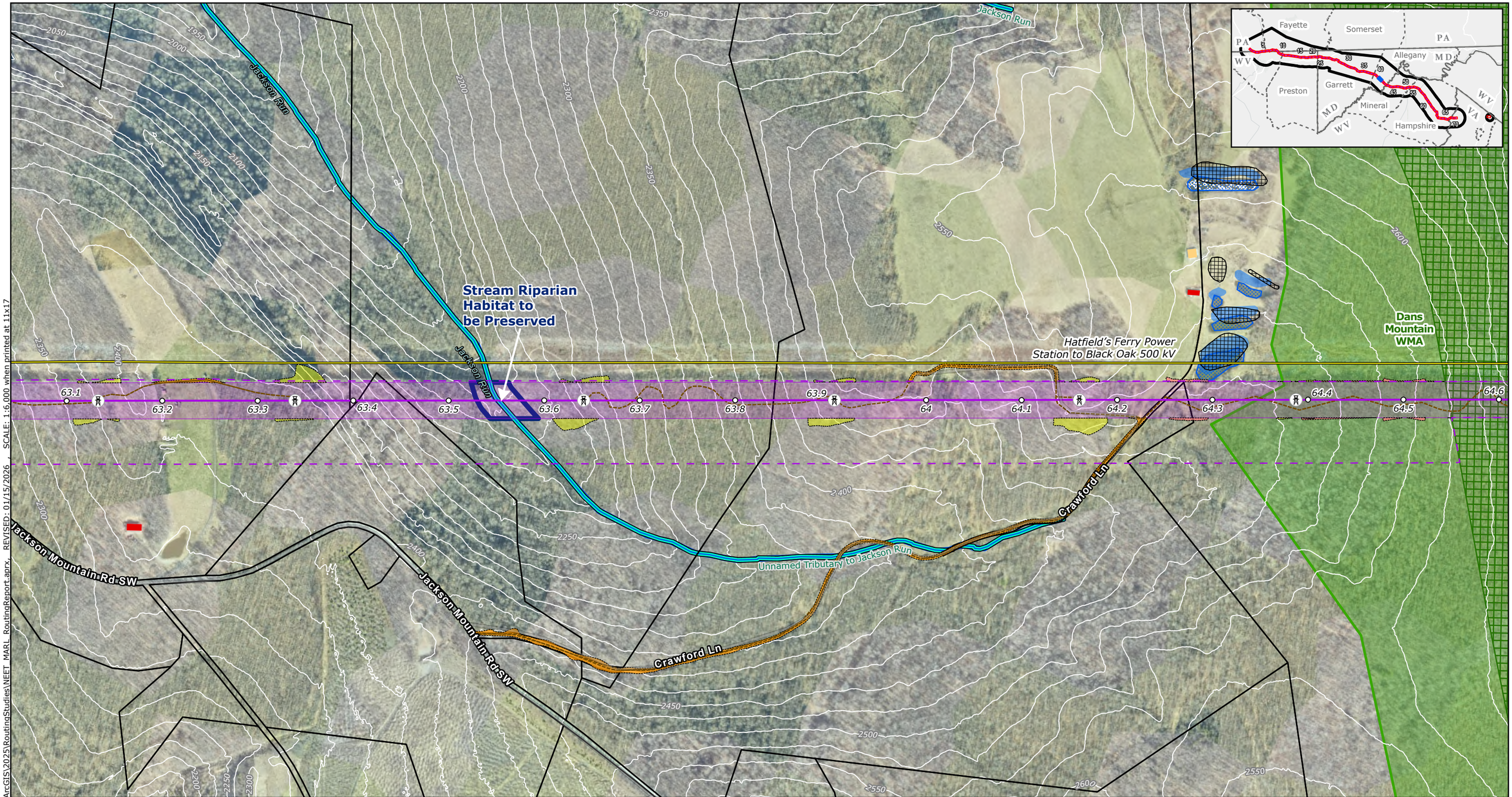

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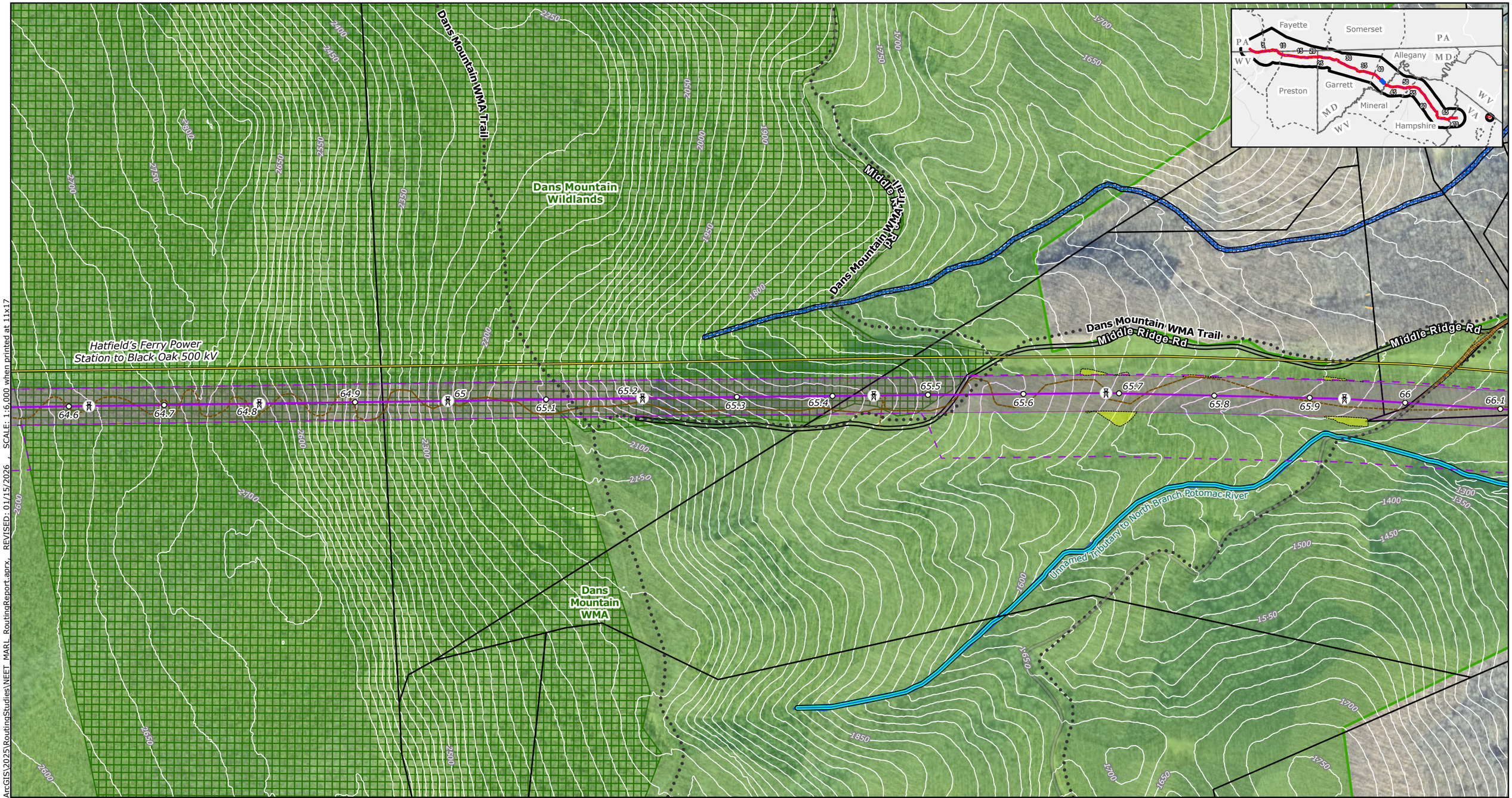

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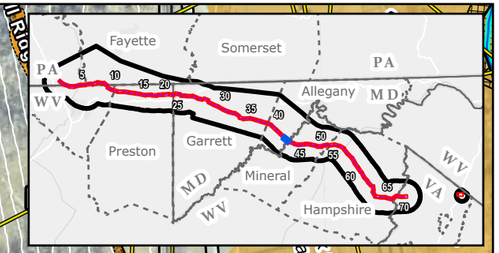

Danville
Middle Ridge Rd
Dans Mountain WMA Trail
DANVILLE COMMUNITY BAPTIST CHURCH
Hatfield's Ferry Power Station to Black Oak 500 kV
Dans Mountain WMA
Unnamed Tributary to North Branch Potomac River
Steeles Hill Rd
McMullen Hwy SW
Carman Dr
Baltimore and Ohio Railroad
220

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Page 45 of 71
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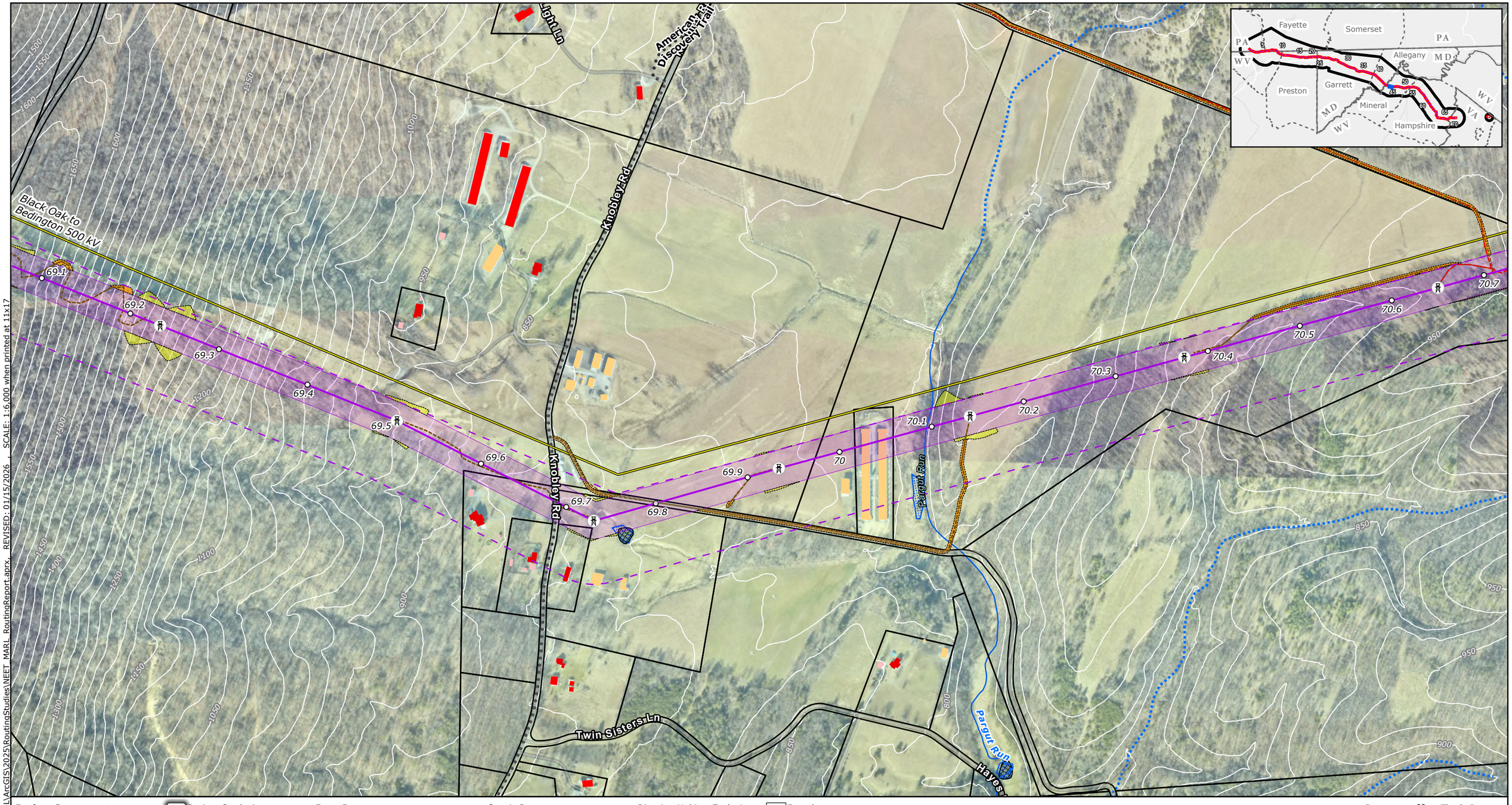

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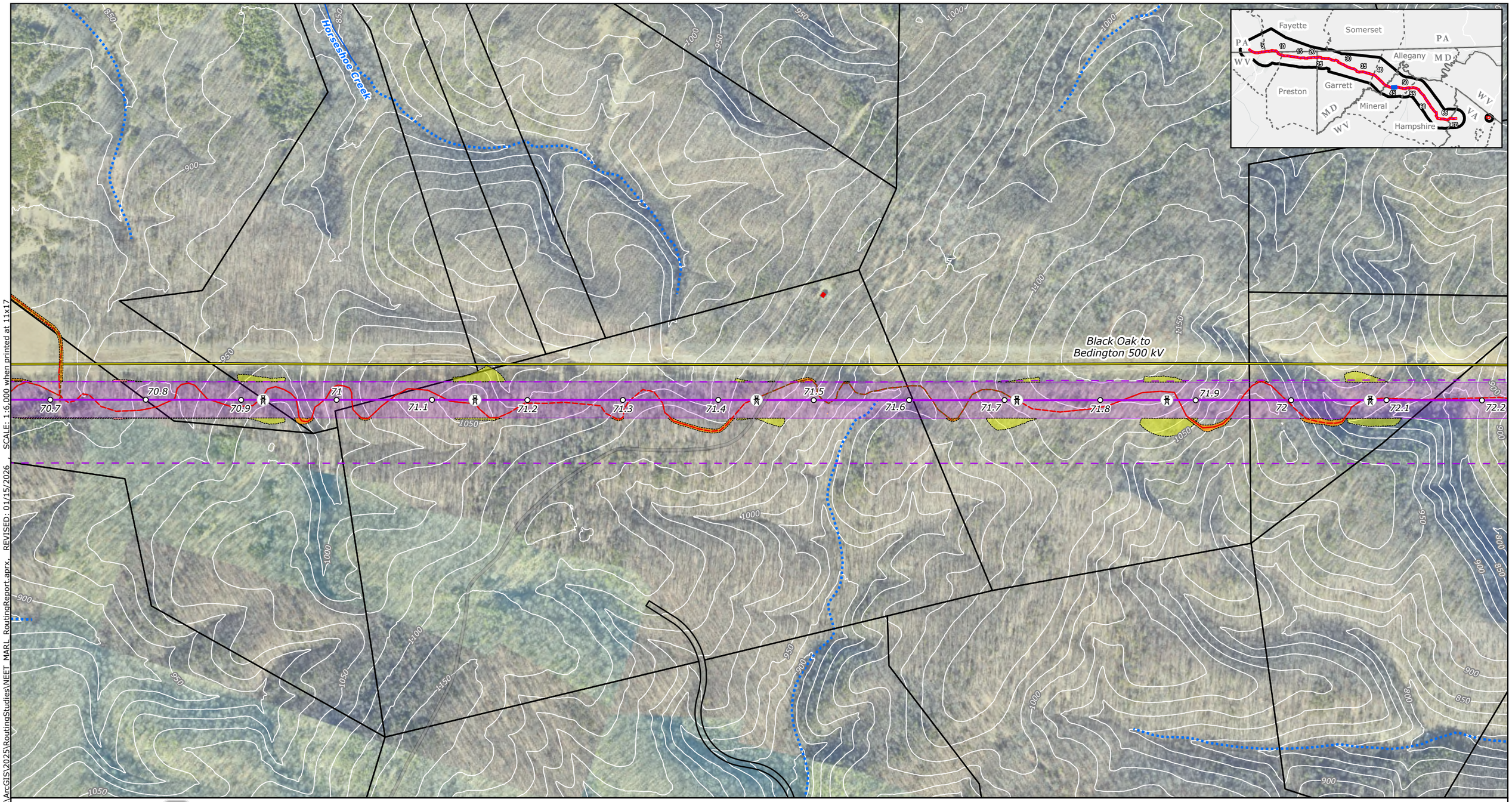

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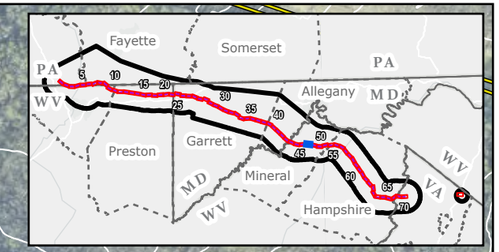

Black Oak to Bedington 500 kV

Ponderosa

Patterson Creek

Lost Hollow Dr

Horseshoe Rd

Black Oak to Junction 138 kV

Patterson Creek Water Trail

72.2 72.3 72.4 72.5 72.6 72.7 72.8 72.9 73 73.1 73.2 73.3 73.4 73.5 73.6 73.7

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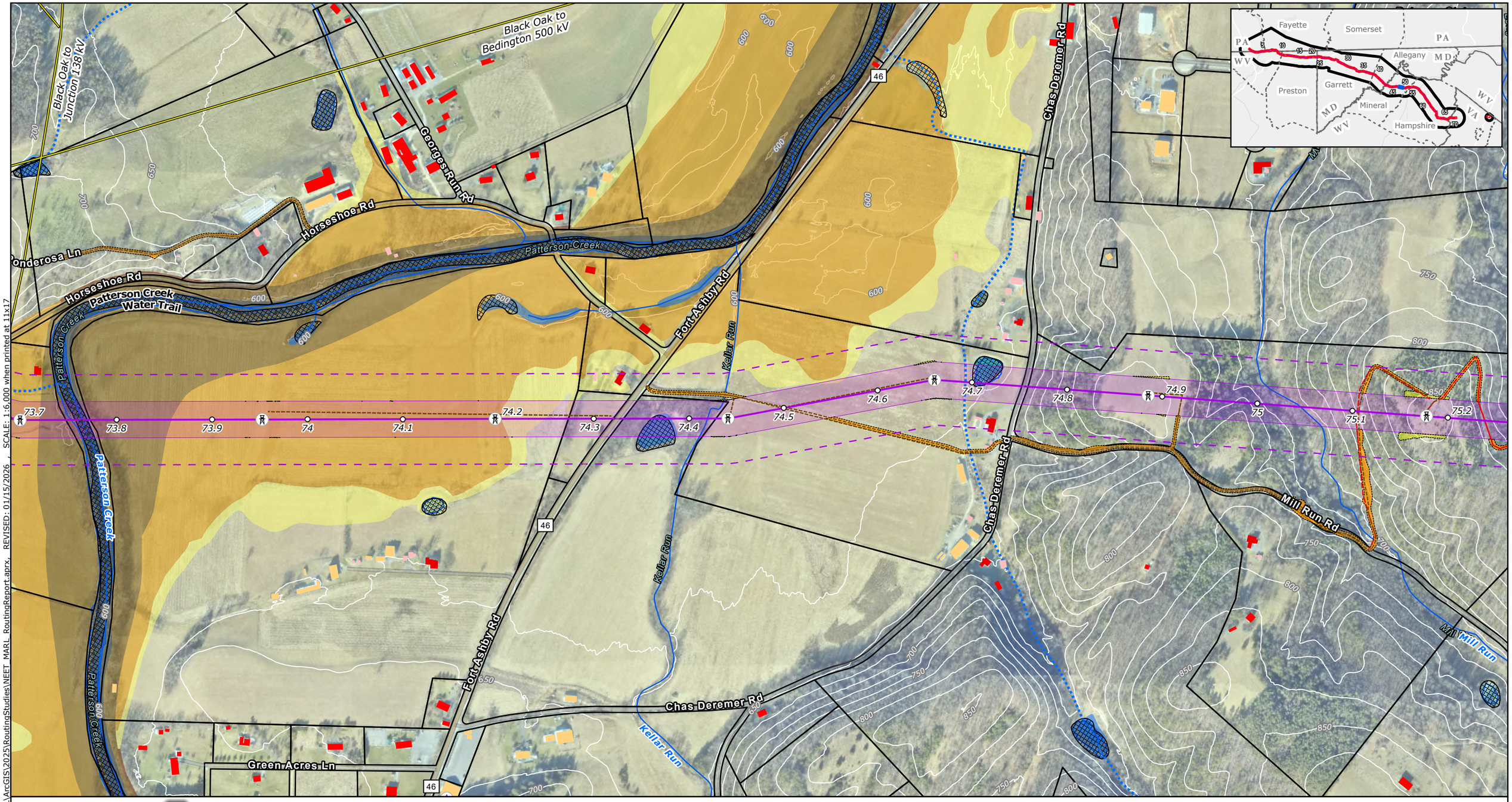

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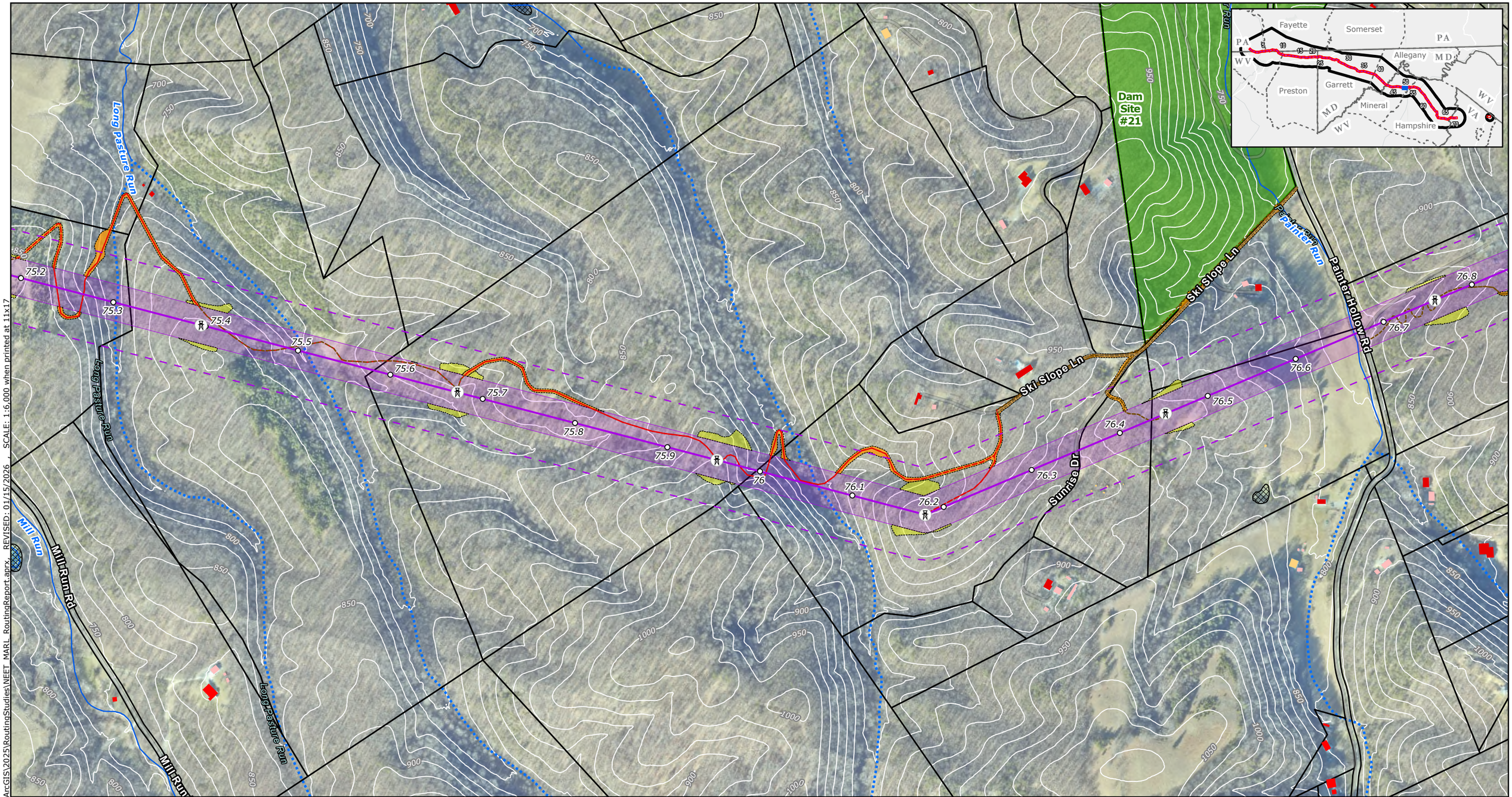

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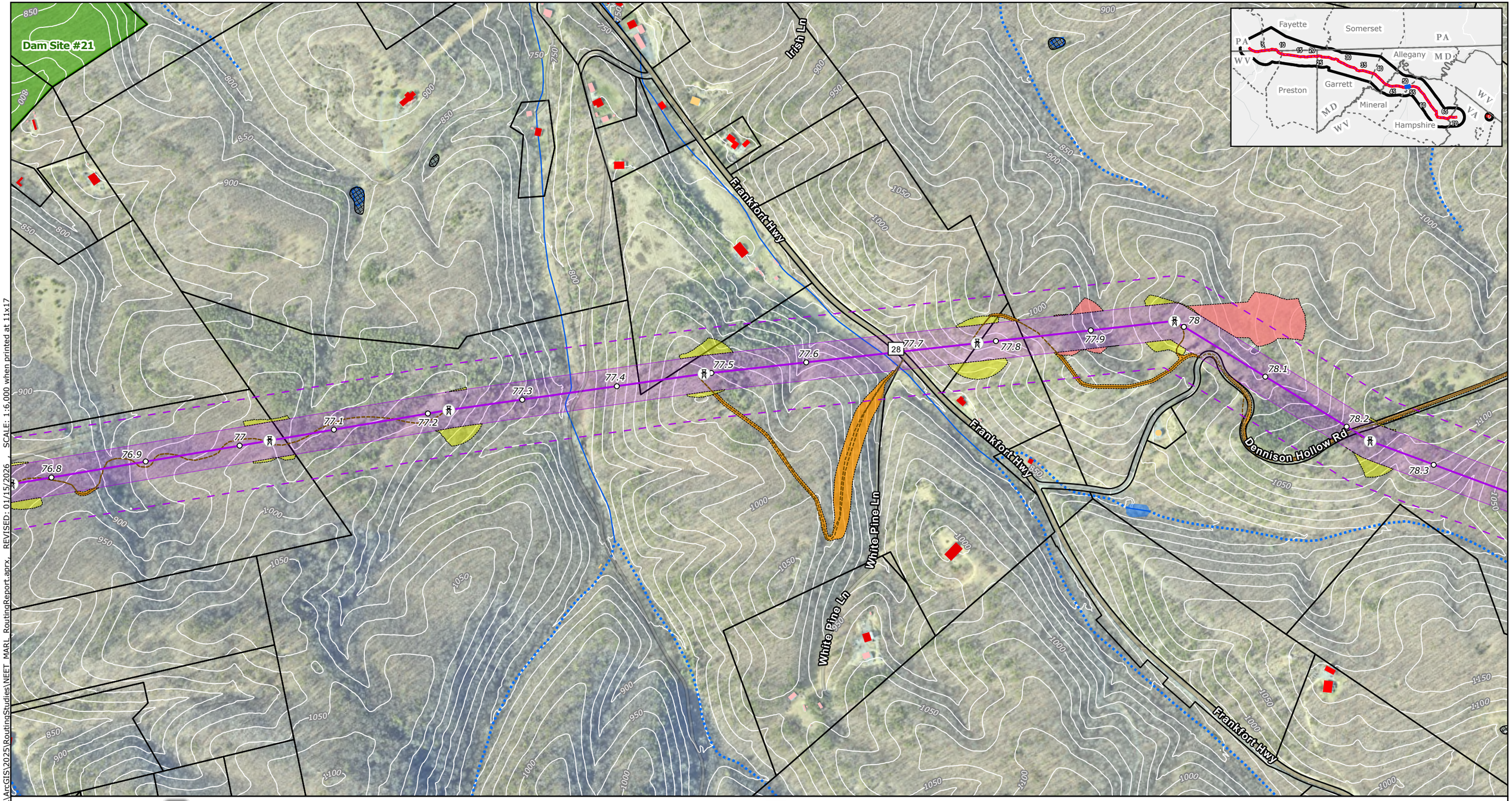

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N

0 0.05 0.1 0.15 0.2

Miles

Scale: 1:6,000
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Appendix E-14
Proposed Route
Page 51 of 71
MidAtlantic Resiliency Link

ERM

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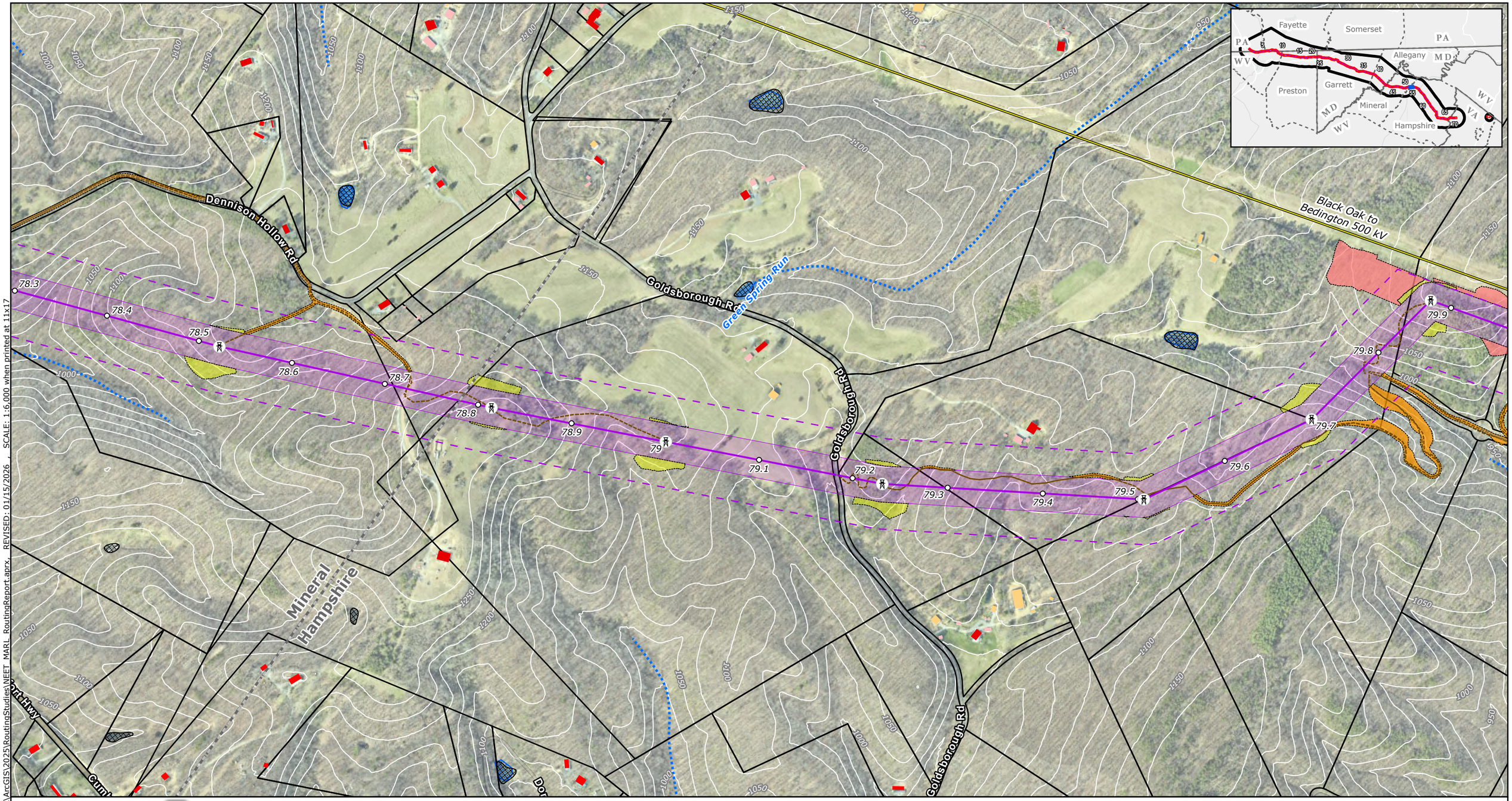

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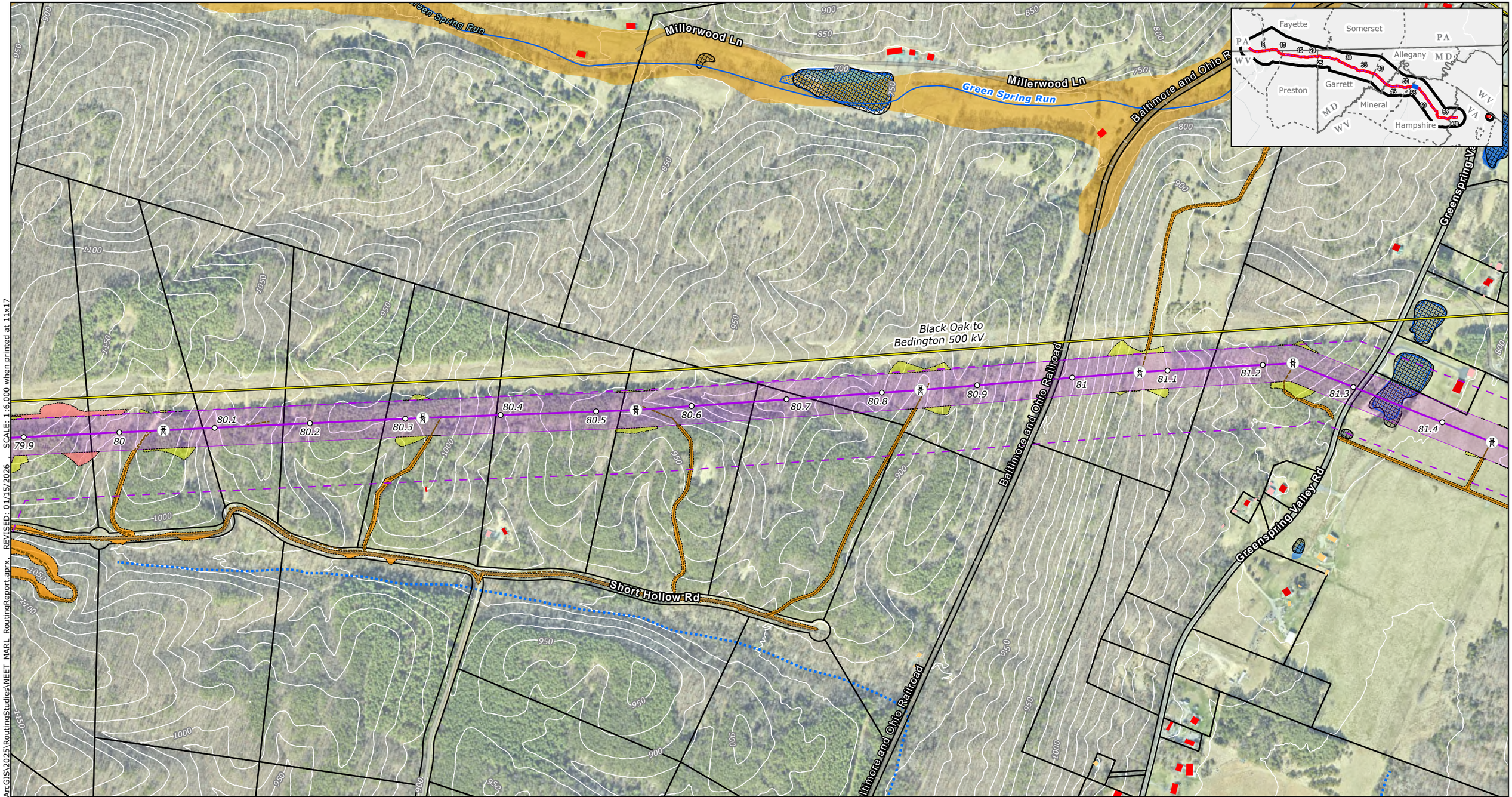

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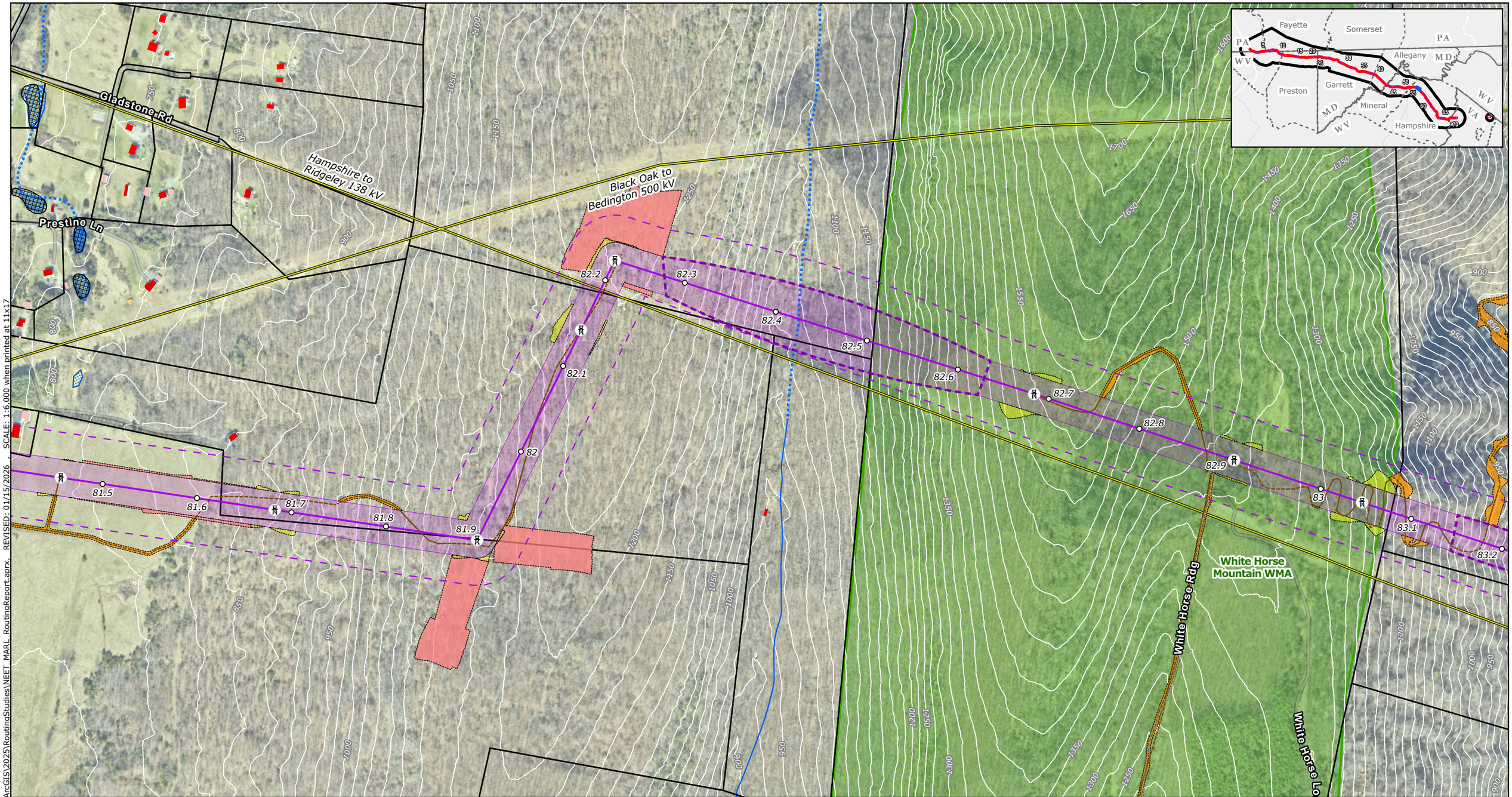

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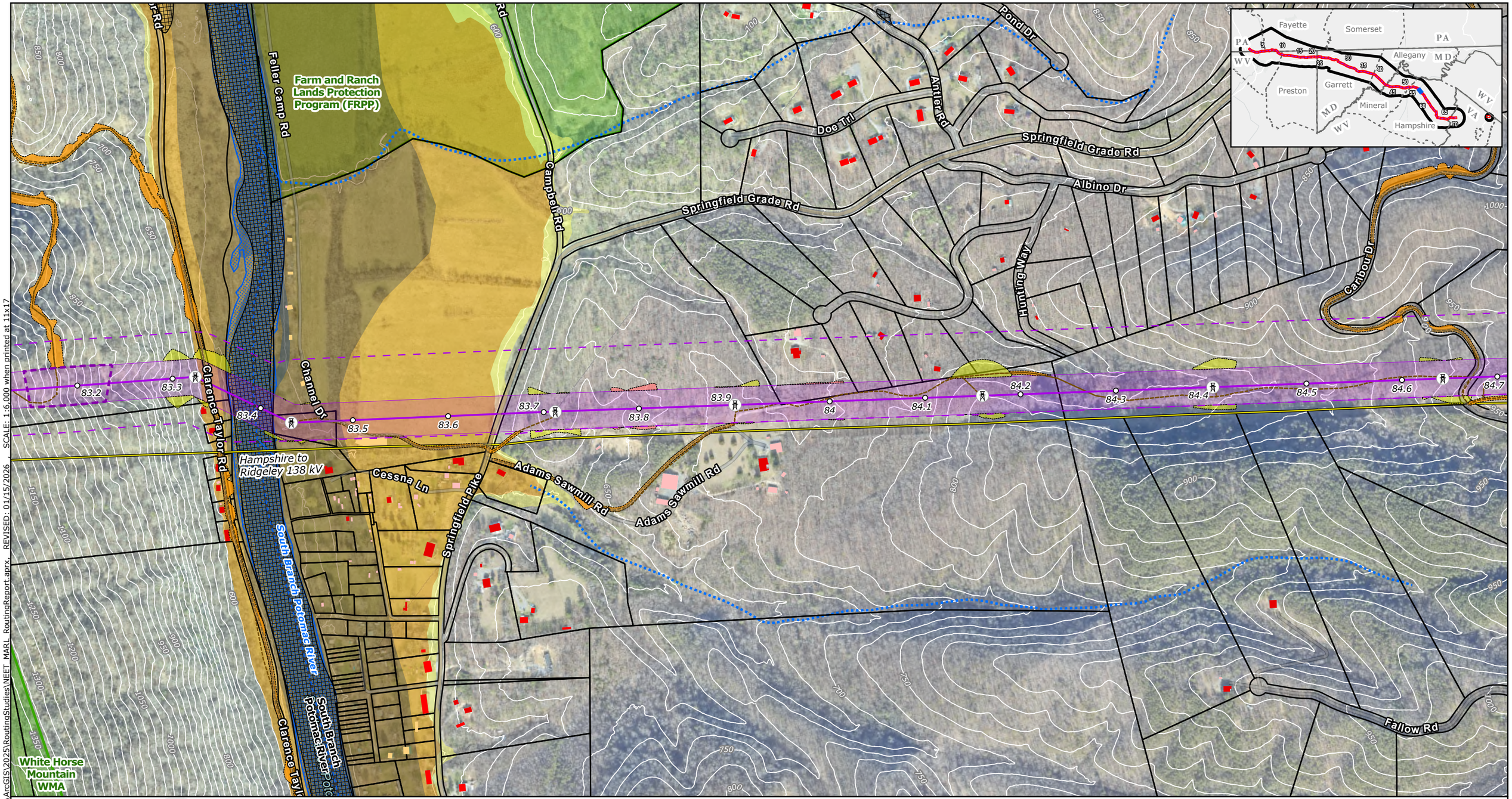

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Appendix E-14
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Page 55 of 71
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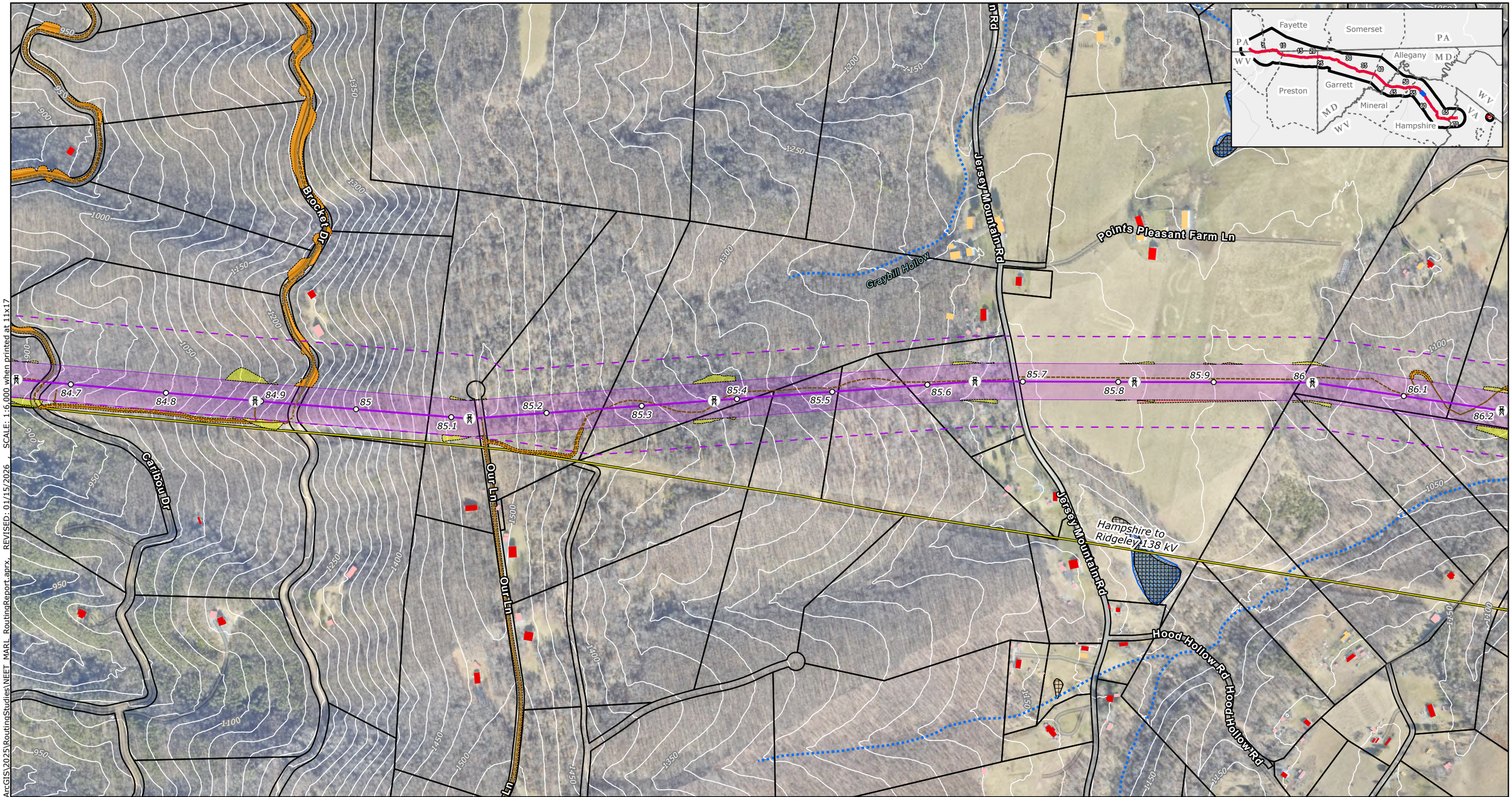

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Page 56 of 71
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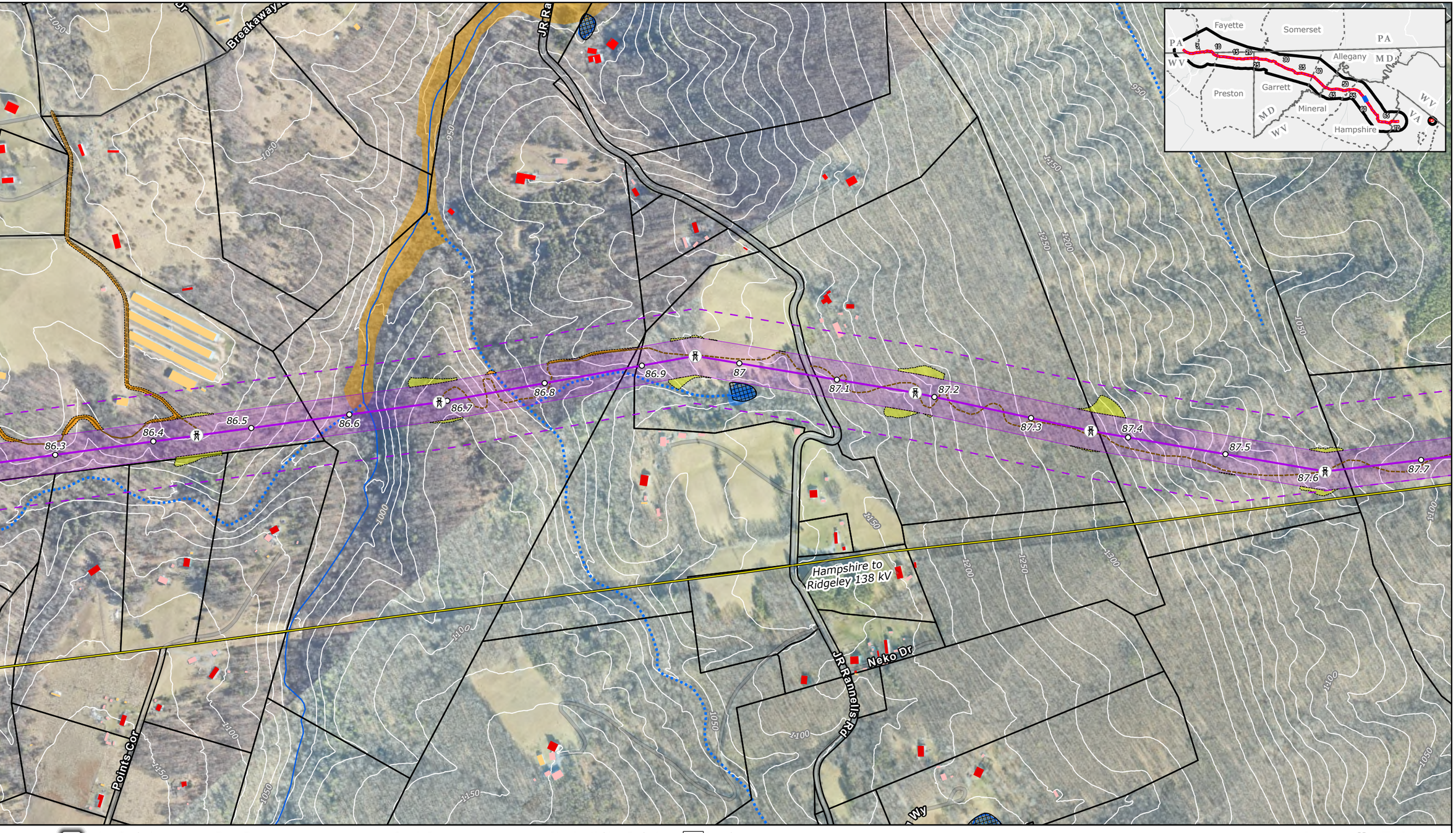

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Page 57 of 71
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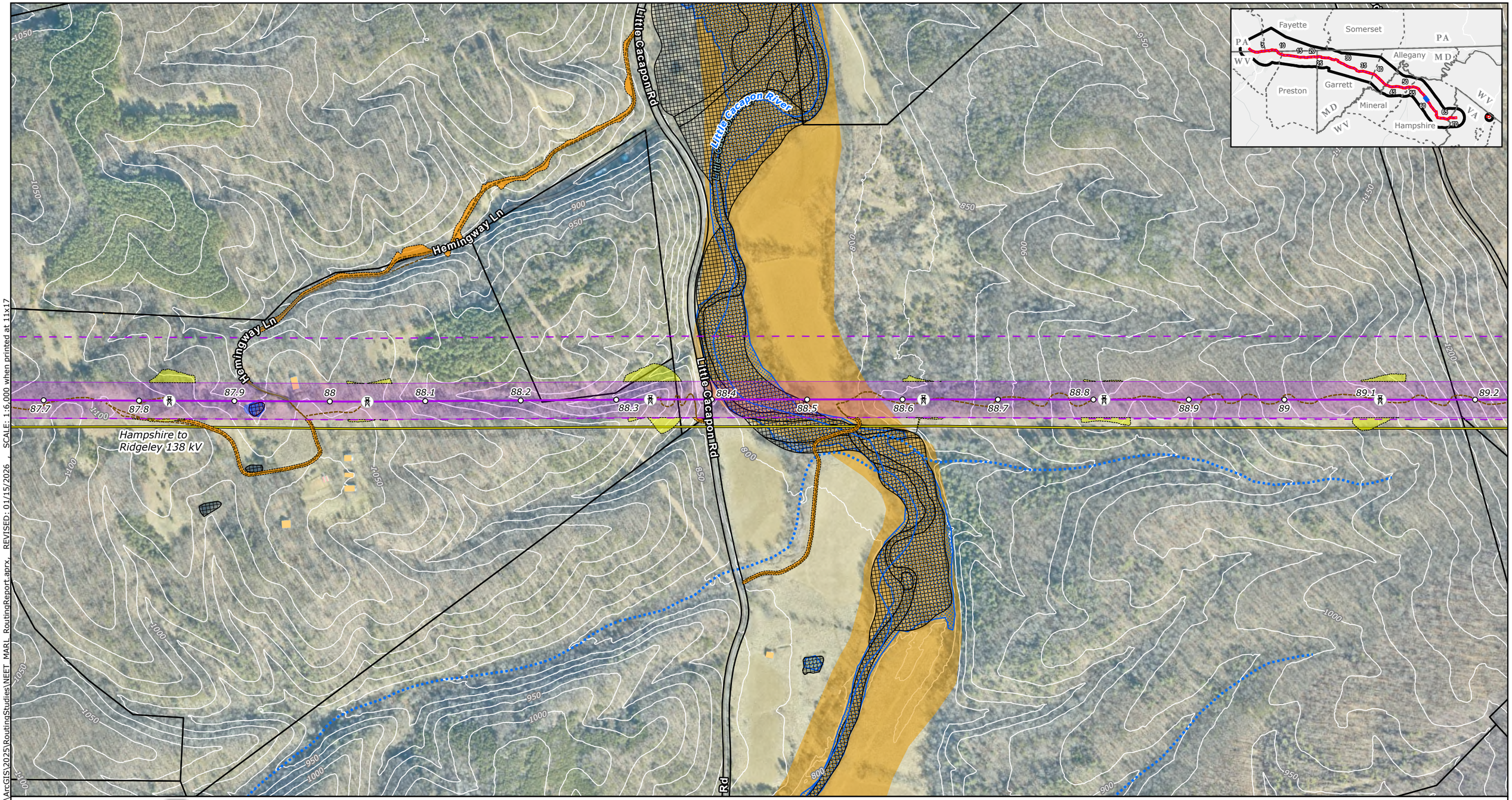

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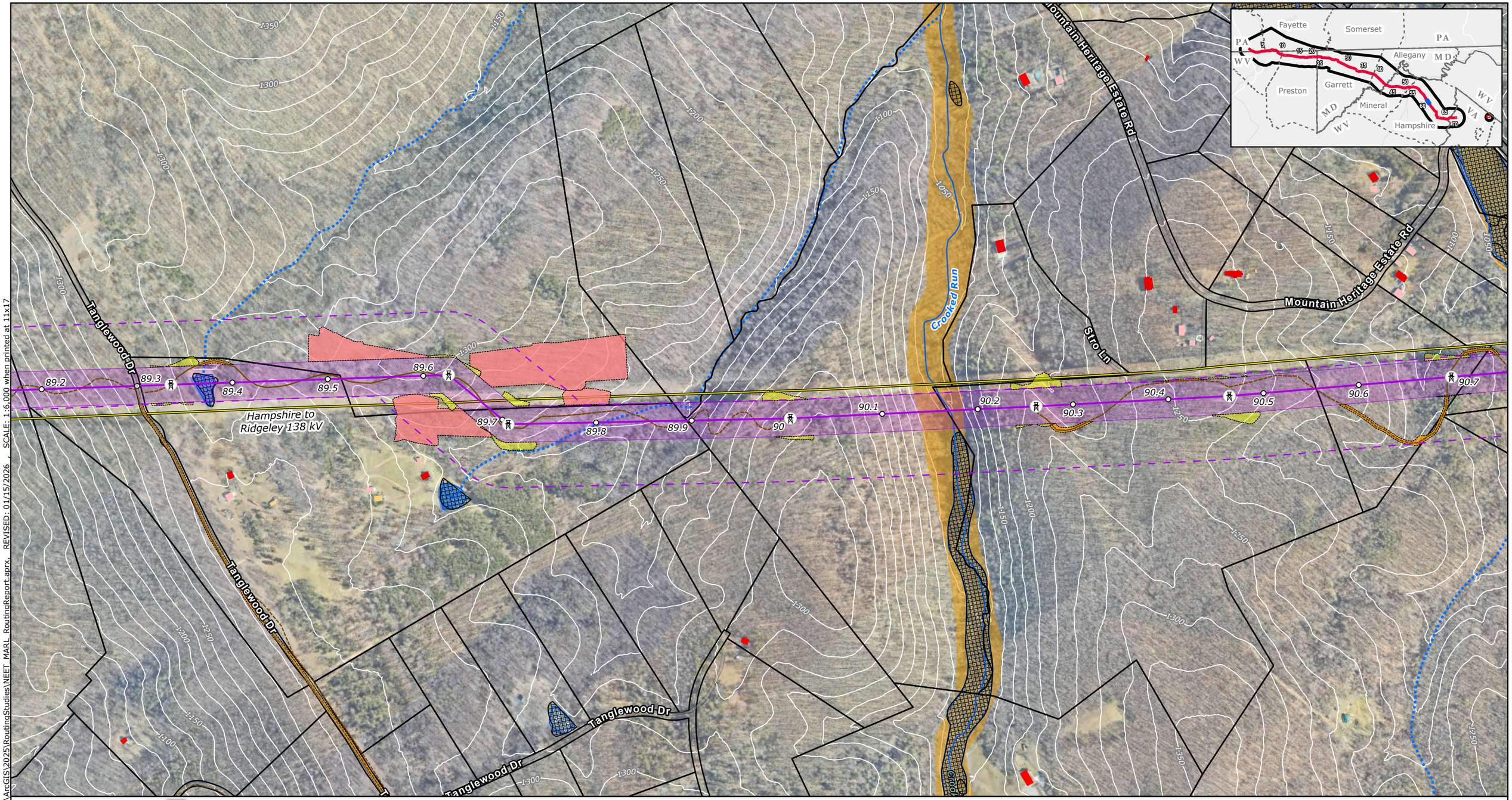

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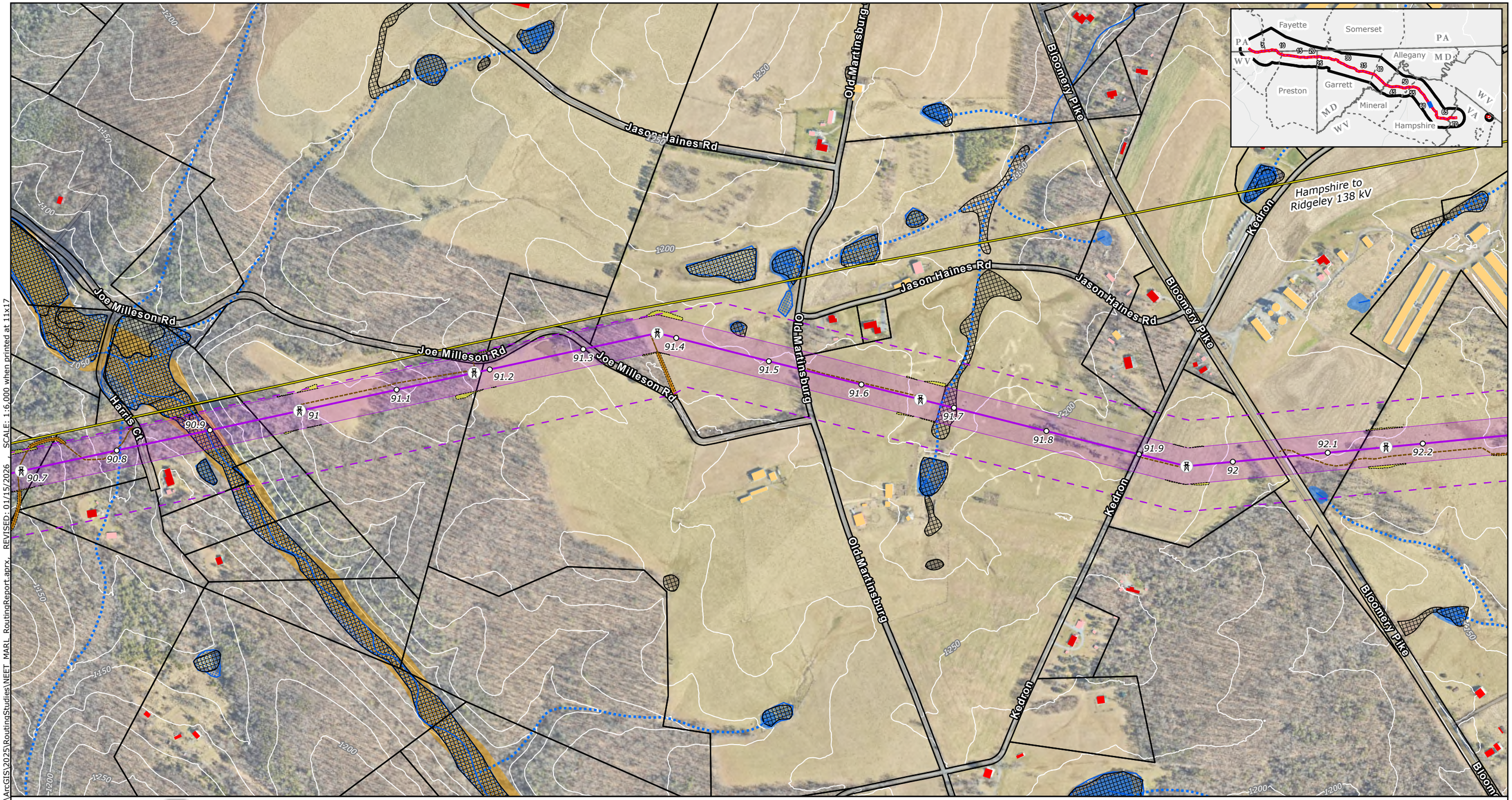

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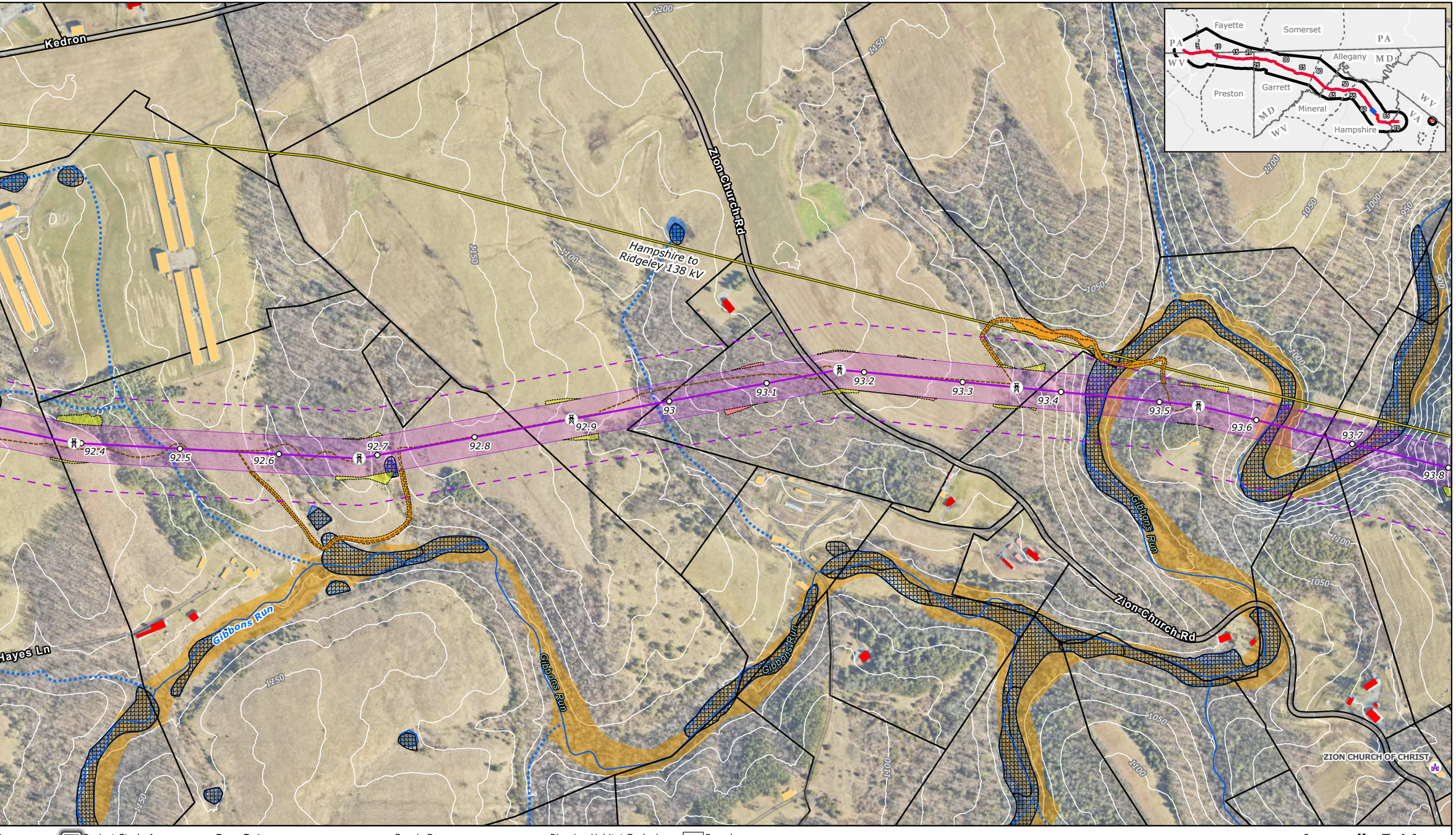

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0 0.05 0.1 0.15 0.2
Miles

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Appendix E-14
Proposed Route
Page 61 of 71
MidAtlantic Resiliency Link

ERM

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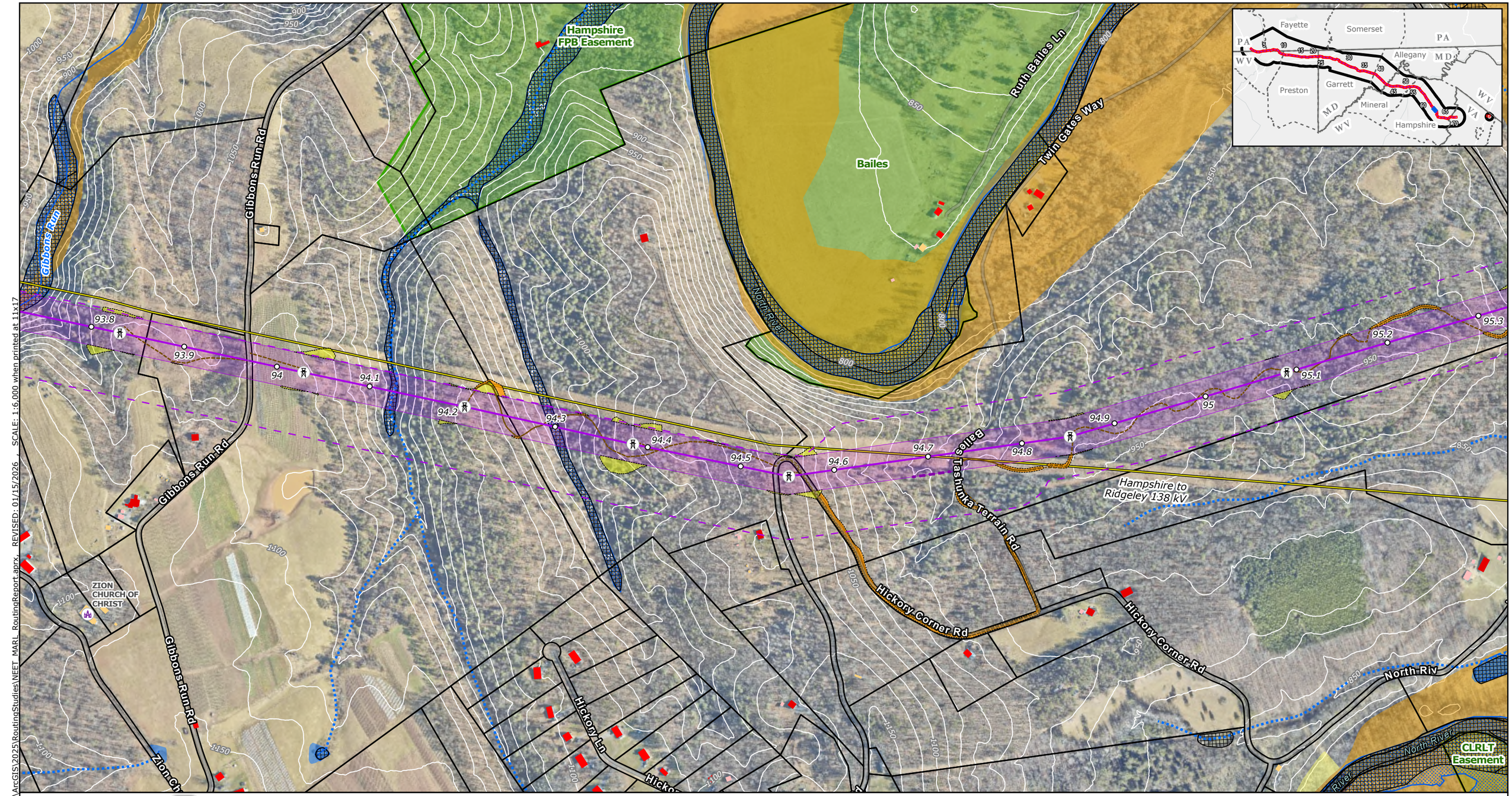

