Application, Appendix, DEQ Supplement, Routing Study, Direct Testimony and Exhibits of Virginia Electric and Power Company

Before the State Corporation Commission of Virginia

230 kV Nebula-Raines Line #2399, 230 kV Nebula Switching Station, and 230 kV Cloud-Nebula Line #2402

Application No. 346

Case No. PUR-2025-00014

Filed: January 24, 2025

Volume 3 of 3

PREPARED FOR

Dominion Energy Virginia

Environmental Routing Study

230-kV Nebula-Raines Line, 230-kV Nebula Switching Station, and 230-kV Cloud-Nebula Line Project230-kV Nebula-Raines Line, 230-kV Nebula Switching Station, and 230-kV Cloud-Nebula Line Project

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Jon Berkin
Partner

Matt Teichert
Principal Consultant

Environmental Resources Management, Inc.
222 South 9th Street
Suite 2900
Minneapolis, Minnesota 55402
T +1 612 347 6789

CONTENTS

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Acronyms	Description
A	Ampere
AADT	annual average daily traffic
AGL	above ground level
BMP	best management practice
CBG	Census Block Group
CCB	Center for Conservation Biology
CDP	Census Designated Place
Company	Virginia Electric and Power Company
CFR	Code of Federal Regulations
CPCN	Certificate of Public Convenience and Necessity
CT	census tract
CWA	Clean Water Act
DKey	USFWS Northern long-eared bat and Tricolored bat Determination Key
DNH	Division of Natural Heritage
EJ	environmental justice
EMF	electromagnetic field
ERM	Environmental Resources Management, Inc.
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCV	Forest Conservation Value
GIS	geographic information system
HUC	hydrologic unit code
ID	Identification
IFP	Instrument Flight Procedures
IPaC	Information for Planning and Consultation
IVMP	Integrated Vegetation Management Plan
KOP	key observation point
kV	Kilovolt
MEC	Mecklenburg Electric Cooperative
MP	milepost

Acronyms	Description
NA	not applicable
NHD	National Hydrography Dataset
NHL	National Historic Landmark
NHP	Natural Heritage Program
NHR	natural heritage resource
NLEB	Northern long-eared bat
nm	nautical mile(s)
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PEM	palustrine emergent
PFO	palustrine forested
Project	Cloud-Nebula-Raines Transmission Project
PSS	palustrine scrub-shrub
PUB	palustrine unconsolidated bottom
ROW	right-of-way
SCC	State Corporation Commission
T&E	threatened and endangered
TCB	Tricolored bat
TOYRs	time-of-year restrictions
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VAC	Virginia Administrative Code
Va. Code	Code of Virginia
VaFWIS	Virginia Fish and Wildlife Information Service
VCRIS	Virginia Cultural Resource Information System
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VDWR	Virginia Department of Wildlife Resources

Acronyms	Description
VEJA	Virginia Environmental Justice Act
VOF	Virginia Outdoors Foundation
VSR	visually sensitive resource
WERMS	Wildlife Environmental Review Map Service
WWTP	Wastewater treatment plant

1 INTRODUCTION AND BACKGROUND

This report presents the results of an environmental constraint identification and routing study undertaken by Environmental Resources Management, Inc. (ERM) on behalf of Virginia Electric and Power Company (Dominion Energy Virginia, Dominion, or the Company) for the following new proposed facilities in Mecklenburg County, Virginia:

- 230-kilovolt (kV) Nebula-Raines Line (Nebula-Raines Line)
- 230-kV Nebula Switching Station (Nebula Switching Station or Nebula Station); and
- 230-kV Cloud-Nebula Line (Cloud-Nebula Line).

These facilities are collectively referred to as the Project.

1.1 PROJECT DESCRIPTION

Dominion proposes to construct and operate the Project to: (i) provide service requested by Old Dominion Electric Cooperative (ODEC) on behalf of Mecklenburg Electric Cooperative (MEC or the Customer) in order for MEC to provide service to its data center customer in Mecklenburg County, Virginia; (ii) relieve identified violations of mandatory North American Electric Reliability Corporation (NERC) Reliability Standards; and (iii) maintain the structural integrity and reliability of the transmission system. To meet this purpose and need, Dominion proposes to construct and operate the following facilities:

- An approximately 14.4-mile-long overhead single circuit, 230-kV transmission line in new 100-foot-wide right-of-way supported by weathering steel double circuit monopoles with an idle conductor from the future Raines Substation[1] , located just south of South Hill, Virginia, to the proposed Nebula Switching Station located east of Boydton, Virginia;[2]
- The new 230-kV Nebula Switching Station located approximately 0.5 mile south of the existing Cloud Switching Station. The proposed Nebula Switching Station will be constructed with 14 230 kV, 4000 ampere (A) breakers with an ultimate design of six rows of breakers arranged in a breaker-and-a-half configuration. It will require the installation of an additional 24 arresters, 32 230-kV 4000A switches. The Nebula Switching Station will be designed to provide six 230-kV feeds to serve a MEC delivery point. The total area of the proposed Nebula Station is approximately 11.3 acres; and
- An approximately 0.9-mile-long overhead single circuit, 230-kV transmission line in new 100-foot-wide right-of-way supported by weathering steel double circuit monopoles with an idle conductor from the proposed Nebula Switching Station to the existing Cloud Switching Station, located just north of the proposed Nebula Switching Station.

Figures 1.1-1 and 1.1-2 depict an overview of the Project. All figures referred to in this document are provided in Appendix A, Figures.

[1] The future Raines Substation is being constructed as part of the SCC approved South Hill 230 kV Transmission Line Project and is not considered a part of this Project.
[2] Although the name of the Project is "Nebula to Raines," the transmission line is evaluated throughout the routing study from the future Raines Substation (starting point) to the proposed Nebula Switching Station (endpoint).

In developing route alternatives for the new transmission lines and Nebula Station, the Company considered the facilities required to construct and operate the Project, the length of new rights-of-way that would be required, the amount of existing development in the area, the potential for environmental impacts and impacts on communities, and cost.[3] As discussed in Section 3.4, ERM identified various viable route options for the Project.

Given the significant growth in the Boydton Load Area—particularly data center load growth—the Company is proposing that Nebula-Raines Line and Cloud-Nebula Line be constructed utilizing 230-kV double circuit construction with an idle 230-kV conductor installed on the proposed double circuit monopoles. The addition of an idle conductor would provide an additional 230 kV source from the east utilizing the future 500-230 kV Unity Switching Station, which could be used to support future load growth in the Boydton Load Area and future growth between Boydton and South Hill. Accordingly, constructing the Project in this manner is reasonable and prudent, as it will allow for the potential energization of the idle 230 kV conductor when the need arises in the future, without requiring new right-of-way or expansion of the transmission right-of-way corridors. Constructing the Project in this manner will allow for the potential energization of the idle 230-kV conductor when the need arises in the future, without requiring new right-of-way or expansion of the transmission right-of-way corridors proposed herein. If needed, the Company will seek Commission approval to energize the idle 230-kV, single-circuit line in the future.

1.2 STRUCTURE TYPES AND RIGHT-OF-WAY WIDTHS

The proposed transmission lines would be constructed on new right-of-way supported primarily by double circuit weathering steel monopoles. The proposed right-of-way width for the Project is 100 feet. The estimated minimum structure height for the Nebula-Raines Line would be 110 feet, with an estimated maximum structure height of 175 feet, and estimated average structure height would be 124 feet. The estimated minimum structure height for the Cloud-Nebula Line would be 130 feet, with an estimated average structure height of 122 feet. The estimated heights are based on preliminary conceptual design, do not include foundation reveal, and are subject to change based on final engineering design. Section views depicting typical right-of-way widths and structure configurations are provided in Appendix B.

1.3 CONSTRUCTION, OPERATION, AND MAINTENANCE PROCESS

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

- Detailed survey of the route alignment;
- Right-of-way acquisition and clearing;
- Construction of access roads, where necessary;
- Installation of tower foundations;
- Assembly and erection of new structures;
- Stringing and tensioning of conductors; and
- Final clean-up and land restoration.

[3] Cost is addressed elsewhere in the Company's Application to the State Corporation Commission of Virginia (SCC) for the Project.

All required materials for the Project's 230 kV structures would be delivered and assembled at each structure location within the proposed right-of-way. Detailed foundation design would be completed prior to construction. The foundation design could include poured concrete requiring excavation or steel piles or caissons that might be vibrated, drilled, or driven into place depending on soil conditions and final design. Structures would be erected with a crane and anchored to the foundation during final assembly. Excess soil from foundation construction (if any) would be evenly distributed at each structure, and the vegetation would be replanted and exposed soils stabilized. In wetland areas, excess soil would be removed and evenly distributed on an upland site within Dominion's proposed right-of-way. Typical construction equipment may include hole diggers or drilling equipment, cranes, wire stringing rigs, tensioners, backhoes, and trucks.

All conductors and shield wires would be strung under tension. This system involves stringing a "lead line" between structures for the conductors and ground wires. The rope pulls a steel cable that is connected to the conductors and shield wires, which are pulled through neoprene stringing blocks to protect the conductor and shield wire from damage. Stringing the conductors and shield wires under tension protects the wires from possible damage should they be allowed to touch the ground, fences, or other objects.

Once the Project is in-service, maintenance of the right-of-way 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 Project will include periodic inspections of the line and the right-of-way; occasional replacement of hardware as necessary; periodic clearing of vegetation, either mechanically or by selective, low-volume application of approved herbicides within the corridor; and the cutting of danger trees outside the right-of-way. Danger trees are trees outside the cleared corridor that are sufficiently tall enough that they could impact the transmission line should the trees fall into the right-of-way. Periodic inspections would occur through both aerial and walking patrols. Normal operation and maintenance would require only infrequent visits by Dominion Energy Virginia or its contractors.

Most maintenance activities would consist of selective, low-volume herbicide applications targeting only tree species on the right-of-way every 3 to 5 years and the cutting of danger trees every 3 years. Dominion uses herbicides approved by the U.S. Environmental Protection Agency (USEPA) on power line rights-of-way.

Based on a discussion between the Company and representatives of the Virginia Department of Conservation and Recreation (VDCR) Division of Natural Heritage (DNH), the Company reviewed its Integrated Vegetation Management Plan (IVMP) for application to both woody and herbaceous species based on the species list available on the VDCR website. The Company continues to coordinate with DNH on an addendum to the IVMP to further explain how the Company's operations and maintenance forestry program addresses invasive species. In November 2023, the Company submitted the addendum draft to VDCR for review and continued discussions. VDCR provided an initial response to the addendum in January 2024. The Company will continue to meet with VDCR to further discuss the documentation provided. Once the addendum is finalized, the

Company will report on the results of its communications with VDCR in future transmission certificate of public convenience and necessity (CPCN) filings.[4]

1.4 OBJECTIVES OF THE STUDY

The Company requested ERM 's services to define a study area for routing of the Project, collect information on routing constraints and opportunities within the study area, identify and compare alternative transmission line routes, and document the routing efforts in this report. More specifically, ERM's scope of work consisted of:

- Defining and describing a study area for routing the transmission lines proposed for the Project;
- Gathering and assessing information about routing constraints and opportunities to be considered as part of the study;
- Identifying and mapping routing constraints and opportunities within the study area;
- Participating in public outreach efforts for the Project (e.g., public open house and agency meetings) to gather information from stakeholders, agency staff, and the public regarding constraints in the study area;
- Identifying buildable route alternatives for the proposed transmission lines meeting the siting criteria provided in the Code of Virginia (Va. Code) and included in the Virginia SCC's minimum filing guidelines for transmission projects (SCC 2024);
- Comparing the route alternatives based on an analysis of environmental impacts and use of routing opportunities; and
- Recommending preferred routes.

[4] *See Application of Virginia Electric and Power Company for approval and certification of electric transmission facilities: 230-kV Line #293 and 115-kV Line #83 Rebuild Project*, Case No. PUR-2021-00272, Final Order at 9-11 (August 31, 2022) (The Commission agreed with the Chief Hearing Examiner and declined to adopt DCR-DNH's recommendation regarding an invasive species management plan, but directed the Company to meet with DCR-DNH and to report on the status of the meetings in the Company's next transmission Certificate of Public Convenience and Necessity [CPCN] filing); *see also* Report of Alexander F. Skirpan, Jr., Chief Hearing Examiner (June 22, 2022) at 22 (agreeing with the Company that, with its IVMP, the Company should not be required to undergo the additional cost of DCR-DNH's invasive species management plan; however, recommending that the Company meet with DCR-DNH regarding its IVMP and report the results of the meeting in the next transmission CPCN filing).

2 METHODOLOGY

The process of routing new electric transmission lines follows a sequence whereby potential route corridors are developed into potential routes that are further refined into viable route alternatives. Although details may differ, the fundamental objectives of the process are the same regardless of project or location: maximize collocation with compatible linear features or land uses; avoid, minimize, or mitigate impacts on the human and natural environment; and provide regulators with viable route alternatives meeting the purpose and need of the project that are both efficient and equitable. Route viability is assessed through consideration of permitting risk, constructability, right-of-way acquisition, and cost after the least impactful alternatives are identified.

The routing process, outlined below, provides a framework for understanding the Project, how routes are identified and screened, and the selection of a preferred alternative.

2.1 STEP 1: DEFINING THE STUDY AREA

The first step in the routing process is to define a geographic study area based on the Company's electric transmission needs and service obligations specific to a project. The study area for the Project was defined to encompass the Nebula-Raines and Cloud-Nebula routes planned beginning and ending points, the proposed Nebula Switching Station, and an area broad enough to allow for the identification of a reasonable range of potential alternatives. Additionally, and to the extent practicable, the limits of the study area are defined by reference to easily distinguished landmarks, such as roads or other features. Doing so helps Dominion and ERM describe the boundaries to stakeholders, such as potentially affected landowners or county and agency staff. Section 3 of this document describes the characteristics of the Project study area in detail.

2.2 STEP 2: MAPPING AND INVENTORY OF ROUTING CONSTRAINTS AND OPPORTUNITIES

The second step in the routing process involves the identification and mapping of environmental and built features within the study area. Based on extensive data collection, this step results in an inventory of routing constraints and opportunities in the study area, including but not limited to:

- Locations of delivery point substations;
- Electric transmission and other utility rights-of-way;
- Residences and residential areas;
- Planned developments;
- Commonwealth, county, and private road rights-of-way;
- Public lands;
- Conservation and open space easements;
- Parks and trails;
- Wetlands and waterbodies;
- Forested land;
- Hospitals, schools, cemeteries, and convalescent centers;

- Natural heritage resources (NHRs; e.g., conservation sites and habitat for rare, threatened, and endangered [T&E] species);
- Visually sensitive resources (VSRs)—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.

2.3 STEP 3: IDENTIFYING POTENTIAL ROUTE CORRIDORS

The third step in the routing process is the identification of potential route corridors—swaths of the study area feasible for routing new transmission infrastructure—and the exclusion of areas where transmission line routing is impracticable due to land use or other constraints. This step is critical in larger, heavily developed or developing areas, where planned developments or protected lands, like parks, can limit potential routes. This step can also aid in the refinement of the study area. Agencies such as the Virginia Department of Transportation (VDOT) and county and city staff are engaged at this stage by the Company to provide insight on current and future developments and land use planning. The viability of a potential route corridor is assessed by evaluating environmental impacts, compatibility with existing and future land uses, permitting risk, community input, ability to acquire new right-of-way, constructability, and cost.

2.4 STEP 4: IDENTIFYING AND ASSESSING ROUTE ALTERNATIVES

After a route corridor is identified, potential route alternatives or variations within that corridor are developed using geographic information system (GIS) software, and field reconnaissance is conducted to better inform the understanding of the area. To the extent practicable, routes are developed that avoid constraints and use opportunities. Throughout this step, the Project team continues to collect and assess data on constraints, obtained through desktop sources, field reconnaissance, and ongoing stakeholder/public engagement activities (e.g., photography, targeted mailings, a Project website, open houses, and virtual and in-person meetings). Information obtained from these sources is used to qualify and better understand resources that could be affected and to refine routes to avoid or reduce potential impacts.

The routes developed for the Project are described in Section 3.7; other routes considered but rejected for the Project are described in Section 3.8.

2.5 STEP 5: FIELD RECONNAISSANCE AND STAKEHOLDER ENGAGEMENT

Field reconnaissance and stakeholder/public engagement activities (e.g., a project website, open houses, targeted mailings, and virtual and in-person meetings) are used to gather information, identify resources, and help inform routing and route selection. Public engagement activities for the Project are discussed in Section 3.5.

2.6 STEP 6: ROUTE ALTERNATIVE ANALYSIS AND ROUTE RECOMMENDATION

Using data and stakeholder outreach feedback gathered during the routing process, route alternatives are analyzed and compared quantitatively and qualitatively based on constraint data and community/stakeholder input. After completing this analysis, a preferred route is selected through comparison of the advantages and disadvantages of each alternative relative to SCC

Guidelines. A proposed route and alternative routes, if applicable, are then presented for notice in the SCC Application for the Project. Conversely, routes deemed too impactful and/or infeasible or impracticable are not carried forward for notice.

3 ROUTING PROCESS

3.1 STUDY AREA DESCRIPTION

The study area identified for the Project encompasses approximately 96 square miles entirely within Mecklenburg County, Virginia. Portions of the incorporated towns of South Hill and Boydton are located at the extreme eastern and western edges, respectively, of the study area. The unincorporated communities of Union Level, Gordon Corner, Callahans Corner, Busy Bee Corner, Lombardy Grove, Dockery, Smiths Crossroads, Radcliff, Big Fork, Cedar Grove, Midway, Baskerville, Gills, Antlers, and Redlawn are also located within the study area. The limits of the study area, depicted on Figure 3.1-1, are generally defined by the following features:

- An area east of Interstate 85 (I-85) to the east;
- The unincorporated community of Gordon Corner to the north;
- The eastern extend of the Town of Boydton to the west; and
- The unincorporated communities of Norvello, Elamtown, and Invermay to the south.

3.2 GIS MAPPING AND INVENTORY OF ROUTING CONSTRAINTS AND OPPORTUNITIES

In accordance with the Guidelines for Transmission Line Applications Filed Under Title 56 of the Va. Code (SCC 2024), ERM assessed opportunities for routing the Project. Sources used by the ERM team to identify constraints and opportunities within the study area include:

- Mecklenburg County GIS datasets online portal (Mecklenburg County 2024);
- VDOT Projects and Studies Database (VDOT 2024a)
- VDCR Virginia Conservation Lands Database (VDCR 2024a);
- U.S. Census Bureau American Community Survey, 5-Year Estimates (2018–2024);
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping (USFWS 2024a);
- Virginia Department of Historic Resources (VDHR) Virginia Cultural Resource Information System (VCRIS; VDHR 2024);
- Existing utility transmission and distribution lines (Rextag 2023); and
- Current aerial imagery taken in November 2023 (VGIN 2023).

ERM researched, vetted, mapped, and incorporated resources identified through these sources into GIS, where the layers were organized by resource type.

3.3 MAJOR ROUTING CONSTRAINTS AND OPPORTUNITIES

The following is a summary of the major constraints and opportunities in the study area affecting transmission line routing. Several of the features discussed below are both constraints and opportunities. Highways and roads, for example, can provide opportunities for routing new transmission infrastructure, but adjacent development can limit the area available for a new transmission right-of-way. Routing constraints and opportunities are shown on Figure 3.3-2. These resources (along with other constraints) are described in more detail in Section 4.

- U.S. Route (US) 58 and US 1: US 58 is the main east/west highway through the study area. The road extends from Boydton east to US 1. US 1 extends south through the study area from South Hill to the Staunton River and beyond. A combination of US 1 and US 58 provide an ideal collocation routing opportunity for most of the required route; however, significant residential and commercial development exists along these highways. This development does not allow any extended collocation opportunities along these highways.
- Recreational Trails: A number of recreational trails cross through the study area, including segments of the Beaches to Bluegrass Trail, East Cost Greenway, Tobacco Heritage Trail and Christanna Loop Birding Wildlife Trail. Goodes Ferry Road, a state scenic byway, and US Bike Route 1 also cross the study area. Routing along these trails was investigated; however, these trails meander through the study area. A route alternative paralleling recreational trails would therefore have significant added length. Additionally, these trails are heavily used for recreation by local residents and visitors.
- Churches and Cemeteries: Numerous churches and cemeteries located throughout the study area. Most are smaller rural churches with associated cemeteries nearby. ERM avoided routes near these establishments where possible.
- Environmental Easements: A Virginia Outdoors Foundation (VOF) easement is located in the east-central portion of the study area. The extreme southern portion of the study area also contains an Ever Green Team Trust Easement and a Virginia Department of Forestry Easement. All three easements are intended to reduce development on the parcel and protect the natural and cultural values of the land, and thus represent routing constraints.
- Public Land: The study area includes a variety of government owned lands. City and county owned includes the South Hill Wastewater Treatment Plant (WWTP), public schools, and landfills. The Virginia Department of Wildlife Resources (VDWR) owns the land associated with Lake Gordon in the central area of the study area and the Department of Corrections owns land at the north end of the study area. Finally, the US Army Corps of Engineers (USACE) owns land associated with the John H. Kerr Reservoir at the south end of the study area. Public land provides both routing constraints and opportunities, depending on the purpose of that public ownership, as described in detail in Section 3.7.
- Rural Residential: Large rural residential and farming plots are scattered throughout the study area. Most are located on secondary roads and are either adjacent to the roads or have a large setback from roads.

3.4 ROUTE ALTERNATIVES

After identifying the routing constraints and opportunities in the study area, ERM developed preliminary potential routes for the Project. Where possible, ERM identified preliminary routes that avoided existing homes and out-buildings; collocated with existing linear infrastructure such as utility lines and roads; and minimized crossings of natural resources such as wetlands, waterbodies, and forested areas. ERM then conducted multiple site visits and began refining and evaluating each preliminary potential route. The Company and ERM also began stakeholder and agency outreach during this time to assist with route evaluation and data gathering. Section 3.6 provides descriptions of the four viable route alternatives for the Nebula-Raines Line (Nebula-Raines Routes 1, 3, 4), and Section 3.7 provides description of the one viable route alternative for

the Cloud-Nebula Line (Cloud-Nebula Route) that ERM identified and developed for the Project. The resource-specific discussions in Section 4 of this report assess and evaluate the potential impacts from the construction of each route alternative, while Section 5 compares the impacts of the route alternatives.

In some instances, during the process of route identification and refinement, or as a result of stakeholder engagement (see Section 3.5), ERM and the Company became aware of a constraint or other issue that rendered a potential alternative infeasible or impracticable. In total, ERM and the Company identified seven routes for the Nebula-Raines Line component of the Project that subsequently were rejected from further consideration. Section 3.8 provides descriptions of these rejected routes and the reasons they were rejected from further consideration.

3.5 STAKEHOLDER ENGAGEMENT

ERM and Company staff conducted field reconnaissance of the study area and potential route corridors from public roads and rights-of-way in the fall of 2023 and spring/summer of 2024. During these visits, ERM took photographs to aid in the analysis of impacts, particularly on visual and cultural resources.

After identifying preliminary routes, Dominion met with Mecklenburg County Planning and Zoning staff in the January/February 2024 to review the Project and potential alternatives. Dominion gathered feedback on the routes through engagement with the public, elected officials, regulatory and planning groups, and land managing agencies. Dominion announced the Project via mail and on their website[5] in May 2024 and held two in-person open houses to share information and receive feedback in July and August of 2024. Dominion maintained the website with up-to-date Project information and an interactive public comment map. Based on feedback obtained through stakeholder engagement, ERM adjusted and optimized some routes and helped inform the Company's decision to reject others. The Company's SCC Application describes the stakeholder engagement process in further detail.

3.6 NEBULA-RAINES ROUTE ALTERNATIVES

ERM identified four viable route alternatives (Routes 1, 3, 4, and 5) for the Cloud-Nebula Line.

3.6.1 NEBULA-RAINES ROUTE 1

Starting at the future Raines Substation, Route 1 heads southwest for about 0.4 mile through forested areas and crosses Flat Creek before turning south for an additional 0.8 mile, crossing Rocky Branch Road at approximately milepost (MP) 0.8, just west of the South Hill WWTP. The route then turns to the southwest for 0.5 mile, crossing Turtle Road at approximately MP 1.5. The route then turns to the south for 1.1 miles, crossing through mostly forested areas (including managed timber land). At this point, the route turns southwest for 1.9 miles, crossing Trinity Church Road at approximately MP 3.6. This segment of the route crosses through mostly dense forested areas. The route then runs west then southwest then west for 1.2 miles, crossing Belfield Road at approximately MP 5.2. The route then turns west and continues for 3.7 miles, crossing Goodes Ferry Road at approximately MP 6.0, US 1 at MP 7.3, and Eureka Road at MP 8.1. This

[5] https://dominionenergy.com/nebula-raines.

segment of the route is primarily through heavily forested land up to approximately MP 8.4, at which point the route crosses through mixed forest and agricultural land. At approximately MP 9.6, the route turns northwest and crosses Baskerville Road at approximately MP 10.0. The route then turns to the west and then southwest for 1.2 miles across forested and agricultural land before crossing Buggs Island Road at approximately MP 11.2. The route continues to the west for 1.0 mile, crossing mostly recently cleared timber lands and some agricultural grazing fields before turning southwest for 0.5 mile, and then northeast for 0.5 mile through primarily agricultural and grazing land. At this point the route turns to the west-northwest for the remaining 2.3 miles, crossing the Company's existing Kerr Dam-Ridge Road Line #137 and Cloud-Kerr Dam Line #38 at approximately MP 13.2 and Antlers Road at approximately MP 13.5, before terminating at the proposed Nebula Station. The segment of the route west of approximate MP 13.5 is through dense managed timber land.

Route 1 measures approximately 15.4 miles in length. The operational right-of-way for this alternative (186.3 acres) and the proposed Nebula Station (11.3 acres) would encompass a combined 197.6 acres. Existing land uses along the route largely consist of a mix of agricultural and forested lands (including substantial areas of managed or replanted timber lands) with scattered rural residences and other low-intensity development at and near road crossings.

3.6.2 NEBULA-RAINES ROUTE 3

Starting at the future Raines Substation, Nebula-Raines Route 3 heads west for about 0.5 mile through forested areas before continuing west and collocating with the south side of US 58 for 0.8 mile across primarily agricultural lands. The route then turns to the southwest and crosses through mostly forested areas for 2.4 miles. At this point, the route turns to the west for 0.2 mile and then southwest for 0.3 mile across forested land, crossing Dockery Road at approximately MP 3.9. The route then turns south for 0.4 mile, crossing through dense forested areas before turning southwest for 0.8 mile and crossing Smith Cross Road at approximately MP 5.5. After crossing Smith Cross Road, the route turns southeast for 0.1 mile and then southwest for 0.7 mile, crossing through mostly dense forested areas. The route then turns to the west, crossing through a mix of forested areas and cleared agricultural lands for 2.7 miles and crossing US 1 at approximately MP 6.8 and Cedar Grove Road at approximately MP 8.5. At this point the route heads southwest for 0.4 mile, crossing through open agricultural lands. At approximately MP 9.5, Nebula-Raines Route 3 crosses Baskerville Road and intersects Route 1. From this point, Nebula-Raines Route 3 follows the same alignment as Nebula-Raines Route 1 for the remaining 5.4 miles to the proposed Nebula Station.

Nebula-Raines Route 3 measures approximately 14.9 miles in length. The operational right-of-way for this alternative (180.7 acres) and the proposed Nebula Station (11.3 acres) would encompass a combined 192.0 acres. Existing land uses along the route largely consist of a mix of agricultural and forested lands (including substantial areas of managed or replanted timber lands) with scattered rural residences and other low-intensity development at and near road crossings.

3.6.3 NEBULA-RAINES ROUTE 4

Nebula-Raines Route 4 follows the same alignment as Nebula-Raines Route 3 for the first 10.1 miles from the future Raines Substation to a point 0.6 mile west of Baskerville Road. At this

point, the route turns to the northwest for 0.4 mile, crossing through mostly forested lands, then turns to the west-northwest for 0.8 mile, crossing Cox Creek at approximately MP 10.5, Buggs Island Road at approximately MP 11.2. The route then turns to the west/southwest for 3.7 miles, crossing Antlers Road at approximately MP 13.0, the Company's existing Lines #137 and #38 at approximately MP 13.1, and Gold Miners Road at approximately MP 13.2. The route then turns northwest for 0.1 mile (using the same right-of-way as Routes 1 and 3) and terminates at the proposed Nebula Station.

Nebula-Raines Route 4 measures approximately 15.0 miles in length. The operational right-of-way for this alternative (181.0 acres), and the proposed Nebula Station (11.3 acres) would encompass a combined 192.3 acres. Existing land uses along the route largely consist of a mix of agricultural and forested lands (including substantial areas of managed or replanted timber lands) with scattered rural residences and other low-intensity development at and near road crossings.

3.6.4 NEBULA-RAINES ROUTE 5

Starting at the future Raines Substation, Nebula-Raines Route 5 follows the same alignment as Nebula-Raines Route 3 for the first 1.3 miles from the future Raines Substation along the south side of US 58. From this point, the route continues along the south side of US 58 for another 1.1 miles before turning to the northwest for 0.1 mile, crossing US 58 and US 1 (where the two roads divide) at approximately MP 2.5, before turning west for 0.1 mile. The route then turns north-northwest for 0.6 mile, crossing Plank Road at approximately MP 3.1. The route then turns to the west for 1.3 miles and then southwest for 2.3 miles, crossing Miles Creek at approximately MP 4.5, Union Level Road at approximately MP 5.6, and Gordon Lake Road at approximately MP 6.8. At this point the route turns to the west for 2.0 miles, crossing Busy Bee Road at approximately MP 7.3. The route turns to the west/southwest for 1.7 miles, crossing Baskerville Road and Wooden Bridge Road at approximately MP 9.0 and then running through mainly forested areas. The route then heads southwest for 1.9 miles, across agricultural land east of the county landfill and crossing U.S. 58 at approximately MP 11.2 and Antlers Road at approximately MP 11.9. At approximately MP 12.5 the route turns to the west, crosses the Company's existing right-of-way for Lines #137 and #38, and shares right-of-way with the south side of the Company's existing right-of-way for Lines #1041 and #38 for 0.9 mile. The route then turns to the southwest (away from Lines #1041 and #38) for 0.6 mile across managed timber lands, before turning west for 0.1 mile (using the same right-of-way as Routes 1 and 3) and terminating at the proposed Nebula Station.

Nebula-Raines Route 5 measures approximately 14.4 miles in length. The operational right-of-way for this alternative (174.0 acres) and the proposed Nebula Station (11.3 acres) would encompass a combined 185.2 acres. Existing land uses along the route largely consist of a mix of agricultural and forested lands (including substantial areas of managed or replanted timber lands) with scattered rural residences and other low-intensity development at and near road crossings.

3.7 CLOUD-NEBULA ROUTE

ERM identified one viable route alternative for the Cloud-Nebula Line.

3.7.1 CLOUD-NEBULA ROUTE

Starting at the existing Cloud Switching Station, the Cloud-Nebula Route heads south for 0.5 mile adjacent to the western boundary of the Cloud Switching Station and an existing data center parcel, crossing through mostly managed timber land. The route then turns to the east for 0.3 mile across managed timber land before turning south for 0.1 mile and terminating at the proposed Nebula Switching Station.

The Cloud-Nebula Route measures approximately 0.9 mile long. The operational right-of-way for this alternative is 10.8 acres. Existing land uses along the route largely consist of managed timber lands with some previously cleared timber lands.

3.8 NEBULA-RAINES ROUTES REJECTED FROM FURTHER CONSIDERATION

In developing the Nebula-Raines route alternatives for the Project, ERM also studied multiple other routes that were subsequently rejected from further consideration (see Figure 3.8-1). Descriptions of these routes and the rationale for both considering and eliminating them are provided below.

There are no railroads, pipelines or existing transmission lines within the study area for the routes to collocate with. The only linear features within the study area are roads, particularly US 1 and US 58. ERM reviewed the potential to collocate with these roadways early in the routing process. Due to substantial commercial and residential development along US 1, ERM determined that collocating with this roadway could not occur without removal of several buildings. ERM also reviewed the potential to collocate with US 58. Similar to US 1, multiple residential and commercial buildings are located in close proximity to the roadway. These buildings could only be avoided through route deviations from the roadway, which would have resulted in a "boxing-in" effect for these buildings, with the transmission line and highway surrounding the buildings on all sides. Additionally, the recently constructed Mecklenburg Middle/High School borders the north side of US 58 in an area where homes border the south side of the road. As a result, a route alternative collocated with this segment of US 58 would need to divert through school property. For these reasons, routes entirely (or primarily) collocated with US 1 and US 58 were eliminated from consideration.

3.8.1 NEBULA-RAINES REJECTED ROUTES

3.8.1.1 REJECTED ROUTE 2

Rejected Route 2 begins at the future Raines Substation and follows the same alignment as Route 1 for 0.4 mile. Where Route 1 turns south, Rejected Route 2 continues southwest for 0.7 mile and crosses Rocky Branch Road before turning south for 1.0 mile, intersecting with Route 1 and sharing the same alignment as Route 1 for 0.4 mile. Rejected Route 2 then turns west and south-southwest for about 4.1 miles, crossing Trinity Church Road, Boxwood Road, Spring Road, Goodes Ferry Road, Smith Cross Road, and Dockery Creek before intersecting with Route 1 near MP 7.0 on Route 1. Rejected Route 2 then shares an alignment with Route 1 for about 5.1 miles (to a point near MP 12.1 on Route 1). From this point, Rejected Route 2 continues west for 1.2 miles (crossing the Company's existing Lines #137 and #38) to Antlers Road. From there, Rejected Route 2 turns north-northwest for about 1.8 miles (at a slightly more northernly angle than

Route 1) and terminates at the proposed Nebula Station. This route is a greenfield route that crosses a mix of cleared agricultural lands and forested areas.

Rejected Route 2 measures approximately 14.5 miles in length. It would have the largest number of homes within 500 feet of all routes reviewed, as well as the most agricultural lands crossed. Rejected Route 2 was presented at the first public community meeting for the Project in July 2024 (named Route 2 at the time of the meeting). At this meeting, the Company received extensive negative feedback on Rejected Route 2, including landowner disapproval of the route's proximity to and visibility from homes in the area. For these reasons the Company removed Rejected Route 2 from further consideration.

3.8.1.2 REJECTED ROUTE 6

Rejected Route 6 is a route segment that begins at the future Raines Substation and heads southeast, crossing forested land east of Flat Creek, for approximately 1.8 miles until it intersects the west side of I-85. At this point it continues south for 2.2 miles, paralleling the west side of the I-85 right-of-way. The route then turns to the west, crossing mostly forested areas and some open agricultural fields for 3.0 miles before terminating at its intersection with Route 1, east of Goodes Ferry Road (near Route 1 MP 5.9).

Rejected Route 6 segment measures approximately 6.9 miles in length (the remainder of the route to the proposed Nebula Switching Station would be the same as Route 1 or Rejected Route 2). Rejected Route 6 is the longest of all routes studied and would have a significant impact on aquatic resources. The route is located close to Flat Creek and a large associated forested wetland complex, especially where the route is located near I-85. Wetland impacts for Rejected Route 6 are nearly double those of other routes. The Virginia Department of Environmental Quality (VDEQ) determined that this route, if selected, would require an individual VDEQ permit for impacts on aquatic resources (a step likely not necessary for any other route). As part of the individual permit application, the Company would need to include an alternatives analysis that discusses the overall impacts of the routes as they relate to wetlands. The individual permit would also require the Company to demonstrate that they have proposed the least environmentally impactful route. Due to the extensive wetland impacts (compared to those of other routes), it is likely that VDEQ would issue a permit for this route. For these reasons the Company removed Rejected Route 6 from further consideration.

3.8.1.3 REJECTED ROUTE 7

Rejected Route 7 is a segment of a route alternative that begins at Rejected Route 2, approximately 0.5 mile southwest of Smith Cross Road. From this point, the route runs generally west for 3.7 miles, crossing US 1, Miles Creek, Cedar Grove Road, and Baskerville Road. West of Baskerville Road, Rejected Route 7 approximately parallels along the north side of Iron Mill Road for about 1.1 miles, crossing Cox Creek. It then crosses Iron Mill Road at an oblique angle and runs west and then west-southwest for 1.5 miles, crossing Buggs Island Road and Allen Creek, until terminating at Nebula-Raines Route 4 (near MP 12.2). This route crosses mostly forested areas and some agricultural land.

Rejected Route 7 segment measures approximately 6.3 miles in length. It is the same length as the comparable portion of Route 2 but is within 500 feet of a substantially larger number of

residences, along with two cemeteries and two churches. For these reasons the Company removed Rejected Route 7 from further consideration.

3.8.1.4 REJECTED ROUTE 8

Rejected Route 8 is an alternative route segment in the eastern third of the study area. The route deviates from Rejected Route 2 approximately 1.0 mile from the future Raines Substation, and extends northwest for 0.4 mile, crossing Goodes Ferry Road. The route then turns to the west and then southwest for 1.7 miles and follows the northwestern boundaries of the parcels on the north side of Goodes Ferry Road. The route then turns south for 0.7 mile, crossing Goodes Ferry Road before terminating at Rejected Route 2.

Rejected Route 8 measures approximately 2.8 miles in length. Rejected Route 8 is approximately 0.7 mile longer route than the comparable segment of Rejected Route 2 and has more forest and wetland impacts, and crosses within 500 feet of two cemeteries (compared to one for Rejected Route 2). Although this route has one fewer residence within 500 feet, a significant number of homes (primarily along Goodes Ferry Road) would have a direct line of sight to this route. For these reasons, the Company removed Rejected Route 8 from further consideration.

3.8.1.5 REJECTED ROUTES 9 AND 10

Rejected Routes 9 and 10 are alternative route segments in the eastern third of the study area. Rejected Route 9 deviates from Rejected Route 2 just southwest of Rocky Branch Road, continuing southwest for 0.4 mile and crossing Trinity Church Road. The route then turns to the south for 1.0 mile before terminating at Rejected Route 2. Rejected Route 9 measures approximately 1.4 miles in length.

Rejected Route 10 begins at the same location as Rejected Route 9 just southwest of Rocky Branch Road and follows Route 2 for 0.6 mile. At that point, Rejected Route 9 turns west/southwest for 0.6 mile before terminating at Rejected Route 2 at the same location as Rejected Route 9. The Rejected Route 10 segment measures approximately 1.6 miles in length.

Compared to the other routes in the area (Rejected Routes 8 and Route 1), Rejected Routes 8 and 10 segments are within 500 feet of a larger number of residences, cross a larger number of streams, and would impact a larger extent of forested lands. As a result, the Company removed Rejected Routes 9 and 10 from further consideration.

3.8.1.6 REJECTED ROUTE 11

Rejected Route 11 is a route segment that was originally part of Nebula-Raines Route 4. It extends northwest from Nebula-Raines Route 4 near MP 8.9 (about 0.6 mile east of Baskerville Road) for 0.7 mile. It then turns west, crosses Baskerville Road, and continues west for 1.0 mile before terminating near MP 10.8 on Nebula-Raines Route 4.

Rejected Route 11 segment measures approximately 1.6 miles in length. At the second open house for the Project, in August 2024, a landowner commented that the route crossed two unmarked cemeteries for formerly enslaved people located on the property east of Baskerville Road. That landowner also stated that the route was too close to their home on the east side of Baskerville Road. Upon review, ERM determined that the edge of the Rejected Route 11 right-of-

way was within 200 feet of the home. For these reasons, the Company removed Rejected Route 11 from further consideration.

4 RESOURCES AND IMPACTS

After defining the study area, ERM developed a list of features to consider and assess as part of the routing process and provide a basis for comparing potential routes. These include constraints (e.g., land uses, planned developments, and biological resources) and opportunities (e.g., existing transmission lines, roads, and other linear features). ERM inventoried existing conditions, constraints, and opportunities using information from publicly available GIS and other databases; agency websites; published documents, such as county or municipal land use plans; communication with agency and county staff, stakeholders, and elected officials; and field reconnaissance. In cases where GIS data were not available for a particular environmental resource or other feature, ERM obtained the best available hard-copy or online map and hand digitized the information needed to complete the study.

The features in the study area and along the route alternatives are discussed by subsection below, with a summary of the features crossed by each route alternative provided in the Features Crossing Table, attached as Appendix C. Impacts associated with construction and operation of the Cloud Switching Station are included in the existing environmental conditions and resources affected assessment for each Nebula-Raines route alternative. Table 4-2 summarizes the length and area of right-of-way associated with each route alternative.

TABLE 4-1 FEATURES CONSIDERED FOR ROUTING

Feature Type	Description
Existing Corridors	
Existing electric facilities	Transmission or distribution lines and substations
Other utilities	Pipelines
Transportation infrastructure	Highways, roads, railroads, and related corridors
Land Uses	
Land ownership	• Federal, state, and local lands • Private lands
Land uses and cover types	• Cover types (e.g., forested, agricultural, developed, open) • Subdivisions and residential areas • Residential areas and residences • Churches, schools, and cemeteries
Recreational areas	• Federal, state, county, or municipal parks or other managed recreation areas • Golf courses • Interpreted historic sites • Trails (e.g., for biking, hiking, birding, or wildlife viewing)
Land use planning and zoning	• Zoning districts • County Comprehensive Plan and related planning documents
Planned developments	• Planned, proposed, or conceptual residential, commercial, or industrial developments

Feature Type	Description
Conservation lands and easements	• VDCR conservation lands and easements • VOF easements • Wetland mitigation banks • Other conservation lands
Transportation	• Road and railroad crossings • Public and private airport facilities
Natural Resources	
Surface waters	• Wetlands • Waterbodies
Protected or managed areas	• Resource protection areas • Conservation sites • Wildlife management areas • Ecological cores
Protected species	• Natural heritage resources • Threatened and endangered species • Bald eagles
Vegetation	• Vegetation characteristics • Forested land
Visual Resources	
Visual resources	• Viewsheds to and from visually sensitive areas • Scenic rivers and byways
Cultural Resources	
Cultural resources	• Archaeological sites • Historical or architectural sites and districts • NRHP-listed and eligible properties • Battlefields4 • VDHR easements • Locally significant resources
Geological Resources	
Mineral resources	Mines or quarries
Environmental Justice	• Low-income populations • Minority populations • Age groups (under age 5 and over age 64) • Linguistically isolated communities

NRHP = National Register of Historic Places; VDCR = Virginia Department of Conservation and Recreation; VDHR = Virginia Department of Historic Resources; VOF = Virginia Outdoors Foundation.