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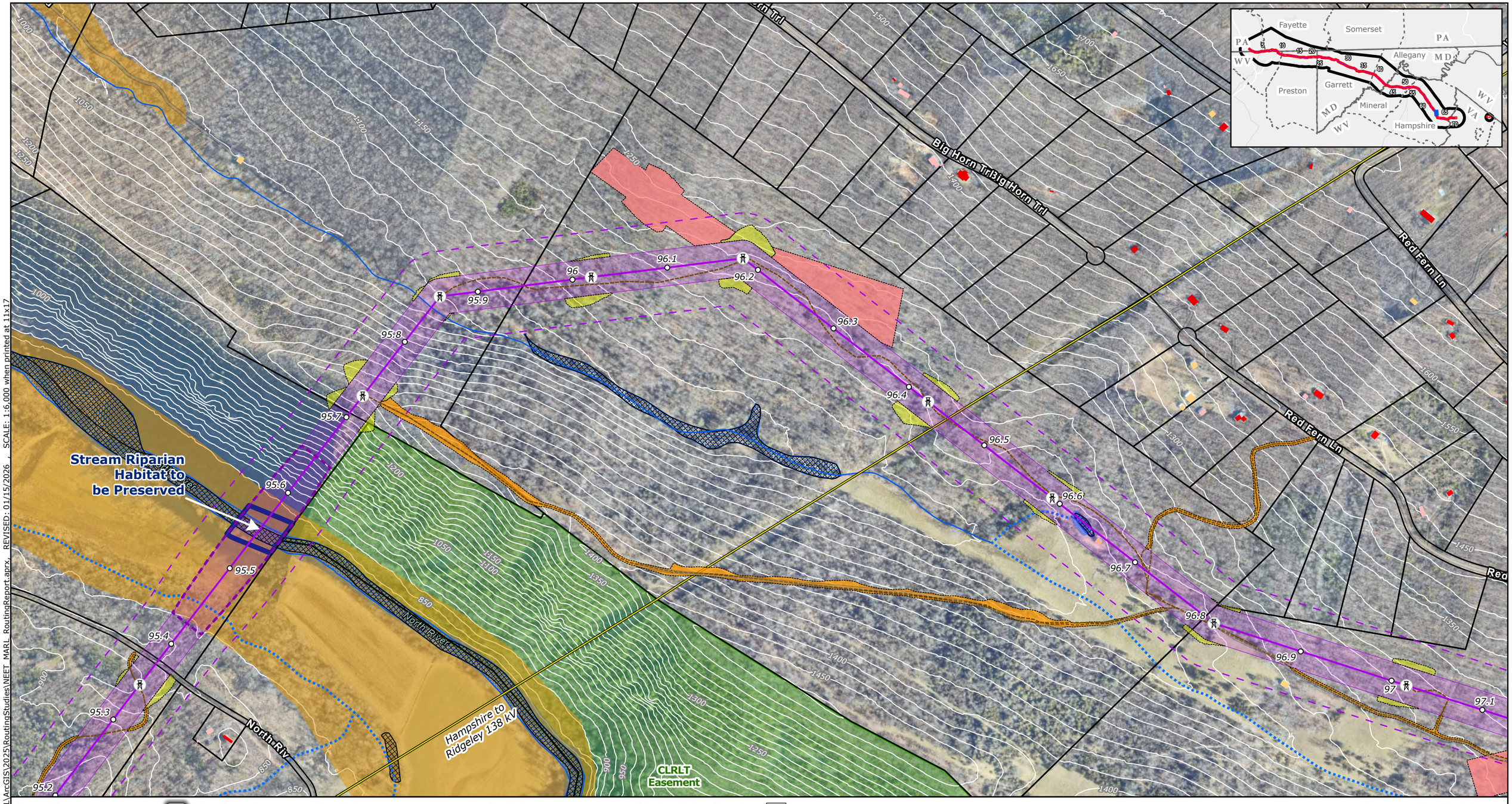

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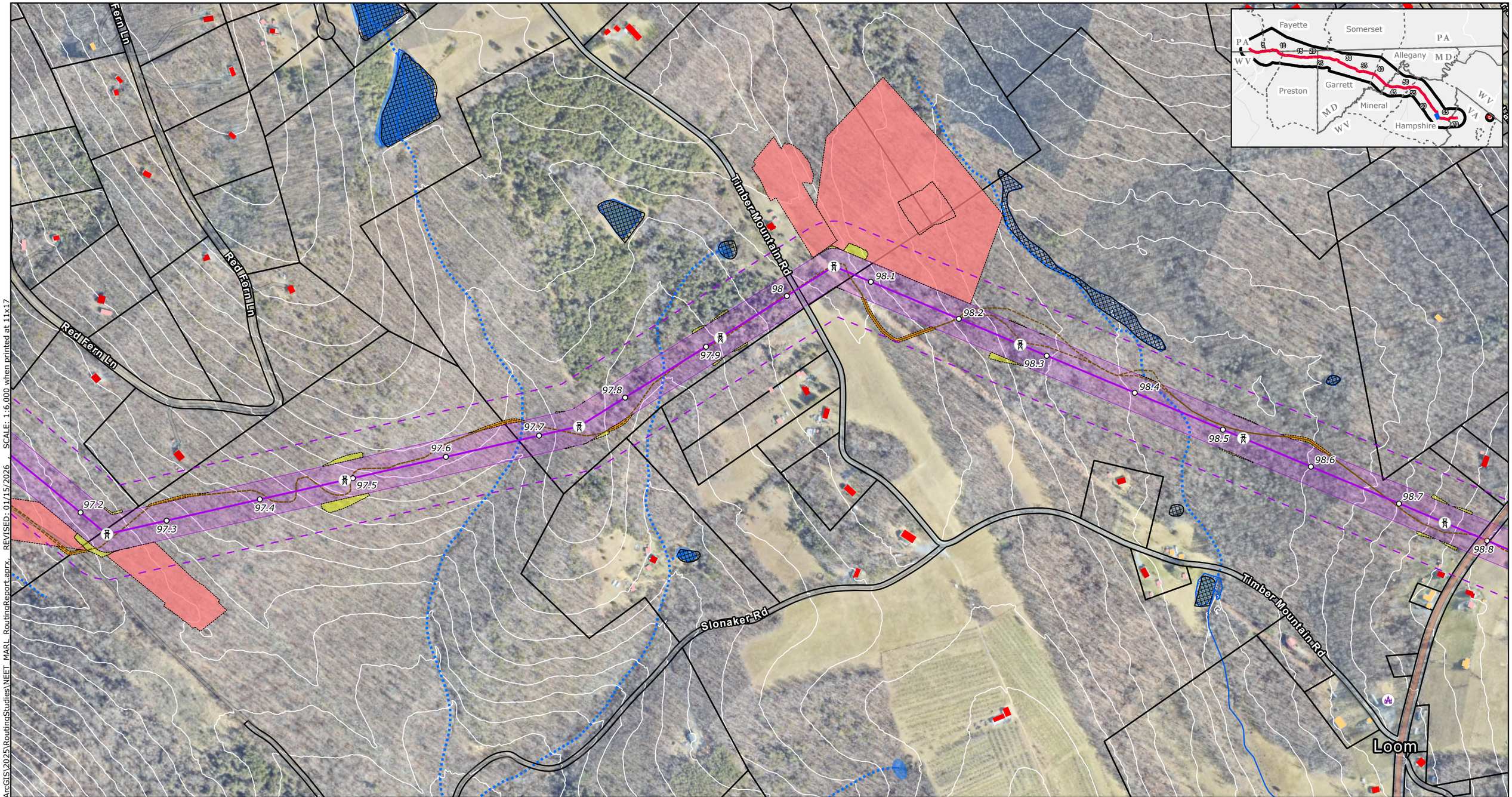

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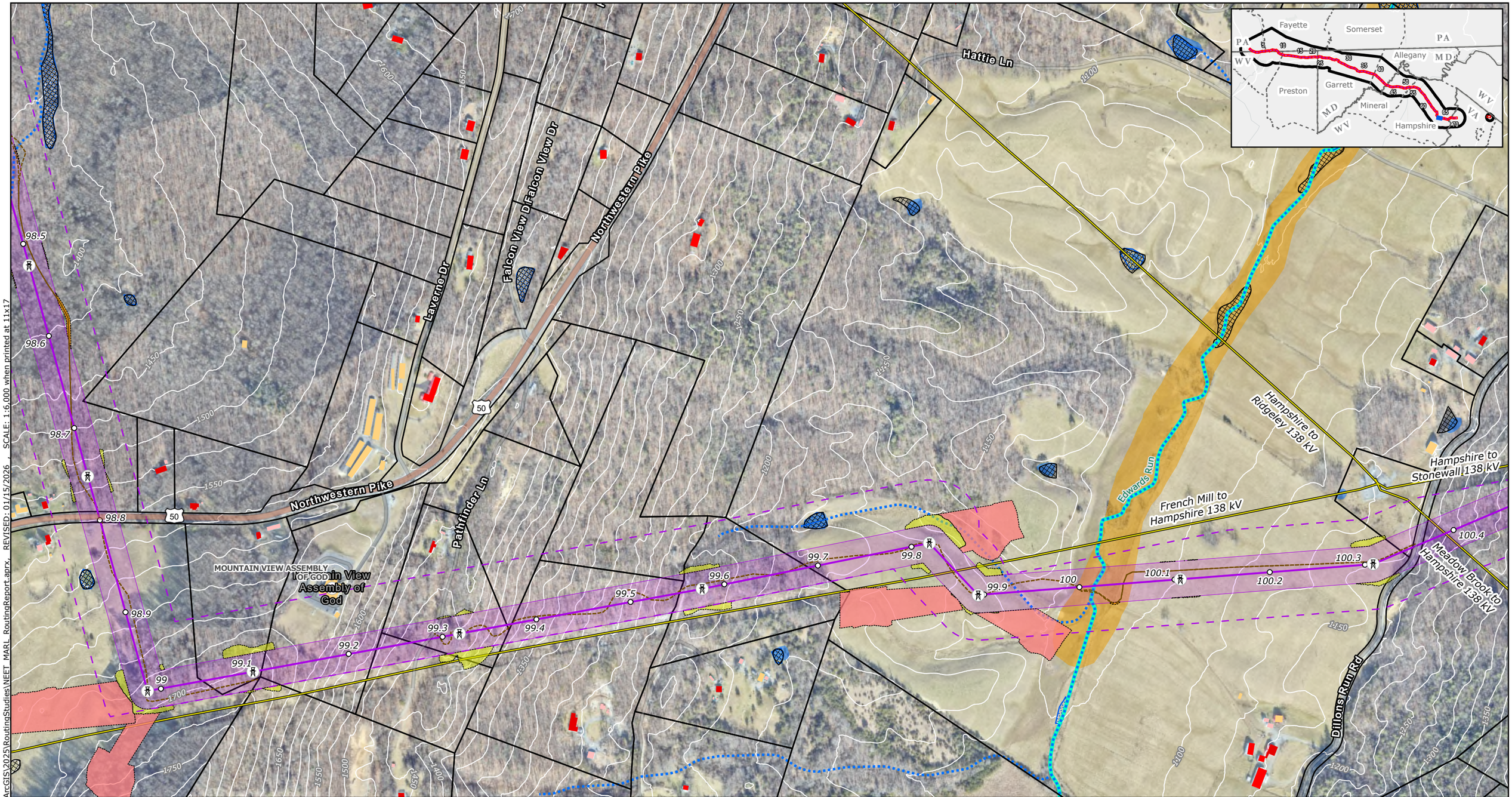

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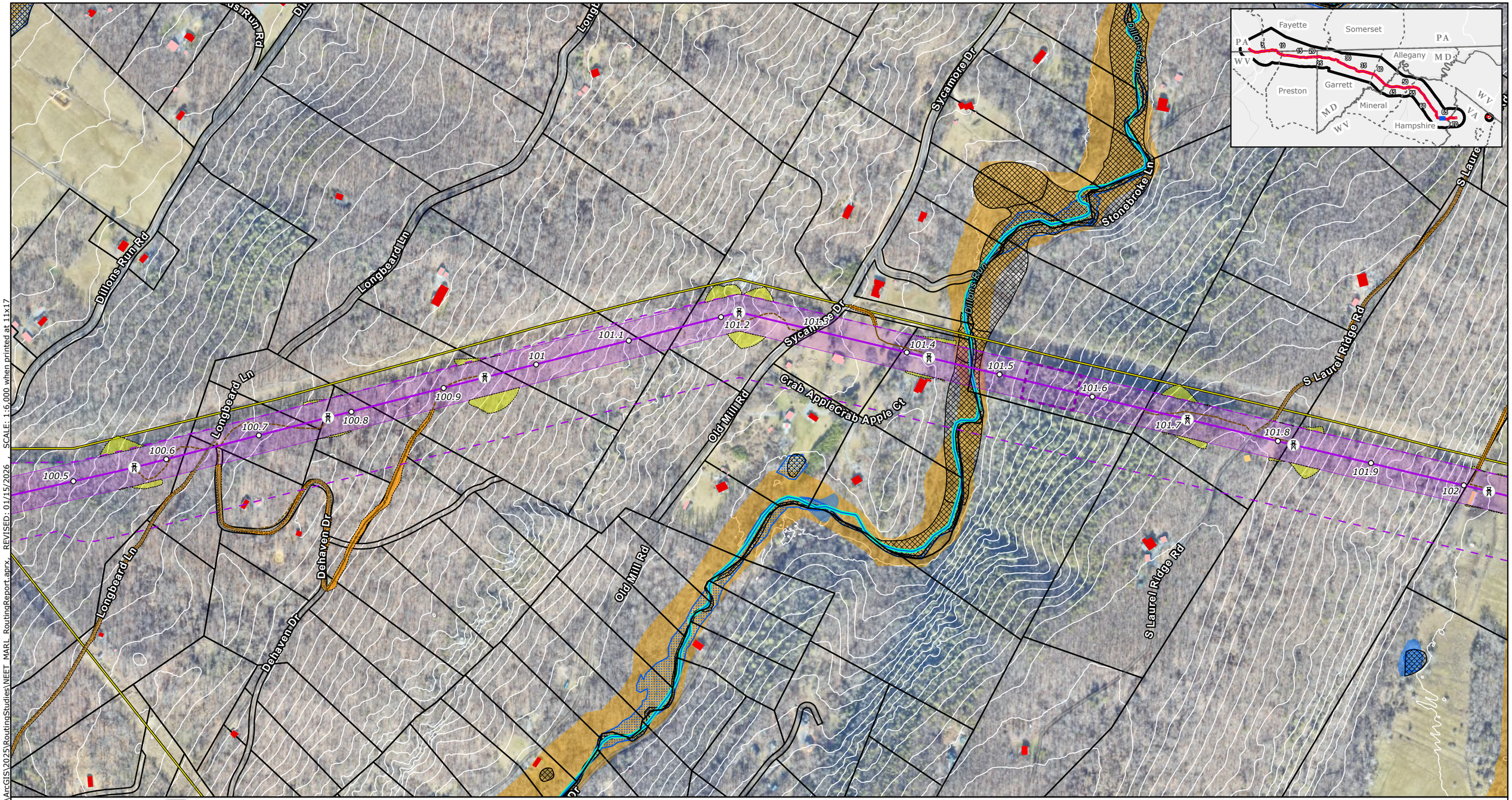

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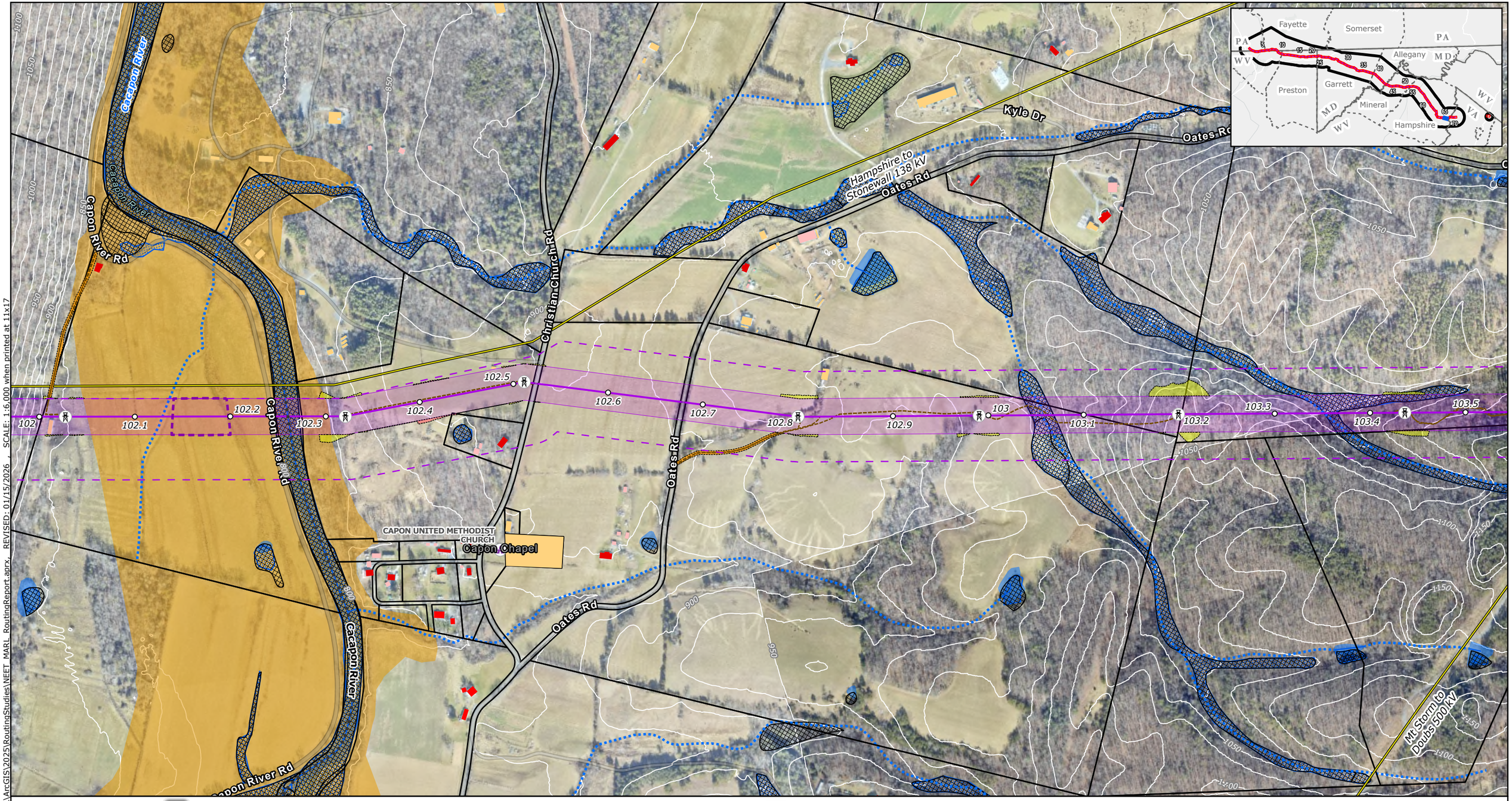

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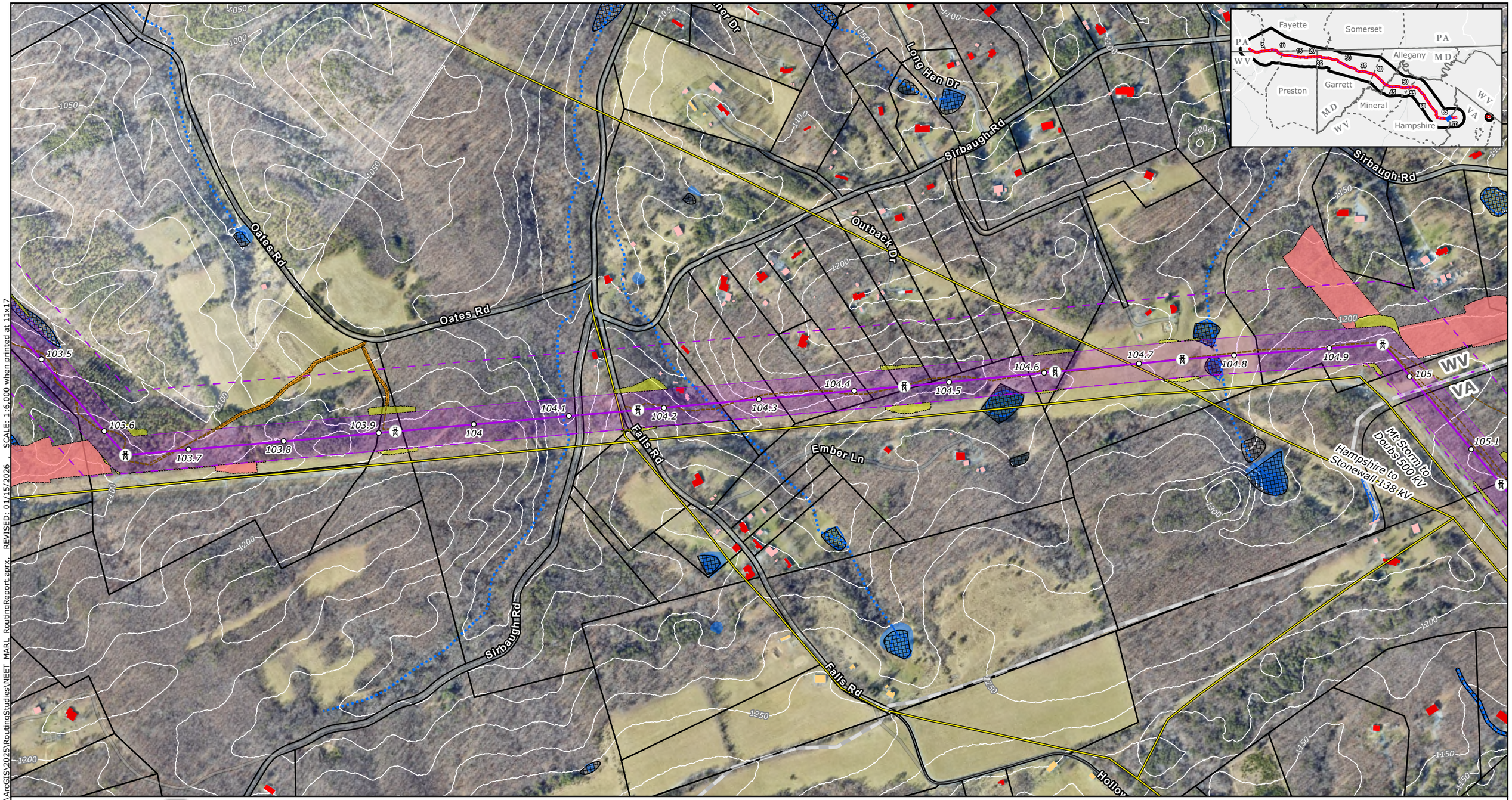

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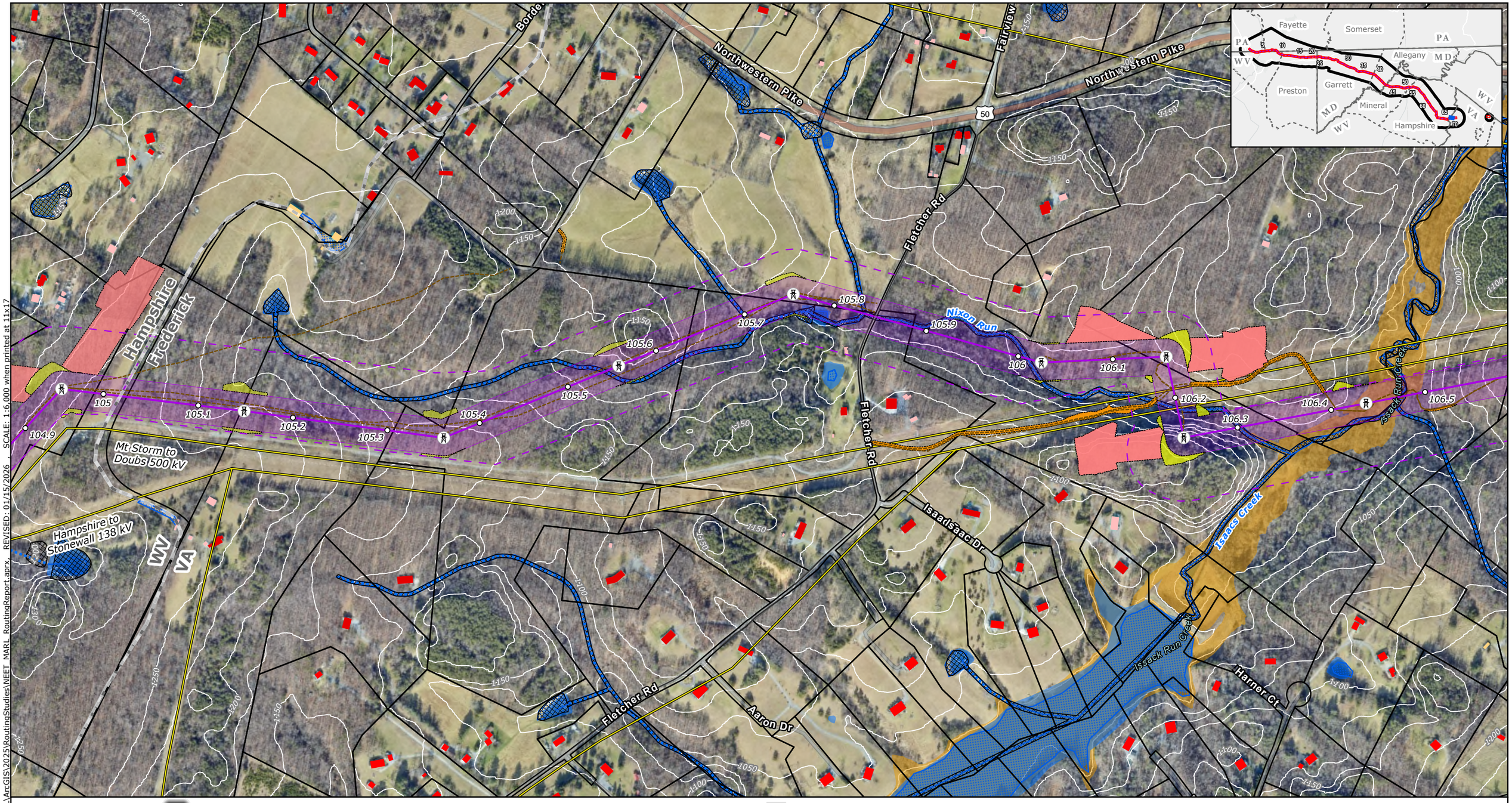

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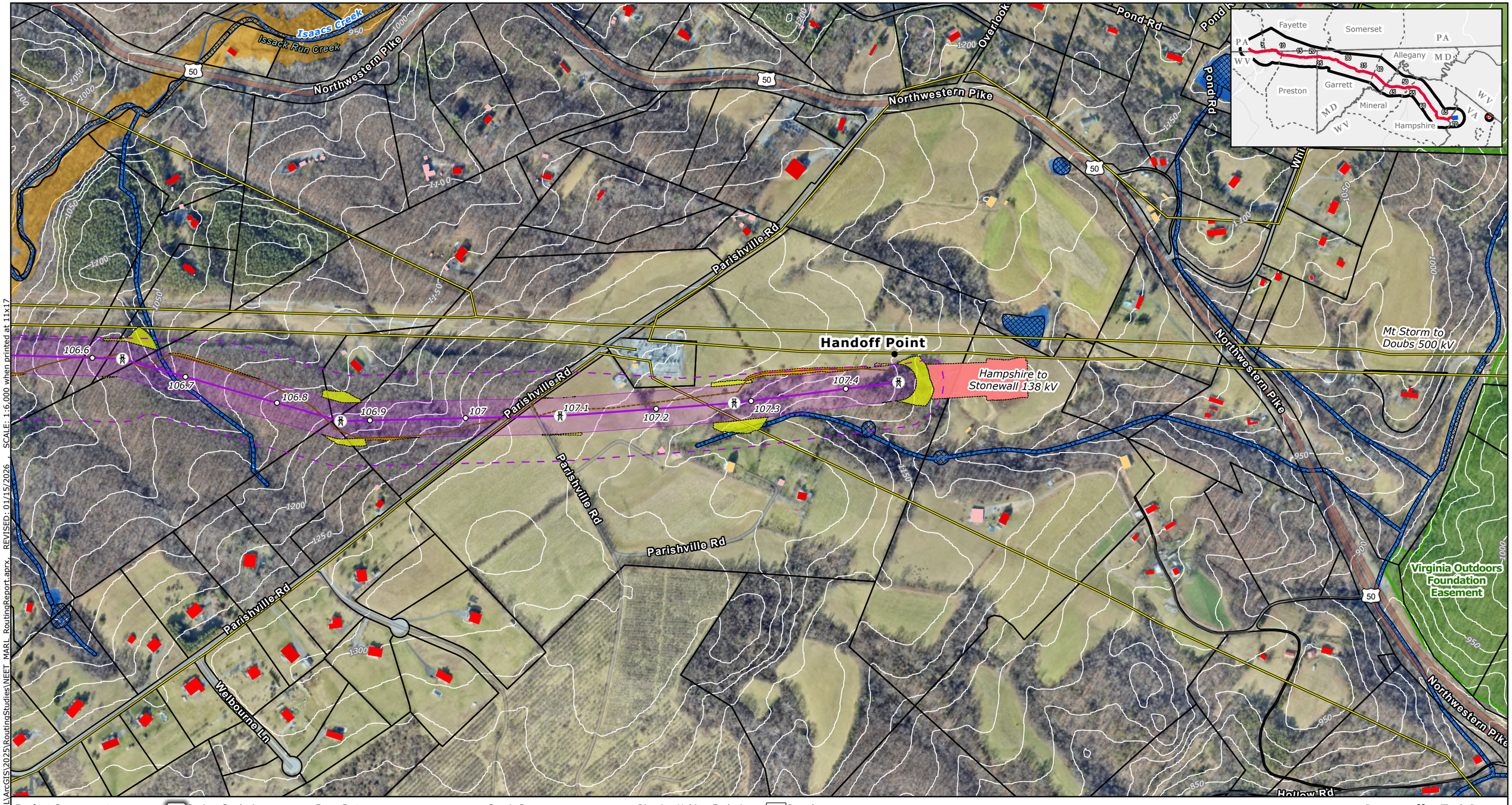

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Appendix E-14
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Page 71 of 71
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ERM

APPENDIX G DATA SOURCES

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Source / Author	Date*	Name	Subcategory	Category
Conservation & Habitat				
U.S. Fish and Wildlife Service (USFWS)	8/22/2025	Critical Habitat Final/Proposed	Critical Habitat Final/Proposed	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	8/1/2025	The Wildlife and Heritage Service Natural Heritage Program	State Listed Species	Conservation & Habitat
Pennsylvania Department of Conservation and Natural Resources (DCNR) and Pennsylvania Fish and Boat Commission (PFBC)	8/6/2025	The Pennsylvania Natural Heritage Program (PNHP)	State Listed Species	Conservation & Habitat
The Virginia Department of Wildlife Resources (DWR)	1/29/2024	Wildlife Environmental Review Map Service (WERMS)	State Listed Species	Conservation & Habitat
West Virginia Department of Natural Resources (WVDNR)	10/16/2024	The West Virginia Natural Heritage Program (WVNHP)	State Listed Species	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	11/14/2024	The Wildlife and Heritage Service Natural Heritage Program	Bat Hibernacula	Conservation & Habitat
Pennsylvania Department of Conservation and Natural Resources (DCNR) and Pennsylvania Fish and Boat Commission (PFBC)	4/4/2024	The Pennsylvania Natural Heritage Program (PNHP)	Bat Hibernacula	Conservation & Habitat
The Virginia Department of Wildlife Resources (DWR)	1/29/2024	Wildlife Environmental Review Map Service (WERMS)	Bat Hibernacula	Conservation & Habitat
West Virginia Department of Natural Resources (WVDNR)	10/16/2024	The West Virginia Natural Heritage Program (WVNHP)	Bat Hibernacula	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	11/14/2024	The Wildlife and Heritage Service Natural Heritage Program	Bat Known Occupied Summer Habitat	Conservation & Habitat
Pennsylvania Department of Conservation and Natural Resources (DCNR) and Pennsylvania Fish and Boat Commission (PFBC)	4/4/2024	The Pennsylvania Natural Heritage Program (PNHP)	Bat Known Occupied Summer Habitat	Conservation & Habitat
The Virginia Department of Wildlife Resources (DWR)	1/29/2024	Wildlife Environmental Review Map Service (WERMS)	Bat Known Occupied Summer Habitat	Conservation & Habitat
West Virginia Department of Natural Resources (WVDNR)	10/16/2024	Bat Known Occupied Summer Habitat	Bat Known Occupied Summer Habitat	Conservation & Habitat
U.S. Fish and Wildlife Service (USFWS)	6/11/2025	Northern Long-Eared Bat (NLEBs)	Northern Long-Eared Bat Area of Interest	Conservation & Habitat
U.S. Fish and Wildlife Service (USFWS)	6/11/2025	Tricolored Bat (TCBs)	Tricolored Bat Area of Interest	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Irreplaceable Natural Areas (INAs)	Irreplaceable Natural Areas (INAs)	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Forests of Recognized Importance (FORIs)	Forests of Recognized Importance (FORIs)	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Ecological Significant Area (ESAs)	Ecological Significant Area	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Targeted Ecological Areas (TEAs)	Targeted Ecological Areas	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/5/2025	Forest Interior Dwelling Species (FIDs)	Forest Interior Dwelling Species Confirmed/Probable	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Natural Heritage Areas (NHAs)	Natural Heritage Areas	Conservation & Habitat
Pennsylvania Department of Conservation and Natural Resources (DCNR) and Pennsylvania Fish and	11/6/2025	Natural Heritage Areas (NHAs)	Natural Heritage Areas	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	8/1/2025	The Wildlife and Heritage Service Natural Heritage Program	Rare, Threatened, and Endangered Species	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Sensitive Species Areas (SSAs)	Sensitive Species Areas	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Biodiversity Conservation Network (BioNet)	Biodiversity Conservation Network	Conservation & Habitat
Virginia Department of Conservation and Recreation (DCR)	8/9/2023	The Virginia Natural Heritage Program (VNHP)	Ecological Cores	Conservation & Habitat
Virginia Department of Forestry (VDOF)	6/28/2021	Forest Conservation Value (FCV)	Forest Conservation Value	Conservation & Habitat
Virginia Department of Conservation and Recreation (DCR)	6/9/2025	Area of Conservation Interest (AOCI)*	Area of Conservation Interest	Conservation & Habitat
The Virginia Department of Wildlife Resources (DWR)	1/29/2024	VA Department of Wildlife Resources (WERMS)	Species Observations	Conservation & Habitat
Maryland Department of Natural Resources (MDNR)	5/12/2025	Habitat Connectivity Network (HCN)	Habitat Connectivity Network	Conservation & Habitat
Environmental Protection Agency (EPA)	6/18/2025	Ecoregions	Ecoregions	Conservation & Habitat
Cultural				
Maryland Historical Trust (MHT)	9/22/2025	Maryland's Cultural Resource Information System (MEDUSA)	Architecture Resources	Cultural
Pennsylvania State Historic Preservation Office (SHPO)	10/22/2025	Pennsylvania's State Historical and Museum Commission (PA-SHARE)	Architecture Resources	Cultural
Virginia Department of Historic Resources (VDHR)	11/7/2025	Virginia Cultural Resources Information System (VCRIS)	Architecture Resources	Cultural
West Virginia State Historic Preservation Office (SHPO)	9/22/2025	Architecture Resources	Architecture Resources	Cultural
Maryland Historical Trust (MHT)	9/19/2025	Maryland's Cultural Resource Information System (MEDUSA)	Archaeology Resources and Surveys	Cultural
Pennsylvania State Historic Preservation Office (SHPO)	10/22/2025	Pennsylvania's State Historical and Museum Commission (PA-SHARE)	Archaeology Resources and Surveys	Cultural
Virginia Department of Historic Resources (VDHR)	11/7/2025	Virginia Cultural Resources Information System (VCRIS)	Archaeology Resources and Surveys	Cultural
West Virginia State Historic Preservation Office (SHPO)	9/22/2025	Archaeology Resources and Surveys	Archaeology Resources and Surveys	Cultural
Maryland Historical Trust (MHT)	9/22/2025	Maryland's Cultural Resource Information System (MEDUSA)	Cemeteries	Cultural
Pennsylvania State Historic Preservation Office (SHPO)	10/22/2025	Pennsylvania's State Historical and Museum Commission (PA-SHARE)	Cemeteries	Cultural
Virginia Department of Historic Resources (VDHR)	11/7/2025	Virginia Cultural Resources Information System (VCRIS)	Cemeteries	Cultural
West Virginia State Historic Preservation Office (SHPO)	9/22/2025	Cemeteries	Cemeteries	Cultural
Maryland Historical Trust (MHT)	9/22/2025	Maryland's Cultural Resource Information System (MEDUSA)	Historic Districts	Cultural
Pennsylvania State Historic Preservation Office (SHPO)	10/22/2025	Pennsylvania's State Historical and Museum Commission (PA-SHARE)	Historic Districts	Cultural
Virginia Department of Historic Resources (VDHR)	11/7/2025	Virginia Cultural Resources Information System (VCRIS)	Historic Districts	Cultural
West Virginia State Historic Preservation Office (SHPO)	9/22/2025	Historic Districts	Historic Districts	Cultural
National Park Service (NPS)	7/1/2025	National Register of Historic Places (NRHP)	National Register of Historic Places	Cultural

Source / Author	Date*	Name	Subcategory	Category
Virginia Department of Historic Resources (VDHR)	7/14/2025	Virginia Cultural Resources Information System (VCRIS)	Preservation Easements	Cultural
Preservation Virginia (APVA)	9/12/2024	Most Endangered Historic Places	Most Endangered Historic Places	Cultural
Maryland Historical Trust (MHT)	3/14/2023	Maryland's Cultural Resource Information System (MEDUSA)	Battlefields	Cultural
Pennsylvania State Historic Preservation Office (SHPO)	3/14/2023	Pennsylvania's State Historical and Museum Commission (PA-SHARE)	Battlefields	Cultural
Virginia Department of Historic Resources (VDHR)	3/14/2023	Virginia Cultural Resources Information System (VCRIS)	Battlefields	Cultural
West Virginia State Historic Preservation Office (SHPO)	3/14/2023	Battlefields	Battlefields	Cultural
Maryland Historical Trust (MHT)	5/12/2025	Maryland's Cultural Resource Information System (MEDUSA)	Heritage Areas	Cultural
Geologic and Soil				
Environmental Protection Agency (EPA)	3/24/2021	Hazardous Waste Sites	Hazardous Waste Sites	Geologic and Soil
Natural Resources Conservation Service (NRCS) and U.S. Department of Agriculture (USDA)	4/11/2025	Soil Survey Geographic Database (SSURGO)	Farmland (prime, state and local importance)	Geologic and Soil
Natural Resources Conservation Service (NRCS) and U.S. Department of Agriculture (USDA)	4/11/2025	Soil Survey Geographic Database (SSURGO)	Soils	Geologic and Soil
Natural Resources Conservation Service (NRCS) and U.S. Department of Agriculture (USDA)	4/11/2025	Soil Survey Geographic Database (SSURGO)	Soil Hydric Class	Geologic and Soil
U.S. Geological Survey (USGS)	12/1/2023	Karst Topography	Karst Topography	Geologic and Soil
U.S. Geological Survey (USGS)	8/1/2017	Geologic Formations	Geologic Formations	Geologic and Soil
Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR)	10/1/2025	Abandoned Mines	Abandoned Mines	Geologic and Soil
West Virginia Department of Environmental Protection (WVDEP)	4/26/2022	Office of Abandoned Mine Lands and Reclamation (AML&R)	Abandoned Mines	Geologic and Soil
U.S. Geological Survey (USGS)	7/31/2025	Earthquakes	Earthquakes	Geologic and Soil
U.S. Geological Survey (USGS)	6/5/2025	Physiographic Sections	Physiographic Sections	Geologic and Soil
Human Environment				
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Child Care Centers	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Colleges and Universities	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Event Centers	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Fire Stations	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Hospitals	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Nursing Homes	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Places of Worship	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Police Stations	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Prisons	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Private Schools	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Public Schools	Human Environment
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Town Halls	Human Environment
Maryland Department of Planning (MDP)	11/12/2024	Agriculture Preservation Areas	Agriculture Preservation Areas	Human Environment
WeConservePA	11/1/2025	Agriculture Preservation Areas	Agriculture Preservation Areas	Human Environment
Environmental Protection Agency (EPA)	5/20/2024	Environmental Justice Areas	Environmental Justice Areas	Human Environment
ESRI	11/1/2023	Demographic Data	Demographic Data	Human Environment
U.S. Department of Transportation (USDOT) and 'Federal Highway Administration (FHWA)	1/19/2021	Federal Highway Administration (FHWA)	National Scenic Byways	Human Environment
Maryland Department of Transportation (MDOT)	8/13/2025	State Highway Administration (SHA)	State Scenic Byways	Human Environment
Pennsylvania Department of Transportation (PennDOT)	8/22/2024	State Scenic Byways	State Scenic Byways	Human Environment
Virginia Department of Transportation (VDOT)	1/14/2025	State Scenic Byways	State Scenic Byways	Human Environment
West Virginia Department of Transportation (WVDOT)	6/15/2023	State Scenic Byways	State Scenic Byways	Human Environment
U.S. Department of Agriculture (USDA) and U.S. Forest Service (USFS)	9/1/2025	National Wild and Scenic Rivers	National Wild and Scenic Rivers	Human Environment
U.S. Geological Survey (USGS)	2/28/2024	Trails	Trails	Human Environment
West Virginia Department of Transportation (WVDOT)	8/25/2021	Trails	Trails	Human Environment
WeConservePA	1/1/2023	Trails	Trails	Human Environment
Maryland Department of Transportation (MDOT)	12/17/2022	Trails	Trails	Human Environment
National Park Service (NPS)	12/29/2022	Potomac Heritage Trail	Potomac Heritage Trail	Human Environment
ERM - Digitized from High-Resolution Imagery	9/26/2025	Residential Dwellings	Residential Dwellings	Human Environment
ERM - Digitized from High-Resolution Imagery	9/26/2025	Residential Outbuildings	Residential Outbuildings	Human Environment
ERM - Digitized from High-Resolution Imagery	9/26/2025	Non-residential Buildings	Non-residential Buildings	Human Environment
ReportAll	1/16/2024	Parcels and Landowners	Parcels and Landowners	Human Environment
U.S. Census Bureau	8/8/2024	States	States	Human Environment
U.S. Census Bureau	8/8/2024	Counties	Counties	Human Environment
U.S. Census Bureau	8/8/2024	Census Designated Place	Census Designated Place	Human Environment
U.S. Census Bureau	8/8/2024	Census Tract	Census Tract	Human Environment
U.S. Census Bureau	8/8/2024	Census Block Group	Census Block Group	Human Environment
U.S. Census Bureau	8/8/2024	Census Block	Census Block	Human Environment
Maryland Department of Housing and Community Development (MDCD)	4/20/2018	Census Designated Opportunity Zones	Census Designated Opportunity Zones	Human Environment

Source / Author	Date*	Name	Subcategory	Category
Pennsylvania Department of Community and Economic Development (DCED)	6/14/2018	Census Designated Opportunity Zones	Census Designated Opportunity Zones	Human Environment
Virginia Department of Housing and Community Development (DHCD)	5/24/2018	Census Designated Opportunity Zones	Census Designated Opportunity Zones	Human Environment
West Virginia Department of Commerce	2/28/2018	Census Designated Opportunity Zones	Census Designated Opportunity Zones	Human Environment
Allegany County, Maryland	1/18/2024	The Geographic Information Systems (GIS) Office and Department of Planning and Zoning	Zoning	Human Environment
Garrett County Government Department of Community Development, Maryland	1/22/2024	The Planning and Land Management Division	Zoning	Human Environment
Greene County, Pennsylvania	4/8/2025	The Department of Planning and Community Development	Zoning	Human Environment
Fayette County, Pennsylvania	4/12/2022	The Fayette County Planning and Zoning Office	Zoning	Human Environment
Hampshire County, West Virginia	2/26/2025	Hampshire County Planning Office	Zoning	Human Environment
Mineral County, West Virginia	2/26/2025	The Office of the Planning Commission	Zoning	Human Environment
Monongalia County, West Virginia	2/26/2025	The Monongalia County Planning Office and Monongalia County Planning Commission	Zoning	Human Environment
Preston County, West Virginia	2/28/2025	Zoning	Zoning	Human Environment
Frederick County, Virginia	6/5/2025	The Frederick County Department of Planning and Development and GIS Division of Information Technologies	Zoning	Human Environment
Infrastructure				
U.S. Census Bureau	9/25/2024	Roads	Roads	Infrastructure
U.S. Department of Transportation (USDOT)	9/30/2025	Railroads	Railroads	Infrastructure
U.S. Department of Transportation (USDOT)	10/14/2025	Federal Aviation Administration (FAA)	Airports	Infrastructure
Pennsylvania Department of Environmental Protection (PA DEP)	11/19/2024	Oil and Gas Wells	Oil and Gas Wells	Infrastructure
West Virginia Department of Environmental Protection (WVDEP)	11/19/2024	Oil and Gas Wells	Oil and Gas Wells	Infrastructure
Maryland Department of the Environment (MDE)	7/28/2017	Maryland Oil and Gas Viewer	Oil and Gas Wells	Infrastructure
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Oil and Gas Wells	Infrastructure
REXTAG	2/15/2025	Power & Renewables Dataset	Wind Turbines	Infrastructure
REXTAG	2/15/2025	Power & Renewables Dataset	Powerplants	Infrastructure
U.S. Energy Information Administration (EIA)	11/3/2025	Coal Mines	Coal Mines	Infrastructure
Environmental Protection Agency (EPA)	4/18/2023	Underground Storage Tanks	Underground Storage Tanks	Infrastructure
REXTAG	2/15/2025	Power & Renewables Dataset	Landfills	Infrastructure
U.S. Department of Transportation (USDOT) and Federal Highway Administration (FHWA)	6/20/2025	National Bridge Inventory (NBI)	Bridges	Infrastructure
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Communication Towers	Infrastructure
U.S. Department of Homeland Security (DHS)	11/2/2022	Homeland Infrastructure Foundation-Level Data (HIFLD)	Cellular Towers	Infrastructure
REXTAG	2/15/2025	Power & Renewables Dataset	Transmission Lines	Infrastructure
REXTAG	2/15/2025	Natural Gas Dataset	Natural Gas Pipelines	Infrastructure
Federal Energy Regulatory Commission (FERC)	10/24/2024	FERC Regulated Boundaries	FERC Regulated Boundaries	Infrastructure
Imagery and Elevation				
U.S. Department of Agriculture (USDA)	2022 and 2023	National Agriculture Imagery Program (NAIP)	Satellite Imagery	Imagery and Elevation
NEET Contracted SAM	12/1/2023 - 2/1/2024	High Resolution Aerial Imagery (3-inch)	High Resolution Aerial Imagery (3-inch)	Imagery and Elevation
NEET Contracted SAM	12/1/2023 - 2/1/2025	LiDAR Digital Elevation Model	LiDAR Digital Elevation Model	Imagery and Elevation
ERM developed from LiDAR DTM	12/1/2023 - 2/1/2025	LiDAR Elevation Contours	LiDAR Elevation Contours	Imagery and Elevation
Land Cover/Land Use				
U.S. Geological Survey (USGS)	10/24/2024	Annual NLCD Collection 1 Science Products	National Land Cover Dataset 2024	Land Cover/Land Use
U.S. Department of Agriculture (USDA)	2/27/2025	National Agricultural Statistics Service (NASS)	Cropland, Pasture/Rangeland, Tree Farms/Orchards	Land Cover/Land Use
ERM	6/17/2025	Visual Landscape Units	Visual Landscape Units	Land Cover/Land Use
Chesapeake Conservancy, University of Vermont Spatial Analysis Lab (UVM SAL), U.S. Geological Survey (USGS), U.S. Environmental Protection Agency (EPA), and the Chesapeake Bay Program	3/15/2023	Land Use Land Cover	Land Use Land Cover	Land Cover/Land Use
Maryland Department of Planning (MDP)	2/4/2025	Land Use	Land Use	Land Cover/Land Use
Allegany County, Maryland	5/21/2014	The Department of Planning and Zoning, Comprehensive Plan	Future Land Use	Land Cover/Land Use
Garrett County Government Department of Community Development, Maryland	11/22/2022	Garrett County Planning Commission	Future Land Use	Land Cover/Land Use
Fayette County, Pennsylvania	9/1/2019	Planning Commission	Future Land Use	Land Cover/Land Use
Greene County, Pennsylvania	7/18/2019	Greene County Board of Commissioners, Comprehensive Plan	Future Land Use	Land Cover/Land Use
Hampshire County, West Virginia	6/1/2019	Hampshire County Planning Commission	Future Land Use	Land Cover/Land Use
Mineral County, West Virginia	12/1/2010	The Office of the Planning Commission	Future Land Use	Land Cover/Land Use
Monongalia County, West Virginia	2/1/2023	The Monongalia County Planning Office and Monongalia County Planning Commission	Future Land Use	Land Cover/Land Use
Preston County Economic Development Authority (PCEDA)	2023	Future Land Use	Future Land Use	Land Cover/Land Use
Frederick County, Viginia	11/10/2021	Frederick County Planning Commission	Future Land Use	Land Cover/Land Use
Protected Areas				
U.S. Geological Survey (USGS)	4/26/2023	Protected Areas Database (PAD-US)	State Forests	Protected Areas
U.S. Geological Survey (USGS)	4/26/2023	Protected Areas Database (PAD-US)	State Parks	Protected Areas
U.S. Geological Survey (USGS)	4/26/2023	Protected Areas Database (PAD-US)	Wildlife Management Areas	Protected Areas
National Conservation Easement Database (NCED), Hampshire and Mineral County Farmland Protection Bureaus	10/8/2024	Agricultural Easements	Agricultural Easements	Protected Areas

Source / Author	Date*	Name	Subcategory	Category
National Conservation Easement Database (NCED)	10/8/2024	Historical Easements	Historical Easements	Protected Areas
National Conservation Easement Database (NCED), Cacapon & Lost Rivers Land Trust (CLRLT), The Nature Conservancy	10/8/2024	Conservation Easements	Conservation Easements	Protected Areas
U.S. Geological Survey (USGS)	4/26/2023	Protected Areas Database (PAD-US)	Local Parks	Protected Areas
U.S. Army Corps of Engineers (USACE)	4/26/2023	Recreation Management Areas	Recreation Management Areas	Protected Areas
Pennsylvania Department of Conservation and Natural Resources (DCNR)	2/1/2024	State Wilderness Areas	State Wilderness Areas	Protected Areas
Pennsylvania Game Commission (PGC)	1/1/2023	State Game Land	State Game Land	Protected Areas
Maryland Department of Natural Resources (MDNR)	12/15/2017	State Wildlands	State Wildlands	Protected Areas
Maryland Department of Natural Resources (MDNR)	5/12/2025	DNR Owned Lands and Conservation Easements	DNR Owned Lands and Conservation Easements	Protected Areas
Maryland Department of Natural Resources (MDNR)	5/12/2025	Rural Legacy Properties	Rural Legacy Properties	Protected Areas
Maryland Department of Natural Resources (MDNR)	5/12/2025	Environmental Trust Easements	Environmental Trust Easements	Protected Areas
Maryland Department of Natural Resources (MDNR)	5/12/2025	Forest Conservation Act Easements	Forest Conservation Act Easements	Protected Areas
Maryland Department of Agriculture (MDA) and The Maryland Agricultural Land Preservation Foundation (MALPF)	5/12/2025	Agricultural Land Preservation Foundation Easements	Agricultural Land Preservation Foundation Easements	Protected Areas
Maryland Department of Natural Resources (MDNR)	5/12/2025	Local Protected Lands	Local Protected Lands	Protected Areas
Maryland Department of Natural Resources (MDNR)	5/12/2025	Private Conservation Lands	Private Conservation Lands	Protected Areas
Maryland Department of Natural Resources (MDNR)	5/12/2025	Transfer Development Rights and Purchase Development Rights	Transfer Development Rights and Purchase Development Rights	Protected Areas
Maryland Historical Trust (MHT) and Maryland Department of Planning (MDP)	5/12/2025	Historical Trust Preservation Easements	Historical Trust Preservation Easements	Protected Areas
WeConservePA	10/1/2023	Agricultural Security Areas (ASAs)	Agricultural Security Areas	Protected Areas
WeConservePA	11/1/2025	Conservation Easements	Conservation Easements	Protected Areas
WeConservePA	11/1/2025	Farmland Preservation Easements	Farmland Preservation Easements	Protected Areas
WeConservePA	11/1/2025	Local Conserved Land	Local Conserved Land	Protected Areas
WeConservePA	11/1/2025	Privately Owned Conserved Land	Privately Owned Conserved Land	Protected Areas
Virginia Department of Conservation and Recreation (DCR)	7/14/2025	Conservation Lands Database	Conservation Lands and Easements	Protected Areas
West Virginia Department of Natural Resources (WVDNR)	1/1/2024	DNR Managed Land	DNR Managed Land	Protected Areas
The Nature Conservancy (TNC)	1/1/2013	TNC Preserves and Easements	TNC Preserves and Easements	Protected Areas
West Virginia Department of Natural Resources (WVDNR)	1/1/2020	County and City Parks	County and City Parks	Protected Areas
		Water Resources		
U.S. Geological Survey (USGS)	9/17/2025	National Hydrography Dataset (NHD)	Perennial Streams	Water Resources
U.S. Geological Survey (USGS)	9/17/2025	National Hydrography Dataset (NHD)	Intermittent Streams	Water Resources
U.S. Army Corps of Engineers (USACE)	10/9/2025	Section 10 Navigable Waters	Section 10 Navigable Waters	Water Resources
Pennsylvania Fish and Boat Commission (PFBC)	7/1/2025	Class A Wild Trout Streams	Class A Wild Trout Streams	Water Resources
Pennsylvania Fish and Boat Commission (PFBC)	5/1/2025	Natural Reproduction Trout Streams	Natural Reproduction Trout Streams	Water Resources
Pennsylvania Fish and Boat Commission (PFBC)	10/1/2022	Wilderness Trout Streams	Wilderness Trout Streams	Water Resources
Virginia Department of Wildlife Resources (WERMS)	1/29/2024	Trout Streams	Trout Streams	Water Resources
West Virginia Department of Environmental Protection (WVDEP)	1/18/2024	Trout Streams	Trout Streams	Water Resources
Maryland Department of Natural Resources (MDNR)	8/25/2025	Trout Watersheds	Trout Watersheds	Water Resources
Virginia Department of Wildlife Resources (DWR)	1/29/2024	Threatened/Endangered Species Waters	Threatened/Endangered Species Waters	Water Resources
West Virginia Department of Environmental Protection (WVDEP)	1/18/2024	Tier 3 Waterways	Tier 3 Waterways	Water Resources
West Virginia Department of Natural Resources (WVDNR)	10/16/2024	Mussel Streams	Mussel Streams	Water Resources
Maryland Department of the Environment (MDE)	5/29/2025	Designated Use Streams	Designated Use Streams	Water Resources
Pennsylvania Department of Environmental Protection (PA DEP)	5/8/2025	Designated Use Streams	Designated Use Streams	Water Resources
Maryland Department of the Environment (MDE)	1/5/2023	Tier II Streams and Catchments	Tier II Streams and Catchments	Water Resources
Maryland Department of the Environment (MDE)	8/25/2025	Stocked Trout Streams	Stocked Trout Streams	Water Resources
Pennsylvania Fish and Boat Commission (PFBC)	11/1/2024	Stocked Trout Streams	Stocked Trout Streams	Water Resources
West Virginia Department of Natural Resources (WVDNR)	10/16/2024	Stocked Trout Streams	Stocked Trout Streams	Water Resources
Virginia Department of Wildlife Resources (DWR)	8/16/2024	Stocked Trout Streams	Stocked Trout Streams	Water Resources
Pennsylvania Department of Environmental Protection (PA DEP)	5/8/2025	Attaining and Non Attaining Streams and Lakes	Attaining and Non Attaining Streams and Lakes	Water Resources
U.S. Fish and Wildlife (USFWS)	5/7/2025	National Wetland Inventory (NWI)	Wetlands/Wetlands of Special State Concern	Water Resources
Maryland Department of Natural Resources (MDNR)	5/12/2025	MD iMAP Data Catalog (DoIT)	Wetlands/Wetlands of Special State Concern	Water Resources
Maryland Department of the Environment (MDE)	5/12/2025	Wetlands/Wetlands of Special State Concern	Wetlands/Wetlands of Special State Concern	Water Resources
West Virginia Department of Environmental Protection (WVDEP)	1/31/2020	Wetlands/Wetlands of Special State Concern	Wetlands/Wetlands of Special State Concern	Water Resources
Virginia Department of Conservation and Recreation (DCR)	2/23/2015	Wetlands/Wetlands of Special State Concern	Wetlands/Wetlands of Special State Concern	Water Resources
ERM	9/19/2025	Modeled Wetlands	Modeled Wetlands	Water Resources
Federal Emergency Management Agency (FEMA)	9/4/2025	National Flood Hazard Layer (NFHL)	Flood Plains	Water Resources

Source / Author	Date*	Name	Subcategory	Category
U.S. Geological Survey (USGS)	5/30/2025	Watersheds	Watersheds	Water Resources
Notes:				
*acquisition date was used when publication date was unavailable				

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APPENDIX H WETLAND IDENTIFICATION MODEL REPORT

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Wetland Identification Model Report

MidAtlantic Resiliency Link Project

PREPARED FOR
NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc.

DATE
January 2026

REFERENCE
0718854



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SIGNATURE PAGE

Wetland and Waterbody Desktop Modeling Report

MidAtlantic Resiliency Link Project

0718854



Heather Heater
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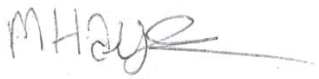

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CONTENTS

1. INTRODUCTION 1

2. METHODOLOGY 3

2.1 MODEL BACKGROUND AND ARCHITECTURE 3
2.2 MODEL AREAS 4
2.3 PREDICTOR VARIABLES 6
2.3.1 Depth-To-Water Index 7
2.3.2 Topographic Wetness Index 7
2.3.3 Curvature 8
2.3.4 National Agriculture Imagery Program Imagery and Derivative Products 9
2.3.5 Land Cover 12
2.3.6 Geomorphons 13
2.4 MODEL TRAINING, DEPLOYMENT, AND EVALUATION 14
2.4.1 Model Evaluation 16

3. RESULTS 17

4. DISCUSSION 26

5. REFERENCES 27

ATTACHMENT 1 MODELED WETLANDS SUMMARY TABLES

ATTACHMENT 2 MODELED WETLANDS MAPBOOK

LIST OF TABLES

TABLE 1-1 NATIONAL WETLANDS INVENTORY AND MARYLAND DEPARTMENT OF NATURAL RESOURCES WETLANDS SUMMARY WITHIN THE MARL PROJECT STUDY AREA 2
TABLE 2-1 WATERSHEDS WITHIN THE TRAINING AND TESTING AREAS 4
TABLE 3-1 ACCURACY METRICS FOR THE HIGH PROBABILITY WETLAND MODEL TESTING AREA 17
TABLE 3-2 ACCURACY METRICS FOR THE HIGH PROBABILITY WETLAND MODEL WITHIN THE MARL PROJECT STUDY AREA 17
TABLE 3-3 SUMMARY OF NATIONAL WETLANDS INVENTORY, MARYLAND DEPARTMENT OF NATURAL RESOURCES, AND MODELED HIGH PROBABILITY WETLANDS WITHIN THE MARL PROJECT STUDY AREA 18
TABLE 3-4 SUMMARY OF NATIONAL WETLANDS INVENTORY, MARYLAND DEPARTMENT OF NATURAL RESOURCES, AND MODELED HIGH PROBABILITY WETLANDS WITHIN THE SITING CORRIDOR 19
TABLE 3-5 SUMMARY OF NATIONAL WETLANDS INVENTORY, MARYLAND DEPARTMENT OF NATURAL RESOURCES, AND MODELED HIGH PROBABILITY WETLANDS WITHIN THE ROW CORRIDOR 19

LIST OF FIGURES

FIGURE 2-1	MARL PROJECT STUDY AREA WITH TRAINING AND TESTING EXTENT	5
FIGURE 2-2	MARYLAND PROJECT STUDY AREA WITH MERGED MARYLAND DEPARTMENT OF NATURAL RESOURCES AND NATIONAL WETLANDS INVENTORY WETLANDS	6
FIGURE 2-3	TOPOGRAPHIC WETNESS INDEX PREDICTOR VARIABLE	8
FIGURE 2-4	CURVATURE PREDICTOR VARIABLE	9
FIGURE 2-5	NORMALIZED DIFFERENCE VEGETATION INDEX PREDICTOR VARIABLE	10
FIGURE 2-6	NORMALIZED DIFFERENCE WATER INDEX PREDICTOR VARIABLE	11
FIGURE 2-7	ENHANCED VEGETATION INDEX PREDICTOR VARIABLE	12
FIGURE 2-8	LAND COVER PREDICTOR VARIABLE	13
FIGURE 2-9	GEOMORPHON LANDFORMS PREDICTOR VARIABLE	14
FIGURE 2-10	PROCESS DIAGRAM	15
FIGURE 3-1	HIGH PROBABILITY WETLAND MODEL RESULTS WITHIN THE TESTING AREA	18
FIGURE 3-2	MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GREENE COUNTY, PENNSYLVANIA, IDENTIFYING MORE ACCURATE BOUNDARY OF PONDED AREA AND UNIDENTIFIED PONDED AREA	20
FIGURE 3-3	MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN PRESTON COUNTY, WEST VIRGINIA, SHOWING MODELED HIGH PROBABILITY WETLANDS EXPANDED IN LOW-LYING AREAS BIG SANDY CREEK	21
FIGURE 3-4	MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, PREDICTING EXPANDED WETLAND AREA NEAR FOXTOWN BOG COMPLEX	22
FIGURE 3-5	MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, PREDICTING LARGER WETLAND AREA ON THE STREAM BANKS OF THE NORTH BRANCH CASSELMAN RIVER	23
FIGURE 3-6	MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, SHOWING SMALLER POTENTIAL WETLAND FOOTPRINT COMPARED TO THE NATIONAL WETLANDS INVENTORY DATA THAT MORE CLOSELY ALIGNS WITH TOPOGRAPHY	24
FIGURE 3-7	MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, SHOWING A POTENTIAL WETLAND AREA NOT PREVIOUSLY IDENTIFIED	25

ACRONYMS AND ABBREVIATIONS

Acronym	Description
CNN	convolutional neural network
DEM	digital elevation model
DTW	Depth-to-Water Index
EVI	Enhanced Vegetation Index
HUC	Hydrologic Unit Code
MARL Project	MidAtlantic Resiliency Link Project
MDNR	Maryland Department of Natural Resources
MHPW	modeled high probability wetlands
NAIP	National Agriculture Imagery Program
NDVI	Normalized Difference Vegetation Index
NDWI	Normalized Difference Water Index
NIR	Near-Infrared
NLCD	National Land Cover Database
nm	nanometer

Acronym	Description
NWI	National Wetlands Inventory
ROW	right-of-way
TWI	Topographic Wetness Index
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WIM	Wetland Identification Model

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1. INTRODUCTION

As a supplement to the desktop review of publicly available wetlands data from the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) and state-specific wetland mapping datasets, a deep learning-based Wetland Identification Model (WIM) was created to further evaluate wetland resources within the MidAtlantic Resiliency Link (MARL) Project Study Area and help better understand existing wetland resources and potential impacts.

The NWI was established by the USFWS to conduct nationwide inventories of wetlands, providing important geospatial information on wetland extents, types, and change. NWI data is primarily created and updated by manually identifying and classifying high-resolution aerial imagery, which is sometimes supplemented by field work and collateral data. To maintain temporal and spatial accuracy, the USFWS works with federal, state, and local agencies, as well as tribal governments, nonprofit organizations, and universities to update the NWI. While NWI maps are important general purpose tools for wetland management and preliminary project assessments, they are not intended to define wetland boundaries for regulatory purposes. Additionally, the age of NWI maps varies widely, with underlying data decades old in many areas (Gage et al. 2020).

The USFWS NWI data for Maryland, Pennsylvania, and Virginia was produced with imagery from the 1980s. West Virginia NWI data was produced with imagery from 2018. In Maryland, wetlands were further mapped by the Maryland Department of Natural Resources (MDNR) using imagery collected from 1988 to 1995. West Virginia wetland data (WVDEP 2020) is similar to USFWS NWI, and Pennsylvania and Virginia do not have comparable state-produced data. Both the USFWS NWI and MDNR characterize wetlands based on the Cowardin Classification System, which classifies wetlands into five major systems. Palustrine, lacustrine, and riverine wetlands are present in the MARL Project Study Area, and this area does not cross marine or estuarine wetlands. Table 1-1 summarizes the extent of NWI- and MDNR-mapped wetlands within the MARL Project Study Area. Generally, NWI maps provide a preliminary basis for identifying these wetlands, with field surveys required to confirm resource location, extent, and classification.

TABLE 1-1 NATIONAL WETLANDS INVENTORY AND MARYLAND DEPARTMENT OF NATURAL RESOURCES WETLANDS SUMMARY WITHIN THE MARL PROJECT STUDY AREA

Classification	Maryland (acres)	Pennsylvania (acres)	Virginia (acres)	West Virginia (acres)	Study Area Total (acres)
NWI					
Palustrine	2,305.5	843.9	77.0	3,260.2	6,486.6
Riverine	1,794.2	2,182.8	244.9	1,829.1	6,051.0
Lacustrine	753.7	155.5	306.2	1,628.5	2,843.9
NWI Total [a]	**4,853.4**	**3,182.2**	**628.1**	**6,717.8**	**15,381.5**
MDNR					
Palustrine	1,706.5	-	-	-	1,706.5
Riverine	454.0	-	-	-	454.0
Lacustrine	679.9	-	-	-	679.9
MDNR Total [a]	**2,840.4**	**-**	**-**	**-**	**2,840.4**

Source: USFWS n.d.; MDNR n.d.

MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory
[a] Totals may not match the sum of addends due to rounding.

2. METHODOLOGY

2.1 MODEL BACKGROUND AND ARCHITECTURE

Using the methodology from WIM research at the University of Virginia and the Chesapeake Conservancy (Mainali et al. 2023; ESRI n.d.-a; ESRI 2024), a deep learning classifier was created to predict wetlands within the MARL Project Study Area. The WIM toolbox for ArcGIS Pro is based on a random trees algorithm. Random trees is a pixel-based machine learning classifier based on ensemble learning. It builds many different decision trees using random samples of training data, with each tree trained on a different subset of data. Each tree makes a prediction based on the subset of data it was given, and the most frequent tree output is used as the overall classification. Using random trees algorithms to identify wetlands is a well-documented approach that can be done using the out-of-the-box WIM toolbox, making it a user-friendly option. However, this algorithm is significantly limited in the quantity of training data it can incorporate because it ingests data as NumPy arrays (data structure withing the Python coding language designed for numerical computation), only able to train on one 12-digit Hydrologic Unit Code (HUC-12; representing subwatersheds) extent at a time. Additionally, random trees algorithms do not consider the spatial context of predictor variables. Since wetlands are a cohesive geomorphologic object, neighboring feature information is important for accurate classification. Without meaningful contextual information from the surrounding area, these pixel-based classifiers often create landcover maps with a high-level of local-scale heterogeneity where a pixel in the middle of a wetland could easily be misclassified (Mainali et al. 2023).

Deep learning models have proven to be accurate and efficient for detecting complex patterns, interactions, and non-linearities in remote sensing data, outperforming traditional machine learning with at least 20 percent greater accuracy in land cover and wetland classification (Rezaee et al. 2018; Liu et al. 2018). Previous studies have indicated the ability of deep learning architectures to serve as the kind of generalizable and repeatable method necessary for wetland monitoring and a proxy for potential impact assessment (Mahdianpari et al. 2018; DeLancey et al. 2019; Du et al. 2020). The model used for this analysis is based on U-Net (Ronneberger et al. 2015), a deep learning classifier that leverages the power of convolutional neural networks (CNNs). CNNs incorporate convolutional layers that extract contextual information from images at multiple scales with a series of learned filters. These filters let CNNs focus on important features within the image without needing to process each pixel individually. This allows for more efficient handling of larger images and the incorporation of spatial context, which is missed in traditional machine learning.

U-Net is a well-known image segmentation algorithm designed like an auto-encoder. It has an encoding path (“contracting”) paired with a decoding path (“expanding”), predicting pixelwise segmentation of the input image. This model was implemented in the ArcGIS API for Python (ESRI n.d.-b). Like traditional image classification, U-Net requires a raster image with several bands (predictor variables) and a label image that contains the label for each pixel (wetland or non-wetland) to train and predict wetlands.

The U-Net model is especially effective for analyzing large areas and identifying wetlands because it can quickly process high-resolution satellite and aerial images (such as LiDAR imagery), finding

subtle patterns that traditional methods often miss. Unlike older machine learning approaches, U-Net uses deep learning to look at both the details and the broader context in each image, which helps it accurately distinguish wetlands from other land types—even when the landscape is complex. Its design allows it to handle big datasets efficiently and consistently, making it a reliable tool for mapping wetlands across extensive regions.

2.2 MODEL AREAS

The MDNR wetland data was used to facilitate model training and testing because this dataset is more recent and has greater accuracy than NWI data due to using newer and higher resolution aerial imagery and integrating modern technology such as LiDAR and digital elevation models (DEMs). This dataset also covers a substantial portion of the MARL Project Study Area. For model training purposes, this wetland data is referred to as "wetland training labels."

The training area is used to train the wetland model on real-world examples. The training area selected for the model included 12 watersheds in Garrett and Allegany Counties (Table 2-1) and was selected because it covers a geographically diverse area representative of the larger MARL Project Study Area. The MDNR wetland data work well across the larger MARL Project Study Area because the areas across the four states are within similar physiographic regions and within the same U.S. Army Corps of Engineers (USACE) Regional Supplement (Eastern Mountains and Piedmont Region). The USACE Regional Supplements consider the same regional characteristics of wetlands across the three USACE wetland criteria (hydrology, hydrophytic vegetation, and hydric soils).

The testing area is a geographic region that the model never sees during training and is used only to evaluate how well the model can identify wetlands in new, unseen places. The testing area is essential for proving that the model accurately predicts wetlands. The model testing area was selected as the remainder of Maryland within the MARL Project Study Area, encompassing six watersheds in Garrett County (Table 2-1). As the model used MDNR wetland data, the training and testing areas needed to be entirely in Maryland. Training and testing areas are shown on Figure 2-1.

After visual review, it was determined that while the MDNR wetland polygons are more accurate than NWI data, they are missing many riverine wetlands; therefore, riverine wetlands from the NWI dataset were merged with the MDNR data. The polygons were dissolved to remove overlaps and Cowardin classifications, resulting in 936 wetlands (5,540 acres) to be used for training and testing data (Figure 2-2) that do not differentiate between different wetland classifications. After training and testing, the model was run on the entire MARL Project Study Area.

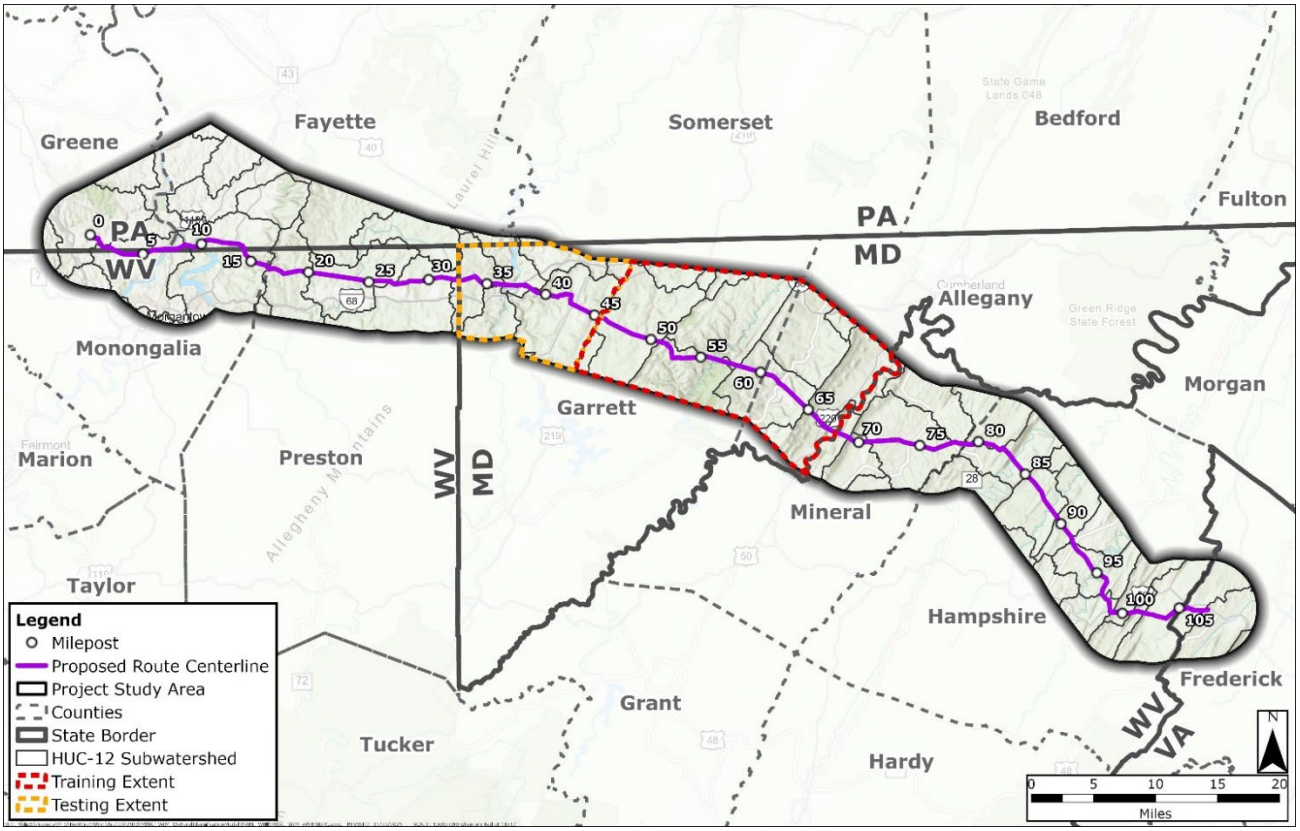
TABLE 2-1 WATERSHEDS WITHIN THE TRAINING AND TESTING AREAS

Area	Watershed Name	County	State
Training Area	Braddock Run—Wills Creek	Allegany	Maryland
	Flag Run—Casselman River	Garrett	Maryland
	Headwaters Casselman River	Garrett	Maryland
	Limestone Run—North Branch Potomac River	Allegany	Maryland
	Lower Deep Creek Lake	Garrett	Maryland
	Lower Georges Creek	Allegany	Maryland

Area	Watershed Name	County	State
	Lower Savage River	Garrett	Maryland
	Mill Run—North Branch Potomac River	Allegany	Maryland
	Red Run—Piney Creek	Garrett	Maryland
	Tub Mill Run—Casselman River	Garrett	Maryland
	Upper Georges Creek	Allegany	Maryland
	Upper Savage River	Garrett	Maryland
Testing Area	Bear Creek	Garrett	Maryland
	Buffalo Run	Garrett	Maryland
	Mill Run	Garrett	Maryland
	Salt Block Run—Youghiogheny River	Garrett	Maryland
	Whites Creek	Garrett	Maryland
	Youghiogheny River Lake—Youghiogheny River	Garrett	Maryland

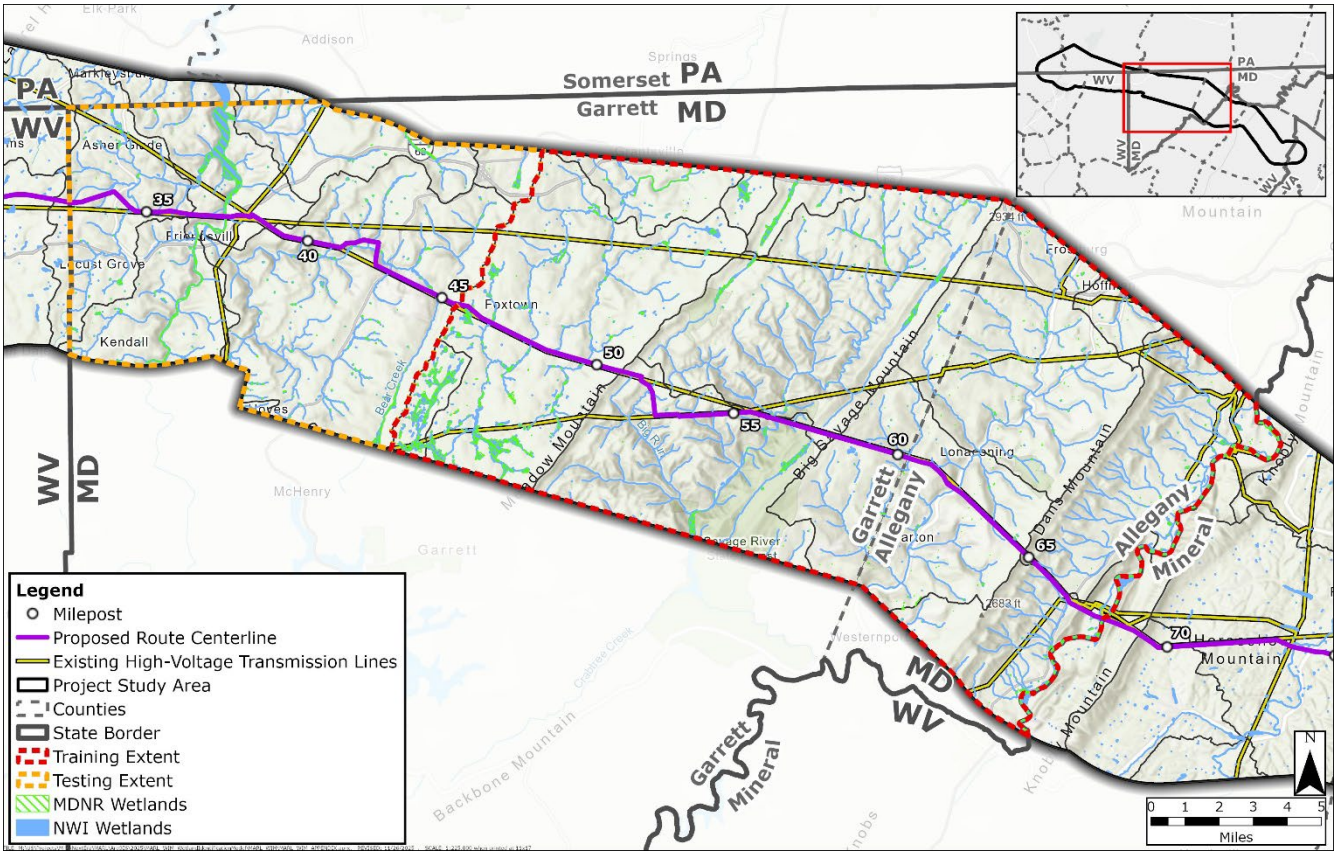
Source: USGS 2025

FIGURE 2-1 MARL PROJECT STUDY AREA WITH TRAINING AND TESTING EXTENT



HUC = Hydrologic Unit Code; MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

FIGURE 2-2 MARYLAND PROJECT STUDY AREA WITH MERGED MARYLAND DEPARTMENT OF NATURAL RESOURCES AND NATIONAL WETLANDS INVENTORY WETLANDS



MD = Maryland; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

2.3 PREDICTOR VARIABLES

Using methodology from the University of Virginia (O'Neil et al. 2018, 2019, 2020) and the Chesapeake Conservancy (Mainali et al. 2023), eight predictor variables were created to identify potential wetland areas. The predictor variables were created from the following data sources:

- High-resolution LiDAR-based DEM: A 3-meter DEM was created from LiDAR flight data from 2024. As recommended by the WIM documentation, the high-resolution DEM was smoothed using the Perona Malik algorithm to remove changes in elevation that are too small to indicate features of interest (Sangireddy et al. 2016).
- U.S. Department of Agriculture National Agriculture Imagery Program (NAIP) multispectral imagery and derivative products: Multispectral NAIP imagery was collected during leaf-on season in 2023 for Maryland and Virginia and during 2022 for Pennsylvania and West Virginia at 1-meter resolution (USDA 2023).
- U.S. Geological Survey National Hydrography Data (USGS 2025).
- High-resolution land cover data (1-meter) from the Chesapeake Conservancy (Chesapeake Conservancy 2018), supplemented by 30-meter resolution National Land Cover Database (NLCD) land cover data (USGS 2024).

These predictors, along with wetland training labels, train the model to identify potential wetlands by recognizing the complex patterns that correspond to wetland characteristics, including hydrology, topography, and geomorphology. Wetland training labels are desktop classifications indicating which areas are wetlands and which are not. The eight predictor variables are discussed below.

2.3.1 DEPTH-TO-WATER INDEX

The Depth-to-Water Index (DTW) is a soil moisture index based on a simple idea: areas that are closer—both in distance and elevation—to streams, ponds, or other surface waters tend to have wetter soils (Murphy et al. 2007). In other words, DTW helps estimate how far water would have to travel downhill to reach each point on the landscape. Lower DTW values suggest areas that stay wet longer, which often makes them good indicators of potential wetlands.

DTW was created using the WIM toolbox for ArcGIS Pro (ESRI 2024). The workflow starts by smoothing the 3-meter DEM, which is then used to calculate a DTW-specific slope raster that acts as the "cost surface"—essentially, a representation of how difficult it is for water to flow across each cell. Surface water features are defined using data from the National Hydrography Data and converted into a 3-meter raster.

The DTW raster was created using the following equation:

$$DTW = \left[\Sigma \left(\frac{dz_i}{dx_i}\right) a\right] * x_c \quad (1)$$

DTW adds up how steep the terrain is along the easiest path water would take to reach the nearest stream or pond. Each part of the formula represents something about that path (Murphy et al. 2007):

- Dz_i/dx_i: the change in elevation from one cell to the next divided by the horizontal distance the water travels across that cell in the data. Together this defines the slope of each step along the path. Steeper slopes mean water can travel there more easily whereas flatter slopes "cost" more for water to move;
- *a*: a small adjustment that accounts for whether water is moving straight (parallel) across a cell or diagonally across the corner; and
- X_c: the cell size (3 meters in this model).

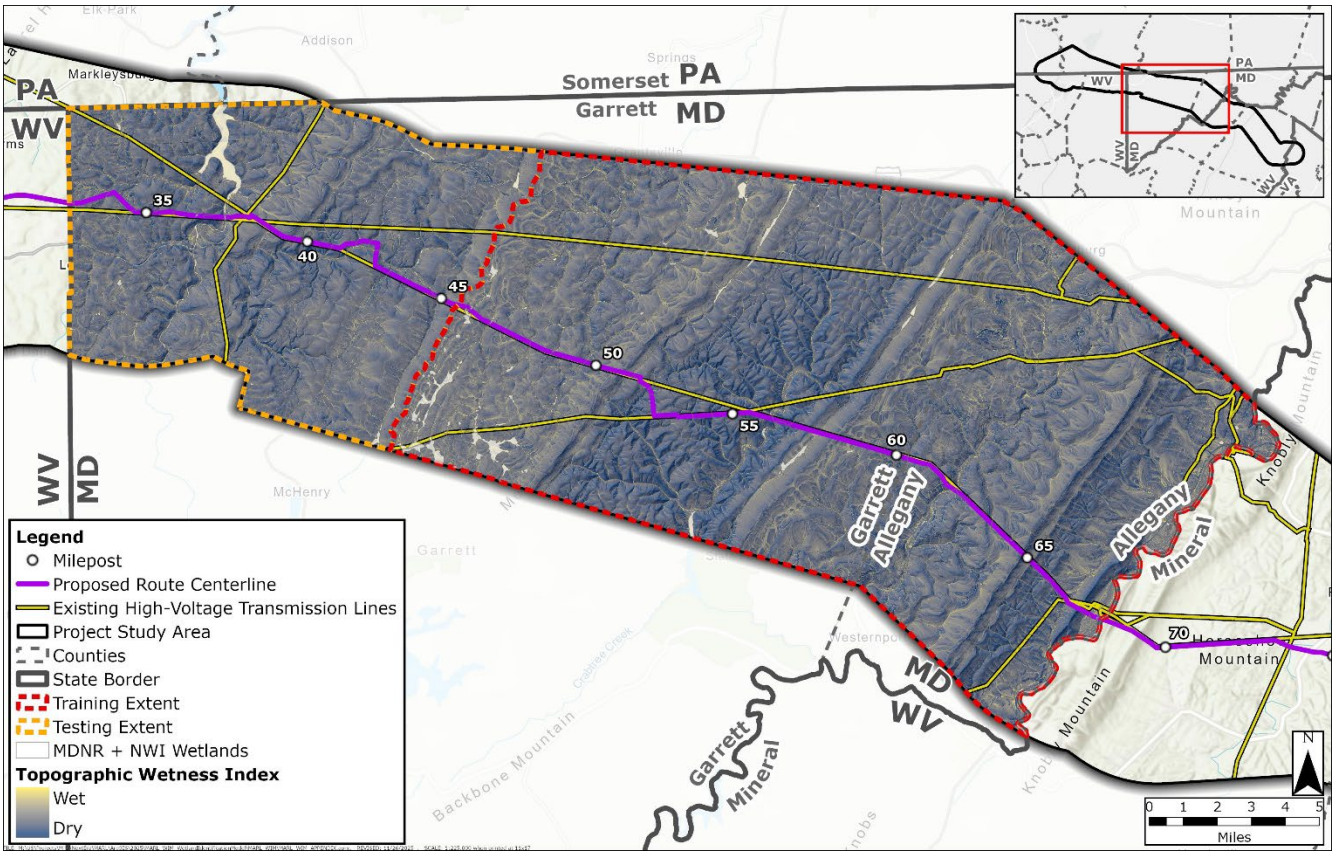
2.3.2 TOPOGRAPHIC WETNESS INDEX

The Topographic Wetness Index (TWI) indicates how wet or saturated a location is likely to be based on terrain, relating the tendency of an area to receive water to its tendency to drain water. TWI was created using the WIM toolbox for ArcGIS Pro (ESRI 2024). The smoothed 3-meter DEM is used to calculate a TWI-specific slope raster and specific catchment area before creating the TWI raster using the following equation:

$$TWI = ln(\frac{\alpha}{tan\,\beta}) \quad (2)$$

Where *a* is the specific catchment area (contributing area per unit contour length), tan(β) is the local slope (Beven and Kirkby 2009). The TWI predictor variable is seen on Figure 2-3.

FIGURE 2-3 TOPOGRAPHIC WETNESS INDEX PREDICTOR VARIABLE



MD = Maryland; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

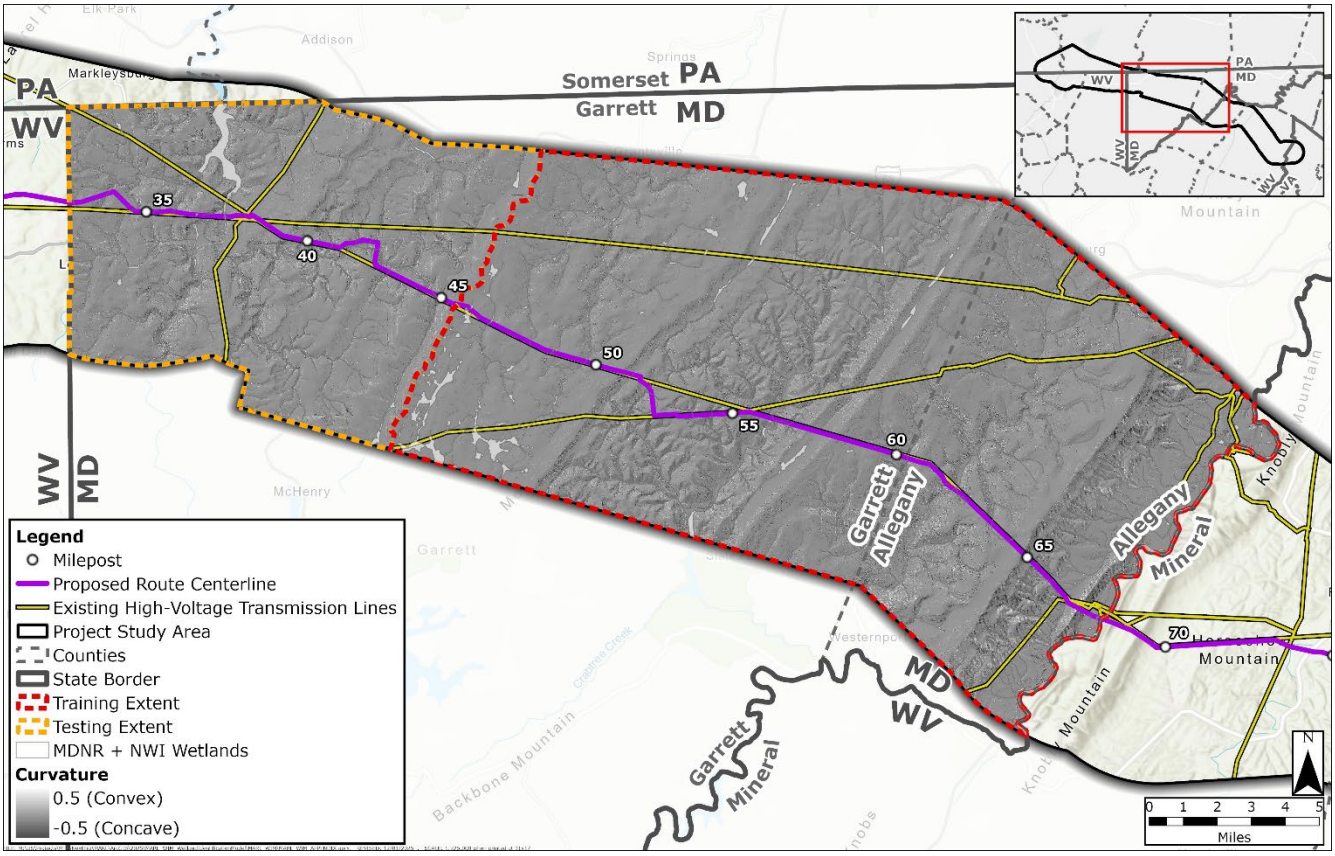
2.3.3 CURVATURE

Curvature indicates how a landform bends, which influences how water accumulates. Curvature was created using the WIM toolbox for ArcGIS Pro (ESRI 2024). The smoothed 3-meter DEM is used to calculate mean curvature, the average of the minimum and maximum curvature. The output raster describes the intrinsic convexity or concavity of the surface, independent of direction or gravity influence. High positive values indicate areas of maximum denudation and high negative values indicate areas of maximum accumulation (Minár et al. 2020), calculated using the following equation:

$$Curvature = \frac{(1+Z_x^2)Z_{yy}-2Z_xZ_yZ_{xy}+(1+Z_y^2)Z_{xx}}{2(1+Z_x^2+Z_y^2)^{3/2}} \quad (3)$$

Where Z_x and Z_y are the first partial derivatives, and Z_{xx}, Z_{yy}, and Z_{xy} are the second partial derivatives. The curvature predictor variable is seen on Figure 2-4.

FIGURE 2-4 CURVATURE PREDICTOR VARIABLE



MD = Maryland; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

2.3.4 NATIONAL AGRICULTURE IMAGERY PROGRAM IMAGERY AND DERIVATIVE PRODUCTS

Multispectral NAIP imagery was collected during leaf-on season in 2023 for Maryland and Virginia and during 2022 for Pennsylvania and West Virginia at 1-meter resolution (USDA 2023). NAIP imagery includes four bands.

- Band 1: Red (600 to 700 nanometer [nm]);
- Band 2: Green (500 to 600 nm);
- Band 3: Blue (400 to 500 nm); and
- Band 4: Near-Infrared (NIR) (800 to 900 nm).

The imagery was resampled to 3-meter resolution to match the DEM and decrease processing burden. Studies have shown that adding "engineered features" values derived from raw remote sensing data increases accuracy of wetland models (Lang et al. 2020). These derived quantities include spectral indices, which are simple calculations that can represent vegetation or wetness by combining two or more spectral reflectance bands. Three spectral indices were derived from the NAIP imagery.

- Normalized Difference Vegetation Index (NDVI) (Figure 2-5);
- Normalized Difference Water Index (NDWI) (Figure 2-6); and
- Enhanced Vegetation Index (EVI) (Figure 2-7).

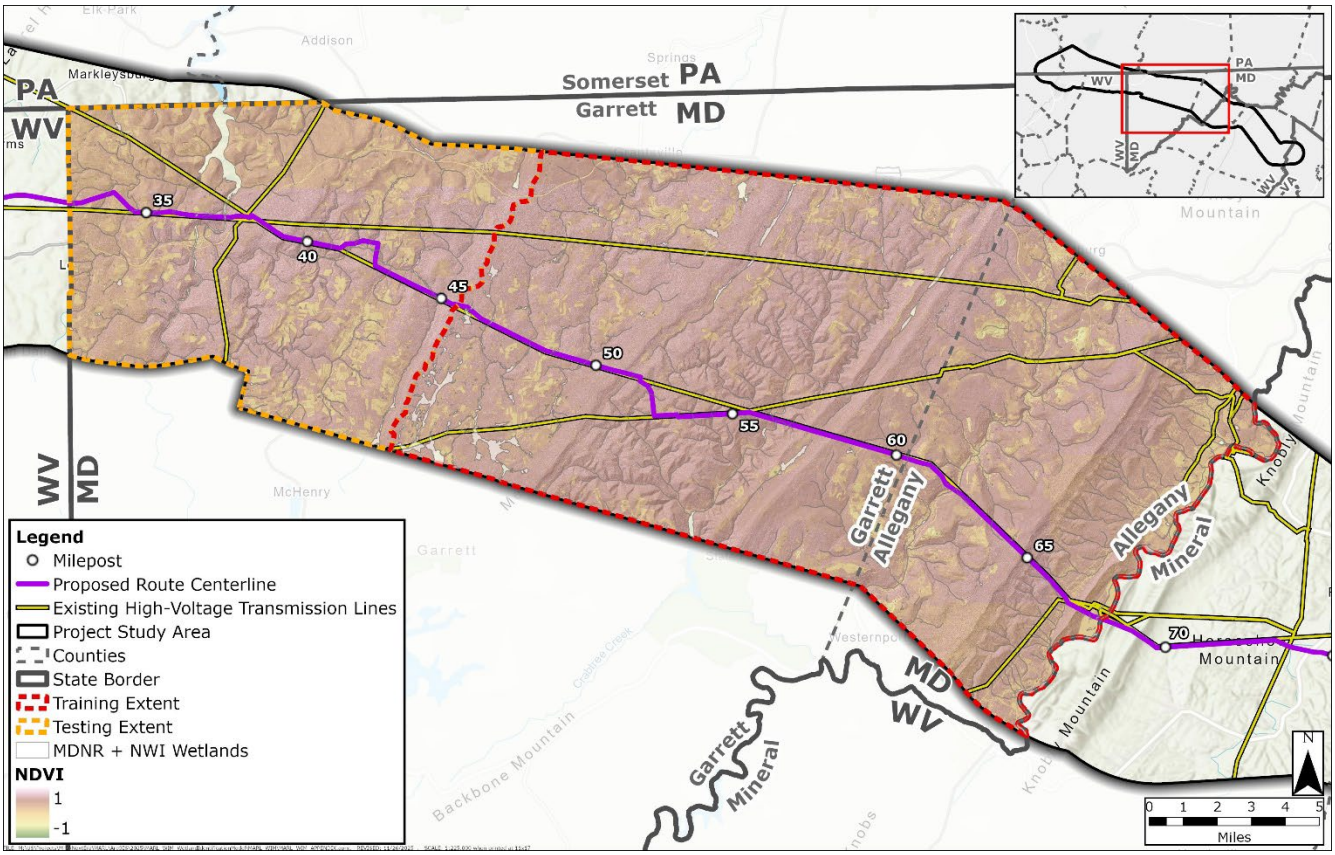
NDWI is used to monitor changes related to water content in water bodies. NDVI is used to quantify vegetation greenness and density. EVI is an optimized vegetation index that accounts for atmospheric influences and vegetation background signal. EVI is similar to NDVI but is less sensitive to noise, allowing for better differentiation of vegetation density than NDVI in areas with very dense green vegetation.

$$NDVI = (NIR - Red)/(NIR + Red) \quad (4)$$

$$NDWI = (Green - NIR)/(Green + NIR) \quad (5)$$

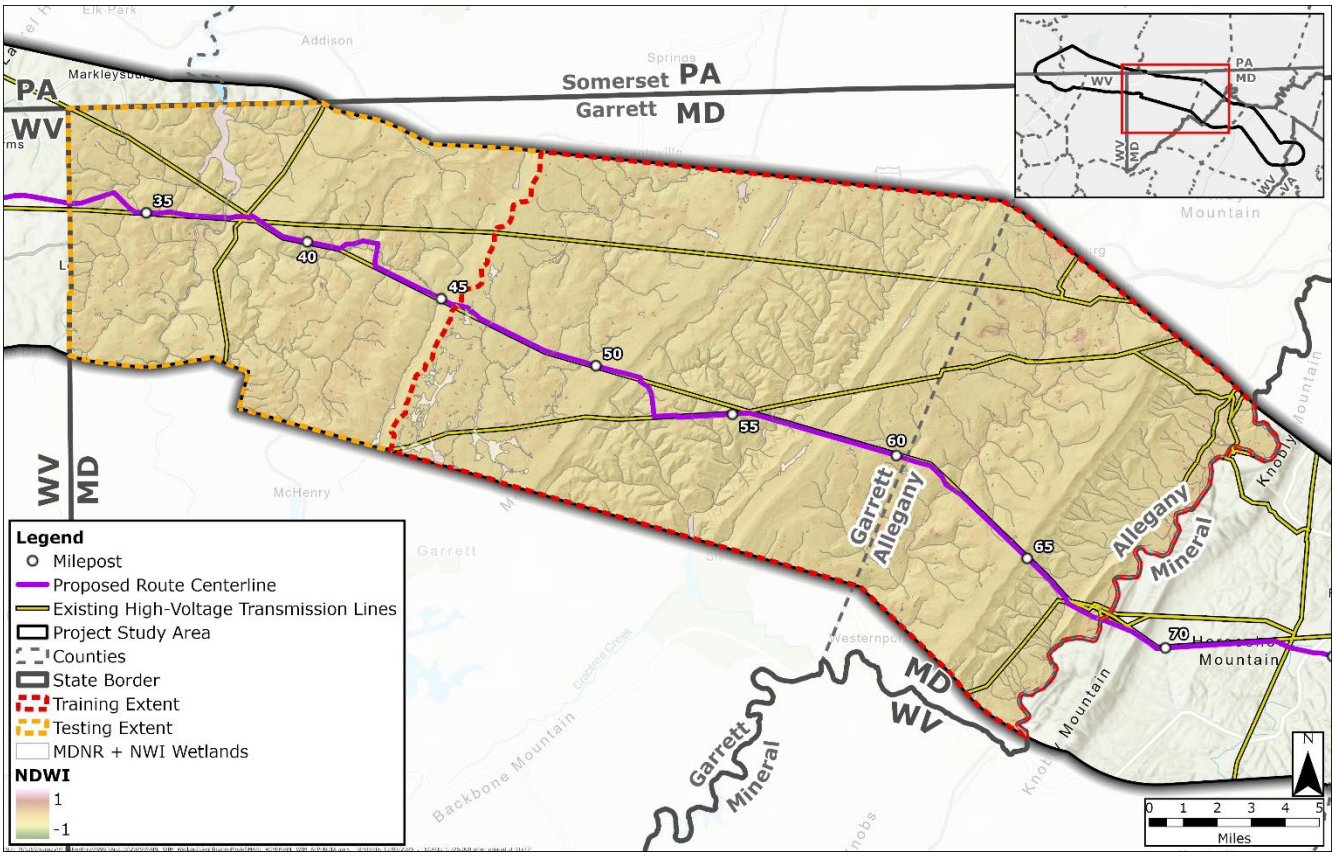
$$EVI = 2.5 * [(NIR - Red)/(NIR + (6 * Red) - (7.5 * Blue) + 1.0)] \quad (6)$$

FIGURE 2-5 NORMALIZED DIFFERENCE VEGETATION INDEX PREDICTOR VARIABLE



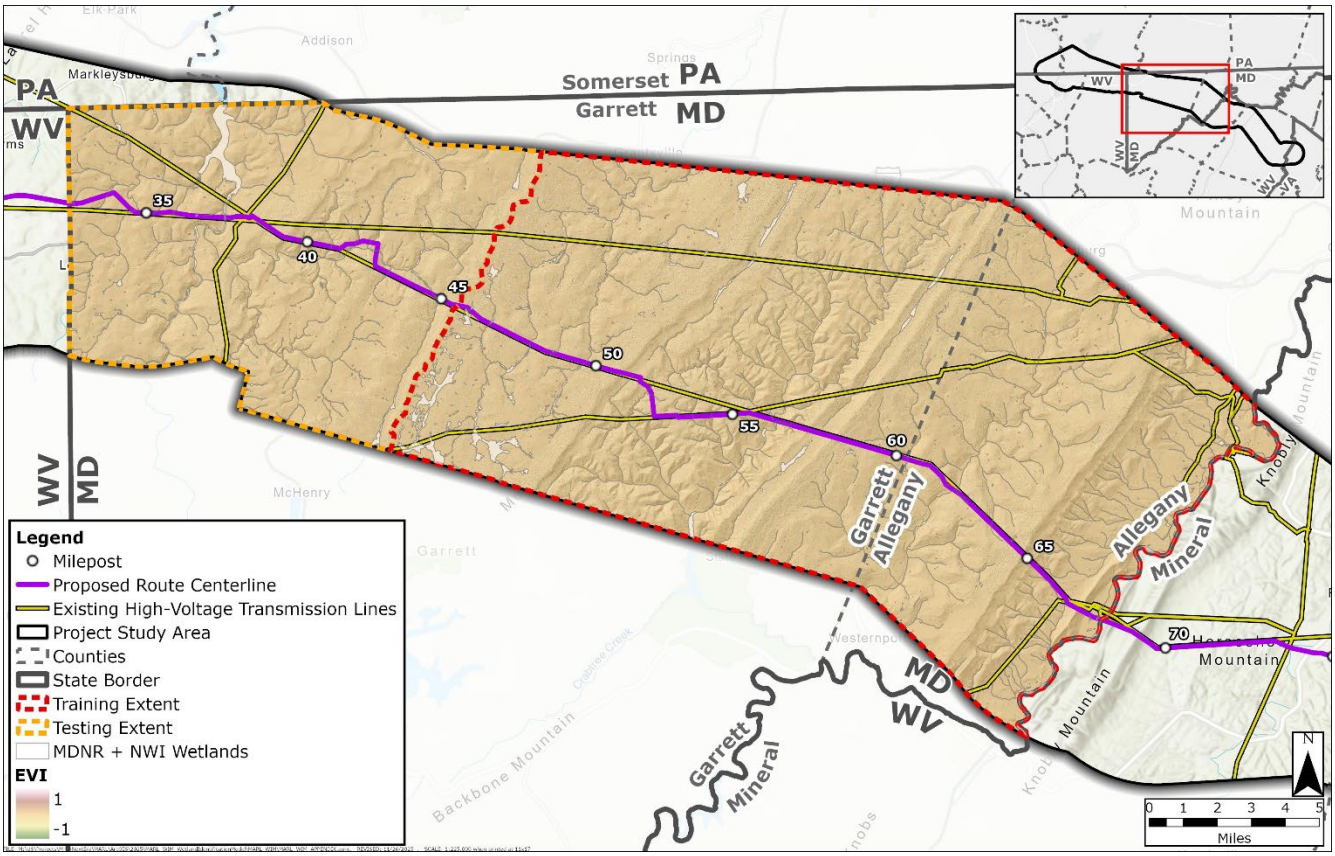
MD = Maryland; MDNR = Maryland Department of Natural Resources; NDVI = Normalized Difference Vegetation Index; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

FIGURE 2-6 NORMALIZED DIFFERENCE WATER INDEX PREDICTOR VARIABLE



MD = Maryland; MDNR = Maryland Department of Natural Resources; NDWI = Normalized Difference Water Index; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

FIGURE 2-7 ENHANCED VEGETATION INDEX PREDICTOR VARIABLE

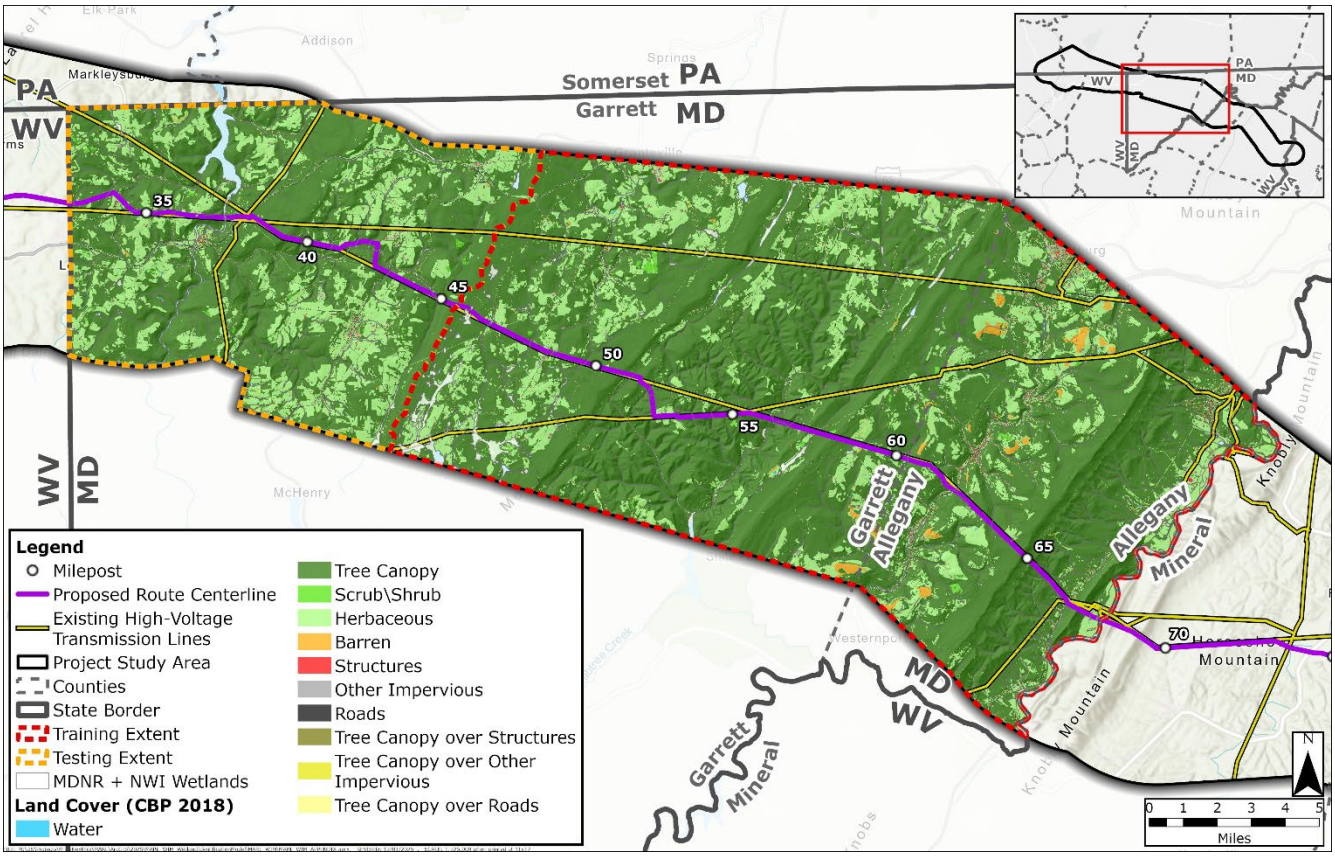


EVI = Enhanced Vegetation Index; MD = Maryland; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

2.3.5 LAND COVER

High-resolution land cover data (1-meter) from the Chesapeake Conservancy (Chesapeake Conservancy 2018) was resampled to a 3-meter resolution to be used as a predictor variable. Using categorical data in addition to continuous data for predictor variables is recommended by the WIM toolbox for ArcGIS Pro guidance (ESRI 2024). The Chesapeake Conservancy land cover dataset from 2017/2018 uses 11 different land cover classes and provides valuable information on impervious surfaces, tree canopy, and water resources in the area (Figure 2-8). The Chesapeake Conservancy land cover dataset covers Maryland, Virginia, and the eastern portion of West Virginia. In Pennsylvania and western West Virginia, the NLCD dataset was used (USGS 2024). The NLCD uses 12 land cover classes that are different than the Chesapeake Conservancy dataset; therefore, the NLCD classes were remapped to match the Chesapeake Conservancy land cover classes.

FIGURE 2-8 LAND COVER PREDICTOR VARIABLE

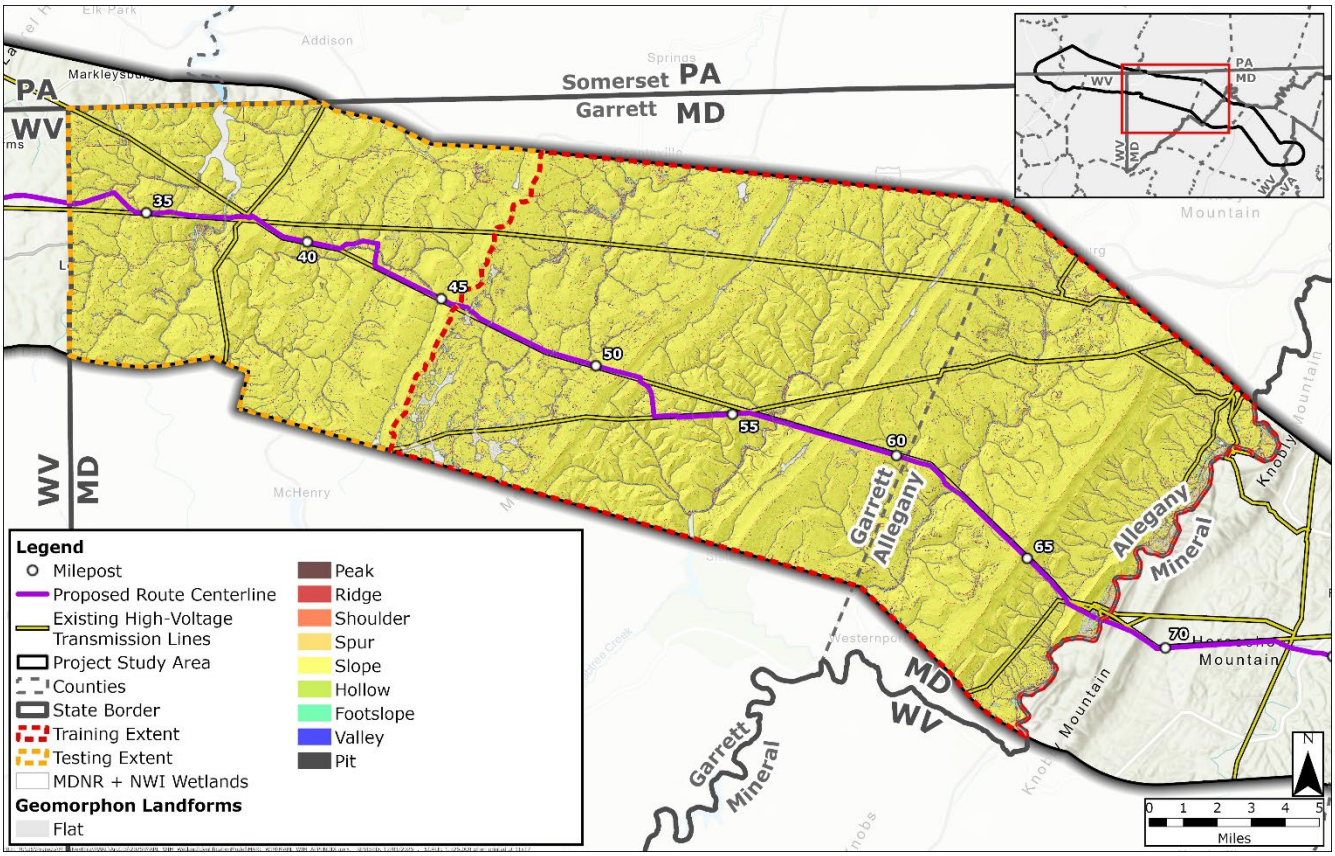


MD = Maryland; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

2.3.6 GEOMORPHONS

Geomorphons, a novel landform classification, were created following the guidance of the Chesapeake Conservancy (Mainali et al. 2023). This study found a unique spatial pattern in geomorphons that corresponded to wetland areas. Geomorphon landforms were calculated in ArcGIS Pro using the smoothed DEM. The tool calculates the local ternary patterns of higher, lower, and equal elevation determined by line-of-sight at each cell, then classifies the unique patterns into 10 common landform types: flat, peak, ridge, shoulder, spur, slope, hollow, footslope, valley, and pit (Jasiewicz and Stepinski 2013). Wetlands are represented by highly repeating series of small, irregular ridges, valleys, pits, flats, and footslopes along otherwise flat or non-slopping areas (Mainali et al. 2023). If there is standing water in a wetland, the DEM may exhibit patterns of interpolation as LiDAR pulses are absorbed by water, resulting in distinct patterns of geomorphons. Geomorphons are seen on Figure 2-9.

FIGURE 2-9 GEOMORPHON LANDFORMS PREDICTOR VARIABLE



MD = Maryland; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

2.4 MODEL TRAINING, DEPLOYMENT, AND EVALUATION

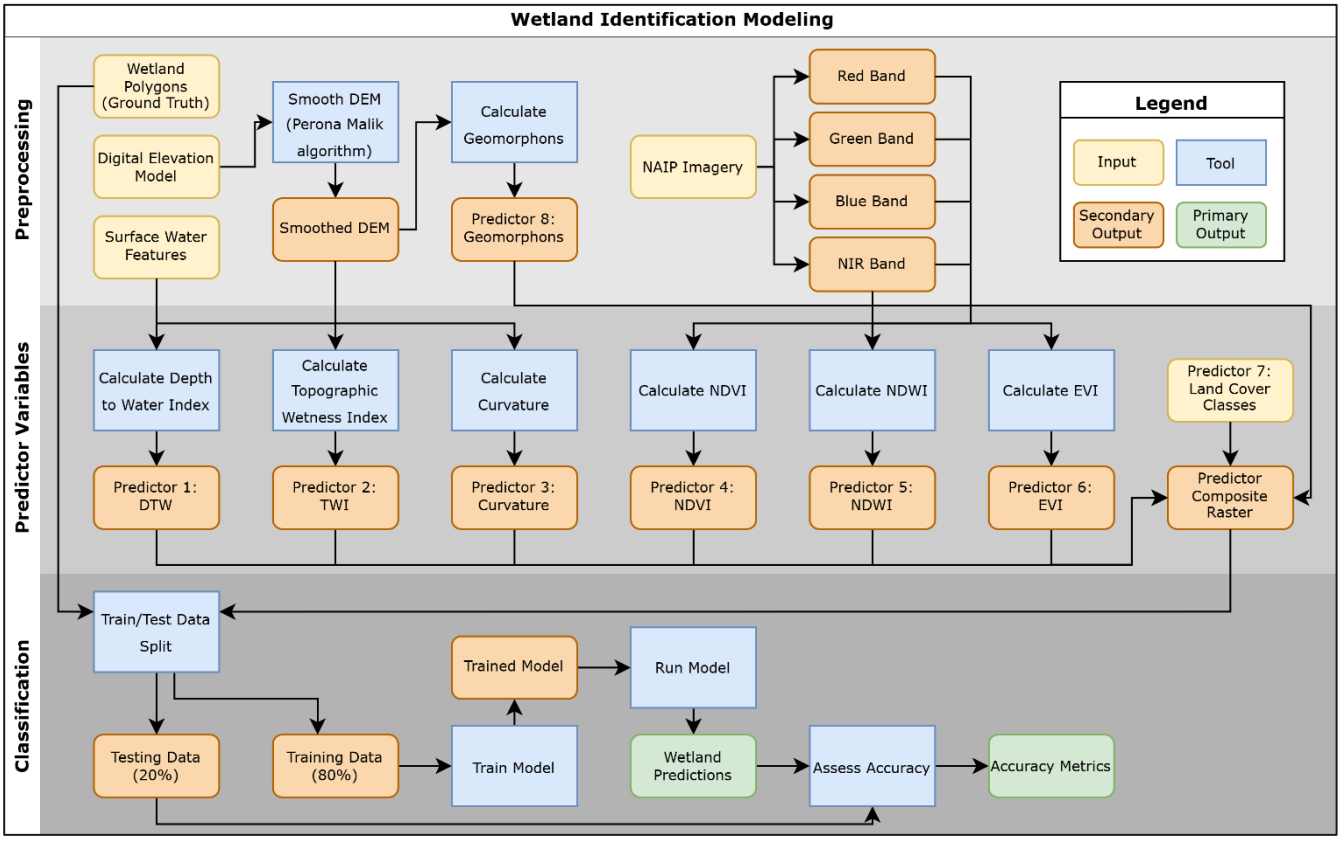
During model evaluation it was determined that DTW was highly variable across the training area and skewing wetland predictions. DTW historically overpredicts wetlands based on nearby surface water (Kekkonen et al. 2025). Wetland water depth fluctuates greatly across time and space and is difficult to capture in a static predictor variable such as DTW, especially for a large study area. Due to this high variability, DTW was excluded from the first composite model. The remaining predictor variables were mosaiced together to create one 7-band composite raster representing the training area. The 7-band based model is referred to as "high probability" wetland predictions. DTW was set aside to create an 8-band based model, which is referred to as "low probability" wetland predictions. The 8-band raster is considered "low probability" based on the assumption that the DTW variable will overpredict wetlands across the MARL Project Study Area. The low probability wetland model is included here for entirety, but the model was significantly inaccurate and is not included in the results. These limitations and future model improvement suggestions are explored further in Section 4, Discussion.

Training data for the predictor variable composite was generated using the Export Training Data for Deep Learning tool in ArcGIS Pro (ESRI n.d.-c.). This tool takes the input raster and training sample data in vector form and creates smaller image chips for model training. The input raster was the predictor variable composite, and the input training sample data was the combined MDNR

wetland polygons. The output image chips are 256 by 256 pixels, with 50 percent overlap containing the predictor variable composite as the base. For each image chip, every pixel is labeled as a wetland or non-wetland based on the combined wetland data. This resulted in 5,776 total image chips with wetland and/or non-wetland labels. These chips were split 80/10/10, with 80 precent (4,622) used for training, 10 precent (577) for validation during model training, and 10 precent (577) kept separate for final model testing. Training data is used to train the deep learning model, while the validation data is used to fine-tune the model and determine the stopping point of training. Validation data is considered part of the training of the model. The testing dataset of previously unseen data is used to determine the final accuracy of the model.

The U-Net model was trained with ResNet34 as the backbone, a dynamic learning rate from 0.00001 to 0.001, a batch size of 16, and 30 epochs. Wetland predictions were then created for the previously unseen testing area and overall MARL Project Study Area using the Classify Pixels Using Deep Learning tool in ArcGIS Pro (ESRI n.d.-d.). The overall process diagram is seen on Figure 2-10.

FIGURE 2-10 PROCESS DIAGRAM



DEM = digital elevation model; DTW = Depth-to-Water Index; EVI = Enhanced Vegetation Index; NAIP = National Agriculture Imagery Program; NDVI = Normalized Difference Vegetation Index; NDWI = Normalized Difference Water Index; TWI = Topographic Wetness Index

2.4.1 MODEL EVALUATION

Using the combined MDNR and NWI riverine wetland dataset as ground truth data, the predicted wetlands from the deep learning model were assessed for accuracy following the WIM toolbox for ArcGIS Pro guidance (ESRI 2024). Predicted wetlands were compared against the combined MDNR and NWI testing data, referred to as "ground truth labels." The calculated accuracy metrics were precision, recall, and F1 score. A value closer to 1 indicates greater accuracy of the model. These metrics are calculated using true positives, false positives, and false negatives. True positive means the pixel was classified correctly as a class of interest (wetland), false positive means the pixel of a background class (non-wetland) was incorrectly assigned to the class of interest (wetland), and false negative means the pixel of a known class (wetland) was incorrectly assigned to the background class (non-wetland).

Precision is the accuracy of positive predictions, accounting for the overprediction of positive classes (wetlands) without being biased by disproportionately large populations of the negative class (non-wetlands). Precision is the percentage of wetland predictions made that were correct, checking how many positive predictions matched ground truth labels and is calculated as follows:

$$Precision = \frac{True\ Positive}{True\ Positive + False\ Positive} \quad (7)$$

Recall is the probability of a ground truth label being corrected classified. It measures the proportion of actual positive pixels (ground truth labels) that were correctly identified by the model, giving the percentage of true wetlands that were correctly identified and is calculated as follows:

$$Recall = \frac{True\ Positive}{True\ Positive + False\ Negative} \quad (8)$$

The F1 score is the weighted average of precision and recall, often used to measure the overall performance of a model. The F1 score is preferred over traditional accuracy metrics, as it offers a more balanced view in datasets with high class imbalance, like wetland/non-wetland classes. F1 is calculated as follows:

$$F1 = \frac{2*(Precision*Recall)}{(Precision+Recall)} \quad (9)$$

3. RESULTS

Predicted wetlands were compared against the combined MDNR and NWI testing data, which was kept independent and not seen by the model during training (Figure 3-1). The F1 score for the high probability model (seven predictor variables) testing area was 0.900 (Table 3-1), which is considerably high for a low number of training samples and minimal model fine-tuning.

TABLE 3-1 ACCURACY METRICS FOR THE HIGH PROBABILITY WETLAND MODEL TESTING AREA

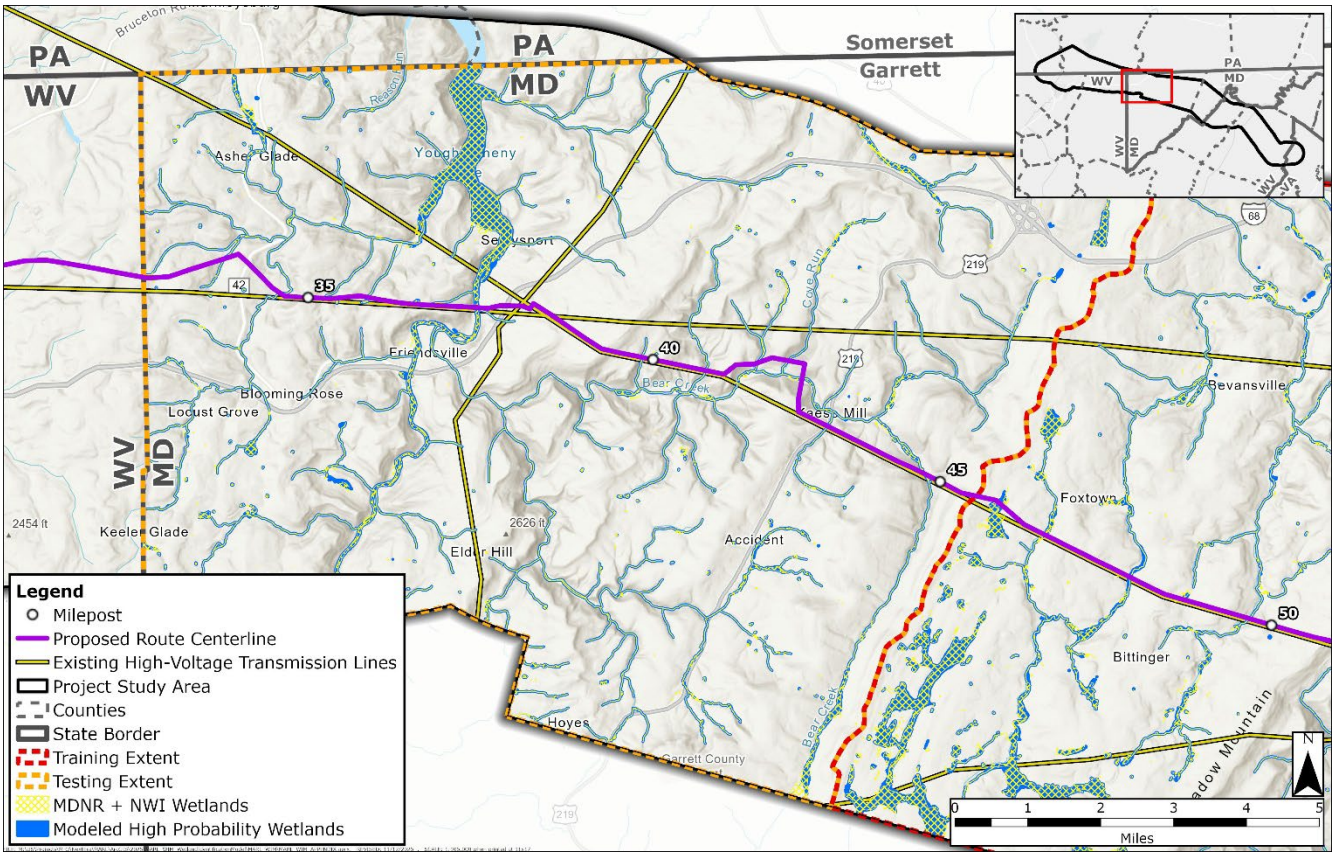
	Wetlands	Non-Wetlands
Precision	0.850	0.998
Recall	0.956	0.996
F1 Score	0.900	0.999

Final wetland predictions were made for the entirety of the MARL Project Study Area, including all proposed project components, with the exception of the Woodside Substation site. More than 23 percent of the MARL Project Study Area was used to train the model, so any accuracy metrics calculated for the larger area are slightly skewed because the model has already seen those ground truth labels. Accuracy metrics for the entire MARL Project Study Area are presented in Table 3-2 regardless of this limitation. The area of modeled high probability wetlands (MHPW) within the MARL Project Study Area is 15,403.5 acres (Table 3-3). The modeled wetland results for the Siting Corridor and ROW Corridor are provided in Table 3-4 and Table 3-5.

TABLE 3-2 ACCURACY METRICS FOR THE HIGH PROBABILITY WETLAND MODEL WITHIN THE MARL PROJECT STUDY AREA

	Wetlands	Non-Wetlands
Precision	0.889	0.996
Recall	0.854	0.997
F1 Score	0.871	0.997

FIGURE 3-1 HIGH PROBABILITY WETLAND MODEL RESULTS WITHIN THE TESTING AREA



MD = Maryland; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; PA = Pennsylvania; VA = Virginia; WV = West Virginia

TABLE 3-3 SUMMARY OF NATIONAL WETLANDS INVENTORY, MARYLAND DEPARTMENT OF NATURAL RESOURCES, AND MODELED HIGH PROBABILITY WETLANDS WITHIN THE MARL PROJECT STUDY AREA

Classification	Maryland (acres)	Pennsylvania (acres)	Virginia (acres)	West Virginia (acres)	Study Area Total (acres)
NWI Total [a]	4,853.4	3,182.2	628.1	6,717.8	15,381.5
MDNR Total [a]	2,840.4	NA	NA	NA	2,804.4
MHPW Total [a]	5,247.5	3,678.9	699.1	5,778.0	15,403.5

Source: USFWS n.d.; MDNR n.d.

MDNR = Maryland Department of Natural Resources; MHPW = modeled high probability wetlands; NA = not applicable; NWI = National Wetlands Inventory

[a] Totals may not match the sum of addends due to rounding.

TABLE 3-4 SUMMARY OF NATIONAL WETLANDS INVENTORY, MARYLAND DEPARTMENT OF NATURAL RESOURCES, AND MODELED HIGH PROBABILITY WETLANDS WITHIN THE SITING CORRIDOR

Classification	Maryland (acres)	Pennsylvania (acres)	Virginia (acres)	West Virginia (acres)	Siting Corridor Total (acres)
NWI Total [a]	28.4	22.1	5.1	46.3	102.0
MDNR Total [a]	12.8	NA	NA	NA	12.8
MHPW Total [a]	37.1	27.9	5.1	29.3	99.4

Source: USFWS n.d.; MDNR n.d.

MDNR = Maryland Department of Natural Resources; MHPW = modeled high probability wetlands; NA = not applicable; NWI = National Wetlands Inventory
[a] Totals may not match the sum of addends due to rounding.

TABLE 3-5 SUMMARY OF NATIONAL WETLANDS INVENTORY, MARYLAND DEPARTMENT OF NATURAL RESOURCES, AND MODELED HIGH PROBABILITY WETLANDS WITHIN THE ROW CORRIDOR

Classification	Maryland (acres)	Pennsylvania (acres)	Virginia (acres)	West Virginia (acres)	ROW Corridor Total (acres)
NWI Total [a]	12.1	9.9	2.1	18.5	42.6
MDNR Total [a]	5.7	NA	NA	NA	5.7
MHPW Total [a]	15.1	13.1	2.1	12.3	42.6

Source: USFWS n.d.; MDNR n.d.

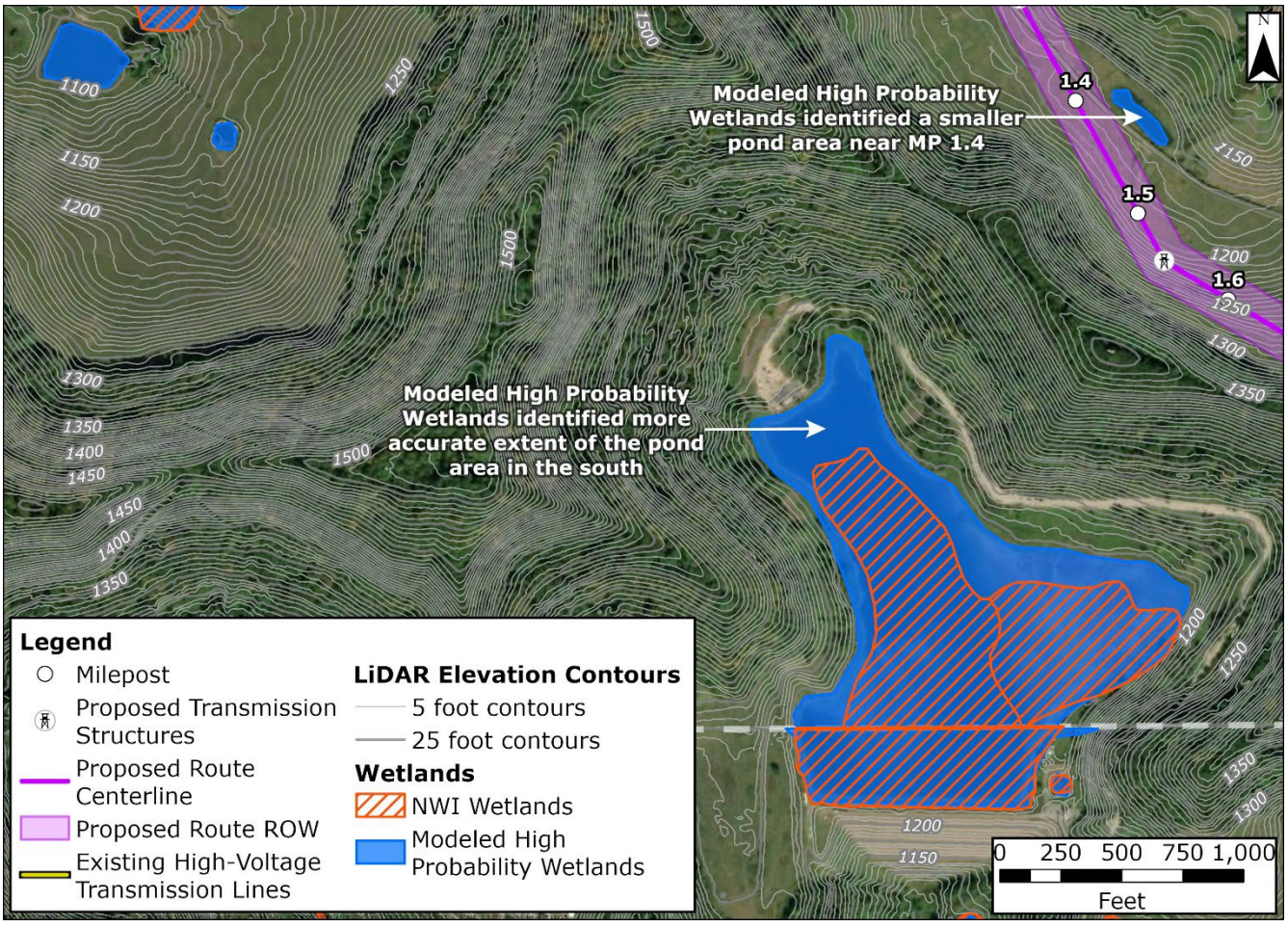
MDNR = Maryland Department of Natural Resources; MHPW = modeled high probability wetlands; NA = not applicable; NWI = National Wetlands Inventory; ROW = right-of-way
[a] Totals may not match the sum of addends due to rounding.

The model predicted more wetlands within the total MARL Project Study Area (15,403.5 acres) compared to NWI mapping (15,381.5 acres) but predicted 2.6 acres less than NWI mapping in the Siting Corridor. The model predicted the same acreage as NWI mapping in the ROW Corridor (42.6 acres) although with different geometries. However, in areas of NWI riverine wetlands concentrated in steeper topographic settings, the modeled wetlands closely matched the NWI wetland geometries potentially due to the use of geomorphons as a predictor variable. Although the USFWS did not use geomorphon-based terrain analysis to delineate NWI riverine wetlands, the strong spatial agreement between modeled geomorphon landforms and NWI riverine wetlands suggests that geomorphology is a primary control on riverine wetland occurrence and supports the validity of the model's predictor variables. Additionally, of the 42.6 acres of NWI wetlands within the ROW Corridor, 54.4 percent are riverine wetlands (23.2 acres). For all three analysis types by state (MARL Project Study Area, Siting Corridor, ROW Corridor), the model predicted more, or the same acreages of wetlands compared to NWI data, with the exception of West Virginia. These sections of West Virginia may be highly different than Maryland in terms of topography, which would result in model mismatch and confusion between the training area in Maryland and unseen areas in West Virginia. Additionally, West Virginia had the largest area for

wetland predictions, which introduces higher potential for errors and misalignment. For more details on acres of MHPW within the MARL Project Study Area, Siting Corridors, or ROW Corridors of the Proposed Route and Alternative Routes, see Attachment 1, Modeled Wetlands Summary Tables.

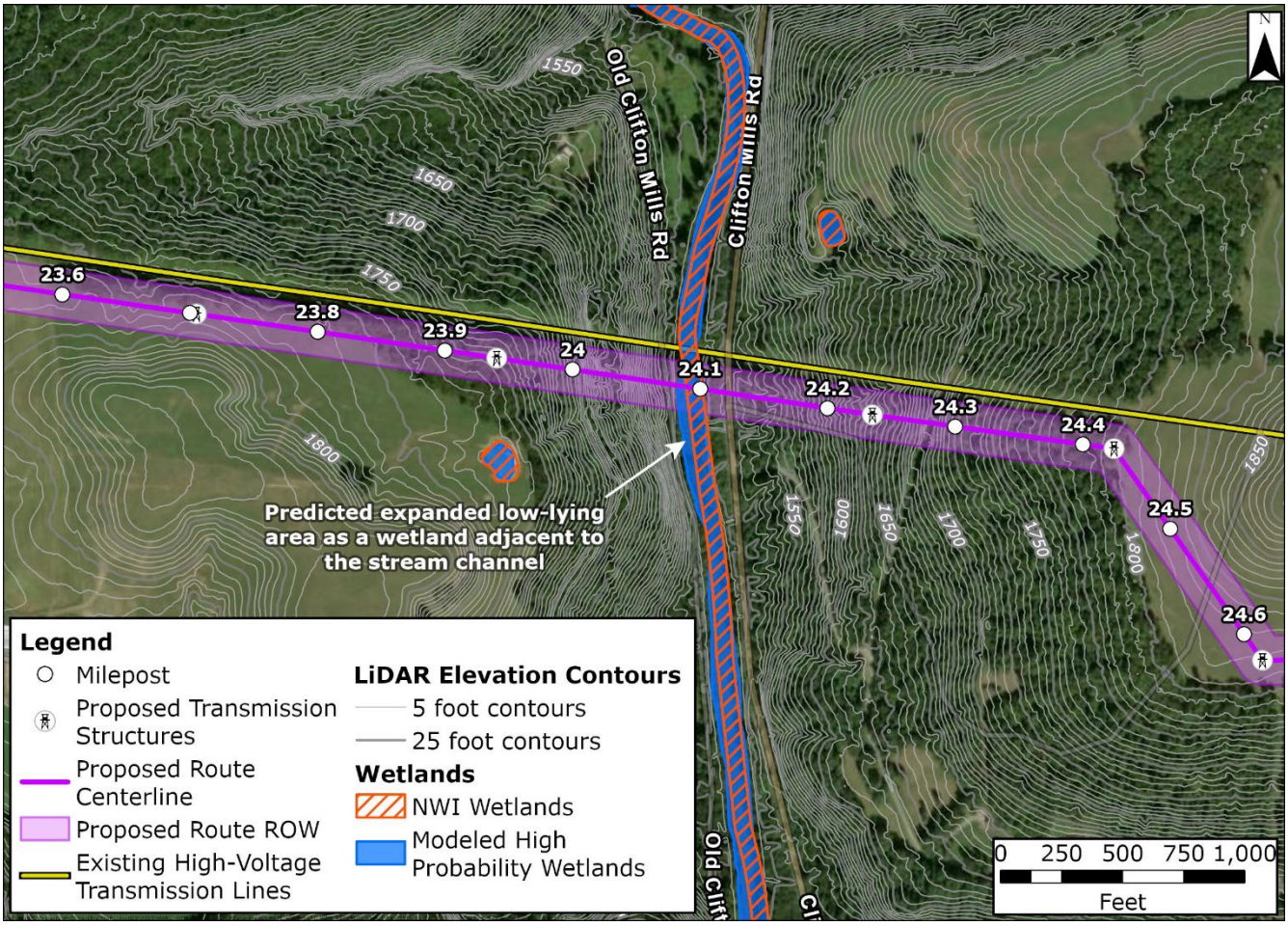
Based on visual review and to provide example differences, Figure 3-2 through Figure 3-7 show discrete examples of model outputs compared to existing wetland data. In some areas the MHPW aligns more closely with topographic features or identify previously unidentified potential wetland areas. Whereas in other places the MHPW matches the NWI or MDNR wetlands. To see additional details, refer to Attachment 2, Modeled Wetlands Mapbook.