TABLE 4-2 LENGTH AND AREA OF RIGHT-OF-WAY FOR ROUTE ALTERNATIVES

	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Route Length (miles)	15.4	14.9	15.0	14.4	0.9
Right-of-way acreage	197.6	192.0	192.3	185.2	10.8

[a] The proposed Nebula Switching Station site occupies approximately 11.3 acres on property associated with the Customer, and the acreage is included in all Nebula-Raines route alternatives.

4.1 LAND USE

4.1.1 LAND OWNERSHIP AND PUBLIC LANDS

4.1.1.1 EXISTING CONDITIONS

ERM reviewed information about land ownership in the study area using publicly available GIS databases and digital parcel data obtained from Mecklenburg County (Mecklenburg County GIS 2024). These data indicate that most of the parcels within the study area are privately owned. The route alternatives do not cross any federal-, state-, county-, or municipal-owned lands; however, there are several County- and State-owned properties in the study area as described below.

Table 4.1-1 summarizes the number of parcels and landowners crossed by each route alternative. Figure 4.1-1 depicts land ownership within the study area.

TABLE 4.1-1 PARCELS CROSSED BY THE ROUTE ALTERNATIVES

	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Total parcels crossed by right-of-way [a]	50	60	68	56	3
Total landowners crossed by right-of-way	40	45	54	38	3

Note:
[a] All parcels crossed are privately owned.

Federal Lands

USACE owns multiple parcels associated with the John H. Kerr Dam and Reservoir, also known as Buggs Island Lake. Most USACE parcels are located south of the study area.

State Lands

Parcels owned by the State of Virginia within the study area include parcels owned by VDWR and the department of corrections. The VDWR owns land associated with Lake Gordon, located off Union Level Road, and the Virginia Department of Corrections owns land located in northwestern portion of the study area.

Local Lands

Mecklenburg County owns parcels throughout the study area. The Industrial Development Authority of Mecklenburg County owns multiple parcels in the western extents of the study area, near the Cloud Switching Station and the proposed Nebula Switching Station. Mecklenburg County also owns parcels north of the unincorporated community of Antlers associated with the county landfill. In 2022, the County opened the new Mecklenburg Middle School and High School on a shared campus at the northwest corner of US 58 and Wooden Bridge Road (Buggs Island Road). The County also retains ownership of the former Park View Middle School and High School lands on the north side of US 1/US 58 near the northern split between the two roads. The Town of South Hill owns parcels south of the future Raines Substation associated the South Hill WWTP, a communication tower, and a landfill. Table 4.1-2 describes publicly owned lands within 0.25 mile of the Project infrastructure. There are no publicly owned lands within 0.25 mile of the Cloud-Nebula Route.

TABLE 4.1-2- PUBLICLY OWNED LANDS WITHIN 0.25 MILE OF PROJECT INFRASTRUCTURE

Facility	Parcel Owner	Description	Distance and Direction from Nearest Project Infrastructure
Lake Gordon	Virginia Department of Wildlife Resources	157-acre lake use for recreation	0.2 mile south of Nebula-Raines Route 5 near MP 4.8
Baskerville Correctional Center	Commonwealth of Virginia (Department of Corrections)	Multi-custody prison opened in 1962 that houses approximately 487 medium-security male inmates.	1.9 miles north of Nebula-Raines Route 5 near MP 9.5
Landfill	Mecklenburg County	Solid waste landfill for household waste and recyclable materials.	70 feet northwest of Nebula-Raines Route 5 at MP 10.8
Mecklenburg County Middle/High School	County School Board of Mecklenburg County School Board	Two-story, 347,000 SF middle/high school facility constructed on a 173-acre site and completed in 2022. The site includes athletic fields, support facilities, car and bus parking lots, site lighting, and related off-site road work.	0.5 mile south of Nebula-Raines Route 5 near MP 9.8
Mecklenburg County Development Parcel	Industrial Development Authority of Mecklenburg County	Parcels currently house commercial/industrial development.	0.2 mile north of Cloud Switching Station
Mecklenburg County	Mecklenburg County	Former location of Park View Middle School. Demolition of this facility began in March 2024.	190 feet northwest of Nebula-Raines Route 3 near MP 3.9 and Nebula-Raines Route 4 near MP 3.9

Facility	Parcel Owner	Description	Distance and Direction from Nearest Project Infrastructure
Mecklenburg County	Mecklenburg County	Former location of Park View High School. Plans for the future of this site are still being determined.	0.3 mile southwest of Nebula-Raines Route 5 near MP 2.7
Wastewater Treatment Facility, Communication Tower, and Landfill	Mecklenburg County and Town of South Hill	The Town of South Hill Facility treats approximately 900,000 gallons of sewage per day. The maximum treatment capacity of the Town's sewage plant is 3 million gallons per day.	90 feet east of Nebula-Raines Route 1 between MPs 0.5 and 0.8

MP = milepost.

4.1.1.2 IMPACT ASSESSMENT

Because the route alternatives would only cross privately owned lands, no public lands would be physically impacted by the Project and no direct impacts on the use of public properties would occur. The discussion below addresses potential impacts from crossings of public lands along and within the various routes and facilities proposed for the Project. Some of the public lands in the study area could be visually impacted by transmission structures and conductors during Project construction and operation. The severity of these impacts would depend on factors such as surrounding tree cover, landscaping, orientation of the development in relation to transmission infrastructure, topography, and screening from other objects. Visual impacts from the Project, including on public lands, are addressed in Section 4.3.

Nebula-Raines Route 1

No federal, state, or county lands are crossed by Nebula-Raines Route 1. Land associated with the South Hill WWTP is adjacent to the route between MPs 0.5 and 0.8, just south of future Raines Substation (Figure 4.1-1); however, construction and operation of the route would not impact the facility’s operations.

Nebula-Raines Route 3

No federal, state, or county lands are crossed by Nebula-Raines Route 3.

Nebula-Raines Route 4

No federal, state, or county lands are crossed by Nebula-Raines Route 4.

Nebula-Raines Route 5

No federal, state, or county lands are crossed by Nebula-Raines Route 5. Multiple Mecklenburg County owned parcels are located adjacent to the route; however, construction and operation of the route would not impact these parcels. Lake Gordon, which is owned by VDWR, is located approximately 0.2 mile south of MP 4.6. Transmission structures are proposed outside of Miles Creek and its associated wetlands. Erosion and sediment control practices would be implemented

during construction to reduce any impacts to waters draining into the lake. The Mecklenburg County Landfill is located adjacent to the route between MPs 10.7 and 11.0, north of Highway 58; however, construction and operation of the route would not impact the facility's operations.

Cloud-Nebula Route

No federal, state, or county lands are crossed by the Cloud-Nebula Route.

4.1.2 LAND USE AND LAND COVER

4.1.2.1 EXISTING CONDITIONS

ERM identified land use and land cover in the study area using a combination of local and statewide datasets, along with aerial photo interpretation to identify the most current uses for a given area (NAIP 2023; VGIN 2024). Figure 4.1-2 depicts land use/land cover in the study area. **Error! Reference source not found.** summarizes the acreage of land use/land cover within the right-of-way for each route alternative. Land use and land cover in the study area is broken down into the five main categories described below.[6]

- **Developed lands**: These are areas characterized by medium to high-density constructed buildings, such as certain residential subdivisions, industrial areas, commercial areas, and impervious surfaces.
- **Open space**: These are areas primarily covered by planted grasses, including vegetation planted in developed settings for erosion control or aesthetic purposes, but also natural herbaceous vegetation and undeveloped land, parks, open space recreational facilities.
- **Forested lands**: These are areas where land cover consists of natural or maintained woody vegetation.
- **Agricultural lands**: These are areas used for commercial farming (e.g., commercial row crops or specialized agricultural activities) or grazing.
- **Open water**: These are open water features, including rivers, streams, lakes, canals, waterways, reservoirs, and ponds.

Forested land is the predominant land use and land cover type in the study area (including substantial areas of forest managed for timber) with larger areas of agricultural lands and open space. Developed land is generally located along arterial roadways (US 58 and US 1). All of the route alternatives predominantly cross forested lands. Nebula-Raines Routes 1 and 3 cross larger extents of agricultural lands than other routes, and Nebula-Raines Routes 1 and 5 cross larger amounts of open space. Cloud Nebula Route crosses approximately equal amounts of forested land and open space. All route alternatives cross small extents of developed land and open water associated with waterbodies.

[6] For purposes of land use/land cover, wetland areas have been classified as open space, forested land, or open water depending on wetland type. Wetlands near the routes are discussed separately in Section 4.2.1.

TABLE 4.1-3 LAND USE/LAND COVER CROSSED BY THE ROUTE ALTERNATIVES

Land Use / Land Cover [a]	Unit	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Total right-of-way	Miles	15.4	14.9	15.0	14.4	0.9
	Acres	197.6	192.0	192.3	185.2	10.8
Forested	Acres	103.1	109.6	132.8	99.5	4.6
Agricultural	Acres	48.7	50.0	33.0	34.4	0.0
Developed	Acres	0.7	0.7	0.7	1.4	0.4
Open Space	Acres	44.7	30.9	25.0	46.7	5.7
Open Water	Acres	0.3	0.7	0.7	3.3	0.0

[a] Based on local and state-wide data sets and aerial photo interpretation by ERM. The Nebula-Raines route alternatives include the proposed 11.3-acre Nebula Switching Station.

4.1.2.2 IMPACT ASSESSMENT

Except for the placement of transmission structures, the Project would have no direct impacts on open space, developed land, or open water land use types. Forested land use within the constructed rights-of-way would be converted to maintained herbaceous land. Typically, open space, agricultural land, developed land and open water would only incur temporary impacts due to disturbances during construction. Impacts on forest are assessed further in Section 4.2.4, Vegetation. Regardless of the route alternatives selected by the SCC, the associated Nebula Switching Station would permanently convert 11.3 acres of open space to developed land.

Nebula-Raines Route 1

Route 1 crosses 15.9 miles of land encompassing approximately 197.6 acres of right-of-way, including the proposed Nebula Switching Station. If Route 1 is selected for the Project, the primary land use/land cover impact would be the conversion of 103.1 acres of forested land to grassy open space within the maintained right-of-way.

Nebula-Raines Route 3

Nebula-Raines Route 3 crosses 14.9 miles of land encompassing approximately 192.0 acres of right-of-way, including the proposed Nebula Switching Station. If Nebula-Raines Route 3 is selected for the Project, the primary land use/land cover impact would be the conversion of 109.6 acres of forested land to grassy open space within the maintained right-of-way.

Nebula-Raines Route 4

Nebula-Raines Route 4 crosses 14.9 miles of land encompassing approximately 192.3 acres of right-of-way, including the proposed Nebula Switching Station. If Nebula-Raines Route 4 is selected for the Project, the primary land use/land cover impact would be the conversion of 132.8 acres of forested land to grassy open space within the maintained right-of-way.

Nebula-Raines Route 5

Nebula-Raines Route 5 crosses 14.4 miles of land encompassing approximately 185.2 acres of right-of-way, including the proposed Nebula Switching Station. If Nebula-Raines Route 5 is selected for the Project, the primary land use/land cover impact would be the conversion of 99.5 acres of forested land to grassy open space within the maintained right-of-way.

Cloud-Nebula Route

The Cloud-Nebula Route crosses 0.9 mile of land encompassing approximately 10.8 acres of right-of-way. This route would require the conversion of approximately 4.6 acres of forested land to grassy open space within the maintained right-of-way.

4.1.3 LAND USE PLANNING AND ZONING

Section 15.2-2223 of the Va. Code requires each local planning commission to adopt a comprehensive plan that provides guidance for physical development within its 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 that a comprehensive plan be reviewed at least once every 5 years to adjust to actual or projected changes in land use conditions or needs (Va. Code Section 15.2-2230).

As discussed in Section 3.0, the Project is located entirely in Mecklenburg County, Virginia, with the eastern portion of the Project located near (but not within) the Town of South Hill and the western portion of the Project located near (but not within) the Town of Boydton. Mecklenburg County, the Town of South Hill and the Town of Boydton all have adopted Comprehensive Plans.

4.1.3.1 MECKLENBURG COUNTY COMPREHENSIVE PLAN

The Mecklenburg County 2035 Long Range Plan, adopted in 2012 and updated in 2017 (Mecklenburg County 2017) describes a countywide vision focusing on natural resource conservation, targeted economic growth, and town revitalization and expansion. The plan considers existing conditions, growth trends, and the desired community vision for the future, and supports infrastructure investment to promote the long-term public health, safety, and welfare of its residents. The plan emphasizes the importance of maintaining agricultural and forested lands for crop and food production, wildlife habitat, and the visual quality of the rural landscape, and ensuring the long-term preservation of natural resources. The plan also identifies aggressive marketing for information technology and data center business opportunities as an action item to support future development and attract high-profile technology companies to the county.

The plan's future land use maps and policies indicate that land uses in the areas crossed by the route alternatives are likely to remain mainly agricultural, with some transition to industry, particularly near the Towns of South Hill and Boydton. Transmission line expansion is not specifically mentioned in the Long-Range Plan. Based on outreach to Mecklenburg County in May 2024, ERM understands that the County is in the early stages of a comprehensive plan update.

4.1.3.2 TOWN OF SOUTH HILL COMPREHENSIVE PLAN

The Town of South Hill is the largest town in Mecklenburg County. The Town's *2022–2042 Comprehensive Plan* (Town of South Hill 2022) envisions a rapidly growing rural community with

high-quality recreational resources, a variety of economic opportunities, and growth in enterprise zone incentives and industrial parks. The plan identifies a 76-acre area of the town as an Urban Development Area (bounded by Mecklenburg Avenue to the west, East Ferrell Street to the north, Franklin Street and Pleasant Street to the South, and Lombardy Street to the east), where residential and commercial development would be concentrated. The plan emphasizes the desire for growth and development that enhances the community character and environmental quality. Future land use within the town boundaries is expected to include expanded residential, commercial, and industrial areas, with industrial parks on the southern, southwestern, and northeastern areas of the town.

4.1.3.3 TOWN OF BOYDTON

The Town of Boydton Comprehensive Plan (Town of Boydton 2009) was adopted in 2009 with the mission of guiding the future of the Town development, while enhancing citizens' well-being and environmental resources. The plan also emphasizes development of a coordinated, well-planned system of public services and utilities.

4.1.3.4 ZONING

Local governments (including Mecklenburg County and the Towns of South Hill and Boydton) use zoning ordinances to formally designate land use districts, identify intended and compatible land uses in those districts, establish standards to guide orderly and efficient land use and development, and implement objectives of their comprehensive plans. A zoning ordinance may be modified by the local Board of Supervisors and governing bodies or through requests from residents or businesses to change zoning designations.

Under Virginia law, public utilities planning to construct a transmission line of 138 kV or higher are required to obtain a CPCN from the SCC or obtain any and all applicable local zoning ordinance approvals (Va. Code § 56-265.2). This requirement preempts the local zoning ordinances; therefore, the SCC's issuance of a CPCN would satisfy the requirements of all local zoning ordinances (Va. Code § 56-265.2). Because Dominion is applying to the Virginia SCC for a CPCN for the Project, no additional discussion of local zoning or local zoning requirements is included in this study.

4.1.3.5 IMPACT ASSESSMENT

With regard to Mecklenburg County's desire to maintain the rural landscape, ERM and the Company designed the route alternatives to minimize visual impacts to the degree possible through collocation with existing infrastructure, following the edges of parcel boundaries, and routing through forested areas, and particularly managed timber areas, to minimize impacts by leaving vegetive buffers that screen the transmission line from viewpoints throughout the county.

All Nebula-Raines Route alternatives would generally have the same impacts with regard to land use planning. Each route alternative begins at the future Raines Substation near the southern boundary of South Hill. The Cloud-Nebula Route would begin at the Cloud Switching Station and route adjacent to an existing industrial development and through a proposed development and would not conflict with future land use planning. Based on the future land use plans for the Town of South Hill, this area is designated for industrial areas and industrial parks.

Based on the future land use map included in the Mecklenburg Long Range Plan, all route alternatives would primarily cross lands designated for agricultural and rural residential land use. Agricultural land uses would not be significantly impacted by any of the routes (outside of the limited area affected by structure placement) because agricultural practices could continue within the right-of-way during Project operations. The routes further support the goals of the county plan by serving technology-based development that the plan recommends recruiting to the county.

Based on review of land planning objectives and coordination with county planning staff, the route alternatives would not conflict with the land planning objectives outlined in the comprehensive plans for Mecklenburg County and the Towns of South Hill and Boydton.

4.1.4 RESIDENTIAL AREAS AND RESIDENCES

ERM identified residences (single-family and multi-family dwellings) and accessory buildings (e.g., sheds, garages, barns, and similar structures on residential or agricultural parcels) within 60 feet of the right-of-way of each route alternative and within 100 feet, 250 feet, and 500 feet of the route centerline of each route alternative through review of various digital datasets, maps, and recent (2023) aerial photography. **Error! Reference source not found.** lists the number of dwellings and residential accessory structures by type within these tiers for all routes, while Figure 4.1-3 depicts the locations of these structures.

The study area is primarily comprised of forested lands, agricultural lands, and undeveloped, open space; therefore, there are limited areas with concentrated residences. These areas are generally located along US 1, with smaller pockets of residential areas along the other secondary roads in the study area.

TABLE 4.1-4 RESIDENCES AND ACCESSORY BUILDINGS WITHIN 100 FEET, 250 FEET, AND 500 FEET OF PROJECT ROUTE ALTERNATIVE CENTERLINES

Route Name	Structure Type	Structures within 60 feet of Right-of-Way	Structures within 100 feet of Centerline	Structures within 250 Feet of Centerline	Structures within 500 Feet of Centerline
Cloud-Nebula Route	Accessory Building [a]	0	0	0	0
	Single-Family Dwelling	0	0	0	0
Nebula-Raines Route 1	Accessory Building [a]	0	1	12	27
	Single-Family Dwelling	0	0	3	15
Nebula-Raines Route 3	Accessory Building [a]	0	0	5	29
	Single-Family Dwelling	0	0	0	16
Nebula-Raines Route 4	Accessory Building [a]	0	0	5	34
	Single-Family Dwelling	0	0	1	17
Nebula-Raines Route 5	Accessory Building [a]	0	1	5	16
	Single-Family Dwelling	0	0	0	11

[a] Includes sheds, garages, barns, and similar structures on residential or agricultural parcels.

4.1.4.1 IMPACT ASSESSMENT

In accordance with SCC Guidelines, routing through agricultural and forested areas is preferred to crossing residential areas to minimize potential conflicts with existing and planned land uses.

Except for temporary impacts such as noise or traffic during construction, the Project would have no direct impacts on the operation or use of residential buildings. Regardless of the route selected, Dominion would coordinate directly with affected owners in the cases where Project construction would temporarily impact access to residences or residential properties.

In developing the route alternatives, the Company attempted to minimize visual impacts to residences and residential areas to the extent practicable by using existing tree cover to visually obscure transmission infrastructure from existing residences. There are no buildings within, or within 60 feet of the rights-of-way of any of the Project route alternatives, and all Project route rights-of-way would be greater than 100 feet from any existing residential dwellings. Potential impacts on residential and other buildings are discussed below. Section **Error! Reference source not found.** discusses the Project's visual impacts.

Cloud-Nebula Route

There are no existing or planned dwellings or accessory buildings within 100, 250, or 500 feet of the Cloud-Nebula Route.

Nebula-Raines Route 1

The nearest residence to Nebula-Raines Route 1 is single family home located approximately 140 feet south of the centerline near MP 5.9. Most residences, with the exception of those located off of Goodes Ferry Road and Belfield Road, will have some vegetation buffer located between the residence and Nebula-Raines Route 1. This buffer will either completely or partially obstruct the view of the route from the residence. The residences located off Goodes Ferry Road and Belfield Road, in proximity to Route 1, are likely to experience a change in viewshed.

Nebula-Raines Route 3

The nearest residence to Nebula-Raines Route 3 is a single-family home located north of the intersection of Goodes Ferry Road and Butterworth at MP 0.6, approximately 248 feet south of the route centerline. Most residences will have some vegetative buffer located between the residence and Nebula-Raines Route 3. This buffer will either completely or partially obstruct the view of the route from the residence. The home located at MP 0.6 has dense tree cover to the east, which will fully obstruct visual impacts to the northeast. There is sparse tree cover surrounding the residence, which will partially obstruct visual impacts in all other directions.

Nebula-Raines Route 4

Similar to Nebula-Raines Route 3, the nearest residence to Nebula-Raines Route 4 is a single-family home located north of the intersection of Goodes Ferry Road and Butterworth at MP 0.6, approximately 248 feet south of the route centerline. There is an additional single-family residence located at MP 11.3, approximately 247 feet south of the route. A vegetative buffer surrounding the home will remain, providing a visual buffer to the transmission line. Most

residences will have some vegetation buffer located between the residence and Nebula-Raines Route 4.

Nebula-Raines Route 5

Similar to Nebula-Raines Routes 3 and 4, the nearest residence to Nebula-Raines Route 5 is a single-family home located north of the intersection of Goodes Ferry Road and Butterworth at MP 0.6, approximately 248 feet south of the route centerline. Most residences will have some vegetation buffer located between the residence and Nebula-Raines Route 5.
Commercial/Industrial Areas and Buildings

Most buildings in the study area are residential or agricultural outbuildings. A limited number of commercial and industrial areas and buildings are present in the study area. These buildings include warehouses and commercial signage retailers. In general, these sparsely distributed commercial businesses and buildings are located in the northeast portion of the study area near the city of South Hill or along US 58 or US 1. Due to the predominance of forested and agricultural land use in the study area, there are no concentrated commercial or industrial areas in the study area.

ERM identified commercial buildings within 500 feet of the alternative routes through a review of county data, U.S. Geological Survey (USGS) topographic quadrangles (USGS 2024a), and recent (2023) digital aerial photography. **Error! Reference source not found.** lists the number of commercial buildings within 60 feet of the right-of-way and within 100, 250, and 500 feet of the centerline of each route alternative, while Figure 4.1-3 depicts the locations of these structures.

TABLE 4.1-5 COMMERCIAL AND NON-RESIDENTIAL BUILDINGS WITHIN RIGHT-OF-WAY AND 500 FEET OF THE PROJECT ROUTE ALTERNATIVES

Route Name	Structure Type	Structures within 60 feet of Right-of-Way	Structures within 100 Feet of Centerline	Structures within 250 Feet of Centerline	Structures within 500 Feet of Centerline
Cloud-Nebula Route	Commercial Buildings	0	0	0	0
Nebula-Raines Route 1	Commercial Buildings	0	0	0	1
Nebula-Raines Route 3	Commercial Buildings	0	0	0	0
Nebula-Raines Route 4	Commercial Buildings	0	0	0	0
Nebula-Raines Route 5	Commercial Buildings	0	0	2	3

4.1.4.2 IMPACT ASSESSMENT

Cloud-Nebula Route

The Cloud-Nebula Route does not have any commercial buildings within 500 feet of its centerline, and therefore no impacts to any existing commercial or non-residential buildings are anticipated.

Nebula-Raines Routes

Nebula-Raines Routes 3 and 4 have no commercial buildings within 500 feet of their respective centerlines; therefore, these route alternatives would have no impacts on commercial buildings and associated businesses. Nebula-Raines Route 1 has one commercial building—Trinity United Methodist Church—within 500 feet of its centerline. Nebula-Raines Route 5 has two commercial buildings within 250 and three commercial buildings within 500 feet of its centerline. One of these commercial buildings is the Lambert's Chapel Reformed Union Apostolic Church. Impacts on these churches are described in more detail in Section 4.1.8. The other two commercial buildings and associated businesses within 500 feet of Nebula-Raines Route 5 are unlikely to be permanently impacted by construction and operation of Nebula-Raines Route 5 due to their distance from the right-of-way. Commercial buildings could experience temporary impacts during construction due to road or lane closures.

4.1.5 PLANNED DEVELOPMENTS

ERM obtained information about planned future developments through consultations with county planning officials and other stakeholders. Mecklenburg County does not have a publicly accessible online database with planned development information. Figure 4.1-4 depicts the planned developments in the study area.

ERM contacted Mecklenburg County via email and phone conversations in December 2023 and May 2024 (Hendrick 2023) to inquire about planned future developments within the study area. Per conversations with the County, the only planned developments at the time of consultation were data centers located in the western portion of the study area, near Boydton. The County did not provide specific site information about these developments. ERM and Dominion are aware of a planned wetland mitigation bank site that is in the process of development. The planned wetland mitigation bank is located on the east side of Antlers Road, adjacent to Allen Creek and its associated wetlands. Nebula-Raines Routes 1 and 3 are the only Project route alternatives that would cross this development. ERM and Dominion will continue to coordinate with the County and stakeholders during the routing process to solicit information on future planned developments in the study area.

4.1.5.1 IMPACT ASSESSMENT

Cloud-Nebula Route

The Cloud-Nebula Route would not cross any planned developments.

Nebula-Raines Routes

Nebula-Raines Routes 1 and 3 would cross the planned wetland mitigation bank along a shared right-of-way (from approximately MPs 12.3 to 13.5 on Nebula-Raines Route 1 and MPs 11.8 to 13.1 on Nebula-Raines Route 3). ERM and Dominion will continue to coordinate with the developer to ensure adverse impacts are mitigated. Nebula-Raines Routes 4 and 5 would not cross any planned developments.

4.1.6 RECREATIONAL RESOURCES

4.1.6.1 EXISTING CONDITIONS

ERM collected information on recreational resources from digital datasets and maps, recent digital aerial photography, publicly available information on county websites, and consultation with county officials and other stakeholders. Unless otherwise noted, information on existing recreational resources is from the Mecklenburg County GIS website (Mecklenburg County 2024) and the county's comprehensive plan (Mecklenburg County 2017), which is currently being updated. Table 4.1-6**Error! Reference source not found.** provides information about the recreational resources crossed by or within 0.25 mile of the Project. Figure 4.1-5 depicts these recreational resources. Most of the existing and planned recreational resources described below are shared-use trails and paths that follow road corridors throughout the county. These trails provide opportunities to walk, bike, ride, and view wildlife. There are no recreational resources within 0.25 mile of Cloud-Nebula Route. Visual impacts are discussed in Section 4.3.

As mentioned in Section 3.3, there is one VOF easement, an Ever-Green Team Trust Easement, and a Virginia Department of Forestry Easement located within the study area. All easements are greater than 0.25 mile from the Project infrastructure, therefore, there would be no direct or indirect impacts on any of the easements in the study area; therefore, they are not discussed further in this report (other than to note their avoidance through routing).

TABLE 4.1-6 RECREATIONAL RESOURCES WITHIN 0.25 MILE OF PROJECT ROUTE ALTERNATIVES

Recreational Resource	Description	Status	Distance to Project
Beaches to Bluegrass Trail	Shared-use path and multi-use trail network that runs from the Cumberland Gap in Virginia to Virginia Beach, intended for use by bicyclists, pedestrians, and equestrians (VDCR 2015). The northern portion of the trail generally follows the same route as the Tobacco Heritage Trail. The southern portion of the trail follows Phillis Road, Redlawn Road, Goodes Ferry Road, and Rocky Branch Road within the study area.	Active. Developed through a partnership between the VDCR Statewide Trails Program and VDOT's Transportation and Mobility Planning Division's Statewide Bicycle and Pedestrian Program. The network includes existing and proposed trails.	Crossed by all Nebula-Raines route alternatives.
Christanna Loop Birding Wildlife Trail	Part of the Virginia Bird and Wildlife Trail, which is an organized network of outdoor sites along driving trails and loops for bird watching and viewing wildlife. The Christanna Loop includes 11 different sites for wildlife viewing along the driving trail (VDWR 2024e). The trail generally follows US 58, US 1, and Buggs Island Road in the study area.	Active. Managed by VDWR and Virginia Green, a joint program involving VDEQ, the Virginia Tourism Corporation, the Virginia Restaurant, Lodging and Travel Association, Virginia State Parks, and the Virginia Green Travel Alliance.	Crossed by all Nebula-Raines route alternatives.

Recreational Resource	Description	Status	Distance to Project
East Coast Greenway	A 3,000-mile walking and biking route that runs from Maine to Florida, connecting local, firm-surface trails across 15 states (East Coast Greenway Alliance, 2024). The East Coast Greenway generally follows Baskerville Road, Busy Bee Road, Gordon Lake Road, and Plank Road in the study area.	Active. Managed by the East Coast Greenway Alliance in coordination with local and state agencies. The Greenway contains existing and proposed trails	Crossed by all Nebula-Raines route alternatives.
Goodes Ferry Road	Designated Virginia Byway running from US 58 in South Hill to the Brunswick County line near Joyceville, Virginia.	Active. Established in 2006 by VDOT in partnership with VDCR.	Crossed by all Nebula-Raines route alternatives.
Park View Athletic Complex	Athletic fields and sports facility associated with the former Park View High School that closed in 2022. Current facilities include recreational fields, locker room, weight room, gymnasium, and parking and is currently maintained by the Park View Boosters Club (Kyte 2024).	Semi-active. The facility is no longer associated with the former Park View High School after the school closed in 2022. Park View Boosters Club submitted a proposal in February 2024 to redevelop portions of the property to update and expand the sports complex. The proposal is currently pending County approval.	Approximately 0.1 mile southwest of Nebula-Raines Route 5.
Tobacco Heritage Trail	A network of mostly off-road, shared-use trails for pedestrians, bicyclists, and equestrians that use former railroad rights-of-way (Roanoke River Rails-To-Trails 2023). The Tobacco Heritage Trail generally follows a portion of the Beaches to Bluegrass Trail in the study area.	Active. Managed by the Roanoke Rails-to-Trails Corporation. The portion in Mecklenburg County was approved by the Mecklenburg County Industrial Development Authority in 2004. The Tobacco Heritage Trail Master Plan 2023 Update includes existing and planned future trails to be included in the network near Boydton and Finchley.	Crossed by all Nebula-Raines route alternatives.
U.S. Bike Route 1	A cross-country, long-distance bicycle route network that includes shared roadways, on-road accommodations, and off-road shared use paths, planned to connect the eastern U.S. from Florida to Maine (VDOT 2024a). U.S. Bike Route 1 generally follows Baskerville Road, Wooden Bridge Road, and Buggs Island Road in the study area.	Active. Established by the American Association of State Highway and Transportation Officials in 1982 as part of the United States Bicycle Route System. The Virginia segment of U.S. Bike Route 1 is approximately 374-miles long and generally follows a similar alignment to the East Coast Greenway, running from north to south between	Crossed by all Nebula-Raines route alternatives.

Recreational Resource	Description	Status	Distance to Project
		Boydton and South Hill in the County.	

VDCR = Virginia Department of Conservation and Recreation; VDEQ = Virginia Department of Environmental Quality; VDOT = Virginia Department of Transportation.

4.1.6.2 IMPACT ASSESSMENT

The discussions below characterize the impacts of each transmission line route on recreational resources. Impacts on trails would generally include tree clearing in forested areas, as well as visual impacts from the presence of new transmission infrastructure. These impacts would not prevent or otherwise affect the ability to use recreational trails but could adversely impact the experience of trail users where new transmission infrastructure makes a trail segment less visually appealing. Visual impacts are discussed in Section 4.3.

Nebula-Raines Route 1

Nebula-Raines Route 1 crosses five recreational trails and one Virginia scenic byway for a total of 10 crossings, including:

- The Beaches to Bluegrass Trail (MPs 0.8 and 6.0);
- The Christanna Loop Birding Wildlife Trail (MPs 7.3 and 11.2);
- The East Coast Greenway (MPs 0.8 and 10.0);
- The Tobacco Heritage Trail (MPs 0.8 and 12.2);
- US Bike Route 1 (MP 11.2); and
- Goodes Ferry Road (MP 6.0).

Nebula-Raines Route 1 crosses these trails and roads at right angles, minimizing impacts. Visual impacts on recreational resources and other resources are discussed in Section 4.3. Although construction noise could temporarily disturb some recreational activity, these impacts would be temporary and limited to the period of construction in the immediate vicinity of the property. Overall, Nebula-Raines Route 1 would not prevent the recreational uses of the trails or scenic byway.

Nebula-Raines Route 3

Nebula-Raines Route 3 crosses five recreational trails and one Virginia scenic byway for a total of nine crossings, including:

- The Christanna Loop Birding Wildlife Trail (MPs 6.8 and 10.7);
- The East Coast Greenway (MPs 0.6 and 9.5);
- The Tobacco Heritage Trail (MPs 0.6 and 11.7);
- The Beaches to Bluegrass Trail (MP 0.6);
- Goodes Ferry Road (MP 0.6); and
- US Bike Route 1 (MP 10.7).

Nebula-Raines Route 3 crosses these trails and roads at right angles, minimizing impacts. Visual impacts to recreational resources and other resources are discussed in Section 4.3. Although construction noise could temporarily disturb some recreational activity, these impacts would be temporary, limited to the period of construction in the immediate vicinity of the property. Overall, Nebula-Raines Route 3 would not prevent the recreational uses of the trails or scenic byway.

Nebula-Raines Route 4

Nebula-Raines Route 4 crosses five recreational trails and one Virginia scenic byway for a total of nine crossings, including:

- The Christanna Loop Birding Wildlife Trail (MPs 6.8 and 11.2);
- The East Coast Greenway (MPs 0.6 and 9.5);
- The Tobacco Heritage Trail (MPs 0.6 and 12.0);
- The Beaches to Bluegrass Trail (MP 0.6);
- Goodes Ferry Road (MP 0.6); and
- US Bike Route 1 (MP 11.2).

Similar to the other routes, Nebula-Raines Route 4 crosses these trails and roads at right angles, minimizing impacts. Visual impacts to recreational resources and other resources are discussed in Section 4.3. Though construction noise could temporarily disturb some recreational activity, these impacts would be temporary, limited to the period of construction in the immediate vicinity of the property. Overall, Nebula-Raines Route 4 would not prevent the recreational uses of the trails or scenic byway.

Nebula-Raines Route 5

Nebula-Raines Route 5 crosses five recreational trails and one Virginia scenic byway for a total of 15 crossings, including:

- East Coast Greenway (MPs 0.6, 3.1, 6.8, and 7.3);
- The Beaches to Bluegrass Trail (MPs 0.6, 8.5, and 11.6);
- The Tobacco Heritage Trail (MPs 0.6, 8.5, and 11.6);
- The Christanna Loop Birding Wildlife Trail (MPs 2.5, 10.8, and 11.3);
- Goodes Ferry Road (MP 0.6); and
- US Bike Route 1 (MP 9.0).

The Nebula-Raines Route 5 recreational trail crossings are generally perpendicular to minimize potential impacts. In addition to the recreational trails, the Park View Athletic Complex is approximately 0.10 mile southwest of Nebula-Raines Route 5 near MP 2.7. Nebula-Raines Route 5 would not cross or impact any existing or future development plans for the athletic sports complex. Though construction noise could temporarily disturb some recreational activity, these impacts would be temporary, limited to the period of construction in the immediate vicinity of the property. Visual impacts to recreational resources and other resources are discussed in Section 4.3. Overall, Nebula-Raines Route 5 would not prevent the recreational uses of the trails, scenic byway, or sports complex.

Cloud-Nebula Route

The Cloud-Nebula Route would not cross any recreational trails, scenic byways, or other recreational resources.

4.1.7 CEMETERIES, SCHOOLS, AND PLACES OF WORSHIP

ERM reviewed the following sources to identify cemeteries, schools, and places of worship within 0.25 mile of the Project route alternatives:

- Recent and historic topographic maps (USGS 2024a)
- Recent and historic digital aerial photography (ESRI 2024; Google Earth LLC 2024; Nationwide Environmental Title Research, LLC 2024)
- County parcel data (Mecklenburg County 2024)
- Cemetery and burial data (Find a Grave 2024)
- School data (Mecklenburg County Public Schools 2024; niche.com 2024)
- Cultural resource data from the VCRIS (VDHR 2024)
- Information from open house attendees

4.1.7.1 CEMETERIES

Table 4.1-7**Error! Reference source not found.** describes the 13 cemeteries identified by ERM within 0.25 mile of the route alternatives, while Figure 4.1-6 depicts the location of each cemetery. None of the cemeteries are crossed by a route alternative.

Of the 13 cemeteries, 9 are more than 500 feet from the nearest route alternative right-of-way, including the Hudson Family Cemetery, Unnamed Cemetery #1, Unnamed Cemetery #3, Chavis Family Cemetery, Bethel Baptist Church Cemetery, Young-Brame Cemetery, Greater Hayes Grove Baptist Church Cemetery, Saint Andrews Church Cemetery, and Unnamed Cemetery #2. The Project would not impact the use of these cemeteries as burial grounds; therefore, they are not discussed further in this report (other than to note their avoidance through routing).

The four remaining cemeteries—William Ray Lassiter Cemetery, Walter Webb Hite Cemetery, Cedar Grove Cemetery, and Lambert's Chapel Reformed Union Apostolic Church Cemetery—are within 500 feet of the right-of-way of one or more route alternatives. The remainder of this section evaluates the Project's potential impacts on those cemeteries.

TABLE 4.1-7 CEMETERIES WITHIN 0.25 MILE OF PROJECT ROUTE ALTERNATIVES

Cemetery	Description [a]	Distance to Project [b]
Hudson Family Cemetery	This cemetery lies on the west side of Trinity Church Road about 0.7 mile south-southeast of the intersection of Trinity Church and Goodes Ferry roads. The parcel encompassing the cemetery, owned by the Willie H. Hudson Estate Cemetery, occupies approximately 1.9 acres, but the burial ground itself in the southwest corner of the tract encompasses about 0.1 acre. The cemetery is maintained and fenced with agricultural lands to the north and east, a residential parcel to the south, and a row of trees to the west. There are at least 33 interments in the cemetery ranging in date from 1890 to 2018.	About 0.2 mile west of Nebula-Raines Route 1 at approximately MP 1.9
Unnamed Cemetery #1	The 1968 USGS topographic quadrangle, South Hill, Virginia (1:24:000), depicts a cemetery near the end of a field road off Green Pines Lane, about 0.4 mile east of the Hudson Family Cemetery described above. A small private parcel encompassing about 0.1 acre corresponds to the location of the cemetery on the map, but the county parcel data and Find a Grave (2024) contain no indication that the site contains burials. There are no visible indications of headstones, fences, tree lines, or other markers indicating the potential location of a burial ground. Moreover, the site is in an area that has been logged in the recent past. As a result, the number and dates of interments at this cemetery is unknown.	About 0.2 mile east of Nebula-Raines Route 1 at approximately MP 2.0
William Ray Lassiter Cemetery	A tract encompassing about 0.2 acre on a forested parcel west of Trinity Church Road is identified in county parcel data as a "cemetery lot" (Mecklenburg County GIS 2024). Recent and historic aerial images, USGS topographic maps, and Find a Grave (2024) provide no evidence of a burial ground at this location. The area within and surrounding the parcel is currently forested but was logged in the recent past. It is unknown whether this site is intended for future burials. As a result, the number and dates of interments at this cemetery is unknown.	Less than 0.1 mile southeast of Nebula-Raines Route 1 at approximately MP 3.9
Walter Webb Hite Cemetery	This cemetery occupies about 0.1 acre on the south side of Butterworth Lane near the intersection with Goodes Ferry Road. The cemetery is fenced and maintained, with a large tree in its center. The area surrounding the cemetery is rural residential with cleared lands, scattered residences. and outbuildings. The cemetery contains at least 24 interments ranging in date from 1889 to 2023.	Less than 0.1 mile south of the common alignment of Nebula-Raines Routes 3, 4, and 5 at approximately MP 0.6

Cemetery	Description [a]	Distance to Project [b]
Unnamed Cemetery #3	This landowner-identified cemetery is east of Smith Cross Road about 0.6 mile southeast of Big Fork. An ERM archaeologist subsequently visited the site to document its location and boundaries. Based on that delineation, the cemetery encompasses about 0.4 acre of overgrown forested land to the north (rear) of an unassociated dwelling and outbuildings. ERM documented 52 graves but suspect more are present within the resource based on its condition. Most of the distinguishable graves have some type of headstone and/or foot stone combination and a depression (ranging from 0.5–2 feet deep) facing east. The stones are simple fieldstones with no inscriptions. The dates of internment are unknown.	Less than 0.1 mile east of the common alignment of Nebula-Raines Routes 3 and 4 at approximately MP 5.5
Cedar Grove Cemetery	This cemetery encompasses approximately 0.9 acre northeast of the intersection of Eureka and Cedar Grove roads. The interior of the cemetery is partially cleared and partially forested. The cemetery boundaries are well defined by tree cuts on recent and historic aerial images of the area. Lands east and north of the cemetery are cleared (hay or pasture) with recently cleared timberland to the east and forest to the south. The resource contains at least 23 interments dating from 1946 to 2023. The cemetery likely is associated with a former church—Cedar Grove Church—depicted on the 1968 USGS topographic map, South Hill, Virginia (1:24:000). Based on review of historic aerial photography, the church structure was demolished or removed from the property sometime between 1967 and 1983.	Less than 0.1 mile south of the common alignment of Nebula-Raines Routes 3 and 4 at approximately MP 7.5
Chavis Family Cemetery	This cemetery occupies about 0.6 acre at the southeast corner of the intersection of Cedar Grove and Eureka roads (on the opposite side of Eureka Road from Cedar Grove Cemetery). The interior of the burial ground is mostly cleared, with the boundary of the resource defined by a tree line with forest to the north, east, and south and Eureka Road to the west. The cemetery contains at least 18 interments dating from 1921 to 2018, although the burial dates for several individuals are listed as unknown.	About 0.2 mile north of Nebula-Raines Route 1 at approximately MP 8.0 About 0.2 mile south of the common alignment of Nebula-Raines Routes 3 and 4 at approximately MP 7.6
Bethel Baptist Church Cemetery	This cemetery lies on the north side of an approximate 9.8-acre parcel associated with Bethel Baptist Church on the east side of Buggs Island Road, about 0.3 mile south of the intersection of Buggs Island and Iron Mill roads. Other than trees along the north, east, and south boundaries, the parcel is developed, with the church building, parking lot, and an outbuilding to the south and the burial area to the north. Surrounding lands are forested to the east and west and agricultural to the north and south. There are at least 24 burials at the cemetery with interments dating from 1995 to 2023.	About 0.1 mile north of Nebula-Raines Route 4 at approximately MP 11.1

Cemetery	Description [a]	Distance to Project [b]
Young-Brame Cemetery	This cemetery sits on the north side of Young Road near its eastern terminus. The burial ground encompasses about 0.1 acre of partially cleared and partially forested land. Surrounding lands are a mix of forest, rural residences, and agricultural fields. A note on findagrave.com identifies the burial ground as the plantation cemetery for the Young family, who reportedly occupied the land for five generations. Burials of individuals in the cemetery with the surname Young (7 of 19) all date from the 20th century. Other families are represented in the cemetery, with the earliest burial (surname Brame) dating from 1789.	About 0.2 mile north of Nebula-Raines Route 4 at approximately MP 12.6
Lambert's Chapel Reformed Union Apostolic Church Cemetery	This church cemetery is on the east side of Snowbird Road, opposite the church, which lies to the west. The site is also known as Lamberts Chapel Rural Cemetery. The parcel containing the cemetery encompasses about 7.3 acres, but the burial ground itself appears to be limited to an approximately 0.5-acre rectangular area, defined by the presence of headstones and tree cuts on recent and historic aerial photography. The cemetery itself is cleared, with forest to the north, east, and west, and Snowbird Road and the church to the east. The resource contains at least 70 interments dating from 1920 to 2024. Because Lambert's Chapel Reformed Union Apostolic Church Cemetery is an African American congregation, the interments are assumed to be mostly or exclusively African American.	Less than 0.1 mile east of Nebula-Raines Route 5 at approximately MP 3.1
Greater Hayes Grove Baptist Church Cemetery	This church cemetery lies just east of Union Level Road about a mile south of the community of Union Level. The parcel encompassing the resource measures about 2.3 acres in area, with the burial ground occupying approximately 0.6 acre in the northwest corner. The cemetery is cleared, with a parking lot to the east, the church building and forest to the south, cleared land (hay or pasture) to the west, and forest to the north. The cemetery contains at least 81 interments dating from 1954 to 2023. Because Greater Hayes Grove Baptist Church is a predominantly African American congregation, the interments are assumed to be mostly or exclusively African American.	About 0.1 mile north of Nebula-Raines Route 5 at approximately MP 5.6
Saint Andrews Church Cemetery	This cemetery, associated with Saint Andrews Church, is along the east side of Baskerville Road in the community of Baskerville. The parcel containing the church and cemetery encompasses about 1.9 acres, with the burial ground occupying about 0.3 acre around the church structure to the west, north, and northeast. The cemetery grounds are clear and maintained, with at least 88 interments dating from 1901 to 2023. Surrounding lands are largely forested with residential development along Baskerville Road.	About 0.2 mile south of Nebula-Raines Route 5 at approximately MP 8.7

Cemetery	Description [a]	Distance to Project [b]
Unnamed Cemetery #2	This cemetery lies within a copse of trees along the west side of a private road or driveway north of US 58, near where the highway crosses Reedy Branch. Lands surrounding the resource are largely agricultural (hay or pasture) with trees along waterbodies. The cemetery is labelled on the 1955 USGS topographic map, Boydton, Virginia (1:62,500), indicating it dates from at least the mid-twentieth century. It occupies about 0.1 acre. A small cluster of stones is visible on the surface within the burial ground on recent aerial images, but it is not clear if these represent memorials. The number and dates of interments at the cemetery are unknown.	About 0.2 mile east of Nebula-Raines Route 5 at approximately MP 11.1

MP = milepost; USGS = U.S. Geological Survey.

[a] Numbers and dates of interments for each cemetery are based on findagrave.com except as noted.

[b] Measured from the edge of right-of-way for each alternative to the burial ground boundary.

4.1.7.2 SCHOOLS

Based on review of the sources identified in Section 4.1.8 above, there are no schools within 0.25 mile of the Project route alternatives.

4.1.7.3 PLACES OF WORSHIP

Table 4.1-8Table 4.1-8 describes five places of worship, all churches, identified by ERM within 0.25 mile of the Project route alternatives, while Figure 4.1-6 depicts the location of each church. Saint Andrews Church is greater than 500 feet from the right-of-way associated with Nebula-Raines Route 5. Due to this distance, the Project would not affect use of Saint Andrews Church, and this church is not discussed further in this report (other than to note its avoidance through routing).

The four remaining churches—Trinity Unity Methodist Church, Bethel Baptist Church, Lambert's Chapel Reformed Zion Union Apostolic Church, and Greater Hayes Grove Baptist Church—are within 500 feet of the right-of-way of one or more Project route alternatives. The right-of-way for Nebula-Raines Route 5 crosses the parcel containing Lambert's Chapel.

TABLE 4.1-8 PLACES OF WORSHIP WITHIN 0.25 MILE OF PROJECT ROUTE ALTERNATIVES

Place of Worship	Description	Distance to Project [a]
Trinity United Methodist Church	This church is on the east side of Trinity Church Road about 0.6 mile south-southwest of the road's intersection with Boxwood Road. The parcel containing the church encompasses about 2.0 acres, of which about two-thirds is forested and the remainder developed. A parking lot fronts Trinity Church Road with the church structure to its east and forest along the northern, eastern, and southern tract boundaries. Surrounding lands are mostly forested with agricultural land (hay or pasture) to the northwest. Recent and historic aerial photography provide no indication of a cemetery at the church. The date of construction of the church building is unknown, but it appears on the 1955 USGS topographic map, Greensboro, North Carolina (1:250,000) and a 1954 aerial image.	Less than 0.1 mile south of Nebula-Raines Route 1 at approximately MP 3.6
Bethel Baptist Church	The campus containing this church and an associated cemetery (described in Table 4.1-7**Error! Reference source not found.**) occupies about 9.9 acres on the east side of Buggs Island Road about 0.3 mile south of the intersection of Buggs Island and Iron Mill Roads. The church building, an outbuilding, and a parking area occupy the southeast corner of the parcel, with the cemetery to the north and a tree line along the north, east, and southern tract lines. Based on review of aerial photography, the church was built between 1996 and 2002. This is consistent with the dates of interment at the cemetery, the earliest of which dates from 1995.	Less than 0.1 mile north of Nebula-Raines Route 4 at approximately MP 11.1
Lambert's Chapel Reformed Zion Union Apostolic Church	The parcel encompassing this church occupies about 2.4 acres in the northwest corner of the intersection of Snowbird and Plank Roads, on the opposite side of Snowbird Road from the associated church cemetery (described in Table 4.1-7**Error! Reference source not found.**). Other than the church structure, which is on the northern end of the parcel along Snowbird Road, the tract is cleared (with herbaceous cover) and used for parking. Surrounding lands are forested to the north, east, and south with agricultural land (hay or pasture) to the west. The church is visible on a 1958 aerial and depicted on the 1968 USGS topographic map, South Hill, Virginia (1:24,000). The congregation is African American.	Crossed by Nebula-Raines Route 5 at approximately MP 3.1
Greater Hayes Grove Baptist Church	This church is on the west side of Union Level Road on the same parcel as an associated cemetery (described in Table 4.1-7**Error! Reference source not found.**). The church building is along the southern tract line, flanked to the south and southwest by trees, the north and east by a parking lot, and the northwest by the cemetery. There are trees immediately north of the parcel, with cleared agricultural land to the east and west. The church building is depicted on the 1954 USGS topographic map, Greensboro, North Carolina (1:250,000) and on an aerial image from the same year. The congregation is African American.	Less than 0.1 mile north of Nebula-Raines Route 5 at approximately MP 5.6

Place of Worship	Description	Distance to Project [a]
Saint Andrews Church	This property encompasses about 1.8 acres on the east side of Bakersville Road just southeast of the intersection of the road with the Norfolk Southern Railroad. The church building faces towards Bakersville Road with an associated cemetery (described in Table 4.1-7**Error! Reference source not found.**) to the northwest and forest to the east and south. Surrounding lands are rural residential to the north, south, and west, and forested to the east. The church and cemetery are depicted on the 1955 USGS topographic map, Boydton, Virginia (1:62,500) and a historic aerial from 1955.	About 0.2 mile south of Nebula-Raines Route 5 at approximately MP 8.7

MP = milepost; USGS = U.S. Geological Survey.
[a] Measured from the edge of right-of-way for each alternative to the edge of the parcel containing the church.

4.1.7.4 IMPACT ASSESSMENT

This section describes the Project's impacts on cemeteries and places of worship. No schools are within 0.25 mile of proposed Project features; therefore, the Project would have no direct impact on schools. Visual impacts on schools are discussed in Section 4.3. Although construction noise and traffic could temporarily disturb activity at schools, these impacts would be temporary and limited to the period of construction in the immediate vicinity of the property and would not prevent or alter the use of these facilities.

Visual impacts of the route alternatives on cemeteries and places of worship are discussed in more detail Section 4.3.

Cloud-Nebula Route

There are no cemeteries, schools, or places of worship within 500 feet of the Cloud-Nebula Route; therefore, this component of the Project would have no impact on these facilities.

Nebula-Raines Route 1

ERM identified one cemetery and one church—William Ray Lassiter Cemetery and Trinity United Methodist Church—within 500 feet of the right-of-way for Nebula-Raines Route 1. An assessment of potential impacts on these resources is provided in the subsections below.

William Ray Lassiter Cemetery

This cemetery (described in Table 4.1-7**Error! Reference source not found.**) would be about 265 feet southeast of the Nebula-Raines Route 1 right-of-way near MP 3.9 along a forested segment of the alternative. If selected for the Project, Nebula-Raines Route 1 would create a cleared corridor and introduce transmission lines and conductors to an otherwise natural area near this cemetery. The tree buffer remaining between the lot and right-of-way would likely screen the transmission infrastructure from within the resource, and access to the cemetery and its use as burial ground would not be impacted.

Trinity United Methodist Church

The church building would be approximately 330 feet south of the Nebula-Raines Route 1 right-of-way. If selected for the Project, Nebula-Raines Route 1 would introduce transmission lines and conductors to the forested and agricultural lands north of the church in an area unaffected by similar infrastructure. Although a tree buffer measuring approximately 200 feet deep would remain between the church and right-of-way, transmission infrastructure would likely be visible from the parcel, particularly to the northeast along Trinity Church Road. Nebula-Raines Route 1 would not likely be noticeable from within the church during services due to the inward-focused nature of most church activities. Nebula-Raines Route 1 would have no impact on access to and use of the church as a place of worship.

Nebula-Raines Route 3

ERM identified two cemeteries—Walter Webb Hite Cemetery and Cedar Grove Cemetery—within 500 feet of the right-of-way for Nebula-Raines Route 3. An assessment of potential impacts on these resources is provided in the subsections below. There are no schools or churches within 500 feet of Nebula-Raines Route 3.

Walter Webb Hite Cemetery

This cemetery (described in Table 4.1-7) would be approximately 410 feet south of the Nebula-Raines Route 3 right-of-way near MP 0.6. Lands surrounding the cemetery are rural residential. If selected for the Project, Route 3 would introduce transmission lines and conductors to an area unaffected by similar infrastructure in the vicinity of the resource (although Route 3 in this area parallels the south side of US 58—a substantial source of traffic, noise, and visual impact). A residence and some scattered trees between the cemetery and right-of-way would provide limited to no screening from within the burial ground. Nebula-Raines Route 3 would have no impact on access to or use of the cemetery as a burial ground.

Cedar Grove Cemetery

This cemetery (described in Table 4.1-7) would be approximately 430 feet south of the Nebula-Raines Route 3 right-of-way near MP 7.5. While lands within the interior of the cemetery are cleared, the burial ground is surrounded and defined by a tree line that screens views to the north and west. Lands to the immediate east are recently logged timberland with cleared agricultural lands (hay or pasture) to the northeast. If selected for the Project, Route 3 would introduce transmission lines and conductors to an area unaffected by similar infrastructure and would likely be visible from within the cemetery. Nebula-Raines Route 3 would have no impact on access to or use of the cemetery as a burial ground.

Nebula-Raines Route 4

ERM identified two cemeteries and one church—Walter Webb Hite Cemetery, Cedar Grove Cemetery, and Bethel Baptist Church—within 500 feet of the right-of-way for Nebula-Raines Route 4. Because this route shares a common alignment with Nebula-Raines Route 3 where it passes near the cemeteries, the impact assessment for these resources is the same as described for Route 3. An assessment of potential impacts on Bethel Baptist Church is provided below.

Bethel Baptist Church

The parcel containing the church would be approximately 285 feet north of the Nebula-Raines Route 4 right-of-way near MP 11.2, with the church building slightly more than 500 feet north of the right-of-way. Lands within the parcel are mostly open with a cemetery (described in Table 4.1-8 and located more than 500 feet from the right-of-way) on the north side of the structure. There are forested lands east and west of the parcel and agricultural land (hay or pasture) to the north and south with trees along waterbodies and the northern and southern perimeter of the tract. If selected for the Project, Nebula-Raines Route 4 would introduce transmission lines and conductors to the setting of the resource in an area unaffected by similar infrastructure. While the transmission line would be visible from the parcel, it would not likely be noticeable from within the church during services due to the inward focused nature of most church activities. Nebula-Raines Route 4 would have no impact on access to and use of the church as a place of worship.

Nebula-Raines Route 5

ERM identified two cemeteries and two churches—Walter Webb Hite Cemetery, Lambert's Chapel Reformed Union Apostolic Cemetery and Church, and Greater Hayes Grove Baptist Church—within 500 feet of the right-of-way for Nebula-Raines Route 5. Because this route shares a common alignment with Route 3 where it passes near Walter Webb Hite Cemetery, the impact assessment for this resource is the same as described above for Nebula-Raines Route 3. An assessment of potential impacts on Lambert's Chapel Reformed Union Apostolic Cemetery and Church and Greater Hayes Grove Baptist Church is provided in the subsections below.

Lambert's Chapel Reformed Union Apostolic Cemetery

The cemetery (described in Table 4.1-7) is on the opposite side of Snowbird Road from the associated church, discussed below. The parcel containing the cemetery has been harvested for timber in the past, but the burial ground itself was excluded from previous clearing activities. The right-of-way for Nebula-Raines Route 5 would be approximately 300 feet west of the cemetery's western boundary near MP 3.2. The right-of-way would be on the opposite side of the church and a forested area west of the church from the burial ground. If selected for the Project, Nebula-Raines Route 5 would introduce transmission lines and conductors to an area unaffected by similar infrastructure, though the church and surrounding forest would provide some visual screening from the resource. Nebula-Raines Route 5 would have no impact on access to and use of the cemetery as a burial ground.

Lambert's Chapel Reformed Union Apostolic Church

The right-of-way for Nebula-Raines Route 5 crosses the parcel containing this church near approximate MP 3.1, passing approximately 120 feet west of the church structure. The parcel is triangular in configuration with the church in the northern point of the triangle and much of the rest of the parcel open and cleared, other than narrow a band of forest (less than 100 feet wide) immediately west of the structure. The church building faces southeast towards the intersection of Snowbird and Plank Roads (i.e., parallel rather than perpendicular to the Nebula-Raines Route 5 right-of-way). If selected for the Project, Nebula-Raines Route 5 would introduce transmission infrastructure to the agricultural and forested lands west and north of the church property. While the transmission line would be visible from within the property, it would not likely be noticeable

from within the church during services due to the inward focused nature of most church activities, the orientation of the church structure relative to the right-of-way, and the forest remaining between the church and right-of-way. Nebula-Raines Route 5 would have no impact on access to and use of the church as a place of worship.

Greater Hayes Grove Baptist Church

The parcel containing this church would be about 500 feet north of the Nebula-Raines Route 5 right-of-way near MP 5.6, with the church structure about 500 feet north of the edge of the right-of-way. The church is along the south side of the parcel with a parking lot and associated cemetery (described in Table 4.1-7 and located more than 515 feet from the right-of-way) to the north. Other than a tree-stand immediately south of the church, surrounding lands are agricultural. If selected for the Project, Nebula-Raines Route 5 would introduce transmission infrastructure to the agricultural lands south of the church in an area unaffected by similar infrastructure. While the transmission line and conductors would likely be visible from the property, it is unlikely they would be seen from inside the church due to the east-west orientation of the building (parallel to rather than perpendicular to the right-of-way) and forested area along the southern tract line. Nebula-Raines Route 5 would have no impact on access to and use of the church as a place of worship.

4.1.8 TRANSPORTATION INFRASTRUCTURE

The existing road network in the study area includes a variety of functional classifications, including a freeway (I-85), principal arterial (US 58), minor arterials (such as US 1, Buggs Island Road, and Union Level Road), minor collectors (such as Goodes Ferry Road and Baskerville Road), as well as local roads. Figure 1.1-1 shows existing roads within the study area. VDOT's 6-year improvement plan program includes several road projects within the study area; however, only one road project is within 0.5 mile of the Project route alternatives: the Mecklenburg Route 672 (Bowers Road) project (VDOT 2024b). The Mecklenburg Route 672 project, anticipated to be completed by 2028 will include reconstruction and resurfacing of Bowers Road—a gravel-surfaced road (VDOT 2024b). Nebula-Raines Route 5 would be approximately 0.3 mile north of (and would not cross) this road upgrade.

The Mecklenburg County 2035 Long Range Plan (Mecklenburg County 2017) notes that US 58 has been designated by VDOT as a corridor of state significance, because it links the Hampton Roads area to the western areas of the state. The Plan notes that the designation brings increased consideration for high priority multimodal projects, although the VDOT 6-year improvement plan includes no such information.

VDOT designated Goodes Ferry Road, between the town of South Hill and the Mecklenburg and Brunswick County border, as a Virginia Byway in 2006. Section 4.3 discusses the Project's visual impacts on this resource.

There are no existing or planned railroads present within the study area. An abandoned Norfolk Southern railroad line in the study area has been converted to a segment of the Tobacco Heritage Trail (see Section 4.1.7).

4.1.8.1 IMPACT ASSESSMENT

All of the Nebula-Raines route alternatives cross existing roads within the study area. Most road crossings are generally perpendicular to minimize potential impacts on traffic. The discussions below detail areas where the route alternatives rights-of-way are collocated with road corridors. Dominion would coordinate with VDOT in cases where road crossings and other Project construction activities require temporary road closures. Any such closures would be temporary and would have limited impact on traffic operations.

Cloud-Nebula Route

The Cloud-Nebula Route does not cross any roads or transportation corridors and there are no planned roadway projects within 0.5 mile of the route, therefore this Project component would have no impacts on transportation.

Nebula-Raines Route 1

Nebula-Raines Route 1 contains 10 road crossings. Nebula-Raines Route 1 crosses each of the following roads once: Rocky Branch Road, Turtle Road, Trinity Church Road, Belfield Road, Goodes Ferry Road, US 1, Eureka Road, Baskerville Road, Buggs Island Road, and Antlers Road. There are no planned VDOT road improvements within 0.5 mile of Nebula-Raines Route 1.

Nebula-Raines Route 3

Nebula-Raines Route 3 contains nine road crossings. Nebula-Raines Route 3 crosses each of the following roads once: Goodes Ferry Road, an unnamed through road connecting Goodes Ferry Road and US 58, Dockery Road, Smith Cross Road, US 1, Cedar Grove Road, Baskerville Road, Buggs Island Road, and Antlers Road. Route 3 also parallels the south side (but does not overlap the road right-of-way) of US 58 for approximately 0.8 mile. Route 3 would have no impacts on US 58. There are no planned VDOT road improvements within 0.5 mile of Route 3.

Nebula-Raines Route 4

Nebula-Raines Route 4 contains nine road crossings. The route crosses each of the following roads once: Goodes Ferry Road, an unnamed through road connecting Goodes Ferry Road and US 58 Dockery Road, Smith Cross Road, Highway One, Cedar Grove Road, Baskerville Road, Buggs Island Road, and Antlers Road. Nebula-Raines Route 4 also parallels the south side (but does not overlap the road right-of-way) of US 58 for approximately 0.8 mile (the same segment as Nebula-Raines Route 3). Nebula-Raines Route 4 would have no impacts on US 58. There are no planned VDOT road improvements within 0.5 mile of Nebula-Raines Route 4.

Nebula-Raines Route 5

There is one planned VDOT road improvement within 0.5 mile of Nebula-Raines Route 5 (Mecklenburg Route 672 (Bowers Road) Rural Rustic Road project). The Bowers Road project is located approximately 0.3 mile north of the route and would not be crossed by the route. No impacts to the Bowers Road project would be anticipated because of the transmission line. Nebula-Raines Route 5 has 13 road crossings, the most of any Nebula-Raines route alternative. The route crosses each of the following roads once: Ferry Road, an unnamed through road connecting Goodes Ferry Road, Theater Road, US 1, Plank Road, Union Level Road, Gordon Lake

Road, Busy Bee Road, Baskerville Road, Wooden Bridge Road, and Antlers Road once each. Nebula-Raines Route 5 crosses US 58 twice at MP 2.5 and 11.2. Nebula-Raines Route 5 parallels the south side (but does not overlap the road right-of-way) of US 58 for approximately 1.8 miles (including the same shared segment as Routes 3 and 4) before crossing US 58 at approximate MP 2.5. Route 5 paralleling US 58 would have no impact on the highway's operations; however, crossing US 58 may impact traffic and operations during construction and/or maintenance and result in temporary lane or road closures. Additional coordination with VDOT would be required.

4.1.9 AIRPORTS AND HELIPORTS

4.1.9.1 EXISTING AIRPORT FACILITIES

Transmission line structures have the potential to affect airspace in and around airports. The following sections describe the airports in the vicinity of the study area and the airspace regulations that could impact the Project, and potential impacts on airports and airspace.

Airports Near the Project Area

ERM reviewed The Federal Aviation Administration's (FAA's) 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 2024). Based on this review, there are 9 airports, private airstrips, or heliports within 10 nautical miles (nm) of the Project facilities (Figure 4.1-7). Table 4.1-9 lists the airports, heliports, or private airstrips in the Project vicinity, including airport identification (ID) number, distance and direction from the nearest route or switching station to the nearest runway or heliport, type of use, and maximum runway length.

TABLE 4.1-9 AIRPORTS AND HELIPORTS LOCATED WITHIN 10 NAUTICAL MILES OF THE PROJECT

Airport/Heliport Name	FAA Identifier	Approximate Distance and Direction from Nearest Project Facility (nm)	Use	Maximum Runway Length (feet)
Loves Helipad Heliport	VG94	2.7 nm northeast of the MP 0.0 (Raines Substation)	Private	NA
Community Memorial Hospital Heliport	35VA	2.9 nm northeast of MP 0.0 (Raines Substation)	Private	NA
Mecklenburg-Brunswick Regional Airport	AVC	3.7 nm east of MP 0.0 (Raines Substation)	Public	5,002
Twin Towers Airport	VA25	5.5 nm northwest of Nebula-Raines Route 5 at approximate MP 10.0	Private	1,500
Martindale Exec Airpark Airport	70NC	6.6 nm southeast of Nebula-Raines Route 1 at approximate MP 4.7	Private	3,000
Merifield Airport	VG34	8.0 nm southwest of the proposed Nebula Switching Station	Private	2,375

Airport/Heliport Name	FAA Identifier	Approximate Distance and Direction from Nearest Project Facility (nm)	Use	Maximum Runway Length (feet)
Nocarva Airport	NC10	8.6 nm southeast of Nebula-Raines Route 1 at approximate MP 4.7	Private	1,900
Lake County Regional Airport	W63	10.0 nm southwest of the Cloud-Nebula Route at approximate MP 0.5	Public	4,007
Chase City Municipal Airport	KCXE	10.0 nm northwest of the Cloud Switching Station	Public	3,400

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

Federal Aviation Administration Regulations

The FAA is responsible for overseeing air transportation in the U.S. The FAA focuses on air transportation safety, including the enforcement of safety standards for aircraft manufacturing, operation, and maintenance. The FAA also manages air traffic in the U.S. 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 utilization of navigable airspace by aircraft.

The regulations that govern objects that may affect navigable airspace are codified in the Code of Federal Regulations (CFR), Title 14, Part 77 (14 CFR Part 77). A summary of the rule as it relates to the Project is provided below, and the full rule is available online at https://www.ecfr.gov/current/title-14/chapter-I/subchapter-E/part-77.

The FAA only regulates public use and federally operated (military use) airports and heliports. Of the airports identified in Table 4.1-9, the only public use airports within 10 nm of any route alternative are Mecklenburg-Brunswick Regional Airport, Lake County Regional Airport and Chase City Municipal Airport. Private use airports do not require evaluation under 14 CFR Part 77.

Civil Airport Imaginary Surfaces

Civil airport imaginary surfaces have been established with relation to each airport and each runway. The imaginary surfaces were developed to prevent existing or proposed objects from extending from the ground into navigable airspace. The following is a description of the civil imaginary surfaces:

- Horizontal surface: This surface is a horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the primary surface of each runway and connecting the adjacent arcs by lines tangent to those arcs. The radius of the arc is 5,000 feet for all runways designated as utility or visual, and 10,000 feet for all other runways. The radius of the arc specified for each end of a runway will have the same arithmetical value. That value will be the highest determined for either end of the runway.
- Conical surface: This is a surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.
- Primary surface: This is a surface longitudinally centered on a runway. The primary surface extends 200 feet beyond the end of each runway. The elevation of any point on the primary

surface is the same as the elevation of the nearest point on the runway centerline. This surface is 250-feet-wide for visual approach runways, 500-feet-wide for runways with non-precision instrument approaches, and 1,000-feet-wide for precision instrument runways.

- Approach surface: This is a surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end (e.g., precision instrument approach, visual approach).
- Transitional surface: These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface that project through and beyond the limits of the conical surface extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

None of the route alternatives discussed in this report would overlap with the civil airport imaginary surfaces of the public airports identified in Table 4.1-9.

Terminal Instrument Procedures

In addition to the civil and military airport imaginary surfaces, FAA Order 8260.3G establishes are imaginary surfaces associated with Terminal Instrument Procedures (TERPs). TERPs are guidelines created by the FAA 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 Terminal Instrument Procedures allows safe aeronautical navigation in poor visibility conditions.

Typically, Civil Airport Imaginary Surfaces are more restrictive than surfaces associated with TERPs. 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 would typically be required to consider that obstruction. 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:

- A height of 499 feet above ground level (AGL) at the site of the object;
- A height of 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 route alternatives discussed in this report would exceed surfaces or obstruction standards associated with TERPs of the airports identified in Table 4.1-9.

Federal Aviation Administration Notice Requirements and Timing

Based on the runway categories and dimensional standards described above, 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 that meets the notification requirements set forth above requires submittal of an FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the FAA regional office with jurisdiction over the area, or submitted electronically via the FAA website. The information that needs 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, such as cranes.

None of the route alternatives discussed in this report would overlap with the civil airport imaginary "Notice" surfaces of the public airports identified in Table 4.1-9. Based on current plans, the proposed transmission line structures for the Project would not exceed 200 feet in height. Temporary cranes would likely be required to install the structures; however, based on the typical maximum crane height needed for tower construction (approximately 35 feet above the structure height), temporary cranes are also unlikely to exceed the FAA notification thresholds.

State and Local Aviation Regulations

Section 5.1-25.1 of the Va. Code establishes that it is unlawful to erect any structure that penetrates into or through any licensed airport's clear zone, approach zone, imaginary surface, obstruction clearance surface, obstruction clearance zone, or surface or zone as described in regulations of the Virginia Department of Aviation or the FAA without first securing a permit from the Board of Aviation. This requirement does not apply to any structure 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. Appendix B, Article 9 of the Mecklenburg County ordinances establish an Airport District that overlays the zoning districts near Mecklenburg-Brunswick County Regional Airport. The district restricts land uses that could create electrical interference with navigational signals or radio communication, make it difficult for pilots to distinguish between airport lights and other light sources, result in glare in the eyes of pilots using the airport, impair visibility in the vicinity of the airport or otherwise in any way create a hazard or endanger the landing, takeoff, or maneuvering of aircraft intending to use the airport. Height restrictions for buildings and other structures in this zone are the same as the standard FAA established surfaces discussed above. None of the Project's route alternatives or other components are within the Mecklenburg County Airport District. No other local ordinances related to airports exist or are anticipated to impact the Project route alternatives.

4.1.9.2 IMPACT ASSESSMENT

ERM conducted an airport analysis to review the height limitations associated with the FAA-defined imaginary surfaces for all runways at the airports identified in Table 4.1-9. 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 applied 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. ERM derived ground surface data for the study area from a USGS 10 Meter Digital Elevation Model.

Of the nine airports and heliports identified within 10 nm of all the route alternatives, three are public-use airports regulated by the FAA, and six are private use airports and heliports. There are no military airfields within 10 nm of the route alternatives. Private airports and heliports are not regulated by the FAA, and none of the Project's route alternatives would conflict with the private facilities listed in Table 4.1-9. None of the three public-use airports within 10 nm (Mecklenburg-Brunswick Regional Airport, Lake County Regional Airport, and Chase City Municipal Airport) are close enough to any of the route alternatives to create overlap between a transmission structure and an FAA defined Civil Airport Imaginary Surface. In addition, none of the proposed structures associated with the route alternatives (nor the cranes used to erect those structures) would exceed 200 feet AGL. As such, the Project would not penetrate any FAA notification thresholds. If the FAA were to ask for additional information regarding the proposed project for any reason, Dominion may be required to use FAA Form 7460-1, Notice of Proposed Construction or Alteration, pursuant to 14 CFR Part 77 for FAA notification. Any submittal would occur after a route is selected by the SCC during the permitting phase of the Project.

4.2 NATURAL RESOURCES

4.2.1 SURFACE WATERS

ERM identified and mapped watersheds, wetlands, and waterbodies (e.g., lakes, streams, ponds, and stormwater features) within the study area using publicly available desktop sources, including:

- Recent aerial imagery, taken in October of 2023 (NAIP 2023);
- Mecklenburg County Interactive Data Portal GIS datasets (Mecklenburg County 2024);
- Google Earth Aerial Imagery (Google Earth LLC 2024);
- ESRI World Elevation Terrain 2-foot contours (ESRI et al. 2024);
- NWI maps from the USFWS online data mapping portal (USFWS 2024a);
- The National Hydrography Dataset (NHD) Plus High Resolution (USGS 2024b); and
- Soil Survey Geographic Database soils data from the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS 2023).

For reference, an overview map illustrating the locations of NWI-mapped wetlands, NHD-mapped waterbodies, and watershed boundaries in the study area is provided as Figure 4.2-1.

4.2.1.1 WATERSHEDS

Watersheds are used to define the geographic area within the boundaries of drainage divides throughout the country. For purposes of classifying watersheds, the U.S. is divided into hydrologic units in four levels—regions, subregions, accounting units, and cataloging units—which may contain an entire or part of a watershed. Each level is identified by a hydrologic unit code (HUC), beginning with major geographic areas or regions. The first level of the code, 2-digit HUCs, identify a major geographic area or region containing either 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.

The study area is within the following HUC areas:

- The South Atlantic-Gulf Region HUC 2 (03) region, which discharges into the Atlantic Ocean, between states of Virginia and Florida, and the Gulf of Mexico between the states of Florida and Louisiana
- The Chowan-Roanoke HUC 4 (0301) subregion, which drains about 18,300 square miles within the Roanoke River Basin, including Virginia and North Carolina
- The Roanoke HUC 6 (030101) watershed, which drains 9,680 square miles into the Staunton River and into Lake Gaston (USGS 2023).

The study area is further split into three smaller HUC 10-digit watersheds, the 169-square mile HUC 10 (0301010602) Upper Lake Gaston on the east side of the study area, the approximately 110-square mile (0301010601) Allen Creek watershed on the west side of the study area, and the approximately 159-square mile (0301010210) Nutbush Creek–John H Kerr Reservoir watersheds in the southwestern corner of the study area. The Nutbush Creek–John H Kerr Reservoir watershed, which encompasses approximately 0.6-square mile of the study area, does not contain any of the Project infrastructure.

Approximately 10 miles of Nebula-Raines Routes 1, 3, and 4, and approximately 7.3 miles of Nebula-Raines Route 5 are within the Upper Lake Gaston HUC. Within the study area, this HUC contains multiple named perennial waterbodies, including Flat Creek, Dockery Creek, Little Miles Creek, Miles Creek, Cox Creek, Parham Creek, and unnamed perennial and intermittent tributaries to these perennial streams flow through the study area. These waterbodies and other surface waters in the watershed generally flow from north to south across the study area, into Miles, Flat, and Parham Creeks, and ultimately into the Staunton River and Lake Gaston to the south.

The proposed Nebula Switching Station, Cloud Switching Station, the Cloud-Nebula Route, approximately 5.9 miles of Nebula-Raines Routes 1 and 3, approximately 5.9 miles of Nebula-Raines Route 4, and approximately 7.0 miles of Nebula-Raines Route 5 are located within the Allen Creek HUC 10-digit. Within the study area, this HUC contains multiple named perennial waterbodies, including Cox Creek, Reedy Branch, Long Branch, Coleman Creek, and Allen Creek. These waterbodies and other surface waters in the watershed generally flow from north to south across the study area, into Allen and Cox Creeks, and ultimately to the Staunton River to the south.

4.2.1.2 WETLANDS

Wetlands within the rights-of-way for the route alternatives (inclusive of the proposed Nebula Station) were identified based on ERM's desktop wetland and waterbody probability analysis, described in the Wetland and Waterbody Desktop Summary (Appendix D). ERM did not conduct an onsite delineation of wetlands or waterbodies along the route alternatives. Wetlands and waterbodies have been classified based on the Cowardin classification system as described below.

- Palustrine Emergent (PEM) wetlands: characterized by erect, rooted, herbaceous hydrophytes (i.e., aquatic plants) and woody species less than 3 feet in height, excluding mosses and lichens;
- Palustrine Scrub-Shrub (PSS) wetlands: characterized by woody vegetation, excluding woody vines, approximately 3 to 20 feet in height;
- Palustrine Forested (PFO) wetlands: characterized by woody vegetation, excluding woody vines, approximately 20 feet or more in height and 3 inches or larger diameter at breast height;
- Palustrine Unconsolidated Bottom (PUB) open waters: characterized by bottom substrate particles smaller than stones (less than 10 inches in diameter) covering greater than 25% of the area, with plants covering less than 30% of the area; and
- Riverine streams: channels containing periodically or continuously moving water (USFWS 2013).

Wetlands provide a wide range of ecological functions, including flood storage and groundwater recharge, nutrient and sediment capture, erosion control, filtration of pollutants from adjacent waterbodies, and diverse fish and wildlife habitat. PFO wetlands are of especially high value because of their habitat biodiversity and carbon sequestration functions, as well as their increased filtration capabilities.

Most wetlands in the study area are adjacent to, or contiguous with streams and associated tributaries regulated by the USACE and VDEQ under Sections 404 and 401 of the Clean Water Act

(CWA), respectively. Most wetlands are forested and are generally concentrated around Perennial Flat Creek, Dockery Creek, Little Miles Creek, Miles Creek, Cox Creek, Allen Creek, Mines Creek, Long Branch and Reedy Branch, and Coleman Creek and associated tributaries throughout the site that flow north and south within the study area. No wetlands were identified within the footprint of the Nebula Station.

Calculated acres of wetlands identified based on the probability analysis described in the Wetland and Waterbody Desktop Summary (attached as Appendix D) as having high, medium-high, or medium probability along each route and route variation are provided in Table 4.2-1 and depicted on Attachment 1 of Appendix D.[7] Riverine (stream) and PUB (open water) features are described in the Waterbody Crossings section below.

TABLE 4.2-1 HIGH, MEDIUM-HIGH, AND MEDIUM PROBABILITY WETLANDS WITHIN THE PROJECT FOOTPRINT

Aquatic Resource Classification	Units	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Total	Acres	17.9	19.5	19.8	22.5	0.7
Palustrine Forested (PFO)	Acres	16.1	16.9	17.3	15.8	0.4
Palustrine Scrub-shrub (PSS)	Acres	NA	0.3	0.3	0.6	NA
Palustrine Emergent (PEM)	Acres	0.4	0.5	0.5	2.6	0.2
Palustrine Unconsolidated Bottom (PUB)	Acres	0.2	0.8	0.8	2.2	NA
Riverine Wetlands	Acres	1.3	1.1	1.0	1.3	0.0

Note: Wetland acreages have been rounded to the tenths place; as a result, the totals may not reflect the sum.
NA: Not applicable due to absence of a wetland type within the Project footprint; 0.0 indicates less than 0.05 acre of the wetland is present.

Cloud-Nebula Route

The Cloud-Nebula Route right-of-way encompasses approximately 0.7 acre of wetlands and waterbodies. PFO wetlands associated with an intermittent tributary to Coleman Creek are located at approximate MP 0.6 within the Cloud-Nebula Route right-of-way.

If this route is selected for the Project, construction and operation of the transmission lines would convert the approximately 0.4 acre of PFO to PSS/PEM-type wetlands within the maintained right-of-way. Wetlands were identified within the proposed right-of-way for Cloud-Nebula Route at the following locations:

- PFO wetlands associated with an intermittent tributary to Coleman Creek at approximate MP 0.6.

[7] Wetland acreages have been rounded to the tenths place; as a result, the totals may not reflect the sum of the addends.

Nebula-Raines Route 1

The Nebula-Raines Route 1 right-of-way encompasses approximately 17.9 acres of wetlands and waterbodies. Larger areas of wetlands along each route are described below:

- PFO wetlands associated with Flat Creek and tributaries to Flat Creek at approximate MPs 0.2, 0.9, 1.8, between 2.2 and 2.3, 3.1, 3.4, 3.8, between 4.3 and 4.5, and 4.9;
- PFO wetlands associated with Dockery Creek and tributaries to Dockery Creek between MPs 5.3 and 5.5, 6.1 and 6.6, and 7.0;
- PFO and PEM wetlands associated with Miles Creek and tributaries to Miles Creek between MPs 7.6 and 7.7, between 8.2 and 8.3, and 9.1 and 9.4;
- PFO wetlands associated with Cox Creek and tributaries to Cox Creek at approximate MPs 10.3 and between MPs 10.6 and 10.8;
- PFO wetlands associated with Allen Creek and intermittent tributaries to Allen Creek between MPs 11.7 and 11.8 and between MPs 12.2 and 12.3; and
- PFO wetlands associated with intermittent tributaries to Mines Creek at approximate MP 13.8 and 14.2.

If this route is selected for the Project, construction and operation of the transmission line would convert the approximately 16.1 acres of PFO to PSS/PEM-type wetlands within the maintained right-of-way.

Nebula-Raines Route 3

The Nebula-Raines Route 3 right-of-way encompasses approximately 19.5 acres of wetlands and waterbodies. At MP 9.5, Route 3 intersects with and shares an alignment with Nebula-Raines Route 1 until it terminates at the proposed Nebula Station. From MP 0.0 (Raines Substation) to MP 9.5, larger areas of wetlands are crossed at the following locations:

- PFO wetlands associated with Flat Creek at approximate MP 0.2;
- PFO wetlands associated with Dockery Creek and tributaries to Dockery Creek between MPs 1.4. and 1.5, 2.1 and 2.2, at approximate MP 2.6, between MPs 4.1 and 4.3, at MP 5.1, 5.5, and 5.7, and between MPs 6.1 and 6.5, and between MPs 6.1 and 6.6;
- PFO wetlands associated Miles Creek and tributaries to Miles Creek between MPs 7.2 and 7.4 and between MPs 7.7 and 8.0, and between MPs 8.9 and 9.1.

From MP 9.5 of Route 3 to the proposed Nebula Station, wetlands crossed are the same as those for Nebula-Raines Route 1 between MP 10.0 and the proposed Nebula Station described above.

If this route is selected for the Project, construction and operation of the transmission lines would convert the approximately 16.9 acres of PFO and potentially 0.3 acre of PSS to PSS/PEM-type wetlands within the maintained right-of-way.

Nebula-Raines Route 4

The Nebula-Raines Route 4 right-of-way encompasses approximately 19.8 acres of wetlands and waterbodies. Nebula-Raines Route 4 overlaps Route 3 between MPs 0.0 and 10.0. From MP 10.0 to the proposed Nebula Station, larger areas of wetlands are crossed at the following locations:

- PFO wetlands associated with Cox Creek and tributaries to Cox Creek between MPs 10.3 and 10.7;
- PFO wetlands associated with Allen Creek and tributaries to Allen Creek at approximate MPs 12.0 and 12.6; and
- PFO wetlands associated with an intermittent tributary to Mines Creek at approximate MP 13.8.