FIGURE 3-2 MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GREENE COUNTY, PENNSYLVANIA, IDENTIFYING MORE ACCURATE BOUNDARY OF PONDED AREA AND UNIDENTIFIED PONDED AREA



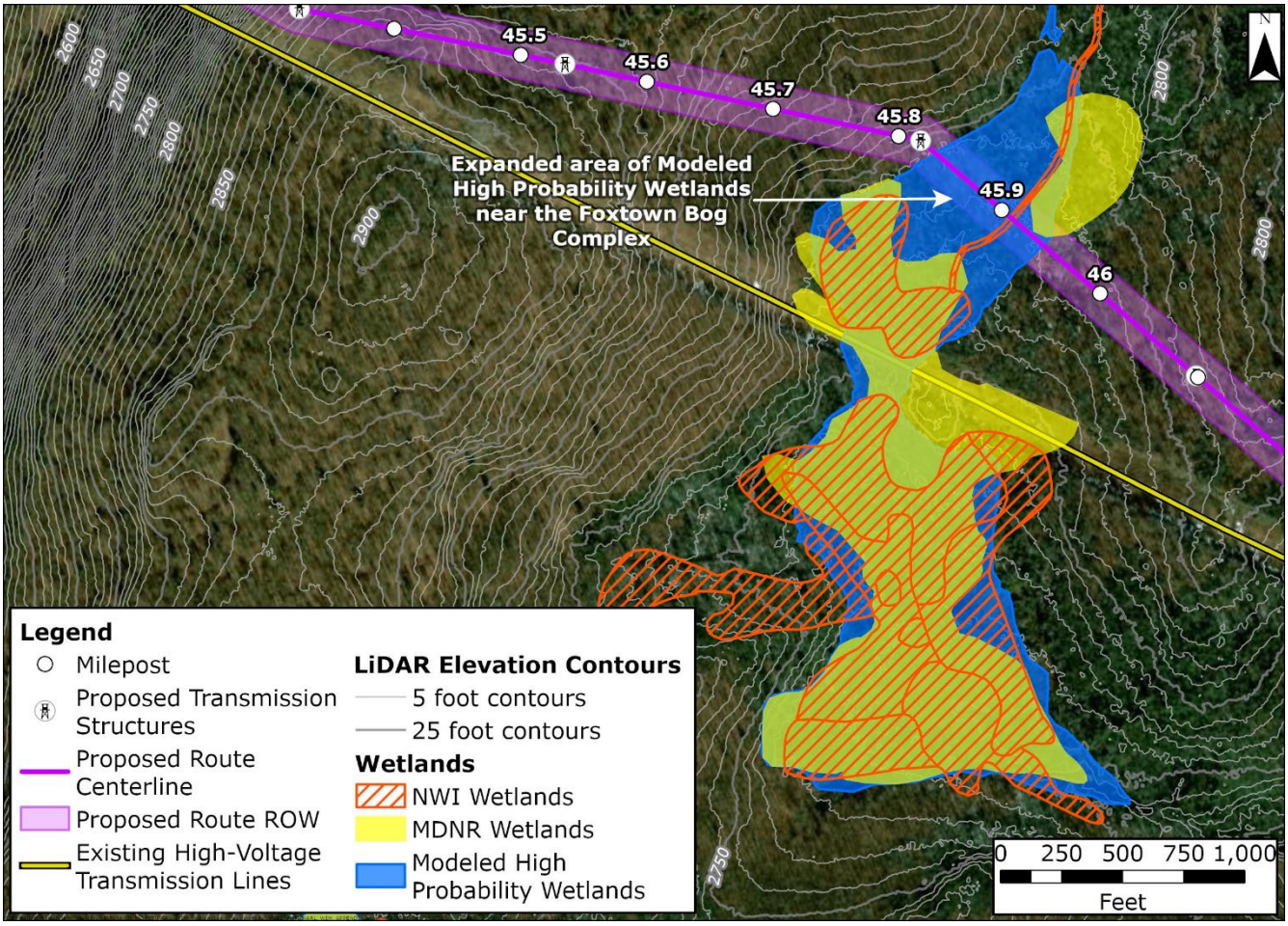
LiDAR = Light Detection and Ranging; MP = milepost; NWI = National Wetlands Inventory; ROW = right-of-way

FIGURE 3-3 MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN PRESTON COUNTY, WEST VIRGINIA, SHOWING MODELED HIGH PROBABILITY WETLANDS EXPANDED IN LOW-LYING AREAS BIG SANDY CREEK



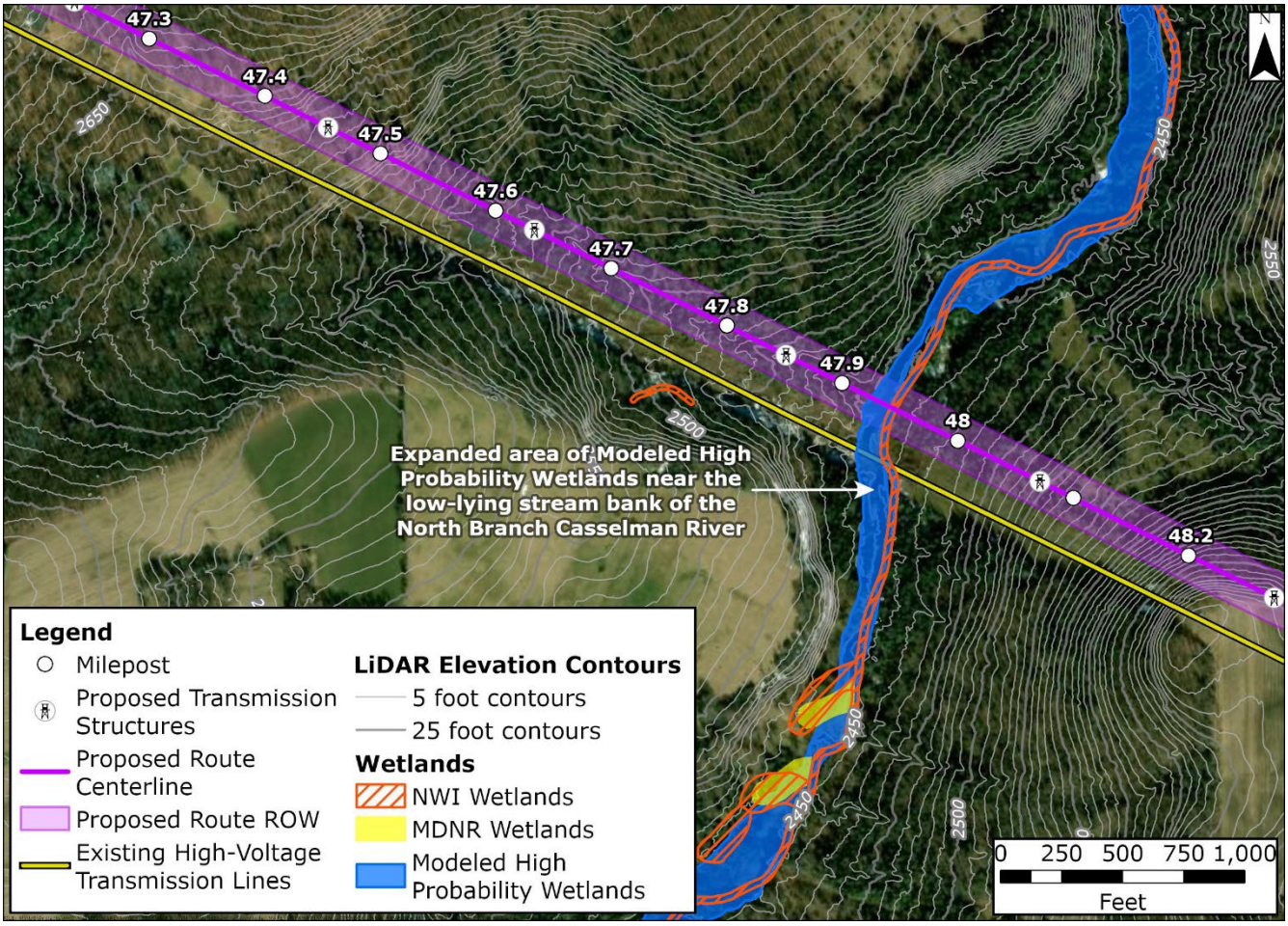
LiDAR = Light Detection and Ranging; NWI = National Wetlands Inventory; ROW = right-of-way

FIGURE 3-4 MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, PREDICTING EXPANDED WETLAND AREA NEAR FOXTOWN BOG COMPLEX



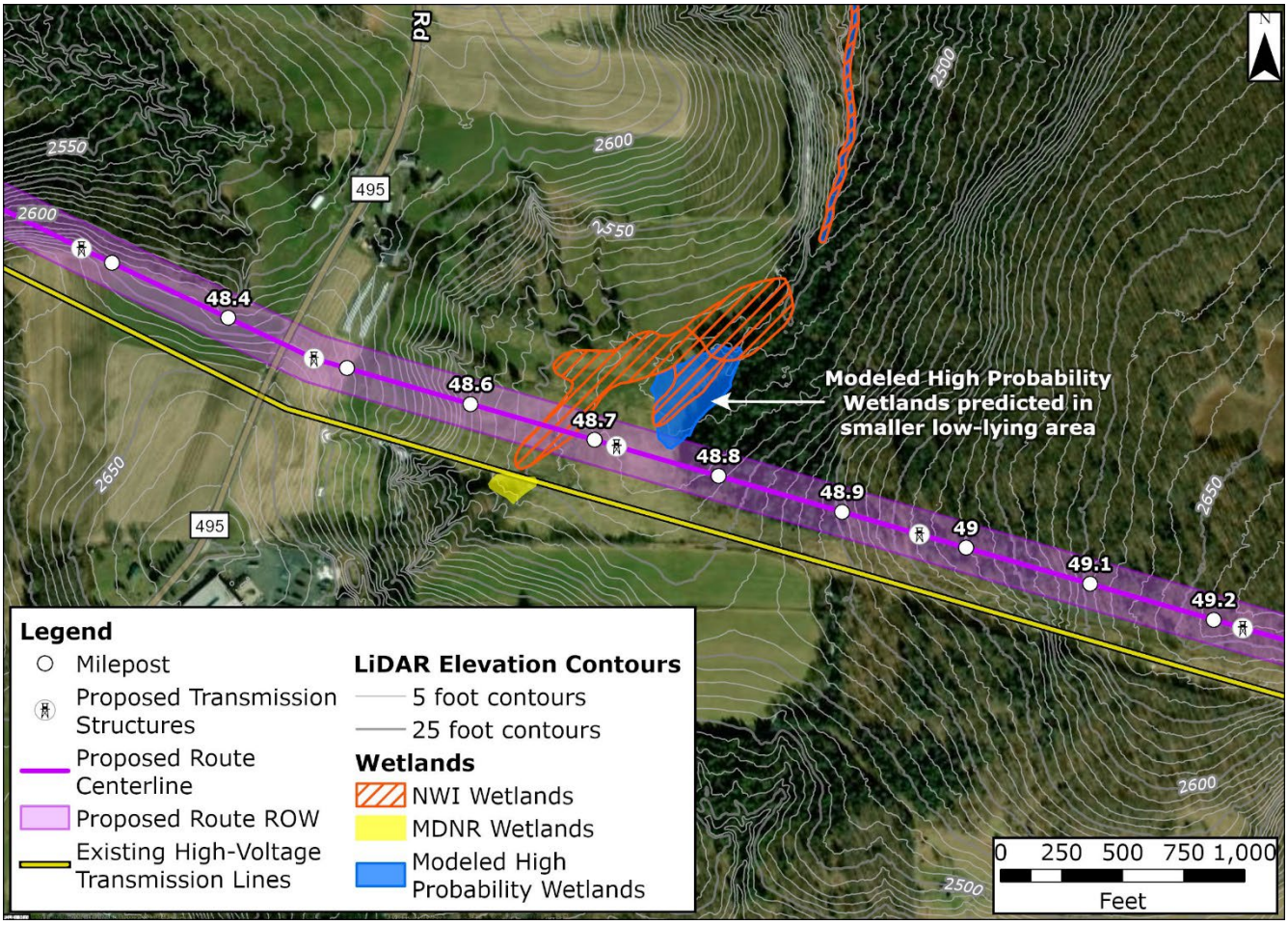
LiDAR = Light Detection and Ranging; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; ROW = right-of-way

FIGURE 3-5 MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, PREDICTING LARGER WETLAND AREA ON THE STREAM BANKS OF THE NORTH BRANCH CASSELMAN RIVER



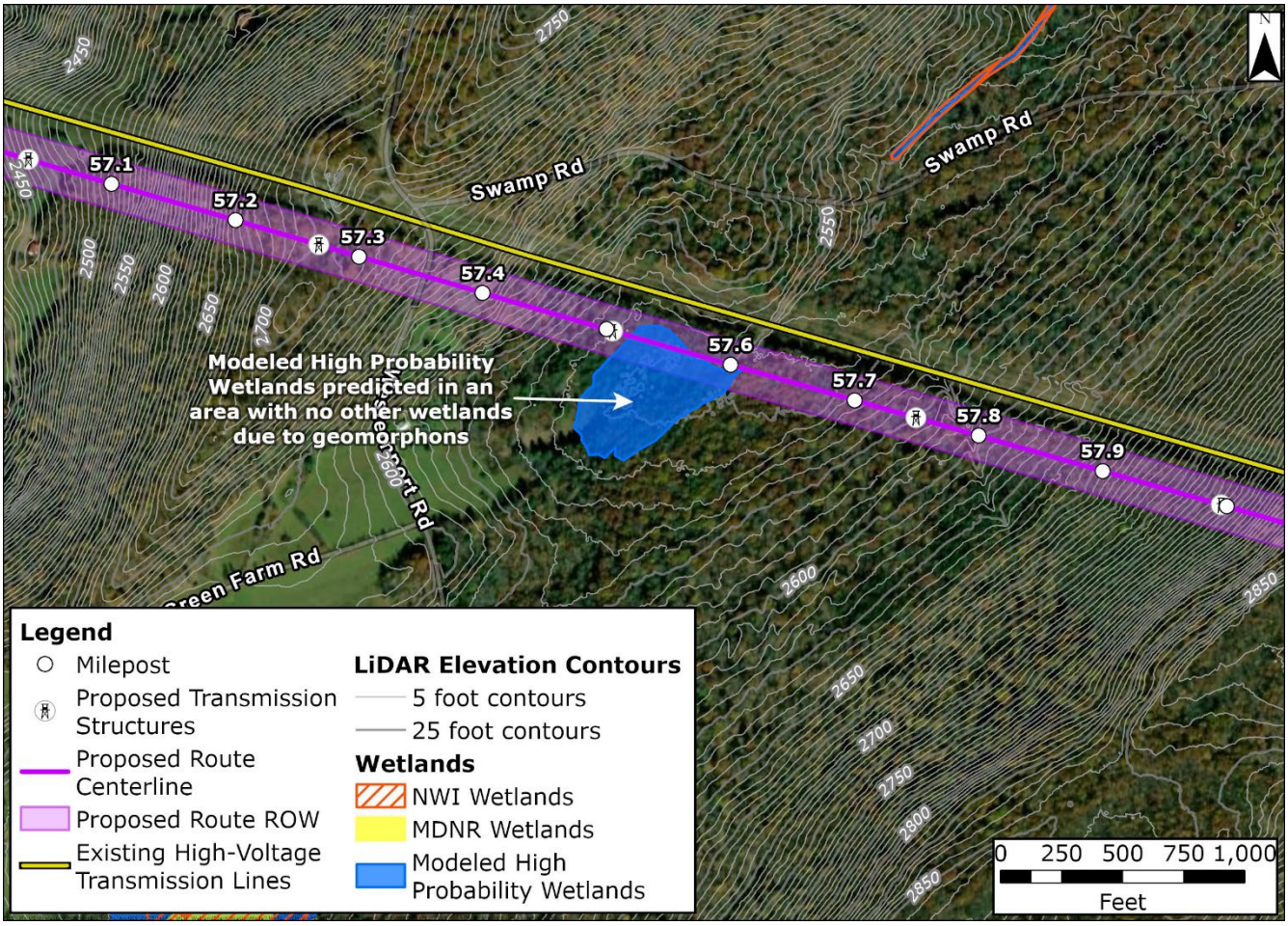
LiDAR = Light Detection and Ranging; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; ROW = right-of-way

FIGURE 3-6 MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, SHOWING SMALLER POTENTIAL WETLAND FOOTPRINT COMPARED TO THE NATIONAL WETLANDS INVENTORY DATA THAT MORE CLOSELY ALIGNS WITH TOPOGRAPHY



LiDAR = Light Detection and Ranging; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; ROW = right-of-way

FIGURE 3-7 MODELED HIGH PROBABILITY WETLANDS EXAMPLE IN GARRETT COUNTY, MARYLAND, SHOWING A POTENTIAL WETLAND AREA NOT PREVIOUSLY IDENTIFIED



LiDAR = Light Detection and Ranging; MDNR = Maryland Department of Natural Resources; NWI = National Wetlands Inventory; ROW = right-of-way

4. DISCUSSION

There are fundamental challenges in training and evaluating a wetland prediction model using non-field delineated, regional datasets that are outdated or inaccurate, such as the MDNR and NWI data. Inaccurate wetland labels, along with temporal and categorical mismatches between these labels and the model outputs (which represent current conditions), introduce uncertainty into the testing data used to assess model performance. A deep learning model does not know what a wetland is because it simply learns the patterns from the predictor variables that exist on the labeled wetlands; therefore, if your labeled wetlands are incorrect, outdated, or misaligned, the model will absorb those mistakes and learn incorrect patterns. Consequently, the accuracy metrics primarily reflect how well the model reproduces MDNR and NWI data. However, the accuracy of the model can be leveraged to extrapolate real-world data from a smaller, representative area to the larger project area. Using field delineated wetlands to fine-tune the current model would produce more reliable and generalizable results, especially by focusing on a small—yet representative—area containing highly accurate ground truth data, which could be useful for early impact assessments and preliminary project planning.

While the model successfully predicted wetlands in the MARL Project Study Area, there are notable limitations with this method. The model is unable to distinguish between different types of wetland classifications (palustrine, riverine, and lacustrine), and the acreage provided in the final predictions is a combination of these classes. To differentiate wetland types within the predictions, it will require new models to be trained using specific Cowardin classes. While this may be possible, it will be considerably inaccurate due to the class imbalance and low sample size per class of the training data. Additionally, the model cannot distinguish MHPW from low probability wetlands. This is partially a limitation of the model type (U-Net) and may require using a different deep learning architecture altogether to achieve this goal. To overcome this challenge, an attempt was made to use the DTW as the eighth variable to create a “low probability” model, as this variable historically overpredicts wetlands based on nearby surface water (Kekkonen et al. 2025). However, DTW is highly variable across the MARL Project Study Area, particularly in Maryland due to the steep topography. Because Maryland was used as the training area, the high variability in DTW significantly skewed results and greatly overpredicted wetlands.

The goal of this model was to detect previously unknown wetlands and refine known wetlands in the MARL Project Study Area to help understand potential impacts and field requirements; therefore, the recall and precision should be lower than expected for other types of deep learning predictions, as these metrics are calculated by comparing to the ground truth features.

Future improvements to the model could include both model training and evaluation. To create a more accurate low probability wetland model, the DTW variable will need to be updated or modified. This could be done with more accurate stream network mapping, through field delineation or additional datasets, or the use of a Soil Wetness Index to quantify moisture at various depths in the nearby soil (Murphy et al. 2007). Additionally, using field delineated wetlands to train and evaluate the model will improve the accuracy of the model and the reliability of accuracy metrics. While the current accuracy metrics show temporal robustness in the model trained with predictor variables and wetland labels collected decades apart, any improvement to ground truth data will significantly improve the model.

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ATTACHMENT 1 MODELED WETLANDS SUMMARY TABLES

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TABLE 1 MODELED HIGH PROBABILITY WETLANDS BY STATE WITHIN THE SITING CORRIDOR

Environmental Features	State	Calculation Type	Measure	Unit	End to End A	End to End B	End to End C	End to End D	End to End E	End to End F
MHPW	Maryland	Siting Corridor	Area	Acres	37.1	32.1	42.2	38.7	37.1	43.8
MHPW	Pennsylvania	Siting Corridor	Area	Acres	27.9	25.6	60.9	27.9	27.9	60.9
MHPW	West Virginia	Siting Corridor	Area	Acres	29.3	35.6	24.9	29.3	32.8	29.7
MHPW	Virginia	Siting Corridor	Area	Acres	5.1	4.5	5.1	5.1	5.1	4.5
Siting Corridor Total [a]					**99.4**	**97.8**	**133.0**	**101.00**	**103.0**	**138.9**

MPHW = Modeled High Probability Wetlands

[a] Totals may not match the sum of addends due to rounding.

TABLE 2 MODELED HIGH PROBABILITY WETLANDS BY STATE WITHIN THE ROW CORRIDORS

Environmental Features	State	Calculation Type	Measure	Unit	End to End A	End to End B	End to End C	End to End D	End to End E	End to End F
MHPW	Maryland	Proposed ROW	Area	Acres	15.1	13.2	18.5	15.8	15.1	19.2
MHPW	Pennsylvania	Proposed ROW	Area	Acres	13.1	12.0	28.4	13.1	13.1	28.4
MHPW	West Virginia	Proposed ROW	Area	Acres	12.3	16.0	10.6	12.3	14.4	13.5
MHPW	Virginia	Proposed ROW	Area	Acres	2.1	1.9	2.1	2.1	2.1	1.9
ROW Total [a]					**42.6**	**43.1**	**59.6**	**43.3**	**44.8**	**63.0**

MPHW = Modeled High Probability Wetlands; ROW = right-of-way

[a] Totals may not match the sum of addends due to rounding.

TABLE 3 MODELED HIGH PROBABILITY WETLANDS BY COUNTY WITHIN THE SITING CORRIDOR

Environmental Features	County	State	Calculation Type	Measure	Unit	End to End A	End to End B	End to End C	End to End D	End to End E	End to End F
MHPW	Garrett	Maryland	Siting Corridor	Area	Acres	30.9	25.9	36.0	29.3	30.9	34.4
MHPW	Allegany	Maryland	Siting Corridor	Area	Acres	6.2	6.2	6.2	9.4	6.2	9.5
MHPW	Greene	Pennsylvania	Siting Corridor	Area	Acres	10.0	10.0	8.2	10.0	10.0	8.2
MHPW	Fayette	Pennsylvania	Siting Corridor	Area	Acres	18.0	15.6	52.8	18.0	18.0	52.8
MHPW	Monongalia	West Virginia	Siting Corridor	Area	Acres	1.4	4.3	1.2	1.4	1.4	1.2
MHPW	Preston	West Virginia	Siting Corridor	Area	Acres	4.3	7.6	< 0.1	4.3	4.3	< 0.1
MHPW	Mineral	West Virginia	Siting Corridor	Area	Acres	2.1	2.1	2.1	2.1	2.1	2.1
MHPW	Hampshire	West Virginia	Siting Corridor	Area	Acres	21.5	21.5	21.5	21.5	25.0	26.3
MHPW	Frederick	Virginia	Siting Corridor	Area	Acres	5.1	4.5	5.1	5.1	5.1	4.5
Survey Total [a]						**99.3**	**97.7**	**133.0**	**101.0**	**102.8**	**138.9**

MPHW = Modeled High Probability Wetlands

[a] Totals may not match the sum of addends due to rounding.

TABLE 4 MODELED HIGH PROBABILITY WETLANDS BY COUNTY WITHIN THE ROW CORRIDOR

Environmental Features	County	State	Calculation Type	Measure	Unit	End to End A	End to End B	End to End C	End to End D	End to End E	End to End F
MPHW	Garrett	Maryland	Proposed ROW	Area	Acres	13.2	11.3	16.6	12.5	13.2	15.9
MPHW	Allegany	Maryland	Proposed ROW	Area	Acres	1.9	1.9	1.9	3.3	1.9	3.3
MPHW	Greene	Pennsylvania	Proposed ROW	Area	Acres	5.1	5.1	3.9	5.1	5.1	3.9
MPHW	Fayette	Pennsylvania	Proposed ROW	Area	Acres	8.0	6.9	24.4	8.0	8.0	24.4
MPHW	Monongalia	West Virginia	Proposed ROW	Area	Acres	< 0.1	1.6	< 0.1	< 0.1	< 0.1	< 0.1
MPHW	Preston	West Virginia	Proposed ROW	Area	Acres	1.7	3.8	< 0.1	1.7	1.7	< 0.1
MPHW	Mineral	West Virginia	Proposed ROW	Area	Acres	1.0	1.0	1.0	1.0	1.0	1.0
MPHW	Hampshire	West Virginia	Proposed ROW	Area	Acres	9.6	9.6	9.6	9.6	11.7	12.5
MPHW	Frederick	Virginia	Proposed ROW	Area	Acres	2.1	1.9	2.1	2.1	2.1	1.9
ROW Total [a]						**42.6**	**43.0**	**59.6**	**43.3**	**44.8**	**63.0**

MPHW = Modeled High Probability Wetlands; ROW = right-of-way

[a] Totals may not match the sum of addends due to rounding.

TABLE 5 MODELED HIGH PROBABILITY WETLANDS BY STATE WITHIN THE MARL PROJECT STUDY AREA

Environmental Features	State	Calculation Type	Measure	Unit	Study Area
MPHW	Maryland	Study Area	Area	Acres	5,247.5
MPHW	Pennsylvania	Study Area	Area	Acres	3,678.9
MPHW	West Virginia	Study Area	Area	Acres	5,778.0
MPHW	Virginia	Study Area	Area	Acres	699.1
Total [a]					**15,403.6**

MPHW = Modeled High Probability Wetlands

[a] Totals may not match the sum of addends due to rounding.

TABLE 6 MODELED HIGH PROBABILITY WETLANDS BY COUNTY WITHIN THE MARL PROJECT STUDY AREA

Environmental Features	County	State	Calculation Type	Measure	Unit	Study Area
MPHW	Garrett	Maryland	Study Area	Area	Acres	4,189.2
MPHW	Allegany	Maryland	Study Area	Area	Acres	1,058.3
MPHW	Greene	Pennsylvania	Study Area	Area	Acres	1,326.2
MPHW	Fayette	Pennsylvania	Study Area	Area	Acres	2,352.7
MPHW	Monongalia	West Virginia	Study Area	Area	Acres	2,071.9
MPHW	Preston	West Virginia	Study Area	Area	Acres	730.5
MPHW	Mineral	West Virginia	Study Area	Area	Acres	428.2
MPHW	Hampshire	West Virginia	Study Area	Area	Acres	2,547.4
MPHW	Frederick	Virginia	Study Area	Area	Acres	699.1
Total [a]						**15,403.6**

MPHW = Modeled High Probability Wetlands

[a] Totals may not match the sum of addends due to rounding.

ATTACHMENT 2 MODELED WETLANDS MAPBOOK

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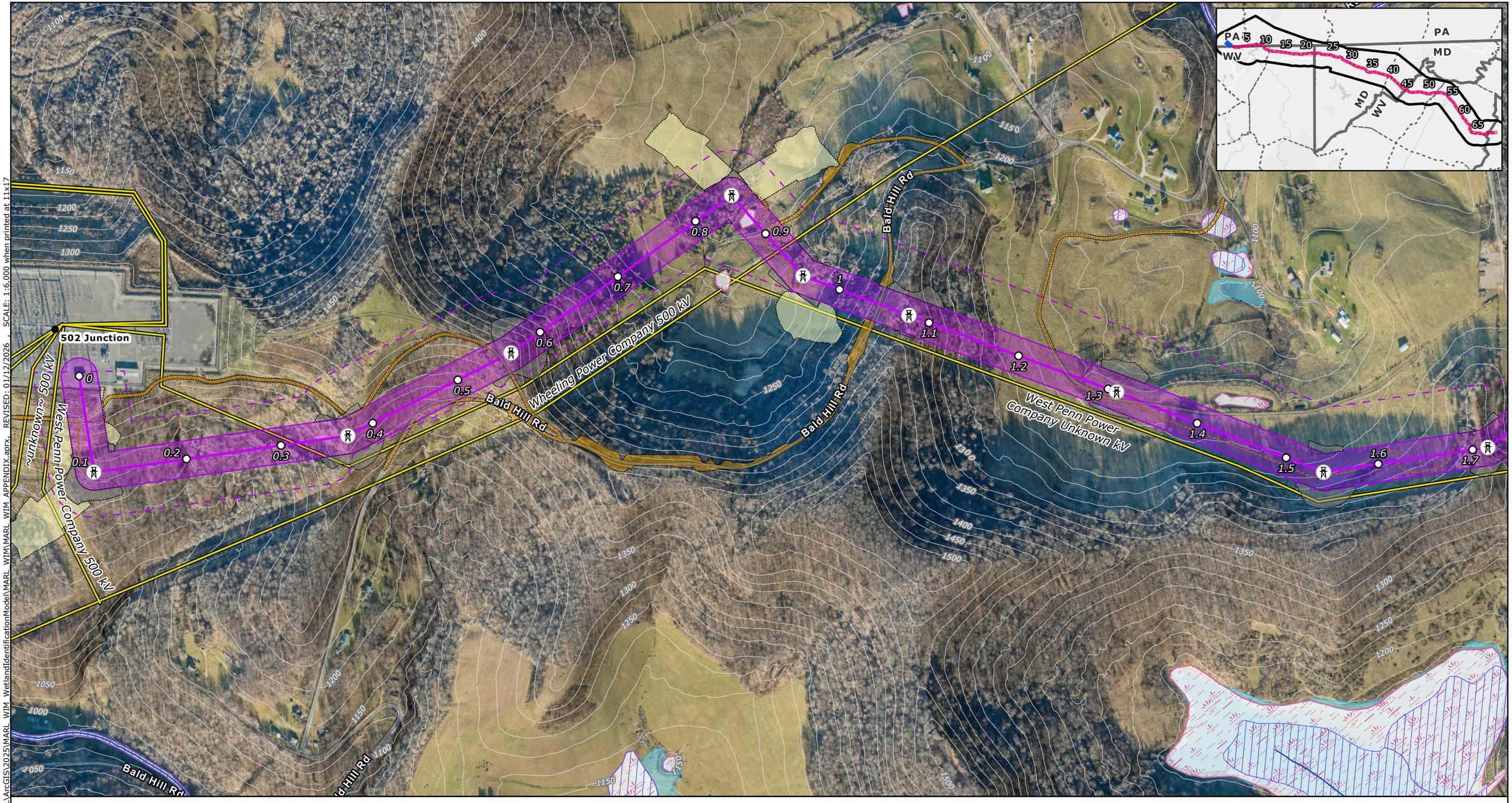

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3. *LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor*
4. *Data source: NextEra, ERM, MD DNR, MDE, USGS NHD, USFWS NWI, MD iMAP Portal*

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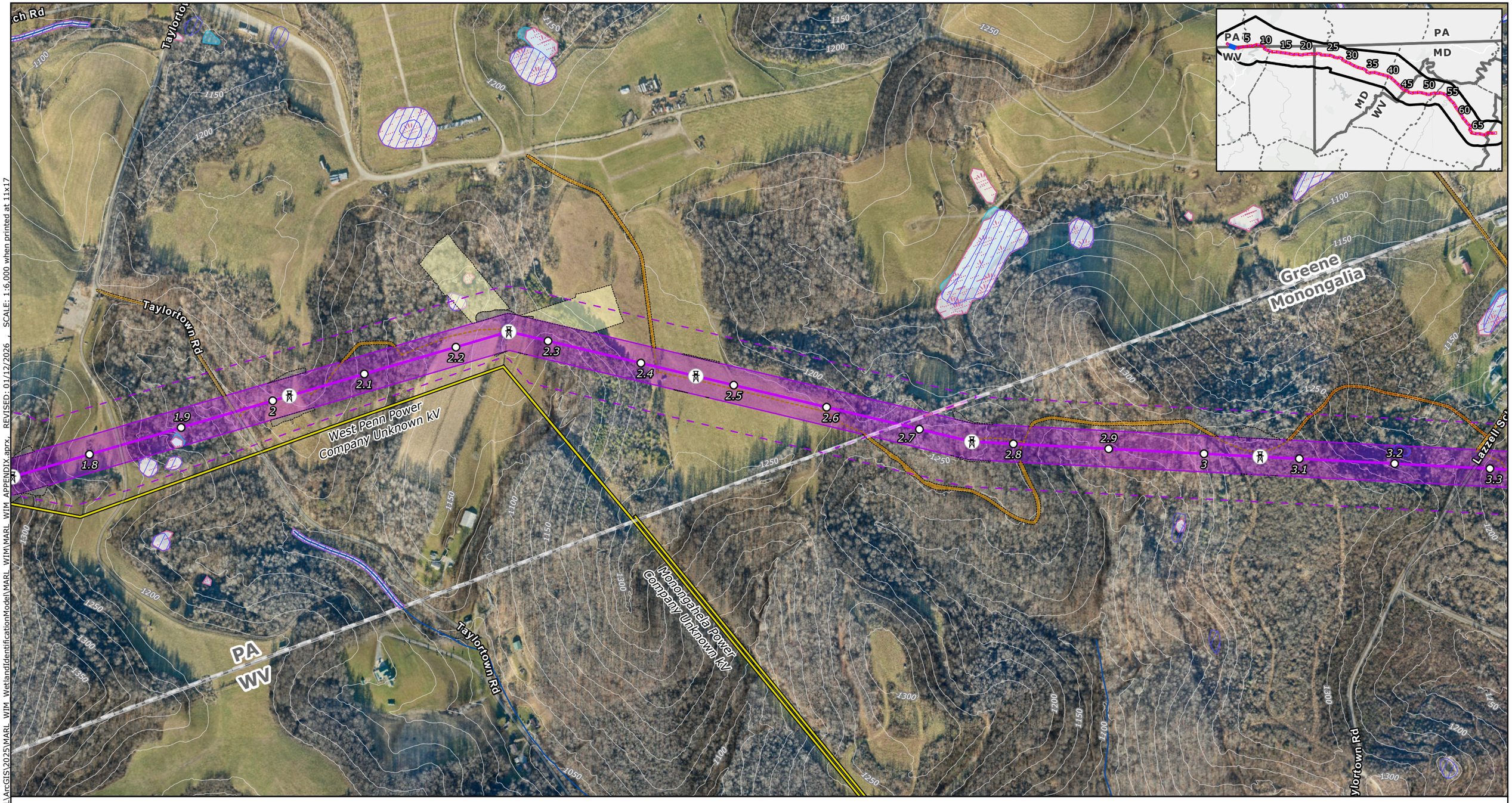

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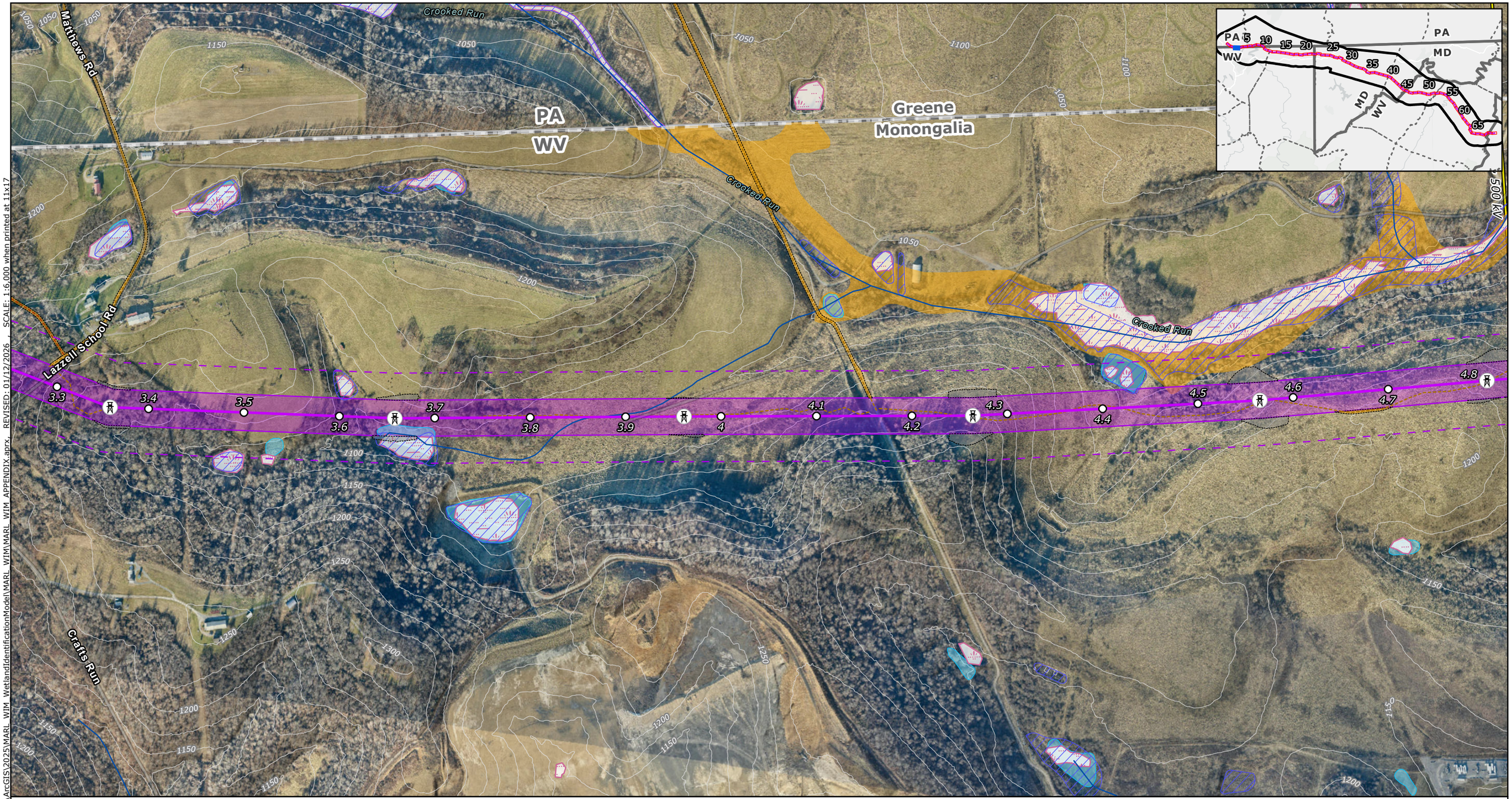

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Page 4 of 69
MidAtlantic Resiliency Link

ERM

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Page 5 of 69
MidAtlantic Resiliency Link

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Page 6 of 69
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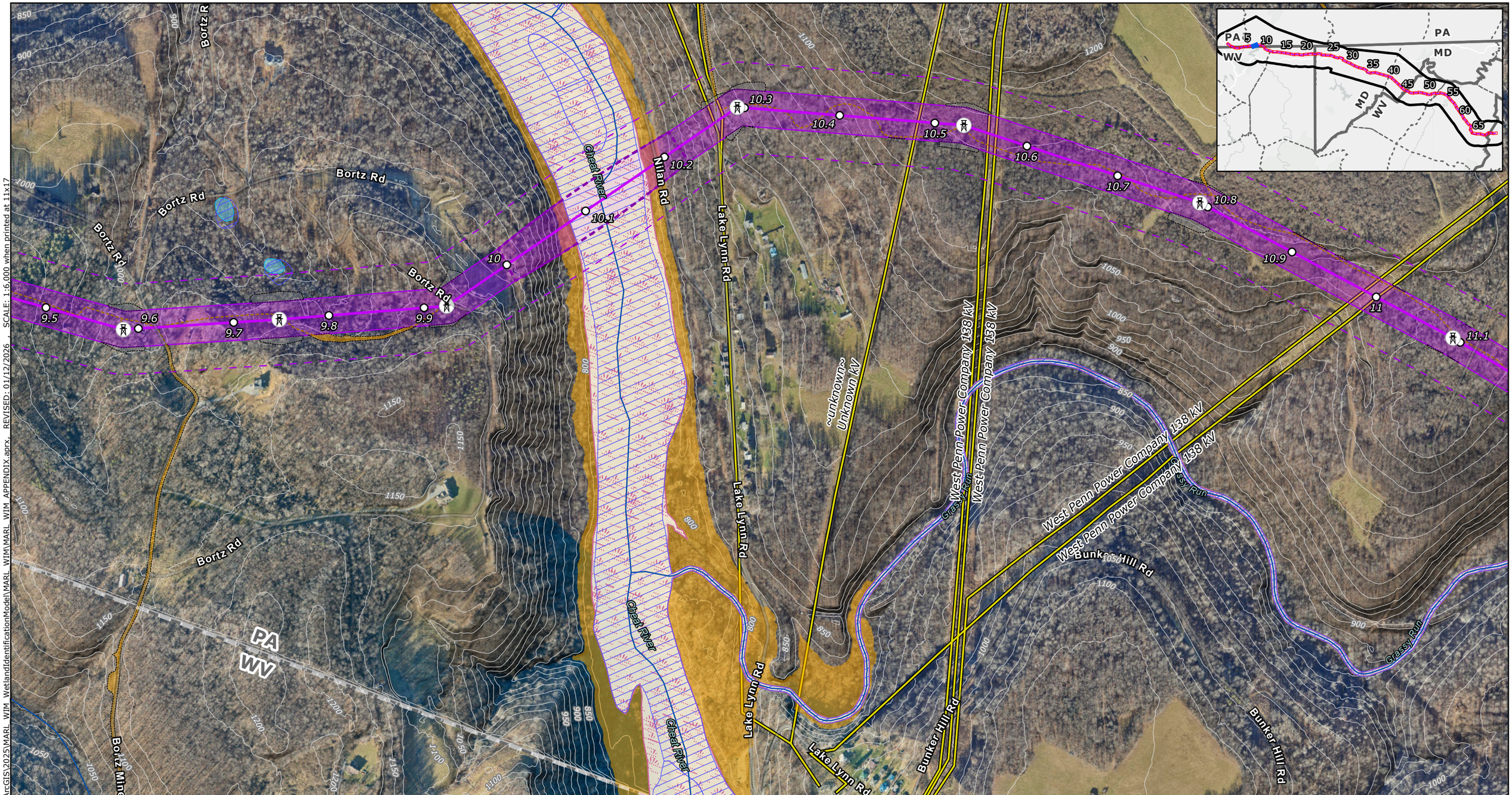

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Page 7 of 69
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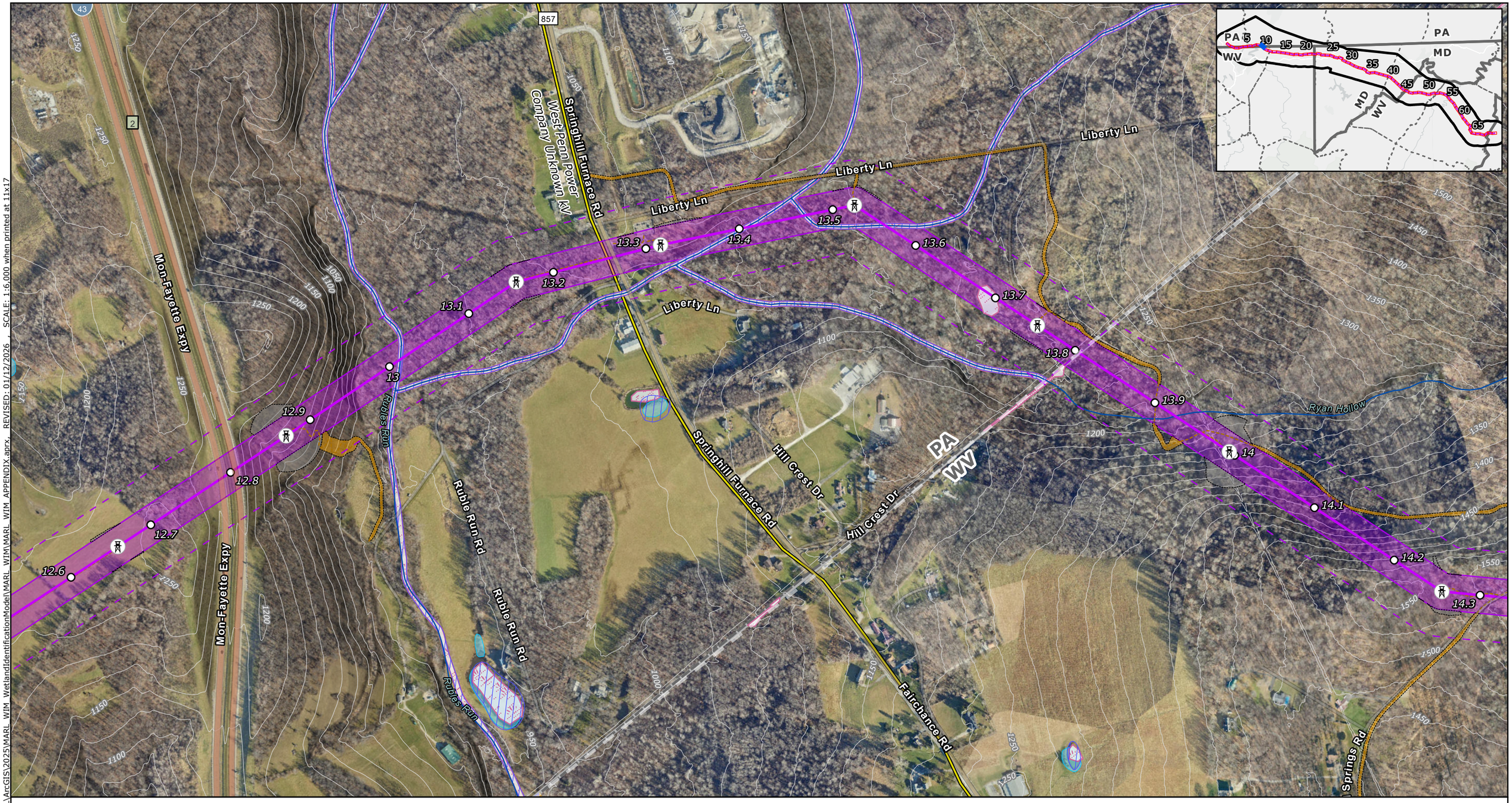

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ERM

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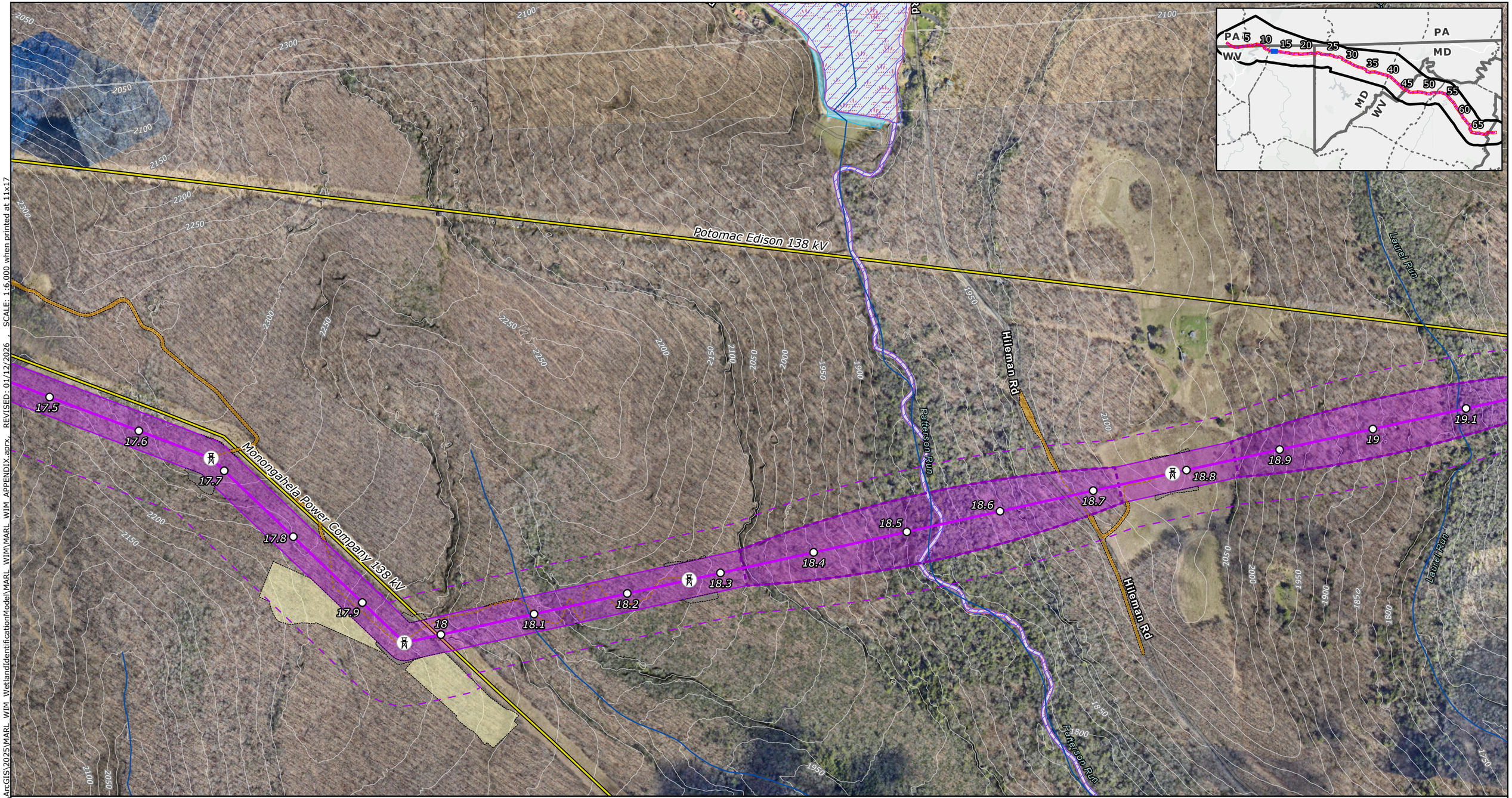

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- Proposed Route Siting Corridor

Proposed Route Ancillary Facilities
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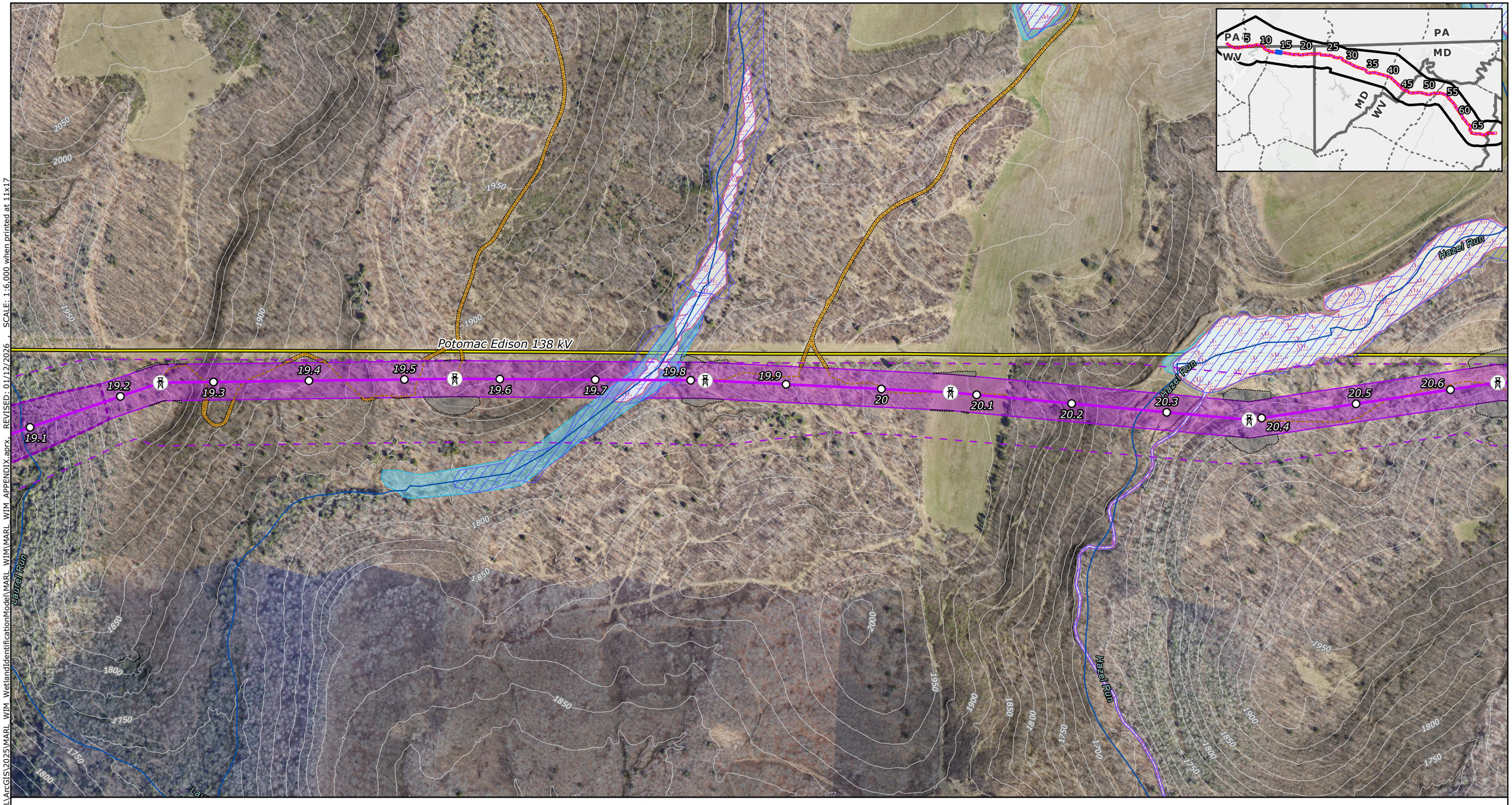

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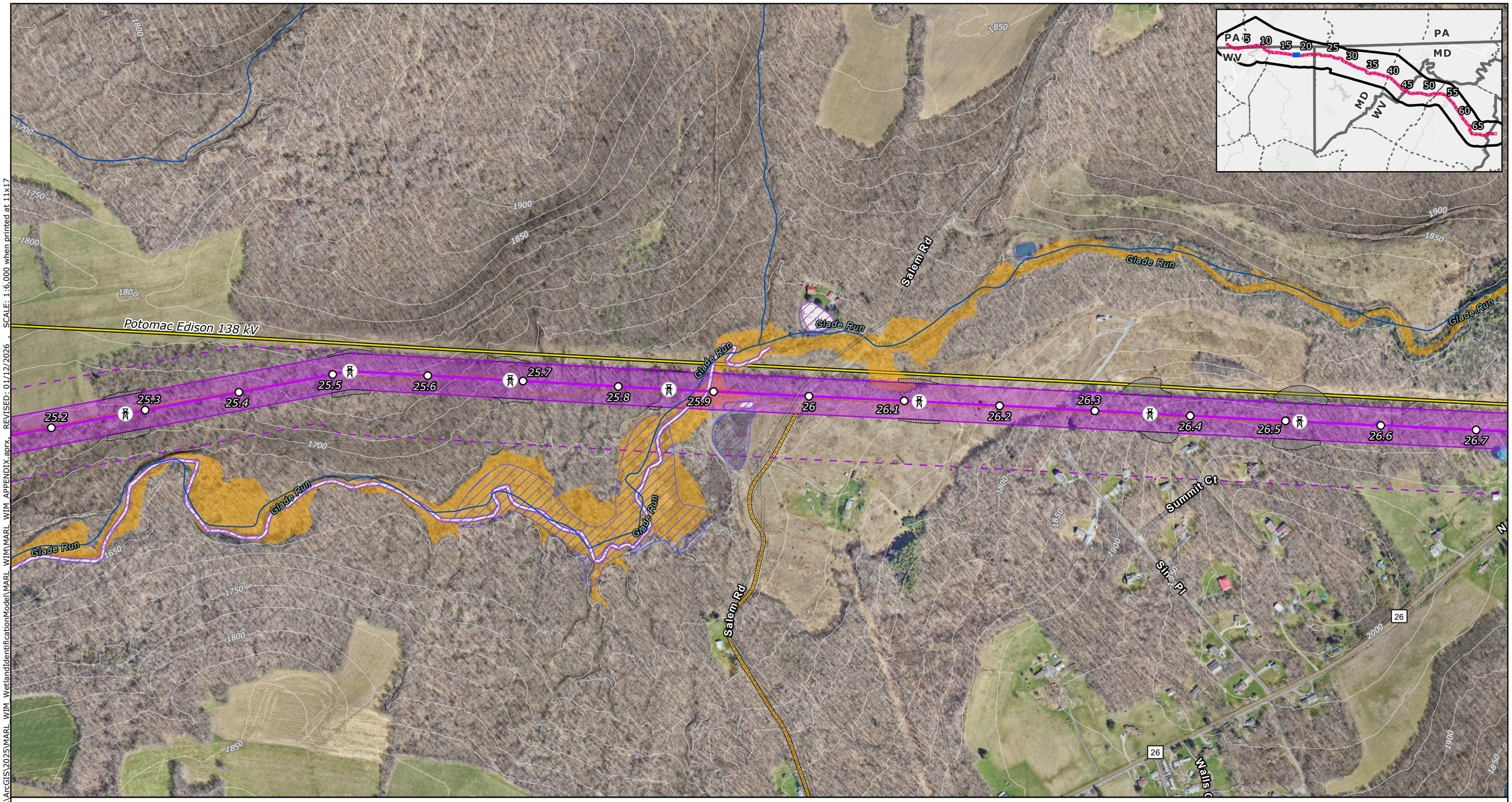

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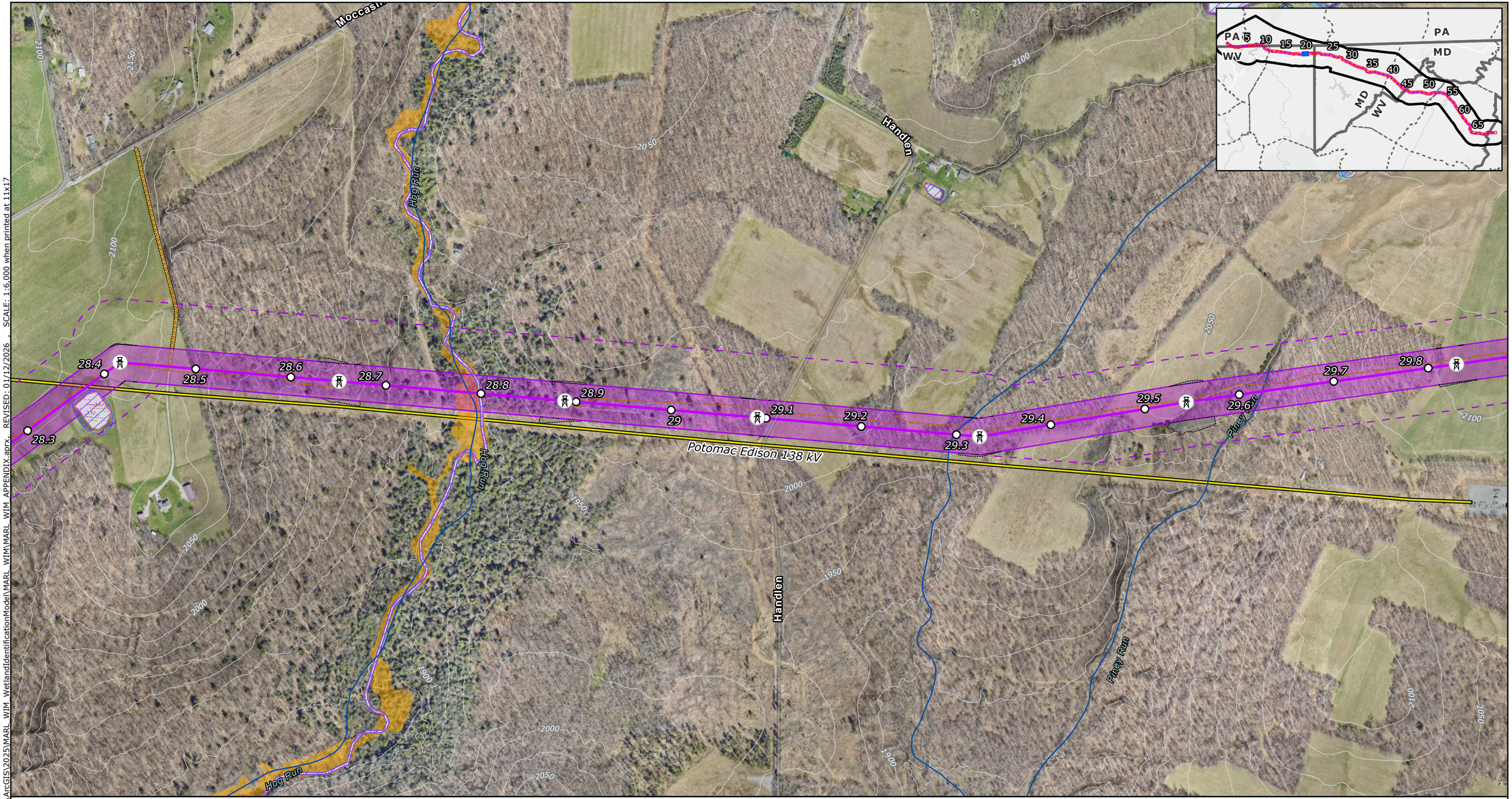

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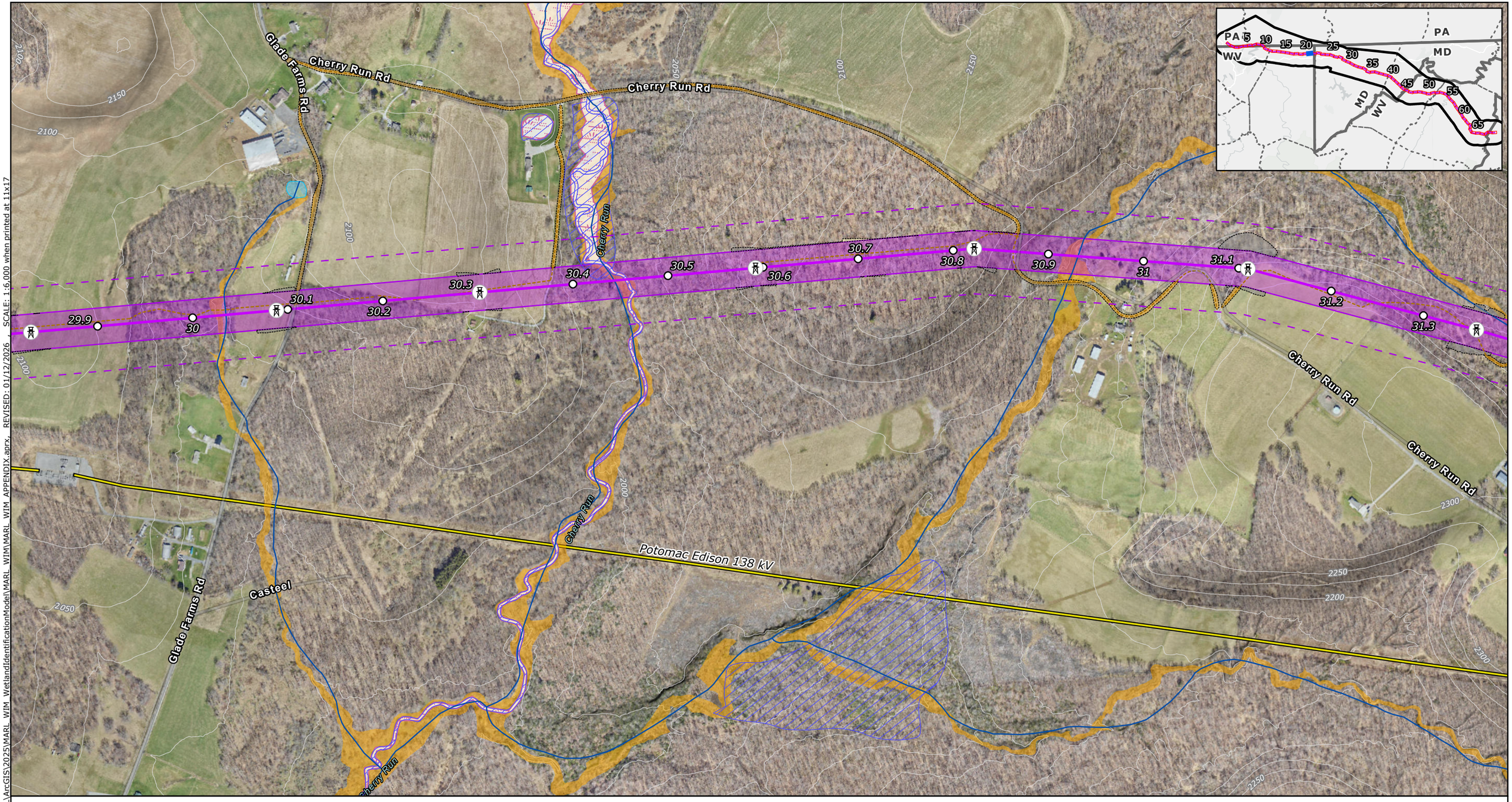

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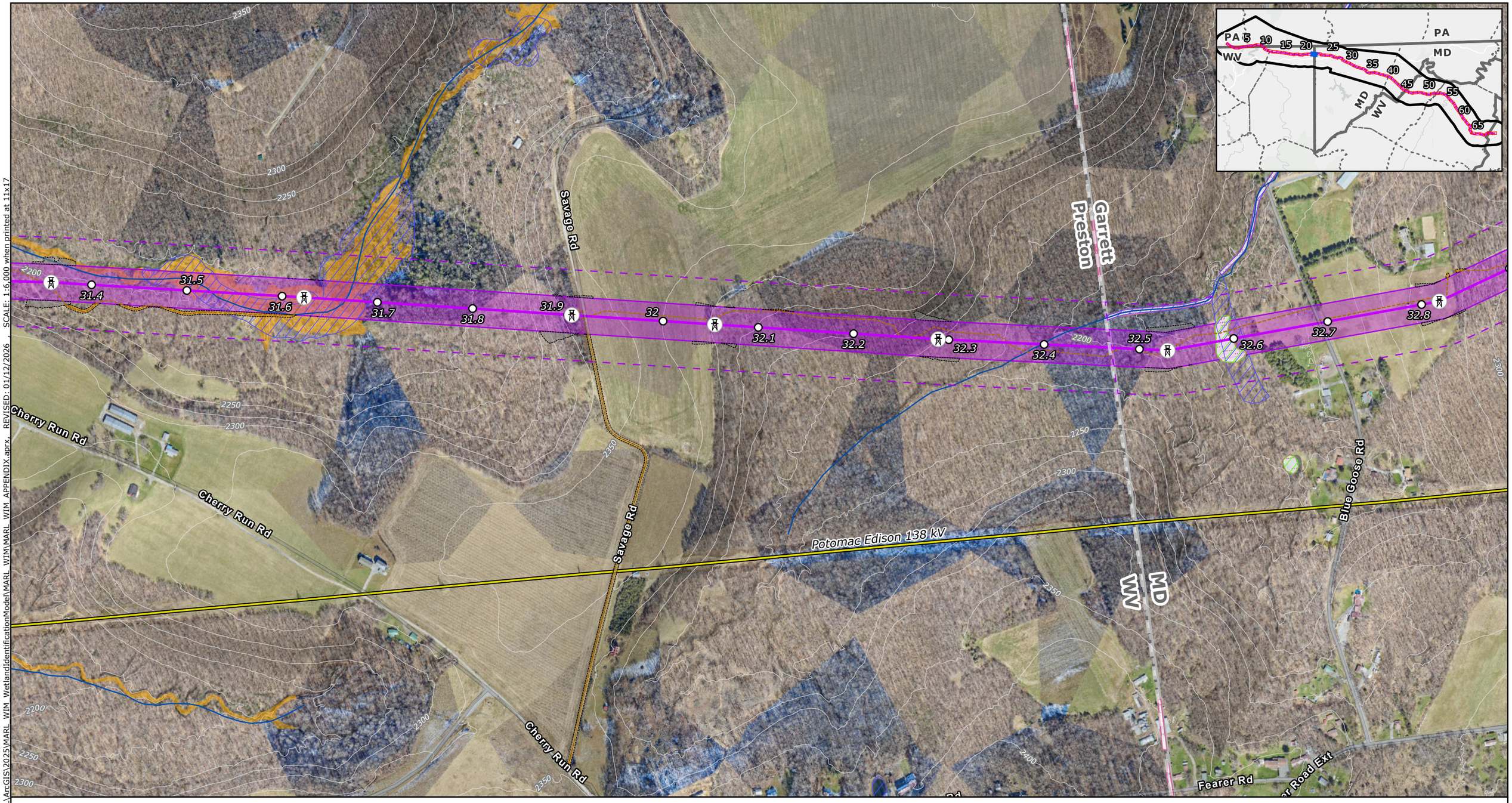

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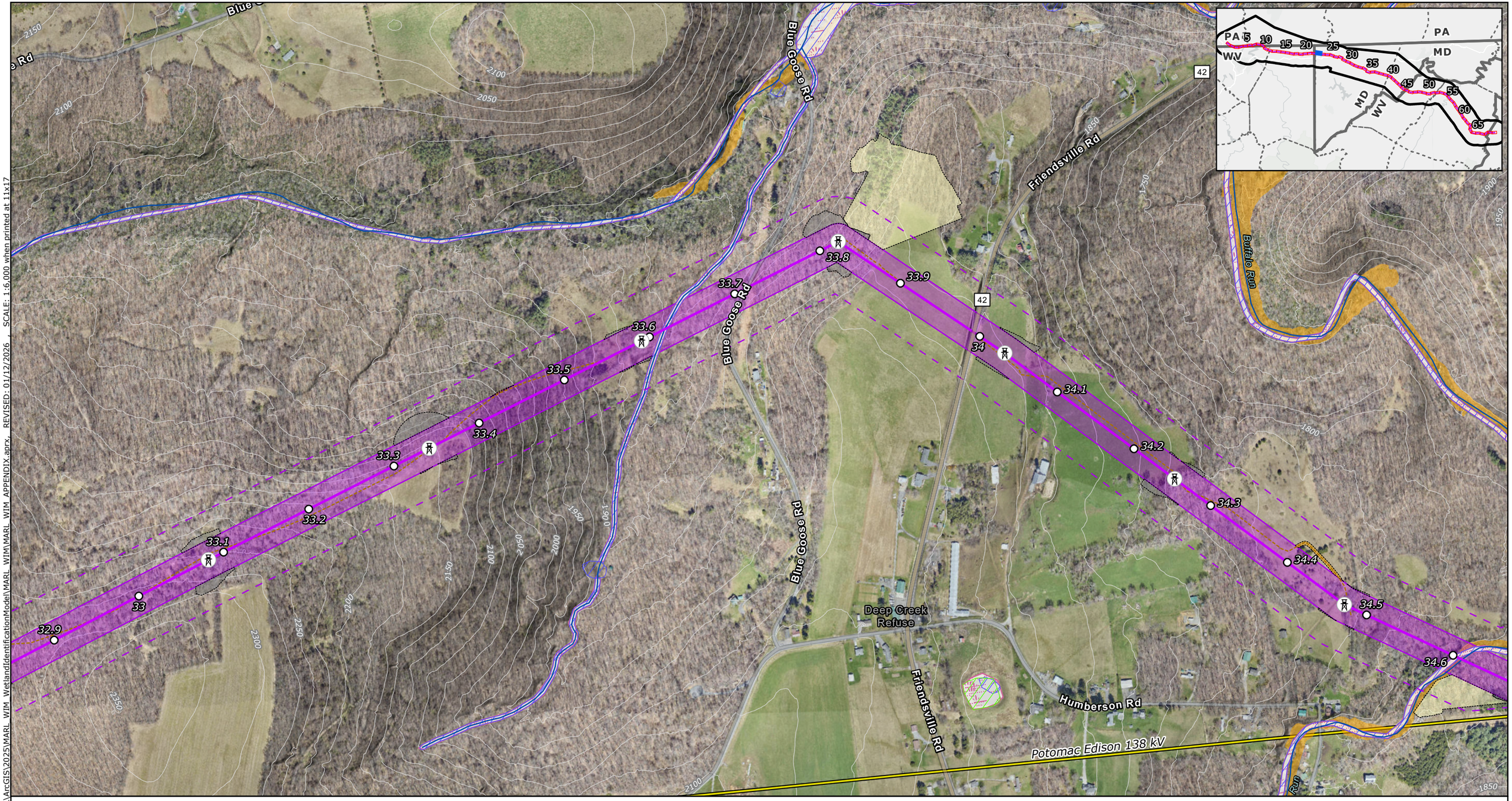

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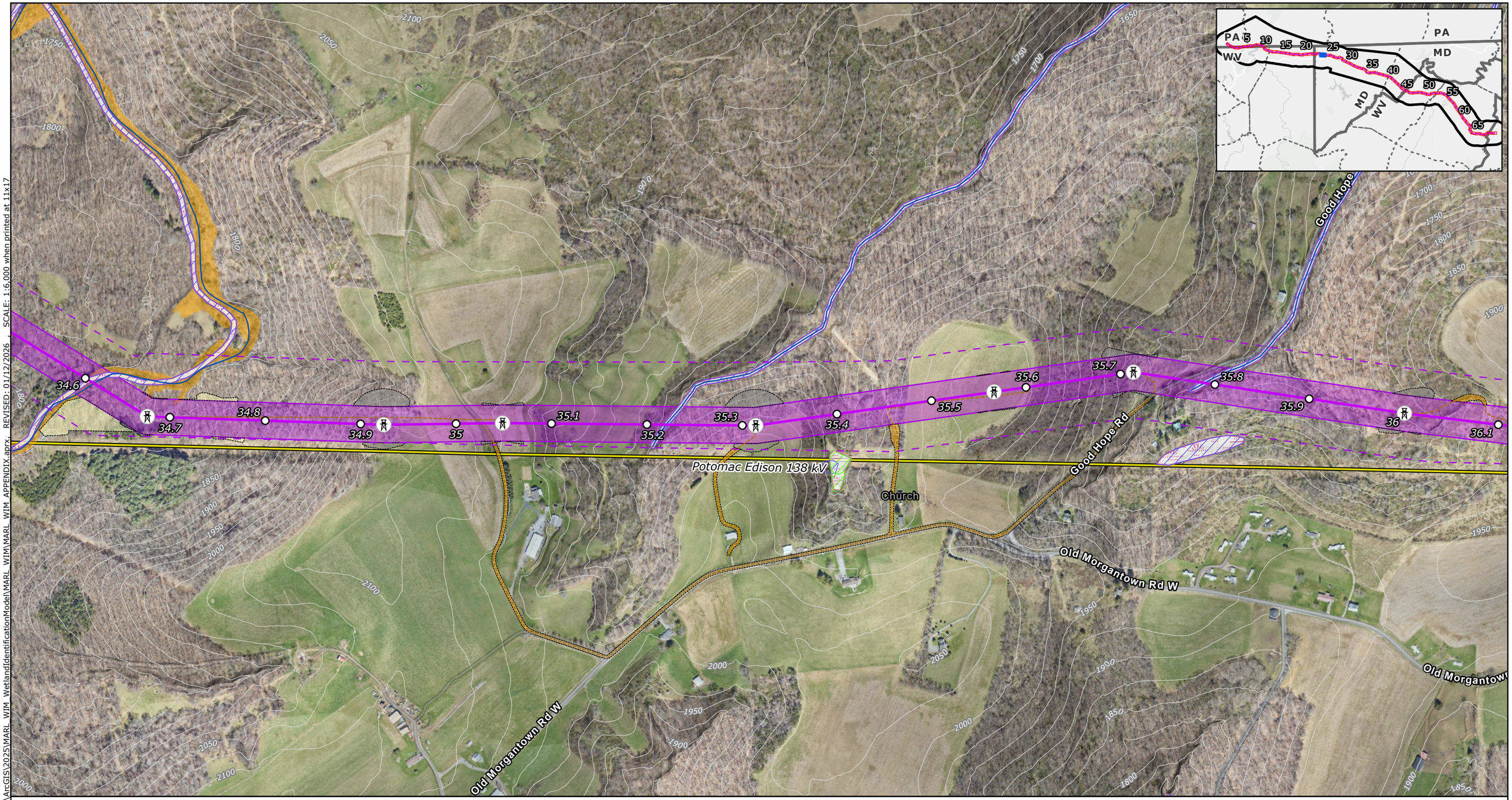

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Attachment 2
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Page 25 of 69
MidAtlantic Resiliency Link

ERM

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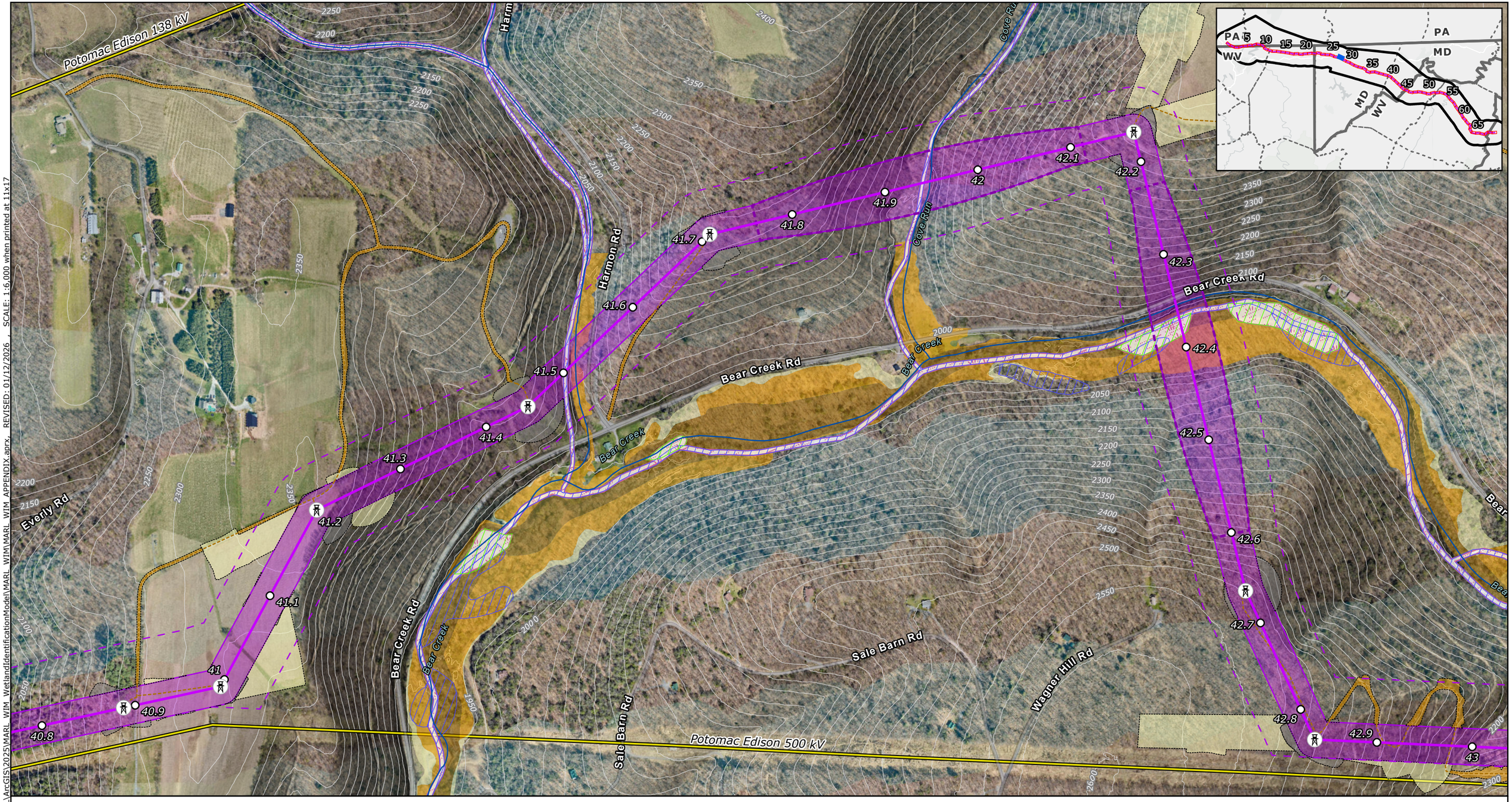

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Page 29 of 69
MidAtlantic Resiliency Link

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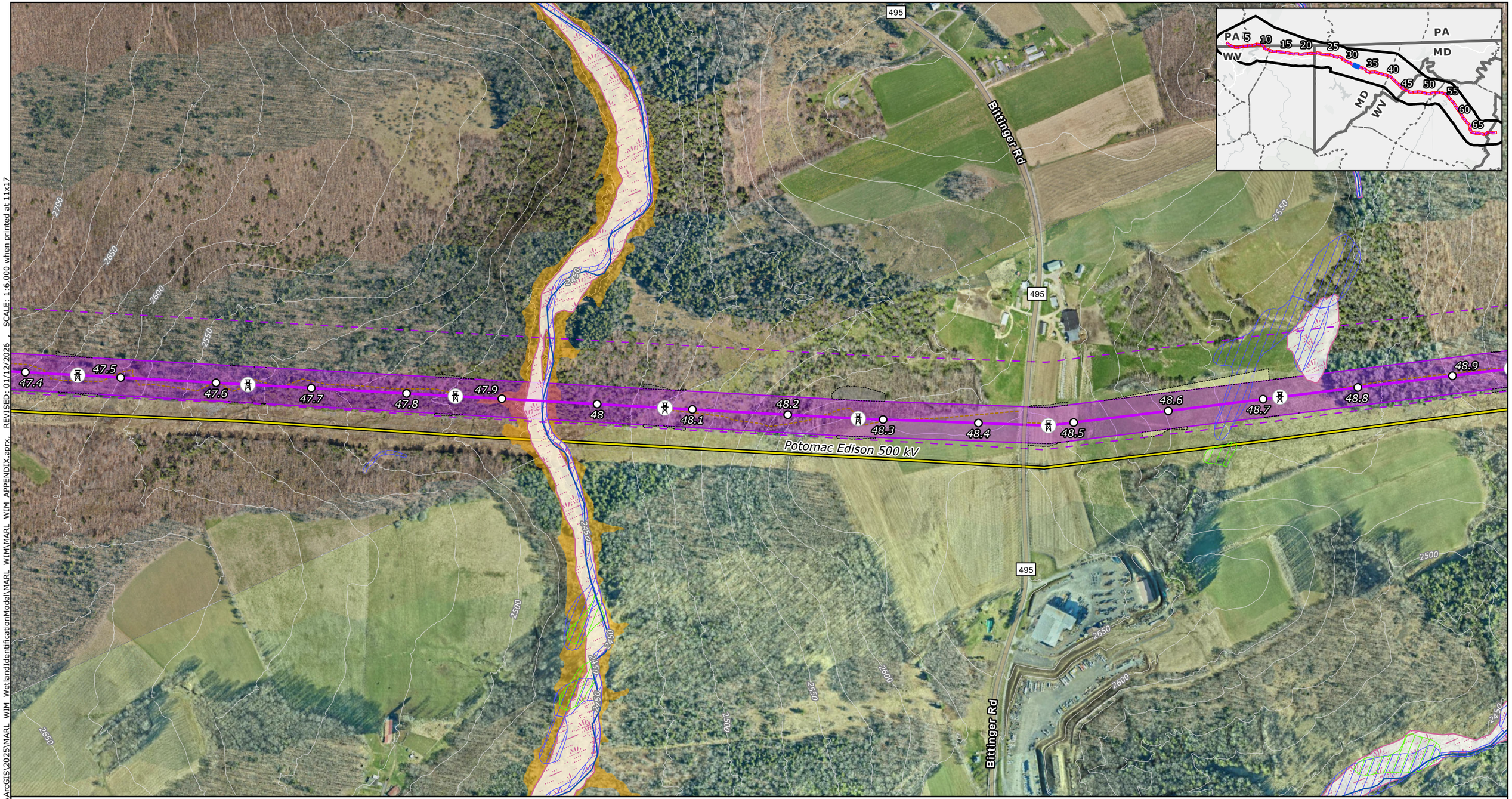

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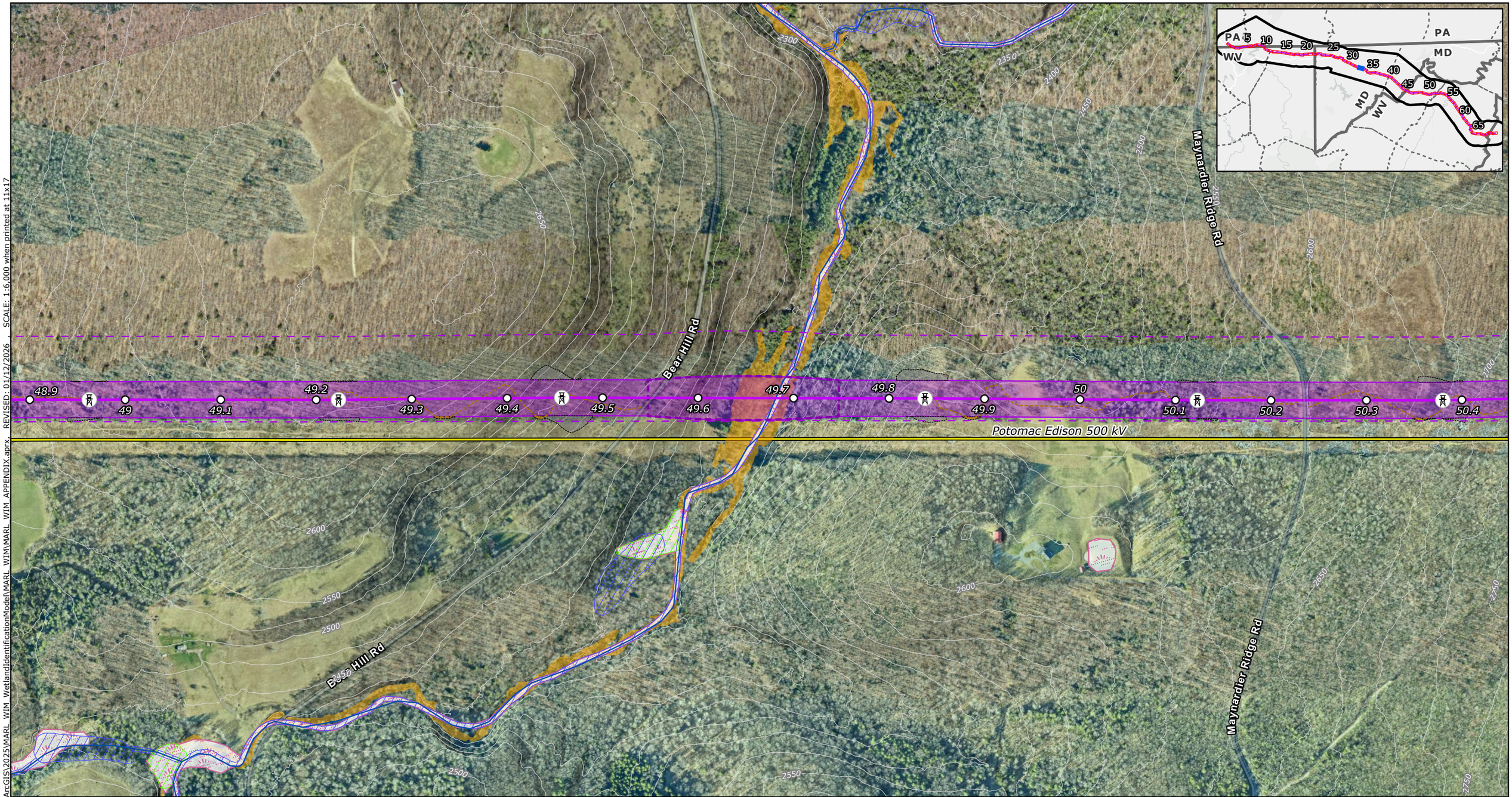

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Page 32 of 69
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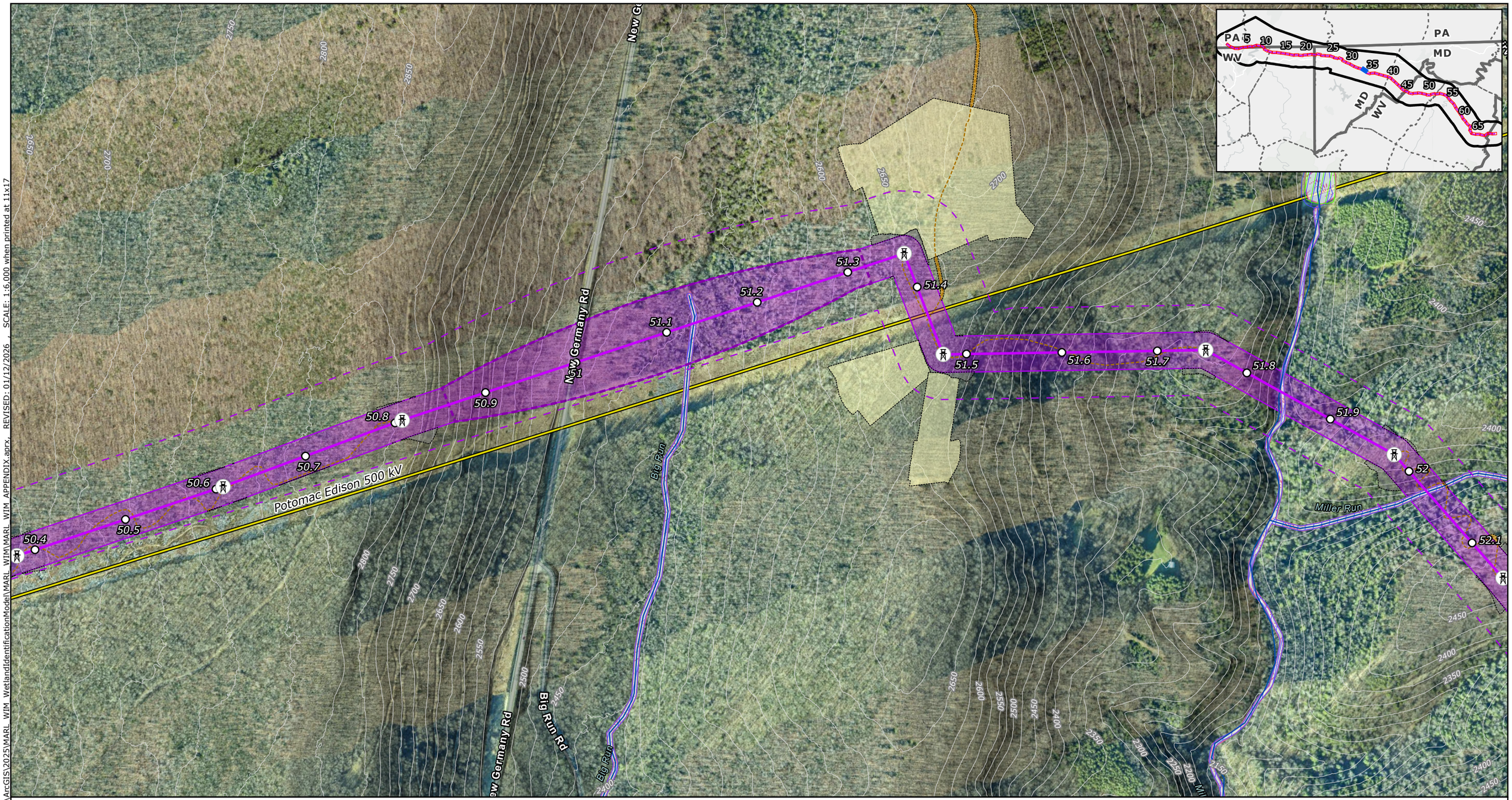

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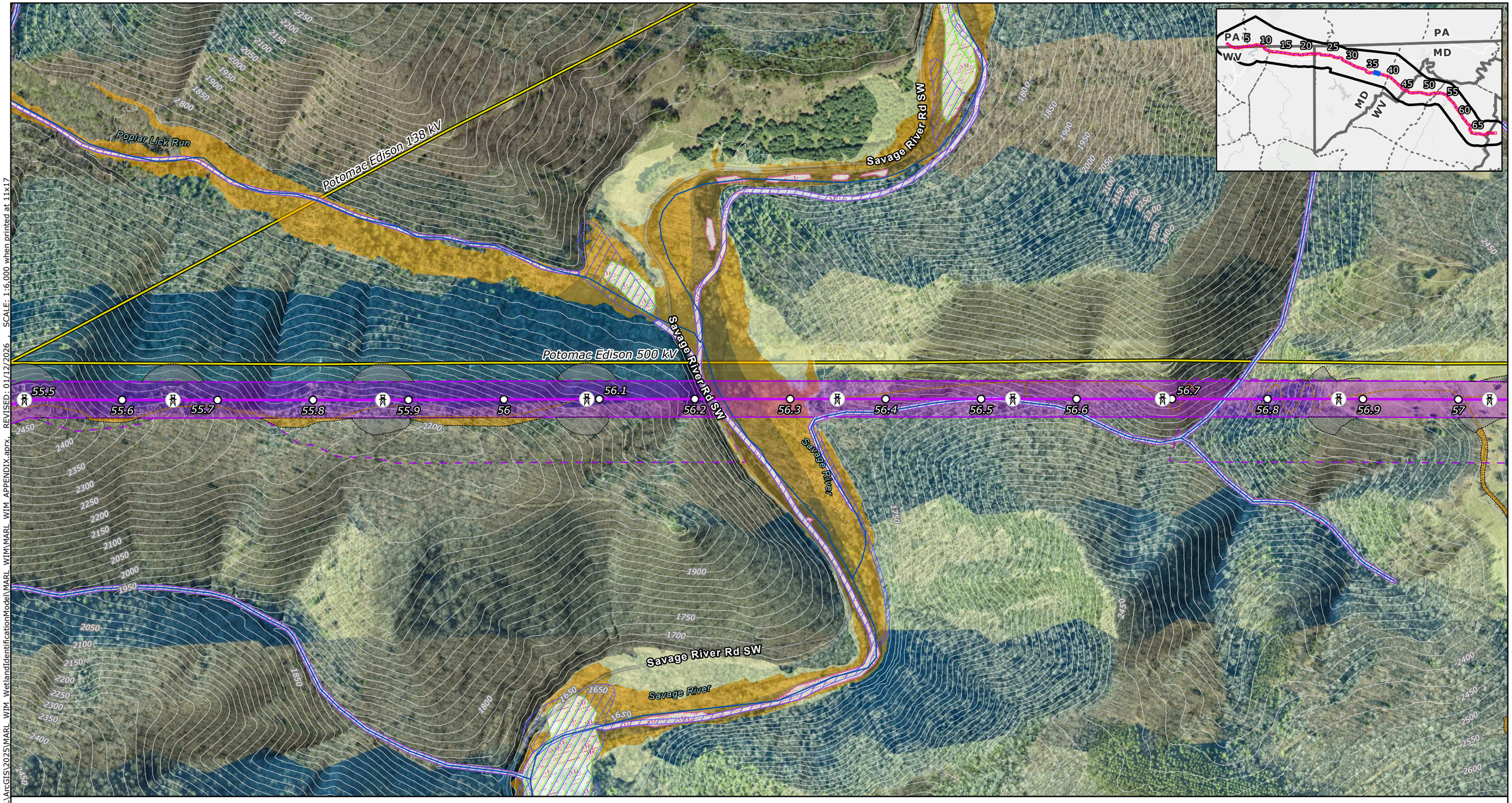

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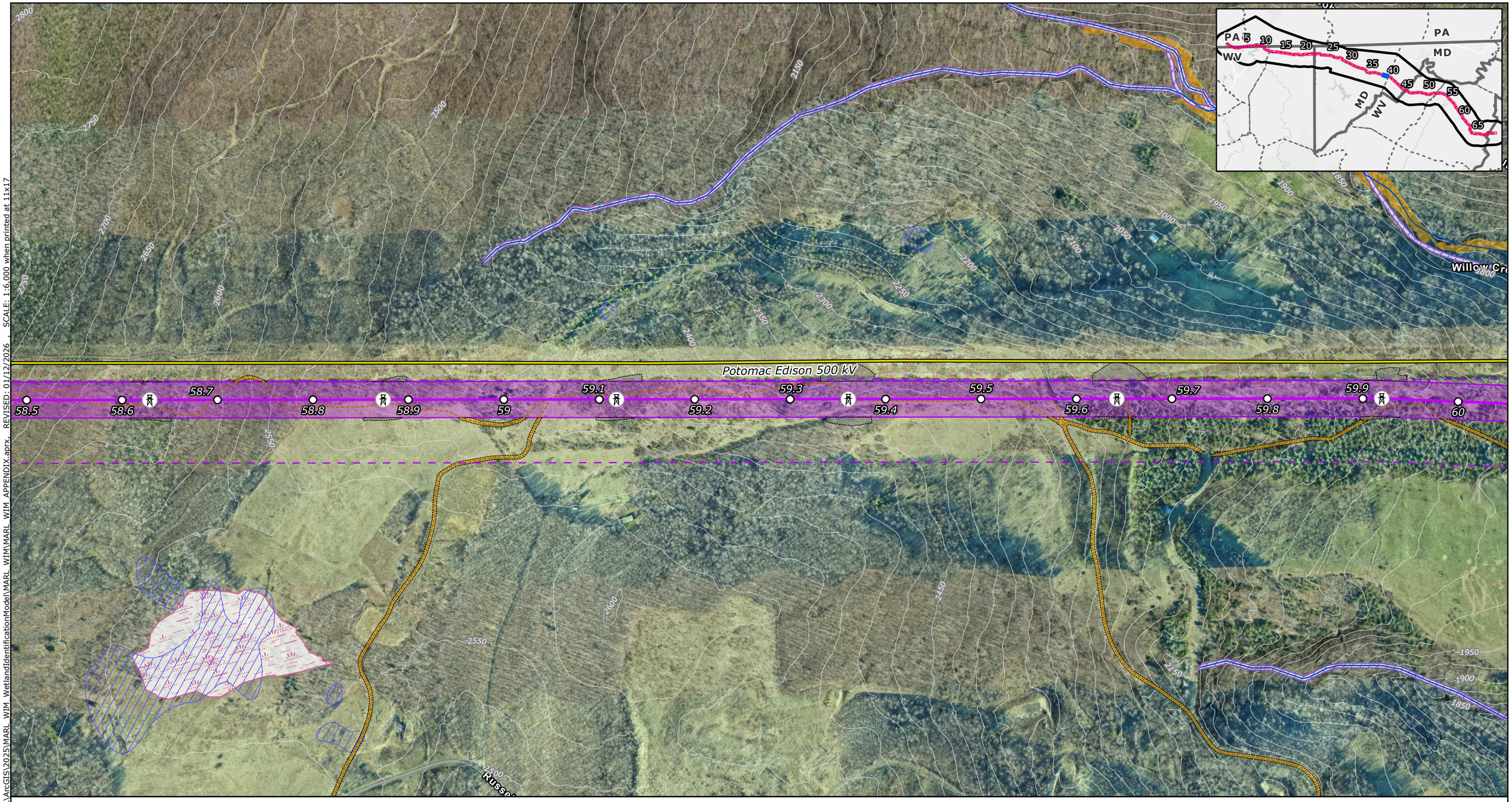

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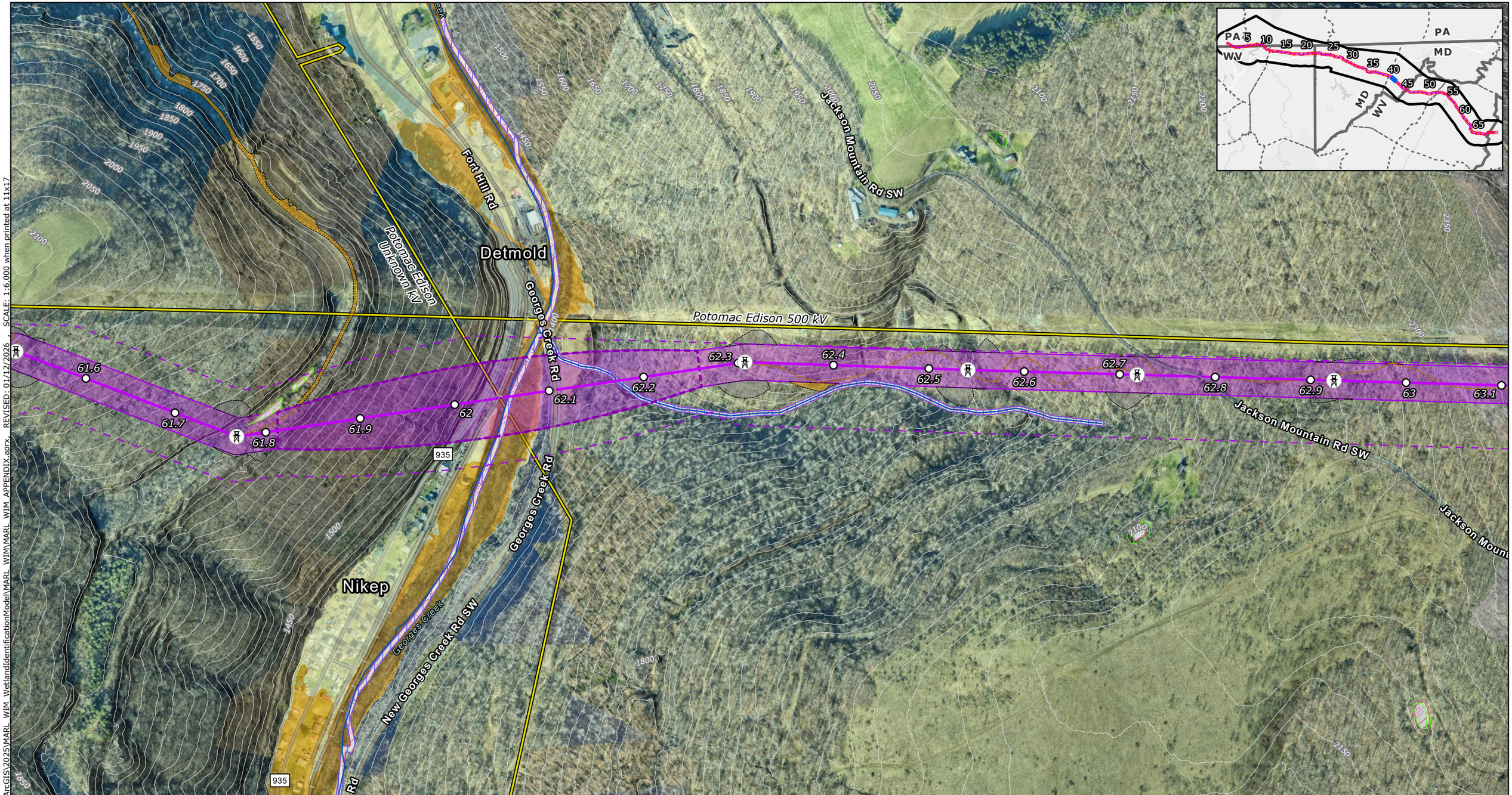

Proposed Project Components
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- Aerial Easement Blowout Area
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N

0 250 500 750 1,000
US Feet
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Attachment 2
Modeled Wetlands Mapbook
Page 40 of 69
MidAtlantic Resiliency Link

ERM

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Page 41 of 69
MidAtlantic Resiliency Link

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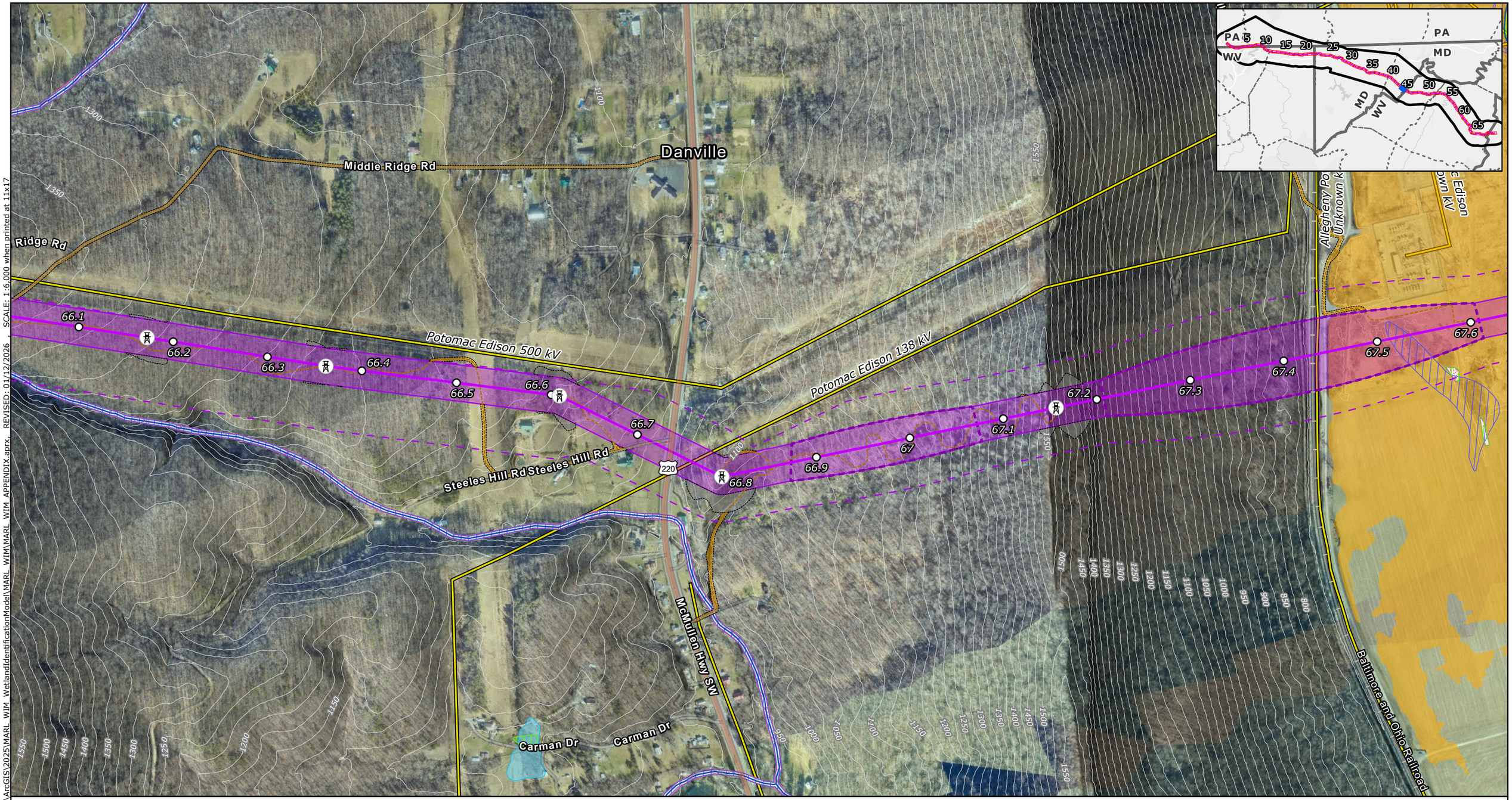

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Page 43 of 69
MidAtlantic Resiliency Link

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Page 44 of 69
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Page 45 of 69
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Page 46 of 69
MidAtlantic Resiliency Link

ERM

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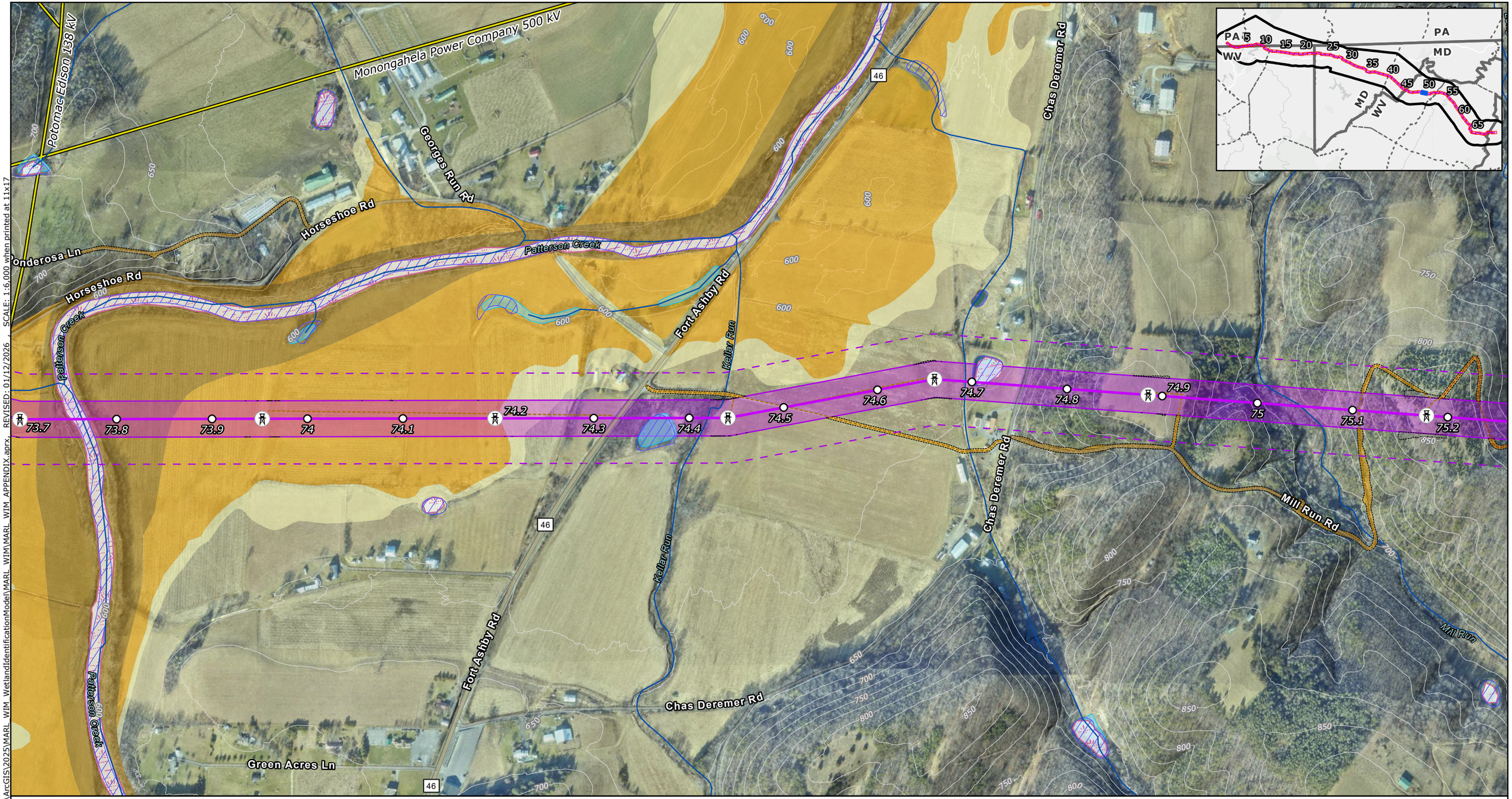

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Page 51 of 69
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Page 53 of 69
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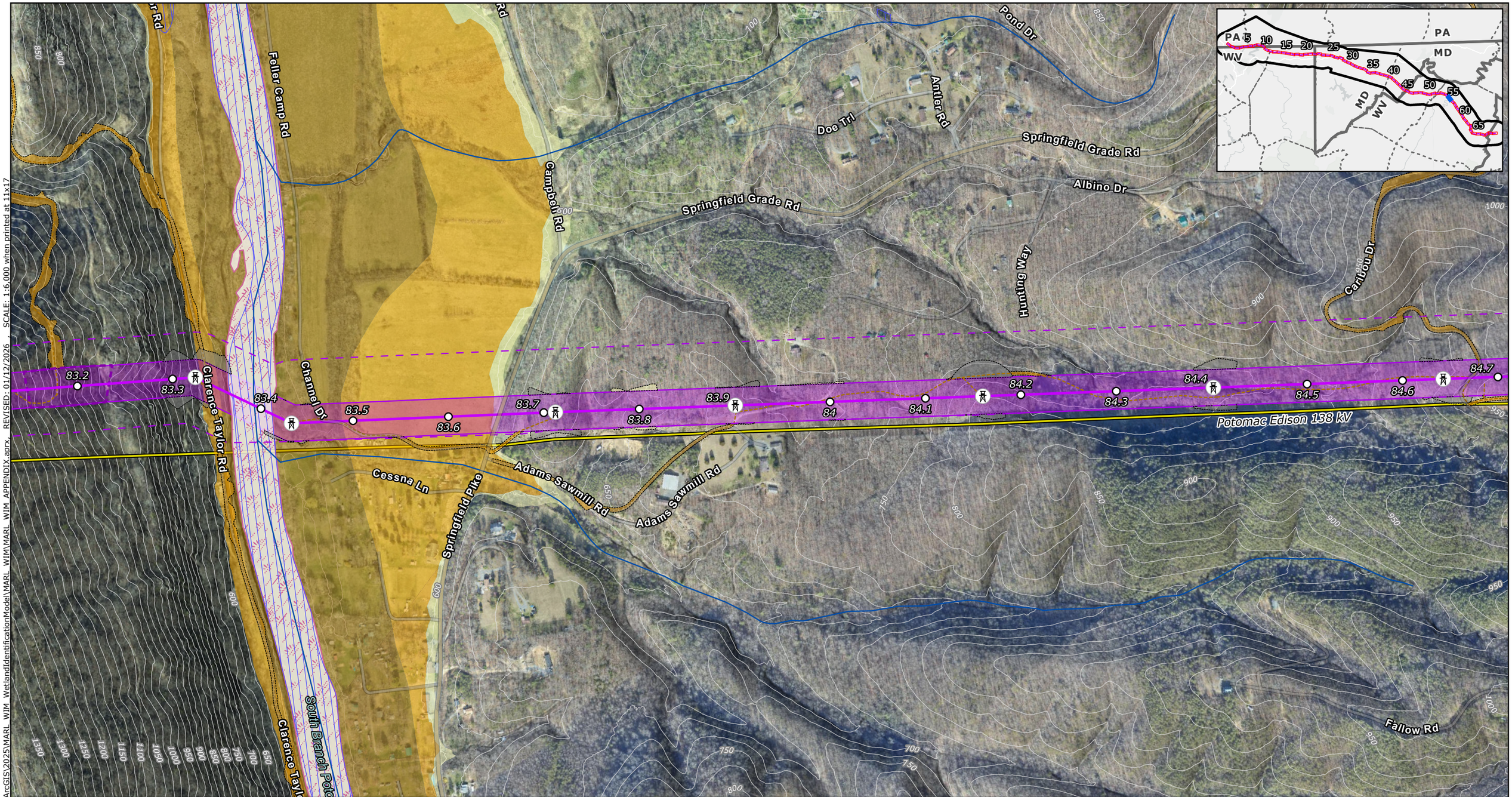

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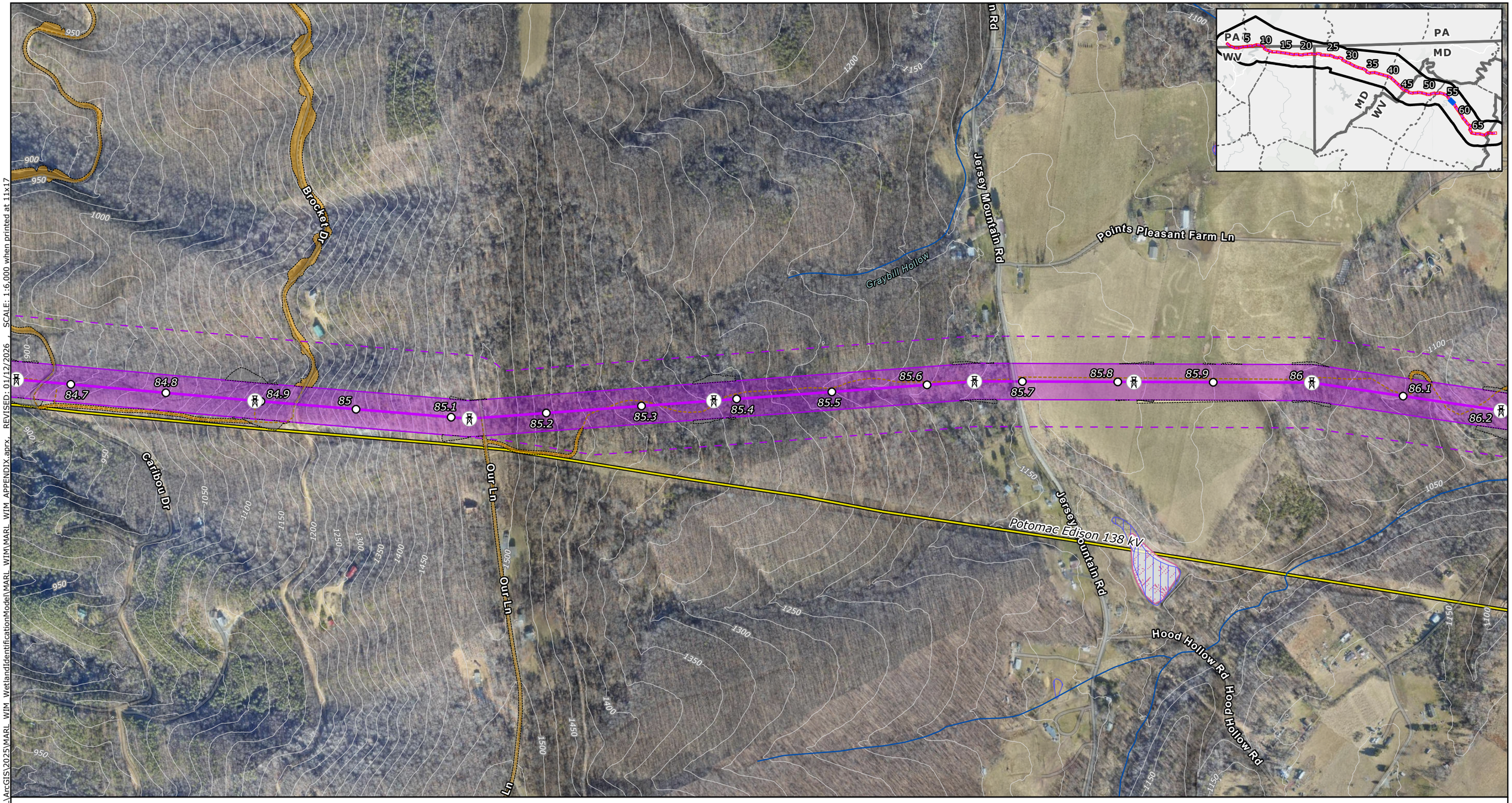

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0 250 500 750 1,000

US Feet

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Attachment 2
Modeled Wetlands Mapbook
Page 55 of 69
MidAtlantic Resiliency Link

ERM

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Page 56 of 69
MidAtlantic Resiliency Link

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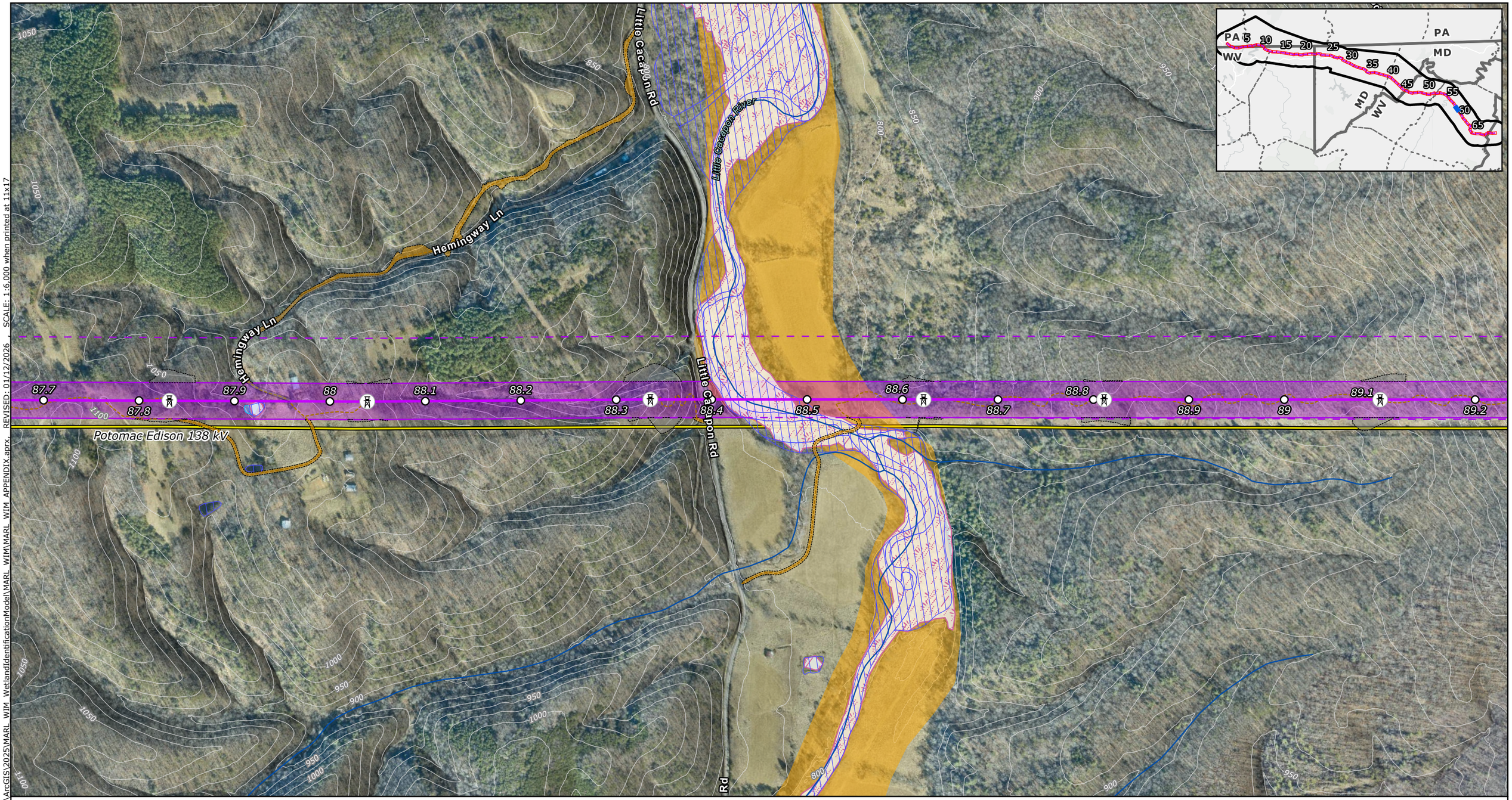

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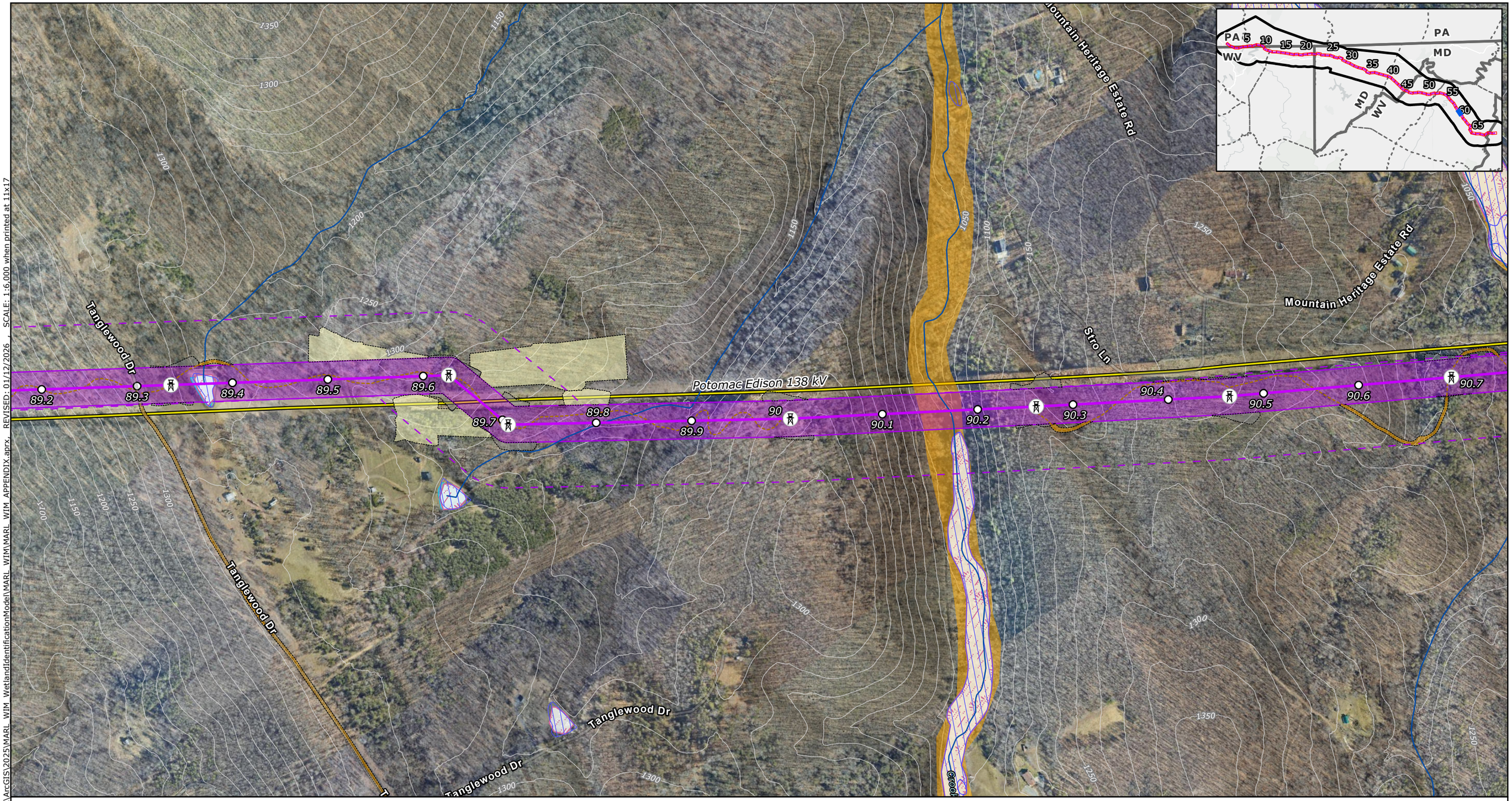

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Page 60 of 69
MidAtlantic Resiliency Link

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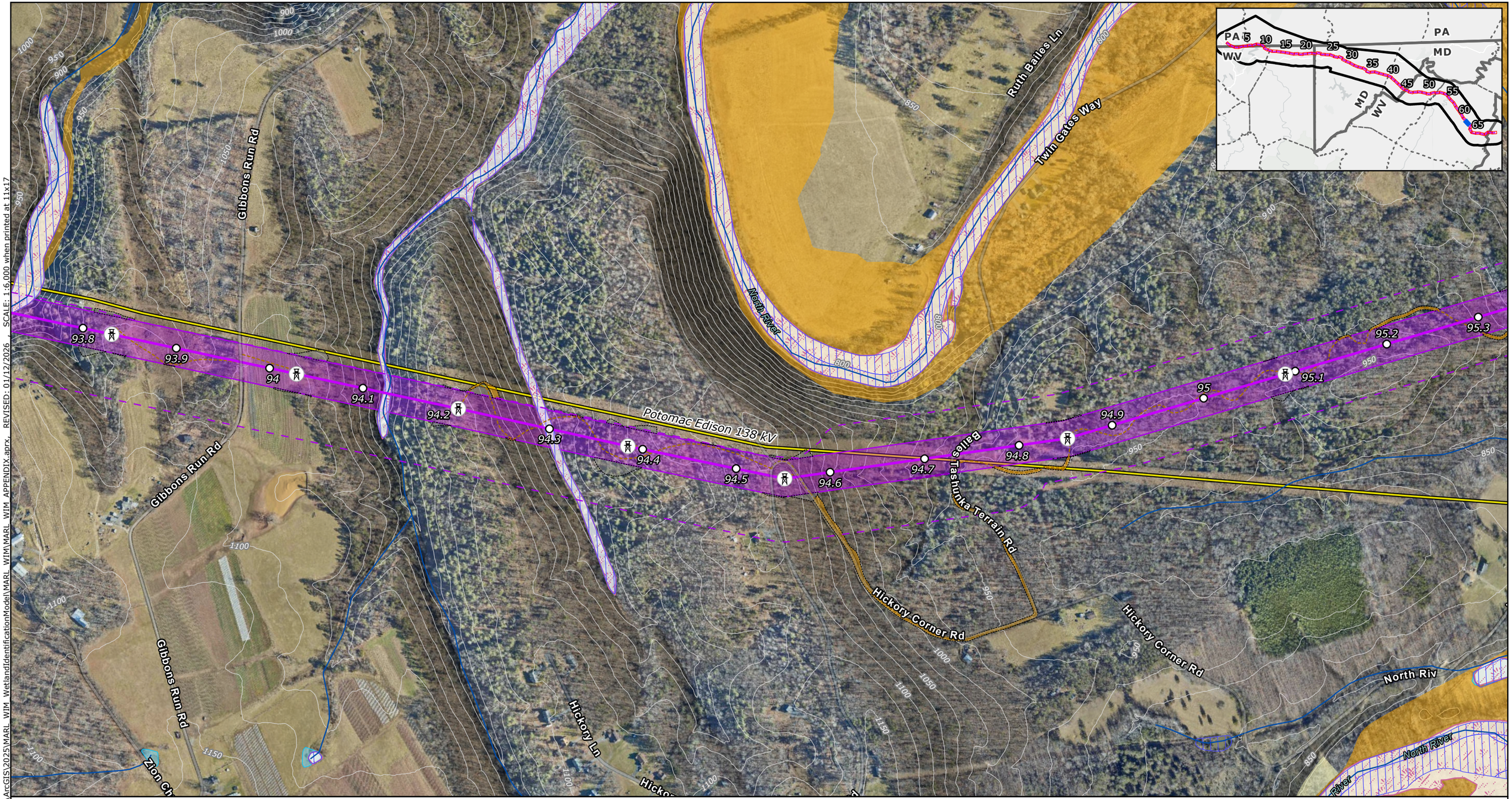

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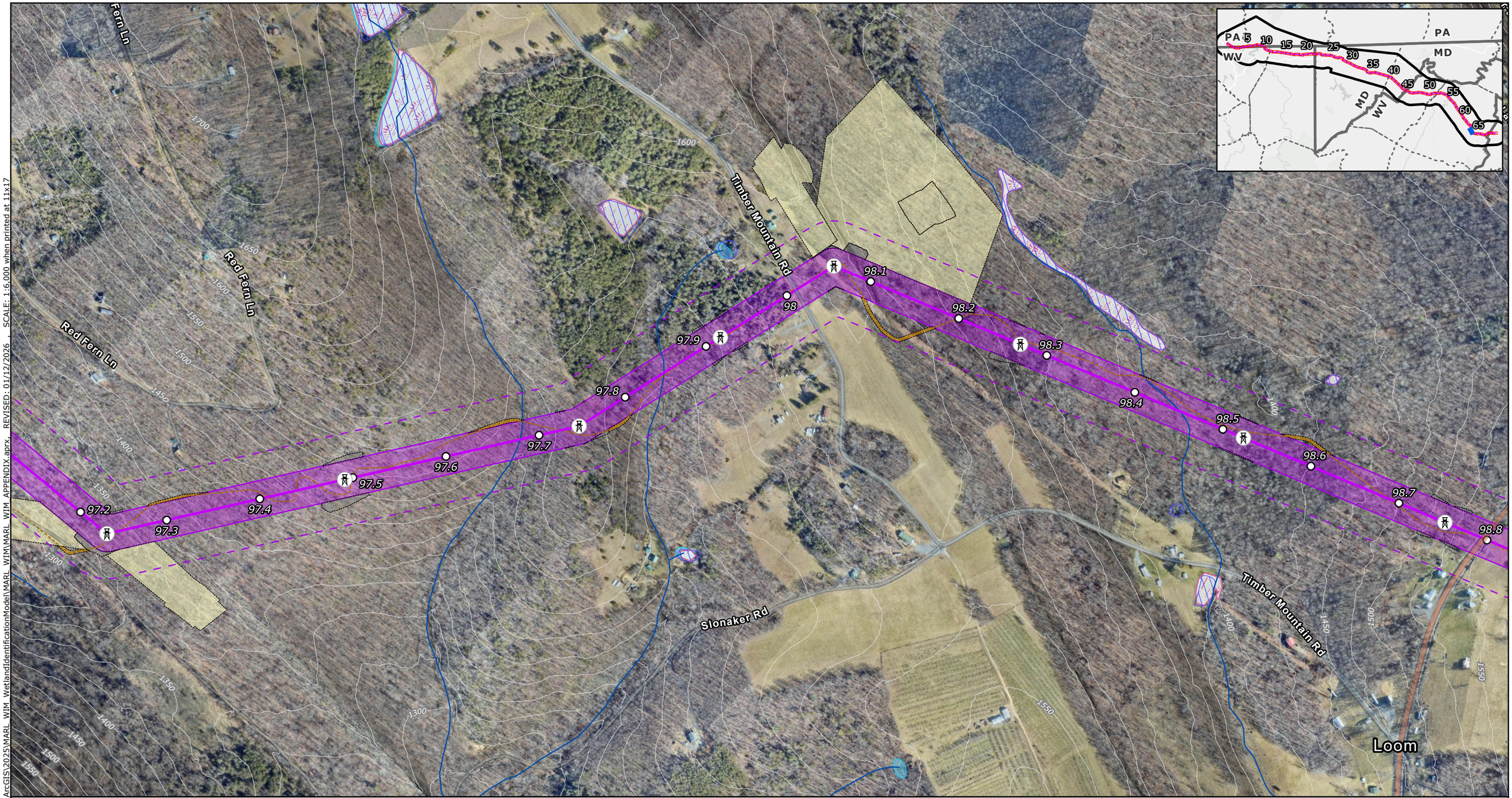

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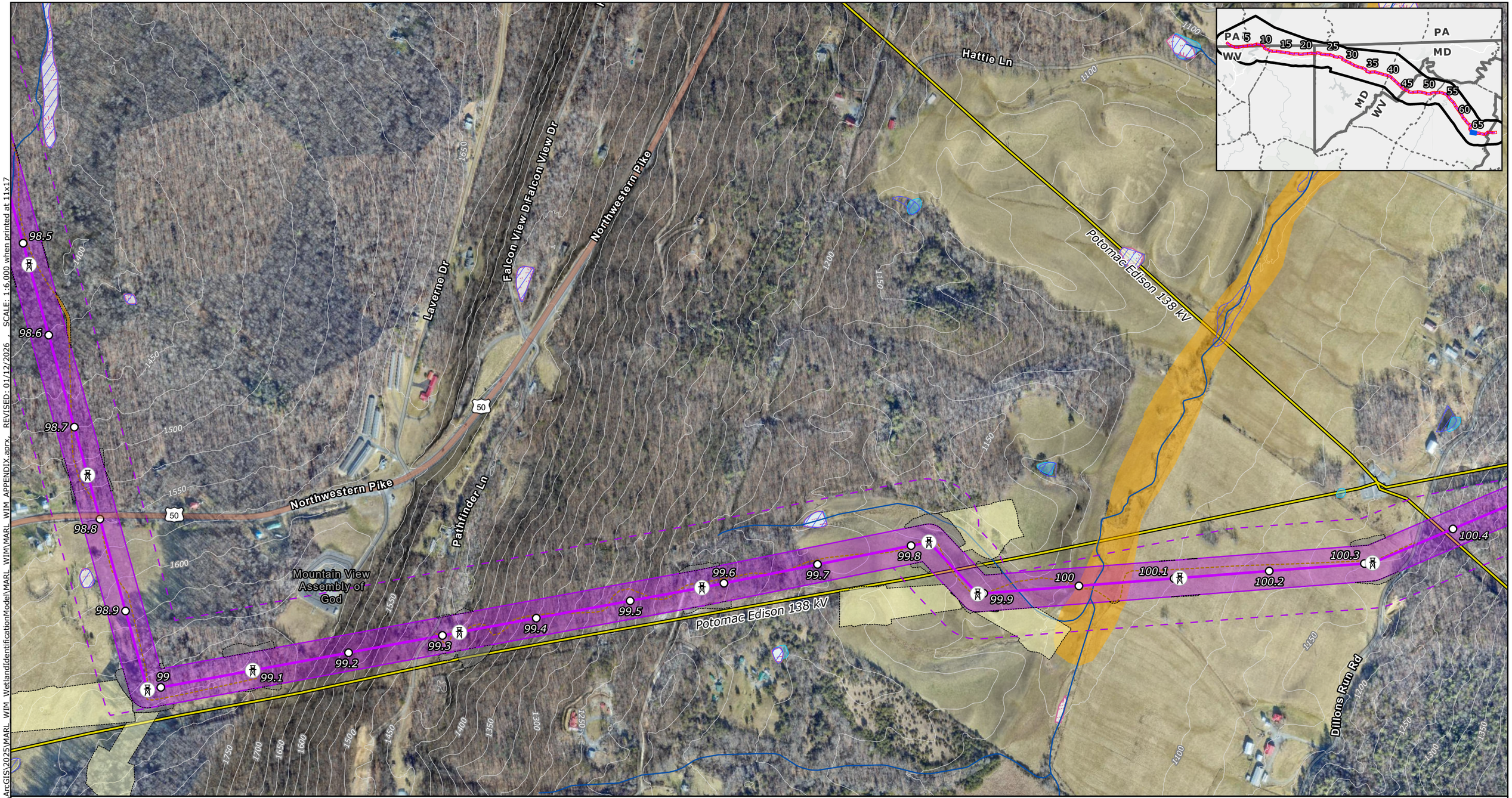