From MP 0.0 (Raines Substation) to MP 10.0, Route 3 wetlands crossed are the same as those for Nebula-Raines Route 1 between MP 0.0 to MP 10.1 described above.

If this route is selected for the Project, construction and operation of the transmission lines would convert the approximately 17.3 acres of PFO and potentially 0.3 acre of PSS to PSS/PEM-type wetlands within the maintained right-of-way.

Nebula-Raines Route 5

The Nebula-Raines Route 5 right-of-way encompasses approximately 22.5 acres of wetlands and waterbodies. Between MPs 12.7 and 13.6, this route shares the existing maintained right-of-way of existing Line #1041. Nebula-Raines Route 5 overlaps Nebula-Raines Route 3 between MPs 0.0 (Raines Substation) and 1.3, crossing the same wetlands as Route 3 described above between these locations. Between MPs 1.3 and the proposed Nebula Station, larger areas of wetlands are crossed at the following locations:

- PFO and PEM wetlands associated with Dockery Creek and tributaries to Dockery Creek between MPs 1.3 and 1.4 and at MP 1.7, 2.4, and 2.9;
- PFO wetlands associated with intermittent tributaries to Little Miles Creek between MPs 3.3 and 4.2, 3.8 and 3.9, and 4.1 and 4.2;
- PFO wetlands associated with Miles Creek between MPs 4.4 and 4.6;
- PFO wetlands associated with a tributary to Lake Gordon at MP 5.2;
- PFO and PSS wetlands associated with intermittent tributaries to Miles Creek between MPs 5.7 and 6.2, and 6.5;
- PFO wetlands associated with Cox Creek and an intermittent tributary to Cox Creek between MPs 8.1 and 8.3 and at approximate MP 8.6;
- PFO and PEM wetlands associated with Reedy Branch and tributaries to Reedy Branch at approximate MPs 9.5, 9.8, and 10.2;
- PFO and PEM wetlands associated with Long Branch between MPs 10.8 and 11.5;
- PFO wetlands associated with Allen Creek between MPs 11.8 and 12.1; and
- PFO, PEM, and PSS wetlands associated with Coleman Creek between MPs 12.4 and 12.9, at approximate MP 13.1 and 13.4, and between MPs 13.8 and 14.1.

If this route is selected for the Project, construction and operation of the transmission lines would convert the approximately 15.8 acres of PFO and potentially 0.6 acres of PSS to PSS/PEM-type wetlands within the maintained right-of-way.

Impact Assessment

To minimize impacts on wetland areas, the Project has been designed to span or avoid wetlands, keeping transmission structures outside of wetland boundaries to the extent practicable. Most potential direct impacts on wetlands due to Project construction would be temporary in nature. Temporary Timber matting would be used for construction equipment to travel over wetlands, as appropriate. Due to the absence of an existing right of way, some new access roads may be necessary along the constructed routes. If a section of line cannot be accessed from existing roads, Dominion may need to install a culvert, ford, or temporary bridge along the right of way to cross small streams. In such cases, some temporary fill material in wetlands adjacent to such crossings may be required. This fill would be placed on erosion control fabric and removed when work is completed, returning ground elevations to preexisting conditions.

Permanent direct impacts to wetlands would be limited to placement of structures within wetlands, if unavoidable, and, due to the necessity of removing trees and shrubby vegetation from the right-of-way, the permanent conversion of PSS/PFO wetlands to PSS or PEM type wetlands. Forested wetlands and riparian buffers provide functions such as peak flood flow reduction, nutrient and sediment capture, filtration of pollutants to adjacent waterbodies, and habitat diversity. The conversion of forested wetlands would reduce or eliminate some of these functions.

Where the removal of trees or shrubby vegetation occurs within wetlands, Dominion would use the least intrusive method reasonably possible to clear the corridor. Hand cutting of vegetation would be conducted, where needed, to avoid and minimize impacts on streams and/or wetlands.

No change in contours of wetlands and waterbodies, or redirection of the flow of water, is anticipated and the amount of spoil from foundation and structure placement would be minimal. Excess spoil in wetlands generated through foundation construction would be controlled through construction best management practices (BMPs; e.g., the implementation erosion and sediment controls).

Upon SCC approval of a route and final line engineering, Dominion will obtain the appropriate permits from the USACE and VDEQ for work within wetlands and waterbodies to ensure full compliance with Section 404 and 401 of the CWA and minimize potential impacts on aquatic resources within the approved transmission line corridor.

4.2.1.3 WATERBODIES

ERM identified and mapped waterbodies, including streams, rivers, and other open waterbody features (e.g., reservoirs, lakes, impoundments, ponds, and stormwater features) within the study area using the publicly available GIS databases identified above. Waterbodies crossings are regulated by the USACE and VDEQ under Sections 404 and 401 of the CWA and the Virginia Water Protection permit program. No navigable waters are crossed by the route alternatives; therefore,

no Rivers and Harbors Act Section 10 authorization from the USACE would be required for the Project.

Named waterbodies crossed by and the routes and route variations include the perennial Flat Creek, Dockery Creek, Little Miles Creek, Miles Creek, Cox Creek, Allen Creek and Mines Creek (all Nebula-Raines route alternatives) Long Branch and Reedy Branch (Nebula-Raines Route 5), and Coleman Creek (Cloud-Nebula Route and Nebula-Raines Route 5). The Project route alternatives also cross unnamed perennial and intermittent tributaries and open waterbody features. Numbers of NHD-mapped waterbody crossings are shown in Table 4.2-2, with the locations of waterbodies described for each route alternative below. For reference, a general location map illustrating waterbodies crossed by each route is provided in ERM's Wetland and Waterbody Desktop Summary, provided as Appendix E.

TABLE 4.2-2 WATERBODIES CROSSED BY THE ROUTE ALTERNATIVES

Waterbodies Crossed	Units	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Total	Number	26	25	25	32	1
Perennial Streams	Number	10	8	8	8	0
Intermittent Streams	Number	15	15	15	21	1
Perennial Lakes/Ponds	Number	1	2	2	3	0
Intermittent Lakes/Ponds	Number	0	0	0	0	0

Source: USGS NHD (NHD 2024b)

Cloud-Nebula Route

Cloud-Nebula Route crosses one NHD-mapped waterbody, an unnamed, intermittent tributary to Coleman Creek between MPs 0.5 and 0.6. Based on ERM's desktop wetland and waterbody analysis, the right-of-way for Cloud-Nebula Route would encompass less than 0.1 acre of riverine features.

Nebula-Raines Route 1

Nebula-Raines Route 1 crosses 26 NHD-mapped waterbodies, including 11 perennial waterbodies (Flat Creek, Dockery Creek, Allen Creek, Miles Creek, Cox Creek, five unnamed tributaries, and one lake/pond) and 15 unnamed, intermittent streams. Based on ERM's desktop wetland and waterbody analysis, the right-of-way for Nebula-Raines Route 1 would encompass approximately 0.2 acre of PUB open water features 1.3 acre of riverine features. Waterbody crossing locations are summarized below:

- Perennial Flat Creek between MPs 0.1 and 0.2 and at approximate MP 4.4;
- An unnamed, perennial tributary to Flat Creek at approximate MP 0.9, and unnamed intermittent tributaries to Flat Creek between MPs 1.2 and 1.3, 1.7 and 1.9, 2.2 and 2.3, 3.0 and 3.1, 3.3 and 3.4, at MP 5.4, between 5.7 and 5.9;

- An unnamed, intermittent tributary to Dockery Creek between MPs 6.2 and 6.4 and a PUB open water feature between MPs 6.5 and 6.6;
- Perennial Dockery Creek at approximate MP 7.0;
- Perennial Miles Creek between MPs 7.6 and 7.7, and an unnamed, perennial tributaries to Miles Creek between MPs 8.2 and 8.3 and 9.1 and 9.4;
- Perennial Cox Creek at approximate MP 10.7;
- Unnamed intermittent tributaries to Allen Creek at approximate MP 11.7 and 12.6 and perennial Allen Creek at approximate MP 12.3; and
- Unnamed, intermittent tributaries to Miles Creek between approximate MPs 13.8 and 13.9 and at MP 14.2.

Nebula-Raines Route 3

Nebula-Raines Route 3 crosses 25 NHD-mapped waterbodies, including 10 perennial waterbodies (Perennial Flat Creek, Dockery Creek, Miles Creek, Cox Creek, Allen Creek, four unnamed tributaries, and two lake/ponds), and 15 unnamed, intermittent streams. Based on ERM's desktop wetland and waterbody analysis, the right-of-way for Route 3 would encompass approximately 0.8 acre of PUB open water features and 1.1 acre of riverine features.

Route 3 intersects with and shares an alignment with Nebula-Raines Route 1 until it terminates at the proposed Nebula Station. From MP 0.0 (Raines Substation) to MP 9.5, Route 3 crosses waterbodies at the following locations:

- Perennial Flat Creek between MPs 0.1 and 0.2;
- Unnamed, intermittent tributaries to Dockery Creek and an open water body feature at approximate MP 1.0, between MPs 1.4 and 1.5, at approximate MP 1.9, between MPs 2.1 and 2.2, 2.6, between 3.0 and 3.6; at MP 4.3, and between MPs 5.0 and 5.1;
- An open waterbody feature at approximate MP 5.3;
- Unnamed, intermittent tributaries to Dockery Creek at approximate MPs 6.2 and 6.5 and perennial Dockery Creek between MPs 6.4 and 6.5; and
- Perennial Miles Creek at approximate MP 7.3 and unnamed tributaries to Miles Creek between MPs 7.7 and 8.0 and at approximate MP 9.0.

From MP 9.5 of Route 3 to the proposed Nebula Station, wetlands crossed are the same as those for Nebula-Raines Route 1 between MP 10.0 and the proposed Nebula Station described above.

Nebula-Raines Route 4

Nebula-Raines Route 4 crosses 25 NHD-mapped waterbodies, including 10 perennial waterbodies (Perennial Miles Creek, Cox Creek, Allen Creek, Flat Creek, Dockery Creek, three unnamed tributaries, and two lake/ponds), and 15 unnamed, intermittent streams. Based on ERM's desktop wetland and waterbody analysis, the right-of-way for Nebula-Raines Route 4 would encompass approximately 0.8 acre of PUB open water features and 1.0 acre of riverine features.

Nebula-Raines Route 4 overlaps Route 3 between MPs 0.0 and 10.0. From MP 10.0 to the proposed Nebula Station, Nebula-Raines Route 4 crosses waterbodies at the following locations:

- An unnamed, intermittent tributary Cox Creek between MPs 10.3 and 10.4 and perennial Cox Creek at approximate MP 10.6;
- Perennial Allen Creek between MPs 12.0 and 12.1, and an unnamed, intermittent tributary to Allen Creek at approximate MP 12.6; and
- An unnamed, intermittent tributary to Mines Creek at approximate MPs 13.3 and 13.8.

From MP 0.0 (Raines Substation) to MP 10.0, Route 3 waterbodies crossed are the same as those for Nebula-Raines Route 1 between MP 0.0 to MP 10.1 described above.

Nebula-Raines Route 5

Nebula-Raines Route 5 crosses 31 NHD-mapped waterbodies, including 11 perennial waterbodies (Perennial Flat Creek, Long Branch, Dockery Creek, Reedy Branch, Miles Creek, Cox Creek, Allen Creek, one unnamed tributary, and three unnamed lake/ponds) and 21 unnamed, intermittent streams. The right-of-way for Nebula-Raines Route 5 would encompass approximately 2.2 acres of PUB open water features and 1.3 acres of riverine features. Between MPs 12.7 and 13.6, this route shares the existing maintained right-of-way of existing Line #1041. The existing right-of-way portion of proposed Nebula-Raines Route 5 (MPs 12.6 to 13.6) crosses two unnamed, intermittent tributaries to Coleman Creek. New impacts to these waterbodies would be limited at these crossings as the right-of-way is already maintained.

Nebula-Raines Route 5 overlaps Route 3 between MPs 0.0 (Raines Substation) and 1.3. Between MPs 1.3 and the proposed Nebula Station, Nebula-Raines Route 5 crosses waterbodies at the following locations:

- Perennial Dockery Creek at approximate MP 1.4, unnamed, intermittent tributaries to Dockery Creek between MPs 1.7 and 1.8, at approximate MP 2.0, between MPs 2.4 and 2.5, and at MP 2.8;
- Unnamed, intermittent tributaries to Miles Creek between MPs 3.3 and 3.4, at MP 3.8, and between MPs 4.1 and 4.2;
- Perennial Miles Creek at approximate MP 4.6 and an unnamed tributary to Miles Creek at approximate MP 5.2;
- A PUB open water feature at approximate MP 5.4;
- Unnamed, intermittent tributaries to Miles Creek between MPs 5.8 and 5.9, and 6.1 and 6.2, at MPs 6.5 and 6.6, at approximate MP 7.1, and an open waterbody feature at approximate MP 7.2;
- A PUB open water feature and an unnamed, intermittent tributary to Cox Creek between MPs 7.6 and 7.7;
- Perennial Cox Creek between MPs 8.2 and 8.3 and unnamed, intermittent tributaries to Cox Creek at approximate MPs 7.7 and at 8.6;
- Perennial Reedy Branch at approximate MP 9.5, and unnamed, intermittent tributaries to Reedy Branch at approximate MPs 9.8, and 10.2;
- Perennial Long Branch at approximate MP 11.2;

- Perennial Allen Creek between MPs 12.0 and 12.1;
- A PUB open water feature between MPs 12.4 and 12.5; and
- Unnamed, intermittent tributaries to Coleman Creek (a tributary to Allen Creek) at approximate MPs 12.9, 13.4, and 14.1.

Impact Assessment

Waterbodies crossed by the routes would be spanned, with permanent impacts to waterbodies limited to riparian buffer transition from tree cover to herbaceous vegetation within the maintained right-of-way. Tree removal adjacent to waterbodies would reduce riparian buffer functions such as stream bank stabilization and erosion control, nutrient and sediment filtration, floodwater storage and peak flow reduction, and water temperature changes due to loss of shading. The right-of-way would be maintained with a cover of herbaceous vegetation during operations, which would provide some filtration and stabilization to protect waterbodies from runoff.

Where removal of trees and/or woody shrubs is required, clearing within 100 feet of a stream would be conducted by hand. Vegetation would be cut at or slightly AGL and there would be no grubbing of stumps. Dominion would use sediment barriers along waterways and steep slopes during construction to protect waterways from soil erosion and sedimentation.

Temporary, minor impacts on water quality could occur during construction from disturbed soils transported by storm water entering into adjacent surface waters during rain events. Increased turbidity and localized sedimentation of stream bottoms may occur from runoff. Potential impacts would be mitigated by the implementation of erosion control measures.

Waterways crossed by the Project would be maintained for proper drainage using culverts or other crossing devices in accordance with Dominion's standard policies. If a section of line cannot be accessed from existing roads, Dominion may need to install a culvert or temporary bridge to cross small streams. In such cases, temporary fill may be required. Fill would be placed on erosion control fabric and removed when work is completed, returning the surface to original contours.

Upon SCC approval of a route and final line engineering, Dominion will obtain the appropriate permits from the USACE and VDEQ for work within wetlands and waterbodies to ensure full compliance with Section 404 and 401 of the CWA and minimize potential impacts on aquatic resources within the approved transmission line corridor.

4.2.2 NATURAL HERITAGE RESOURCES

The Virginia Natural Area Preserves Act of 1989 defines natural heritage resources (NHRs) as habitats of rare, threatened, or endangered 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 (Va. Code § 10.1-209 through 217). ERM consulted the VDCR's Natural Heritage Program (NHP) and requested an environmental review of the routes to identify NHRs along and near each alternative. ERM also reviewed ecological datasets provided via the NHP for the area within 1.0 mile of the rights-of-way for each Project route alternative. Resources reviewed included natural area preserves, conservation sites, stream conservation sites, and ecological cores (VDCR 2024b).

The VDCR responded to ERM's request for environmental review of the Project in a letter dated September 11, 2024 (attached as Appendix E; VDCR 2024c). The VDCR identified ecological cores as a NHR within the study area. The VDCR letter indicates that no natural area preserves, conservation sites, stream conservation sites, or state-listed plant and insects are present along the routes; therefore, no further discussion of these resource types is provided in this study.

4.2.2.1 ECOLOGICAL CORES

Ecological cores are areas of 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, as well as species that use marsh, dune, and beach habitats. Interior ecological core areas begin 100 meters inside the nearest core edges and continue to the deepest parts of the ecological core. Smaller areas of continuous interior cover (i.e., 10 to 99 acres), called habitat fragments, support ecological cores and provide similar functions and values. Ecological cores and habitat fragments together provide the natural and economic benefits of open space, recreation, water quality (including erosion prevention and drinking water recharge and protection), and air quality (including carbon sequestration and oxygen production). The integrity of ecological cores is ranked from C1 to C5 using nine prioritization criteria, including the NHR habitats that the cores contain. Habitat fragments are similarly classified, although habitat fragments are only ranked C3, C4, or C5 (VDCR 2023b). The VDCR ranking system for the integrity of ecological cores includes the following categories:

- Rank C1—Outstanding
- Rank C2—Very High
- Rank C3—High
- Rank C4—Moderate
- Rank C5—General

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. Therefore, the VDCR recommends avoidance of ecological cores ranked C1 or C2 and a formal impact analysis to minimize impacts if they are unavoidable. Lower ranked ecological cores may have smaller fragments of forested habitat (10 to 99 acres of contiguous landcover); however, the VDCR notes that habitat fragments can also provide important ecological functions and values and recommends avoiding impacts to habitat fragments when feasible. Per VDCR recommendation, no formal impact analysis is provided for the cores crossed that are ranked C3, C4, or C5 (Gustafson 2024; see Appendix D).

The VDCR review of the Project found that the Project route alternatives intersect multiple ecological cores with rankings of C2, C3, C4, and C5. None of the route alternatives cross ecological cores ranked C1. Table 4.2-3 summarizes the area of C2, C3, C4, and C5 ecological cores crossed by the Project's route alternatives. Figure 4.2-2 shows the locations of each ecological core unit crossed by the Project route alternatives.

TABLE 4.2-3 VDCR-MAPPED ECOLOGICAL CORES CROSSED BY ROUTE ALTERNATIVES

Ecological Cores	Unit	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Outstanding (C1)	acres	0.0	0.0	0.0	0.0	0.0
Very High (C2)	acres	31.6	31.6	32.5	31.1	10.8
High (C3)	acres	29.8	0.0	0.0	0.0	0.0
Moderate (C4)	acres	31.7	50.6	65.1	42.4	0.0
General (C5)	acres	20.5	15.0	12.1	19.0	0.0
Total [a]	**acres**	**113.7**	**97.2**	**109.7**	**92.5**	**10.8**

[a] Totals are inclusive of ecological cores and habitat fragments. Totals may not equal the sum of addends due to rounding.

Impact Assessment

Impacts on ecological cores occur when their natural cover is partially or completely converted to developed land uses. Habitat conversion can result in changes that reduce ecosystem processes, biodiversity, population viability, and habitat quality (VDCR 2023a). Impacts to the ecological cores crossed by the route alternatives would be limited to structure placement and conversion of forest cover to open, vegetated space within the maintained right-of-way.

As referenced above, VDCR recommends a formal impact analysis of only C1- and C2-ranked ecological cores; therefore, the following sections do not discuss the impacts to C3-, C4-, and C5-ranked cores due to the route alternatives (Gustafson 2024; see Appendix E). All route alternatives cross the ecological core ranked C2 (Core ID 75315). This 3,090-acre core is almost entirely managed for silviculture, apart from small amounts of developed and open land on its northern, northwestern, and eastern edges. The proposed Nebula Switching Station is located in an approximately 46.5-acre area of cleared land. Due to existing infrastructure (i.e., existing transmission lines and Cloud Switching Station) and the clearing already present within Core ID 75315, the Project would not be the first disturbance of the core and may therefore be considered less significant. The Company will work with the appropriate jurisdictional agencies to minimize any impacts on ecological cores during implementation of the Project. Route-specific impacts to this C2 ranked ecological core are discussed in the following sections.

ERM calculated potential impacts on ecological cores by estimating the amount of tree clearing that would be required for each route alternative. As shown in Table 4.2-3, Nebula-Raines Route 5 would impact the smallest combined area of ecological cores, as well as the smallest area of the highest-ranking core crossed, Core ID 75315 (ranked C2), compared to other Nebula-Raines route alternatives. Additional descriptions of potential impacts to ecological cores from Project route alternatives are provided below.

Cloud-Nebula Route

The Cloud-Nebula Route crosses one ecological core (Core ID 75315, ranked C2) and has a crossing length of 0.9 mile and a right-of-way footprint of approximately 10.8 acres within the

core. The route crosses the central/western portion of the core through a forested area and a cleared area. Approximately 0.5 mile (approximately 56%) of the core crossing is through a cleared area, and the remainder of the core crossing borders areas cleared for development. No new impacts on Core ID 75315 are anticipated due to the Cloud-Nebula Route crossing.

Nebula-Raines Route 1

Nebula-Raines Route 1 crosses 15 ecological cores, totaling approximately 8.4 miles and a combined right-of-way footprint of approximately 113.7 acres (58% of the Nebula-Raines Route 1 right-of-way). Nebula-Raines Route 1 crosses Core ID 75315 (ranked C2) from approximate MPs 13.6 to 15.4. Approximately 0.4 mile (22% of total core crossing) of this C2 core crossing spans through cleared land, and the remaining land within the core crossed by Nebula-Raines Route 1 is managed timber. Nebula-Raines Route 1 would have net new impacts on approximately 17.0 acres of the C2-ranked Core ID 75315. Table 4.2-4 summarizes the impacts of Nebula-Raines Route 1 on ecological cores.

TABLE 4.2-4 SUMMARY OF ECOLOGICAL CORE IMPACTS FOR NEBULA-RAINES ROUTE 1

Core Rank	Core IDs	Acres Impacted	Miles Crossed
C2	75315	31.6	1.7
C3	74773 75338	29.8	2.4
C4	75639 75260 75694 75764 75518 75502	31.7	2.6
C5	74445 74622 75702 75763 75480 75667	20.5	1.7
Total [a]		**113.7**	**8.4**

[a] The sum may not equal the totals due to rounding.

Nebula-Raines Route 3

Nebula-Raines Route 3 crosses 11 ecological cores, totaling approximately 7.1 miles and a combined right-of-way footprint of approximately 97.2 acres (51% of the Route 3 right-of-way). From approximate MPs 13.1 to 14.9, Route 3 follows the same alignment through Core ID 75315 (ranked C2) as the Nebula-Raines Route 1 crossing; therefore, the same impacts to the core are anticipated, including approximately 17.0 acres of net new impact. Table 4.2-5 summarizes the impacts of Route 3 on ecological cores.

TABLE 4.2-5 SUMMARY OF ECOLOGICAL CORE IMPACTS FOR NEBULA-RAINES ROUTE 3

Core Rank	Core IDs	Acres Impacted	Miles Crossed
C2	75315	31.6	1.7
C4	74499 74666 75004 75260 75321 75518 75502	50.6	4.2
C5	74445 75480 75667	15.0	1.2
Total [a]		**97.2**	**7.1**

[a] The sum may not equal the totals due to rounding.

Nebula-Raines Route 4

Nebula-Raines Route 4 crosses 11 ecological cores, totaling approximately 8.1 miles and a combined right-of-way footprint of approximately 109.7 acres (57% of the Nebula-Raines Route 4 right-of-way). Nebula-Raines Route 4 crosses Core ID 75315 (ranked C2) from approximate MPs 13.1 to 15.0. Approximately 0.1 mile (less than 1% of total core crossing) of this C2 core crossing spans through cleared land as it approaches the proposed Nebula Switching Station, and the remaining land within the core crossed by Nebula-Raines Route 4 is managed timber. Nebula-Raines Route 4 would have net new impacts on 21.8 acres of the C2-ranked Core ID 75315. **Error! Reference source not found.** summarizes the impacts of Nebula-Raines Route 4 on ecological cores.

TABLE 4.2-6 SUMMARY OF ECOLOGICAL CORE IMPACTS FOR NEBULA-RAINES ROUTE 4

Core Rank	Core IDs	Acres Impacted	Miles Crossed
C2	75315	32.5	1.8
C4	74499 74666 75004 75260 75321 75518 75502	65.1	5.4
C5	74445 75480 75508	12.1	1.0
Total [a]		**109.7**	**8.1**

[a] The sum may not equal the totals due to rounding.

Nebula-Raines Route 5

Nebula-Raines Route 5 crosses 13 ecological cores, totaling approximately 6.8 miles for a combined right-of-way footprint of approximately 92.5 acres (50% of the Nebula-Raines Route 5 right-of-way). Nebula-Raines Route 5 crosses Core ID 75315 (ranked C2) from approximate MPs 12.6 to 14.4. Approximately 0.9 mile (50% of the total core crossing) is collocated with Dominion's existing transmission line right-of-way for Lines #1041/#38. Minimal impacts to the core are anticipated in this area as no additional clearing would be required. Additionally, 0.7 mile of the crossing (38% of total core crossing) spans through either managed timberland that was recently cleared (2016) and replanted (2019) or currently cleared land. The remaining land within Core ID 75315 that is crossed by Nebula-Raines Route 5 (0.1 mile) is managed timber. Nebula-Raines Route 5 would have net new impacts on 1.2 acres of the C2-ranked Core ID 75315. Table 4.2-7 summarizes the impacts of Nebula-Raines Route 5 on ecological cores.

TABLE 4.2-7 SUMMARY OF ECOLOGICAL CORE IMPACTS FOR NEBULA-RAINES ROUTE 5

Core Rank	Core IDs	Acres Impacted	Miles Crossed
C2	75315	31.1	1.7
C4	74499 74291 74621 74834 74656	42.4	3.6
C5	74445 74405 74767 74860 75213 75328 75418	19.0	1.5
Total [a]		**92.5**	**6.8**

[a] The sum may not equal the totals due to rounding.

4.2.3 PROTECTED SPECIES

Protected species are generally defined as animal and plant species that are protected under State or Federal law. ERM reviewed protected species according to regulations under the following state and federal laws:

- Federal- and state-listed T&E species protected under the federal Endangered Species Act (ESA) enacted in 1973 and administered by USFWS and the National Oceanic and Atmospheric Administration, in cooperation with the VDWR, and also 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.
- Migratory birds protected under the Migratory Bird Treaty Act enacted in 1918 and administered by the USFWS.

ERM identified protected species along and near the Project using the following sources:

- USFWS Information for Planning and Consultation System (IPaC) online system (USFWS 2024b)
- VDCR NHP (VDCR 2024b)
- VDCR Environmental Review (VDCR 2024c)
- VDWR Wildlife Environmental Review Map Service (WERMS) (VDWR 2024a)
- Virginia Fish and Wildlife Information Service (VaFWIS) (VDWR 2024b)
- Center for Conservation Biology (CCB) Eagle Nest Locator (CCB 2022)
- VDWR Little Brown Bat and Tricolored Bat Winter Habitat and Roost Tree Application (VDWR 2024c)
- VDWR Northern Long-eared Bat Regulatory Buffer Interactive Tool (VDWR 2024d)

ERM obtained database query results from the VDCR NHP, the VDWR VaFWIS, the VDWR WERMS, and the USFWS IPaC to identify federal- and state-listed species that may occur within the study area. ERM obtained digital data from the VDCR to identify locations within potential rights-of-way of the route alternatives and switching station (along with an associated 100-foot buffer) that potentially support protected species. Query results from the VDCR include species known to occur in the area and communities known to historically or currently contain protected species (VDCR 2024b). Query results from USFWS IPaC include species that may occur in the study area (USFWS 2024b). Query results from VaFWIS include species known to occur or likely to occur within a 2.0-mile radius of the Project study area (VDWR 2024b), as well as Bald eagle nest and migratory bird information. Data for species known to occur within the Project route alternatives rights-of-way were retrieved using queries of the VDWR WERMS.

4.2.3.1 FEDERAL- AND STATE-LISTED THREATENED AND ENDANGERED SPECIES

To protect and recover imperiled species and the ecosystems they depend on, Congress passed the federal ESA in 1973, which states that T&E plant and animal species are of aesthetic, ecological, educational, historic, and scientific value to the U.S., and protection of these species and their habitats is required. The ESA is administered by both the National Oceanic and Atmospheric Administration and USFWS. 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 federally permitted.

To 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 near future throughout all or a significant portion of its range (33 U.S.C. §1532).

Virginia has adopted separate codes for protecting animals and plants in the state. The Virginia ESA (Va. Code, §§ 29.1-563 through -570) designates the VDWR as the state agency with jurisdiction over state-listed endangered or threatened fish and wildlife. The Virginia ESA

authorizes the Board of the VDWR to adopt the federal list of endangered and threatened species and to 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 (Title 2, Virginia Administrative Code [VAC], Agency 5 §320-10 [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, which is responsible for state-listed plants and insects, in providing comments regarding potential impacts on these species.

ERM database queries identified multiple federal- and state-listed T&E species within and adjacent to the study area. Federal-listed species (which are also state-listed) consist of Northern long-eared bat (NLEB; *Myotis septentrionalis*) and Atlantic pigtoe (*Fusconaia masoni*). Four additional state-listed species (which are not also federally listed) identified by the queries include: Tricolored bat (TCB; *Perimyotis subflavus*), Loggerhead shrike (*Lanius ludovicianus*), Carolina darter (*Etheostoma collis*), and Whitemouth shiner (*Miniellus alborus*).

Each federal- and state-listed species was reviewed for potential of occurrence within and adjacent to the route alternatives. Table 4.2-8 provides information on the federal- and state-listed species with potential to occur in the study area.

TABLE 4.2-8 FEDERAL- AND STATE-LISTED SPECIES POTENTIONALLY OCCURRING IN THE STUDY AREA

Common Name	Scientific Name	Status	Global Rank	Habitat	Source
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	FE, ST	G2	Generally associated with old growth or late successional interior forests. Use partially dead or decaying trees for breeding, summer day roosting, and foraging. Hibernation occurs primarily in caves, mines, and tunnels.	IPaC VDWR—Winter Habitat and Roost Tree Map VDWR—NLEB Regulatory Buffer Interactive Tool
Tricolored bat	*Perimyotis subflavus*	FPE, SE	G3	Typically roost in trees near forest edges during summer. Hibernate deep in caves or mines in mountainous areas with warm, stable temperatures during winter.	IPaC VDWR—Winter Habitat and Roost Tree Map
Invertebrates					
Atlantic pigtoe	*Fusconaia masoni*	FT, ST	G1	Requires clean and fast flowing water with coarse sand and gravel substrates. Typically, only found in high quality riverine/large creek habitat. Extremely sensitive to pollution and disturbed habitats.	VaFWIS
Birds					
Loggerhead shrike	*Lanius ludovicianus*	ST	G4	Prefers grazed pastures for nesting purposes and shrub/open forest habitats during winters. For breeding season, the species prefers open country with shrubs, scrub, and scattered trees.	VaFWIS
Fish					
Carolina darter	*Etheostoma collis*	ST	G3	Inhabits streams in the lower and middle Piedmont. Found in small streams and rivulets with low current velocities and sand or gravel substrates. Occasionally found among vegetation, brush/fallen tree limbs, and stick-littered areas.	VaFWIS VDCR
Whitemouth shiner	*Miniellus alborus*	ST	G4	Primarily found in small warm creeks and larger streams on the middle and lower Piedmont. Prefers colorless waters with sand-bedrock substrate, swift currents, and no vascular plants.	VaFWIS VDCR

Sources: USFWS 2024b; VDCR 2024c; VDWR 2024b, 2024c, 2024d.

IPaC = Information for Planning and Consultation; VaFWIS = Virginia Fish and Wildlife Information Service; VDCR = Virginia Department of Conservation and Recreation; VDWR = Virginia Department of Wildlife Resources.

Federal/State Status:

FE	Federally listed as endangered	SE	State listed as endangered	FPE	Federally proposed as endangered
FT	Federally listed as threatened	ST	State listed as threatened		

Global Rank:

G1 Critically Imperiled: At very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors

G2 Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors

G3 Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors

G4 Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors

G5 Secure: Common, widespread, and abundant

Federal-Listed Species

As shown in Table 4.2-8, ERM identified two federally listed species (each of which is also state-listed) and one species with a proposed federal listing that may potentially occur within the Project study area. While all three of these species were identified by either the IPaC or VaFWIS database as potentially occurring within a 2.0-mile radius of the study area boundary, only the Atlantic pigtoe has a confirmed occurrence within this buffer. The Atlantic pigtoe has been found in Taylors Creek (a tributary of Meherrin River), approximately 1.8 miles northeast of the study area boundary (VDWR 2024b).

Potential summer foraging habitat for the NLEB and TCB includes multiple forested areas along each route. A review of the VDWR winter habitat and roost trees online mapping system did not show summer habitat (i.e., maternity roosts), winter habitat (i.e., hibernacula), or roost trees for NLEB or TCB within the route alternatives (VDWR 2024c, 2024d). Additionally, the VaFWIS and WERMS databases did not show any confirmed occurrences of the NLEB or TCB within the route alternative rights-of-way (VDWR 2024a). A NLEB capture (with a 3.0-mile buffer) occurred within the study area on August 23, 2023 (VDWR 2024d). Nebula-Raines Routes 1, 3, 4, and 5 occur within the 3.0-mile buffer capture, verifying that summer foraging habitat for the NLEB and TCB exists along each route.

State-Listed Species

Six state-listed species (NLEB, TCB, Loggerhead shrike, Atlantic pigtoe, Carolina darter, and Whitemouth shiner) were identified as potentially occurring within the study area. Each of these species are also federal-listed or proposed to be listed, as described above. Of these six species, only the Atlantic pigtoe, Loggerhead shrike, Carolina darter, and Whitemouth shiner have documented occurrences within the 2.0-mile search radius around the study area.

The Loggerhead shrike was observed along the southern boundary of the study area and along the northeast boundary of the study area. The Loggerhead shrike prefers open, agricultural land as habitat.

Potential habitat for both the Carolina darter and Whitemouth shiner is present within the Project study area, and the VaFWIS database confirmed the presence of the species within Kettles Creek, Mines Creek, two unnamed tributaries of Kettles Creek, and one unnamed tributary of Mines Creek. The Whitemouth shine was also confirmed as present within Allen Creek. Due to the documented occurrences of these two state-listed species, these waterbodies have been classified as T&E Waters. This designation classifies streams and rivers that contain documented occurrences of federal- or state-listed species and their habitat. Most of Kettles Creek runs alongside (and outside of) the southern boundary of the study area; however, it briefly crosses into the study area approximately 1.3 miles south of Nebula-Raines Routes 1 and 3. Mines Creek is entirely located within the Project study area, and a tributary of Mines Creek is crossed by Nebula-Raines Route 1 (between MPs 14.2 and 14.3), Nebula-Raines Route 3 (between MP 13.7 and 13.8), and Nebula-Raines Route 4 (at approximately MP 13.8). The portion of Allen Creek that is classified as T&E Waters for the Whitemouth shiner runs through the northwest portion of the

study area and is approximately 2.0 miles northwest of Nebula-Raines Route 5. The Cloud-Nebula Route and Nebula-Raines Route 5 do not cross T&E Waters.

Impact Assessment

Table 4.2-8 provides information on the six federal-listed and/or state-listed species identified as potentially occurring within the study area and/or within a 2.0-mile radius of the study area. Potential habitat exists for all six species along the Project route alternatives; however, the VDWR, VaFWIS, WERMS, and VDCR data show that only the Atlantic pigtoe, Loggerhead shrike, Carolina darter, and Whitemouth shiner have been confirmed within the study area or 2.0-mile radius of the study area boundary.

VDWR data show that occurrences of federal- and state-listed bat hibernaculum (winter habitat) have not been confirmed within a 2.0-mile radius of the study area. However, summer foraging habitat for these species is likely present within forested habitats crossed by each route. No impacts to these bat species are anticipated for any route alternative if trees are cleared during the winter according to VDWR time-of-year restrictions (TOYRs).

The Company is actively monitoring the regulatory changes and requirements associated with the NLEB and how they could potentially impact construction timing associated with TOYRs. On October 15, 2024, the USFWS issued the NLEB Final Guidance for development projects. The USFWS Interim Guidance for the NLEB expired on November 30, 2024, and the Final Guidance took effect.

The Company is also monitoring regulatory changes associated with the potential up-listing of the TCB. The Company is anticipating the TCB will be listed; therefore, the Company assumes any regulatory changes associated with the potential listing of the TCB will affect this Project. On September 14, 2022, the TCB was proposed to be listed as Endangered by the USFWS (USFWS 2022). USFWS extended its Final Rule issuance target from September 2023 to the end of 2024. At this time, the TCB Final Rule has not been issued.

In October 2024 USFWS issued a final NLEB and TCB Range-wide Determination Key (DKey) to allow project proponents to assess project impacts, practicable avoidance and minimization measures, and consultation requirements under the final NLEB guidance and the eventual TCB listing ahead of the final decision. The Company will use the DKey to further assess project impacts and determine appropriate avoidance and minimization measures to ensure compliance with state and federal regulations when the Project enters permitting.

The Loggerhead shrike was documented along the southern boundary and northeast boundary of the study area. Impacts to open or agricultural areas that may provide habitat for the shrike would be limited to potential structure placement. The affected habitat would continue to function as they had prior to construction. In addition, the description of the preferred habitat of the shrike is more consistent with the anticipated nature of the site post construction than with the preconstruction condition. No impacts to the Loggerhead shrike are anticipated due to any route alternative.

The Carolina darter and Whitemouth shiner species were documented within the Allen, Kettles, and Mines Creeks. While no instream construction would be required for the Project, if shade is

reduced along the streambanks due to right-of-way clearing, water temperatures may increase in the area adjacent to the tree clearing, which could adversely impact the Atlantic pigtoe or the spawning of the Carolina darter or Whitemouth shiner if their habitat is crossed. Because the Allen, Kettles, and Mines Creeks are located within the study area, the VaFWIS and WERMS databases identified them as features that could be impacted by the Project (VDWR 2024a, 2024b). Of these waterbodies, the Kettles and Mines Creeks are crossed by route alternatives; therefore, the Project may have an impact on these T&E Waters and their associated species.

To control erosion and sediment runoff and prevent stream and groundwater flow changes, BMPs will be employed by the Company before, during, and after construction to reduce any form of negative impacts on the Carolina darter and Whitemouth shiner habitat. The Cloud-Nebula Route would not cross any Carolina darter or Whitemouth shiner habitat, so no impact is anticipated from this route. Table 4.2-9 summarizes the acreage of Carolina darter and Whitemouth shiner habitat crossed by route alternatives. Nebula-Raines Route 4 would cross the greatest combined amount of predicted suitable habitat for the Carolina darter and Whitemouth shiner, at approximately 15.2 acres. Nebula-Raines Route 5 would cross the least amount of predicted suitable habitat, at approximately 10.5 acres. The Cloud-Nebula Route would cross no predicted suitable habitat for either species. Figure 4.2-3 depicts the areas of Carolina darter and Whitemouth shiner predicted suitable habitat along the route alternatives.

TABLE 4.2-9 CAROLINA DARTER AND WHITEMOUTH SHINER PREDICTED SUITABLE HABITAT ACRES CROSSED BY THE ROUTE ALTERNATIVES

Species with Potential Suitable Habitat	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Carolina darter	5.4	5.6	9.9	2.0	0.0
Carolina darter and Whitemouth shiner	6.0	6.0	5.3	8.5	0.0
Total Acres [a]	**11.5**	**11.6**	**15.2**	**10.5**	**0.0**

Source: VDCR 2024c (see Appendix E).

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

Regardless of the route alternative selected for the Project, Dominion will coordinate with state and federal agencies as needed to determine if surveys, construction TOYRs, or other mitigation required to mitigate potential impacts on threatened or endangered species. If any T&E species are encountered during Project construction, Dominion will work with the VDWR and other appropriate jurisdictional agencies to minimize any impacts on the species.

4.2.3.2 BALD EAGLES

While the Bald eagle is no longer federally listed under the ESA and was de-listed from the Virginia List of Threatened and Endangered Species in 2013, the species remains protected under the federal Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act, as well as Virginia Code § 29.1-521 and VDWR regulations (4 VAC 15-30-10). *The Management of Bald Eagle Nests, Concentration Areas, and Communal Roosts in Virginia: A Guide for Landowners*, issued by the then Virginia Department of Game and Inland Fisheries (now VDWR) identifies management

practices for avoiding the take of Bald eagles and outlines restrictions on construction activities within defined management zones. Proposed activities that have the potential to affect Bald eagles are evaluated by the VDWR on a case-by-case basis (Virginia Department of Game and Inland Fisheries 2012).

Multiple large river tributary systems that flow into Chesapeake Bay host large populations during winter and summer seasons. Eagles across the Atlantic Coast are attracted to habitat in the Chesapeake Bay watershed due to the temperate climate and abundance of fish and waterfowl prey. Eagles from the southeastern U.S. migrate north to the Chesapeake Bay every spring, and Bald eagles from the northeastern United States (and Canada) migrate south to the Bay for the winter. As a result, the Chesapeake Bay watershed supports three populations of Bald eagles, including Chesapeake Bay residents, southeast migrants, and northeast migrants.

ERM reviewed current eagle datasets in Virginia, including Eagle Concentration Areas and individual Bald eagle nests, available from the CCB VaEagles website (CCB 2022) and the CCB's annual eagle nest survey. ERM also reviewed Bald eagle data provided through the VaFWIS and WERMS databases. Current data from the CCB (2022) and VDWR (2024a) show that the study area is not within an Eagle Concentration Area. The eagle nest nearest to study area (Nest ID ME1404) is approximately 0.7 mile south of the study area. This nest was last observed in 2016 and last occupied in 2016 (CCB 2022).

The VDWR provides activity-specific guidelines for work within 330-foot and 660-foot buffer zones surrounding a known Bald eagle nest. If eagle nests are identified within 660 feet of the right-of-way approved by the SCC, Dominion will work with the VDWR and other appropriate jurisdictional agencies to minimize any impacts on the species.

4.2.3.3 OTHER SPECIES OF INTEREST

Other species of interest when evaluating projects typically include rare plants and animals that are not afforded the same level of protection as federal- and state-listed T&E species. NatureServe, an international network of NHPs, assigns a global rank to species based on rarity and conservation status (NatureServe 2024). Species ranked "G1" (global rank 1/critically imperiled) or "G2" (global rank 2/imperiled) are most at risk. State rankings are similar (S1 and S2), but only indicate the status of the species within Virginia. The VDCR continually catalogues, gathers, and analyzes geographic information about Virginia's rare species to develop land conservation data, provide online mapping tools, and help resource agencies make conservation decisions. No species of concern have the potential to occur in the study area (VDCR 2024c).

4.2.4 VEGETATION

4.2.4.1 LOCAL VEGETATION CHARACTERISTICS

The study area is situated within the Southern Piedmont physiographic province, specifically within the Braun's Oak-Pine Forest Region (VDCR 2021). Vegetation in this province has been altered by clearing as part of ongoing agricultural and silvicultural practices occurring since European settlement. Prior to the effects of European settlement, vegetation was influenced by the practices of Native Americans. Literature from early explorers indicate that parts of the Piedmont province

were once open, savanna-like woodlands and grasslands (VDCR 2021). Native American practices included burning the forests to drive game and keep the understory of forests clear for hunting (VDCR 2021).

More recently, forests in the Southern Piedmont have undergone a cycle of clearing, farming, and regenerating. The effects of human development activities on the landscape have resulted in a patchwork of early and late successional forests, pastures, and agricultural fields outside of urbanized areas. The study area lies in a highly forested portion of Mecklenburg County with small, interspersed tracts of agricultural land. Forest clearing has occurred across much of the study area in the last 20 years; thus, much of the vegetation in the study area consists of immature mixed pine (*Pinus spp*.), hardwood forest communities, and forested "edge" communities that border larger forested tracts.

As noted in Section 4.1.2, ERM classified land cover along the routes using a combination of local and statewide datasets as well as aerial photo interpretation to identify the most current uses for a given area. Table 4.2-10 summarizes the acreage of vegetation types crossed by the route alternatives. Figure 4.1-2 depicts land use/land cover, including forested areas, along the routes.

TABLE 4.2-10 VEGETATED LAND USE CROSSED BY THE ROUTE ALTERNATIVES (ACRES)

Vegetation Crossed	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Forest	103.1	109.6	132.8	99.5	4.6
Agriculture	48.7	50.0	33.0	34.4	0.0
Open Space	0.7	0.7	0.7	1.4	5.7
Total [a]	**152.5**	**160.3**	**166.5**	**135.3**	**10.3**

[a] The sum of the addends may not equal the totals due to rounding.

Forested vegetation in the study area is generally associated with relatively small contiguous tracts of trees found in upland forests. These forests contain both deciduous hardwood stands and evergreen/mixed forests that include stands of Shortleaf pine (*Pinus echinata*), Loblolly pine (*Pinus taeda*), and Virginia pine (*Pinus virginiana*) where the land has been altered by human activities. Fallow farmlands, when left unattended, undergo a successional regeneration process that generally results in a prevalence of early successional tree stands of pines, oaks, American sweetgum (*Liquidambar styraciflua*), and Red maple (*Acer rubrum*). Late-successional forests in the Southern Piedmont include stands of mixed oaks, American beech (*Fagus grandifolia*), and Tulip-poplar (*Liriodendron tulipifera*) (VDCR 2021).

4.2.4.2 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 2023b). 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:

- 5: Outstanding
- 4: Very High
- 3: High
- 2: Moderate
- 1: Average

ERM reviewed the FCV model data to assess the value of forest resources along the route alternatives. Upon reviewing recent aerial photography, ERM found that many recently cleared areas have been ranked using the FCV model data; therefore, the model may be outdated and not reflective of current conditions. Table 4.2-11 summarizes the area of FCVs within the right-of-way for each route alternative. Nebula-Raines Route 1 would cross the most forested land with an Outstanding FCV rating, while Nebula-Raines Route 4 would cross the most forested land with any FCV rating.

TABLE 4.2-11 FOREST CONSERVATION VALUES CROSSED BY THE ROUTE ALTERNATIVES

Forest Conservation Values	Unit	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
Average (1)	acres	30.0	34.7	30.2	31.7	0.0
Moderate (2)	acres	37.2	35.6	40.6	39.5	0.0
High (3)	acres	42.5	48.5	55.4	37.4	2.1
Very High (4)	acres	33.0	22.8	21.8	29.5	8.7
Outstanding (5)	acres	9.4	3.8	4.6	0.0	0.0
Total [a]	**acres**	**152.1**	**145.4**	**152.7**	**138.1**	**10.8**

[a] The sum of the addends may not equal the totals due to rounding.

4.2.4.3 IMPACT ASSESSMENT

Loss of habitat presents the greatest risk to biodiversity (VDCR 2024b). When development alters the landscape and fragments large natural tracts of land into smaller, scattered pieces, the biodiversity of the area declines. Large, contiguous patches of land have more benefits than the same area of land among smaller fragmented pieces, including:

- A progressive increase in the number and diversity of species as contiguous habitat size increases;
- Increased habitat diversity and protection from disturbance in adjacent developed areas; and
- Greater ecosystem services (i.e., any direct or indirect benefits that ecosystems provide to people) (VDCR 2024b).

ERM reviewed recent aerial photography to calculate impacts on vegetation (NAIP 2023, VGIN 2024). As shown in **Error! Reference source not found.**, the Nebula-Raines route alternatives

would primarily affect forested vegetation. Nebula-Raines Route 1 would impact the largest extent of forest, while the Cloud-Nebula Route would primarily impact open space.

Fragmentation

ERM assessed the potential for each route to create new fragments in the forested areas they cross by measuring the length of each route centerline where it crosses the interior of a forest stand and therefore would create a new fragment. Table 4.2-12 displays approximations of where forest fragmentation occurs along the routes.

TABLE 4.2-12 LOCATIONS OF FOREST FRAGMENTATION ALONG ROUTE ALTERNATIVES

Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5	Cloud-Nebula Route
MPs 0.0 to 0.4 MPs 0.8 to 1.0 MPs 1.2 to 1.3 MPs 1.5 to 1.9 MPs 2.2 to 2.4 MPs 3.7 to 4.1 MPs 4.2 to 5.1 MPs 5.2 to 5.6 MPs 5.6 to 5.8 MPs 6.1 to 7.3 MPs 7.3 to 8.2 MPs 9.3 to 9.4 MPs 10.7 to 10.8 MPs 12.2 to 12.3 MPs 13.8 to 15.3	MPs 0.0 to 0.5 MPs 1.3 to 1.5 MPs 1.5 to 2.7 MPs 2.8 to 2.9 MPs 3.1 to 3.9 MPs 3.9 to 4.7 MPs 4.8 to 4.9 MPs 5.0 to 5.2 MPs 5.3 to 5.5 MPs 5.6 to 6.0 MPs 6.1 to 6.7 MPs 7.3 to 7.4 MPs 7.6 to 7.8 MPs 7.8 to 8.0 MPs 8.1 to 8.3 MPs 8.7 to 8.8 MPs 8.8 to 8.9 MPs 9.0 to 9.1 MPs 10.2 to 10.4 MPs 11.7 to 11.8 MPs 13.4 to 14.8	MPs 0.0 to 0.5 MPs 1.3 to 1.5 MPs 1.5 to 2.7 MPs 2.8 to 2.9 MPs 3.0 to 4.7 MPs 4.8 to 4.9 MPs 4.9 to 5.2 MPs 5.3 to 5.5 MPs 5.5 to 6.0 MPs 6.0 to 6.7 MPs 6.8 to 6.9 MPs 7.3 to 7.4 MPs 7.6 to 7.8 MPs 7.8 to 8.0 MPs 8.1 to 8.2 MPs 8.6 to 8.8 MPs 8.8 to 8.9 MPs 9.0 to 9.1 MPs 10.0 to 10.6 MPs 10.8 to 10.9 MPs 11.3 to 11.6 MPs 11.7 to 11.8 MPs 11.9 to 12.3 MPs 12.4 to 12.9 MPs 12.9 to 13.0 MPs 13.1 to 14.8	MPs 0.0 to 0.5 MPs 3.2 to 3.6 MPs 3.6 to 4.6 MPs 4.8 to 5.0 MPs 5.0 to 5.3 MPs 5.9 to 6.4 MPs 6.7 to 6.8 MPs 6.8 to 7.1 MPs 7.1 to 7.2 MPs 7.4 to 7.5 MPs 7.8 to 7.9 MPs 8.1 to 8.8 MPs 9.4 to 9.9 MPs 10.0 to 10.1 MPs 11.3 to 11.6 MP 11.8 MPs 11.9 to 12.3 MPs 13.7 to 14.0 MPs 14.0 to 14.2	None

MP = milepost.

Of the four Nebula-Raines route alternatives, Nebula-Raines Routes 1 and 5 would result in the smallest overall extent of fragmentation impacts. Nebula-Raines Route 1 primarily runs adjacent to cleared, agricultural, or developed lands. Nebula-Raines Route 5 avoids fragmentation by collocating along existing transmission lines, roads, and cleared land. Nebula-Raines Route 4 would create the greatest amount of fragmentation.

In forested areas, trees would be cleared from the right-of-way, which would subsequently be maintained with an herbaceous cover during Project operations. This would differ substantially from existing conditions. Vehicle movement associated with construction of transmission lines in open areas would temporarily impact herbaceous vegetation. Impacts on vegetation within open space or agricultural land would be limited to required structure footprints along the routes,

temporary construction impacts, and intermittent mowing required for maintenance access. Disturbed areas resulting from use of temporary workspace would revert to preconstruction vegetative conditions.

4.3 VISUAL RESOURCES

Visual resources capture the combination of natural landforms, vegetation, water features, and human modifications that characterize and contribute to a landscape's visual quality. This visual resource assessment identifies important visible features (e.g., natural and/or cultural resources that contribute to scenic quality) and elements (i.e., forms, lines, colors, textures, etc.) of the surrounding landscape as the basis for determining how and to what degree the Project will affect visual resources.

The Cloud-Nebula Route and the proposed Nebula Station are located east of Herbert Drive on private property, inaccessible from public rights-of-way. Because there are no public viewing points of the Cloud-Nebula right-of-way or the proposed Nebula Station, these Project components would not have visual impacts on the public. Therefore, these components are not discussed further in this section.

4.3.1 EXISTING CONDITIONS

4.3.1.1 METHODOLOGY

ERM conducted a visual resource assessment to characterize the existing scenic/landscape conditions and understand the potential impact from the installation of Project components on these conditions. This assessment included the following activities:

- Identification of VSRs through the review of recent (2023) digital aerial photography and other available mapping resources;
- Site reconnaissance and local outreach;
- Descriptions of existing conditions from key observation points (KOPs) along the route alternatives;
- Definition of potential user groups (i.e., groups of people, such as residents or tourists who experience views) within the study area;
- Description of the likely sensitivity of user groups to visual changes in the landscape;
- Preparation and review of visual simulations or renderings of the proposed transmission infrastructure from KOPs in the study area; and
- Evaluation of the Project with respect to visual impacts.

The visual impact approach in this section draws on established landscape planning and design techniques for describing existing landscape characteristics and identifying the potential changes or contrasts created by proposed surface-disturbing activities, including (but not limited to) the Bureau of Land Management's Visual Resource Management system (BLM 1984), U.S. Forest Service's Scenery Management System (USFS 1995), and Federal Highway Administration's Visual Impact Assessment for Highway Projects (FHWA 2015).

4.3.1.2 REGULATORY SETTING

The Virginia Outdoors Plan includes guidance on scenic resources in the state (VDCR 2018). In general, VDCR defers to local governments for the protection and management of scenic resources; however, VDCR works with local governments and other stakeholders on scenic resources with statewide importance through the Virginia Scenic Rivers Program and Virginia's Byways. There are no designated Virginia Scenic Rivers or Scenic Byways in the Project study area. The East-Coast Greenway, a pedestrian and bicycle route that connects Maine to Florida follows roads within the study area (see Section 4.1.7), but it is not a designated Virginia scenic resource.

The 2035 Long Range Plan for Mecklenburg County does not include a section on scenic resources (Mecklenburg County 2012). There are no county-designated scenic resources in the study area, nor does the Long Range Plan provide direction (e.g., goals and objectives) regarding the preservation of important scenic resources outside of the Scenic River designation for the Meherrin River. The Mecklenburg County Zoning Ordinance also does not identify scenic resource objectives and/or established thresholds (or criteria) for what constitutes a significant impact to scenic resources (Mecklenburg County 2024).

In the absence of a local regulatory framework for assessing visual resources, ERM's assessment of the Project's impacts on visual resources reflects the commonly used federal systems and best practices described above (Section 4.3.1.1).

4.3.1.3 VISUALLY SENSITIVE RESOURCES

The Project study area includes portions of central and eastern Mecklenburg County. This largely rural area is within the Piedmont physiographic province, which is dominated by highland and forest ecosystems (VDCR 2021). The study area is characterized by gently rolling hills and forested areas. Some of the forested areas have been cleared for timber production and lower density development (e.g., residential, agricultural, commercial, and industrial uses) that is found primarily along the major transportation corridors and local roadways through the area (Section 4.1.2). Existing forested areas and the absence of substantial topographic relief limits panoramic views in the study area and generally constrains most viewsheds to the foreground and middle ground (i.e., within approximately 1 mile of the viewer).

Table 4.3-1 lists the VSRs in the study area, including locations or features where views contain unique scenic qualities, sensitive viewsheds, and/or areas where a Project's components and any associated vegetation clearing would likely contrast with the surrounding landscape. Common examples of VSRs include designated scenic resources (e.g., scenic byways, rivers, overlooks, and landscapes), residential areas, parks and other recreational sites, historic sites, conservation areas and other open spaces, natural features, cultural destinations, road corridors, and areas of high public concentration. Figure 4.3-1 depicts the location of each VSR relative to the proposed Project components.

TABLE 4.3-1 VISUALLY SENSITIVE RESOURCES AND USER GROUPS

VSR #	VSR Name	VSR Description	Primary Viewer Group(s)
Educational Resources (Schools)			
1	Mecklenburg County High/Middle School	Middle School (grades 6 through 8) and High School (grades 9 through 12) share the same campus at the northwest corner of the intersection of US 58 and Wooden Bridge Road (Buggs Island Road) in Baskerville. The campus includes athletic fields and playgrounds.	Local residents
2	South Hill Elementary	Includes Pre-Kindergarten through 5th grade, located on the north side of US 1 and Plank Road near Hillsman Road on the west side of South Hill. The campus includes outdoor playgrounds.	Local residents
Places of Worship & Cemeteries			
3	Bethany Baptist Church and Cemetery	Faith gathering site and associated cemetery located at the southwest corner of the Baskerville Road/Iron Mill Road intersection.	Local residents
4	Bethel Baptist Church/Academy	Faith gathering site located on the east side of Buggs Island Road, south of the intersection with Iron Mill Road.	Local residents
5	Bloom Hill Baptist Church	Faith gathering site located on the east side of Busy Bee Road, north of the intersection with Gordon Lake Road.	Local residents
6	Greater Hayes Grove Baptist Church	Faith gathering site and associated cemetery located on the west side of Union Level Road, south of the intersection with Busy Bee Road.	Local residents
7	Kingdom Hall of Jehovah's Witnesses	Faith gathering site located on the north side of the US 58/US 1 intersection, south of Smith Cross Road.	Local residents
8	Lambert's Chapel RZUA Church and Cemetery	Faith gathering site located on the west side of Snowbird Road, with an associated cemetery is located on the east side. Both sites are north of the intersection with Plank Road.	Local residents
9	Saint Andrews Church and Cemetery	Faith gathering site and associated cemetery located on the east side of Baskerville Road, south of the intersection with Wooden Bridge Road.	Local residents, and tourists
10	Trinity United Methodist Church	Faith gathering site located on the east side of Trinity Church Road south of the intersection with Boxwood Road.	Local residents

VSR #	VSR Name	VSR Description	Primary Viewer Group(s)
11	Hudson Family Cemetery (Willie Hudson Cemetery)	Cemetery located on the west side of Trinity Church Road south of the intersection with Goodes Ferry Road.	Local residents
Recreational Resources (see Section 4.1.7)			
12	Beaches to Bluegrass Trail	A multi-use nonmotorized and motorized vehicle trail network, under development, that uses other state trails and roads. The existing trail uses Goodes Ferry Road and Rocky Branch Road. Within the study area, a planned segment of the trail overlaps with the Tobacco Heritage Trail between Boydton and South Hill.	Local residents, recreationalists, and tourists
13	Christanna Loop	A Virginia Bird and Wildlife Viewing Trail in southern Virginia that uses roadways to access wildlife viewing areas. Within the study area, Christanna Loop uses US 1 and Union Level Road to access Lake Gordon.	Local residents, recreationalists, tourists
14	East Coast Greenway	Biking and walking route that runs from Maine and Florida with a mixture of trail and roadway segments. Within the study area, the greenway uses Rocky Branch Road, Goodes Ferry Road, South Mecklenburg Avenue, West Main Street, West Atlantic Street, South Thomas Street, Plank Road, Union Level Road, Gordon Lake Road, Busy Bee Road, US 58, and Baskerville Road.	Local residents, recreationalists, tourists
15	Lake Gordon Recreational Area	157-acre lake property managed by VDWR. Accessed from Union Level Road, west of US 1 approximately 5 miles southwest of South Hill. An access permit is required for fishing.	Local residents, recreationalists
16	Park View Athletic Complex	Sports fields with associated bleachers and lighting at the site of the now-closed Park View High School on the east side of Park View Lane approximately 2.8 miles southwest of South Hill. The fields are situated between US 1 to the south and Plank Road to the north.	Local residents, recreationalists
17	Tobacco Heritage Trail	Former Norfolk Southern Railroad line that has been converted to a trail, along with segments on paved roadways. The trail segment in the study area uses portions of South Hill Avenue, Goodes Ferry Road, and Rocky Branch Road, along with former rail segments.	Local residents, recreationalists, and tourists
18	US Bike Route 1	Cross-country bicycle route running from Florida to Maine. Within the study area, the route uses Buggs Island Road, Wooden Bridge Road, and Baskerville Road.	Local residents, recreationalists, and tourists

VSR #	VSR Name	VSR Description	Primary Viewer Group(s)
Road Corridors			
19	Baskerville Road	Two lane paved unstriped road running north-south. The roadway carries an AADT of approximately 300 to 600 vehicles per day.	Local residents
20	Buggs Island Road/ Old Wooden Bridge Road	Two lane paved and striped road running north-south. Wooden Bridge Road is the roadway name north of US 58, and Buggs Island Road south of US 58. The roadway carries an AADT of approximately 300 (north of US 58) to 1,200 (south of US 58) vehicles per day.	Local residents
21	Smith Cross Road	Two lane paved unstriped road north of the US 58/US 1 intersection. The roadway carries and AADT of approximately 500 vehicles per day.	Local residents
22	US 1	Three lane paved, striped roadway south of the southern intersection with US 58 (two lanes northbound, one southbound) and north of the northern intersection with US 58 (one lane in each direction plus a continuous center turn lane). The road segment shared by US 1 and US 58 has a 5-lane section (two lanes in each direction, plus a continuous center turn lane and paved shoulders) The roadway carries an AADT of: • 2,500 vehicles per day south of the southern intersection with US 58; • 10,000 vehicles per day on the shared US 1/US 58 segment south of Dockery Road; • 7,400 vehicles per day on the shared US 1/US 58 segment north of Dockery Road; and • 360 vehicles north of the northern intersection with US 58.	Local residents, commuters, through travelers
23	US 58	Four-lane paved and striped divided highway roadway with paved shoulders, occasional left turn lanes, and vegetated median west the southern intersection with US 1 and east of the northern intersection with US 1. The roadway carries an AADT of: • 7,500 vehicles per day west of Buggs Island Road/Old Wooden Bridge Road; • 8,100 vehicles per day between Buggs Island Road/Old Wooden Bridge Road and US 1; • 7,400 vehicles per day between Dockery Road and Goodes Ferry Road; and • 7,700 vehicles per day from Goodes Ferry Road to Maple Lane	Local residents, commuters, through travelers

VSR #	VSR Name	VSR Description	Primary Viewer Group(s)
Areas of High Public Concentration			
24	Baskerville CDP	Unincorporated area along US 58 between South Hill and Boydton with a population of 120.	Local residents, commuters, through travelers
25	Town of South Hill	Incorporated town with a population of 4,690 west of I-85, bisected by US 1 and US 58.	Local residents, commuters, through travelers
26	Mecklenburg County	Total county population of 30,319. Named unincorporated areas within the study area that do not have CDP status include Big Fork, Busy Bee Corner, Callahans Corner, Cedar Grove, Dockery, and Smiths Crossroads.	Local residents, commuters, through travelers
27	Union Level CDP	Unincorporated area west of South Hill, north of US 58 and northwest of US 1, with a population of 161.	Local residents

Sources: U.S. Census Bureau 2023 (population data); VDOT 2023 (AADT data).

AADT = annual average daily traffic; CDP = Census Designated Place; US = U.S. Route; VSR = visually sensitive resource.

4.3.1.4 VIEWER GROUPS

The perception of visual resources by the primary viewer groups in a study area provides additional context in assessing a project's potential impacts on the visual elements and features of a landscape. Viewer groups identified for the study area (and included in Table 4.3-1) are described below. Individuals may fall into one or more viewer group categories depending on the context of the view. For example, a local resident may also be considered a commuter as they travel to their job

- Local/area residents: These viewers live in the area. They are more likely to be highly sensitive to potential changes in landscape characteristics, because they tend to value the scenic integrity of the landscape 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.
- Workers: These viewers work in the area and thus have a higher degree of awareness of the landscape compared to some other viewing groups (e.g., motorists). While more aware (based on time spent in the project region), the sensitivity of workers is variable depending on the type and location of work being done (e.g., office workers may be less sensitive to landscape change than employees who primarily work outdoors).
- Motorists, commuters, and other travelers: These viewers primarily travel through the study area and have multiple opportunities to view the area landscape as they travel along the primary travel corridors. This means that their potential exposure to views of a proposed 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 are typically less sensitive to changes in scenic conditions.
- Recreationists and tourists: These viewers select area parks, recreation areas, and other tourist attractions in part based on the scenic setting and quality of these areas. As such, they also tend to be more sensitive to changes in the landscape.

Sensitivity and potential 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, some workers, etc.), as well as those viewers engaged in setting-dependent activities (e.g., some types of recreation, tourism, etc.) tend to have higher levels of sensitivity to change compared to others.

4.3.1.5 KEY OBSERVATION POINTS

In addition to considering the existing landscape characteristics across broader geographic areas through the lens of VSRs, ERM identified 21 specific KOPs to document location-specific existing conditions and anticipated changes due to Project construction and operation. These KOPs are described in Table 4.3-2 and shown on Figure 4.3-2. The KOPs for the Project were selected because they:

- Illustrate visibility from specific VSRs (not every VSR has a corresponding KOP);
- Illustrate representative views that would be available to identified user groups;
- Illustrate the route alternatives and switching stations; and

- Provide views of Project structures and vegetative clearing.

Descriptions of the existing visual conditions and the anticipated changes to these conditions are provided below for each KOP. Photographs of existing conditions, as well as visual simulations of the proposed Project infrastructure from each KOP are provided in Appendix F.

TABLE 4.3-23 KEY OBSERVATION POINTS

KOP #	Location	Reason for Inclusion	Viewer Groups Represented	Project Components Represented
003	View looking southwest from Antlers Road north of existing Lines #137 and #38	Example of proposed right-of-way crossing a local roadway through a rural landscape of wooded areas (with clearing) and multiple residences. Representative of common rural road views.	Local residents	Nebula-Raines Route 4
004A	View looking southeast from Antlers Road south of Johnsons Pond	Example of proposed right-of-way crossing a local rural roadway through a rural landscape of open fields and dense woodland. Representative of common rural road views.	Local residents	Nebula-Raines Route 1; Nebula-Raines Route 3
004B	View looking southwest from Antlers Road south of Johnsons Pond	Example of proposed right-of-way crossing timber harvest fields (with clearing). Representative of common rural road views.	Local residents	Nebula-Raines Route 1; Nebula-Raines Route 3
007	View looking west from Baskerville Road south of the intersection with Wooden Bridge Road	Example of proposed right-of-way crossing a local rural roadway through open fields and dense woodland (with clearing). Representative of VSR Baskerville Road.	Local residents	Nebula-Raines Route 5
010	View looking southeast from Buggs Island Road, south of the intersection with Iron Mill Road	Example of proposed right-of-way crossing a local roadway through a rural landscape with open fields and woodland (with clearing) and multiple residences. Representative of VSR Bethany Baptist Church, VSR Buggs Island Road, VSR Christanna Loop, and VSR US Bike Route 1	Local residents	Nebula-Raines Route 1; Nebula-Raines Route 3
011	View looking west from Baskerville Road	Example of proposed right-of-way crossing a rural landscape with multiple residences, open fields and trees. Representative of common rural road views.	Local residents	Nebula-Raines Route 1; Nebula-Raines Route 3; Nebula-Raines Route 4
012	View looking north from Baskerville Road	Example of proposed right-of-way crossing a local roadway with farmsteads and open fields. Representative of common rural road views.	Local residents	Nebula-Raines Route 1; Nebula-Raines Route 3;

KOP #	Location	Reason for Inclusion	Viewer Groups Represented	Project Components Represented
				Nebula-Raines Route 4
014A	View looking north from US 1	Example of proposed right-of-way crossing a through-corridor roadway with residences and trees. Representative of common rural road views.	Local/area residents, Motorists	Nebula-Raines Route 3; Nebula-Raines Route 4
014B	View looking southwest from US 1	Example of proposed right-of-way crossing a rural landscape with residences and trees along a through-corridor roadway. Representative of common rural road views.	Local/area residents, Motorists	Nebula-Raines Route 1
016	View looking northwest from the intersection of Plank Road and Snowbird Road	Example of proposed right-of-way crossing a rural landscape next to a local roadway with open fields and trees. Representative of common rural road views and Lambert's Chapel Reformed Union Apostolic Church and cemetery.	Local residents	Nebula-Raines Route 5
017	View looking west from the intersection of US 58 and Theater Road	Example of proposed right-of-way crossing a through-corridor roadway through a rural landscape of wooded areas (with clearing) and commercial buildings. Representative of common rural road views.	Local/area residents, Motorists	Nebula-Raines Route 5
019	View looking northwest from Smith Cross Road	Example of proposed right-of-way crossing a roadway through a rural landscape of wooded areas. Representative of common rural road views.	Local residents	Nebula-Raines Route 3; Nebula-Raines Route 4
021	View looking south from Goodes Ferry Road	Example of proposed right-of-way crossing a rural landscape with open fields, wooded areas and residences. Representative of common rural road views.	Local residents	Nebula-Raines Route 1
022	View looking south from Belfield Road	Example of proposed right-of-way crossing a roadway with residences, wooded areas and open fields. Representative of common rural road views.	Local residents	Nebula-Raines Route 1
025	View looking northwest from Trinity Church Road	Example of proposed right-of-way crossing a roadway through a rural landscape with open fields and woodlands (with clearing). Representative of VSR Trinity Church.	Local residents	Nebula-Raines Route 1

KOP #	Location	Reason for Inclusion	Viewer Groups Represented	Project Components Represented
027	View looking southwest from Goodes Ferry Road over US 58	Example of proposed right-of-way crossing a roadway near an overpass. Representative of common rural road views.	Local residents, Motorists	Nebula-Raines Route 3; Nebula-Raines Route 4; Nebula-Raines Route 5
028	View looking southwest from US 58	Example of proposed right-of-way crossing a through-corridor roadway lined with trees. Representative of common rural road views.	Local/area residents, Motorists	Nebula-Raines Route 3; Nebula-Raines Route 4; Nebula-Raines Route 5
029	View looking northwest from Turtle Road	Example of proposed right-of-way crossing a roadway with farmsteads, wooded areas and open fields. Representative of common rural road views.	Local residents, Motorists	Nebula-Raines Route 1
031	View looking south from Baskerville Road	Example of proposed right-of-way crossing a rural landscape with open fields and trees. Representative of common rural road views.	Local residents, Motorists	Nebula-Raines Route 5
034	View looking southwest from Butts Street	Example of proposed substation interconnect through an industrial landscape with a wooded area, paved lot and commercial buildings.	Local residents, Workers	All Nebula-Raines route alternatives
035	View looking west from US 58	Example of proposed right-of-way crossing a divided through-corridor highway lined with trees. Representative of common rural road views.	Local residents, Workers	Nebula-Raines Route 5

KOP = key observation point; US = U.S. Route; VSR = visually sensitive resource.

KOP 003

Existing Conditions

KOP 003 is located on the east side of Antlers Road approximately 0.1-mile northeast of the Company's existing Lines #137 and #38. This KOP faces southwest and provides a restricted view of Antlers Road, due to the dense mature woodland of mixed evergreens and deciduous trees in the foreground on both sides of the roadway. The smooth, light grey, paved roadway of Antlers Road curves out of view due to the left, behind the screening trees on the east side of the roadway. Several unpaved private driveways branch off from Antlers Road and are partially screened by the mature trees. The view opens up somewhat at the right-of-way for Existing Lines #137 and #38. A berm of light to dark green mixed grasses and leafy shrubs is visible on the west side of the road, adjacent to a two-story rectangular residence and several outbuildings.

The primary viewer groups at KOP 003 include residents and motorists, who would have a medium to high sensitivity to visual changes at this spot. Due to the KOP's location along a roadway with dense woodland and several residences, views from KOP 003 would be static and dynamic, with the duration of the dynamic view dependent on the direction and speed of the viewer. The residents of Antlers Road would have static views from their homes and a higher sensitivity to visual change than motorists traveling along the roadway.

Visual Simulation/Rendering

Nebula-Raines Route 4 crosses Antlers Road less than 0.1-mile from KOP 003. The bottom portion of a single transmission line pole and multiple conductors would be visible from this location. The visible portion of the transmission line pole would be similar in form and color to nearby tree trunks, but the conductors would add new thin, horizontal lines across the foreground of the view. While the existing trees in the vicinity would partially obscure the transmission line in this area, the degree of vegetation removal in the Nebula-Raines Route 4 right-of-way would substantially reduce tree cover and create a more open view at KOP 003. This change would be most pronounced for viewers in the foreground, including nearby residents and motorists on Antlers Road. The remaining dense forest vegetation would likely help screen the transmission line from more distant locations to the north and south along Antlers Road. Due to the removal of trees and other vegetation, the impacts of Nebula-Raines Route 4 on visual conditions at KOP 003 would be moderate to high.

KOP 004A

Existing Conditions

KOP 004A would be located on the north side of the Antlers Road/Gold Miners Road intersection. This KOP faces southeast and provides an open view of the rural and rolling landscape from the top of a small rise. In the foreground, the medium grey, paved roadway of Antlers Road slopes downhill to the right and out of view. On the left (east) side of Antlers Road, a light grey crushed rock driveway is bordered by medium brown and light to medium green tall grasses and woody shrubs. Wooden post fences border the property and both sides of the driveway. Several clusters of tall, mature deciduous trees with branching medium grey textured trunks border the eastern

side of Antlers Road and partially obscure views into the adjacent field. The open field to the south is dominated by short, light brown and medium green grasses. The thin silver-grey monopoles of Existing Lines #137 and #38 are partially visible at the southeastern end of the field. These existing transmission lines are mostly absorbed into the forested background at this location. Wooden post fences border the property and both sides of the driveway. Several mature deciduous trees with branching medium grey textured trunks and medium to dark green leaves border the south interior side of the property fencing at the driveway and farther along Antlers Road to the south. A telecommunication line with dark brown wooden poles and thin horizontal conductors crosses and then parallels the left side of Antlers Road. Dense mixed evergreen and deciduous trees frame the background of the view creating an irregular horizon line.

The primary viewer groups at KOP 004A include residents and motorists. The residents along this portion of Antlers Road would have static views from their homes and a higher sensitivity to visual change than motorists traveling along the roadway. For motorists, the views from KOP 004A would be dynamic, with the duration of the view dependent on the direction and speed of travel.

Visual Simulation

Nebula-Raines Routes 1 and 3 would share the same alignment in this area and would be less than 0.1 mile from KOP 004A. The bottom of a single monopole (thin, brown, vertical structure) would be visible, but the top portion would be obscured by a large tree in the foreground of the view. The conductors would also be visible except where trees in the foreground blocks them. During leaf-off conditions, both the monopole and conductors would likely be visible through the trees. The installation of either Nebula-Raines Route 1 or Route 3 would add vertical and horizontal forms and lines to the view from KOP 004A, where similar infrastructure from existing Lines #137 and #38 and other distribution and telecommunication lines are also visible. The Project's infrastructure would be visible and would increase the perceived extent of development across this rural area. The changes in visual conditions due to either Nebula-Raines Route 1 or Route 3 would result in moderate to major impacts on visual resources at KOP 004A.

KOP 004B

Existing Conditions

KOP 004B is at the same location as KOP 004A but faces southwest. The landscape in this direction is characterized by a wide, open field covered in irregular piles of slash in the foreground, transitioning into multiple horizontal layers of forest cover. The forested areas along the periphery of the field and beyond generally limit more extensive views of the landscape from this location. In the foreground, a reddish-brown metal farm gate with wooden posts sits at the righthand side of the hairpin turn from Antlers Road and restricts access to Gold Miners Road. Due to the lack of foreground vegetation and varying heights of the more distant tree lines, the gently rolling topography of the area is noticeable from KOP 004B.

The primary viewer groups at KOP 004B include residents along this portion of Antlers Road and motorists. Similar to KOP 004A, the residents of Antlers Road would have static views from their homes and a higher sensitivity to visual change compared to motorists. Motorists would have

dynamic views of the landscape from this location, with the duration of the view dependent on the direction and speed of the viewer.

Visual Simulation

KOP 004B shows the continuation of the shared alignment of Nebula-Raines Routes 1 and 3 (from the view provided in KOP 004A) after they cross to the righthand side of Antlers Road. Recent timber activities have removed the dense forest cover that previously characterized this area. Due to the lack of tall screening vegetation at this location, the transmission line poles and conductors would be highly visible on the landscape. Two tall, vertical poles, each with four horizontal crossarms, would stand above the piles of slash in the foreground and above the tree line that extends across the perimeter of the timbered area in the middle ground. A third pole would be partially visible above this tree line on the righthand side of the photograph. Multiple pairs of slightly curved, thin, horizontal connectors would stretch between the poles and would be clearly visible against the open sky.

The installation of Nebula-Raines Route 1 or Route 3 would add new, prominent vertical and horizontal forms and lines to the landscape. The Project's monopoles along either Nebula-Raines Route 1 or Route 3 would be the tallest structures on the landscape, especially when viewed in the foreground and middle ground. This would result in a high degree of change to existing visual conditions at this location and correspondingly result in major impacts on visual resources at KOP 004B.

KOP 007

Existing Conditions

KOP 007 is located on the northeast side of Baskerville Road less than 0.1 mile northwest of the post office. This KOP faces northwest and provides an extensive view of a roadway and rural landscape. In the foreground, the smooth, paved, medium grey roadway of Baskerville Road extends diagonally to the right and is bordered by pale yellow and medium green grasses interspersed with purple and white flowers. On the left side of Baskerville Road, an open field with orange-red and medium green grasses with pale yellow tassels extends towards Wooden Bridge Road (not visible as it is screened by the tall grasses). A single, smooth wooden telecommunication pole with vines near the base and a taller, thinner radio tower are visible to the left. A line of dense mixed evergreen and deciduous trees extends from left to right across the view and generally encloses the landscape. These trees also limit more distant views, except in isolated locations (to the north along the Baskerville Road corridor and to the west/left toward the more distant radio tower). The thin, repeating, vertical poles of a distribution line that parallels Baskerville Road are visible, but the distribution poles are partially absorbed into the wooded backdrop. The conductors along this line are most visible in the foreground against the sky and harder to perceive against vegetated backgrounds. The left side of Baskerville Road includes a single, yellow road sign and a continuation of the high green and pale-yellow grasses with purple flowers. Dense mature trees also border the right side of Baskerville Road towards the intersection with Wooden Bridge Road.

The primary viewer group at KOP 007 is motorists (primarily local residents and workers) who would have a medium sensitivity to visual changes along this roadway. The views from KOP 007 would be dynamic, with the duration of the view dependent on direction and speed of travel.

Visual Simulation

Nebula-Raines Route 5 would cross Baskerville Road less than 0.1 mile to the north of KOP 007. The new transmission line would be highly visible on the landscape in this location. Due to the lack of screening elements. The wide-open fields that Nebula-Raines Route 5 crosses on both sides of Baskerville and Wooden Bridge Roads allows for unobstructed views of the long, linear route in this area. Two tall, vertical monopoles and their thin, horizontal crossarms would be visible as the route heads to the west (left). Multiple long, thin, horizontal conductors connect the monopoles and would be particularly visible against the sky. The brown color of the monopoles and darker hues of the conductors would generally complement the existing colors found throughout the landscape. While the new transmission line structures would add additional repeating, linear features to the view at this location, their contrast with existing conditions would be partially muted due to the existing level of development, as well as the current mix of forms, lines, and colors found in the landscape. As such, Nebula-Raines Route 5 would have a moderate impact on visual resources at KOP 007.

KOP 010

Existing Conditions

KOP 010 is located on the east side of Buggs Island Road approximately 0.9 mile south of Bethel Baptist Church. This KOP faces southeast and provides an extensive view of the rural agricultural landscape. In the foreground, a light grey gravel driveway heads curves to the left towards several outbuildings with silver-grey rooves and dark brown sides. Tall, medium to dark green evergreen and deciduous trees partially screen the buildings and views to the left. Dark reddish-brown swing gates are open and visible on each side of the driveway and several bright orange posts to the south of the driveway note underground utilities. Bright medium green groundcover vegetation borders both sides of the driveway before transitioning into muted yellow vegetation in an agricultural field to the south. A short segment of Buggs Island Road, a paved and striped, smooth, medium grey road, is visible along the righthand side of the view before curving out of sight behind the dense line of mature deciduous trees that border the right side of the roadway. A vegetated berm of medium green, light brown, and pale yellow grasses along the left side of Buggs Island Road screens further views of the adjacent fields. Contiguous areas of mixed mature evergreen and deciduous trees create a rolling, densely vegetated horizon line with occasional breaks in the trees showing distant vegetated hills, residences, and outbuildings.

The primary viewer groups at KOP 010 include residents and motorists. The residents along this portion of Buggs Island Road would have static views from their homes and a higher sensitivity to visual change compared to motorists. For motorists, the views from KOP 010 would be dynamic, with the duration of the dynamic view dependent on the direction and speed of the viewer.

Visual Simulation

Nebula-Raines Routes 1 and 3 would share the same alignment in this area and cross Buggs Island Road about 0.2 mile south of KOP 010. A single thin monopole would be visible in the field, with multiple conductors stretching to the left and right to monopoles that are screened by existing trees. The visible monopole would generally be taller than most other landscape features (e.g., trees, buildings, etc.) and the horizontal lines created by the conductors would be elevated above the distant tree line making them highly visible against the sky. Overall, the changes in landscape conditions due to either Nebula-Raines Route 1 or Route 3 in this location would result in moderate impacts on visual resources.

KOP 011

Existing Conditions

KOP 011 would be located on the east side of Baskerville Road approximately 0.5 mile south of the intersection with Iron Mill Road. This KOP faces southwest and provides a view of several rural residences. The geometric forms of several homes are partially visible through shrubs and trees. The smooth, medium grey, paved roadway of Baskerville Road bisects the small residential area and curves out of view to the left. Shallow vegetated ditches, lawns, and other short ground vegetation are found on both sides of the road. A low split-rail fence borders a field on the right side of the road, while a mailbox, newspaper box, and electrical box are clustered on the opposite side of the road. Several light brown distribution poles and thin, horizontal conductors cross the roadway and then disappear behind tall mature evergreen and deciduous trees. Short shrubs and large, mature, evergreen and deciduous trees with conical and amorphous shapes are scattered across the residential properties and along the side of the road. A field of pale yellow, light brown, and bright green grasses is partially visible through the trees in the distance. Both the trees in the foreground, as well as the tree line at the south side of the field screen most views beyond the foreground in this location.

The primary viewer group at KOP 011 is residents, although motorists travelling along Baskerville Road would also have views of the landscape in this location. The residents along this section of Baskerville Road would have static views from their homes and high sensitivity to visual change. For motorists, the views from KOP 011 would be dynamic, with the duration of the view dependent on the direction and speed of the viewer.

Visual Simulation

Nebula-Raines Routes 1, 3, and 4 would all cross Baskerville Road nearly 0.3 mile south of KOP 011. The proposed alignments for these routes would converge just east of Baskerville Road and then continue to the west within the same right-of-way. The gently rolling topography, as well as the trees and other structures between this location and the route alternatives would obscure all views of the proposed transmission line structures; therefore, Nebula-Raines Routes 1, 3, and 4 would result in no changes and no impacts on visual resources from KOP 011.