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Page 64 of 69
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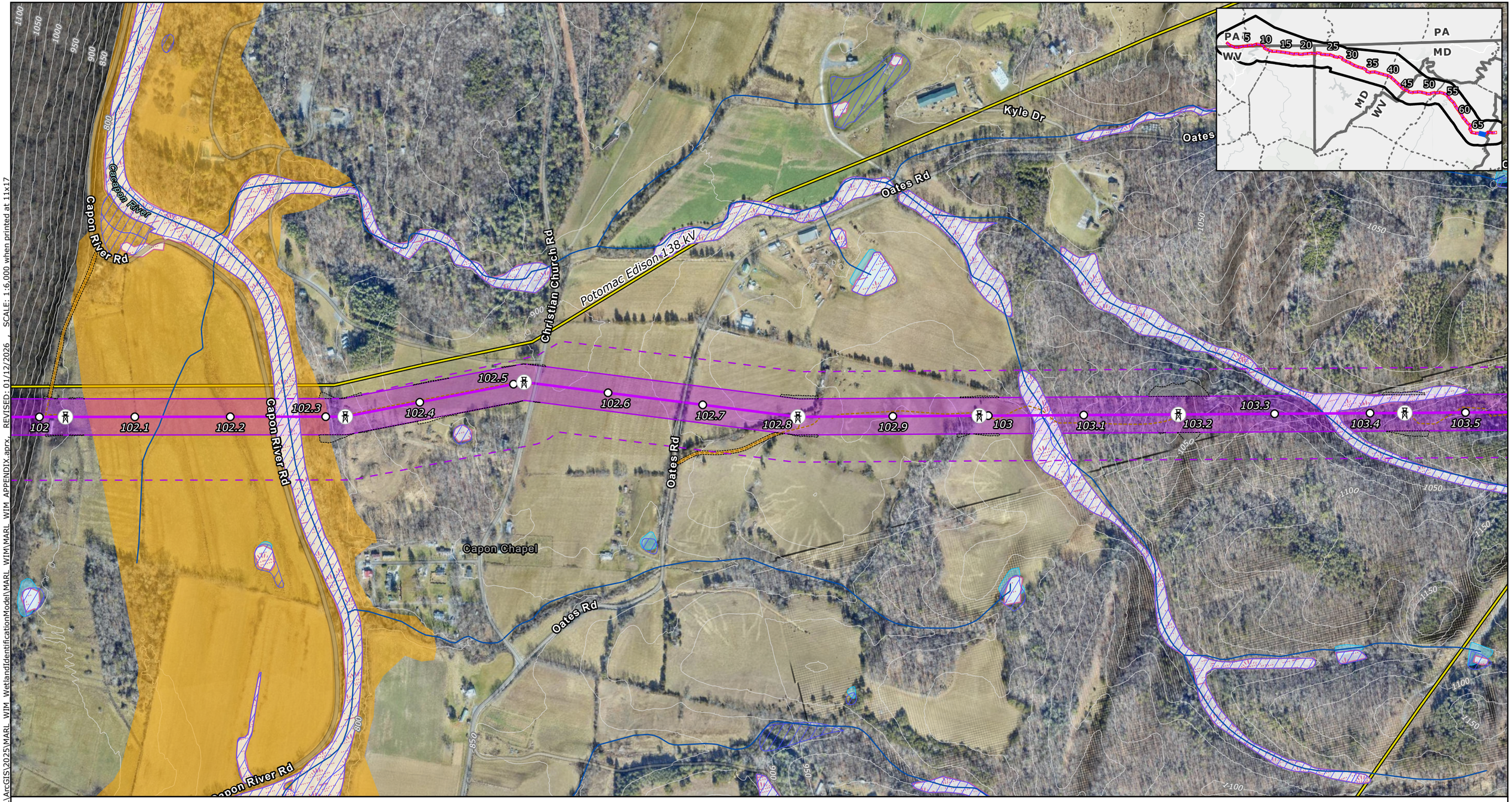

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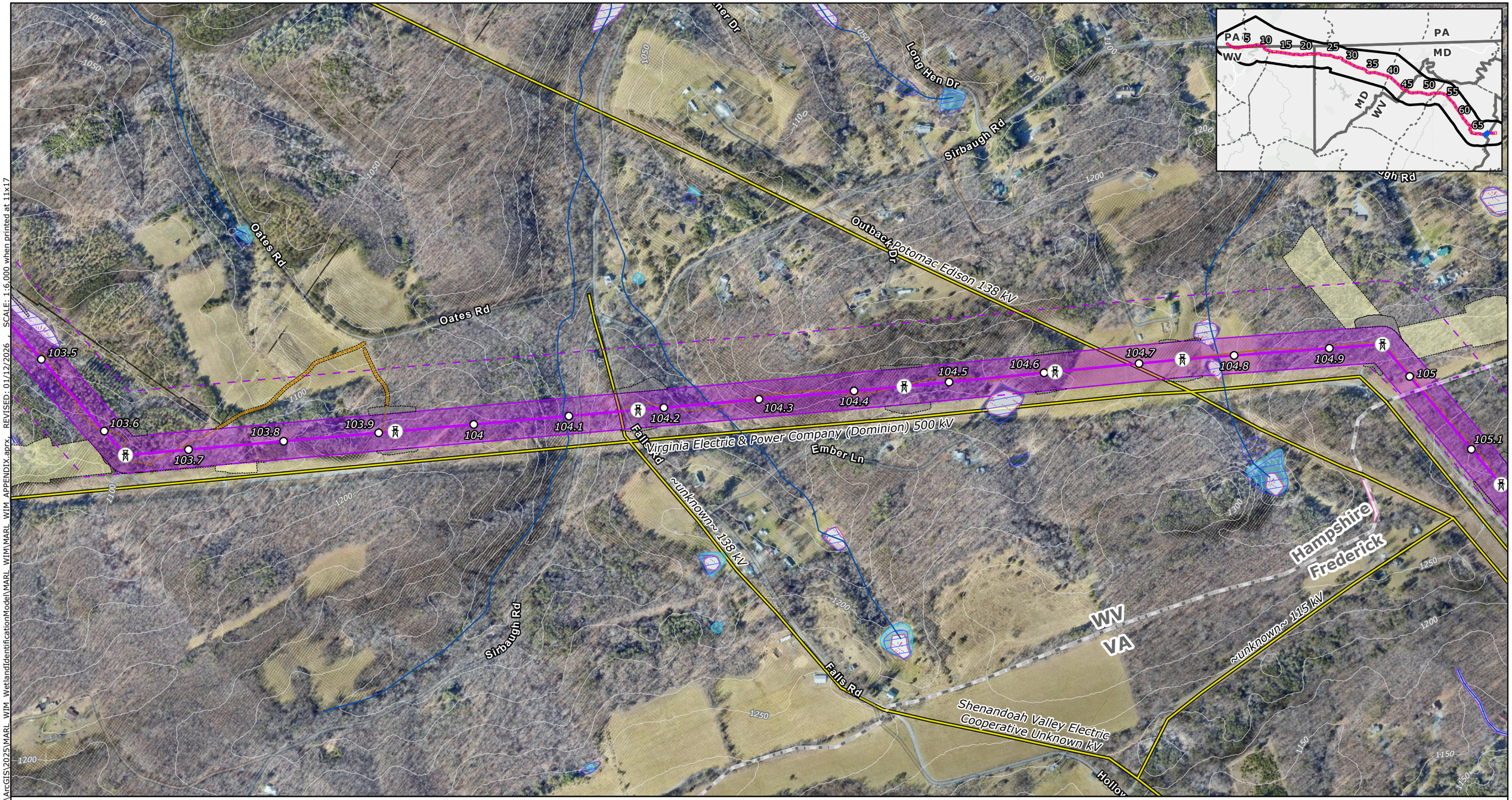

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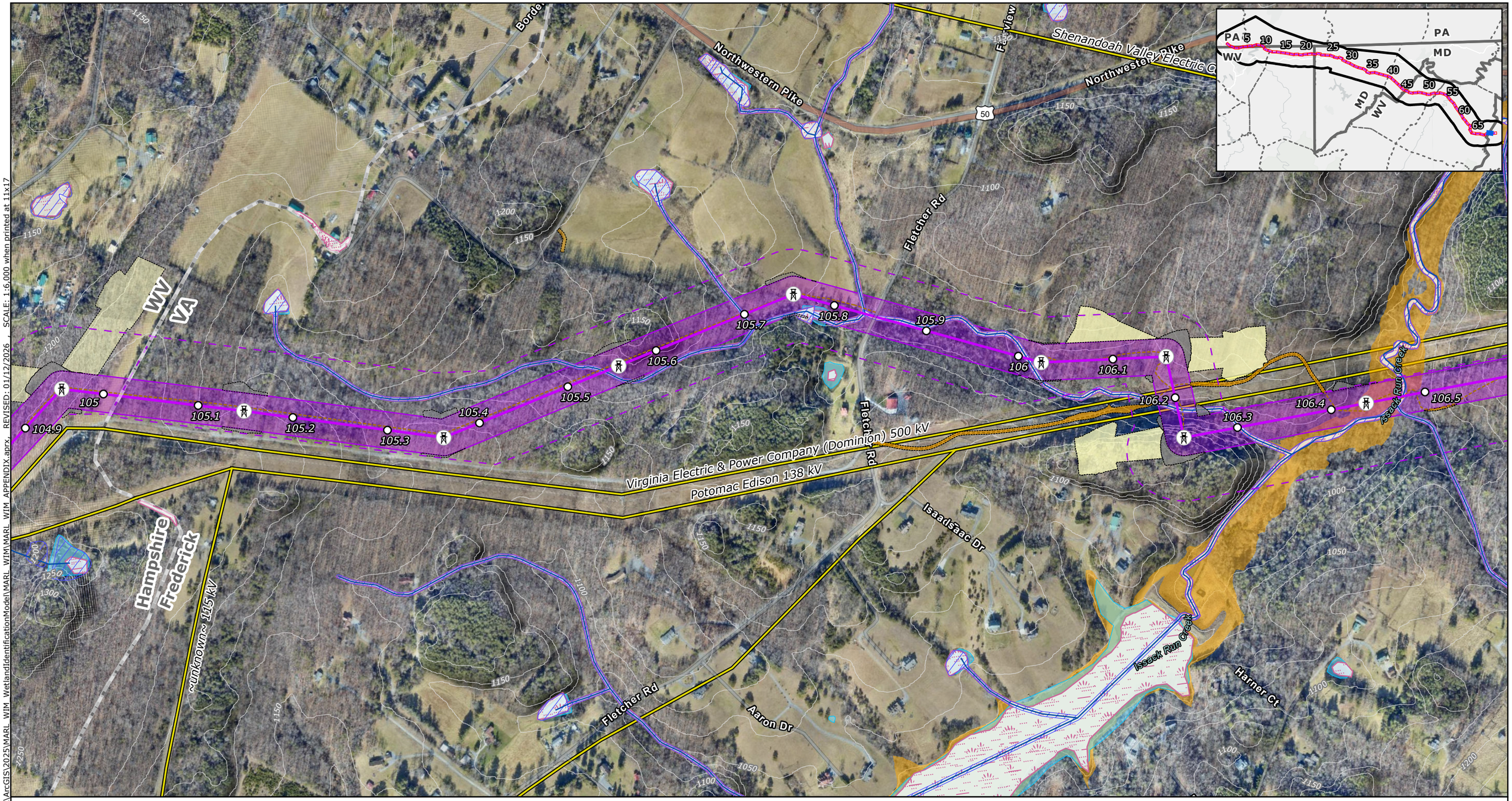

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MidAtlantic Resiliency Link

ERM

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Coordinate system: NAD 1983 UTM Zone 17N

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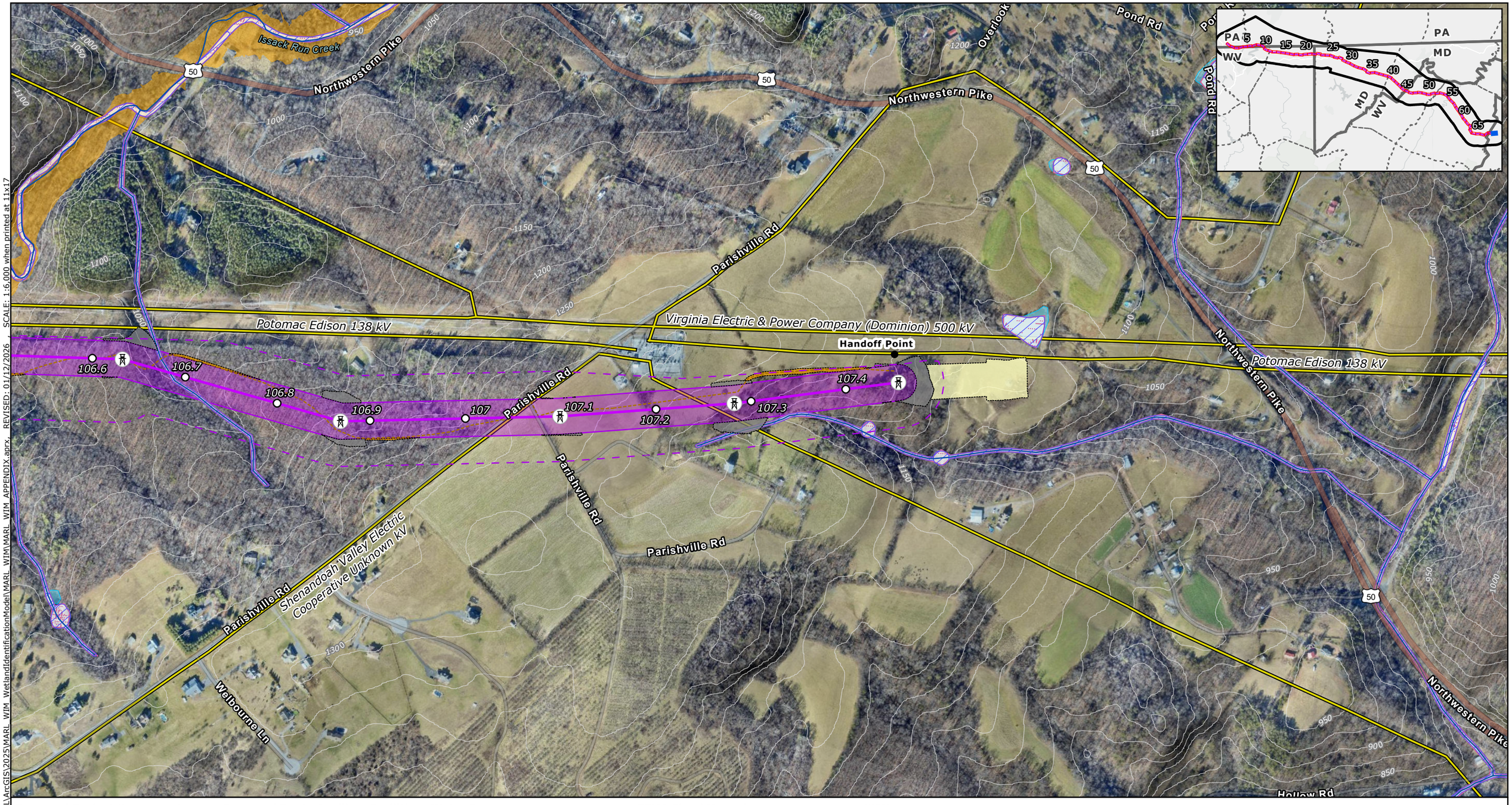

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REVISED: 01/12/2026

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Proposed Project Components
- Project Endpoints
- Proposed Route Towers
- Milepost
- Proposed Route Centerline
- Proposed Route ROW Corridor
- Aerial Easement Blowout Area
- Proposed Route Siting Corridor

Proposed Route Ancillary Facilities
- Permanent Access Road
- Temporary Access Road
- Access Road LoD
- Wire Work Area LoD
- Structure Pad LoD

Base Data
- Existing High-Voltage Transmission Lines (>69kV)
- State Border
- County Boundary

Water Resources
- NHD Flowline
- NHD Waterbody
- MDNR Wetlands
- NWI Wetlands
- Modeled High Probability Wetlands

FEMA Flood Hazard
- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

NOTES
1. *Proposed tower locations are preliminary and subject to change*
2. *Ancillary facilities were only designed for the proposed route*
3. *LoD is the limit of disturbance of the ancillary facilities outside of the ROW Corridor*
4. *Data source: NextEra, ERM, MD DNR, MDE, USGS NHD, USFWS NWI, MD iMAP Portal*

N

0 250 500 750 1,000

US Feet

Scale: 1:6,000

1 inch equals 500 ft (when printed at 11x17)

Coordinate system: NAD 1983 UTM Zone 17N

Attachment 2
Modeled Wetlands Mapbook
Page 69 of 69
MidAtlantic Resiliency Link

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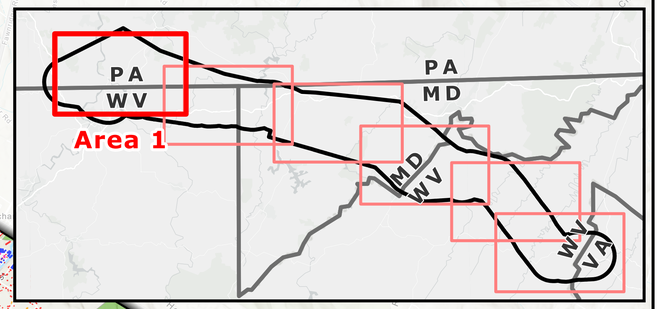
APPENDIX I PUBLIC OPEN HOUSE CONTENT

Preliminary Draft Route Options: Area 1



State Game Land 138

Forbes State Forest

Friendship Hill National Historic Site

State Game Land 223

Fayette County

Greene County

End Point

Point Marion Lock and Dam

Lake Lynn Dam

PA
WV

Greene County
Monongalia County

Fayette County
Preston County

River Trail

Cheat Lake

Monongahela River

Lake O' Woods

Coopers Rock State Forest

Quebec Run Wild Area

Agricul Easem

Legend

- End Points
- Project Study Area
- Counties
- Preliminary Proposed Route Options
- Existing High-Voltage Transmission Lines

High-Level Constraints

- Potomac Heritage Trail
- Hiking/Walking Trails
- Scenic Byways
- Stream/River (NHD)
- Maryland Wildlands
- Protected Areas

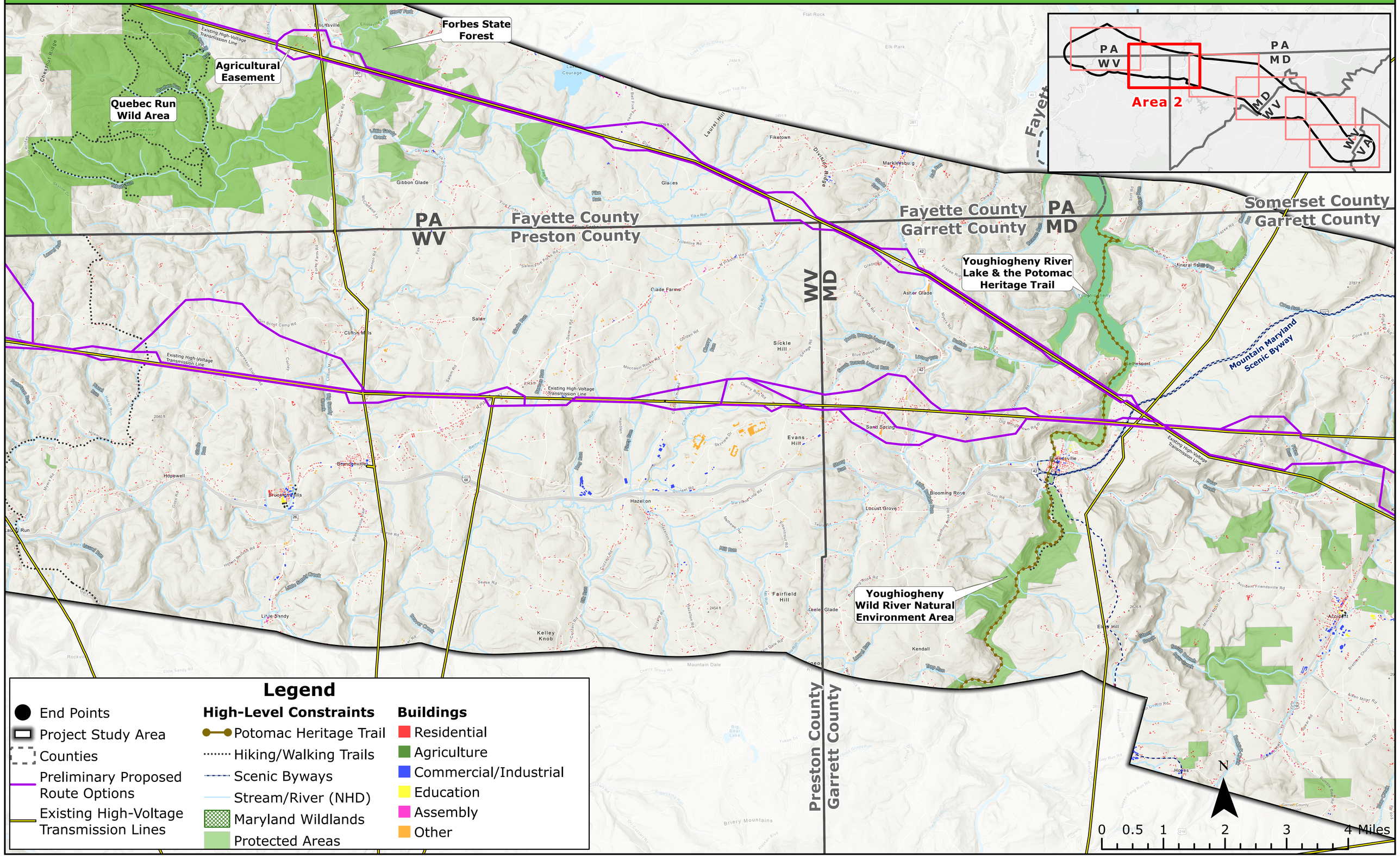
Buildings

- Residential
- Agriculture
- Commercial/Industrial
- Education
- Assembly
- Other

N

0 0.5 1 2 3 4 Miles

Preliminary Draft Route Options: Area 2



Legend

- End Points
- Project Study Area
- Counties
- Preliminary Proposed Route Options
- Existing High-Voltage Transmission Lines

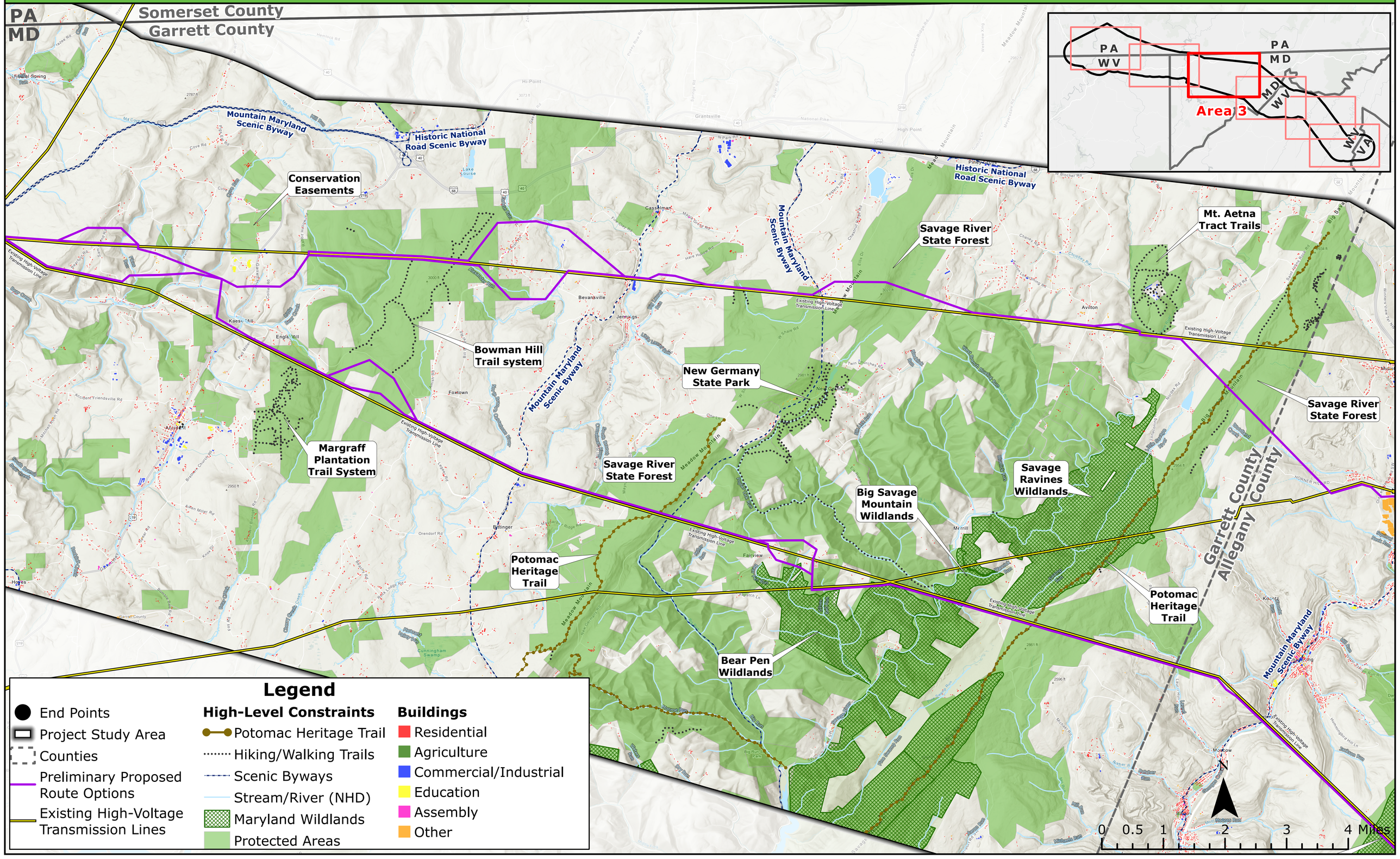
High-Level Constraints

- Potomac Heritage Trail
- Hiking/Walking Trails
- Scenic Byways
- Stream/River (NHD)
- Maryland Wildlands
- Protected Areas

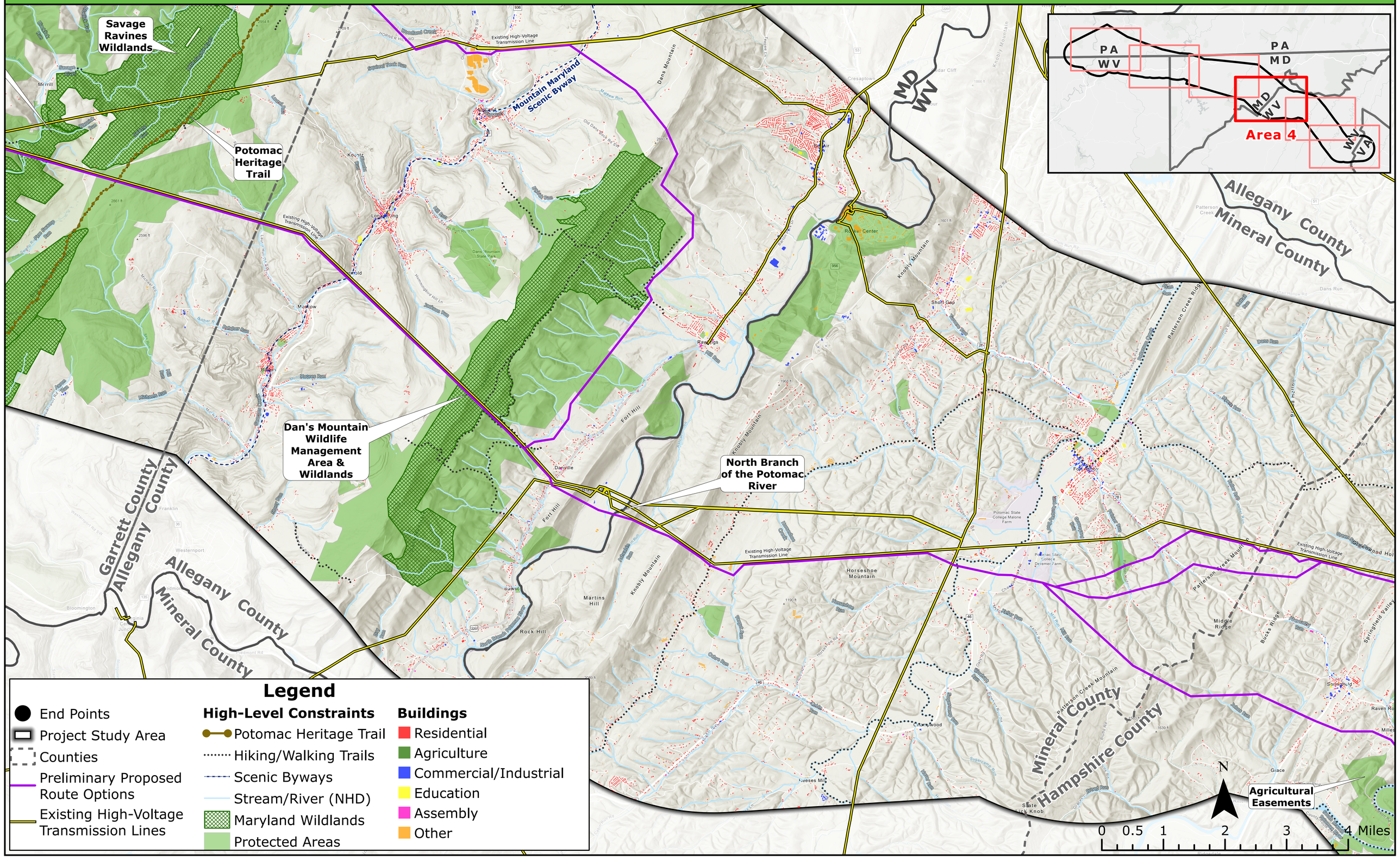
Buildings

- Residential
- Agriculture
- Commercial/Industrial
- Education
- Assembly
- Other

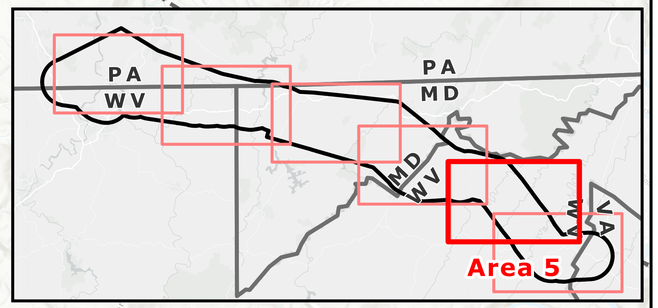
Preliminary Draft Route Options: Area 3



Preliminary Draft Route Options: Area 4



Preliminary Draft Route Options: Area 5



White Horse Mountain Wildlife Management Area

South Branch of the Potomac River

Agricultural Easements

Agricultural Easements

Cacapon & Lost Rivers Land Trust

Mineral County
Hampshire County

Legend

- End Points
- Project Study Area
- Counties
- Preliminary Proposed Route Options
- Existing High-Voltage Transmission Lines

High-Level Constraints

- Potomac Heritage Trail
- Hiking/Walking Trails
- Scenic Byways
- Stream/River (NHD)
- Maryland Wildlands
- Protected Areas

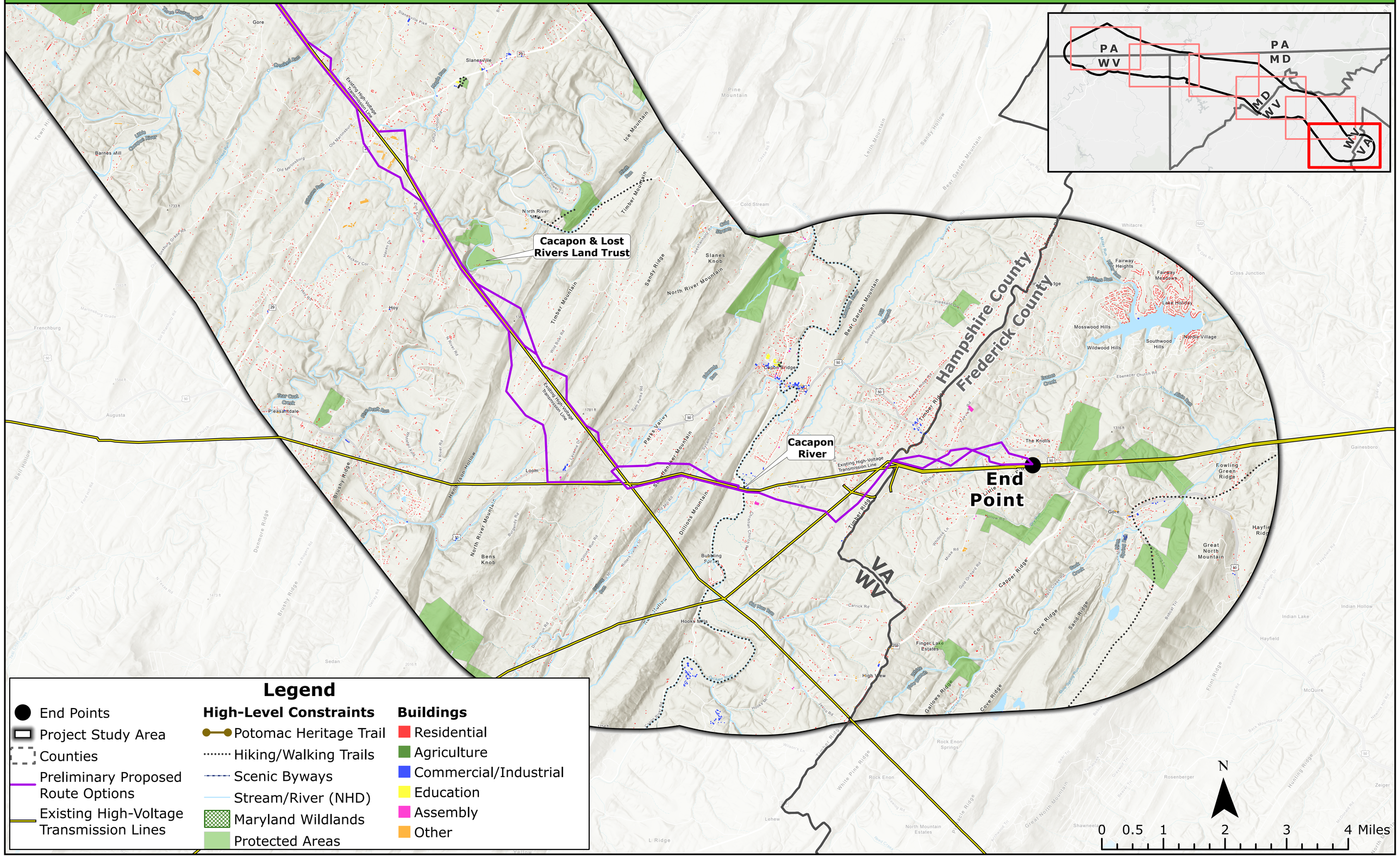
Buildings

- Residential
- Agriculture
- Commercial/Industrial
- Education
- Assembly
- Other

N

0 0.5 1 2 3 4 Miles

Preliminary Draft Route Options: Area 6



APPENDIX J VISUAL IMPACT ASSESSMENT

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Visual Impact Assessment

MidAtlantic Resiliency Link Project

PREPARED FOR
NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc.

DATE
January 2026

REFERENCE
0718854



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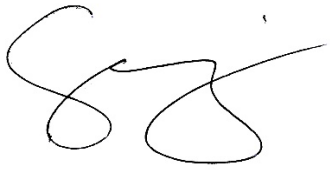
SIGNATURE PAGE

Visual Impact Assessment

MidAtlantic Resiliency Link Project

0718854



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CONTENTS

1. INTRODUCTION 1

2. METHODOLOGY 2

2.1 DETERMINE THE REGULATORY CONTEXT 2
2.2 IDENTIFY EXISTING VISUAL CHARACTERISTICS (LANDSCAPE UNITS) 2
2.3 DEFINE TYPICAL VIEWER GROUPS IN THE MARL PROJECT STUDY AREA 3
2.4 VIEWSHED ANALYSIS AND POTENTIAL VISIBILITY 4
2.5 VISUAL SIMULATIONS AND IMPACT EVALUATION 5

3. EXISTING CONDITIONS 7

3.1 REGULATORY SETTING FOR VISUAL RESOURCES 7
3.1.1 Pennsylvania Regulatory Setting 7
3.1.2 West Virginia Regulatory Setting 8
3.1.3 Maryland Regulatory Setting 8
3.1.4 Virginia Regulatory Setting 9
3.2 PHYSIOGRAPHIC PROVINCES 9
3.3 EXISTING VISUAL CHARACTERISTICS 13
3.3.1 Proposed Route Landscape Units 13
3.3.2 Alternative Route Landscape Units 27

4. IMPACT ASSESSMENT 29

4.1 MARL PROJECT FEATURES 29
4.2 VIEWSHED ANALYSIS AND VISIBILITY 31
4.3 SIMULATIONS AND CHANGES IN LANDSCAPE CHARACTERISTICS 36
4.3.1 Key Observation Points and Aerial Views 36
4.3.2 Impact Assessment by Landscape Unit 65

5. CONCLUSIONS 69

6. REFERENCES 70

ATTACHMENT 1 VIEWSHED ANALYSIS FIGURES

ATTACHMENT 2 EXISTING CONDITIONS AND SIMULATION PHOTOGRAPHS

LIST OF TABLES

TABLE 3.3-1 LANDSCAPE UNITS CROSSED BY THE PROPOSED ROUTE AND ALTERNATIVE ROUTES 28
TABLE 4.1-1 MILES OF PARALLELING OPPORTUNITIES BY ROUTE 31
TABLE 4.2-1 PROPOSED ROUTE POTENTIAL VISIBILITY BY LANDSCAPE UNIT TYPE AND VIEWING DISTANCE 33
TABLE 4.2-2 STRUCTURES POTENTIALLY VISIBLE BY LANDSCAPE UNIT AND DISTANCE 33

TABLE 4.2-3	PROPOSED ROUTE ROAD CROSSINGS BY STATE	34
TABLE 4.2-4	PROPOSED ROUTE AND ALTERNATIVE ROUTE ROAD CROSSINGS	34
TABLE 4.2-5	PARKS, TRAILS, AND PROTECTED AREAS CROSSED BY THE PROPOSED ROUTE ROW CORRIDOR	35
TABLE 4.2-6	PRIVATE RESIDENCES WITHIN 500 FEET OF THE ROUTE CENTERLINES	35
TABLE 4.3-1	KOP 102-CR LANDSCAPE CHARACTERISTICS	40
TABLE 4.3-2	KOP 133-CR LANDSCAPE CHARACTERISTICS	41
TABLE 4.3-3	AV 153 LANDSCAPE CHARACTERISTICS	44
TABLE 4.3-4	KOP 308 LANDSCAPE CHARACTERISTICS	45
TABLE 4.3-5	KOP 105A-CR LANDSCAPE CHARACTERISTICS	46
TABLE 4.3-6	KOP 310 LANDSCAPE CHARACTERISTICS	48
TABLE 4.3-7	KOP 314 LANDSCAPE CHARACTERISTICS	50
TABLE 4.3-8	AV 268 LANDSCAPE CHARACTERISTICS	53
TABLE 4.3-9	AV 252 LANDSCAPE CHARACTERISTICS	55
TABLE 4.3-10	KOP 325 LANDSCAPE CHARACTERISTICS	57
TABLE 4.3-11	AV 296 LANDSCAPE CHARACTERISTICS	59
TABLE 4.3-12	KOP 110-CR LANDSCAPE CHARACTERISTICS	61
TABLE 4.3-13	KOP 319 LANDSCAPE CHARACTERISTICS	63
TABLE 4.3-14	KOP 360B LANDSCAPE CHARACTERISTICS	64

LIST OF FIGURES

FIGURE 3.2-1	PHYSIOGRAPHIC PROVINCES	11
FIGURE 3.3-1	LANDSCAPE UNITS	15
FIGURE 3.3-2	RURAL AGRICULTURAL LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)	17
FIGURE 3.3-3	RURAL AGRICULTURAL LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)	17
FIGURE 3.3-4	RURAL AGRICULTURAL LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)	18
FIGURE 3.3-5	FORESTED MOUNTAINS LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)	18
FIGURE 3.3-6	FORESTED MOUNTAINS LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)	19
FIGURE 3.3-7	FORESTED MOUNTAINS LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)	19
FIGURE 3.3-8	DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)	20
FIGURE 3.3-9	DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)	21
FIGURE 3.3-10	RIVER VALLEY LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)	22
FIGURE 3.3-11	RIVER VALLEY LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)	22
FIGURE 3.3-12	RIVER VALLEY LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)	23
FIGURE 3.3-13	RURAL DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)	24
FIGURE 3.3-14	RURAL DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)	24
FIGURE 3.3-15	RURAL DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)	25
FIGURE 3.3-16	FORESTED RIDGES LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)	26
FIGURE 3.3-17	FORESTED RIDGES LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)	26
FIGURE 3.3-18	FORESTED RIDGES LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)	27
FIGURE 4.1-1	TYPICAL MARL PROJECT LATTICE TRANSMISSION LINE STRUCTURE	30
FIGURE 4.3-1	KEY OBSERVATION POINTS AND AERIAL VIEWS	37
FIGURE 4.3-2	KOP 102-CR EXISTING CONDITIONS	39
FIGURE 4.3-3	KOP 102-CR SIMULATED CONDITIONS WITH THE PROPOSED ROUTE	39
FIGURE 4.3-4	KOP 133-CR EXISTING CONDITIONS	40
FIGURE 4.3-5	KOP 133-CR SIMULATION CONDITIONS WITH THE PROPOSED ROUTE	41
FIGURE 4.3-6	AV 153 EXISTING CONDITIONS	42

FIGURE 4.3-7 AV 153 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 43
FIGURE 4.3-8 KOP 308 EXISTING CONDITIONS 44
FIGURE 4.3-9 KOP 105A-CR EXISTING CONDITIONS 45
FIGURE 4.3-10 KOP 105A-CR SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 46
FIGURE 4.3-11 KOP 310 EXISTING CONDITIONS 47
FIGURE 4.3-12 KOP 310 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 48
FIGURE 4.3-13 KOP 314 EXISTING CONDITIONS 49
FIGURE 4.3-14 KOP 314 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 50
FIGURE 4.3-15 AV 268 EXISTING CONDITIONS 51
FIGURE 4.3-16 AV 268 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 52
FIGURE 4.3-17 AV 252 EXISTING CONDITIONS 54
FIGURE 4.3-18 AV 252 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 55
FIGURE 4.3-19 KOP 325 EXISTING CONDITIONS 56
FIGURE 4.3-20 KOP 325 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 57
FIGURE 4.3-21 AV 296 EXISTING CONDITIONS 58
FIGURE 4.3-22 AV 296 SIMULATION CONDITIONS WITH THE PROPOSED ROUTE 59
FIGURE 4.3-23 KOP 110-CR EXISTING CONDITIONS 60
FIGURE 4.3-24 KOP 110-CR SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 61
FIGURE 4.3-25 KOP 319 EXISTING CONDITIONS 62
FIGURE 4.3-26 KOP 319 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE 62
FIGURE 4.3-27 KOP 360B EXISTING CONDITIONS 63
FIGURE 4.3-28 KOP 360B SIMULATED CONDITIONS WITH THE WOODSIDE SUBSTATION 64

ACRONYMS AND ABBREVIATIONS

Acronym	Description
AV	aerial view
DEM	Digital Elevation Model
ERM	Environmental Resources Management, Inc.
GIS	geographic information system
KOP	key observation point
kV	kilovolt
MARL Project	MidAtlantic Resiliency Project
NEET MA	NextEra Energy Transmission MidAtlantic, Inc.
NEET VA	NextEra Energy Transmission Virginia, Inc.
ROW	right-of-way
SALDO	subdivision and land development ordinance
SCORP	Statewide Comprehensive Outdoor Recreation Plan
VDCR	Virginia Department of Conservation and Recreation
VSR	visually sensitive resource

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1. INTRODUCTION

Visual resources capture the combination of natural landforms, vegetation, water features, and human modifications (including cultural/historic features) that characterize and contribute to a landscape's visual quality. Impacts on visual resources occur when the existing visual character of the landscape (environment) is substantially modified or altered by a project.

NextEra Energy Transmission MidAtlantic, Inc. (NEET MA) and NextEra Energy Transmission Virginia, Inc. (NEET VA) are proposing to build the MidAtlantic Resiliency Project (MARL Project), a new 107.5-mile, 500 kilovolt (kV) transmission line that will traverse portions of Pennsylvania, West Virginia, Maryland, and Virginia, and include the new 500/138 kV Woodside Substation to be located in Frederick County, Virginia.[1] The purpose of this Visual Impact Assessment is to:

1. Define the existing visual resource character of the MARL Project Right-of-Way (ROW) Corridor and vicinity, including landscape units, visually sensitive resources (VSRs), and viewer groups.
2. Evaluate potential visibility of and changes to existing visual resource conditions from the MARL Project.

While the focus of the Visual Impact Assessment is on the Proposed Route, visual resource information for the Alternative Routes is provided for context, where applicable.

[1] NEET MA is responsible for constructing the portions of the MARL Project in Pennsylvania, West Virginia, and Maryland. NEET VA is responsible for constructing the portions of the MARL Project in Virginia, as well as a new 500/138 kV Woodside Substation in Frederick County, Virginia. The permitting of the substation is subject to the siting authority of Frederick County, and information in this Visual Impact Assessment related to the Woodside Substation is provided for overall context of the full MARL Project.

2. METHODOLOGY

This assessment uses a structured approach to visual resources that relies on established techniques for describing existing landscape characteristics and identifying the potential changes or contrasts resulting from proposed surface-disturbing activities. These established techniques include (but are not limited to) the Federal Highway Administration's *Guidelines for the Visual Impact Assessment of Highway Projects* (FHWA 2015), Bureau of Land Management's Visual resource management system (BLM 1984), and U.S. Forest Service's scenery management system (USFS 1995). This section outlines the specific methods used to define existing conditions and evaluate changes from the MARL Project, including the Woodside Substation, on existing visual resource conditions.

2.1 DETERMINE THE REGULATORY CONTEXT

Environmental Resources Management, Inc. (ERM) conducted a comprehensive review of federal, state, regional, and local plans and policies to identify relevant guidance related to scenic resources. These documents (e.g., comprehensive plans and other types of management plans and policies) often outline goals and objectives, protective measures, and/or highlight sensitive scenic resources that are crucial for understanding the existing visual resource context of a project. Additionally, they tend to reflect the visual preferences of a community, making them vital in assessing the perspectives of viewers and their sensitivity to changes in existing visual resource conditions. Ordinances, such as zoning and other adopted regulations, may provide enforceable regulations related to visual resources. Section 3.1, Regulatory Setting for Visual Resources, provides a more detailed discussion of the regulatory setting for the MARL Project.

2.2 IDENTIFY EXISTING VISUAL CHARACTERISTICS (LANDSCAPE UNITS)

ERM visual resource specialists systematically categorized the MARL Project Study Area into distinct landscape units. Each landscape unit is characterized by similar types of land cover, along with other corresponding visual traits. The units were delineated through a combination of geographic information system (GIS) layers (e.g., physiographic provinces, land use / land cover, slope/topography, logical boundaries such as roads and rivers, known VSRs) and a review of photographs from the MARL Project Study Area. Landscape units are intended to capture representative visual characteristics across an entire landscape area, providing a macro-scale framework to assess existing conditions and identify potential changes in visual conditions from a proposed project. Landscape characteristics are a set of attributes, qualities, or traits that make the landscape unit identifiable or unique. Landscape characteristics are described based on the specific combination of visual features in a landscape unit, including:

- Landforms—the topography/terrain features of the landscape, including any waterbodies or rivers;
- Vegetation—the variety of vegetation/vegetative communities present on the landscape; and
- Built environment—the existing structures, facilities, or other built modifications on the landscape.

For each identified landscape unit, these visual features are described in terms of their primary visual elements, including forms, lines, colors, and textures. ERM reviewed GIS data layers and aerial photography, as well as photography from representative key observation points (KOPs) and aerial views (AVs) throughout the MARL Project Study Area to identify the primary visual features and their corresponding visual elements. A KOP is a location that represents an important or sensitive viewpoint within a landscape unit, while an AV offers an elevated perspective that provides a broader view of a landscape, including transition areas between landscape units.

Each KOP and AV provides a representative view of existing landscape characteristics within a landscape unit and offers a location from which to evaluate visual resource changes from a project. KOPs are typically established at publicly available, high-use viewing areas such as highways and other travel corridors, trails and recreation sites, communities, or designated scenic facilities (e.g., scenic byways, overlooks). Conversely, AVs may also be located in areas with high visual potential, albeit with limited public access for ground-level photography due to safety concerns or challenging access (e.g., hazardous highway locations, water-based sites). AVs are designed to provide elevated, unobstructed perspectives not available to most observers that illustrate the spatial relationship between landscape features, particularly in areas where ground level perspectives may be limited by private ownership, complex terrain, and/or vegetation patterns.-

2.3 DEFINE TYPICAL VIEWER GROUPS IN THE MARL PROJECT STUDY AREA

Understanding how different viewer groups perceive visual resources is essential for evaluating a project's visual impacts. Generally, individuals with a strong attachment to a landscape or an expectation of scenic quality exhibit greater sensitivity to changes than those for whom scenic resources are incidental or irrelevant to their activities. The typical viewer groups in the MARL Project Study Area are listed below:

- Area residents: These viewers live near the MARL Project and are likely to be highly sensitive to potential changes in landscape characteristics. They value the scenic integrity of the landscape (the degree to which a landscape retains its natural or cultural visual character) around their homes and often have frequent and prolonged views from their homes. Additionally, area residents are typically more familiar with the local landscape, making them more sensitive to changes over time.
- Motorists, commuters, and other travelers: These viewers travel along the primary road corridors in the area and have multiple opportunities to view the landscape. Their exposure to views of the MARL Project varies based on speed, direction of travel, and trip length, as well as viewing angles and screening, among other factors. Consequently, these viewers, particularly those on high-speed roadways, tend to be less sensitive to changes in scenic conditions.
- Recreationists and tourists: These viewers choose parks, recreation areas, and other tourist attractions, in part, based on the scenic setting and quality of these areas; therefore, they also tend to be more sensitive to changes in the landscape.

Sensitivity and perception of visual resource changes (impacts) tend to vary by setting and viewer group. Therefore, anticipating viewer sensitivity is crucial for the comprehensive evaluation of potential impacts from a proposed project on visual resources. Several factors influence viewer sensitivity and the perception of impacts. Generally, users with static, direct, frequent, or prolonged views (area residents) and those engaged in setting-dependent activities (e.g., some types of recreation, tourism), tend to have higher levels of sensitivity to change compared to others.

2.4 VIEWSHED ANALYSIS AND POTENTIAL VISIBILITY

The objective of a GIS-based viewshed model is to provide a generalized understanding of areas from which a proposed project may be visible. A viewshed model uses terrain data, the heights of the proposed infrastructure, and various obstructions (e.g., terrain, vegetation, buildings) to identify areas where a project may be visible by calculating line-of-sight visibility. The MARL Project viewshed modeling relied on the datasets described below to determine visibility.[2]

- Digital Elevation Model (DEM): ERM obtained multiple 1-meter resolution DEMs from the U.S. Geological Survey National Elevation Dataset. These DEMs were derived from LiDAR flights that took place between 2018 and 2022 across the MARL Project Study Area. The DEMs represent a "bare earth" terrain dataset that does not include the heights of buildings or trees. For purposes of the viewshed analysis, ERM merged this data into a single, 10-meter resolution dataset that covers the entire MARL Project Study Area.
- Vegetation Model: To account for the screening impacts of vegetation on visibility, ERM developed a MARL Project-specific vegetation model using land cover data from the European Space Agency. This model defines the extent of vegetation and incorporates tree height data from the U.S. Department of Agriculture / U.S. Department of Interior LandFire data layer. By combining this vegetation data with the bare earth DEM, ERM created an approximate Digital Surface Model, which provides a more accurate representation of on-the-ground conditions by including forest and vegetation heights.
- Proposed infrastructure: ERM used preliminary tower placements and heights provided by NEET MA and NEET VA and a cleared ROW Corridor that ranges in width from 200 feet to 426 feet.

Using the Geodesic Viewshed tool in ArcGIS Pro, ERM identified areas within the foreground (less than 0.5 mile from the Proposed Route centerline) and middle ground (0.5 to 2 miles from the Proposed Route centerline) that may have potential visibility of the proposed structures. The analysis was limited to the foreground and middle ground, as these viewing distances represent the areas from which proposed changes in visual resource conditions would likely be most pronounced and discernible. The output model estimates the approximate number of towers visible at any given location, assuming an observer height (average eye level) of 1.5 meters tall. The output model includes vegetation screening impacts, indicating that proposed infrastructure would not be visible to a viewer standing within a forest due to the obstruction caused by the vegetation. However, the model does not differentiate between varying degrees of visibility, such as whether only the top of the structure or the entire structure is visible.

[2] The viewshed model was only developed for the transmission route, not the Woodside Substation.

The intent of the viewshed assessment is to identify the locations with the highest potential for unobstructed views of the MARL Project. While there may be additional viewing opportunities at greater distances (more than 2 miles from the Proposed Route), the MARL Project would likely begin to blend into the landscape and not act as a focal point for casual viewers at these distances. This does not mean that viewers would not perceive the new transmission line; rather, the prominence of the transmission line infrastructure would generally diminish with increasing distance. Additionally, the GIS model's accuracy in capturing visibility tends to decrease as distance increases because of intervening vegetation and built structures, as well as atmospheric conditions and other factors that influence more distant views. Therefore, the emphasis on potential foreground and middle ground views aims to identify those locations with the greatest potential to affect a viewer group.

In addition to the viewshed analysis, visibility from area roads and VSRs was also assessed based on proximity to the Proposed Route. For this assessment, VSRs included residences within 500 feet of the Proposed Route centerline and publicly accessible, designated recreational resources (e.g., parks, trails, forests, wildlife management areas) crossed by the Proposed Route. While cultural/historic properties and sites are also typically considered VSRs, these sites are evaluated (including potential visibility) and addressed separately in the cultural resource sections of each state-specific Environmental Review Document. While proximity does not guarantee visibility, there is a higher likelihood for unobstructed views from area roads and VSRs near the Proposed Route, along with greater sensitivity to visual change from viewer groups compared to more distant roads and VSRs because of intervening terrain, vegetation, and other screening factors.

2.5 VISUAL SIMULATIONS AND IMPACT EVALUATION

As noted previously, a KOP serves as a specific location for documenting existing conditions and creating photographic simulations of future scenarios involving a proposed project. While each KOP depicts a specific location, most are also chosen to represent the broader types of views or viewing opportunities available across a landscape. For the MARL Project, KOPs were established in publicly accessible areas (e.g., roads, parks, trails) that are representative of the predominant landscape units within the MARL Project Study Area. These points provide both individual and collective context for cataloging existing visual conditions across various landscape units affected by the MARL Project, as well as for assessing potential visual resource changes resulting from the MARL Project.

For baseline photographs at KOPs, field photographers used a Nikon Z6ii professional specification digital single-lens reflex camera outfitted with a Nikkor AF 50mm f/1.8 prime lens. The camera was mounted on a panoramic head of a tripod, positioned in portrait orientation with the lens height typically set at 5.5 feet. The photographers ensured the tripod head and camera were level while aiming the viewfinder at the centerline of the MARL Project. They then recorded the exposure and focus settings and fixed those settings manually so they could not be inadvertently altered. Photographers then captured a series of 36 frames, rotating the panoramic head approximately 10 degrees after every frame, resulting in approximately a 50 percent overlap of the previous frame (rotating approximately 10 degrees between frames) until the full 360-degree sequence was captured. After the photos were complete, visualization specialists compiled a

single panorama from all 36 photos at each KOP using PTGui Pro version 12.11, a professional photographic stitching software. Each panorama documents existing conditions and serves as the basis for the photographic simulations of the MARL Project.

To evaluate future changes in visual resource conditions from the MARL Project, visualization specialists developed photographic simulations of the MARL Project from each KOP based on the panoramas and digital engineering drawings provided by NEET MA and NEET VA. This process began with plotting each KOP camera location in Global Mapper version 23.1, followed by creating digital models of the MARL Project in Autodesk 3DS Max 2023. The structures of the MARL Project were then rendered in Vray version 6 from each KOP camera location. The renderings employed a simulated physical camera along with a sun and sky simulation lighting model, ensuring consistency with the conditions depicted in the original KOP photography. The resulting 3D imagery was subsequently exported for overlay on the panoramas for each KOP.

The visualization specialists produced the photographic simulations by overlaying the rendered images on the existing photograph for each KOP using known control points. They adjusted the brightness and contrast of the rendered images to match the existing photograph and made other minor changes to the images (e.g., adding or removing vegetation to reflect future conditions) where necessary using Adobe Photoshop. Finally, the visualization specialists cropped the final images to the proper proportions and exported the images to a PDF format.

Using the photographic simulations, visual resource specialists conducted a visual assessment focused on describing existing conditions and the changes anticipated at full buildout of the MARL Project. This assessment involved comparing the existing visual conditions (panoramic images and field notes) against the photographic simulations of the MARL Project at each representative KOP. The analysis identified changes in visual conditions (form, line, color, and texture) resulting from the MARL Project. The magnitude of change, as well as viewer sensitivity and visibility, served as indicators of the impact on visual resources.

3. EXISTING CONDITIONS

The description of existing conditions in the MARL Project Study Area focuses primarily on the landscapes and scenic resources crossed by or in the vicinity of the Proposed Route. This includes—where applicable—similarities and differences between existing conditions along the Proposed Route and the Alternative Routes. The descriptions of existing conditions are presented geographically from the western to eastern ends of the MARL Project.

3.1 REGULATORY SETTING FOR VISUAL RESOURCES

The MARL Project crosses portions of Pennsylvania, West Virginia, Maryland, and Virginia. The remainder of this section describes state and local laws, ordinances, regulations, and statutes that may be applicable to visual resources. County and municipal comprehensive plans in Pennsylvania, West Virginia, and Virginia are advisory documents, whereas subdivision and land development ordinances are legally enforceable. In Maryland, zoning must be consistent with the adopted comprehensive plan of the corresponding jurisdiction (MDP n.d.).

3.1.1 PENNSYLVANIA REGULATORY SETTING

The Pennsylvania State Constitution affirms that "the people [of Pennsylvania] have the right clean air, pure water, and to the preservation of the natural, scenic, historic and [a]esthetic values of the environment" (Article I, § 27). Pennsylvania's Statewide Comprehensive Outdoor Recreation Plan (SCORP) addresses these values and others (e.g., clean air and water, natural and cultural resources, outdoor recreation) by providing statewide goals, objectives, and guidance to protect and preserve natural and cultural resources (PADCNR 2025). While the Pennsylvania SCORP does not include a specific section on aesthetic or scenic resources, it acknowledges the importance of scenic values and identifies "important" scenic resources throughout the state (e.g., trails, overlooks). In Greene and Fayette Counties, the Proposed Route and Alternative Routes do not cross any important scenic resources identified in the Pennsylvania SCORP; however, other trails and outdoor recreation sites crossed by the Proposed and/or Alternative Routes in Pennsylvania do have scenic value. These trails, sites, and use areas are identified in Section 4.2, Viewshed Analysis and Visibility.

Similar to the SCORP, the comprehensive plans for both Greene County and Fayette County do not include a dedicated section on scenic or visual resources (Greene County 2019; Fayette County 2019). Both plans acknowledge the scenic settings and availability of scenic vistas in their respective county, although they do not specify particular scenic vistas. Comprehensive plans for the individual municipalities in Pennsylvania crossed by the MARL Project are not readily available online.

In Pennsylvania, public utilities (e.g., transmission lines) are generally exempt from subdivision and land development ordinances (SALDOs), which may contain provisions such as zoning and subdivision requirements. Substations may be subject to regulations related to visual buffers around the substation site. The Fayette County zoning ordinance and Greene County SALDO do not specifically mention visual resources related to transmission infrastructure.

3.1.2 WEST VIRGINIA REGULATORY SETTING

The West Virginia SCORP (similar in intent and content to the Pennsylvania document of the same name) acknowledges the substantial contributions that scenic resources make to the state's natural and cultural heritage, as well as to protected areas (WVDED 2021). It highlights designated scenic byways, trails, water trails, and overlooks, alongside various other state and federal outdoor recreation sites and use areas that play a crucial role in conservation and tourism. The scenic quality of these areas is a factor in the overall visitor experience. Although the West Virginia SCORP does not explicitly outline goals and objectives for visual resources, it emphasizes the important benefits that scenic resources provide to residents and visitors statewide.

The Monongalia, Mineral, and Hampshire County comprehensive plans lack a detailed section on scenic or visual resources (Monongalia County Planning Commission 2023; Mineral County Planning Commission 2010; Hampshire County Planning Commission 2019); however, these plans acknowledge the scenic setting and/or quality in their respective counties. The *Hampshire County Comprehensive Plan*, includes several goals and objectives focused on protecting and preserving scenic resources and scenic quality related to housing, transportation infrastructure, and parks and recreation. Preston County has a strategic plan instead of a comprehensive plan (Preston County Economic Development Authority 2023). This plan notes scenic views as one of the strengths of the county. While all four counties recognize the scenic quality of their respective settings, none of the planning documents specify particular scenic resources or vistas that have visual protections. Additionally, they do not establish clear visual or scenic quality objectives aimed at preserving existing visual characteristics or delineating acceptable levels of change.

In West Virginia, transmission lines are generally exempt from land development ordinances such as zoning and subdivision requirements. Substations may be subject to regulations related to visual buffers around the substation site.

The Magnolia County and Hampshire County land development ordinances do not specifically mention visual resources related to transmission infrastructure. In Mineral County, the subdivision ordinance exempts utility parcels from ordinance requirements. Preston County does not appear to have a SALDO.

3.1.3 MARYLAND REGULATORY SETTING

Maryland’s *Land Preservation and Recreation Plan 2019–2023* serves as a framework for managing the state’s natural and cultural resources, including their scenic values (MDNR 2019). The plan identifies both state and federal protected areas and sites, as well as specific programs intended to protect and conserve cultural and natural resources; however, it lacks defined goals, objectives, or guidance specifically focused on the protection and preservation of scenic values at these resources. Scenic use areas and sites identified in the plan and crossed by the Proposed Route are listed in Section 4.2.

In Maryland, the MARL Project crosses Garrett and Allegany Counties. Neither the Garrett County Comprehensive Plan nor the Allegany County Comprehensive Plan have a dedicated section or goals and objectives for scenic or visual resources (Garrett County 2022; Allegany County 2014). Several scenic areas are referenced in both, and the Allegany County plan highlights the

importance of scenic vistas and uninterrupted scenic viewsheds. As noted above, local municipal zoning must be consistent with the adopted comprehensive plan of the corresponding jurisdiction.

In Maryland, transmission lines are generally exempt from zoning and subdivision requirements. Substations may be subject to regulations related to visual buffers around the substation site. The Allegany County zoning and subdivision ordinances do not specifically mention visual resources related to transmission infrastructure. Garrett County does not administer zoning or subdivision requirements within unincorporated areas outside of the Deep Creek Lake watershed (which the MARL Project would not cross); therefore, visual resources related to transmission infrastructure are not regulated.

3.1.4 VIRGINIA REGULATORY SETTING

The Virginia Outdoors Plan previously featured a dedicated chapter and guidance on scenic resources in the state (VDCR 2018). According to this guidance, the Virginia Department of Conservation and Recreation (VDCR) defers to local governments for the protection and management of scenic resources. VDCR also collaborates with local governments and other stakeholders to address scenic resources with statewide importance through the Virginia Scenic Rivers Program and Virginia's Byways. Although the most recent Virginia Outdoors Plan does not specifically address scenic resources (VDCR 2024), both the scenic river and byways programs help preserve the scenic and other important resource values associated with designated rivers and byways. The Proposed Route and the Woodside Substation site do not intersect any designated Virginia Scenic Rivers or Scenic Byways.

The Frederick County comprehensive plan does not have a scenic or visual resource section or objectives associated with scenic or visual resources (Frederick County 2021). The plan recognizes the county's scenic setting and visual quality and emphasizes the contribution of scenic resources and quality to both residents and visitors. It also recognizes the county's natural and historic/ cultural resources, which also offer opportunities to experience the landscape and scenic resources.

In Virginia, transmission lines are generally exempt from zoning requirements. Substations may be subject to regulations related to visual buffers around the substation site. The Frederick County zoning and subdivision ordinances do not specifically mention visual resources related to transmission infrastructure.

3.2 PHYSIOGRAPHIC PROVINCES

Physiographic provinces are large land areas that are characterized by a cohesive pattern of landforms, geologic formations, elevations, and vegetation, all of which directly influence the visual resource identity of a landscape. As a result, physiographic provinces provide a framework for understanding the natural landscape character across a broad geographic area. The Proposed Route crosses the Appalachian Plateau and the Valley and Ridge physiographic provinces, as shown on Figure 3.2-1 and described below (NPS 2017).

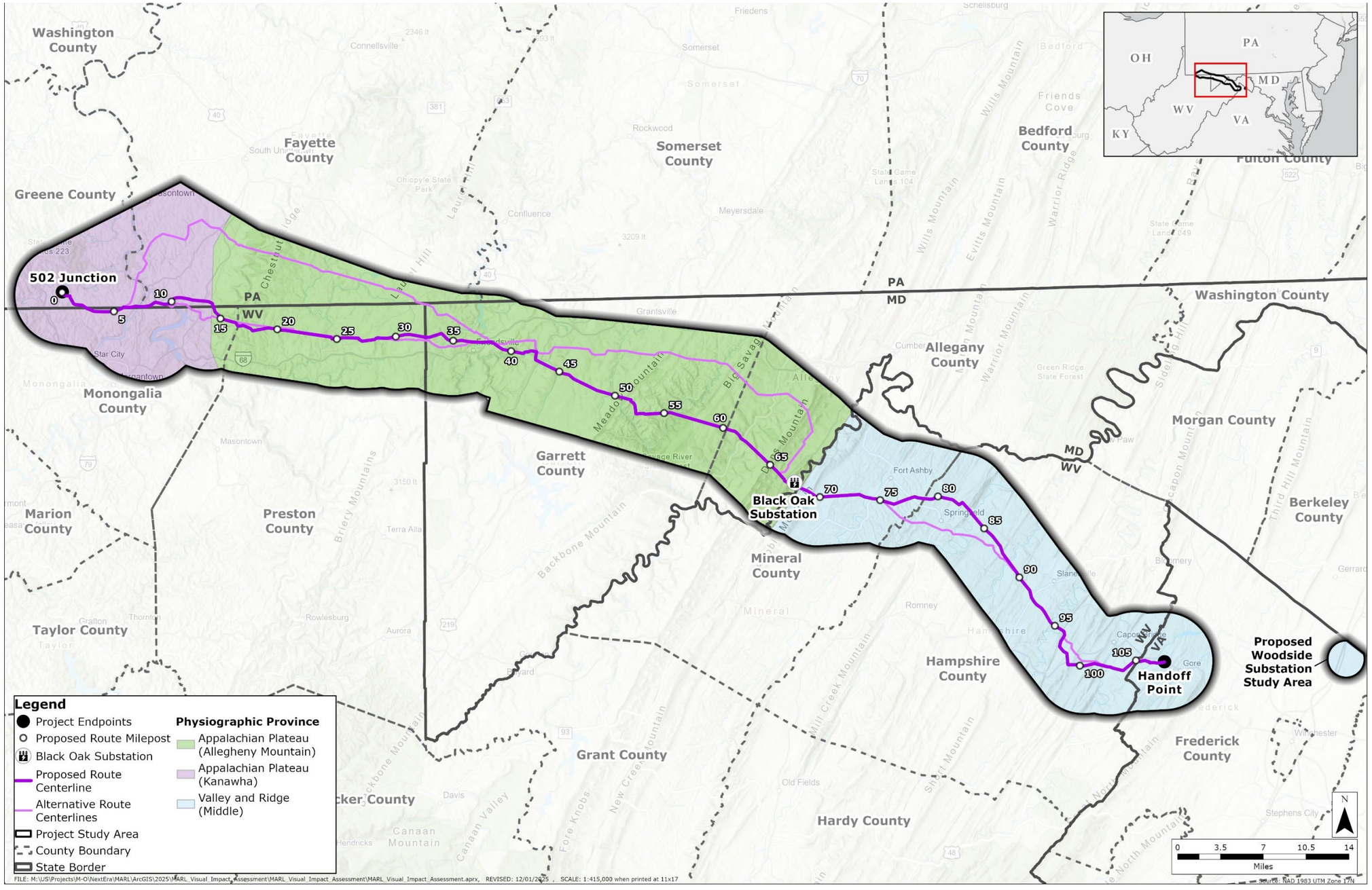
The Appalachian Plateau province[3] is characterized by mountainous terrain incised by rivers and streams that contribute to the rolling, gently undulating terrain and curvilinear forms. The vegetation is a mix of large, contiguous forested areas interspersed with open agricultural fields. The forests contribute vertical features, textural complexity, and seasonal color dynamics to the landscape. The forest canopy often obscures but mimics the underlying landforms and creates a sense of visual enclosure in many areas. Human development is generally low-density and rural in character with residential, agricultural, and commercial/industrial structures primarily located along transportation corridors, which generally follow river and stream valleys. These structures add geometric forms and straight lines to the landscape. Additionally, linear infrastructure (e.g., highways, roads, transmission and distribution lines) throughout the area introduces strong linear and geometric forms with their visual prominence dependent on the scale of the structures (mass and height), topography, and vegetative screening.

The Valley and Ridge province is characterized by long, narrow mountain ridges (generally running northeast to southwest) with intervening valleys. The mountain ridges form strong diagonal and horizontal lines that appear as repeating, undulating bands across the landscape. The valleys between these ridges tend to have gently rolling to flat terrain. Rivers and streams occur frequently in the valleys and add sinuous, curvilinear forms and lines to the landscape. The vegetation patterns generally follow the landform patterns, with the ridges covered in dense forests and a patchwork of agricultural fields, riparian areas, and maintained lawns dotting the valley floors. The forested areas add vertical features that reinforce the elevation differences present on the landscape and help enclose views. Variations in vegetation types and patterns also create textural complexity and seasonal color dynamics that contribute to the aesthetic character of the area. Human development is primarily concentrated in the valleys, where small communities and clusters of agricultural structures follow the natural alignment of the terrain. The built environment typically consists of low geometric structures (single- and two-story buildings) that are often subordinate to the dominant natural features. Major roads, utility corridors, and other linear infrastructure generally follow valley bottoms and occasionally cross ridges through gaps or engineered cuts. In certain areas (e.g., elevated vantage points), this type of infrastructure is highly visible and contrasts with the landscape's natural forms and patterns.

The MARL Project crosses landscape units (Section 3.3, Existing Visual Characteristics) that incorporate the broad visual characteristics of these physiographic provinces, as well as other area-specific land use and other visually oriented factors (e.g., topography, degree of development).