KOP 012

Existing Conditions

KOP 012 is located on the west side of Baskerville Road, approximately 0.7 mile north of the intersection with Redlawn Road. This KOP faces north and provides a view of the rural agricultural and forested landscape. The foreground is dominated by the smooth, paved, medium-grey roadway of Baskerville Road running north and disappearing into the trees in the distance, and an off-white/light-grey unpaved private driveway that is bordered by several large boulders heading to the left. Recently mowed green grasses and light-tan/yellow agricultural fields occupy both sides of Baskerville Road. A distribution line with medium grey-brown wooden poles parallels the left side of the road. Its thin conductors are somewhat visible against the sky as they extend from the pole to buildings to the right and left (mostly out of view). The geometric forms of several white buildings with red roofs are visible across the field on the right side of Baskerville Road. A clump of tall, amorphous-shaped trees near the buildings stands taller than many of the other landscape features in this area and partially blocks one of the buildings. A dense line of trees extends across and defines the back of the view from this location. These trees block views beyond the foreground in this location.

The primary viewer group at KOP 012 is residents who would be highly sensitive to visual changes in this area. Motorists on Baskerville Road would also have views of the landscape in this location and a higher sensitivity to visual change than motorists traveling along the roadway. For motorists, the views from KOP 012 would be dynamic, with the duration of the view dependent on the direction and speed of the viewer.

Visual Simulation

Nebula-Raines Routes 1, 3, and 4 would all cross Baskerville Road about 0.2 mile north of KOP 012. All three route alternatives converge to the east of Baskerville Road. Before converging, Nebula-Raines Route 1 would generally parallel Routes 3 and 4 but along a more southerly alignment (Routes 3 and 4 would share the same alignment in this area). After converging, these route alternatives would cross Baskerville Road and continue along a common alignment to the west.

To the right of Baskerville Road, Nebula-Raines Route 1 would be visible as it crosses through a rural residential and agricultural area. Two tall, thin, vertical transmission line poles would be visible, as would the thin horizontal conductors, except where they cross behind a tall cluster of trees. During leaf-off conditions, the full extent of the Nebula-Raines Route 1 conductors would potentially be visible through the trees.

Two transmission line poles associated with both Nebula-Raines Routes 3 and 4 would be visible to the left of Baskerville Road. The pole closest to Baskerville Road would be common to all three route alternatives (Nebula-Raines Routes 1, 3, and 4). The top of the second pole would appear as a very thin vertical line above the distant tree line to the right. At this distance, the elevated conductors would be slightly perceptible as thin lines extending horizontally from the pole. Because the Nebula-Raines Route 1 alignment is about 0.1 mile closer to KOP 012 than Routes 3 and 4, it would appear larger and more prominent on the landscape before the convergence point.

From the common convergence pole on the right side of Baskerville Road, all three route alternatives would continue along the same alignment to the left. A wide, open agricultural field to the left of the road facilitates views of the proposed transmission line in this area. Two transmission line poles would also be visible on the lefthand side of Baskerville Road. The bottom portion of both poles, as well as some of the lower conductors would be absorbed into the dense trees that define the northern extent of the agricultural field; however, the tops of the poles and conductors would be visible against the open sky above the tree line. While there are other tall, vertical forms and thin, horizontal lines on the landscape in this location, Nebula-Raines Routes 1, 3, and 4 all would add more prominent examples of these forms and would increase the level of visible development across this rural area. This would result in moderate impacts on visual resources at KOP 012.

KOP 014A

Existing Conditions

KOP 014A is located on the east side of US 1 approximately 0.1 mile south of the intersection with Cedar Grove Road. This KOP faces north and provides a view of the paved road and forest vegetation on each side of the roadway. The tall trees on each side of the road create an enclosed view with a focal point in the distance where the road disappears into the trees on the horizon. The light grey paved roadway with its double-yellow centerline and white edge lines contrasts with the textured, deep greens, browns, and tans of the adjacent forest vegetation. Due to the height and density of the adjacent vegetation, the view from KOP 014A in this location is primarily limited to the road corridor.

The primary viewer group at KOP 014A is motorists. Their views would be dynamic, with the duration of the view dependent on the direction and speed of the viewer. Motorists would have low to moderate sensitivity to changes in visual conditions at this KOP. Residents who live near (but not at) KOP 014A would have static views from their homes to the road corridor and would be more sensitive to visual changes than motorists.

Visual Simulation

Nebula-Raines Routes 3 and 4 would share the same alignment in this area and would be approximately 0.2 mile north of KOP 014A. The existing dense forest vegetation on both sides of US 1 would screen views of the transmission poles. The only evidence of the proposed routes would be several pairs of thin, horizontal conductors stretching across the road. At this distance, the conductors would be only slightly perceptible against the open sky above the road, but they would become more prominent as viewers (especially motorists) approach the crossing. The Nebula-Raines Routes 3 and 4 conductors would not be prominent and would therefore result in minor impacts on visual resources at KOP 014A.

KOP 014B

Existing Conditions

KOP 014B shares its location with KOP 014A, but the view is oriented to the southwest. The view in this direction is similarly enclosed by tall, dense vegetation on both side of the road. The roadway runs uphill to a rise and out of sight at a focal point in the distance. The views from KOP 014B are also limited to the US 1 corridor due to the dense trees on both sides of the road.

As is the case for KOP 014A, the primary viewer group at KOP 014B is motorists, with residents near (but not at) KOP 014B. Motorists would likely have low to moderate sensitivity while residents would have high sensitivity to visual changes in this area.

Visual Simulation

Nebula-Raines Route 1 would be nearly 0.2 mile south of KOP 014B. The existing dense forest vegetation on both sides of US 1 would screen views of the transmission poles. While no poles would be visible, the conductors would stretch across the road and would be visible as thin, horizontal lines crossing the sky above the road. The Nebula-Raines Route 1 conductors would be small change to existing conditions and would therefore result in minor impacts on visual resources at KOP 014B.

KOP 016

Existing Conditions

KOP 016 is located on the west side of the intersection of Plank Road and Snowbird Road. This KOP faces northwest and provides a view of the open field in front of the Lambert's Chapel Reformed Union Apostolic Church. Snowbird Road, a smooth, medium-grey, paved roadway, runs along the righthand side of the view up a gentle grade and out of sight. The right side of the roadway has a narrow, grassy, vegetated area that transitions into a dense wall of predominantly deciduous medium green leafy trees intermixed with a few dark green evergreens. These trees, as well as the forested area behind the church on the left side of the road enclose the view and limit more distant views of the landscape from this location. A smooth, maintained lawn leads from the intersection to the church. The brighter green lawn with small patches of bare soil generally complements the darker green hues of the surrounding vegetation. There is a bright white and green sign for the church on the lawn near the road. A length of dark brown steel pipe creates a strong horizontal shape in the foreground, next to the sign. The white and brick church building sits at the far end of the lawn and stands out from the dark, dense mature mixed evergreen and deciduous trees that border the back of the property.

The primary viewer groups at KOP 016 include motorists (primarily local residents and workers), as well as local residents who use the church. Motorists would have low to medium sensitivity to visual changes along this roadway. The views for motorists traveling along Plank Road would be dynamic, with the duration of the view dependent on direction and speed of travel. Churchgoers would have a higher level of sensitivity, although most church activities would likely occur inside the building.

Visual Simulation

Nebula-Raines Route 5 would be less than 0.1 mile west of KOP 016. The proposed transmission line would be visible in this location where it crosses Plank Road from the south and parallels the Lambert's Chapel Reformed Union Apostolic Church property before turning to the west. Vegetation removal adjacent to the church (on the west side of the property) would open views into the cleared right-of-way and create viewing opportunities of the proposed line. From this location, a single monopole would be visible, although remaining vegetation would partially obscure portions of the lower half of the pole and a couple of the horizontal crossarms on the right side of the pole. The top of the pole, multiple crossarms, and the conductors would be visible against the open sky above and to the left of the remaining tree line. The route alternative would be screened by existing vegetation behind (generally to the north/northwest) the church. The proposed route would add new tall, vertical forms and thin, horizontal lines on the landscape and generally increase the level of visible development in this location. The degree of vegetation removal and subsequent addition (and corresponding visibility) of transmission line infrastructure along Nebula-Raines Route 5 would result in moderate impacts on visual resources at KOP 016.

KOP 017

Existing Conditions

KOP 017 is located at the northwest corner of the intersection of US 1 and US 58 (South Hill Bypass). This KOP faces west/southwest along US 58. The highway dominates the foreground and appears as a smooth, medium-grey road with white dashed lane lines, white road edge striping, multiple road signs, and a vegetated median. Across the highway corridor (on the south side of US 58), a series of low, geometric, grey buildings denotes a cluster of commercial/industrial development. In addition to the buildings, paved parking lots with overhead lighting and low fencing are also visible. A distribution line is visible as it crosses US 58 to the right of the commercial/industrial area. The highway and buildings convey the developed character of the landscape in this area. Several lines of trees adjacent to the cleared US 58 right-of-way and behind the commercial/industrial development, generally limit panoramic views of the landscape from KOP 017.

The primary viewer group at KOP 017 is motorists (primarily local residents, commuters, and workers) who would have low-to-medium sensitivity to visual changes in this area. The views for motorists would be dynamic, with the duration of the view dependent on the direction and speed of travel.

Visual Simulation

Nebula-Raines Route 5 would be less than 0.1 mile south of KOP 017. The route alternative would be highly visible where it parallels the south side of US 58, crosses the highway, and continues to the west along a newly cleared right-of-way. The high degree of visibility would be due to proximity (primarily foreground views), the extent of the existing cleared highway right-of-way, the lack of existing screening features along the south side of US 58, and the extensive vegetation removal that would be needed to facilitate installation of the line where it crosses US 58 to the west. From KOP 017, a repeating series of transmission line poles connected by elevated

conductors would be visible. The tall, thin, vertical poles would rise above the nearby buildings and trees. The tops of the poles, including the thin, short, horizontal crossarms would be visible against the sky while the bottoms of the poles and some of the lower crossarms would be partially absorbed into the background vegetation. The thin, horizontal conductors that span the area between the poles and would also be visible against the sky. Similar to the lower half of the poles, the lower conductors would also be partially absorbed into the trees but would still be partially visible. Vegetation removal within the route's right-of-way, particularly to the west of US 58 would decrease vegetation density and create new viewing opportunities of the proposed route in this location. While KOP 017 is characterized by a high level of modification (e.g., highway, buildings, traffic signs, distribution lines) and similar forms, lines, and colors in the existing landscape, the monopoles and conductors would be prominent, especially when viewed in the foreground. Nebula-Raines Route 5 would therefore result in a moderate degree of change and therefore moderate impacts on visual conditions at KOP 017.

KOP 019

Existing Conditions

KOP 019 is located at the south side of Smith Cross Road nearly 0.9 mile southeast of the intersection with US Route 1. This KOP faces northwest and provides an enclosed view that is limited to the road corridor, due to the density of trees alongside and overhanging both sides of the roadway. The narrow roadway is a medium-grey paved surface that runs straight for a short distance before curving to the right out of sight behind the dense screen of tall deciduous trees. Several signs are visible on the left side of the roadway. The trees on both sides of the roadway have narrow light grey-brown vertical textured trunks with medium green leaves. The right side of the roadway has a low vegetated berm with medium green leafy groundcover vegetation. Immature trees and taller undergrowth are also visible amongst the trees. The dense forest cover on both sides of the roadway limit views outside of the immediate road corridor.

The primary viewer group at KOP 019 is motorists (primarily local residents and workers) who would have a medium sensitivity to visual changes along this roadway. The views from KOP 019 would be dynamic, with the duration of the view dependent on the direction and speed of the viewer.

Visual Simulation

Nebula-Raines Route 3 would be less than 0.1-mile northwest of KOP 019. Installation of the Project along this route would require vegetation clearing within the right-of-way that would somewhat reduce the enclosed nature of the views in this location. The immediate road corridor and cleared right-of-way would be more open compared to existing conditions, but the degree of adjacent dense, forest vegetation would still limit views to the foreground. Within the foreground, the cleared right-of-way and a single transmission pole would be visible. At this distance, only the bottom of the pole and portions of the lower conductors would be visible. The remaining trees and other vegetation would partially absorb the pole and conductors into the landscape, although these features would still be visible. The prominence of the pole and conductors may be more pronounced during leaf-off conditions. Due to the amount of vegetation clearing and the addition

of new development on the landscape (structures with prominent vertical and horizontal lines), Nebula-Raines Route 3 would result in major impacts on existing visual conditions at KOP 019.

KOP 021

Existing Conditions

KOP 021 is located on the southeast side of Goodes Ferry Road approximately 0.4 mile southwest of the intersection with Smith Cross Road. This KOP faces south and provides a panoramic view of the mix of rural, agricultural, and forested areas that characterize much of the study area's landscape. In this location, the foreground is dominated by a broad, open field with light-to-medium-green and light-brown grasses. A dark line in the field delineates the visible portion of an impounded pond. A contiguous line of darker green trees defines the southern extent of the field, creates a distinct line against the sky, and limits more distant views. The geometric forms of several residences and associated outbuildings are visible along the righthand portion of the tree lines. These lighter color buildings stand out against the darker green background of the trees. The tall, thin poles of a distribution line are discernible near the buildings but generally are absorbed into the forested background. Goodes Ferry Road, a light-grey, paved roadway with double-yellow striping and no shoulder, gently curves and disappears behind screening vegetation along the righthand side of the view. A large, distinct cluster of trees on the right side of the road blocks views to the southwest.

The primary viewer group at KOP 021 is residents. The residents along Goodes Ferry Road would have static views from their homes and a high sensitivity to changes in visual conditions. Motorists would be a second viewer group. Motorists traveling on Goodes Ferry Road would have dynamic views of the landscape, with the duration of the view dependent on the direction and speed of travel. These viewers would have low to medium sensitivity to changes in visual conditions.

Visual Simulation

Nebula-Raines Route 1 would be about 0.3 mile south of KOP 021. The proposed transmission line would be highly visible across the landscape from this location due to the low, open fields and lack of tall screening structures in the foreground. Four transmission poles and the associated conductors would be visible across the landscape, although the lower halves of the poles and the lower conductors would be screened or partially absorbed into adjacent forested areas. These poles would appear as tall, thin, vertical structures with short, horizontal crossarms that extend above the tree line and are taller than all other existing features on the landscape. Long, thin, slightly undulating horizontal conductors would stretch between the poles and would be most noticeable against the sky. While the proposed transmission line infrastructure would add visible new forms and lines, their prominence is slightly reduced due to distance and by the extent of forest cover that helps to absorb the structures into the landscape. As such, Nebula-Raines Route 1 would result in a moderate degree of change to existing visual conditions and would therefore have moderate impacts on visual conditions at KOP 021.

KOP 022

Existing Conditions

KOP 022 is located on the west side of Belfield Road just south of the intersection with Smith Cross Road. This KOP faces south and provides a view of a rural residential area near forested and agricultural lands. From this location, Belfield Road is a straight, smooth, medium-grey roadway that bisects the view. On the left side of the road, a mostly grey, single-story rectangular house with a small, matching shed is visible. Several rounded shrubs and small trees are scattered around the bright green lawn that extends around the home and to the road. A single pale-grey distribution pole (which also holds an overhead light) is visible at the end of the unpaved gravel driveway to the left of the residence. The west side of Belfield Road is an open field with medium green and reddish-brown grasses interspersed with golden yellow and white flowers. A distribution line parallels the right side of Belfield Road. Two distribution poles and conductors are visible but generally blend with the line of deciduous and evergreen trees that crosses the field and road to the south of the residential property. The road and distribution line's rights-of-way cut through the tree line and provide views of the field (pale green) and a more distant tree line (dark green) beyond.

The primary viewer group at KOP 022 is residents, who would have static views of the surrounding landscape from their homes. These viewers would have high sensitivity to changes in visual conditions in this area. Motorists on Belfield Road would also have views of the landscape. Because neither Belfield Road nor Smith Cross Road, are major thoroughfares, most of the potential motorists are likely also residents. Motorists who are not residents would have less sensitivity to visual changes compared to residents.

Visual Simulation

Nebula-Raines Route 1 would be approximately 0.3 mile to the south of KOP 022. The existing trees between the KOP location and the route alternative would generally screen most views of transmission line infrastructure. Portions of some conductors would be visible through gaps in the trees as thin, horizontal lines. The poles and conductors of Nebula-Raines Route 1 would potentially be more visible during leaf-off conditions. During leaf-off, the poles may be similar in form and color to the visible tree trunks and distribution poles, but the horizontal conductors would likely be more apparent (albeit thin and not visually prominent) due to their orientation across the landscape. As a result, Nebula-Raines Route 1 would only have minor impacts on visual resources at KOP 022.

KOP 025

Existing Conditions

KOP 025 is located on Trinity Church Road, approximately 0.7 mile south of the intersection with Boxwood Road, in the parking lot of Trinity United Methodist Church. The KOP faces northwest and provides a view of a rolling rural landscape with a mix of forested and agricultural fields. A short segment of Trinity Church Road (flat, smooth, light grey) crosses the foreground before turning and disappearing behind a dense group of mixed evergreen (dark green) and deciduous (medium

green) trees on the righthand side of the view. A small portion of the light grey paved church parking lot is also visible on the right side of the road. A distribution line with grey-green smooth wooden poles and thin, dark grey conductors parallels the left side of the roadway. One distribution conductor crosses the roadway and disappears into the trees. Immediately to the left of the KOP is a recently timbered area with a mix of light-grey and brown slash covering the ground. A clump of tall trees delineates the northern extent of the cleared timber area and partially screens more distant views from this location. Past this clump of trees, the landscape transitions into low, light-green grassy field areas. The lack of tall features both in the timbered area and the grass/agricultural field facilitates views of the dense, deeper green forested area that defines the background of the view from KOP 025.

The primary viewer groups at KOP 025 are church visitors/attendees and motorists (primarily local residents and workers), who would have medium sensitivity to visual changes along this roadway. The views from KOP 025 would be dynamic, with the duration of the view dependent on the direction and speed of travel. Churchgoers would have a higher level of sensitivity, although most church activities would likely occur inside the building.

Visual Simulation

Nebula-Raines Route 1 would be less than 0.1 mile to the north of KOP 025. The proposed transmission line would be visible from this location as it crosses Trinity Church Road from the right and continues to the left across the recently harvested area. Other than a cluster of trees near the road and along the periphery of the site, the lack of trees in this parcel creates wide, open viewing opportunities of the route for viewers traveling on Trinity Church Road, as well as from nearby static locations such as Trinity United Methodist Church. From this location, a single transmission line pole and several sets of conductors would be visible. Similar to other areas where new transmission line infrastructure would be visible, the single monopole would appear as a tall, thin, vertical form with short, thin horizontal crossarms, while the conductors appear as thin, long, horizontal lines that tend to be most visible against the sky. There are existing vertical forms (e.g., distribution line poles, tree trunks) and horizontal lines (e.g., distribution lines, roadway, top of the tree line against the sky) across the landscape, but Nebula-Raines Route 1 would add more such lines and would increase the perceived level of development in this area. Overall, the construction and installation of Nebula-Raines Route 1 and its associated components would have a moderate impact on existing visual conditions at KOP 025.

KOP 027

Existing Conditions

KOP 027 is located on Goodes Ferry Road, north of US 58, approximately 0.1 mile south of the intersection with Betty Lane. This KOP faces south and provides a view of a rural residential landscape commonly found in the area. Goodes Ferry Road is prominent in the foreground before meandering into the dark green tree line in the distance. The light grey, paved roadway with double-yellow centerline striping is bordered by silver-grey guardrails and low off-white cement walls on the bridge over US 58 (the highway is not visible from this location). A distribution line with repeating vertical light grey-brown wooden poles and thin black conductors parallels the right

side of the roadway and also crosses to the left side of the roadway to supply residences with electricity. The distribution line poles and conductors are visible but partially absorbed into the adjacent and background vegetation. A single, two-story white house features prominently on the landscape to the left of Goodes Ferry Road. A maintained lawn and multiple large trees dot the area between the roadway and the house. A second white building is partially visible through the trees in this area. The deciduous trees scattered across the yards of area residences, along with the adjacent densely forested areas on both sides of Goodes Ferry Road add height to the landscape and generally enclose views in the foreground at this location.

The primary viewer groups at KOP 027 include residents and motorists (primarily local residents, commuters, and workers). The residents would have static views from their homes and a higher sensitivity to visual change compared to motorists traveling along Goodes Ferry Road and other adjacent roads. For motorists, the views from KOP 027 would be dynamic, with the duration of the view dependent on the direction and speed of travel. These viewers would have low-to-medium sensitivity to visual changes on the landscape in this area.

Visual Simulation

Nebula-Raines Route 5 would be less than 0.1 mile to the south of KOP 027. The route alternative would be highly visible as it parallels the south side of US 58 in this area. The existing clearing along both US 58 and Goodes Ferry Road, as well as the adjacent lawns and low fields provide wide potential views of the proposed transmission line infrastructure. From KOP 027, a series of repeating transmission line poles connected by elevated conductors would be visible. The tall, thin, vertical poles would rise above the nearby trees. The tops of the poles including the thin, short, horizontal crossarms would be visible against the sky. The bottoms of the poles would be partially absorbed into the dense background vegetation. The thin, horizontal conductors span the area between the poles and would also be visible against the sky. The lower conductors would be partially absorbed into the nearby trees but would still be visible. Some vegetation removal would also be needed within the route's right-of-way. This would slightly decrease the vegetation density and height along this portion of the route. While there is a moderate level of modification (e.g., roads, distribution lines) and some similar forms, lines, and colors in the existing landscape, the monopoles would add the tallest structures and a series of long, horizontal lines across the sky in this area that would be prominent, especially when viewed in the foreground. Therefore, Nebula-Raines Route 5 would result in a high degree of change and major impacts on visual conditions at KOP 027.

KOP 028

Existing Conditions

KOP 028 is located on the north side of westbound US 58, approximately 1.2 miles east of the intersection with Theatre Road (see KOP 017). The KOP faces west along the highway corridor. The smooth, flat, medium-grey, paved highway with white striping dominates the foreground and middle ground, before disappearing into a forested area on the horizon. A vegetated median with green and brown grasses partially screens views of the eastbound lanes of US 58. Berms with short ground vegetation and topped by a dense line of trees create a walled corridor along the

south side of the highway. The tall mixed evergreen and deciduous trees add several shades of green to the landscape and create an uneven line against the sky. These trees also screen views to the right (north) and left (south) and help create a focal point at the far (right) end of the visible highway from this location.

The primary viewer group at KOP 028 is motorists (primarily local residents, commuters, and workers), who would have a medium sensitivity to visual changes along this roadway. The views from KOP 028 would be dynamic, with the duration of the view dependent on direction and speed of travel.

Visual Simulation

Nebula-Raines Routes 3 and 4 would share the same proposed corridor in this area along US 58. These routes would be less than 0.1 mile south of KOP 028 and would each result in similar changes to visual conditions. From this location, two transmission poles would be partially visible. One of the poles and its short, horizontal crossarms and horizontal conductors would extend above the tree line that parallels the US 58 right-of-way. A second pole on the right side of the view would mostly be obscured by trees but may be more visible during leaf off conditions. The proposed transmission line infrastructure would add prominent new forms and lines to the landscape and would generally increase the level of visible development along this portion of US 58. As such, Nebula-Raines Routes 3 and 4 would result in moderate impacts on visual conditions at KOP 028.

Nebula-Raines Route 5 would also be located along the southern side of US 58 and would share a portion of its right-of-way with Nebula-Raines Routes 3 and 4. Unlike Nebula-Raines Routes 3 and 4, Nebula-Raines Route 5 would continue to parallel the southern side of US 58 to the right (west) and would extend toward the western horizon. A series of tall, repeating, vertical transmission poles would be visible above the tree line. The new poles would be the tallest structures on the landscape and would generally increase the perceived level of development in this location. The thin conductors would be most prominent in the foreground where they extend above the tree line against the sky. The conductors would be less apparent where they are further from the viewer. The Nebula-Raines Route 5 transmission line infrastructure would add prominent new forms and lines and would increase the level of visible development on the landscape. Nebula-Raines Route 5 would affect a more extensive portion of US 58 than Routes 3 and 4 but would also result in moderate impacts on visual conditions at KOP 028.

KOP 029

Existing Conditions

KOP 029 is located on Turtle Road approximately 0.2 mile north of the intersection with Green Pines Lane. This KOP faces northwest and includes an expansive agricultural area in front of a distant tree line. Turtle Road is a medium-grey paved roadway that curves to the left as it heads towards Rocky Branch Road. It cuts through the agricultural area before disappearing behind the tree line. Both sides of the road have low fencing and open green grassy fields. The roadside vegetation on the left side of the road is overgrown with taller, medium-green grasses with light-tan seed heads. The fence on the left side of the road has vertical square wooden posts and metal

stakes with thin, horizontal fabric fence lines. The grassy field beyond the fence slopes towards a small, impounded pond. Several darker-green and brown shrubs are scattered along and inside the fence line, and two silver-grey circular hay troughs are visible at the lefthand extent of the view. There is a similar mix of square wooden posts and metal stakes delineating the fence on the right side of Turtle Road. Thin horizontal wires are barely perceptible between the posts and stakes. The low, green grass field slopes downward toward the right on this side of the road. A dense line of trees at the northern end of the fields on both side of the road frames the back of the view from this location. While the distinct and amorphous forms of some individual trees positioned closer to the viewer stand out, most of the trees appear to form a long, vegetated wall that serves as the horizon line at KOP 029.

The primary viewer groups at KOP 029 include residents and motorists (primarily local residents and workers). Residents along Turtle Road would have static views from their homes and a higher sensitivity to visual change than motorists. For motorists, the views from KOP 029 would be dynamic, with the duration of the view dependent on direction and speed of travel. Their sensitivity to visual changes would likely be low to medium.

Visual Simulation

Nebula-Raines Route 1 would be located slightly more than 0.2 mile north of KOP 029. Similar to other areas that have broad, open fields and lack tall screening structures, the proposed transmission line would be highly visible across the landscape from this location. Four transmission poles and the conductors that span the area between the poles would be visible, although the lower halves of the poles and the lower conductors would be partially absorbed into or sit behind the trees at the northern extent of the view. Two of the transmission line poles would be fully visible in front of nearby trees. These poles would appear as tall, thin, vertical structures that are taller than all other existing features on the landscape. The thin tops of the two remaining poles and their short, horizontal crossarms would be partially visible above the tree line to the north of KOP 029. Long, thin, slightly undulating horizontal conductors would stretch between the poles. The transmission line infrastructure at KOP 029 would not only add prominent new forms and lines but would also increase the magnitude of visible modifications to the landscape in this area. Nebula-Raines Route 1 would result in a high degree of change to existing visual conditions in the foreground and would therefore have major impacts on visual conditions at KOP 029.

KOP 031

Existing Conditions

KOP 031 is located on Baskerville Road approximately 0.3 mile north of the intersection with Wooden Bridge Road. This KOP faces south and provides a view of a wide agricultural field bordered by forest and bisected by a rural road. Baskerville Road, a flat, light grey, linear strip of roadway with double-yellow lines running through the middle of the roadway, heads diagonally from left to right across the view towards the intersection with Wooden Bridge Road. The road disappears into the trees that form the backdrop of the view and limit more distant views along the road corridor. Open fields border both sides of the roadway with dense blankets of light-to-medium-green, golden, and pale-yellow grasses. A telecommunication line with grey-brown,

vertical, wooden poles and thin, horizontal conductors parallels the left side of Baskerville Road. The poles are most perceptible closest to the KOP and blend into the forested background at farther distances. Dense, contiguous forested areas border the fields to the left and right of Baskerville Road, creating a solid wall of green that defines and limits the view from KOP 031 to the foreground.

The primary viewer group at KOP 031 is motorists (primarily local residents, commuters, and workers). Motorist views from KOP 031 would be dynamic with the duration of the view dependent on direction and speed of travel. These viewers would have low to medium sensitivity to visual changes along this roadway.

Visual Simulation

Nebula-Raines Route 5 would be located approximately 0.4 mile to the south of KOP 031. At this distance, the tops of several transmission line poles and some conductors would be visible above the tree line at the southern extent of this view. The tops of three poles would appear as thin, vertical forms that extend above the trees and the higher-positioned conductors would appear as thin, horizontal lines that stretch between the poles. The bottoms of the poles and the lower conductors would be screened by trees. At this distance (in the middle ground of the view) and scale, the proposed transmission line infrastructure would be partially absorbed into the landscape, which would help decrease the magnitude of change to existing visual conditions. While Nebula-Raines Route 5 would increase the level of visible development, the changes would generally result in minor impacts on visual conditions at KOP 031.

KOP 034

Existing Conditions

KOP 034 is located at the north end of a parking lot at an industrial area on the southeast side of the intersection of Butts and Raines streets. This KOP faces southwest and provides a view of the Interstate Industrial Park. The foreground of the view is dominated by developed features, including parking areas, buildings, fencing, light poles, and mobile equipment and vehicles. Two tall, rough-barked deciduous trees with medium green leaves border the right side of the parking lot, while three blue-green evergreen trees demark the far border of the parking lot. A chain-link fence surrounds the property, and several thin, vertical light poles are visible along the periphery of the left side of the parking lot. The paved, light-grey roadway of Butts Street is visible along the right side of the fenced property and terminates at a construction area characterized by cement culverts, construction vehicles, and additional chain-link fencing. The low, geometric forms of several buildings (likely construction trailers) are visible beyond the chain-link fence and contribute to the overall high level of development at this location. The right side of Butts Street is densely wooded with mixed medium to dark green evergreens and medium green deciduous trees. These trees screen views to the right. Beyond the industrial park and adjacent construction area, the rolling, forested landscape is partially visible in the distance and creates a low, solid green horizon line.

The primary viewer group at KOP 034 is workers who would have a low-to-medium sensitivity to visual changes, because most of their work would be indoors. The views from KOP 034 would be static within the parking lot and dynamic along Butts Street.

Visual Simulation

The future Raines Substation, which is not a component of the Project, and the eastern terminus of all four routes, would be located about 0.1 mile southwest of KOP 034. The low, grey substation (which would be constructed as part of the South Hill Project) would be visible through a gap in the trees and add to the level of development in this location. Project infrastructure would be fully screened from existing vegetation. As such, the proposed Project would have no impacts on visual resources at KOP 034.

KOP 035

Existing Conditions

KOP 035 is located on US 58 approximately 0.5 mile southeast of Antlers Road. The KOP faces northwest and provides a view of a divided highway through a forested area. The KOP sits at a lower elevation along the highway. From the KOP, the highway rises to the northwest, limiting views to the foreground. The US 58 corridor dominates the foreground and appears as a medium grey, multi-lane paved roadway with a vegetated median and low, silver-grey guardrails paralleling the roadway on both the inner and outer sides of the traveling lanes. The repeating vertical poles and thin, horizontal conductors of a distribution line parallels the right side of the roadway. The distribution line is visible but partially absorbed into the forested area behind the line. A dense mix of multi-hued green evergreens and deciduous trees frame both the right and left sides of the highway and enclose views to the highway corridor.

The primary viewer group at KOP 035 is motorists (primarily local residents, commuters, and workers). These viewers would have dynamic views of the highway corridor, with the duration of the view dependent on their direction and speed of travel. Motorists would have low-to-medium sensitivity to visual changes at this KOP.

Visual Simulation

Nebula-Raines Route 5 crosses US 58 less than 0.1 mile to the west of KOP 035. A new, tall, vertical pole would be visible on the righthand side of US 58. Thin, horizontal conductors would extend both to the right and left from this single pole. The pole and conductors would be most visible against the sky and partially absorbed but still visible in front of the adjacent vegetation. The new transmission line infrastructure would be similar to the existing distribution line (e.g., repeating vertical poles and directional horizontal lines) that parallels the right side of the highway but would be taller and more prominent on the landscape, especially when viewed at close range. While the view from KOP 035 places Nebula-Raines Route 5 in the foreground, it would also be visible from greater distances along this portion of US 58. Due to the overall level of modifications created along the US 58 corridor and similarity with existing forms, lines, and colors, Nebula-Raines Route 5 would result in minor to moderate impacts on existing visual conditions at KOP 035.

4.3.2 IMPACT ASSESSMENT

4.3.2.1 IMPACT ASSESSMENT FOR VISUALLY SENSITIVE RESOURCES

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, human-made development, etc.), duration of the view, 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 study area. Table 4.3-4 describes the Project's anticipated impacts on visual resource conditions at each VSR Table 4.3-4and indicates a potential impact rating (major, moderate, minor, or negligible) for each VSR.

TABLE 4.3-4 SUMMARY OF ANTICIPATED IMPACTS BY VISUALLY SENSITIVE RESOURCE AND KEY OBSERVATION POINT

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating/ Visual Sensitivity
Educational Resources				
1	Mecklenburg County High/Middle School	NA	All measurements are taken from the main entrance to the school. All Nebula-Raines routes would require vegetation clearing. • Nebula-Raines Route 4 (MPs 11.2 to 11.8) is approximately 1.0 mile to the south and runs through forested areas. • Nebula-Raines Route 5 (MPs 10.8 to 11.2) is approximately 1.1 miles to the west crossing open fields and the edge of a forested area.	Impact: Negligible to Minor due to screening by topography and vegetation. Visual sensitivity is medium because most activities occur inside the school building, except for outdoor activities and sporting events.
2	South Hill Elementary	NA	All measurements are taken from the main entrance to the school. All Nebula-Raines routes would require vegetation clearing. • Nebula-Raines Routes 3 and 4 (MP 1.3) share the same corridor approximately 1.0 mile to the south and would parallel the south side of US 58 before heading southwest. • Nebula-Raines Route 5 (MPs 1.3 to 1.6) is approximately 0.9 mile to the south paralleling the south side of US 58.	Impact: Negligible to Minor due to distance and screening by vegetation. Visual sensitivity is low because most activities would occur inside the school building and outdoor activities would be screened by the school building.
Places of Worship & Cemeteries				
3	Bethany Baptist Church and Cemetery	NA	All Nebula-Raines routes would require vegetation clearing. • Nebula-Raines Route 1 (MPs 10 to 10.1) is approximately 0.7 mile to the south crossing Baskerville Road. • Nebula-Raines Routes 3 and 4 (MPs 9.0 to 9.1 and MP 9.5) share the same corridor and cross Baskerville Road approximately 0.7 mile to the south; and would cross open fields and woodland approximately 0.6 mile to the southeast.	Impact: Negligible due to distance and screening by vegetation. Visual sensitivity is low to medium, because most activities occur inside the church building.
4	Bethel Baptist Church	NA	Nebula-Raines Route 4 (MPs 11.1 to 11.2) crosses Buggs Island Road and open agricultural fields	Impact: Minor to Moderate, because the route crosses nearby open views.

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating / Visual Sensitivity
			running northwest-southeast, approximately 0.1-mile south of the front doors to the church. Additional vegetation clearing would occur on the west side of Buggs Island Road.	Visual sensitivity is low to medium due to proximity to the church, although most activities would occur inside the building.
5	Bloom Hill Baptist Church	NA	Nebula-Raines Route 5 (MPs 6.8 to 7.3) crosses the rural agricultural and wooded landscape approximately 0.4 mile to the south and would require additional vegetation clearing.	Impact: Negligible, due to distance from the corridor and screening by vegetation. Visual sensitivity is low to medium due to proximity to the church, although most activities would occur inside the building.
6	Greater Hayes Grove Baptist Church	NA	Nebula-Raines Route 5 (MPs 5.2 to 5.8) crosses Union Level Road approximately 0.1-mile southeast of the church. The corridor runs northeast-southwest through rural agricultural and wooded landscapes and would require additional vegetation clearing.	Impact: Minor to Moderate, because the route crosses nearby open views. Visual sensitivity is low to medium due to proximity to the church, although most activities would occur inside the building.
7	Kingdom Hall of Jehovah's Witnesses	NA	Nebula-Raines Routes 3 (MPs 5.3 to 5.6) and 4 (MPs 6.7 to 6.9) share the same corridor at this location and cross the rural timbered landscape approximately 0.7 mile to the southeast, west of Smith Cross Road.	Impact: Minor, because potential views of the routes would be limited to the skylined upper portions of transmission infrastructure above the tree line, along with topography, screening vegetation, and distance from the corridor. Visual sensitivity is low to medium, because most activities likely occur inside the building and views would be stationary.
8	Lambert's Chapel Reformed Union Apostolic Church and Cemetery	016	Nebula-Raines Route 5 (MPs 3.1 to 3.3) crosses approximately 200 feet southwest of the church entrance on the west side of a line of mature trees. The corridor crosses through rural agricultural and forested areas and would require additional vegetation clearing.	Impact: Minor to Moderate, because the route crosses nearby views with upper skylined portions visible above the tree line. Visual sensitivity is low to medium due to proximity to the church, although most activities would occur inside the building.
9	Saint Andrews Church and Cemetery	NA	Nebula-Raines Route 5 (MPs 8.5 to 9.0) crosses rural residential and timbered landscape approximately	Impact: Minor, due to distance from the corridor and screening vegetation.

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating/ Visual Sensitivity
			0.2-mile north of the church. The corridor would require additional vegetation clearing.	Visual sensitivity is low to medium because most activities likely occur inside the building and views would be stationary.
10	Trinity United Methodist Church	025	Nebula-Raines Route 1 (MPs 3.6 to 3.7) crosses Trinity Church Road approximately 0.1 mile north of the church. The corridor crosses rural agricultural and timbered land requiring additional vegetation clearing.	Impact: Minor to Moderate, because the route crosses nearby views. Visual sensitivity is low to medium due to proximity to the church, although most activities would occur inside the building.
11	Hudson Family Cemetery (Willie Hudson Cemetery)	NA	Nebula-Raines Route 1 (MPs 1.7 to 2.1) crosses rural agricultural and timbered land/forested areas approximately 0.2 mile east of the cemetery and would require additional clearing.	Impact: Minor to Moderate, because the route crosses nearby open views. Visual sensitivity is medium due to outdoor activities at the cemetery.
Recreational Resources				
12	Beaches to Bluegrass Trail	021 027	All Nebula-Raines routes would require additional vegetation clearing where they cross forested lands. • Nebula-Raines Route 1 (MPs 0.5 to 0.9) crosses Rocky Branch Road approximately 0.7 mile east of the intersection with Goodes Ferry Road. • Nebula-Raines Route 1 (MPs 5.6 and 5.8 to 6.1) crosses Goodes Ferry Road approximately 0.8 mile south of the intersection with Smith Cross Road. • Nebula-Raines Routes 3, 4, and 5 (MPs 0.5 to 0.7) share the same corridor and cross Goodes Ferry Road on the south side of US 58 approximately 0.1 mile north of the intersection with Butterworth Lane.	Impact: Minor to Moderate, because roadway views are limited to roadway crossings due to existing vegetation and topography. Visual sensitivity is low to medium for motorists.
13	Christanna Loop	010 014A 014B 017 035	All Nebula-Raines routes would require additional vegetation clearing where they cross forested areas. • Nebula-Raines Route 1 (MPs 7.3 to 7.4 and MPs 10.9 to 11.5) crosses US 1 approximately 0.3 mile south of the intersection with Cedar Grove Road through dense forested areas on both sides of the roadway. Nebula-Raines Route 1 would open views along the corridor on either side of the road.	Impact: Minor to Moderate as views would be limited to immediate road crossings due to existing vegetation and topography. Visual sensitivity is medium for motorists as the purpose of the loop is birding and wildlife sightings.

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating/ Visual Sensitivity
			• Nebula-Raines Routes 1 (MPs 10.8 to 11.5) and 3 (MPs 10.4 to 11.0) share the same corridor and cross Buggs Island Road 1.4 miles south of the intersection with Iron Mill Road across open agricultural and timbered lands. Due to the open landscape, the corridor would be visible beyond the roadway crossing. • Nebula-Raines Route 3 (MPs 10.4 to 11) crosses Buggs Island Road approximately 1.4 miles south of the intersection with Iron Mill Road with open agricultural views to the east and agricultural fields bordered by forest to the west. • Nebula-Raines Route 4 (MPs 10.9 to 11.3) crosses Buggs Island Road approximately 0.5 mile south of the intersection with Iron Mill Road, with open agricultural views to the east and forested views to the west • Nebula-Raines Routes 3 (MPs 6.7 to 6.8) and 4 (MPs 6.7 to 6.8) share the same corridor parallel US 1 approximately 0.7 mile to the east, through timber/forested areas that limit views to the upper portions of transmission structures that are skylined above the tree line. Routes 3 and 4 then crossing US 1 approximately 1.1 miles south of the intersection with US 58 in an area with forest on both sides of the road. • Nebula-Raines Route 5 (MPs 2.4 to 2.7 and 11.0 to 11.3) crosses US 1 at the split with the South Hill Bypass (US 58) in an area with timbered land to the northwest and a commercial area with forested buffer to the southeast. The corridor also crosses US 58 approximately 0.4 mile east of Antlers Road with agricultural land to the north and forested areas to the south.	
14	East Coast Greenway	011 012 016 027	All Nebula-Raines routes would require additional vegetation clearing.	Impact: Minor to Moderate, because potential views cross the roadway in areas with open views.

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating / Visual Sensitivity
			• The impacts of Nebula-Raines Route 1 between MPs 0.4 and 1.1 would be the same as described for VSR 12 at Rocky Branch Road. • Nebula-Raines Route 1 (MP 5.6 and MPs 5.8 to 6.1) crosses this VSR where it uses Goodes Ferry Road approximately 1.8 miles north of the intersection with Redlawn Road, crossing through open agricultural fields that transition to forested areas away from the roadway. • Nebula-Raines Routes 3, 4, and 5 (MPs 0.5 to 0.7) share the same corridor for this VSR. The impacts of these routes would be the same as described for VSR 12 at Goodes Ferry Road.	Visual sensitivity is medium as the purpose of the greenway is showcasing natural views for bicyclists along existing roadways.
15	Lake Gordon Recreational Area	NA	Nebula-Raines Route 5 (MPs 4.4 to 5.1) crosses through timbered lands approximately 0.1 mile north of the northernmost tip of Lake Gordon, in a northeast-southwest direction. The route would require additional vegetation clearing.	Impact: Minor, because potential views would be limited to skylined upper portions of transmission towers. Visual Sensitivity is medium due to static and dynamic views from vessels on the lake.
16	Park View Athletic Complex	NA	Nebula-Raines Route 5 (MPs 2.7 to 2.9) crosses timbered land on the east side of the VSR and would require additional vegetation clearing.	Impact: Minor, because potential views would be limited to of the skylined upper portions of transmission towers. Visual sensitivity is medium due to outdoor sporting activities.
17	Tobacco Heritage Trail	027	This VSR includes the roadway crossings for VSRs 12 and 14 and would require additional vegetation clearing through timber areas. • The impacts of the Nebula-Raines Route 1 (MPs 0.4 to 1.1) would be the same as VSR 12 at Rocky Branch Road. • Nebula-Raines Routes 1 (MP 12.1) and 3 (MP 11.7) share the same corridor where it crosses an off-road trail segment that runs road through forested areas on the east side of Allen Creek.	Impact: Moderate to Major, because the trail uses both on-road (motorized use) and off-road segments (pedestrian use) with structures visible at varying distances from the trail. Visual sensitivity is high due to outdoor recreation use.

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating/ Visual Sensitivity
			• The impacts of Nebula-Raines Routes 3 through 5 (MPs 0.5 to 0.7) would be the same as VSR 12 at Goodes Ferry Road. • Nebula-Raines Route 4 (MP 12.0) crosses the Trail approximately 0.9 mile north of where Routes and 1 and 3 cross, also on the east side of Allen Creek through a forested/riparian area, west of Buggs Island Road. • Nebula-Raines Routes 3, 4, and 5 (MPs 0.5 to 0.7) cross the Trail on the south side of US 58 where the Trail follows Goodes Ferry Road. • Nebula-Raines Route 5 (MPs 8.4 to 8.6 and 11.4 to 11.6) crosses the Trail approximately 0.5 mile east of the Baskerville Road/Wooden Bridge Road intersection through timbered areas; and again 0.3 mile south of US 58 and approximately 0.4 mile east of Antlers Road through forested areas north of several agricultural fields.	
18	US Bike Route 1	011 012 031	All Nebula-Raines routes cross open agricultural land and forested areas along Buggs Island Road (south of US 58) or Wooden Bridge Road to Baskerville Road (north of US 58). Nebula-Raines Routes 1 and 3 share the same corridor. All Nebula-Raines routes would need additional vegetation clearing. • The impacts of Nebula-Raines Routes 1 (MPs 10.9 to 11.5), 3 (MPs 10.4 to 11), and 4 (MPs 10.9 to 11.3) would be the same as VSR 13 at Buggs Island Road. • Nebula-Raines Route 5 (MPs 8.9 to 9.1) crosses Wooden Bridge Road approximately 0.1 mile southeast of the intersection with Baskerville Road and has open agricultural fields to the east and forested lands to the west.	Impact: Moderate, because potential views cross the roadway in areas with open views. Visual sensitivity is medium to high due to recreation use on a roadway.
Road Corridors				
19	Baskerville Road	007 011 012	Vegetation removal would be necessary for all Nebula-Raines routes where they cross forested areas.	Impact: Minor to Moderate, because potential views cross the roadway in areas with open and forested views.

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating/ Visual Sensitivity
		031	• Nebula-Raines Route 1 (MPs 10.9 to 11.5) • Nebula-Raines Route 3 (MPs 10.4 to 11) • Nebula-Raines Route 4 (MPs 10.9 to 11.3) • The crossing for Nebula-Raines Routes 1, 3, and 4 are the same as described above for VSR 18 (US Bike Route 1). • Nebula-Raines Route 5 (MPs 8.8 to 9.0) crosses approximately 0.1 mile southeast of the intersection with Wooden Bridge Road, through the same landscape as described for VSR 18.	Visual sensitivity is low to medium for motorists.
20	Buggs Island Road/Old Wooden Bridge Road	010	The crossings and impacts of Nebula-Raines Routes 1, 3, and 4 are the same as described for VSR 13 (Christanna Loop). • Nebula-Raines Route 1 (MPs 10.8 to 11.5) • Nebula-Raines Route 3 (MPs 10.4 to 11.0) • Nebula-Raines Route 4 (MPs 10.9 to 11.3)	Impact: Minor to Moderate, because potential views cross the roadway in areas with open views. Visual sensitivity is low to medium for motorists.
21	Smith Cross Road	019	Nebula-Raines Routes 3 and 4 (MPs 5.4 to 5.5) cross the roadway northeast-southwest approximately 0.7 mile southeast of the intersection with US 1, through a wooded area on both sides of the roadway, which would require extensive vegetation clearing.	Impact: Minor to Moderate, because potential views cross the roadway in forested areas, so views are limited to the immediate roadway or to views of the upper portions of structures above the tree line. Visual sensitivity is low to medium for motorists.

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating / Visual Sensitivity
22	US 1	014A 014B	The crossings and impacts of Nebula-Raines Routes 1, 3, and 4 are the same as described for VSR 13 (Christanna Loop) and would require vegetation clearing in woodland areas on both sides of the roadway. • Nebula-Raines Route 1 (MPs 7.3 to 7.4) • Nebula-Raines Route 3 (MPs 6.7 to 7.3) • Nebula-Raines Route 4 (MPs 6.7 to 7.3)	Impact: Minor to Moderate, because potential views cross the roadway in forested areas, so views are limited to the immediate roadway or to views of the upper portions of structures above the tree line. Visual sensitivity is low to medium for motorists.
23	US 58	017 028 035	• Nebula-Raines Route 3 (MPs 0.6 to 1.3) • Nebula-Raines Route 4 (MPs 0.6 to 1.3) • Nebula-Raines Route 5 (MPs 0.6 to 1.5, 2.2 to 2.5, and 10.2 to 11.3) • Nebula-Raines Routes 3, 4, and 5 share the same corridor parallel to US 58 from MPs 0.5 to 1.3. Some vegetation clearing would be required between MPs 0.7 and 0.8. • Nebula-Raines Route 5 runs parallel to US 58 from MPs 1.3 to 2.4 and crosses US 58 at MP 2.5. This route would require additional vegetation clearing along the south side of US 58 between MPs 1.3 and 2.2. • The impacts of the Nebula-Raines Route 5 crossing of US 58 would be the same as discussed for VSR 13 (Christanna Loop).	Impact: Moderate, because potential views parallel the roadway and cross the roadway in areas with open views. Visual Sensitivity is low to medium for motorists.
Areas of High Public Concentration				
24	Baskerville CDP	007 031	The crossings and impacts of Nebula-Raines Route 5 (MPs 8.8 to 9.0) are the same as discussed for VSR 19 (Baskerville Road).	Impact: Minor to Moderate, because potential views cross the roadway in open and forested areas. Visual sensitivity is low to medium for motorists, and medium for local residents who would have views of the corridor.
25	Town of South Hill	016 027 028	The mileposts below indicate where each Nebula-Raines route would be visible from a residence or public road.	Impact: Minor to Moderate

VSR #	VSR Name	KOP #	Relevant Route(s) and Impacts	Potential Impact Rating/ Visual Sensitivity
		034	• Nebula-Raines Route 1 (MPs 0 to 0.1) • Nebula-Raines Route 3 (MPs 0 to 0.1 and 0.5 to 1.1) • Nebula-Raines Route 4 (MPs 0 to 0.1 and 0.5 to 1.1) • Nebula-Raines Route 5 (MPs 0 to 0.1, 0.5 to 1.9, and MPs 3.1 to 3.2) All Nebula-Raines routes would be visible from the current terminus of Butts Street at the future Raines Substation location within an industrial park. Construction of the route corridors would require vegetation clearing. The routes cross forested land and open agricultural fields within and near South Hill. Crossings of specific VSRs within South Hill are provided above.	Visual sensitivity is low to medium for motorists and medium to high for residents who would have views of the corridors.
26	Unincorporated Mecklenburg County	All except 007, 016, 027, 028, 031, and 034	Segments of all Nebula-Raines route alternatives would be intermittently visible from unincorporated areas of Mecklenburg County for the entire extent of the Project. The routes would cross forested land (which would require vegetation clearing) and open agricultural fields. Crossings of specific VSRs are provided above.	Impact: Minor to Moderate, because potential views cross the roadway in open and forested areas. Visual sensitivity is low to medium for motorists and medium to high for residents.

CDP = Census Designated Place; KOP = key observation point; NA = not applicable; VSR = visually sensitive resource.

4.3.2.2 IMPACT ASSESSMENT BY ROUTE ALTERNATIVE

Table 4.3-5 summarizes the anticipated impacts on visual conditions from the Cloud-Raines Route and Nebula-Raines Routes 1, 3, 4, and 5. This table also provides a potential impact rating (major, moderate, minor, or negligible) for each route.

Cloud-Nebula Route

Transmission line infrastructure installed along the Cloud-Nebula Route is almost entirely through timbered land, much of which is adjacent to an existing data center. The route would potentially be visible from the southern end of Herbert Drive where it enters the data center, although the route at this location would be visible behind the infrastructure of the data center and the existing Cloud Switching Station and Dominion's existing Lines #1041 and #38. Viewed from this location, the Cloud-Raines Route transmission infrastructure would generally be similar or compatible with to visible existing data center and electrical infrastructure.

Nebula-Raines Route 1

Nebula-Raines Route 1 would primarily cross woodland/timber production areas but would be most visible where the route crosses and runs parallel to public roads, including US 1, Baskerville Road, and Buggs Island Road. Views would primarily be from residences near the route or vehicles travelling along those roadways. The rolling landscape and dense woodlands screen large segments of the route. Where visible, Nebula-Raines Route 1 would introduce tall vertical poles and elevated horizontal linear conductors to the landscape. While the weatherized steel material of the poles would blend with tree trunks in forested landscapes, it could attract the eye in agricultural and open areas. Nebula-Raines Route 1 would require significant vegetation removal along most of the corridor. Vegetation clearing would reduce the screening effects of vegetation and may create new opportunities to view the surrounding landscape, including the transmission infrastructure. Nebula-Raines Route 1 transmission infrastructure would generally be comparable in appearance to existing transmission and distribution infrastructure in the study area; however, the height of the new transmission lines would make them more prominent than existing infrastructure, especially when viewed at close range.

Nebula-Raines Route 3

Nebula-Raines Route 3 would primarily cross woodland/timber production areas east of Baskerville Road before sharing the same corridor as Nebula-Raines Route 1 to the west of Baskerville Road. Overall, the impacts of Nebula-Raines Route 3 would be similar to those described for Nebula-Raines Route 1, except for larger impacts where the route parallels the south side of South Hill Bypass (US 58) and would be prominently visible. While the weatherized steel material of the poles would blend with tree trunks in forested landscapes, it could attract the eye in agricultural and open areas. Nebula-Raines Route 3 would require significant vegetation removal along most of the corridor, particularly in forested areas. Vegetation clearing would reduce the screening effects of vegetation and may create new opportunities to view the surrounding landscape, including the transmission infrastructure. Nebula-Raines Route 3 transmission infrastructure would generally be comparable in appearance to existing transmission and distribution infrastructure in

the study area; however, the height of the new transmission lines would make them more prominent than existing infrastructure, especially when viewed at close range.

Nebula-Raines Route 4

Nebula-Raines Route 4 shares the same corridor as Nebula-Raines Route 3 for the first 10 miles from future Raines Substation through open agricultural fields and woodland/timber areas and would be most visible where it parallels South Hill Bypass and at other road crossings. West of Baskerville Road, Nebula-Raines Route 4 runs through dense timber and forest areas. While the weatherized steel material of the poles would blend with tree trunks in forested landscapes, it could attract the eye in agricultural and open areas. Similar to Nebula-Raines Routes 1 and 3, Nebula-Raines Route 4 would require significant vegetation removal along most of the corridor, particularly in forested areas. Vegetation clearing would reduce the screening effects of vegetation and may create new opportunities to view the surrounding landscape, including the transmission infrastructure. Nebula-Raines Route 4 transmission infrastructure would generally be comparable in appearance to existing transmission and distribution infrastructure in the study area; however, the height of the new transmission lines would make them more prominent than existing infrastructure, especially when viewed at close range.

Nebula-Raines Route 5

Nebula-Raines Route 5 shares the same corridor from future Raines Substation as Routes 3 and 4 for the first 1.3 miles before continuing along the south side of South Hill Bypass (US 58). West of the US 58/US 1 intersection, Nebula-Raines Route 5 runs through predominately forested areas and would be most visible where it parallels South Hill Bypass and other road crossings. While the weatherized steel material of the poles would blend with tree trunks in forested landscapes, it could attract the eye in agricultural and open areas. Similar to Nebula-Raines Routes 1, 3, and 4, Nebula-Raines Route 5 would require significant vegetation removal along most of the corridor, particularly in forested areas. Vegetation clearing would reduce the screening effects of vegetation and may create new opportunities to view the surrounding landscape, including the transmission infrastructure. Nebula-Raines Route 5 transmission infrastructure would generally be comparable in appearance to existing transmission and distribution infrastructure in the study area; however, the height of the new transmission lines would make them more prominent than existing infrastructure, especially when viewed at close range.

Summary

Nebula-Raines Routes 1, 3, and 4 cross the largest area of agricultural land. The Project would be most visible in these areas due to the presence of open landscape views and the lack of tall screening vegetation. Nebula-Raines Route 1 would be the most visible route alternative from area residences, because its alignment is the closest to several rural residential areas in the study area. Routes 3, 4, and 5 would have an enhanced visual impact where they would run parallel to the south side of US 58, which is currently forested. Nebula-Raines Route 5 would have the least visual impact on residents and motorists, due to existing tree cover and topography that would fully or partially block many views of the corridor.

As previously stated, the Cloud-Nebula Route and the proposed Nebula Station would not be visible to the public and therefore would have no visual impacts.

Overall, the changes to existing visual conditions due to Project infrastructure would result in moderate impacts for the following reasons:

- Human influences and built structures (modifications to the landscape), including transmission and distribution line infrastructure, are common in the area;
- Portions of the study area near major roads and closer to the Town of South Hill contain and are planned for increased extents of mixed commercial, industrial, and residential development and related infrastructure (e.g., travel corridors, distribution lines, lights, signs, cell towers); and
- Opportunities for foreground views (where the transmission route structures are most noticeable) are limited due to vegetated areas and topography that block sightlines. Foreground views would occur most frequently along travel corridors where there is already a higher level of visual disturbance and where most viewers are in moving vehicles.

TABLE 4.3-5 IMPACT ASSESSMENT

Route Alternative	Potentially Impacted VSRs	Impacted Areas and Viewer Groups	Potential Impact Rating
Cloud-Nebula Route	**Total: 0**	Road crossings: • New right-of-way—No crossings Impacted Viewer Groups: • Workers	VSR Impact: No VSRs affected by this route Viewer Group Impact: Minor to Moderate **Overall Rating: Minor to Moderate**
Nebula-Raines Route 1	3, 10 through 14, 17 through 20, 22, 25, and 26 **Total: 13**	Road crossings: • New right-of-way—11 crossings Sensitive VSRs [a] • Baskerville Road (VSR 19) • Beaches to Bluegrass Trail (VSR 12) • Buggs Island Road (VSR 20) • Christanna Loop (VSR 13) • East Coast Greenway (VSR 14) • Hudson Family Cemetery (Willie Hudson Cemetery) (VSR 11) • Tobacco Heritage Trail (VSR 17) • Town of South Hill (VSR 25) • Unincorporated Mecklenburg County (VSR 26) • US Bike Route 1 (VSR 18) • US 1 (VSR 22) Impacted Viewer Groups: • Residents • Motorists—commuters/through-travelers • Workers • Recreationists/tourists	VSR Impact: Negligible to Moderate Viewer Group Impact: Moderate **Overall Rating: Moderate**
Nebula-Raines Route 3	2, 3, 7, 12 through 14, 17 through 23, 25, and 26 **Total: 15**	Road crossings: • New right-of-way—9 crossings Sensitive VSRs [a]	VSR Impact: Negligible to Moderate

Route Alternative	Potentially Impacted VSRs	Impacted Areas and Viewer Groups	Potential Impact Rating
		• Baskerville Road (VSR 19) • Beaches to Bluegrass Trail (VSR 12) • Buggs Island Road (VSR 20) • Christanna Loop (VSR 13) • East Coast Greenway (VSR 14) • Kingdom Hall of Jehovah's Witnesses (VSR 7) • Smith Cross Road (VSR 21) • South Hill Elementary (VSR 2) • Tobacco Heritage Trail 9 (VSR 17) • Town of South Hill (VSR 25) • Unincorporated Mecklenburg County (VSR 26) • US Bike Route 1 (VSR 18) • US 1 (VSR 22) • US 58 (VSR 23) Impacted Viewer Groups: • Residents • Motorists—commuters/through-travelers • Workers • Recreationists/tourists	Viewer Group Impact: Moderate **Overall Rating: Moderate**

Route Alternative	Potentially Impacted VSRs	Impacted Areas and Viewer Groups	Potential Impact Rating
Nebula-Raines Route 4	1 through 4, 7, 12 through 14, 17 through 23 **Total: 17**	Road crossings: • New right-of-way—9 crossings Sensitive VSRs [a] • Baskerville Road (VSR 19) • Beaches to Bluegrass Trail (VSR 12) • Bethel Baptist Church/Academy (VSR 4) • Bethany Baptist Church and Cemetery (VSR 3) • Buggs Island Road (VSR 20) • Christanna Loop (VSR 13) • East Coast Greenway (VSR 14) • Kingdom Hall of Jehovah's Witnesses (VSR 7) • Mecklenburg County High/Middle School (VSR 1) • Smith Cross Road (VSR 21) • South Hill Elementary (VSR 2) • Tobacco Heritage Trail 9 (VSR 17) • Town of South Hill (VSR 25) • Unincorporated Mecklenburg County (VSR 26) • US Bike Route 1 (VSR 18) • US 1 • US 58 (VSR 23) Impacted Viewer Groups: • Residents • Motorists—commuters/through-travelers • Workers • Recreationists/tourists	VSR Impact: Negligible to Moderate Viewer Group Impact: Moderate **Overall Rating: Moderate**

Route Alternative	Potentially Impacted VSRs	Impacted Areas and Viewer Groups	Potential Impact Rating
Nebula-Raines Route 5	1, 2, 5, 6, 8, 9, 12 through 21, 24 through 27 **Total: 20**	Road crossings: • New right-of-way—9 crossings Sensitive VSRs [a] • Baskerville CDP (VSR 24) • Baskerville Road (VSR 19) • Beaches to Bluegrass Trail (VSR 12) • Christanna Loop (VSR 13) • East Coast Greenway (VSR 14) • Greater Hayes Grove Baptist Church (VSR 6) • Lake Gordon Recreational Area (VSR 15) • Lambert's Chapel Reformed Union Apostolic Church and Cemetery (VSR 8) • Mecklenburg County High/Middle School (VSR 1) • Old Wooden Bridge Road (VSR 20) • Park View Athletic Complex (VSR 16) • Saint Andrews Church and Cemetery (VSR 9) • South Hill Elementary (VSR 2) • Tobacco Heritage Trail 9 (VSR 17) • Town of South Hill (VSR 25) • Unincorporated Mecklenburg County (VSR 26) • Union Level CDP (VSR 27) • US Bike Route 1 (VSR 18) • US 58 (VSR 23) Impacted Viewer Groups: • Residents • Motorists—commuters/through-travelers • Workers • Recreationists/tourists	VSR Impact: Minor to Moderate Viewer Group Impact: Moderate **Overall Rating: Moderate**

US = United States Route; VSR = visually sensitive resource.
[a] This list includes VSRs where visual impacts would be greater than negligible.

4.4 CULTURAL RESOURCES

4.4.1 EXISTING CONDITIONS

4.4.1.1 METHODOLOGY

ERM conducted a pre-application analysis (the analysis) of potential impacts on known cultural resources along and near the proposed Project under consideration in accordance with the VDHR's *Guidelines for Assessing Impacts of Proposed Electric Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia* (Guidelines) (VDHR 2008). For each route alternative, the analysis identified and considered previously recorded resources within the following study tiers as specified in the Guidelines:

- National Historic Landmarks (NHLs) within a 1.5-mile radius of the route centerline;
- Properties listed on the National Register of Historic Places (NRHP), NHLs, battlefields, and historic landscapes within a 1.0-mile radius of the route centerline;
- NRHP-eligible and NRHP-listed properties, NHLs, battlefields, and historic landscapes within a 0.5-mile radius of the route centerline; and
- All of the above qualifying resources and archaeological sites within the right-of-way of each route alternative.

ERM obtained data on previously recorded cultural resources within each study tier from the VCRIS. One previously recorded resource met the study tier criteria listed above; however, this resource was demolished in the 1990s and is therefore only mentioned in Section 4.3 of the pre-application analysis for VDHR's records. Because this resource is no longer extant, it is not included in the resource findings. ERM also collected information from the Historically Black Schools of Mecklenburg County Virginia (2024) and Preservation Virginia (2024) and contacted several possibly interested parties (South Central Virginia Genealogical Society, Virginia Museum of History and Culture, Virginia Genealogical Society, Mecklenburg County Planning Commission, and the Tobacco Heritage Trail) to find locally significant resources within a 1.0-mile radius of each proposed route alternative centerline. ERM also included architectural resources within a 1.0-mile radius of each centerline that were mentioned in a May 30, 2024, email response from Preservation Virginia about sensitive resources in the area (Parham 2024). These resources were included in the locally significant category.

Many of the previously recorded aboveground cultural resources in the vicinity of the route alternatives have not been assessed for NRHP eligibility and therefore are not included in the analysis, per the Guidelines. These resources should be considered potentially eligible for listing in the NRHP until they are assessed, and a determination of eligibility is made by the VDHR. Additionally, there may be unreported historic and archaeological resources that could be affected by construction or operation of the Project. Any such resources would be addressed during an intensive cultural resources survey to be conducted along the route certificated by the SCC in a subsequent phase of investigation to support permitting of the Project.

Along with the records review, ERM conducted field assessments of the considered architectural resources and historic districts for the Project, in accordance with the Guidelines. ERM captured

digital photographs of each architectural resource with views toward the applicable route alternatives and/or other Project facilities. ERM then prepared visual simulations depicting the proposed Project infrastructure as it would appear in views from the considered resources to assess potential visual effects on those resources. For the previously recorded archaeological sites under consideration, ERM examined aerial photographs to assess the current land condition and spatial relationship between the sites and any existing or planned transmission lines. The results of these assessments are presented in Sections 4.4.1 and 4.4.2, as appropriate.

As discussed in more detail below, ERM identified a total of eight previously recorded archaeological sites within the proposed route alternative rights-of-way. None of these previously recorded archaeological sites have been formally evaluated for inclusion in the NRHP.

With regard to historic architectural resources, ERM identified nine previously recorded resources and/or districts within the study tiers described above, as well as one previously unrecorded resource. Of these, one is eligible for listing in the NRHP, and one is potentially eligible. The remaining eight are considered locally significant for the purposes of this report. Of these, six have not been formally evaluated for inclusion in the NRHP, one was evaluated as not eligible for the NRHP, and one is previously unrecorded.

4.4.1.2 ARCHAEOLOGICAL SITES AND FINDINGS

ERM considered crossings of archaeological sites to be a routing constraint, due to the potential for an electric transmission line project to impact archaeological deposits in these areas (e.g., due to transmission structure placement, tree clearing, or heavy equipment usage within a site). Table 4.4-1 lists and describes the known archaeological sites within the proposed right-of-way for each route alternative and the Nebula Switching Station site. A confident evaluation of the nature of archaeological deposits at each site and impacts on the sites from prior land use activities would require a field survey.

Because portions of some route alternatives share common alignments, the same sites may occur in the same tier for more than one route. Of the eight known archaeological sites proximate to the routes, one is located along Nebula-Raines Route 1 (44MC0416); five along Nebula-Raines Route 3 (44MC0367, 44MC0416, 44MC0474, 44MC0475, and 44MC0585); six along Nebula-Raines Route 4 (44MC0367, 44MC0444, 44MC0460, 44MC0474, 44MC0475, and 44MC0585); and five along Nebula-Raines Route 5 (44MC0367, 44MC0457, 44MC0474, 44MC0475, and 44MC0585). No archaeological sites were identified within the right-of-way of the Cloud-Nebula Route or the proposed Nebula Switching Station.

A confident and complete evaluation of the nature of archaeological deposits at each site and impacts from prior land use activities would require a field survey to verify the desktop analysis. These investigations would be conducted along the route certificated by the SCC in a subsequent phase of investigation to support permitting of the Project.

TABLE 4.4-1 KNOWN ARCHAEOLOGICAL SITES WITHIN THE RIGHTS-OF-WAY FOR THE PROJECT

Project Component	Greenfield or Existing / Expanded ROW	Site Number	Description	NRHP Status
Cloud-Nebula Route	NA	None identified	NA	NA
Nebula-Raines Route 1	Greenfield	44MC0416	Temporary camp (Archaic, Woodland)	Unevaluated
Nebula-Raines Route 3	Greenfield	44MC0367	Lithic scatter (Pre-Contact); Church site (Antebellum Period, Civil War, Reconstruction and Growth)	Unevaluated
	Greenfield	44MC0416	Temporary camp (Archaic, Woodland)	Unevaluated
	Greenfield	44MC0474	Lithic scatter (Pre-Contact); Domestic artifact scatter (Antebellum Period, Civil War, Reconstruction and Growth)	Unevaluated
	Greenfield	44MC0475	Lithic scatter (Pre-Contact)	Unevaluated
	Greenfield	44MC0585	Temporary camp (Prehistoric/Unknown); Tobacco barn (20th Century)	Unevaluated
Nebula-Raines Route 4	Greenfield	44MC0367	Lithic scatter (Pre-Contact); Church site (Antebellum Period, Civil War, Reconstruction and Growth)	Unevaluated
	Greenfield	44MC0444	Temporary camp (Archaic)	Unevaluated
	Greenfield	44MC0460	Temporary camp (Middle Archaic)	Unevaluated
	Greenfield	44MC0474	Lithic scatter (Pre-Contact); Domestic artifact scatter (Antebellum Period, Civil War, Reconstruction and Growth)	Unevaluated
	Greenfield	44MC0475	Lithic scatter (Pre-Contact)	Unevaluated
	Greenfield	44MC0585	Temporary camp (Prehistoric/Unknown); Tobacco barn (20th Century)	Unevaluated
Nebula-Raines Route 5	Greenfield	44MC0367	Lithic scatter (Pre-Contact); Church site (Antebellum Period, Civil War, Reconstruction and Growth)	Unevaluated

Project Component	Greenfield or Existing / Expanded ROW	Site Number	Description	NRHP Status
	Existing ROW	44MC0457	Transportation foundation remains (Historic)	Unevaluated
	Greenfield	44MC0474	Lithic scatter (Pre-Contact); Domestic artifact scatter (Antebellum Period, Civil War, Reconstruction and Growth)	Unevaluated
	Greenfield	44MC0475	Lithic scatter (Pre-Contact)	Unevaluated
	Greenfield	44MC0585	Temporary camp (Prehistoric/Unknown); Tobacco barn (20th Century)	Unevaluated

Source: VDHR 2024.

NA = not applicable; NRHP = National Register of Historic Places; ROW = right-of-way.

4.4.1.3 CLOUD-NEBULA ROUTE

No known archaeological sites fall within the right-of-way for the Cloud-Nebula Route.

4.4.1.4 NEBULA-RAINES ROUTE 1

One archaeological site is located within the right-of-way for Nebula-Raines Route 1: Site 44MC0416.

Site 44MC0416 is a prehistoric (Archaic and Woodland) temporary camp site that has previous ground disturbance due to cultivation activities and is unevaluated for the NRHP (Gardner 1985). The site is located in a cultivated field. The Nebula-Raines Route 1 centerline would cross approximately 400 feet of the site. Due to previous ground disturbance by agricultural activities, it is unlikely that Nebula-Raines Route 1 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

4.4.1.5 NEBULA-RAINES ROUTE 3

Five archaeological sites are located within the right-of-way for Nebula-Raines Route 3, including Sites 44MC0367, 44MC0416, 44MC0474, 44MC0475, and 44MC0585.

Site 44MC0367 is a multi-component prehistoric (unknown temporal affiliation) lithic scatter and historic (1850–1874) church site that has previous ground disturbance due to historic cultivation activities and is unevaluated for the NRHP (Jones et al. 1990a). The site was subjected to a Phase II archaeological evaluation in 1990 performed by the William and Mary Archaeological Project Center for the VDOT and was recommended as ineligible for the NRHP due to the sparsity of artifacts recovered and the lack of intact cultural features from either the prehistoric or historic components (Jones et al. 1990b). The site is located approximately 13 feet to the north of the Nebula-Raines Route 3 centerline. The Nebula-Raines Route 3 centerline would cross approximately 143 feet of the southernmost portion of the site. Due to previous ground disturbance by roadway grading and development (South Hill Bypass), it is unlikely that Nebula-

Raines Route 3 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

The Nebula-Raines Route 3 crossing of Site 44MC0416 would be the same as described above for Nebula-Raines Route 1.

Site 44MC0474 is a multi-component prehistoric (unknown temporal affiliation) lithic scatter and historic (1850–1874) domestic artifact scatter that has previous ground disturbance by cultivation activities and is unevaluated for the NRHP (Jones et al. 1990a). Approximately 53 feet of the Nebula-Raines Route 3 centerline would cross the southernmost corner of the site. Due to previous ground disturbance by roadway grading and development (South Hill Bypass), it is unlikely that Nebula-Raines Route 3 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

Site 44MC0475 is a prehistoric lithic scatter of unknown temporal affiliation that has previous ground disturbance due to cultivation activities and is unevaluated for the NRHP (Jones et al. 1990a). Approximately 310 feet of the Nebula-Raines Route 3 centerline would cross the southern portion of the site. Due to previous ground disturbance by roadway grading and development (South Hill Bypass), it is unlikely that Nebula-Raines Route 3 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

Site 44MC0585 is a multi-component prehistoric temporary camp site of unknown temporal affiliation and historic (1900–1949) tobacco barn and associated artifact scatter that has previous ground disturbance due to roadway grading and development (South Hill Bypass) and is unevaluated for the NRHP. A previous Phase I survey performed by the William and Mary Archaeological Project Center for the Department of Transportation in 1996 recommended the site as ineligible for the NRHP due to the sparse recovery of artifacts from the prehistoric component and the lack of lack of cultural integrity of the historic component (Stuck and Downing 1996). Approximately 0.1 mile of the Nebula-Raines Route 3 centerline would cross the southernmost portion of the site. Due to previous ground disturbance by roadway grading and development, it is unlikely that Nebula-Raines Route 3 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

4.4.1.6 NEBULA-RAINES ROUTE 4

Six archaeological sites are located within the right-of-way for Nebula-Raines Route 4, including Sites 44MC0367, 44MC0444, 44MC0460, 44MC0474, 44MC0475, and 44MC0585.

The Nebula-Raines Route 4 crossing of Sites 44MC0367, 44MC0474, 44MC0475, and 44MC0585 would be the same as described above for Nebula-Raines Route 3.

Site 44MC0444 is a prehistoric (Archaic) temporary camp site that that has previous ground disturbance due to timbering activities and is unevaluated for the NRHP (Gardner 1985). The site is in managed timbered area and is intersected by an access path on the parcel. Approximately 300 feet of the Nebula-Raines Route 4 centerline crosses the southern half of the site. Due to previous ground disturbance by timbering, it is unlikely that Nebula-Raines Route 4 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

Site 44MC0460 is a prehistoric (Middle Archaic) temporary camp site that has previous ground disturbance due to timbering activities and is unevaluated for the NRHP (Gardner 1985). The site is in an active timber farm and approximately 300 feet of the route's centerline would cross the center of the site. Due to previous ground disturbance by timbering, it is unlikely that Nebula-Raines Route 4 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

4.4.1.7 NEBULA-RAINES ROUTE 5

Five archaeological sites are located within the right-of-way for Nebula-Raines Route 5, including Sites 44MC0367, 44MC0457, 44MC0474, 44MC0475, and 44MC0585.

The Nebula-Raines Route 5 crossing of Sites 44MC0367, 44MC0474, 44MC0475, and 44MC0585 would be the same as described above for Nebula-Raines Route 3.

Site 44MC0457 is an unknown historic site that contains structure foundation remnants and has previous ground disturbance from timbering and land clearing from the installation of an existing transmission line right-of-way. The site is unevaluated for the NRHP. A previous Phase I archaeological survey performed in 2019 by Power Engineers, Inc. for Dominion Energy was unable to locate the site, leading to the interpretation that the site had been destroyed by previous ground disturbance activities (Haynes and Parrott 2020). The Nebula-Raines Route 5 centerline crosses approximately 200 feet of the southern half of the site boundary. The site is already intersected by Dominion's existing Lines #38/1041. Due the unsuccessful previous efforts to locate the site during survey, it is unlikely that Nebula-Raines Route 5 would encounter any intact cultural remains that would be evaluated as eligible for the NRHP.

4.4.2 ABOVEGROUND HISTORIC RESOURCES AND ARCHITECTURAL SITES AND FINDINGS

Each route alternative reviewed in this study has the potential to affect a number of historic architectural sites and districts. This section of the report presents information on known aboveground cultural resources in the vicinity of each Project route alternative, using VDHR's tiered study area model described above. Figure 4.4-1 depicts the locations of resources relevant to the route alternatives. Appendix G, the Pre-application Report, provides a description and location of each resource. Some of these resources could be affected regardless of the route selected by the SCC for the Project.

Table 4.4-2 provides a comparison of the number of resources that would be impacted and the degree of impact on these resources for each Project route alternative. The Cloud-Nebula Route passes near one resource meeting the VDHR criteria for inclusion in the study tiers, while Nebula-Raines Route 1 passes near three, Nebula-Raines Route 3 passes near five, Nebula-Raines Route 4 passes near eight, and Nebula-Raines Route 5 passes near four such resources.

TABLE 4.4-2 ABOVEGROUND HISTORIC RESOURCES IN VDHR TIERS

Route	Number of Considered Resources in Each Impact Category				
	No Impact	Minimal Impact	Moderate Impact	Severe Impact	Total
Cloud-Nebula Route	1	0	0	0	1
Nebula-Raines Route 1	1	2	0	0	3
Nebula-Raines Route 3	2	3	0	0	5
Nebula-Raines Route 4	4	4	0	0	8
Nebula-Raines Route 5	3	0	0	1	4

As discussed in more detail below, ERM recommends that:

- Cloud-Nebula Route would have no impact on one resource.
- Nebula-Raines Route 1, which includes the proposed Nebula Switching Station, would have no impact on one resource and a minimal impact on two resources.
- Nebula-Raines Route 3, which includes the proposed Nebula Switching Station, would have no impact on two resources and a minimal impact on three resources.
- Nebula-Raines Route 4, which includes the proposed Nebula Switching Station, would have no impact on four resources and a minimal impact on four resources.
- Nebula-Raines Route 5, which includes the proposed Nebula Switching Station, would have no impact on three resources and a severe impact on one resource.

For the Nebula-Raines Lines, Nebula-Raines Route 1 appears to present the least impact on aboveground cultural resources because it impacts the least number of resources, while Nebula-Raines Route 5 would have the highest impact on cultural resources.

The subsections below discuss the specific resources affected by each route alternative.

4.4.2.1 CLOUD-NEBULA ROUTE

Table 4.4-3 provides information on the considered resource that lies within the VDHR study tiers for the Cloud-Nebula Route. ERM conducted a field reconnaissance at the resource to assess its condition and take photographs to support the preparation of simulations. Construction and operation of new transmission infrastructure along this route is predicted to have no impact on one resources (058-5092).

The Mecklenburg County Poor House Cemetery (058-5092) lies approximately 0.5 mile west of the Cloud-Nebula Route at approximate MP 0.0 and about 0.8 mile northwest of the proposed Nebula Switching Station. The Cloud-Nebula Route and proposed switching station would have no impact on 058-5092 because of intervening vegetation and distance.

TABLE 4.4-3 HISTORIC RESOURCES IN VDHR TIERS FOR CLOUD-NEBULA ROUTE

Buffer (miles)	Resource Category	Resource Number	Description	Impact
1.0 to 1.5	National Historic Landmarks	NA	None identified	NA
0.5 to 1.0	National Register Properties (listed)	NA	None identified	NA
	Locally Significant	058-5092 [a]	Mecklenburg County Poor House Cemetery	None
0.0 to 0.5	National Register—Eligible	NA	None identified	NA
0.0 (within the ROW)	National Historic Landmarks, National Register Properties (listed and eligible)	NA	None identified	NA

Source: VDHR 2024.

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

[a] Resource is within the designated tiers for the proposed Nebula Switching Station.

4.4.2.2 NEBULA-RAINES ROUTE 1

The Mecklenburg County Poor House Cemetery (058-5092) lies approximately 0.9 mile west of Nebula-Raines Route 1 at approximate MP 15.3 and approximately 0.8-mile northwest of the proposed Nebula Switching Station. Nebula-Raines Route 1 and the proposed Nebula Switching Station would have no impact on 058-5092 because of intervening vegetation and distance.

The M.H. Upton House (058-0140) lies approximately 0.3-mile north of Nebula-Raines Route 1 at approximate MP 13.2 The transmission line conductors could be visible through the trees as one looks to the south. However, the existing Dominion Transmission Line #38/#137 currently bisects the western portion of the resource's boundary, which has already diminished the historic viewshed. Thus, the construction of a new route would have a minimal impact on 058-5412.

The Carey Farmhouse (058-5412) lies approximately 0.6-mile northwest of Nebula-Raines Route 1 at approximate MP 3.7. Most of the resource would have no visibility of the route, however, the top of a singular structure could be visible from the southernmost boundary. Thus, the construction of the route could have a minimal impact on 058-5412.

Table 4.4-4 provides information on the three considered resources that lie within the VDHR study tiers for Nebula-Raines Route 1. ERM conducted a field reconnaissance of these resources to assess conditions and take photographs to support the preparation of simulations. Construction and operation of the new transmission facilities associated with this route would have no impact on one resource (058-5092) and a minimal impact on two resources (058-0140 and 058-5412).

The Mecklenburg County Poor House Cemetery (058-5092) lies approximately 0.9 mile west of Nebula-Raines Route 1 at approximate MP 15.3 and approximately 0.8-mile northwest of the proposed Nebula Switching Station. Nebula-Raines Route 1 and the proposed Nebula Switching Station would have no impact on 058-5092 because of intervening vegetation and distance.

The M.H. Upton House (058-0140) lies approximately 0.3-mile north of Nebula-Raines Route 1 at approximate MP 13.2 The transmission line conductors could be visible through the trees as one looks to the south. However, the existing Dominion Transmission Line #38/#137 currently bisects the western portion of the resource's boundary, which has already diminished the historic viewshed. Thus, the construction of a new route would have a minimal impact on 058-5412.

The Carey Farmhouse (058-5412) lies approximately 0.6-mile northwest of Nebula-Raines Route 1 at approximate MP 3.7. Most of the resource would have no visibility of the route, however, the top of a singular structure could be visible from the southernmost boundary. Thus, the construction of the route could have a minimal impact on 058-5412.

TABLE 4.4-4 HISTORIC RESOURCES IN VDHR TIERS FOR NEBULA-RAINES ROUTE 1

Buffer (miles)	Resource Category	Resource Number	Description	Impact
1.0 to 1.5	National Historic Landmarks	NA	None identified	NA
0.5 to 1.0	National Register Properties (listed)	NA	None identified	NA
	Locally Significant	058-5092[a]	Mecklenburg County Poor House Cemetery	None
		058-5412	Carey Farmhouse	Minimal
0.0 to 0.5	National Register—Eligible	NA	None identified	NA
	Locally Significant	058-0140	M.H. Upton House	Minimal
0.0 (within the ROW)	National Historic Landmarks, National Register Properties (listed and eligible)	NA	None identified	NA

Source: VDHR 2024

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

[a] Resource is within the designated tiers for the proposed Nebula Switching Station.

4.4.2.3 NEBULA-RAINES ROUTE 3

Table 4.4-5 provides information on the five considered resources that lie within the VDHR study tiers for Nebula-Raines Route 3. ERM conducted a field reconnaissance of these resources to assess conditions and take photographs to support the preparation of simulations. Construction and operation of the new transmission facilities associated with this route would have no impact on two resources (058-0057 and 058-5092) and a minimal impact on three resources (058-0073, 058-0140, and East End High School).

There would be no visibility of Project infrastructure along Nebula-Raines Route 3 due to intervening vegetation, infrastructure, and distance from the following resources:

- Sycamore Lodge (058-0057) lies approximately 0.5-mile southeast of Nebula-Raines Route 3 at approximate MP 3.3.

- The Mecklenburg County Poor House Cemetery (058-5092) lies approximately 0.9-mile west of Nebula-Raines Route 3 at approximate MP 14.9 and approximately 0.8-mile northwest of the proposed Nebula Switching Station.