[3] There are two sections to the Appalachian Plateau province: the Allegheny Mountain and Kanawha sections. These sections are distinguished by their underlying geologic characteristics; however, these sections share similar visual characteristics.

FIGURE 3.2-1 PHYSIOGRAPHIC PROVINCES



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

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3.3 EXISTING VISUAL CHARACTERISTICS

The MARL Project Study Area was divided into landscape units, which are geographic areas that share similar land use / land cover and corresponding visual characteristics. Figure 3.3-1 shows the delineated landscape units in the MARL Project Study Area, as well as the Proposed Route and Alternative Routes. The MARL Project is most likely to directly affect landscapes crossed by the new transmission infrastructure; therefore, Section 3.3.1, Proposed Route Landscape Units, focuses only those landscape units crossed by the Proposed Route, while Section 3.3.2, Alternative Route Landscape Units, identifies the units crossed by the Alternative Routes. In addition to landscape characteristics, the common types of viewer groups are also identified for each landscape unit.

3.3.1 PROPOSED ROUTE LANDSCAPE UNITS

As shown on Figure 3.3-1, the Proposed Route crosses the Rural Agricultural, Forested Mountains, Developed, River Valley, Rural Developed, and Forested Ridges Landscape Units. The remainder of this section describes those landscape units.

3.3.1.1 RURAL AGRICULTURAL LANDSCAPE UNIT

Rural Agricultural Landscape Units primarily feature expansive agricultural fields and natural grass and shrublands, interspersed with patches of dense forest. These units commonly extend through the valleys between areas of forested mountain ranges. Small towns and other areas of low-density development are often found along roadways in these valleys. Figure 3.3-2, Figure 3.3-3, and Figure 3.3-4 show representative views in Rural Agricultural Landscape Units. As shown on these figures, Rural Agricultural Landscape Units share the following visual characteristics:

- Landform/Water—broad, gentle slopes, horizontal profile bounded by taller, rounded mountains; long, flat to rolling lines delineating transition between ground and sky; colors and textures in underlying terrain obscured by vegetation and built features.
- Vegetation—fields appear as low, geometric forms with clusters of taller, forested vegetation forming vertical, amorphous, strips; mix of fields and forested areas create open, wide, low, regular (along the ground) to irregular (along the canopies of forested areas) horizontal lines with simple, repetitive vertical lines; fields create continuous areas of green, yellow, and tan colors, while forested areas dominated by tan, green, brown, and other natural hues and subject to seasonal variation; fine, uniform, continuous textures of the fields broken by medium, patchy, contrasting textures of adjacent clusters of forest.
- Built Environment—roads appear as linear, smooth, flat, gray strips; residences, farm structures, and other buildings add definite, solid, geometric forms; transmission and distribution lines create distinct, repetitive, vertical forms; straight to curvilinear horizontal lines (roads); short, vertical, and horizontal lines (structures and buildings); long, thin, slightly undulating horizontal lines; roads, buildings, and energy infrastructure add multiple colors (e.g., white, gray, tan, yellow) and smooth, directional, ordered, stippled, sparse textures.

The primary viewer groups in Rural Agricultural Landscape Units include area residents and motorists.

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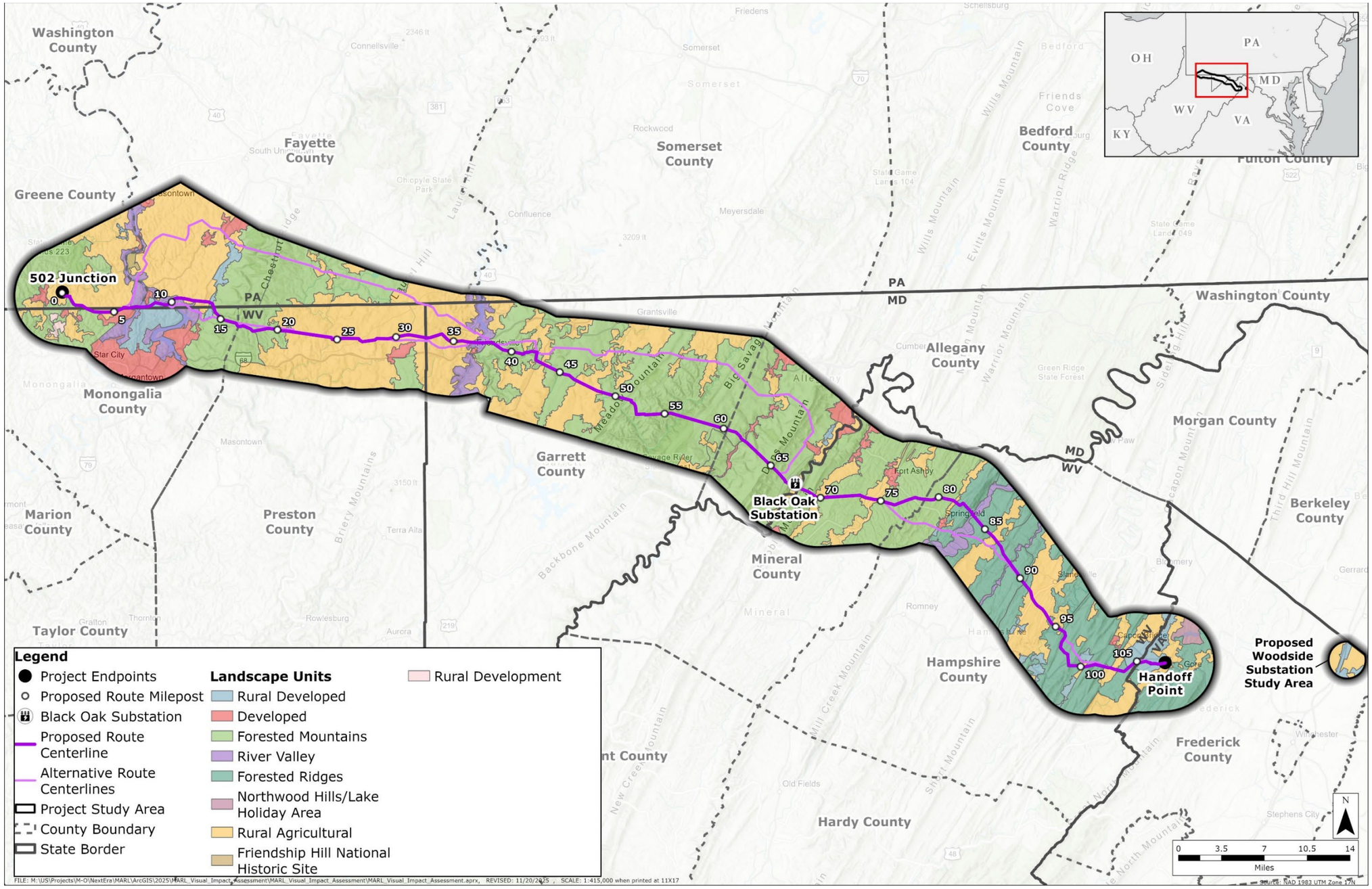
FIGURE 3.3-1 LANDSCAPE UNITS



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

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FIGURE 3.3-2 RURAL AGRICULTURAL LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)



Image location: Bald Hill Church Road, Greene County, Pennsylvania

FIGURE 3.3-3 RURAL AGRICULTURAL LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)



Image location: Compressor Station Road, Preston County, West Virginia

FIGURE 3.3-4 RURAL AGRICULTURAL LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)



Image location: Near intersection of Bloomery Pike and Kedron Road, Hampshire County, West Virginia

3.3.1.2 FORESTED MOUNTAINS LANDSCAPE UNIT

Forested Mountains Landscape Units are characterized by mountainous terrain that is dominated by native forest cover and other vegetation with periodic clusters of low-density development and linear infrastructure. Figure 3.3-5, Figure 3.3-6, and Figure 3.3-7 show representative views of Forested Mountains Landscape Units.

FIGURE 3.3-5 FORESTED MOUNTAINS LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)



Image location: Garrett Highway near Kaese Mill, Garrett County, Maryland

FIGURE 3.3-6 FORESTED MOUNTAINS LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)



Image location: Fairview Road, Garrett County, Maryland

FIGURE 3.3-7 FORESTED MOUNTAINS LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)



Image location: Waxler Road (Knobly Mountain), Mineral County, West Virginia

As shown on these figures, Forested Mountains Landscape Units share the following visual characteristics:

- Landform/Water—generally obscured by vegetation and built environment but underlying landform is characterized by prominent rolling to steep, rounded, wide, nondirectional, and trapezoidal forms with dominant horizontal lines that generally follow ridgelines.
- Vegetation—dominated by deciduous mixed forest with vertical layering, tall and amorphous forms and short, rounded forms; repeating vertical lines, irregular horizontal line across the canopy; a mix of green hues with assorted browns and grays with seasonal variability; medium to coarse textures.
- Built Environment—roads, residences and other buildings, and energy infrastructure add low, flat, geometric, tall, vertical forms; curvilinear, straight vertical and horizontal lines; various colors including white, gray, brown, blue, yellow, metallic, and others; fine, smooth, patchy, discontinuous, scattered, and stippled textures.

The primary viewer groups in Forested Mountains Landscape Units include area residents, motorists, and recreationists.

3.3.1.3 DEVELOPED LANDSCAPE UNITS

Developed Landscape Units are dominated by cleared lands with a high level of development, including residential, commercial, and/or industrial buildings and structures; aboveground infrastructure; and maintained lawns/planting areas and remnant native vegetation. Figure 3.3-8 and Figure 3.3-9 show representative views of Developed Landscape Units.

FIGURE 3.3-8 DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)



Image location: Hanekamp Street West, Lonaconing, Allegany County, Maryland

FIGURE 3.3-9 DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)



Image location: Springfield Pike, Springfield, Hampshire County, West Virginia

As shown on these figures, Developed Landscape Units share the following visual characteristics:

- Landform/Water—terrain creates broad benches, flat to rolling areas with rounded ridgetops and steep drainage cuts; long horizontal and diagonal lines; colors and textures generally obscured by aboveground buildings and structures, as well as vegetation.
- Vegetation—lawns and grasslands add low, smooth, simple, geometric to irregular forms with clusters of forest contributing medium to high, repetitive forms that add vertical context; regular horizontal and vertical, simple lines; vibrant to matte greens, tans, browns with pops of brilliant colors and subject to seasonal variation; smooth to coarse textures.
- Built Environment—residential, commercial, and industrial development adds rectilinear, geometric, definite, solid, multi-height, linear forms; bold, angular, horizontal, vertical, simple, hard lines; subtle to vivid, multiple hues (gray, white, blue, green, yellow, etc.); coarse to fine, patchy, ordered, discontinuous, and granular textures.

The primary viewer groups in Developed Landscape Units include area residents and motorists.

3.3.1.4 RIVER VALLEY LANDSCAPE UNITS

River Valley Landscape Units are similar to Rural Agriculture Landscape Units but have serpentine rivers (including in-stream lakes and other impoundments) as a focal feature of the valley. Figure 3.3-10, Figure 3.3-11, and Figure 3.3-12 show representative views of River Valley Landscape Units.

FIGURE 3.3-10 RIVER VALLEY LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)



Image location: Sheepskin Trail / Monongahela River Trail North, West Virginia / Pennsylvania border

FIGURE 3.3-11 RIVER VALLEY LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)



Image location: Cheat Lake Trail south of Lake Lynn Power Station, West Virginia

FIGURE 3.3-12 RIVER VALLEY LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)



Image location: Springfield Pike, Hampshire County, West Virginia

As shown on these figures, River Valley Landscape Units share the following visual characteristics:

- Landform/Water—broad, north-to-south oriented valleys; horizontal profile, flat to gentle slopes bordered by steeper inclines that define the valley; sinuous, meandering forms (rivers and lakes); horizontal lines across skyline with curvilinear lines delineating the transition from water to riparian vegetation; blue, gray, reflective colors (water); smooth textures; except for the river, most underlying terrain colors and textures obscured by vegetation and built features.
- Vegetation—forested areas appear as vertical, strips, and amorphous forms; broken and contiguous tall, rounded forms along rivers (riparian vegetation); open, wide, low, regular (grasslands and other scrub-shrubs areas) to irregular (forest canopies) horizontal lines; dominated by tan, green, brown, and other natural hues and subject to seasonal variation; fine to medium continuous patches of uniform textures.
- Built Environment—buildings/structures, roads, and energy infrastructure create definite, solid, geometric, hard, flat, repeating tall, vertical forms with straight to curvilinear horizontal and vertical lines; multiple colors (e.g., white, gray, tan, yellow, red, blue) and ordered, smooth, stippled, and sparse textures.

The primary viewer groups in River Valley Landscape Units may include area residents, recreationists, and motorists.

3.3.1.5 RURAL DEVELOPED LANDSCAPE UNITS

Rural Developed Landscape Units are similar to Developed Landscape Units but are smaller, less dense, and primarily aligned along a travel corridor interspersed with forested areas and/or agricultural fields. Figure 3.3-14, Figure 3.3-15, and Figure 3.3-15 show representative views of Rural Developed Landscape Units.

FIGURE 3.3-13 RURAL DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)



Image location: Stewartstown Road, Monongalia County, West Virginia

FIGURE 3.3-14 RURAL DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)



Image location: West Virginia Route 26, Brandonville, West Virginia

FIGURE 3.3-15 RURAL DEVELOPED LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)



Image location: Cedar Hill Road, Frederick County, Virginia

As shown on these figures, Rural Developed Landscape Units share the following visual characteristics:

- Landform/Water—terrain appears as rolling to flat, gentle to moderate slopes, narrow, and irregular forms with varied elevations and shapes (low hills, graded areas); long, soft horizontal and diagonal lines; colors and textures obscured by aboveground vegetation and structures.
- Vegetation—lawns, fields, remnant grasslands, individual trees, and patches of forest vegetation add low, flat, geometric bounded by tall, irregular, vertical, amorphous forms; regular, simple, soft, branching and repeating vertical lines with smooth to broken horizontal lines; mix of natural green hues with splashes of bright hues (e.g., red, pink, orange) and subject to seasonal variation; smooth to medium, patchy, discontinuous textures.
- Built Environment—dominated by buildings and structures that appear as low, geometric, smooth, regular forms; bold, straight, simple, vertical, and horizontal lines; multiple colors (e.g., white, gray, black, blue, yellow); smooth to medium, patchy, scattered textures.

The primary viewer groups in Rural Developed Landscape Units include area residents and motorists.

3.3.1.6 FORESTED RIDGES LANDSCAPE UNITS

Forested Ridges Landscape Units are similar to Forested Mountains Landscape Units, with different underlying landforms. Forested Ridges Landscape Units generally include long, narrow mountain ridges that are mostly oriented northeast to southwest, with native forest cover and occasional clusters of low-density development and linear infrastructure. Figure 3.3-16, Figure 3.3-16, and Figure 3.3-18 show representative views of Forested Ridges Landscape Units.

FIGURE 3.3-16 FORESTED RIDGES LANDSCAPE UNIT (REPRESENTATIVE VIEW 1)



Image location: Red Fern Lane, Hampshire County, West Virginia

FIGURE 3.3-17 FORESTED RIDGES LANDSCAPE UNIT (REPRESENTATIVE VIEW 2)



Image location: Northwestern Pike, Hampshire County, West Virginia

FIGURE 3.3-18 FORESTED RIDGES LANDSCAPE UNIT (REPRESENTATIVE VIEW 3)



Image location: Northwestern Pike, Hampshire County, West Virginia

As shown on these figures, Forested Ridges Landscape Units share the following visual characteristics:

- Landform/Water—underlying landform is low, long, narrow, linear, rounded; ridgelines form continuous, regular, horizontal lines across skyline; colors and textures obscured by vegetation in most areas.
- Vegetation—dominated by deciduous mixed forest with interspersed evergreen species; contiguous forested areas appear as rounded to amorphous forms on the landscape; individual trees and shrubs add multi-height amorphous, round, and conical forms; soft, feathered horizontal lines, and repeating vertical lines; mix of green hues with assorted browns and grays, medium to coarse textures, and seasonal variability.
- Built Environment—occasional buildings, roads, and other types of infrastructure add low, flat, smooth, tall, vertical linear and geometric forms; straight, vertical and horizontal, thin, slightly undulating horizontal lines; various colors; fine, smooth, directional (roads) and discontinuous (other sporadic structures), and stippled textures.

The primary viewer groups in Forested Ridges Landscape Units include area residents, motorists, and recreationists.

3.3.2 ALTERNATIVE ROUTE LANDSCAPE UNITS

The Alternative Routes generally cross the same types of landscape units as the Proposed Route (Figure 3.3-1). Table 3.3-1 lists the mileage of each landscape unit crossed by the Proposed Route and each Alternative Route.

TABLE 3.3-1 LANDSCAPE UNITS CROSSED BY THE PROPOSED ROUTE AND ALTERNATIVE ROUTES

Landscape Unit Type	Proposed Route		Alternative Route B		Alternative Route C		Alternative Route D		Alternative Route E		Alternative Route F	
	Count [a]	Miles [b]	Count [a]	Miles [b]	Count [a]	Miles [b]	Count [a]	Miles [b]	Count [a]	Miles [b]	Count [a]	Miles [b]
Rural Agricultural	33	35.6	33	33.7	31	40.2	43	39.1	33	35.3	39	43.4
Forested Mountains	22	45.8	25	45.6	18	50.0	31	50.1	22	44.8	28	53.3
Developed	2	0.2	2	0.2	4	0.7	1	0.2	2	0.2	3	0.7
River Valley	9	4.2	9	5.6	4	3.1	9	4.2	9	4.5	4	3.4
Rural Developed	10	4.1	12	5.0	6	2.2	10	4.1	11	4.3	10	2.9
Forested Ridges	18	17.4	19	17.1	18	17.4	17	17.4	15	17.1	16	15.4

[a] The count column indicates the number of landscape units crossed by each route.
[b] The miles column indicates the cumulative mileage of route within each type of landscape unit.

4. IMPACT ASSESSMENT

This section addresses the anticipated changes in visual resource conditions from the MARL Project. The changes are primarily focused on the Proposed Route, but similarities and differences with the Alternative Routes are also noted where applicable.

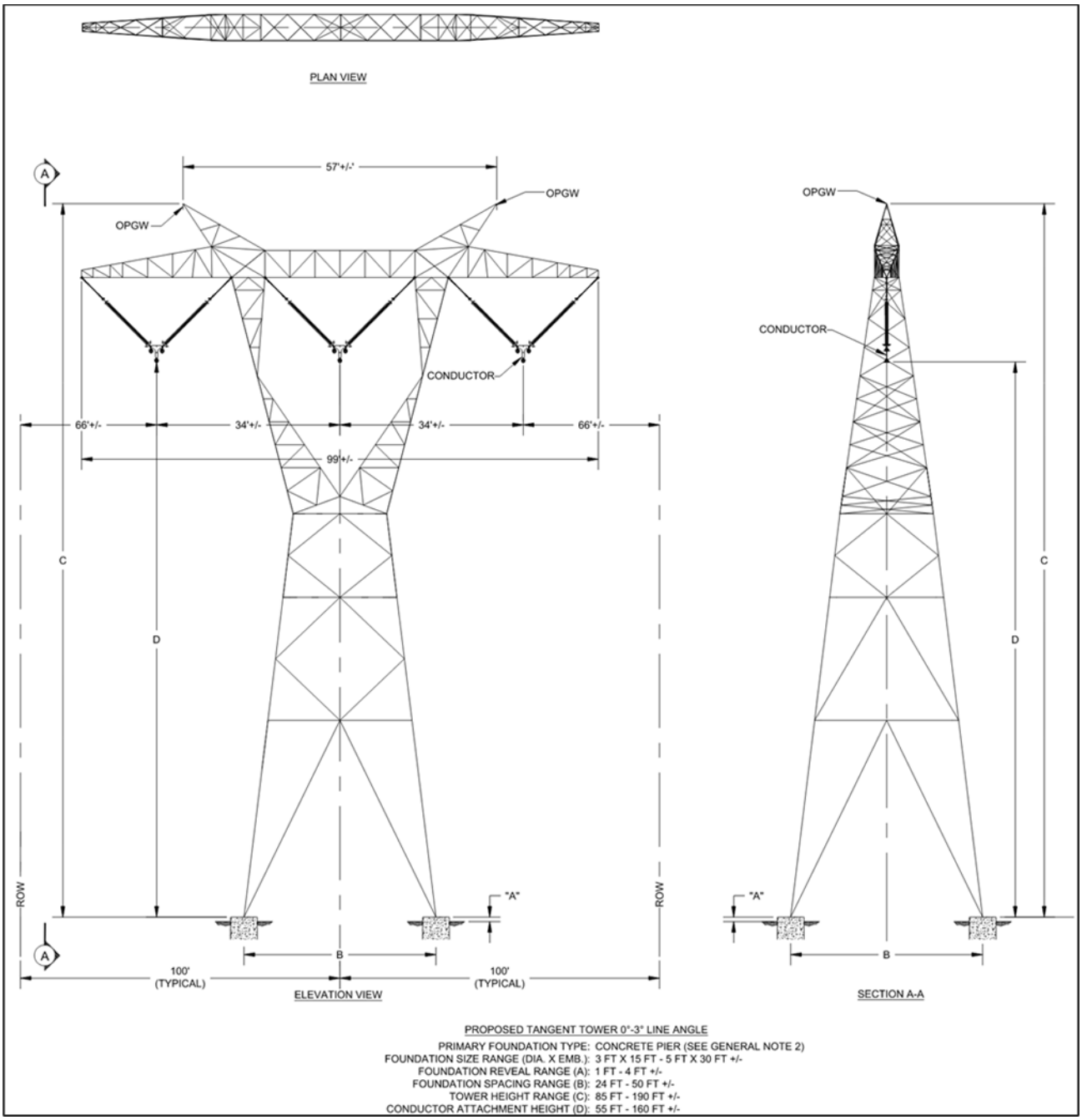
4.1 MARL PROJECT FEATURES

The MARL Project (Proposed Route) will include 452 new structures that will be primarily lattice steel structures ranging in height from 85 feet to 190 feet with an average structure height of 145 feet above ground level (final structure heights are subject to change based on final engineering design and exclude foundation reveal). Figure 4.1-1 displays a typical MARL Project lattice transmission line structure. The average distance between towers (span) will be 1,258 feet for the MARL Project, with the span between transmission structures depending on the type of structure used, as well as topography, ground elevation, and nearby constraints. The width of the ROW Corridor varies and ranges from 200 feet to 426 feet (average width of 289 feet) based on several factors including paralleling opportunities, greenfield areas, and aerial easement needs. The number of structures, average structure height, and average span length for the Alternative Routes vary but are generally similar to the Proposed Route (see Table 1.4-1 of the Routing Study).

Construction of the MARL Project would result in increased visibility of construction equipment and construction activity, particularly at road crossings and from open areas directly adjacent to the ROW Corridor. Clearing of trees in the ROW Corridor will also occur during the construction period. Construction impacts would be short-term and temporary and last only for the duration of construction, anticipated to be 24 months for the entire MARL Project, although construction at any single location along the Proposed Route will occur over multiple shorter periods of time during the overall construction period.

Once constructed, the new transmission line infrastructure would introduce tall, geometric structures and long, linear conductors to the landscape. Where visible, the transmission structures would create a series of repetitive, dominant vertical features that rise above the existing tree canopies and add new focal points that shift the vertical structure of the landscape. The conductors would appear as multiple undulating, overhead horizontal lines spanning the areas between transmission poles. The thin conductors would be most apparent in foreground views (less than 0.5 mile), in particular where they span open fields and roads with few to no screening features. In forested areas, the conductors would be better absorbed into the landscape and, at greater distances (into the middle ground and background), would be harder to discern against background features and the sky. The ROW Corridor would be most apparent in forested landscapes and areas, where the cleared ROW would modify the existing forms and lines in the vegetation and expose new areas to view.

FIGURE 4.1-1 TYPICAL MARL PROJECT LATTICE TRANSMISSION LINE STRUCTURE



OPGW = Optical Ground Wire; ROW = right-of-way

The Proposed Route and corresponding ROW Corridor were designed, in part, to maximize paralleling opportunities with existing high-voltage transmission lines where feasible. Aligning the MARL Project ROW Corridor with these existing transmission line corridors helps minimize visual impacts by repeating landscape elements that are already present (i.e., existing transmission structures and conductors), better absorbing these elements into the existing landscape. This approach also helps maintain existing vegetative screening, particularly in forested areas. Table 4.1-1 includes the total miles of paralleling opportunities for the Proposed Route and Alternative Routes, as well as the total length of each route.

TABLE 4.1-1 MILES OF PARALLELING OPPORTUNITIES BY ROUTE

State	Proposed Route	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Pennsylvania	2.3	2.3	16.9	2.3	2.3	16.9
West Virginia	27.7	31.7	18.5	27.7	22.1	10.9
Maryland	25.5	25.0	28.0	12.1	25.5	14.7
Virginia	1.0	0.7	1.0	1.0	1.0	0.7
Total Paralleling Miles [a]	**56.5**	**59.7**	**64.4**	**43.1**	**50.9**	**43.2**
Total Route Miles [b]	**107.5**	**107.3**	**113.6**	**115.2**	**106.3**	**119.1**

[a] Totals may not match the sum of addends due to rounding.
[b] This includes the centerline length for the Proposed Route and each Alternative Route (see Table 1.4-1 of the Routing Study).

Where the MARL Project will be located adjacent to an existing transmission line, the MARL Project ROW Corridor will generally abut the existing corridor. The additional clearing for the MARL Project ROW Corridor would primarily change vegetation features in these areas but may also expose additional areas of the underlying terrain to view. These changes would be most pronounced in forested landscapes and patches of dense forest cover in other types of landscape where tall trees and shrubs would be removed, thereby modifying the existing combination of forms, lines, and textures in the vegetation and terrain.

In addition, many of the existing high-voltage transmission lines that the MARL Project will parallel and abut lattice structures that are similar in design to the MARL Project's proposed towers (Figure 4.1-1). While the MARL Project towers may be taller (depending on final engineering design) and potentially more prominent on the landscape, they add similar forms, lines, colors, and textures to existing visual conditions. Some of the existing high-voltage transmission lines have short, paired H-frame wooden towers that are visually distinct from the MARL Project infrastructure. In these areas, the MARL Project would add new forms, lines, and colors to the existing landscape.

4.2 VIEWSHED ANALYSIS AND VISIBILITY

The GIS-based viewshed analysis (Section 2.4, Viewshed Analysis and Potential Visibility) identified the locations from which the Proposed Route may be visible. The viewshed mapping and corresponding figures are provided in Attachment 1, Viewshed Analysis Figures. The results indicate that approximately 11 percent of the viewshed area, inclusive of both foreground and middle ground regions, may potentially have views of one or more structures along the Proposed Route. The limited extent of potential visibility is largely due to the area's topography and forest cover, which provide effective screening.

The Proposed Route would be potentially visible across slightly more than 18 percent of the foreground (up to 0.5 mile from the Proposed Route centerline) and slightly less than 9 percent of the middle ground (0.5 to 2 miles from the Proposed Route centerline). In both the foreground and middle ground areas with potential visibility, most views are expected to reveal fewer than 12 structures.

Across the different landscape unit types (Section 3.3.1), potential foreground and middle ground visibility would be greatest in Rural Agricultural and Developed Landscape Units, while visibility would be most limited in the Forested Mountains and Forested Ridges Landscape Units. The different extents of screening vegetation and topography in landscape unit types account for these differences (i.e., there are fewer screening features in Rural Agricultural and Developed Landscape Units compared to Forested Mountains and Forested Ridges Landscape Units). Table 4.2-1 lists the extent of visibility (acres of potential visibility) in each landscape unit, while Table 4.2-2 shows the portion of each landscape unit where structures may be visible, by number of structures.

As indicated by the GIS-based viewshed model (Attachment 1 and Table 4.2-1), potential visibility of the Proposed Route would be greatest in the foreground. In foreground areas, the new transmission line infrastructure acts as focal points that draw the attention of viewers. At longer viewing distances (middle ground to background), the Proposed Route may be apparent but would be one of multiple potential focal points. Since potential visibility is greatest in the foreground, this area was also assessed to determine the number of locations with potential visibility and greatest sensitivity to changes in visual resource characteristics. For purposes of this assessment, these locations included road crossings, residences, parks, recreation sites, and other protected areas.

In general, visibility of the Proposed Route would be most pronounced at shorter distances (generally less than 0.5 mile). Views of the Proposed Route and changes to existing visual conditions would be greatest from within the cleared ROW Corridor, at road crossings, across open fields or other clearings, and from elevated areas with broad, panoramic views. Some segments of the Proposed Route and Alternative Routes would cross through forested areas (e.g., Forested Mountains and Forested Ridges Landscape Units) that generally provide a substantial amount of screening that would limit views. While the new transmission line may also be visible at greater distances (generally more than 0.5 mile), including from higher elevation areas that provide panoramic views of the regional landscape, its presence on the landscape would diminish at longer distances.

Ultimately, actual visibility of the MARL Project will be influenced by the existing terrain, vegetation, and the built environment in each landscape unit. For example, in Forested Mountains and Forested Ridges Landscape Units, dense vegetation and rugged terrain will help screen views of the transmission line (tall lattice towers and long, thin overhead conductors), limiting visibility primarily to road crossings and other foreground locations. In contrast, Rural Agricultural and Rural Developed Landscape Units offer broader sightlines, making the MARL Project structures more visually prominent and apparent from area roads, farm buildings, and residences sporadically located throughout the area.

TABLE 4.2-1 PROPOSED ROUTE POTENTIAL VISIBILITY BY LANDSCAPE UNIT TYPE AND VIEWING DISTANCE

Landscape Unit	Viewing Distances								
	Foreground			Middle Ground			Foreground and Middle Ground, Total [c]		
	Total Acres	Acres Visible [a]	Percent [b]	Total Acres	Acres Visible [a]	Percent [b]	Total Acres	Acres Visible [a]	Percent [b]
Rural Agriculture	22,716.2	8,314.3	36.6%	73,332.2	13,078.5	17.8%	96,048.4	21,392.8	17.8%
Forested Mountains	29,085.4	2,484.7	8.5%	83,499.1	1,747.4	2.1%	112,584.5	4,232.1	2.1%
Developed	695.2	219.9	31.6%	4,471.3	795.4	17.8%	5,166.5	1,015.3	17.8%
River Valley	2,584.1	438.1	17.0%	8,525.1	1,383.5	16.2%	11,109.2	1,821.6	16.2%
Rural Developed	3,147.8	587.2	18.7%	8,115.9	582.6	7.2%	11,263.7	1,169.7	7.2%
Forested Ridges	10,555.7	665.6	6.3%	30,651.7	308.3	1.0%	41,207.4	973.9	1.0%

[a] Acres within each distance zone for each landscape unit where the MARL Project (one or more structures) is potentially visible.
[b] Indicates the percentage of the viewing distance within each landscape unit where the proposed MARL Project would potentially be visible.
[c] Totals may not match the sum of addends due to rounding.

TABLE 4.2-2 STRUCTURES POTENTIALLY VISIBLE BY LANDSCAPE UNIT AND DISTANCE

Number of Structures Visible	Rural Agricultural (%)	Forested Mountains (%)	Developed (%)	River Valley (%)	Rural Developed (%)	Forested Ridges (%)
Foreground (Up to 0.5 mile from viewer)						
0 structures (no visibility)	63.4%	91.5%	68.4%	83.0%	81.3%	93.7%
1 to 11 structures	33.0%	7.4%	27.0%	16.7%	16.5%	6.0%
12 or more structures	3.6%	1.2%	4.6%	0.2%	2.1%	0.3%
Middle ground (0.5 to 2 miles from viewer)						
0 structures (no visibility)	82.2%	97.9%	82.2%	83.8%	92.8%	99.0%
1 to 11 structures	16.4%	1.8%	16.2%	16.2%	6.8%	1.0%
12 or more structures	1.5%	0.3%	1.6%	0.1%	0.3%	0.0%

Road crossings are a specific type of opportunity for foreground views of the MARL Project. Table 4.2-3 lists the number of road crossings for the Proposed Route, while Table 4.2-4 lists the total number of road crossings for the Proposed Route and Alternative Routes. At these crossings, the MARL Project would be visible and result in changes to vegetation forms and lines within the cleared ROW Corridor. The tall, geometric transmission structures and overhead undulating horizontal lines would also be highly perceptible at these crossings. The duration of these views (structure visibility) would depend on the speed and direction of travel for motorists on these roads.

TABLE 4.2-3 PROPOSED ROUTE ROAD CROSSINGS BY STATE

Road Category [a]	Number of Road Crossings				
	Pennsylvania	West Virginia	Maryland	Virginia	Total
Primary	1	0	1	0	2
Secondary	3	5	6	0	14
Tertiary	12	78	47	3	140
Total [a]	**16**	**83**	**54**	**3**	**156**

[a] Roads are categorized by function, as follows:
Primary Roads (arterials): Major, high-speed routes that connect larger towns and cities
Secondary Roads (collectors): Smaller, intermediate speed roads that connect towns/cities and arterials
Tertiary Roads (local): Small, low speed roads that provide access within towns/cities and properties and that connect to collectors.

TABLE 4.2-4 PROPOSED ROUTE AND ALTERNATIVE ROUTE ROAD CROSSINGS

Road Category [a]	Number of Road Crossings					
	Proposed Route	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Primary	2	2	2	2	2	2
Secondary	14	13	16	14	14	16
Tertiary	140	139	148	144	133	150
Total	**156**	**154**	**166**	**160**	**149**	**168**

[a] Roads are categorized by function, as follows:
Primary Roads (arterials): Major, high-speed routes that connect larger towns and cities
Secondary Roads (collectors): Smaller, intermediate speed roads that connect towns/cities and arterials
Tertiary Roads (local): Small, low speed roads that provide access within towns/cities and to properties and connect to collectors. In addition to road crossings, a number of parks, trails, protected areas, and other recreation sites and use areas are in the vicinity of the Proposed Route. Viewer groups in these areas may be more sensitive to changes in scenic conditions because there is an expectation of scenic quality (i.e., visitors expect a higher level of visual quality at these areas). Table 4.2-5 lists the parks, trails, and other protected areas that the Proposed Route ROW Corridor will cross. Other parks, trails, and protected areas in the vicinity of the Proposed Route may also have potential viewing opportunities of the Proposed Route. However, the distance and intervening topography, vegetation, and built environment would likely screen many of these viewing opportunities.

While private residences are not considered public use areas (i.e., areas from which the general public would have views of a project), area residents are typically a viewer group with higher levels of sensitivity to changes in visual resources. The MARL Project siting process treated private residences as a routing constraint to minimize potential impacts, including changes in visual resource conditions. Nonetheless, 151 private residences are within 500 feet of the Proposed Route, while 142 to 192 private residences are within 500 feet of the Alternative Routes, as shown in Table 4.2-6.

TABLE 4.2-5 PARKS, TRAILS, AND PROTECTED AREAS CROSSED BY THE PROPOSED ROUTE ROW CORRIDOR

State	Parks, Trails, and Protected Areas
Pennsylvania	• Upper Monongahela River Water Trail • Sheepskin Trail
West Virgina	• Cooper's Rock State Forest • White Horse Mountain WMA • Allegheny Trail • Patterson Creek Water Trail • American Discovery Trail • South Branch Potomac River • Cacapon River Water Trail
Maryland	• Youghiogheny River Lake • Dan's Mountain WMA • Savage River State Forest • Big Savage Mountain Trail • Dan's Mountain WMA Trail • Meadow Mountain Trail • Mountain Maryland Scenic Byway • Potomac Heritage National Scenic Trail
Virginia	• None

WMA = Wildlife Management Area

This proximity does not mean that these residents will have unobstructed views of the ROW Corridor and Proposed Route, but it increases the likelihood that changes in landscape conditions may be visible from these residences. There are additional individual and clusters of residential development in the vicinity of the Proposed Route. The Proposed Route would also potentially be visible from other clusters of residential development in the vicinity of the Proposed Route (beyond 500 feet); however, distance would help minimize potential viewing opportunities.

TABLE 4.2-6 PRIVATE RESIDENCES WITHIN 500 FEET OF THE ROUTE CENTERLINES

State	Number of Private Residences					
	Proposed Route	Alternative Route B	Alternative Route C	Alternative Route D	Alternative Route E	Alternative Route F
Pennsylvania	16	10	47	16	16	47
West Virginia	91	128	73	91	82	77
Maryland	40	50	37	59	40	56
Virginia	4	4	4	4	4	4
Total	**151**	**192**	**161**	**170**	**142**	**184**

4.3 SIMULATIONS AND CHANGES IN LANDSCAPE CHARACTERISTICS

To evaluate anticipated visual change, photographic simulations of the MARL Project were compared to photographs of existing conditions at 14 KOPs and AVs representing the landscape units along the Proposed Route. KOPs and AVs are intended to be a sample of common, representative views along the length of the MARL Project. The degree to which overhead transmission lines influence and are visible on a landscape depends on a number of factors, including (but not limited to) structure height, design, and color; existing landscape features (e.g., topography, vegetation, human-made development); duration of the view; the extent of transmission infrastructure visible; and distances from the viewer. The specific combination of these factors changes from location to location, contributing to a range of potential influences and impacts across the MARL Project Study Area. For example, a transmission line that is partially obscured by vegetation and topography and visible at a substantial distance would have less visual impact than an unobstructed transmission line viewed at close distance.

4.3.1 KEY OBSERVATION POINTS AND AERIAL VIEWS

KOPs present a view that casual observers could have from publicly accessible locations. AVs were used instead of KOPs in some areas because of the lack of public access in proximity to the Proposed Route (e.g., river corridors). While public access is limited in these areas, they represent sensitive VSRs and viewer groups (e.g., residents, recreationists). The 14 KOPs and AVs are displayed on Figure 4.3-1. The remainder of this section describes existing conditions and the visual impacts of the Proposed Route by KOP and AV, including small-scale versions of the panoramic existing conditions photographs and simulation images. Larger format panoramic photographs and simulations are provided in Attachment 2, Existing Conditions and Simulation Photographs.

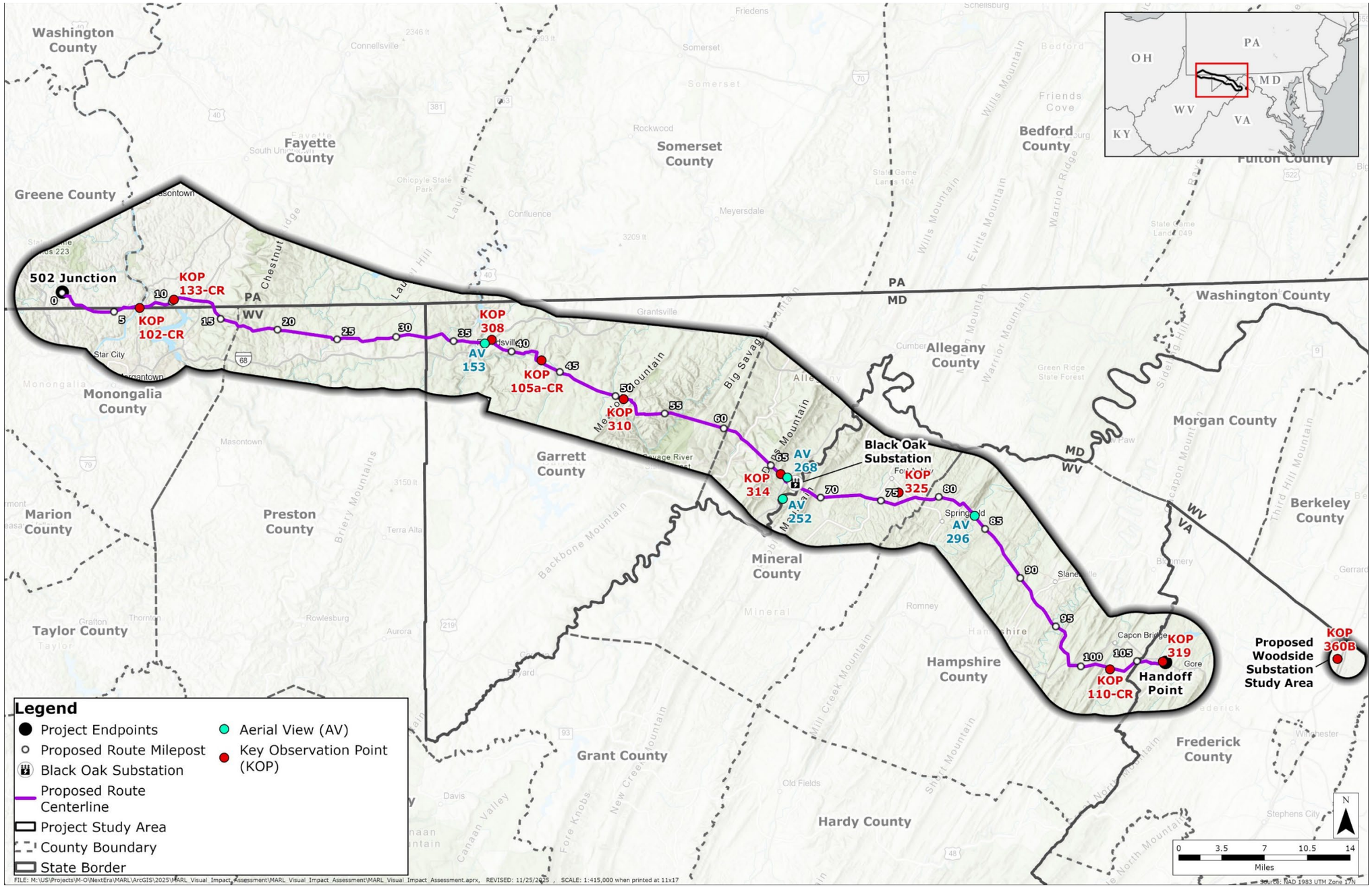
4.3.1.1 KOP 102-CR

KOP 102-CR is on the Monongahela River Trail / Sheepskin Trail and is less than 0.1 mile south of the Proposed Route (Alternative Routes B, D, and E share the same alignment as the Proposed Route in this area). The view is oriented to the north where the Monongahela River is visible through forest vegetation (Figure 4.3-2). The KOP is within and representative of a River Valley Landscape Unit.

From KOP 102-CR, the Proposed Route would be visible as it crosses the Monongahela River (Figure 4.3-3). Two transmission structures would be partially visible on the far side of the river (circled in red on Figure 4.3-3), and several conductors would be visible where they cross the river (circled in yellow on Figure 4.3-3). The existing trees in this location would obscure these features and make them difficult to discern at this distance.

Table 4.3-1 summarizes the existing visual characteristics of the landscape visible from KOP 102-CR, along with changes to these characteristics due to the Proposed Route.

FIGURE 4.3-1 KEY OBSERVATION POINTS AND AERIAL VIEWS



MD = Maryland; PA = Pennsylvania; VA = Virginia; WV = West Virginia

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FIGURE 4.3-2 KOP 102-CR EXISTING CONDITIONS



FIGURE 4.3-3 KOP 102-CR SIMULATED CONDITIONS WITH THE PROPOSED ROUTE

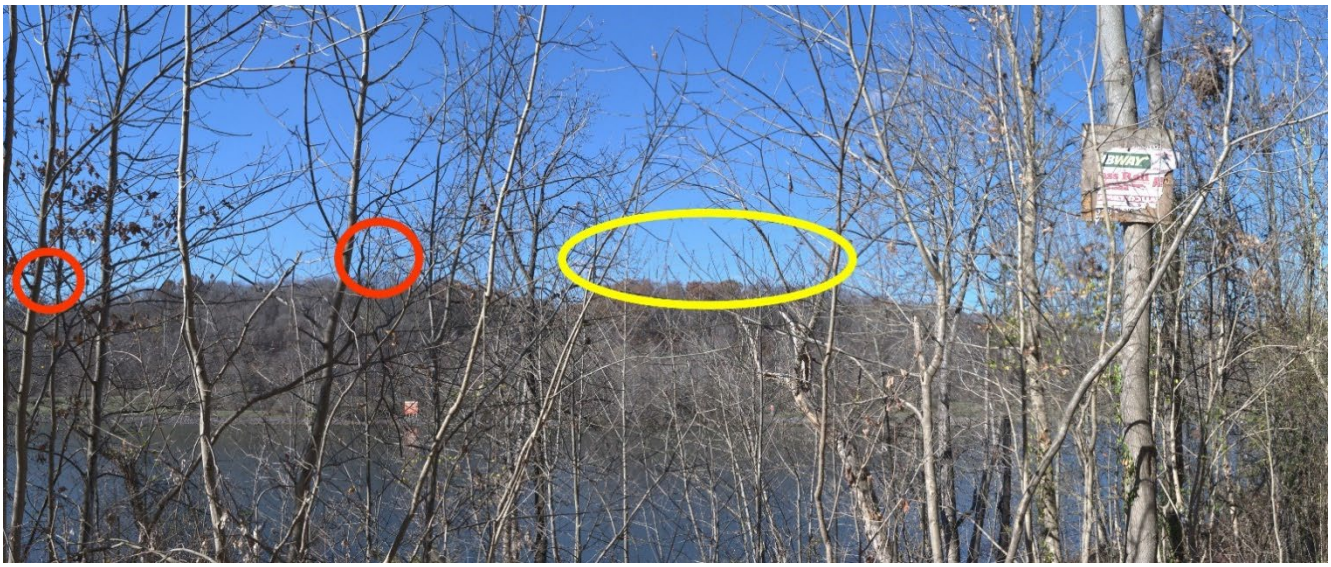

TABLE 4.3-1 KOP 102-CR LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Low, flat, rectangular forms; weak horizontal lines; blue-gray colors (Monongahela River); uniform, smooth textures	No change
Vegetation	Rounded, contiguous, strip forms (forested areas); simple horizontal and irregular vertical lines; brown, gray, tan, green colors (subject to seasonal variation); fine to medium, stippled textures	No change
Built Environment	Simple, geometric forms; straight lines; red, white, green colors (signage); fine, random textures	Tall, angular, geometric, linear forms; vertical, diagonal, parallel, horizontal lines; dull metallic, gray hues; fine, smooth texture

4.3.1.2 KOP 133-CR

KOP 133-CR is on Lake Lynn Road and is less than 0.1 mile to the south of the Proposed Route (Alternative Routes D and E share the same alignment as the Proposed Route in this area). The view is oriented to the north/northwest and includes forested areas on both sides of a paved, two-lane road that is bordered and crossed by two existing distribution lines (Figure 4.3-4). The KOP is within and representative of a River Valley Landscape Unit. While not in view, the Cheat River is to the west (left) of Lake Lynn Road.

FIGURE 4.3-4 KOP 133-CR EXISTING CONDITIONS



The Proposed Route would be visible from KOP 133-CR as it crosses Lake Lynn Road (Figure 4.3-5). A single transmission structure would be visible on the east (right) side of the road and multiple new overhead conductors would span the road. These new features would generally increase the level of visual clutter at this location. The Proposed Route would also require removal of trees on both sides of the road, opening direct views of the Cheat River and more distant areas to the left of the road.

FIGURE 4.3-5 KOP 133-CR SIMULATION CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-2 summarizes the existing visual characteristics of the landscape visible from KOP 133-CR, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-2 KOP 133-CR LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Simple, flat to angular forms (hills); weak diagonal lines; colors and textures obscured by vegetation and built features	Curving, rounded forms; simple, slightly curved, horizontal lines; subtle blue hue; fine, smooth, textures
Vegetation	Strip, amorphous, irregular, rounded forms (clusters of trees); vertical, branching, irregular horizontal lines; brown, tan, multiple green hues; fine to medium, continuous, stippled textures	New individual amorphous, patchy forms and changes to weak, branching lines; additional area of fine texture
Built Environment	Flat, strip, simple, linear, repeating forms (road and distribution lines); diagonal, straight to slightly curving, multiple, diagonal and vertical lines; light gray, brown, black colors; smooth, continuous, stippled textures	New tall, angular, geometric forms; additional parallel, diagonal lines; dull metallic, gray hues; fine, smooth texture

4.3.1.3 AV 153

AV 153 is taken from above Friendsville Addison Road and is less than 0.1 mile south of the Proposed Route (Alternative Routes D and E share the same alignment as the Proposed Route in this area; Alternative Route B also has a similar alignment as the Proposed Route but deviates as it approaches from the west in this area). The view is oriented to the west along an existing 138 kV transmission line and captures the Youghiogheny River as it flows between forested hills (Figure 4.3-6). While the view is not from the Youghiogheny River (e.g., boater or angler perspective from the river), it is intended to help characterize views from the river. The AV is within and representative of a River Valley Landscape Unit.

FIGURE 4.3-6 AV 153 EXISTING CONDITIONS



As shown on Figure 4.3-7, the Proposed Route would be visible in the expanded cleared ROW on both sides of the Youghiogheny River from AV 153. The wider ROW would further modify the forest cover in this area and increase the visibility of the underlying terrain. The transmission structures and overhead conductors would be visible within the expanded ROW Corridor. While the Proposed Route structures would be similar to the existing transmission line structures in the ROW, they would be larger (increased mass) and taller, resulting in increased prominence on the landscape. From the river (recreationist perspective), the new transmission line crossing would be similar to views at a road crossing; that is, the overhead conductors would be clearly visible above the river and the structures would be visible within the cleared ROW.

FIGURE 4.3-7 AV 153 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-3 summarizes the existing visual characteristics of the landscape visible from AV 153, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-3 AV 153 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Rolling, moderate, trapezoidal, strip, low forms (valley bounded by hills/mountains); regular, curvilinear, smooth, diagonal and horizontal lines; colors and textures generally obscured by vegetation and built features	No change
Vegetation	Simple, contiguous, transparent, amorphous, patch forms; weak diagonal, vertical, straight to irregular lines; brown, various green hues; fine to medium, directional, continuous, contrasting textures	Additional lines and change in contrasting textures
Built Environment	Low, angular to curving, geometric, linear forms; straight, diagonal, parallel, simple lines; gray, brown, white colors; fine, patchy, ordered, sparse, scattered textures	New tall, angular, geometric, forms; additional parallel lines; dull metallic, gray hues; fine, smooth texture

4.3.1.4 KOP 308

KOP 308 is from the Youghiogheny Overlook Welcome Center on Interstate 68. It is 0.2 mile north of the Proposed Route (Alternative Routes B, D, and E share the same alignment as the Proposed Route in this area; Alternative Routes C and F also cross through this area along a separate alignment). The view is oriented to the southwest and includes a portion of the access road and parking area at the overlook, a walking path, signs, a forested hillside, and an existing 115 kV transmission line and cleared ROW (Figure 4.3-8). The KOP is within and representative of a Forested Mountains Landscape Unit.

FIGURE 4.3-8 KOP 308 EXISTING CONDITIONS



The Proposed Route would not be visible from KOP 308, due to distance, intervening topography, and the presence of tall, mature trees that limit more extensive southwestern views of the landscape from this location. Table 4.3-4 summarizes the existing visual characteristics of the landscape visible from KOP 308.

TABLE 4.3-4 KOP 308 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Domed, simple, sloped forms (mountains); weak, curving lines; colors and textures obscured by vegetation and built environment	No change
Vegetation	Amorphous, tall, irregular, strip, patch forms (dense forested areas); horizontal and vertical, branching, curving lines; green, brown, red, yellow colors; smooth, fine to medium, discontinuous, clumped textures	No change
Built Environment	Definite, flat, solid, geometric, linear, directional forms (parking area, road, pathway); bold, regular, straight and curving, diagonal, vertical, simple lines; gray, tan, dull metallic, white, yellow, red, blue colors; fine, smooth, stippled textures	No change

4.3.1.5 KOP 105A-CR

KOP 105a-CR is on U.S. Route (US) 219 (Garrett Highway) and is 0.2 mile north of the Proposed Route (Alternative Routes B, C, and E share the same alignment as the Proposed Route in this area). The view is oriented to the south/southwest along the road corridor, which marks the transition between a Forested Mountains Landscape Unit to the west and a Rural Agricultural Landscape Unit to the east (Figure 4.3-9). An existing set of overhead conductors is visible across the highway.

FIGURE 4.3-9 KOP 105A-CR EXISTING CONDITIONS



From KOP 105a-CR, the Proposed Route would be visible as it crosses Garrett Highway (Figure 4.3-10). The cleared ROW Corridor would also be visible on the east (left) side of the highway. A single transmission structure would be partially visible through the trees along the ridge on the left side of the highway (circled in red on Figure 4.3-10). Several parallel overhead conductors would also be visible above the highway corridor and over adjacent trees.

FIGURE 4.3-10 KOP 105A-CR SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-5 summarizes the existing visual characteristics of the landscape visible from KOP 105a-CR, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-5 KOP 105A-CR LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Gentle, rolling, sloped forms (hills); horizontal and diagonal lines; colors and textures obscured by vegetation and built features	No change
Vegetation	Dense, rounded, conical, and amorphous forms (forest); weak vertical, branching, irregular horizontal lines; brown, tan, multiple green hues; fine to medium, continuous, stippled textures	New low, flat form; diagonal lines; light green color; directional, smooth texture
Built Environment	Prominent, flat, simple, linear, geometric to curving forms (road); regular, continuous, straight, and curving lines; gray, brown, white, yellow colors; smooth, directional, ordered textures	New tall, angular, geometric forms; additional parallel, horizontal lines; dull metallic, gray hues; fine, smooth texture

4.3.1.6 KOP 310

KOP 310 is on the Potomac Heritage National Scenic Trail and is less than 0.1 mile south of the Proposed Route (Alternative Routes B, C, and E share the same alignment as the Proposed Route in this area). The view is oriented to the northwest along an existing ROW. The cleared ROW creates an open area in the densely forested landscape within which an existing 500 kV transmission line is prominent (Figure 4.3-11). The elevation and topography at this existing ROW crossing provide trail users a broad, long-distance view of the landscape from KOP 310. The KOP is within and representative of a Forested Mountains Landscape Unit.

FIGURE 4.3-11 KOP 310 EXISTING CONDITIONS



The Proposed Route would be visible within the expanded ROW to the right of the existing transmission line at KOP 310 (Figure 4.3-12). Multiple transmission structures and overhead conductors would be visible and would contribute additional visual elements that are similar to the existing transmission line in this area. The expanded ROW would expose new areas of the underlying terrain and open broader views of the regional landscape. These changes would be most pronounced for trail users from within the expanded ROW and would likely be minimal from within the adjacent forested areas where dense tree cover would help screen the new transmission line.

FIGURE 4.3-12 KOP 310 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-6 summarizes the existing visual characteristics of the landscape visible from KOP 310, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-6 KOP 310 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Indistinct, rolling, low, simple forms (mountains); weak horizontal and diagonal lines; gray colors; fine to medium, patchy textures (most colors and textures obscured by vegetation)	No change
Vegetation	Strip, patch, continuous, amorphous, short to tall forms (forest and cleared ROW); weak horizontal, short vertical, branching lines; green, brown, tan, white colors; fine to medium, stippled textures	Additional short, flat forms and subtle changes to lines and textures
Built Environment	Tall, angular, geometric, linear, flat forms (transmission line); regular, straight, undulating, parallel, diagonal, horizontal lines; gray, dull metallic colors; fine, smooth, stippled textures	Additional tall, angular, geometric, linear forms; additional parallel, horizontal lines; additional dull metallic, gray hues; additional fine, smooth textures

ROW = right-of-way

4.3.1.7 KOP 314

KOP 314 is on Middle Ridge Road at the edge of the existing cleared ROW that descends Dan's Mountain from the northwest and continues to the southeast. The Proposed Route is less than 0.1 mile east of KOP 314 (the five Alternative Routes share the same alignment as the Proposed Route in this area; Alternative Routes D and F approach this area from the north but then follow the same northwest to southeast alignment as the other routes in this area). The view is oriented to the northwest and includes an existing cleared ROW, high-voltage transmission line, and dense forested areas (Figure 4.3-13). Attachment 2 provides a second view to the southeast at this KOP. The KOP is within and representative of a Forested Mountains Landscape Unit.

FIGURE 4.3-13 KOP 314 EXISTING CONDITIONS



From KOP 314, the Proposed Route would be visible within the expanded ROW to the left of the existing transmission line (Figure 4.3-14). Multiple transmission structures and overhead conductors would be visible and would contribute additional visual elements that are similar to the existing transmission line in this area. The expanded ROW would expose new areas of the underlying terrain and open views to a broader area. These changes would be most pronounced from within the expanded ROW and would likely be minimal from within the adjacent forested areas where dense tree cover would help screen the new transmission line.

FIGURE 4.3-14 KOP 314 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-7 summarizes the existing visual characteristics of the landscape visible from KOP 314, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-7 KOP 314 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Rolling, domed, simple forms (mountains); weak horizontal and diagonal lines; gray, tan colors; fine to medium, patchy textures (most colors and textures obscured by vegetation)	No change
Vegetation	Strip, block, continuous, amorphous, short to tall forms (forest and cleared ROW); irregular horizontal, repetitive vertical, branching lines; green, brown, tan, red colors; fine to medium, stippled textures	Additional short, flat forms and subtle changes to lines and textures
Built Environment	Tall, angular, geometric, linear, flat forms (transmission line); regular, straight, undulating, parallel, diagonal, horizontal lines; gray, dull metallic colors; fine, smooth, stippled textures	Additional tall, angular, geometric, forms; additional parallel, undulating, horizontal lines; additional dull metallic, gray colors; additional fine, smooth textures

ROW = right-of-way

4.3.1.8 AV 268

AV 268 is taken from above US 220 (McMullen Highway) and is nearly 0.4 mile east of the Proposed Route (the five Alternative Routes share the same alignment as the Proposed Route in this area; Alternative Routes D and F approach this area from the north but then follow the same northwest to southeast alignment as the other routes). This AV shows an existing transmission line and cleared ROW as it descends the forested slope of Dan's Mountain from the west/ northwest and continues to the east/southeast (Figure 4.3-15). Another utility ROW runs left-to-right across the view, crossing the existing transmission line perpendicularly. The view is intended to help characterize visual resource conditions within a densely forested, mountainous area. KOP 314 is nearby and provides a land-based perspective in this type of landscape (Section 4.3.1.7, KOP 314). AV 268 is within and representative of a Forested Mountains Landscape Unit.

FIGURE 4.3-15 AV 268 EXISTING CONDITIONS



From AV 268, the Proposed Route would be clearly visible within the expanded ROW through the forested eastern slope of Dan's Mountain (Figure 4.3-16). The MARL Project would add a second set of transmission structures and long, undulating overhead conductors to the expanded ROW in this area. As noted in KOP 314 (Section 4.3.1.7), from within the cleared ROW, the additional transmission line structures would be prominent on the landscape; however, views of any changes in visual resource conditions due to the Proposed Route would be minimal from other nearby locations within the adjacent forest, because of the dense tree cover and area topography.

FIGURE 4.3-16 AV 268 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-8 summarizes the existing visual characteristics of the landscape visible from AV 268, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-8 AV 268 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with MARL Project
Topography	Prominent, rolling, domed, steep, tall, solid forms (mountains); regular, curving, horizontal, diagonal, continuous lines; light gray, white colors (largely obscured by vegetation and built environment); fine, smooth, dotted textures	No change
Vegetation	Weak, contiguous, amorphous to geometric forms (forest, cleared ROW, and lawns); curving, simple, straight lines; brown, tan, gray, green colors; smooth, medium, continuous textures	Additional low, flat forms and similar lines, colors, and textures
Built Environment	Short to tall, bold, angular, regular, geometric, linear, simple forms (transmission line and homes); bold, straight, diagonal, thin, simple, parallel lines; gray, dull metallic, brown, black, white, green colors; scattered, fine to medium, stippled, smooth textures	Additional tall, angular, geometric, linear forms; additional parallel, horizontal lines; similar dull metallic, gray hues; additional fine, smooth, stippled textures

ROW = right-of-way

4.3.1.9 AV 252

AV 252 is taken from above Gerstell Road and is 1.5 miles southwest of the Proposed Route (all five Alternative Routes share the same alignment as the Proposed Route in this area). The view is oriented to the northeast within a wide agricultural valley bordered by forested mountains (Figure 4.3-17). The North Branch of the Potomac River flows across the valley before turning to the north along the eastern (right) side of the valley. A series of existing high-voltage transmission lines connected to the existing Black Oak Substation cross the valley from west (left) to east (right). The view is intended to help characterize the view from the North Branch of the Potomac River, as well as for residents within the valley. The AV is within and representative of a Rural Agricultural Landscape Unit that is bordered by Forested Mountains Landscape Units.

FIGURE 4.3-17 AV 252 EXISTING CONDITIONS



The Proposed Route would be clearly visible as it spans the open agricultural valley and forested mountains visible from AV 252 (Figure 4.3-18). The additional transmission structures and long, undulating overhead conductors would repeat the visual elements created by the existing high-voltage transmission lines already present on the landscape in this area. Clusters of trees may help screen the Proposed Route from the North Branch of the Potomac River and other land-based locations within the agricultural valley. The new transmission line infrastructure would nonetheless be prominent on the landscape, due to the open nature of the valley and contrasting slopes of the adjacent mountains.

FIGURE 4.3-18 AV 252 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-9 summarizes the existing visual characteristics of the landscape visible from AV 252, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-9 AV 252 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Bold, flat, triangular, trapezoidal, contrasting, concave, directional forms (valley bordered by mountains); straight, diagonal, curvilinear, angular, continuous lines; deep/dark blue; fine, smooth textures (most colors and textures obscured by vegetation and built features	No change
Vegetation	Strip, patch, contiguous, amorphous, contrasting forms (fields, riparian vegetation, forests); weak, curvilinear, vertical, irregular horizontal, continuous lines; tan, brown, green, white colors; fine to medium, patchy, ordered, contrasting textures	Subtle changes in patchy forms and irregular horizontal lines
Built Environment	Tall, angular, geometric, linear, directional forms (transmission lines, substation, road); regular, straight to curving, angular, simple, parallel, undulating, continuous lines; light gray, green, dull metallic, white colors; smooth, stippled, sparse textures	Additional tall, angular, geometric, linear forms; additional parallel, undulating, horizontal lines; additional dull metallic, gray hues; additional fine, smooth textures

4.3.1.10 KOP 325

KOP 325 is located on Painter Hollow Road adjacent to Painter Run/Fort Ashby Dam. It is slightly more than 0.8 mile north of the Proposed Route (Alternative Routes B, C, and D share the same alignment as the Proposed Route in this area). The view is oriented to the south and shows Painter Hollow Road as it heads to the south behind a small hill, a portion of the gravel parking area/fishing access at Fort Ashby Dam, and forested hillsides. Painter Run is partially visible through the trees bordering the reservoir (right side of Figure 4.3-19). The KOP is within and representative of a Forested Mountains Landscape Unit.

FIGURE 4.3-19 KOP 325 EXISTING CONDITIONS



From KOP 325, the Proposed Route would be partially visible. Two transmission structures would be mostly obscured but perceptible behind trees on both sides of Painter Hollow Road (circled in red on Figure 4.3-20). A portion of the new overhead conductors would also be visible above the trees where Painter Hollow Road curves to the right (circled in yellow on Figure 4.3-20).

FIGURE 4.3-20 KOP 325 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-10 summarizes the existing visual characteristics of the landscape visible from KOP 325, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-10 KOP 325 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Steep, domed, flat forms (hills and lake); diagonal, smooth, straight, horizontal lines; brown, tan, black, dark green colors; fine, smooth textures	No change
Vegetation	Strip, conical, amorphous, diverse forms (trees and other ground vegetation); irregular, horizontal, vertical, branching lines; green, brown, tan colors; fine to medium, patchy, discontinuous, stippled textures	No change
Built Environment	Definite, flat, solid, low, curving forms (road and parking area); curvilinear, continuous, directional lines; gray, yellow colors; smooth, continuous textures	New angular, geometric forms; new thin, horizontal lines; new dull metallic, gray hues; new fine, smooth textures

4.3.1.11 AV 296

AV 296 is taken from above Springfield Pike and is less than 0.1 mile east of the Proposed Route (Alternative Routes B, C, and D share the same alignment as the Proposed Route in this area). The view is oriented to the northwest along an existing 138 kV transmission line and captures the South Branch Potomac River as it flows between forested ridges (Figure 4.3-21). An existing 500 kV ROW is also visible on the right (north) side of the image. While the view is not from the South Branch Potomac River (e.g., boater, angler, private camp perspectives), it is intended to help characterize views from and along the river. The AV is within and representative of a River Valley Landscape Unit, as well as adjacent Forested Ridge Landscape Units that border the river valley.

The Proposed Route would be clearly visible from AV 296 as it descends in a new cleared ROW through the forested eastern/southeastern slope of the White Horse Mountain Wildlife Management Area and then crosses the South Branch Potomac River (Figure 4.3-22). It would add another cleared ROW and set of transmission structures and long, undulating overhead conductors to the landscape in this area. The new transmission infrastructure would be similar in appearance to the existing 500 kV route and would be larger and more prominent than the existing 138 kV route to the south (left). From the river (recreationist perspective), the new transmission line crossing would be similar to the other nearby transmission line crossings; that is, the overhead conductors would be clearly visible above the river, and the structures would be visible within the cleared ROW.

Table 4.3-11 summarizes the existing visual characteristics of the landscape visible from AV 296, along with changes to these characteristics due to the Proposed Route.

FIGURE 4.3-21 AV 296 EXISTING CONDITIONS



FIGURE 4.3-22 AV 296 SIMULATION CONDITIONS WITH THE PROPOSED ROUTE



TABLE 4.3-11 AV 296 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Rolling, rounded, flat, tall, directional forms (river valley bordered by mountains); horizontal, curving, simple lines; dark green/blue, gray colors; fine, smooth, sparse granular textures	No change
Vegetation	Solid, linear, strip, amorphous forms (fields and forest); bold, straight, irregular, continuous lines; green, brown, light gray, tan colors; fine to medium, continuous, contrasting textures	Additional low, flat forms and similar lines, colors, and textures
Built Environment	Angular, geometric, linear, low, directional forms (transmission lines, buildings); short to long, straight and curving, simple, continuous lines; gray, dull metallic, white, blue, green colors; scattered, fine to medium, stippled, smooth textures	Additional tall, angular, geometric, linear forms; additional parallel, horizontal lines; additional dull metallic, gray hues; additional fine, smooth textures

4.3.1.12 KOP 110-CR

KOP 110-CR is on Christian Church Road and is less than 0.2 mile south of the Proposed Route (all five Alternative Routes share the same alignment as the Proposed Route in this area). The view is oriented to the northwest and includes a narrow two-lane road, agricultural fields, clusters of trees, residential and farm structures, and a distribution line (Figure 4.3-23). The KOP is within and representative of a Rural Agricultural Landscape Unit.

FIGURE 4.3-23 KOP 110-CR EXISTING CONDITIONS



From KOP 110-CR, the Proposed Route would be visible as it crosses from west (left) to east (right) across Christian Church Road and the adjacent open fields (Figure 4.3-24). Some of the new transmission structures would be mostly screened by existing trees (left side of Christian Church Road), while the tops of other structures would be visible above the existing tree canopy (circled in red on Figure 4.3-24). The long, thin overhead conductors would be visible as they cross the open areas between clusters of forest vegetation. The cleared ROW would create several new gaps in the clusters of forest vegetation on the right side of the view that would be visible from this location.

FIGURE 4.3-24 KOP 110-CR SIMULATED CONDITIONS WITH THE PROPOSED ROUTE



Table 4.3-12 summarizes the existing visual characteristics of the landscape visible from KOP 110-CR, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-12 KOP 110-CR LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with MARL Project
Topography	Gentle, rounded forms (hills); weak horizontal lines; colors and textures obscured by vegetation and built features	No change
Vegetation	Wide, rolling, low forms with tall, irregular, patches(fields and clusters of trees); weak, slightly curving and weak, irregular vertical lines; green, tan, and brown colors; fine to medium, discontinuous textures	Subtle changes to patchy forms
Built Environment	Flat, strip, simple, geometric and linear forms (road and distribution line); diagonal, slightly rounded, vertical lines; gray, white, light tan, black colors; smooth, continuous textures	Additional tall, angular, linear forms; additional parallel, horizontal lines; dull metallic, gray hues; fine, smooth textures

4.3.1.13 KOP 319

KOP 319 is on Parishville Road and is slightly more than 0.1 mile north of the Proposed Route (all five Alternative Routes share the same alignment as the Proposed Route in this area). The view from this location is oriented to the southwest and includes a two-lane road, the Gore Substation, a cell phone tower, several transmission and distribution lines, and a grassy hillside with clusters of forest vegetation (Figure 4.3-25). The KOP is within and representative of a Rural Agricultural Landscape Unit.

FIGURE 4.3-25 KOP 319 EXISTING CONDITIONS



The Proposed Route would be visible as it crosses Parishville Road and continues past the substation to the south (left) of the road (Figure 4.3-26). A single new transmission structure (circled in red on Figure 4.3-26) would be partially visible behind several distribution poles and substation structures. The MARL Project's overhead conductors would be visible crossing Parishville Road and then continuing to the east (left) with other existing overhead conductors (circled in yellow on Figure 4.3-26). The MARL Project's new transmission structure and conductors would be similar in appearance to the existing transmission, substation, and distribution infrastructure on the landscape at this KOP.

FIGURE 4.3-26 KOP 319 SIMULATED CONDITIONS WITH THE PROPOSED ROUTE

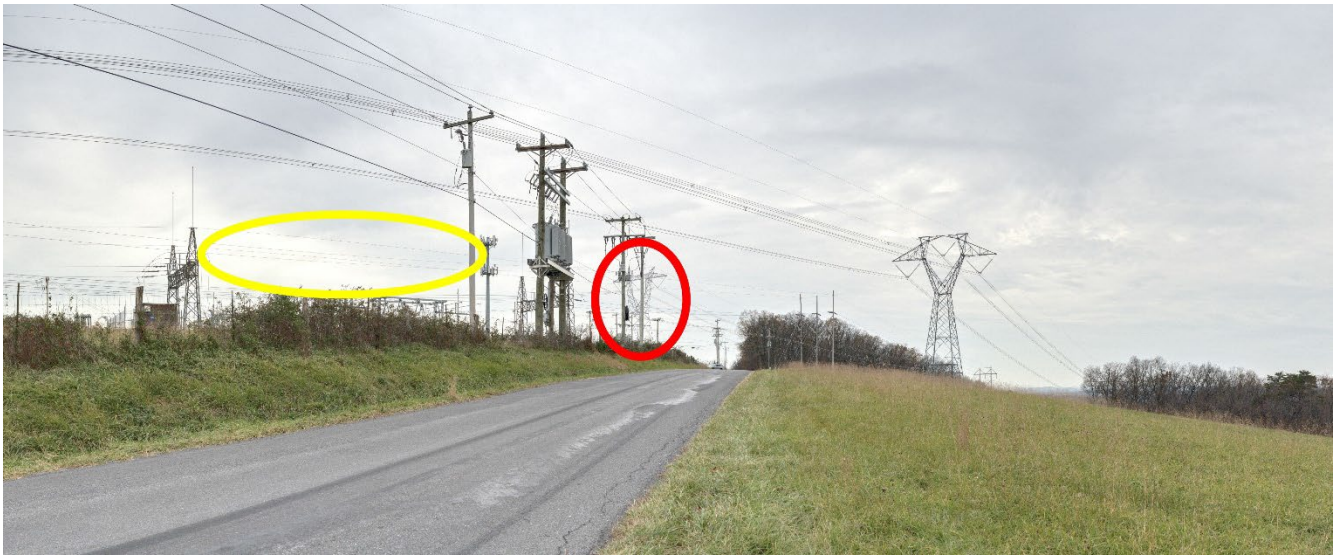

Table 4.3-13 summarizes the existing visual characteristics of the landscape visible from KOP 319, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-13 KOP 319 LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Proposed Route
Topography	Rolling, domed, simple, regular forms (hills); horizontal, diagonal lines; colors and textures obscured by vegetation and built environment	No change
Vegetation	Low, simple, patch, block, amorphous forms (fields and clusters of trees); weak, vertical, branching, discontinuous, irregular lines; green, tan, brown colors; fine to medium, patchy textures	No change
Built Environment	Tall, repeating, angular, geometric, linear, cylindrical forms (transmission line, substation, and road); straight, parallel, vertical, diagonal, continuous lines; gray, light brown, dull metallic colors; smooth to rough, ordered, stippled textures	Additional tall, angular, geometric, linear forms; additional parallel, horizontal lines; additional dull metallic, gray colors; additional smooth, stippled textures

4.3.1.14 KOP 360B

KOP 360B is on Thistle Lane, which runs along the southern side of the proposed Woodside Substation property. The view from this KOP is oriented to the northeast across an open field that is crossed by two existing transmission lines. The KOP is within and representative of a Rural Agricultural Landscape Unit.

FIGURE 4.3-27 KOP 360B EXISTING CONDITIONS



The Woodside Substation would be prominent in the view from KOP 360B (Figure 4.3-28). Multiple substation structures and facilities, as well as a retention pond and a support building outside of the walled footprint of the substation would be visible. While the existing transmission lines have similar visual elements as MARL Project elements, the new substation would add multiple new elements and would substantially increase the extent of energy infrastructure on the landscape in this area.

FIGURE 4.3-28 KOP 360B SIMULATED CONDITIONS WITH THE WOODSIDE SUBSTATION



Table 4.3-14 summarizes the existing visual characteristics of the landscape visible from KOP 360B, along with changes to these characteristics due to the Proposed Route.

TABLE 4.3-14 KOP 360B LANDSCAPE CHARACTERISTICS

Landscape Feature	Existing Conditions	Conditions with Woodside Substation
Topography	Flat, low forms (terrain); weak horizontal lines; colors and textures obscured by vegetation and built environment	Similar low, flat forms; strong horizontal lines; colors and textures remain obscured by vegetation and the built environment
Vegetation	Rounded, amorphous, clump, low, strip forms (field and clumps of trees); irregular, horizontal, curving lines; brown, tan, multiple green hues; soft, fine, continuous, clumped textures	Low, flat, small clusters, strip, simple, forms; weak diagonal, irregular horizontal; tan, green colors; smooth, fine, clumped, subtle textures
Built Environment	Tall, angular, geometric, linear, parallel, undulating, vertical, horizontal lines (transmission lines and gravel road); light to dark gray, dull metallic colors; fine, smooth, ordered, stippled textures	Solid, definitive, tall, linear, geometric, tall, angular, geometric, repetitive forms; additional horizontal, vertical, diagonal lines; multiple gray and dull metallic hues; fine, smooth, ordered textures

4.3.2 IMPACT ASSESSMENT BY LANDSCAPE UNIT

Based on the visual characteristics of the Proposed Route infrastructure (Section 4.1, MARL Project Features) and the anticipated changes in visual resource conditions (Section 4.3.1, Key Observation Points and Aerial Views), this section describes the permanent changes that are anticipated from the Proposed Route in each landscape unit type. These descriptions are centered on typical landscape characteristic changes resulting from the Proposed Route. While the descriptions are not intended to represent a view from a specific location, they are representative of the visual changes that may be expected at locations with Proposed Route visibility throughout each landscape unit. The descriptions are focused on the Proposed Route, but similar visual resource changes would also be expected from the Alternative Routes in each landscape unit.

4.3.2.1 RURAL AGRICULTURAL LANDSCAPE UNITS

Because the Rural Agricultural Landscape Unit type is characterized by flat, open areas between low mountains, the addition of the MARL Project would introduce new, large-scale, visually prominent features to the landscape unit. The changes in visual characteristics of Rural Agricultural Landscape Units due to the Proposed Route are summarized below:

- Landform/Water—largely unchanged from existing conditions; structure-specific grading may change landforms in specific locations but would not result in landscape level changes.
- Vegetation—existing vegetation patterns would be disrupted by vegetation clearing within the ROW Corridor, introducing new linear gaps with altered colors and textures, particularly in areas with clusters of trees and other taller vegetation; low, agricultural vegetation would remain unchanged.
- Built Environment—addition of tall, metallic towers with dominant vertical and geometric forms, spaced at regular intervals, and extending linearly across the landscape; introduction of thin, undulating horizontal lines.

These changes would generally decrease the scenic integrity of the landscape and would be most pronounced in areas without existing transmission line infrastructure.

4.3.2.2 FORESTED MOUNTAINS LANDSCAPE UNITS

Forested Mountains Landscape Units benefit from varied terrain and dense forest cover, both of which tend to screen and help limit the visibility of changes in visual resource characteristics from the Proposed Route. The changes in visual characteristics of Forested Mountains Landscape Units due to the Proposed Route are summarized below:

- Landform/Water—largely unchanged from existing conditions; structure-specific grading may change landforms in specific locations but would not result in landscape level changes.
- Vegetation—new, wide, linear gaps with distinct edges that break up the continuity of dense forest vegetation; modifications to the forms, lines, and textures of the vegetation in the ROW Corridor.
- Built Environment—introduction of tall, metallic towers with dominant vertical and geometric forms extending linearly across the landscape would contrast with the organic forms of adjacent forest areas; addition of thin, undulating, horizontal overhead lines.

The ROW Corridor and repetitive structures would decrease the scenic integrity of the landscape by creating new visual intrusions into the forested landscape. Changes to visual characteristics would be most prominent within or near the cleared ROW Corridor, as well as from nearby elevated locations that provide a broader view of the landscape. Forest vegetation would limit views of the ROW Corridor (and thus of changes to visual characteristics) from other areas. These changes would be less apparent in areas with existing transmission line infrastructure.

4.3.2.3 DEVELOPED LANDSCAPE UNITS

Because Developed Landscape Units are dominated by cleared lands with high levels of development, the introduction of new and/or additional transmission line infrastructure would be more compatible with the existing landscape characteristics than in more natural-appearing landscape units such as Forested Mountains. The changes in the characteristics of these more visually complex landscapes due to the Proposed Route are summarized below:

- Landform/Water—largely unchanged from existing conditions; structure-specific grading may change landforms in specific locations but would not result in landscape level changes.
- Vegetation—new gaps in taller vegetation, such as ornamental trees and pockets of remnant forests; changes to forms, lines, and textures in the cleared ROW Corridor.
- Built Environment—addition of tall, highly visible metallic towers with vertical and geometric forms that may conform to or be somewhat consistent with existing structures and development patterns; addition of thin, undulating, horizontal overhead lines above existing buildings; in more densely developed areas, the addition of new transmission line structures and conductors may be partially absorbed into the complex built environment, but in more suburban areas or locations at the edge of development, the transmission infrastructure may be more visually prominent and reduce the visual cohesion of the landscape.

In general, the cleared ROW Corridor and new transmission infrastructure would be more compatible with the scenic integrity of the landscape in Developed Landscape Units than in other landscape units. The new infrastructure would be similar to some existing landscape elements but may be more prominent because of its mass and height.

4.3.2.4 RIVER VALLEY LANDSCAPE UNITS

River Valley Landscape Units are similar to Rural Agricultural Landscape Units. The introduction of transmission infrastructure in these areas would add prominent linear and vertical elements that contrast with the landscape's horizontal orientation and visual character. The Proposed Route often crosses this landscape unit perpendicular to the general direction of each valley (including the river and road features that define each valley), making MARL Project components more prominent in these areas. The changes in visual characteristics of River Valley Landscape Units due to the Proposed Route are summarized below:

- Landform/Water—largely unchanged from existing conditions; structure-specific grading may change landforms in specific locations but would not result in landscape level changes.
- Vegetation—existing vegetation patterns would be disrupted by vegetation clearing within the ROW Corridor, introducing new linear gaps with altered colors and textures, particularly in areas with clusters of trees and other taller vegetation, including riparian areas.

- Built Environment—addition of tall, metallic towers with dominant vertical and geometric forms spaced at regular intervals and extending linearly across the landscape; introduction of thin, undulating horizontal lines; in visually open areas, including river crossings, the transmission infrastructure would be a dominant visual feature that introduces forms, lines, and colors that contrast with the surrounding natural environment.

These changes would generally decrease the scenic integrity of the landscape and would be most pronounced in areas without existing transmission line infrastructure. Except in riparian habitat exclusion zones in Maryland and West Virginia, the trimming and removal of trees and other taller riparian vegetation would be visible and would potentially affect the recreational experience of river users by reducing the sense of natural enclosure within the river corridor.

4.3.2.5 RURAL DEVELOPED LANDSCAPE UNITS

Rural Developed Landscape Units have a blend of human-altered and natural landscape features, with varied landscape elements and visual complexity. The addition of new transmission line infrastructure would introduce new vertical and linear built elements that may contrast with the form and scale of the existing landscape. The changes in the visual characteristics of Rural Developed Landscape Units due to the Proposed Route are summarized below:

- Landform/Water—largely unchanged from existing conditions; structure-specific grading may change landforms in specific locations but would not result in landscape level changes.
- Vegetation—existing vegetation patterns would be disrupted by vegetation clearing within the ROW Corridor, introducing new linear gaps with altered colors and textures, particularly in areas with clusters of trees and taller shrubs; any new breaks in taller vegetation would reduce screening, modify vegetative patterns, and increase the visibility on the landscape.
- Built Environment—addition of tall, metallic towers with dominant vertical and geometric forms spaced at regular intervals and extending linearly across the landscape; introduction of thin, undulating horizontal lines; a higher degree of compatibility in more developed areas with similar landscape elements, but scale and height of new infrastructure would make it a prominent feature across the landscape unit.

The anticipated changes from the Proposed Route would generally decrease the scenic integrity of Rural Developed Landscape Units, in particular in areas with less development.

4.3.2.6 FORESTED RIDGES LANDSCAPE UNITS

Forested Ridges Landscape Units are similar to Forested Mountains Landscape Units. The changes in the visual characteristics of Forested Ridges Landscape Units due to the Proposed Route are summarized below:

- Landform/Water—largely unchanged from existing conditions; structure-specific grading may change landforms in specific locations but would not result in landscape level changes.
- Vegetation—new wide, linear gaps with distinct edges that break up the continuity of dense forest vegetation; modifications to the forms, lines, and textures of the vegetation in the ROW Corridor.

- Built Environment—introduction of tall, metallic towers with dominant vertical and geometric forms that contrast with the organic forms of adjacent forest areas; addition of thin, undulating, horizontal overhead lines.

In Forested Ridges Landscape Units, the new ROW Corridor and repetitive structures would decrease the scenic integrity of the landscape by creating new visual intrusions into the forested landscape. Changes to visual characteristics would be most prominent within or near the cleared ROW, as well as from nearby elevated locations that provide a broader view of the landscape. Forest vegetation would limit views of the ROW Corridor (and thus of changes to visual characteristics) from other areas. Similar to other types of landscape units, the changes would also be less apparent in areas with existing transmission line infrastructure.

5. CONCLUSIONS

The MARL Project involves the construction and operation of a new 500 kV transmission line and associated ROW Corridor that will cross portions of Pennsylvania, West Virginia, Maryland, and Virginia. As noted previously, the degree to which overhead transmission lines influence and are visible on a landscape depends on a number of factors, including, but not limited to, structure height and color, existing landscape features (e.g., topography, vegetation, built environment), duration of the view, and distances from the viewer. The specific combination of these factors changes by location, contributing to a range of potential influences and changes to existing visual resource characteristics.

As noted previously, construction of the MARL Project would result in increased visibility of construction equipment and construction activity including clearing of trees and other vegetation from the ROW Corridor. These changes would be short-term, temporary impacts that would last only for the duration of construction, anticipated to be 24 months for the entire MARL Project, although construction at any single location along the Proposed Route will occur over multiple shorter periods of time during the overall construction period. Upon completion of construction, vehicles, equipment, and personnel will depart, and disturbed portions of the ROW Corridor and any ancillary facilities workspaces will be restored. Stable, early succession plant communities will be re-established in disturbed areas following construction through implementation of a prescribed vegetation management plan.

During operation, the new transmission line will add tall, geometric structures and long, gently curving lines to the landscape that will be most apparent in foreground areas. The transmission structures will create a series of repetitive, dominant, vertical features that will extend above existing trees canopies and add new focal points that shift the vertical structure of the landscape. The conductors will appear as multiple undulating, overhead horizontal lines spanning the areas between transmission poles. These changes will be most perceptible in landscape unit types with fewer screening features (e.g., Rural Agricultural Landscape Units) and least perceptible in areas with more screening features (e.g., Forested Mountains Landscape Units).

Overall, the Proposed Route was selected because it offers a balanced approach to potential resource impacts, including visual, environmental, and socioeconomic resources, as well as engineering feasibility. Changes to visual resources are not completely avoidable from large-scale transmission line projects; however, where possible, the Proposed Route centers these unavoidable changes in areas with lower levels of viewer sensitivity and on landscapes that are better able to absorb visual resource changes. Along the Proposed Route alignment, the greatest visual resource impacts would be expected where the following conditions are met:

- Where unobstructed views with few to no screening opportunities are common;
- At road crossings and near residences and other VSRs where viewer sensitivity is high; and
- In areas with no existing transmission line infrastructure or other large-scale development.

In these areas, changes to existing visual characteristics would be most pronounced, and viewer exposure and sensitivity to these changes would be greatest. This combination would result in impacts on visual resources. Areas with this combination of factors generally represent a small percentage of the area within the foreground and middle ground of the Proposed Route.

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WVDED (West Virginia Department of Economic Development). 2021. West Virginia 2021 Statewide Comprehensive Outdoor Recreation Plan. Accessed: October 2025. Retrieved from: https://wvrecreation.org/

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ATTACHMENT 1 VIEWSHED ANALYSIS FIGURES

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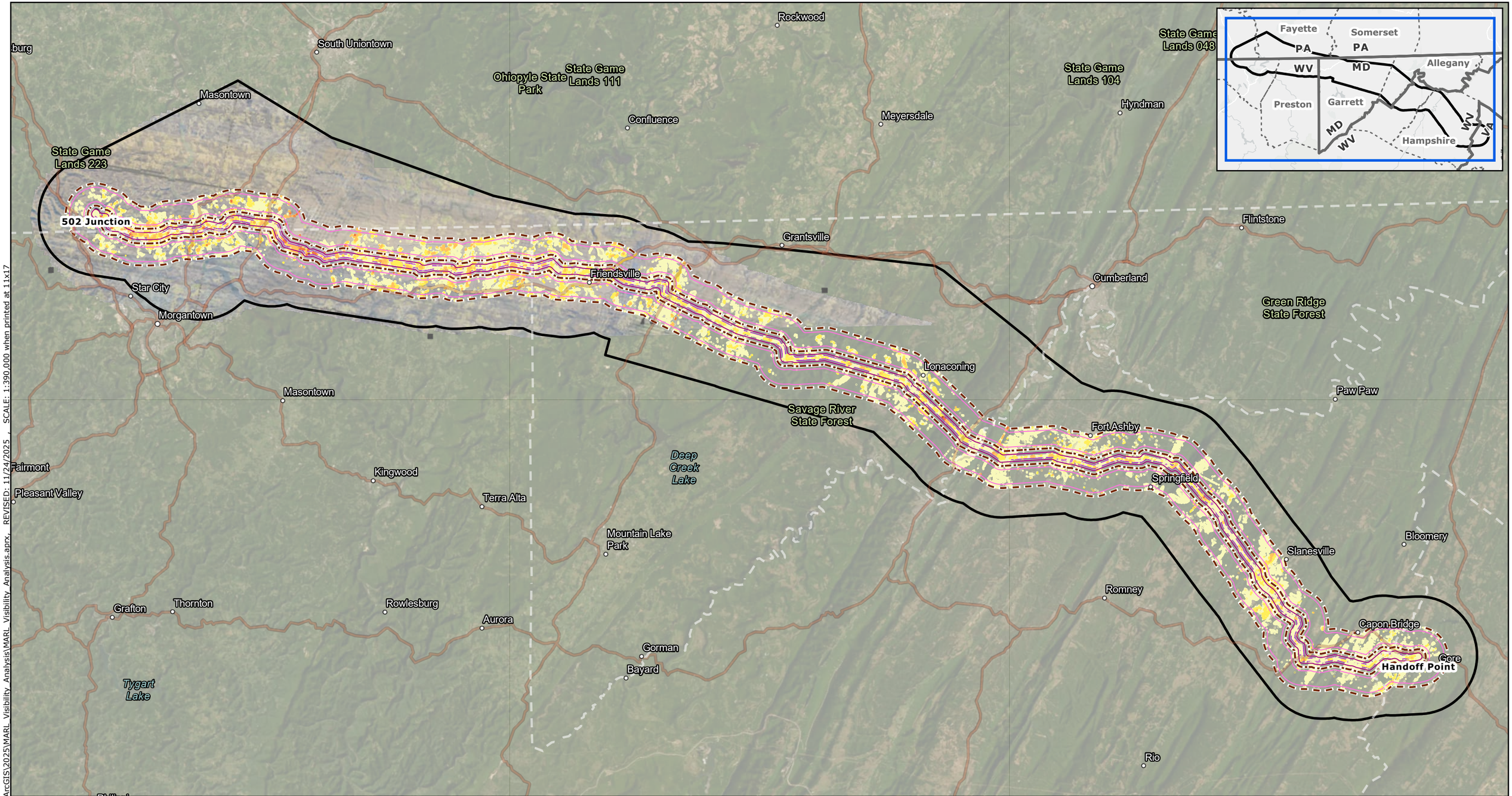

Proposed Route Towers
Proposed Route (A) Centerline
Proposed Route ROW

Visibility Range

Foreground - Centerline to 0.5 Miles
Middle Ground - 0.5 to 2 Miles

Structures Visible

More than 67 Structures Visible
46 - 67 Structures Visble
23 - 45 Structures Visible
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Fewer than 12 Structures Visible

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4. Data source: NEET, ERM, USFWS, PA NHI, PAD-US

N

0 16,000 32,000 48,000 64,000

US Feet

Scale: 1:390,000
1 inch equals 32,500 ft (when printed at 11x17)

Viewshed Analysis

Page 1 of 14

MidAtlantic Resiliency Link

ERM

Coordinate System: NAD 1983 UTM Zone 17N

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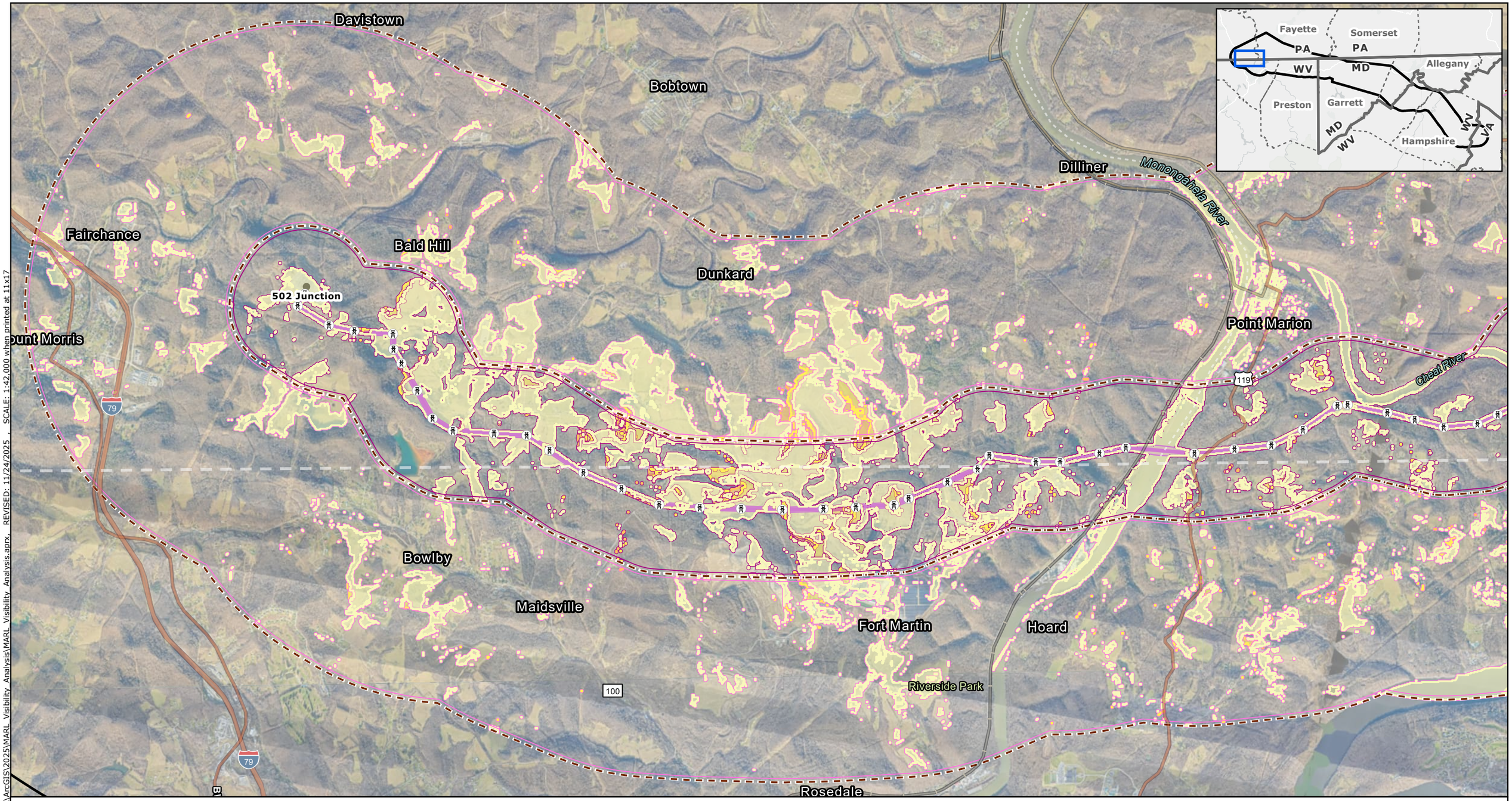

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Viewshed Analysis

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MidAtlantic Resiliency Link

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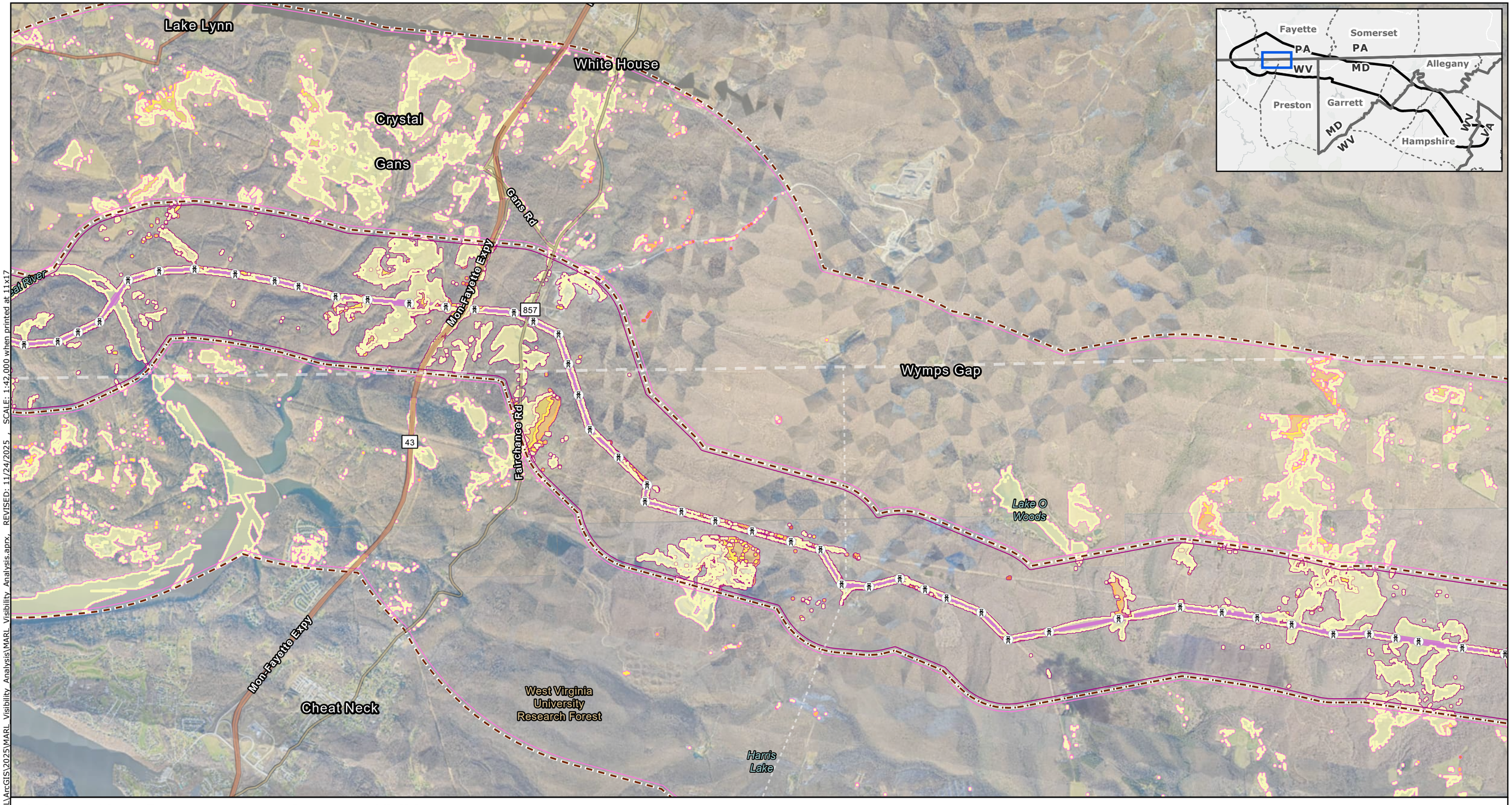

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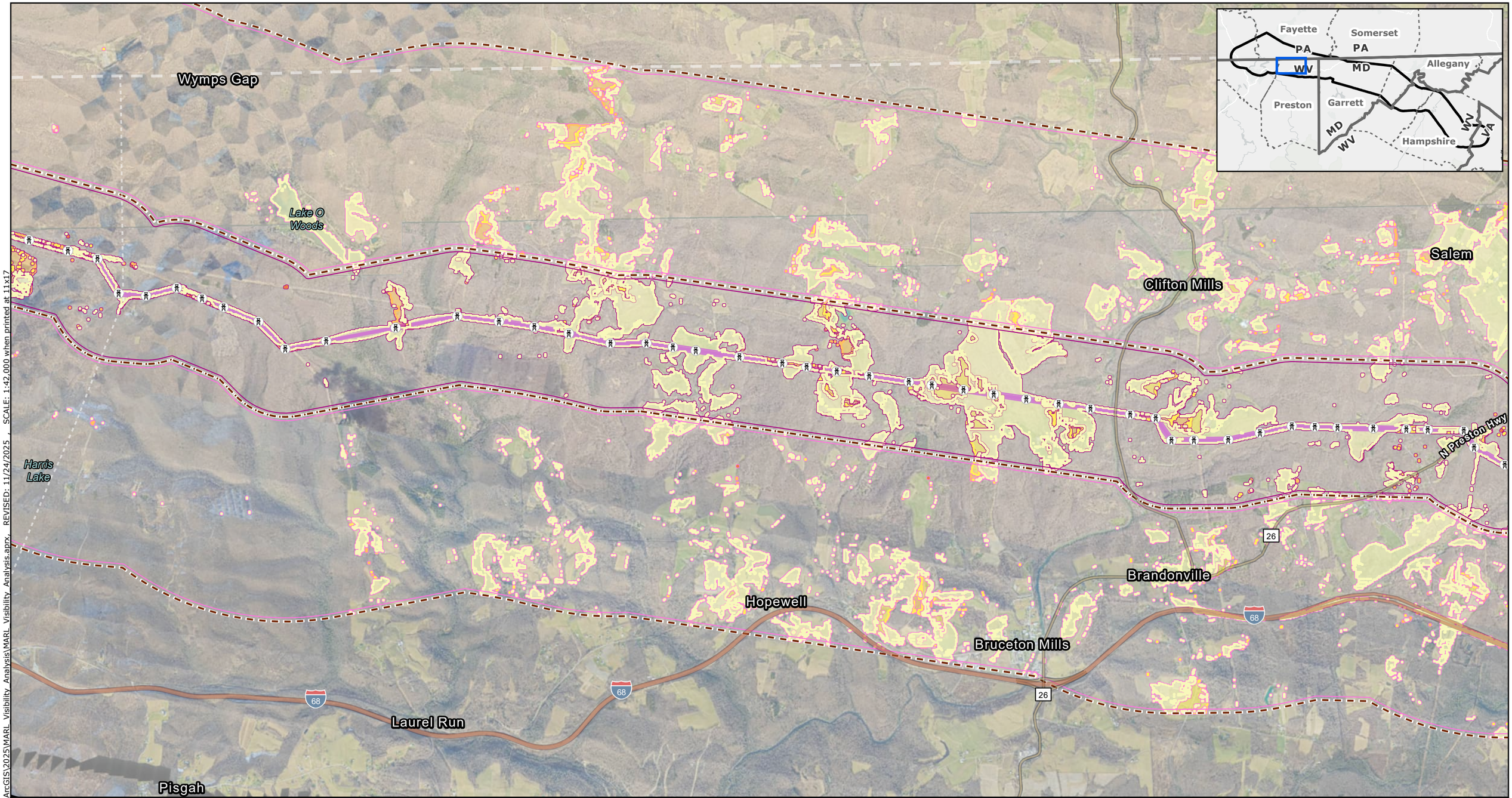

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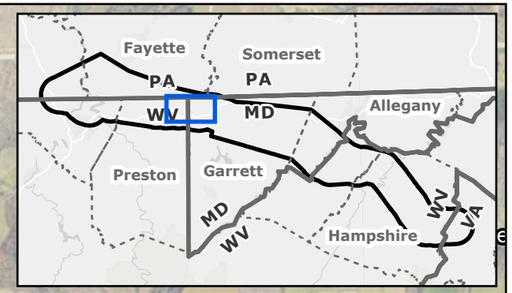

Five Forks
N Preston Hwy
Glade Farms
Friendsville Rd
Asher Glade
Youghiogheny Lake
Selbysport
26
42
Sand Spring
68
Friendsville
Blooming Rose
Hazelton
Locust Grove
42

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Page 5 of 14
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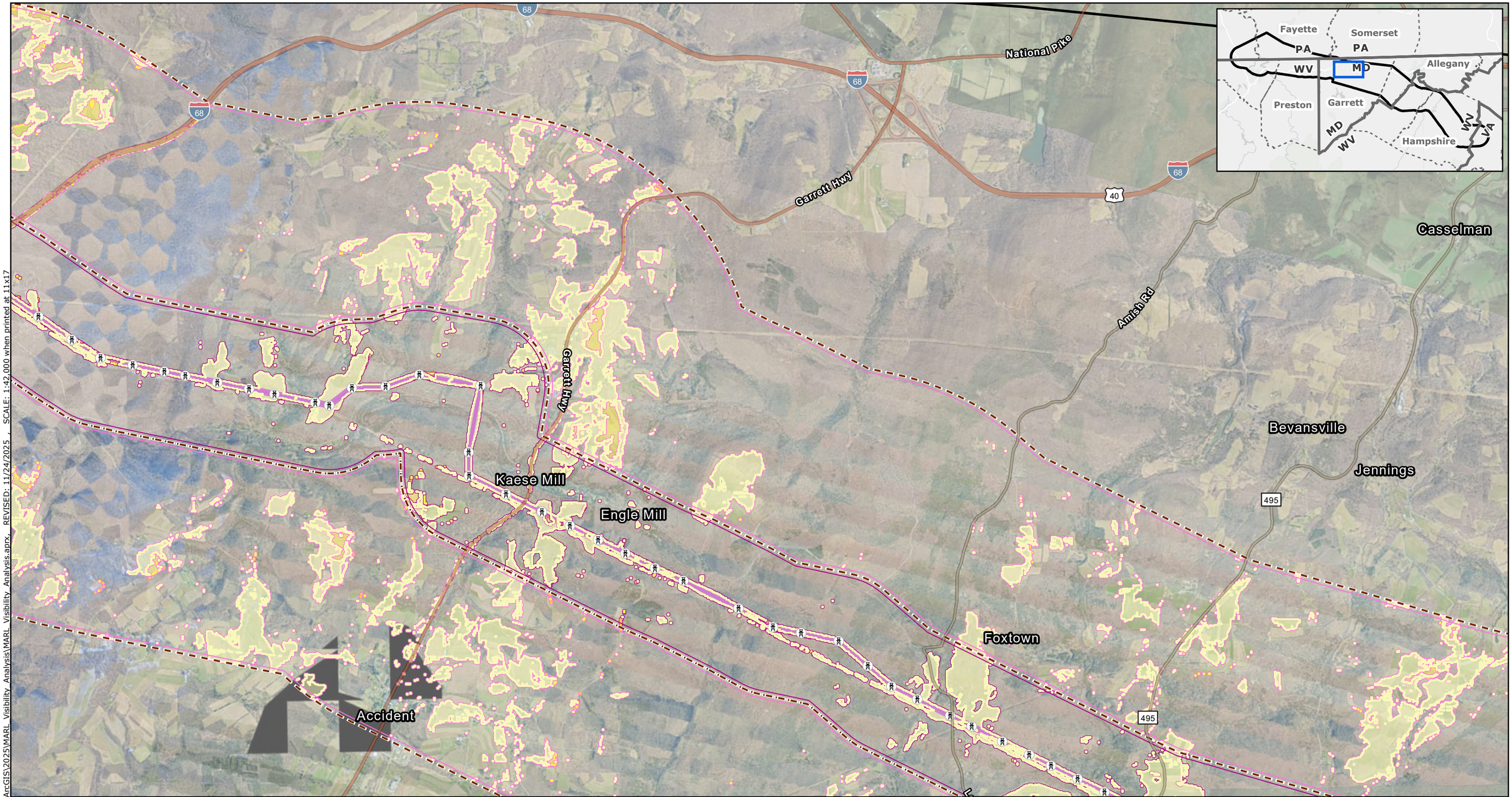

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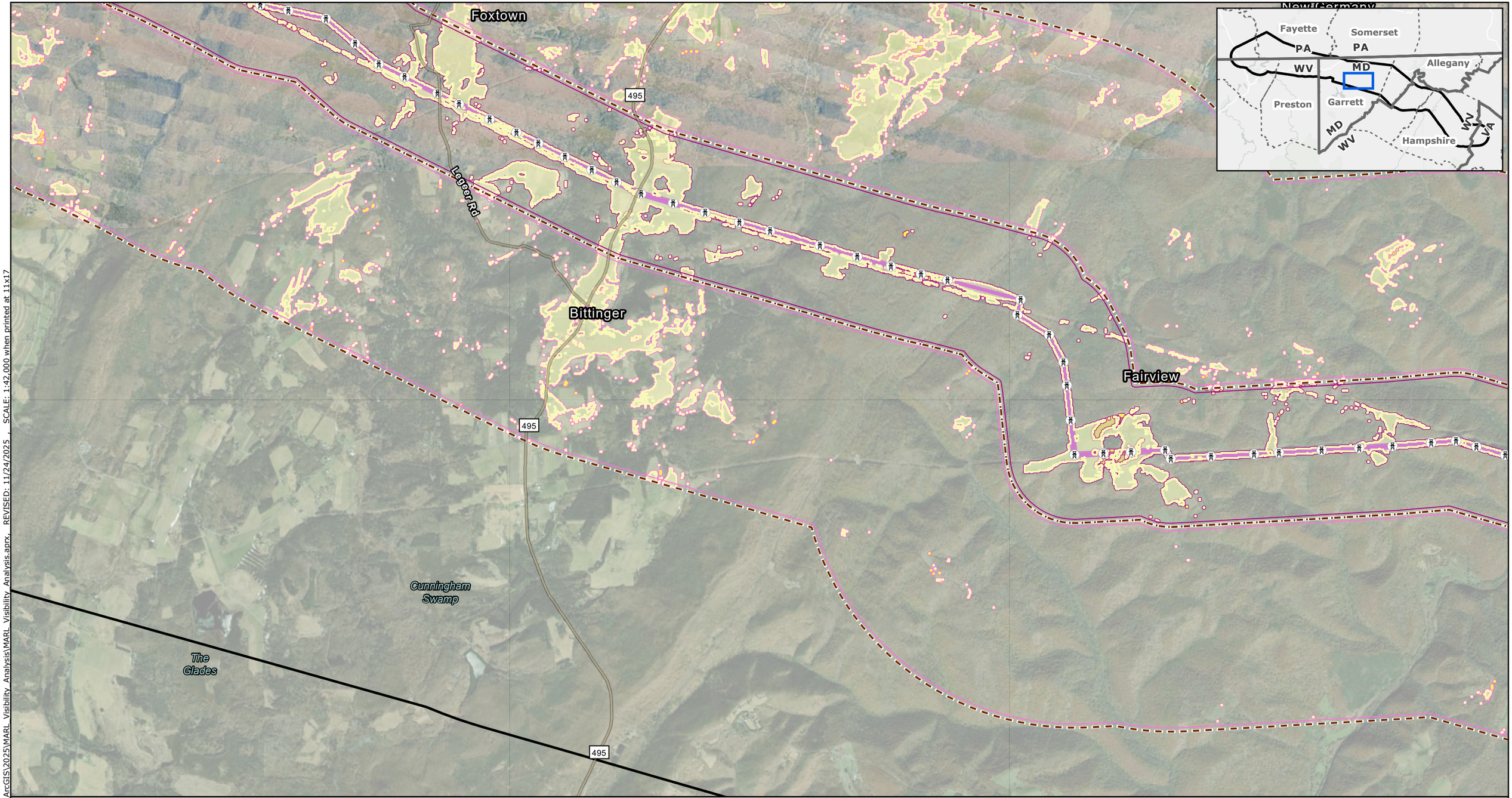

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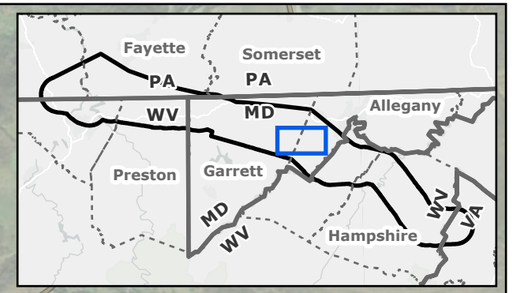

Merrill

Koontz

Midland

36

Lonaconing

Fort Hill Rd

Dan's Mountain Campground

Detmold

Moscow

Barton

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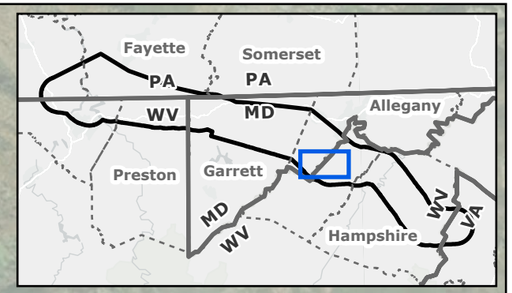

Danville

Black Oak

McMullen Hwy SW

Dawson

McMullen Hwy SW

Piedmont Rd

Fort Ashby Rd

220

220

Proposed Route Towers
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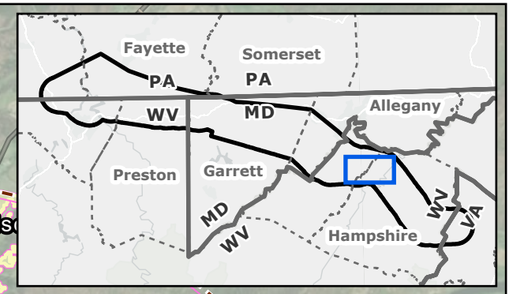

Fort Ashby
Frankfort Hwy
S Green St
Potomac State College Malone Farm
Fort Ashby Rd
Potomac State College Deremer Farm
Frankfort Hwy
Cumberland Rd
Milleson
Springfield
Raven Rocks
Millesons Mill
Grace
wood

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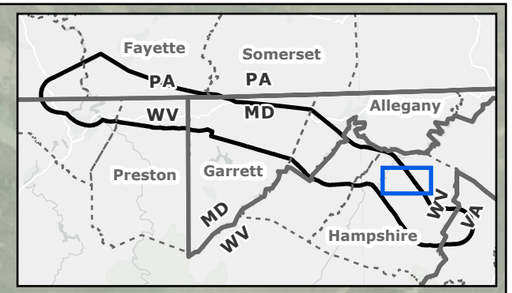

Points

Creekvale

Higginsville

Three Churches

29

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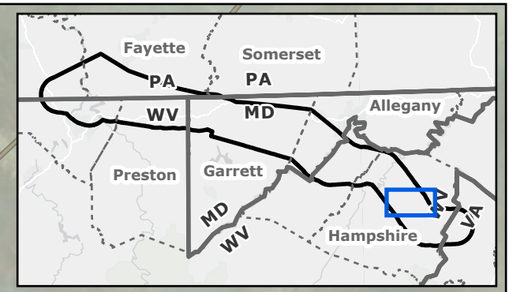

Gore

Slanesville Pike

Slanesville

Bloomery Pike

Barnes Mill

Bloomery Pike

North River Mills

Cold

Hoy

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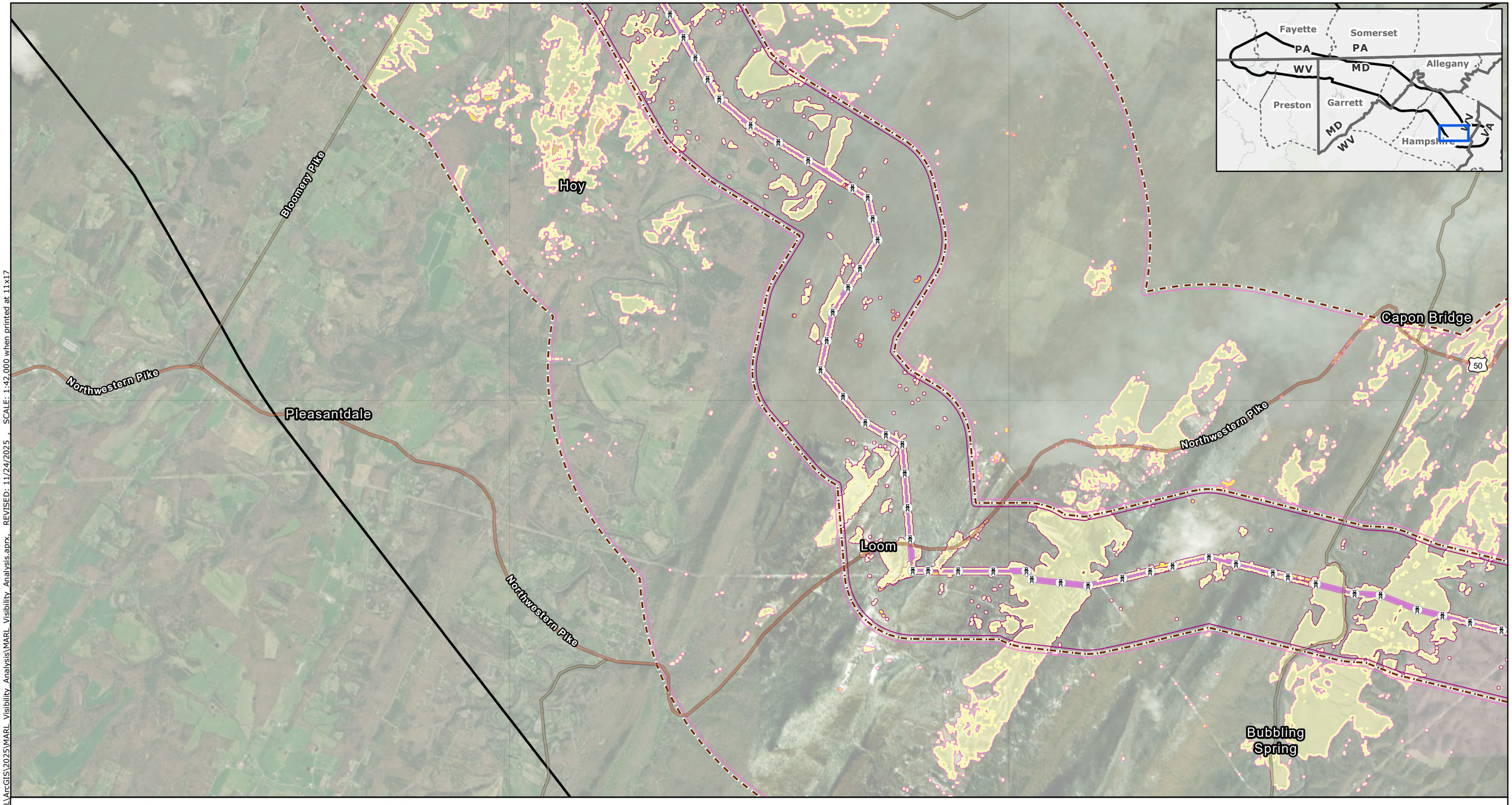

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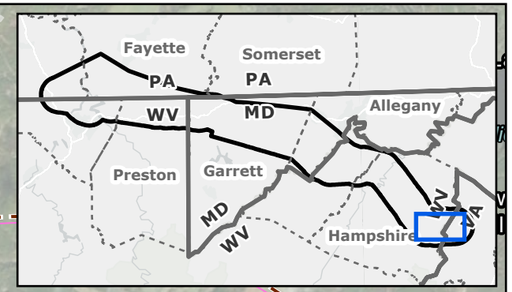

Capon Bridge
50
Northwestern Pike
Northwestern Pike
The Knolls
Loom
Handoff Point
Gore
Bubbling Spring
Carpers Pike
Hooks Mills
Finger Lake

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ATTACHMENT 2 EXISTING CONDITIONS AND SIMULATION PHOTOGRAPHS

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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

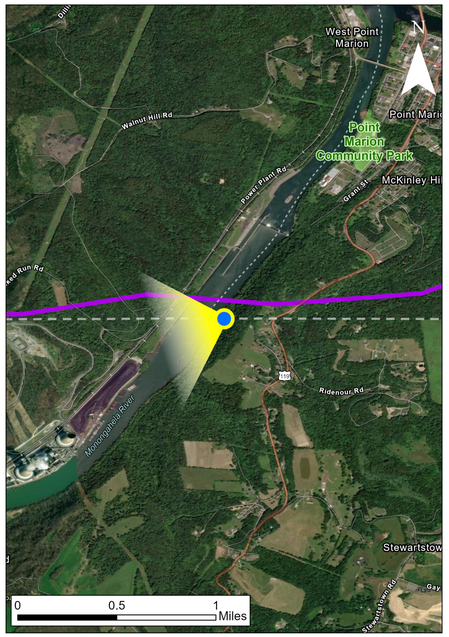
NextEra Energy Transmission subsidiaries[1]

KOP 102-CR

Sheepskin Trail

Proposed Route

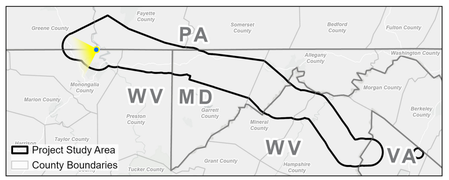
Date: 11/12/2024
Time: 1:02 pm
Viewing Direction: Southwest
Landscape Unit: River Valley



Viewpoint Direction

Protected Lands

Preliminary Draft Route Options



[1] NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc. are subsidiaries of NextEra Energy Transmission, LLC.

EXISTING CONDITIONS

PROPOSED CONDITIONS

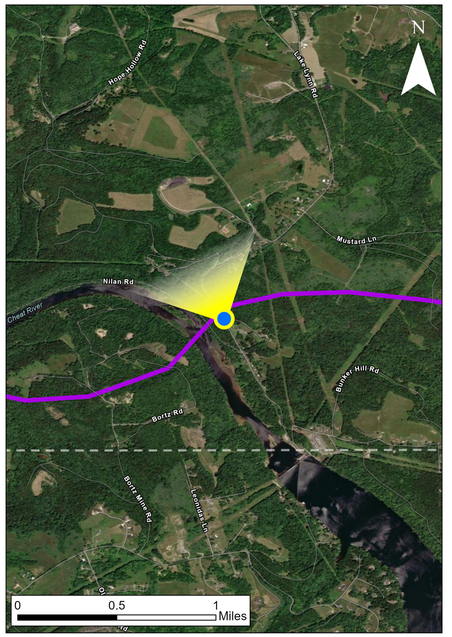
MidAtlantic Resiliency Link
500 kV Electric Transmission Project
NextEra Energy Transmission subsidiaries[1]

KOP 133-CR

Lake Lynn Historic District

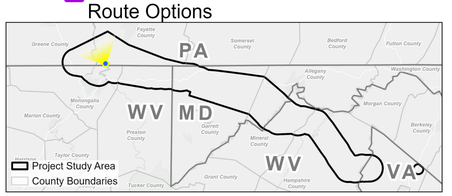
Proposed Route

Date: 11/12/2024
Time: 4:56 pm
Viewing Direction: Northeast
Landscape Unit: River Valley



Viewpoint Direction

Preliminary Draft Route Options



[1] NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc. are subsidiaries of NextEra Energy Transmission, LLC.





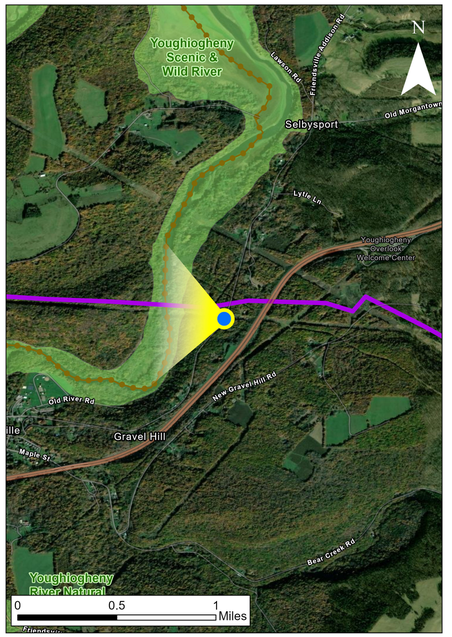
MidAtlantic Resiliency Link
500 kV Electric Transmission Project
NextEra Energy Transmission subsidiaries[1]

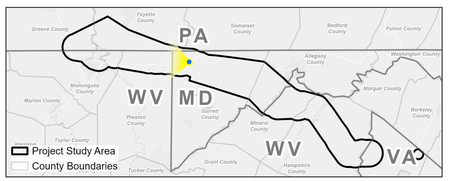
Aerial View 153

Youghiogheny River

Proposed Route

Date: 12/08/2024
Time: 1:16 pm
Viewing Direction: West
Landscape Unit: Rural Development





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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

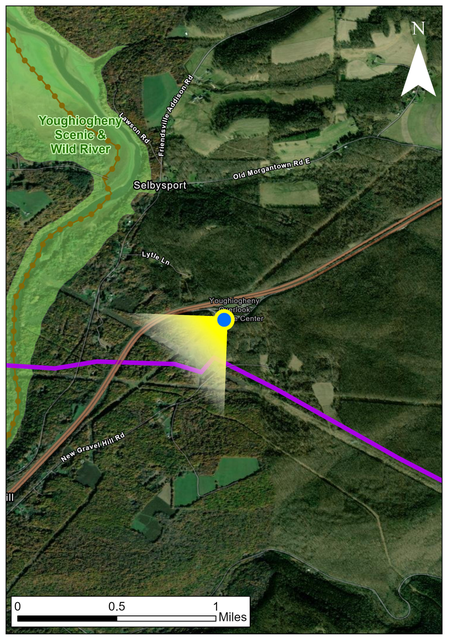
NextEra Energy Transmission subsidiaries[1]

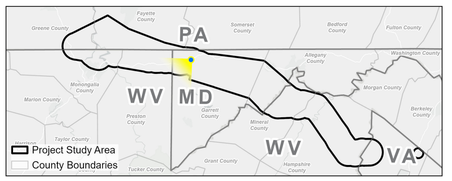
KOP 308

Youghiogheny Overlook Welcome Center

Proposed Route

Date: 11/13/2024
Time: 1:17 pm
Viewing Direction: Southwest
Landscape Unit: Forested Mountains





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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

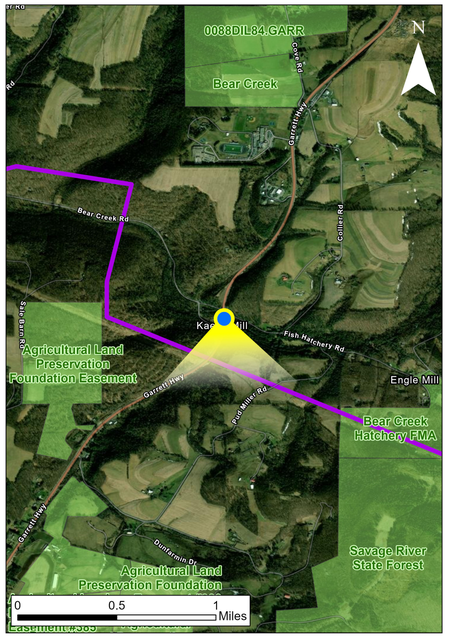
NextEra Energy Transmission subsidiaries[1]

KOP 105a-CR

Garrett Highway/Kaese Mill

Proposed Route

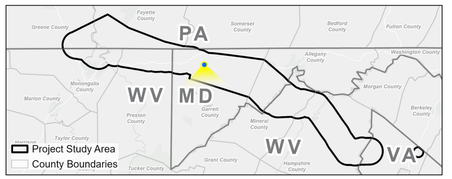
Date: 11/19/2024
Time: 2:44 pm
Viewing Direction: South
Landscape Unit: Forested Mountains



Viewpoint Direction

Protected Lands

Preliminary Draft Route Options



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MidAtlantic Resiliency Link

500 kV Electric Transmission Project

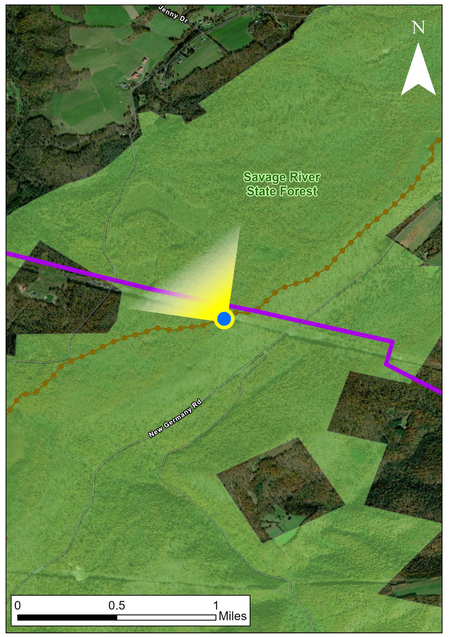
NextEra Energy Transmission subsidiaries[1]

KOP 310

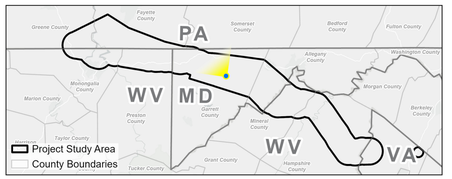
Potomac Heritage National Scenic Trail

Proposed Route

Date: 11/18/2024
Time: 12:5 pm
Viewing Direction: Northwest
Landscape Unit: Forested Mountains



Viewpoint Direction
Preliminary Draft Route Options
Potomac Heritage Trail
Protected Lands



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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

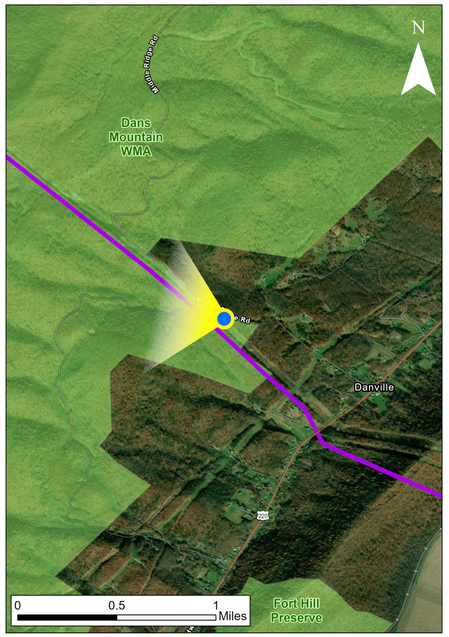
NextEra Energy Transmission subsidiaries[1]

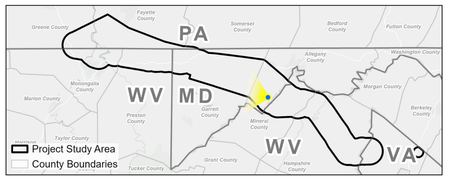
KOP 314

Dan's Mountain Wildlife Management Area

Proposed Route

Date: 11/14/2024
Time: 10:23 am
Viewing Direction: Northeast
Landscape Unit: Forested Mountains





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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

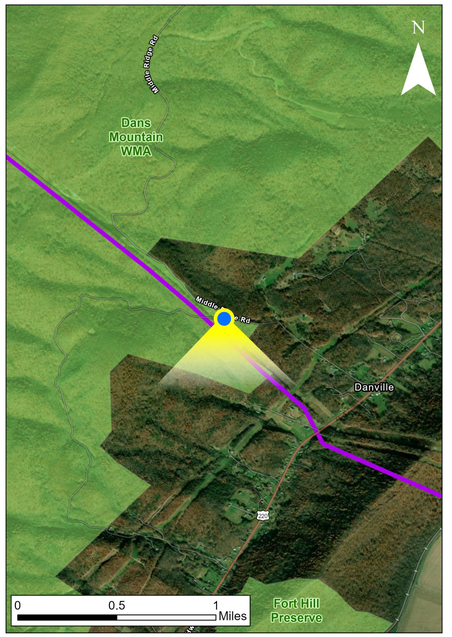
NextEra Energy Transmission subsidiaries[1]

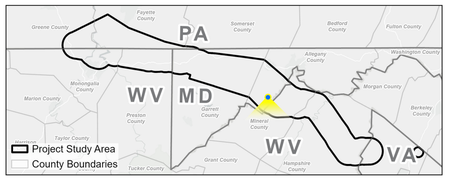
KOP 314

Dan's Mountain Wildlife Management Area

Proposed Route

Date: 11/14/2024
Time: 10:23 am
Viewing Direction: South
Landscape Unit: Forested Mountains





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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

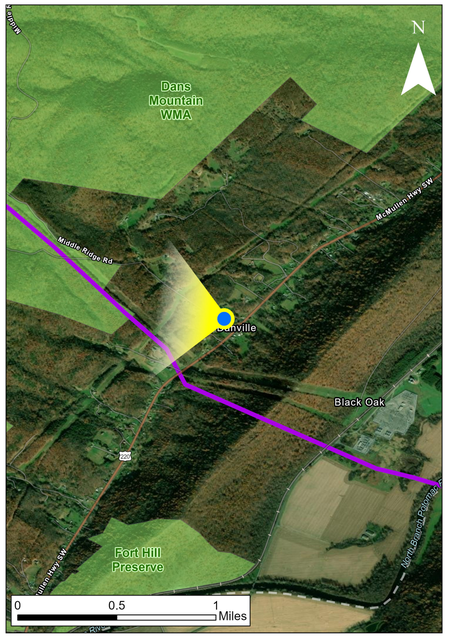
NextEra Energy Transmission subsidiaries[1]

Aerial View 268

Dan's Mountain Wildlife Management Area

Proposed Route

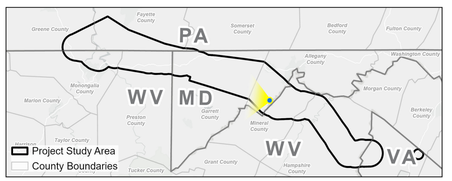
Date: 12/09/2024
Time: 12:21 pm
Viewing Direction: West
Landscape Unit: Forested Mountains



Viewpoint Direction

Protected Lands

Preliminary Draft Route Options



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MidAtlantic Resiliency Link
500 kV Electric Transmission Project
NextEra Energy Transmission subsidiaries[1]

Aerial View 252

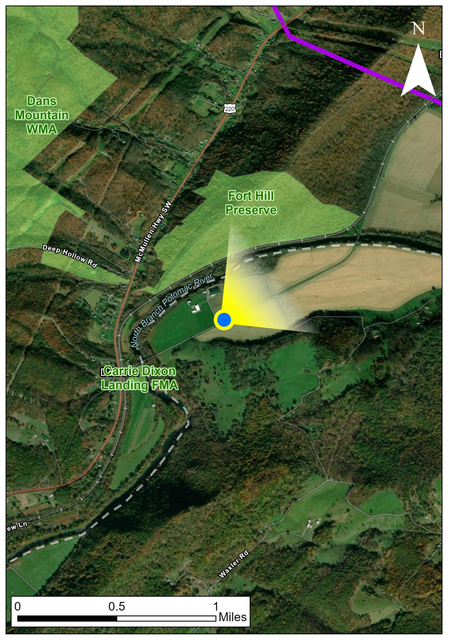
North Branch of the Potomac River

Proposed Route

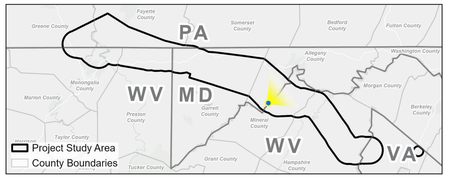
Date: 12/08/2024
Time: 3:21 pm
Viewing Direction: Northeast
Landscape Unit: Rural Agricultural

EXISTING CONDITIONS

PROPOSED CONDITIONS



Viewpoint Direction
Protected Lands
Preliminary Draft Route Options



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MidAtlantic Resiliency Link

500 kV Electric Transmission Project

NextEra Energy Transmission subsidiaries[1]

KOP 325

Painter Hollow Rd

Proposed Route

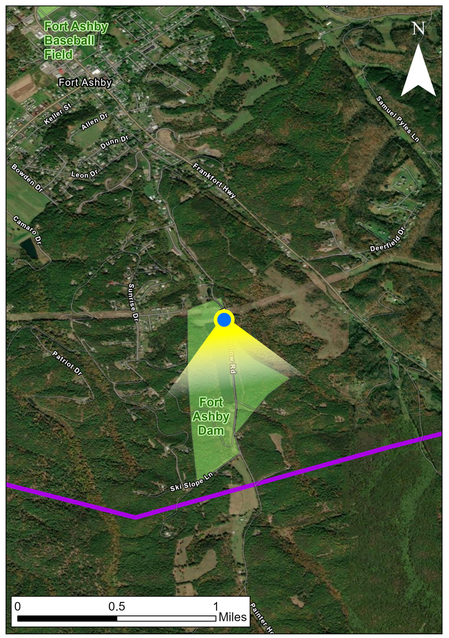
Date: 11/15/2024
Time: 2:53 pm
Viewing Direction: South
Landscape Unit: Forested Mountains

EXISTING CONDITIONS



PROPOSED CONDITIONS

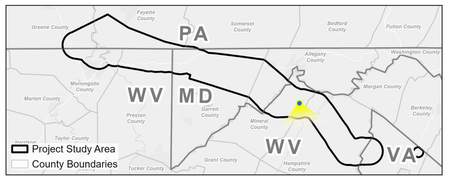




Viewpoint Direction

Protected Lands

Preliminary Draft Route Options



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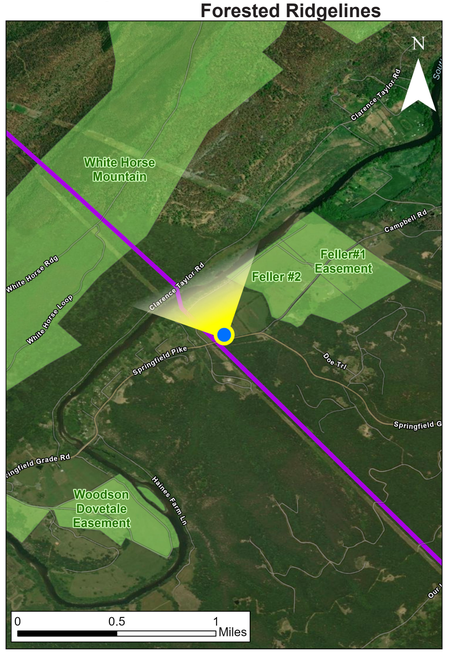
MidAtlantic Resiliency Link
500 kV Electric Transmission Project
NextEra Energy Transmission subsidiaries[1]

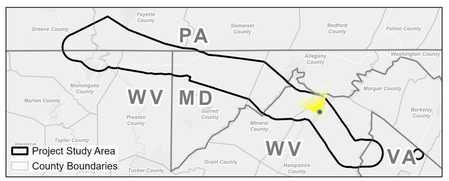
Aerial View 296

South Branch Potomac River

Proposed Route

Date: 12/09/2024
Time: 1:43 pm
Viewing Direction: Northwest
Landscape Unit: River Valley
Forested Ridgelines





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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

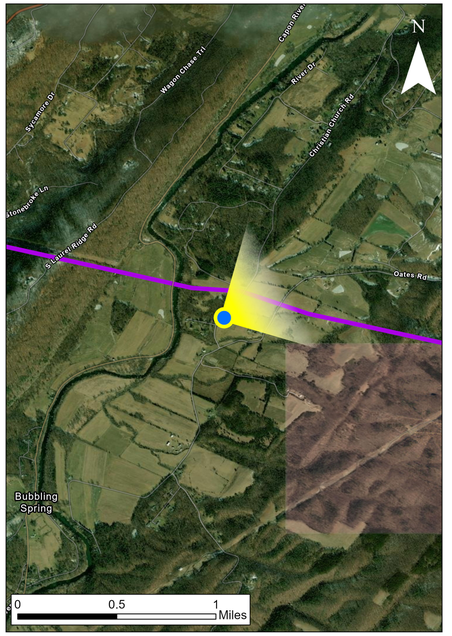
NextEra Energy Transmission subsidiaries[1]

KOP 110-CR

Capon Chapel

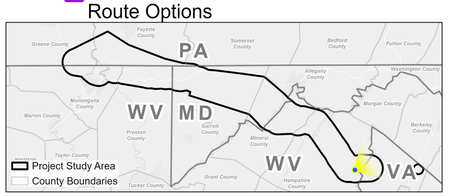
Proposed Route

Date: 11/19/2024
Time: 1:29 pm
Viewing Direction: Northeast
Landscape Unit: Rural Agricultural



Viewpoint Direction

Preliminary Draft Route Options



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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

NextEra Energy Transmission subsidiaries[1]

KOP 319

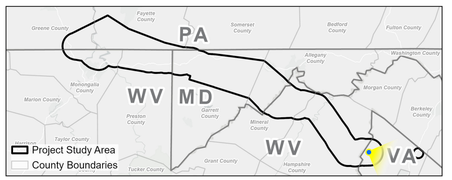
Parishville Rd

Proposed Route

Date: 11/19/2024
Time: 11:32 am
Viewing Direction: Southeast
Landscape Unit: Rural Agricultural



Viewpoint Direction
End Points
Preliminary Draft Route Options
Protected Lands



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EXISTING CONDITIONS

PROPOSED CONDITIONS

MidAtlantic Resiliency Link

500 kV Electric Transmission Project

NextEra Energy Transmission subsidiaries[1]

KOP 360B

Thistle Lane

Woodside Substation

Date: 09/08/2025
Time: 12:26 pm
Viewing Direction: Northeast
Landscape Unit: Rural Agricultural
Forested Ridgelines



Viewpoint Direction

Project Study Area



[1] NextEra Energy Transmission MidAtlantic, Inc. and NextEra Energy Transmission Virginia, Inc. are subsidiaries of NextEra Energy Transmission, LLC.