Consequently, construction and operation of the Nebula-Raines Route 3 would have no impact on these resources.

The Lombardy Grove Tavern (058-0073) lies approximately 0.6 mile west of Nebula-Raines Route 3 at approximate MP 4.2. The tops of three structures associated with the route would be visible from the eastern boundary of the resource when looking to the northeast. Thus, Nebula-Raines Route 3 would have a minimal impact on 058-0073

The M.H. Upton House (058-0140) lies approximately 0.3 mile north of Nebula-Raines Route 3 at approximate MP 12.7. The conductors of the route would be visible between the trees. However, the existing Dominion Transmission Line #38/#137 already bisects the resource's parcel. Although there are trees and dense vegetation bordering the southern resource boundary, the route would be partially visible from the resource and add a modern element to the southern viewshed where there currently is none. Because the historic viewshed has already been diminished by the existing transmission line, the route would have a Minimal Impact on 058-0140.

The parcel associated with East End High School lies approximately 200 feet west of Nebula-Raines Route 3 at approximate MP 3.9. The transmission line conductors would only be visible where the route intersects from the intersection of Dockery Road, and the route when looking to the east from the southern property boundary (adjacent to Dockery Road) of East End High School. In addition, the construction of the route would involve tree clearing, which could thin the vegetation and increase route visibility from the resource. Thus, the route would have a Minimal Impact on East End High School.

TABLE 4.4-5 HISTORIC RESOURCES IN VDHR TIERS FOR NEBULA-RAINES ROUTE 3

Buffer (miles)	Resource Category	Resource Number	Description	Impact
1.0 to 1.5	National Historic Landmarks	NA	None identified	NA
0.5 to 1.0	National Register Properties (listed)	NA	None identified	NA
	Locally Significant	058-0073	Lombardy Grove Tavern	Minimal
		058-5092[a]	Mecklenburg County Poor House Cemetery	None
0.0 to 0.5	National Register—Eligible	NA	None identified	NA
	Locally Significant	058-0057	Sycamore Lodge	None
		058-0140	M.H. Upton House	Minimal
		NA	East End High School	Minimal

Buffer (miles)	Resource Category	Resource Number	Description	Impact
0.0 (within the ROW)	National Historic Landmarks, National Register Properties (listed and eligible)	NA	None identified	NA

Source: VDHR 2024

NA = not applicable; ROW = right-of-way.
[a] Resource is within the designated tiers for the proposed Nebula Switching Station.

4.4.2.4 NEBULA-RAINES ROUTE 4

Table 4.4-6 provides information on the eight considered resources that lie within the VDHR study tiers for Nebula-Raines Route 4. ERM conducted a field reconnaissance of these resources to assess conditions and take photographs to support the preparation of simulations. Construction and operation of the new transmission facilities associated with this route would have no impact on four resources (058-0057, 058-0141, 058-0309, and 058-5092) and a minimal impact on four resources (058-0073, 058-0140, 058-0175, and East End High School).

There would be no visibility of Project infrastructure along Nebula-Raines Route 4 due to intervening vegetation, infrastructure, and distance from the following resources:

- Sycamore Lodge (058-0057) lies approximately 0.5 mile southeast of Nebula-Raines Route 4 at approximate MP 3.3.
- The Sanders Farm (058-0141) lies approximately 0.3 mile north of Nebula-Raines Route 4 at approximate MP 12.8.
- The Tobacco Barn (058-0309) lies approximately 1.0 mile north of Nebula-Raines Route 4 at approximate MP 12.9.
- The Mecklenburg County Poor House Cemetery (058-5092) lies approximately 0.9-mile west of Nebula-Raines Route 4 at approximate MP 14.9 and approximately 0.8-mile northwest of the proposed Nebula Switching Station.

Consequently, construction and operation of Nebula-Raines Route 4 would have no impact on these resources.

The Lombardy Grove Tavern (058-0073) lies approximately 0.6 mile west of Nebula-Raines Route 4 at approximate MP 4.5. The tops of three structures associated with the route would be visible from the eastern boundary of the resource when looking to the northeast. Thus, Nebula-Raines Route 4 would have a minimal impact on 058-0073.

The M.H. Upton House (058-0140) lies approximately 0.3 mile south of Nebula-Raines Route 4 at approximate MP 12.7. A small portion of the conductors would be visible where the route intersects the existing Dominion Transmission Line #38/#137, to the north of the resource. Although the existing line is more prevalent in the landscape, and intersects the resource parcel boundary, the construction of the route could introduce additional modern elements to the northern viewshed. If visible, only the tops of the structures would be visible. Thus, Nebula-Raines Route 4 could have a minimal impact on 058-0140.

The Tobacco Barns (058-0175) lie approximately 0.6 mile north of Nebula-Raines Route 4 at approximate MP 11.3. Although the resource is over a half mile north of the route, the top of a singular structure would be visible above the trees when looking to the south from Buggs Island Road. While this is a minor change, the construction of the route would introduce a modern element to the southern viewshed, which currently consists of rural land and vegetation. Thus, Nebula-Raines Route 4 would have a minimal impact on 058-0175.

East End High School lies approximately 200 feet west of Nebula-Raines Route 4 at approximate MP 3.9. The route conductors would only be visible where the route intersects from the intersection of Dockery Road, and the route when looking to the east from the southern property boundary (adjacent to Dockery Road) of East End High School. In addition, the construction of the route would involve tree clearing, which could thin the vegetation and increase route visibility from the resource. Thus, the route would have a Minimal Impact on East End High School.

TABLE 4.4-6 HISTORIC RESOURCES IN VDHR TIERS FOR NEBULA-RAINES ROUTE 4

Buffer (miles)	Resource Category	Resource Number	Description	Impact
1.0 to 1.5	National Historic Landmarks	NA	None identified	NA
0.5 to 1.0	National Register Properties (listed)	NA	None identified	NA
	Locally Significant	058-0073	Lombardy Grove Tavern	Minimal
		058-0175	Tobacco barns	Minimal
		058-0309	Tobacco barn	None
		058-5092[a]	Mecklenburg County Poor House Cemetery	None
0.0 to 0.5	National Register—Eligible	NA	None identified	NA
	Locally Significant	058-0057	Sycamore Lodge	None
		058-0140	M.H. Upton House	Minimal
		058-0141	Sanders Farm	None
		NA	East End High School	Minimal
0.0 (within the ROW)	National Historic Landmarks, National Register Properties (listed and eligible)	NA	None identified	NA

Source: VDHR 2024

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

[a] Resource is within the designated tiers for the proposed Nebula Switching Station.

4.4.2.5 NEBULA-RAINES ROUTE 5

Table 4.4-7 provides information on the four considered resources that lie within the VDHR study tiers for Nebula-Raines Route 5. ERM conducted a field reconnaissance of these resources to

assess conditions and take photographs to support the preparation of simulations. Construction and operation of the new transmission facilities associated with this route would have no impact on three resources (058-0140, 058-0309, and 058-5092) and a severe impact on one resource (058-0141).

There would be no visibility of Project infrastructure along Nebula-Raines Route 5 due to intervening vegetation and distance from the following resources:

- The M.H. Upton House (058-0140) lies approximately 0.8 mile southeast of Nebula-Raines Route 5 at approximate MP 12.5.
- The Tobacco Barn (058-0309) lies approximately 0.3 mile west of Nebula-Raines Route 5 at approximate MP 11.6.
- The Mecklenburg County Poor House Cemetery (058-5092) lies approximately 0.9 mile west of Nebula-Raines Route 5 at approximate MP 14.3 and about 0.8 mile northwest of the proposed Nebula Switching Station.

Consequently, construction and operation of Nebula-Raines Route 5 would have no impact on the above resources.

The Nebula-Raines Route 5 centerline traverses approximately 600 feet of the northernmost boundary of Sanders Farm (058-0141) between approximate MP 12.0 and 12.1. Because the route intersects the resource, it would have a direct impact to the resource. Not only would the route be visible where it intersects the resource, it would also be visible to the west, before it connects to an existing Dominion transmission line. This would introduce modern elements and tree removal to the western viewshed and northern boundary where there currently is only vegetation or open field. Thus, Nebula-Raines Route 5 would have a severe impact on 058-0141.

TABLE 4.4-7 HISTORIC RESOURCES IN VDHR TIERS FOR NEBULA-RAINES ROUTE 5

Buffer (miles)	Resource Category	Resource Number	Description	Impact
1.0 to 1.5	National Historic Landmarks	NA	None identified	NA
0.5 to 1.0	National Register Properties (listed)	NA	None identified	NA
	Locally Significant	058-0140	M.H. Upton House	None
		058-5092[a]	Mecklenburg County Poor House Cemetery	None
0.0 to 0.5	National Register—Eligible	NA	None identified	NA
	Locally Significant	058-0309	Tobacco barn	None
0.0 (within the ROW)	National Historic Landmarks, National Register Properties (listed and eligible)	NA	None identified	NA
	Locally Significant	058-0141	Sanders Farm	Severe

Source: VDHR 2024

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

[a] Resource is within the designated tiers for the proposed Nebula Switching Station.

4.4.3 SUMMARY OF EXISTING DATA COLLECTED UNDER SECTION 106 OR 110 OF THE NATIONAL HISTORIC PRESERVATION ACT

Some portions of the alternative routes and associated facilities were previously surveyed for cultural resources. Research indicates that 22 prior Phase I cultural resource surveys have been conducted within 1.0 mile of the alternative routes, including 11 that overlap portions of various individual routes. Because the alternative routes share some common segments, many of the previous surveys have covered portions of multiple routes. Table 4.4-8 provides information on the previous surveys within 1.0 mile of the route alternatives. These survey areas are also shown on Figure 4.4-2.

TABLE 4.4-8 CULTURAL RESOURCE SURVEYS COVERING PORTIONS OF THE PROJECT

VDHR Survey #	Title	Author(s)	Date
MC-010	A Phase I Archaeological Survey South Hill Wastewater Treatment System Mecklenburg County, Virginia Project	Antony F. Opperman	1984
MC-011	A Preliminary Archaeological Reconnaissance of Selected Locations in Mecklenburg County, Virginia	William M. Gardner	1985
MC-014	Phase I Archaeological Reconnaissance Survey, Route 663, Mecklenburg County, Virginia	J. Cooper Wamsley	1984
MC-018	A Phase I Cultural Resource Survey of the Proposed Route 58 Widening, Mecklenburg County, Virginia	Joe B. Jones, Dennis B. Blanton, Charles M. Downing, Willie Graham, Lawrence McLaughlin, and Christopher McDaid	1990
MC-019	A Phase I Cultural Resource Survey of the Proposed Route 58, South Hill Bypass, Mecklenburg County, Virginia	Joe B. Jones, Dennis B. Blanton, Charles M. Downing, and Willie Graham	1990
MC-020	Phase I Cultural Resource Reconnaissance of the Proposed Interstate Industrial Park in the Town of South Hill, Virginia	Christopher Egghart and Luke Boyd	1991
MC-025	A Phase I Cultural Resource Survey of The Proposed Route 708 Widening in Mecklenburg County, Virginia	Craig R. Lukezic	1992
MC-031	Phase I Cultural Resources Investigation for the U.S. Route 58 Widening Study Between Boydton and South Hill, Mecklenburg County, Virginia	J. Sanderson Stevens, Margarita Jerabek Wuellner, and Joshua Lea Thackston	1992
MC-032	An Additional Phase I Cultural Resource Survey of Redesigned Sections of The Proposed Route 58 South Hill Bypass Project, Mecklenburg County, Virginia	Stevan C. Pullins and Charles M. Downing	1993

VDHR Survey #	Title	Author(s)	Date
MC-045	A Phase I Archaeological Survey of a Realignment of Section E23 of the Proposed Route 58, South Hill Bypass, Mecklenburg County, Virginia	Kenneth E. Stuck and Charles M. Downing	1996
MC-050	A Supplemental Archaeological Survey of Route 58 Widening, Mecklenburg County, Virginia	Maureen Myers	1999
MC-068	Roanoke Rapids and Gaston Hydropower Project: Cultural Resources Overview and Survey of Eroded Shoreline in Locations of Previously Recorded Sites, Brunswick and Mecklenburg Counties, Virginia	Lawrence E. Abbott, Erica E. Sanborn, Lawrence E. Abbott, Jr., and John S. Cable	1998
MC-070	Roanoke Rapids and Gaston Hydropower Project: Cultural Resources Survey of High Probability Areas Parallel to the Shoreline, Brunswick and Mecklenburg Counties, Virginia	Lawrence E. Abbott and Peter E. Siegel	1998
MC-074	Archaeological Survey of the Proposed Routes 1/58 to Route 47 Connector Project, Town of South Hill, Mecklenburg County, Virginia	Courtney J. Birkett	2005
MC-081	A Phase I Cultural Resources Survey of Approximately 0.5 Acre for the Baskerville Cellular Tower Site Mecklenburg County, Virginia	Aimee J. Leithoff and Ellen M. Brady	2007
MC-084	Phase I Cultural Resources Survey and Cemetery Delineation Study for the Proposed Boydton Horse Park, Mecklenburg County, Virginia	Mike Klein, Tracy McDonald, Emily J. Lindtveit, and Dane T. Magoon	2010
MC-099	Phase I Cultural Resources Survey of the ±69.6 Hectare (±172 Acre) Mecklenburg County Public Schools Project Area, Mecklenburg County, Virginia	David Dutton	2019
MC-100	Phase I Cultural Resources Survey of the ±105 Hectare (±260 Acre) Prison Property Project Area, Mecklenburg County, Virginia	David Dutton and Hope Smith	2017
MC-101	Phase I Cultural Resources Survey of the ±12.92-Hectare (±31.93-Acre) Prison Expansion Project Area, Mecklenburg County, Virginia	Hope Smith	2019
MC-104	Cloud Breaker Station and Coleman Creek Delivery Point Project, Phase I Cultural Resource Survey Report	Tanner Haynes and Derek Parrott	2020
MC-119	Phase I Cultural Resources Survey of the Line #235 Extension to Cloud 230-kV And Related Projects, Mecklenburg County, Virginia	Robert J. Taylor and David H. Dutton	2023
MC-122	Phase IA Cultural Resource Assessment of the ±53.8-Hectare (±133-Acre) AVC43 Project Area, Mecklenburg County, Virginia	David Dutton	2021

*Highlighted rows correspond to survey reports that overlap portions of the proposed Project.

4.5 ENVIRONMENTAL JUSTICE

4.5.1 EXISTING CONDITIONS

4.5.1.1 IDENTIFICATION OF ENVIRONMENTAL JUSTICE POPULATIONS

Federal guidelines for environmental justice (EJ) studies define potential EJ communities based on the share of minority and low-income populations of a given area, compared to the minority or low-income population in the state or county that contains the community.[8]

The guidelines established in the Virginia Environmental Justice Act (VEJA) of 2021 (Va. Code §§ 2.2-234 through 235) are more stringent than federal guidelines. As such, this report uses the Commonwealth's guidelines. VEJA defines "Environmental Justice" and "Environmental Justice Community" as follows (Va. Code § 2.2-234):

- "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.
- "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.
- "Meaningful involvement" means the requirements that (i) 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 (ii) decision makers will seek out and consider such participation, allowing the views and perspectives of community residents to shape and influence the decision.
- "Environmental Justice Community" means any low-income community, population of color, or community of color.

Based on the VEJA guidelines, EJ communities are identified in this report using the criteria described below:

Racial/Ethnic Composition:

- The percent of individuals in an EJ analysis area who identify as a race and ethnicity other than "white alone, not Hispanic or Latino" is greater than 40% of the total population (the Commonwealth average) (i.e., a "community of color"); OR
- The percent of any racial or ethnic group that is not "white alone, not Hispanic or Latino" in the population for the analysis area is greater than the Commonwealth average for that racial or ethnic group (i.e., "population of color"); OR

[8] For more information on the federal guidelines for EJ analysis, please see the March 2016 report from the Federal Interagency Working Group on Environmental Justice and National Environmental Policy Act Committee "Promising Practices for EJ Methodologies in NEPA Reviews" accessible at: https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

- The percent of the population in the analysis area considered linguistically isolated (individuals in households where nobody speaks English at least "very well") is greater than the Commonwealth average of 3%.

Low-Income:

- The share of households with total earnings less than 200% of the Federal poverty level and less than or equal to 80% of the median household income of the analysis area is greater than 30% (Virginia Law 2024).

ERM used the Census Block Group (CBG) as the analysis area for this study because the CBG is the smallest unit for which U.S. Census Bureau demographic data are available. Based on the EJ criteria thresholds described above, all nine CBGs within one mile of the route alternatives contain EJ communities (Figure 4.5-1). Each of the Nebula-Raines route alternatives crosses four of these CBGs. Cloud-Nebula crosses one of these CBGs. Table 4.5-1 provides population and demographic information for each of the CBGs crossed and within one mile of the route alternatives. CBGs are identified first according to the census tract (CT) that contains them.

Low-income populations comprise greater than 30% of the total population in eight of the nine CBGs in the study area, including each of the CBGs crossed by the Nebula-Raines and Cloud-Nebula route alternatives.

All nine CBGs in the study area have populations or communities of color and all route alternatives cross CBGs where communities of color—and specifically Black or African American residents—comprise a larger percentage of total population than the state average. Hispanic and Latino residents are largely concentrated in three CBGs the northeastern portions of the project area.

One CBG (CT 9302.01 BG 3), which is not crossed by any route alternatives, contains individuals that have limited English speaking skills. The CBG (CT 9301.01 BG 2) with the highest percentage of Hispanic and Latino population (27%) also has a high percentage of low-income populations in the study area (67%).

One CBG (CT 9301.01 BG 2) has an American Indian or Alaska Native population percentage (1.3%) that is more than 10 times the size of the state average (0.1%). This CBG is not crossed by any of the route alternatives. There are no tribal lands within Mecklenburg County. The nearest tribal lands to the route alternatives—the Haliwa-Saponi state-designated tribal statistical area in North Carolina—are approximately 21 miles southeast of the nearest route alternative (USEPA 2024).

4.5.1.2 OTHER SENSITIVE POPULATIONS

ERM used three other indicators to identify populations with additional socioeconomic burdens in study area communities: education attainment (the percent of people over age 25 in a CBG with less than a high school education) and age-based vulnerabilities (i.e., the percent of people in a CBG under age 5 or over age 64). There is no equivalent VEJA definition for these groups; therefore, ERM used the federal threshold guidance of a "meaningfully greater" percentage of population than the reference (state) population. Specifically, a CBG is considered to contain a potential age-based vulnerable community, or community with low education attainment, when

the percentage of the population either below age 5 or above age 64 (or with less than a high school education) exceeds twice the corresponding state averages.

Less than a High School Education

In four CBGs in the study, the population of people aged 25 years or older without at least a high school education is more than twice the stage average. Nebula-Raines Routes 1, 3, and 5 cross one of these CBGs (CT 9302.02 BG 1), while no route alternatives cross the other three CBGs meeting this criterion.

Population Under Age 5

Children are particularly susceptible to environmental burdens for several reasons, encompassing physiological, developmental, and behavioral factors. In the Project area, one CBG (CT 9303 BG 2) has a population percentage of young people under the age of 5 that is at least twice the state average. All four Nebula-Raines route alternatives cross this CBG.

Population Over Age 64

People over 64 years of age are more susceptible to pollution due to several physiological, immunological, and health-related factors. In the Project area, two CBGs (CT 9301.04 BG 2 and CT 9302.01 BG 3) have population percentages with people over the age of 64 that are at least twice the state average; however, no route alternatives cross either of these CBGs.

TABLE 4.5-1 DEMOGRAPHC AND SOCIOECONOMIC INDICATORS IN THE 1-MILE ENVIRONMETAL JUSTICE ANALYSIS AREA

Geography	Population	Total Populations of Color (%) [a]	White, non-Hispanic (%)	Black or African American (%)	American Indian and Alaska Native (%)	Asian (%)	Pacific Islander (%)	Some Other Race Alone (%)	Two or More Races (%)	Hispanic or Latino (%)	Low-Income Population (%) [b]	Limited English-Speaking Household (%) [c]	Population with Less than High School Education (%) [d]	Population Under Age 5 e (%)	Population Over Age 64 (%) [e]	Route Alternatives Crossed
Virginia	8,624,511	40	60	19	0.1	7	0.1	0.5	4	10	23	3	9	6	16	-
Mecklenburg County	30,367	40	60	33	0.4	1	0.0	0.0	2	3	40	1	14	5	26	-
CT 9301.01 BG 2	859	76	24	48	1.3	0	0.0	0.0	0	27	67	0	19	3	16	None
CT 9301.04 BG 2	395	26	74	22	0.0	0	0.0	0.0	0	4	30	0	18	2	45	None
CT 9302.01 BG 3	954	38	62	20	0.0	0	0.0	0.0	0	18	31	9	23	7	41	None
CT 9302.02 BG 1	1036	76	24	57	0.0	0	0.0	0.0	6	13	45	0	31	4	8	All Nebula-Raines Routes
CT 9302.02 BG 2	770	60	40	56	0.0	0	0.0	0.3	3	0	61	0	16	8	28	Nebula-Raines Route 5
CT 9303.00 BG 1	1,023	42	58	36	0.0	0	0.0	0.0	6	0	35	0	14	7	17	Nebula-Raines Routes 1, 3, 4
CT 9303.00 BG 2	902	33	67	31	0.0	0	0.0	0.7	0	1	66	0	14	15	20	All Nebula-Raines Routes
CT 9306.00 BG 1	971	36	64	36	0.0	0	0.0	0.0	0	0	35	0	14	3	21	All Nebula-Raines Routes, Cloud-Nebula Route
CT 9306.00 BG 2	1,333	49	51	44	0.0	1	0.0	0.0	1	3	23	0	13	10	19	None

Source: U.S. Census Bureau (2022a,b,c,d,e). American Community Survey, 5 Year Estimates (2018-2022), Tables B03002, C17002, C16002, B15002, B01001.

CT = census tract.
[a] U.S. Census Bureau American Community Survey 5 Year Estimates (2018–2022), Table B03002.
[b] U.S. Census Bureau American Community Survey 5 Year Estimates (2018–2022), Table C17002.
[c] U.S. Census Bureau American Community Survey 5 Year Estimates (2018–2022), Table C16002.
[d] U.S. Census Bureau American Community Survey 5 Year Estimates (2018–2022), Table B15002.
[e] U.S. Census Bureau American Community Survey 5 Year Estimates (2018–2022), Table B01001.
Light gray shaded cells indicate the reference population, Virginia.
Dark gray shaded cells indicate the population of Mecklenburg County, Virginia.
Light tan shaded cells indicate populations of color.
Green shaded cells indicate low-income populations.
Yellow shaded cells indicate communities with linguistic isolation.
Purple shaded cells indicate communities with age- or education-based vulnerabilities.

4.5.2 IMPACT ASSESSMENT

Project route alternatives were identified through a systematic process that examined a variety of factors to identify constraints and opportunities, including avoidance of residential areas and sensitive environmental and cultural resources, identification of compatible land uses, and collocation with existing roads, utility rights-of-way, or other linear corridors, where feasible.

All five routes (the four Nebula-Raines route alternatives and the Cloud-Nebula Route) cross potential EJ communities (Figure 4.5-1, Table 4.5-1). In all cases, the routes largely pass through wooded areas devoid of structures and residences. No route alternative has more than 17 residences within 500 feet of its centerline.

To ensure that stakeholder concerns regarding the potential direct and indirect impacts of the Project are understood and considered in routing decisions, Dominion designed and implemented a comprehensive outreach program early in the Project's development phase to identify and engage with all community stakeholders regardless of EJ community status, including federally recognized tribes. As part of the outreach program, the Company shared Project materials through written and in-person methods (e.g., letters and open houses), documented comments provided by stakeholders, and responded to feedback by seeking ways to mitigate or avoid identified impacts, including any potential disproportionate impacts on vulnerable communities. As part of outreach, Dominion held community meetings on July 17, 2024, and August 28, 2024, at The Dogwood Event Venue in South Hill, Virginia.

In assessing whether a community would bear a disproportionately adverse impact from the Project, ERM considered construction impacts (specifically, noise and ground disturbance), visual impacts, property devaluation, and health impacts related to electric and magnetic fields discussed in the sections below. The Project route alternatives share many similarities; therefore, the impacts discussed below are general to all project routes, except where specific route alternatives would have different impacts; these are called out and discussed separately.

Overall, while all the communities within the one-mile radius of the site are potential EJ communities, the Project would not have adverse or significant impacts, primarily due to the limited number of homes and businesses near the route alternatives.

4.5.2.1 CONSTRUCTION ACTIVITIES

Impacts associated with Project construction would be temporary, lasting less than a year. Regardless of the routes selected, construction activity and crews would be present at a particular location during daytime hours for a few to several days at a time, on multiple occasions throughout the construction period between initial right-of-way clearing and final restoration.

Various regulations, industry standards, and BMPs would guide construction and restoration of the right-of-way. The short-term impacts of construction could include equipment noise, dust, potential changes in traffic patterns, and ground disturbance. All of these impacts would be short term and temporary.

Noise is generally defined as unwanted sound. The primary noise receptors in the study area would be the single-family homes that are within 500-feet of the centerline of the routes

(See Section 4.1.4). The nearest school to any of the Project route alternatives is the Mecklenburg public Middle/High School located at the northwest corner of the intersection of US 58 and Wooden Bridge Road in Baskerville. The school is approximately 0.6 mile south of Nebula-Raines Route 5. Section 4.1 (Land Use) provides additional details on distances and locations of potentially sensitive resources from each of the route alternatives. Exceedances of daytime noise limits are not expected; if any such exceedances occur, they would be temporary.

During construction, Dominion would minimize ground-disturbing activities to the extent practicable. Following construction, Dominion would remove construction-related equipment and debris from the right-of-way and restore the land within the right-of-way as closely as possible to preconstruction contours and maintain the right-of-way during operations with an herbaceous cover.

4.5.2.2 VISUAL IMPACTS

Section 4.3 assesses the Project's visual impacts. Because all the CBGs in the study area contain sensitive populations, many of the KOPs used in the analysis of visual impacts are representative of views in potential EJ communities.

KOP 010 (Routes 1 and 3), KOP 011 (Nebula-Raines Routes 1, 3, and 4), KOP 028 (Nebula-Raines Route 5), and KOP 034 (Routes 1 and 5) illustrate how the proposed routes would look from residential areas in potential EJ communities. There are no KOPs associated with Cloud-Nebula Route, and this Project component would not be visible to the public. Section 4.3.1.5 provides a detailed description of visual impacts from each KOP. Key findings related to potential EJ communities are summarized below.

- At KOP 10, the new features on the landscape associated with either Nebula-Raines Route 1 or Route 3 in this location would result in moderate visual impacts on existing conditions.
- At KOP 11, residents are unlikely to experience substantive changes in views.
- Due to dense vegetation around KOP 028 and KOP 034, views of the Project's infrastructure would not dominate the visual landscape in those areas.

Overall, visual impacts to surrounding communities would be moderate.

4.5.2.3 PROPERTY VALUES

Affected communities and landowners often express concern that the presence of transmission lines in the viewshed of homes could adversely affect aesthetics, resulting in the reduction of property values and deterring potential buyers. Indirect impacts on property values caused by direct visual impacts from high-voltage transmission lines depend on proximity, visibility, size, and type of transmission structures; easement landscaping; and surrounding topography. Peer-reviewed articles and industry research published in peer-reviewed journals and trade journals finds that residential property values and sales prices are primarily affected by factors unrelated to the presence of a transmission line. Specifically, this research found that factors such as location, type, and condition of improvements to the property; neighborhood characteristics; and broader local real estate market conditions have a greater influence on the value of residential property than the presence of a transmission line (Jackson and Pitts 2010; Anderson 2017).

Each Project route alternative has fewer than 20 homes that are within 500-feet of its centerline. The landscapes that the routes pass through are predominantly rural, with mixed residential and open, agriculture, or forested land. None of the route alternatives cross major urban or suburban population centers. Development in the study area is largely confined to areas along existing paved roads, with most homes in the study area clustered along US 1 and US 58. The Town of South Hill, Virginia is located roughly 1.2 miles north of the future Raines Substation, the start of the Nebula-Raines route alternatives.

4.5.2.4 HEALTH IMPACTS

The conclusions of multidisciplinary scientific review panels assembled by national and international scientific agencies during the past three decades are the foundation of Dominion's opinion that no adverse health impacts are anticipated to result from the operation of transmission infrastructure, including the Project. The general scientific consensus of agencies that have reviewed this research, relying on generally accepted scientific methods, is that common sources of electromagnetic fields (EMFs) in the environment, including from transmission lines and other parts of the electric system, appliances, etc., are not a cause of any adverse health impacts.

Research on EMF and human health varies widely in approach. Some studies evaluate the impacts of high, short-term EMF exposures not typically found in people's day-to-day lives on biological responses, while others evaluate the impacts of common, lower EMF exposures found throughout communities. Studies also have evaluated the possibility of impacts (e.g., cancer, neurodegenerative diseases, and reproductive impacts) of long-term exposure. Altogether, this research includes well over 100 epidemiologic studies of people in their natural environment, and many more laboratory studies of animals (in vivo) and isolated cells and tissues (in vitro). Standard scientific procedures, such as weight-of-evidence methods, were used by the expert panels assembled by agencies to identify, review, and summarize the results of this large and diverse research.

The reviews of EMF-related biological and health research have been conducted by numerous scientific and health agencies, including, for example, the European Health Risk Assessment Network on Electromagnetic Fields Exposure, the International Commission on Non-Ionizing Radiation Protection, the World Health Organization, the Institute of Electrical and Electronics Engineers International Committee on Electromagnetic Safety, the Scientific Committee on Emerging and Newly Identified Health Risks of the European Commission, and the Swedish Radiation Safety Authority (formerly the Swedish Radiation Protection Authority; WHO 2007; SCENIHR 2009, 2015; ICNIRP 2010; SSM 2015, 2016, 2018, 2019, 2020, 2021, 2022; ICES 2019). The general scientific consensus of the agencies that have reviewed this research, relying on generally accepted scientific methods, is that the scientific evidence does not confirm that common sources of EMF in the environment, including transmission lines and other parts of the electric system, appliances, etc., are a cause of any adverse health impacts.

The route alternatives were designed to be as far from dwellings and other sensitive receptors as practicable both within and outside of EJ communities. While the desktop review suggests that EJ populations live within one mile of the route alternatives, there are few homes in the immediate

vicinity of the Project study area; therefore, impacts on EJ communities from EMF associated with the Project are not anticipated.

4.6 GEOLOGICAL AND MINERAL RESOURCES

4.6.1 EXISTING CONDITIONS

4.6.1.1 GEOLOGICAL RESOURCES

The study area is within the Piedmont geologic province, characterized by strongly weathered bedrock due to the humid climate, thick soils overlying saprolite (weathered bedrock), and rolling topography that becomes more rugged to the west near the Blue Ridge mountains. In general, the Piedmont province consists of several complex geologic terranes where rock units with differing igneous and metamorphic histories are separated by faults. Based on review of the Geologic Map of Virginia, the Project area is located within the Clarksville Terrane, where the general bedrock underlying the study area comprises Proterozoic-age (approximately 2.5 billion to 540 million years before present) metamorphic bedrock (mylonite, phyllite, and biotite gneiss) along with sections of Mississippian Pennsylvanian-age (approximately 360 to 300 million years ago) volcanics (primarily granite) (William and Mary Department of Geology 2024).

Based on review of the Geologic Map of Virginia, the Nebula-Raines route alternatives begin within a section of Proterozoic granite before crossing a section of Proterozoic-age biotite gneiss. The route alternatives then encounter an interval of Proterozoic-Paleozoic age mylonite followed by Mississippian-Pennsylvanian age granite, before returning to the interval of mylonitic bedrock. Each of the Project route alternatives terminate at the Nebula Switching Station, which is located within a section of Proterozoic-age phyllite. Beginning at the Cloud Switching Station and terminating at the Nebula Station, the entirety of Cloud-Nebula Route is located within the section of Proterozoic-age phyllite (William and Mary Department of Geology 2024).

4.6.1.2 MINERAL RESOURCES

ERM reviewed publicly available Virginia Department of Energy datasets (Virginia Energy 2024), USGS topographic quadrangles, and recent (2023) digital aerial photographs to identify mineral resources in the study area. Based on this review, no active mineral resources were identified within 0.25 mile of the Nebula-Raines route alternatives. The closest mineral occurrence is an inactive clay and shale prospect located approximately 0.25 mile north of Nebula-Raines Route 5.

4.6.2 IMPACT ASSESSMENT

As Project construction will require minimal ground disturbance, the Project would have no impacts on geological resources. The closest active mineral resource site is located more than 0.25 mile from the Project area. Due to distance to the mineral resource, construction and operation of the Project's transmission infrastructure would not impact the operations of any active mineral resource sites.

5 COMPARISON OF ALTERNATIVES

ERM identified the Project route alternatives discussed in this report based on the geography of major constraints and routing opportunities in the study area. In accordance with the Guidelines for Transmission Line Applications Filed Under Title 56 of the Va. Code (specifically the provision that existing rights-of-way should be given priority for routing new transmission facilities), ERM assessed opportunities for routing along existing rights-of-way. Collocation opportunities in the study area include existing roadways—in particular US 1 and US 58 (running east/west through the study area)—and existing transmission rights-of-way. The transmission rights-of-way include the northwest-southeast right-of-way for existing Lines #1041, #137, and #38 in the far western extent of the study area, in addition to an east-west right-of-way that connects the main transmission rights-of-way to the Cloud Switching Station. As discussed in Section 3.3, collocation with the major highways was limited to the northeast portion of the study area, due to residential and commercial development along these roads. Collocation with existing transmission lines was limited to the east-west right-of-way for Line #1041/#38, because the main northeast/southeast transmission right-of-way did not support efficient collocation. No other public utilities were available for collocation opportunities.

Route alternatives were constrained by publicly owned land (city, county, and state) and a VOF easement in the central and southern portions of the study area, as well as rural residential and farming communities throughout the study area.

The Project would require the construction of the proposed Nebula Switching Station, the Cloud-Nebula Line, and the Nebula-Raines Line along one of the four viable route alternatives. Impacts from the Project would therefore include the impacts of both the Cloud-Nebula Route and the selected Nebula-Raines route alternative. The proposed Nebula Switching Station has been included in the impacts for the Nebula-Raines route alternatives.

Given there is only one route alternative for the Cloud-Nebula Route, there is no further discussion in this section comparing the route to an alternative.

The remainder of this report provides a comparative analysis of the Nebula-Raines route alternatives to identify a preferred route. The Features Crossing Table (Appendix C) lists the resources crossed by each route alternative, while the sections below describe the comparison of each route alternative's impacts on resources. Resources that would not be directly or indirectly impacted by the Project are excluded from this section. These include land use planning and zoning, schools, conservation easements, airports and heliports, and geological and mineral resources.

5.1 LAND USE

Impacts on land use from the Project would include the placement of transmission structures on private property, clearing of trees within the right-of-way, visual impacts on resources (such as residences and recreational resources) within proximity of the transmission facilities, and temporary road closures associated with construction at road crossings. Potential impacts on land use from each route alternative are compared below.

5.1.1 LENGTHS, FOOTPRINTS, PARCELS, AND COLLOCATION

Table 5.1-1 shows the lengths and right-of-way footprints of each route, as well as the number of parcels crossed and collocation lengths for those routes.

TABLE 5.1-1 LENGTH, ACREAGE, PARCELS CROSSED, AND COLLOCATION LENGTHS OF THE NEBULA-RAINES ROUTE ALTERNATIVES

Route Feature	Unit	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5
Total Route Length	Miles	15.4	14.9	15.0	14.4
Construction Footprint [a]	Acres	197.6	192.0	192.3	185.2
Parcels Crossed by Right-of-way	Number	50	60	68	56
Landowners Crossed by Right-of-Way	Number	40	45	54	38
Collocation	Miles	0.3	0.8	0.8	2.9
Forested Land	Acres	103.1	109.6	132.8	99.5

[a] The construction footprint includes the proposed Nebula Switching Station.

Nebula-Raines Route 1 would be the longest route alternative and would have the largest right-of-way crossing 15.4 miles and encompassing approximately 197.6 acres. Routes 3 and 4 are similar in length and footprint, differing by only 0.1 mile and 0.3 acre. Nebula-Raines Route 5 is the shortest route with the smallest footprint by 0.5 mile and 5.6 acres.

Nebula-Raines Routes 3 and 4 collocate with US 58 for the same length of the right-of-way (0.8 mile). Nebula-Raines Route 1 has only 0.3 mile of collocation opportunity along an unnamed gravel road. Nebula-Raines Route 5 has the most collocation opportunities, including 1.9 miles along US 58 and 0.9 mile of shared right-of-way with existing Lines #38/#1041. This would eliminate new impacts along 0.9 mile and approximately 10.9 acres of the proposed route, further reducing the length and acreage compared to the other Nebula-Raines route alternatives.

5.1.2 LAND OWNERSHIP

The Project would not cross any publicly owned lands. All parcels crossed by the Nebula-Raines route alternatives are privately owned. Nebula-Raines Route 4 would cross the largest number of parcels (68), while Nebula-Raines Route 1 would cross the fewest (50). Two of the 56 parcels crossed by Nebula-Raines Route 5 would occur entirely within the existing Lines #38/#1041 right-of-way, eliminating new impacts on these parcels. Additionally, Nebula-Raines Route 5 would affect the fewest number of landowners among all route alternatives.

5.1.3 LAND USE AND LAND COVER

Except for the placement of transmission structures, the Project would have no direct impacts on open space, developed land, 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 right-of-way.

All of the Nebula-Raines route alternatives predominantly cross forested lands. Nebula-Raines Route 4 would cross the most forested land, while Nebula-Raines Route 5 would require the least forest clearing. Impacts on forest are assessed further in Section 5.2.

5.1.4 PLANNED DEVELOPMENTS

Nebula-Raines Routes 1 and 3 would cross the planned wetland mitigation bank in the southern portion of the study area; however, the Company has coordinated with the developer to avoid impacts on the mitigation bank. The Nebula-Raines route alternatives do not cross and would not be near any other planned developments.

5.1.5 RESIDENTIAL AND COMMERICAL BUILDINGS

None of the Nebula-Raines route alternatives would have any buildings located within the right-of-way. Indirect impacts would be limited to temporary impacts from construction (noise) and visual impacts from the transmission lines. There are no residential dwellings within 60 feet of the right-of-way or within 100 feet of the centerlines of any of the Nebula-Raines route alternatives. Nebula-Raines Route 1 has 3 residential dwellings and Nebula-Raines Route 4 has 1 residential dwelling within 250 feet of their centerlines, while Nebula-Raines Routes 3 and 5 have none. Routes 1, 3, and 4 have similar numbers of residential dwellings within 500 feet of their centerlines (15, 16, and 17, respectively). Nebula-Raines Route 5 has the fewest dwellings within 500 feet of its centerline (11).

No commercial (or other non-residential) buildings are within 60 feet of the right-of-way or within 100 feet of the centerline of any of the Nebula-Raines route alternatives. Nebula-Raines Route 1 has one commercial building (a church) within 500 feet of its centerline. Nebula-Raines Route 5 has the largest number of commercial buildings within 500 feet of its centerline—three buildings, two of which are two within 250 feet of the centerline (one of which is a church). Routes 3 and 4 have no commercial buildings within 500 feet of their centerlines and would therefore have no impacts on commercial structures. Impacts on churches are discussed further in Section 5.1.7.

5.1.6 RECREATIONAL RESOURCES

Impacts on recreational resources would be limited to temporary impacts from construction (noise), clearing of trees and vegetation within the right-of-way, and visual impacts from the transmission lines. All Nebula-Raines route alternatives would cross the Goodes Ferry Road (a Virginia Byway) and five recreational trails: the Beaches to Bluegrass Trail, Christanna Loop Birding Wildlife Trail, the East Coast Greenway, U.S. Bike Route 1, and Tobacco Heritage Trail. Existing trees at the crossings of these trails would be cleared within the right-of-way, altering trail views at those locations, but the functions of the trails would not be impacted. Nebula-Raines Routes 3 and 4 would have 9 recreational resource crossings, Nebula-Raines Route 1 would have 10, and Nebula-Raines Route 5 would have 14.

Nebula-Raines Route 5 also passes within 0.1 mile of the Park View Athletic Complex; however, this route would have no impacts on this resource due to a forested buffer between the recreational facilities and the right-of-way.

Overall, Nebula-Raines Routes 3 and 4 would have the least impact on recreational resources.

5.1.7 CEMETERIES AND PLACES OF WORSHIP

Impacts on cemeteries and places of worship would be limited to temporary impacts from construction (noise) and visual impacts from the transmission lines. Table 5.1-2 shows the number of cemeteries and places of worship within 500 feet of the Nebula-Raines route alternatives centerlines.

TABLE 5.1-2 CEMETERIES AND PLACES OF WORSHIP WITHIN 500 FEET OF THE NEBULA-RAINES ROUTE ALTERNATIVE CENTERLINES

Route Feature	Unit	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5
Cemeteries	Number	1	2	2	2
Places of Worship	Number	1	0	1	2
Total	**Number**	**2**	**2**	**3**	**4**

Transmission infrastructure would likely be visible from the places of worship and cemeteries located in close proximity to the Nebula-Raines route alternatives; however, transmission infrastructure would not prohibit use of these facilities. Impacts on places of worship would be limited, because most activities at those facilities occur inside. Visual impacts are discussed in Section 5.3.

5.1.8 TRANSPORTATION INFRASTRUCTURE

Project construction would require temporary road or lane closures and/or detours regardless of the Nebula-Raines route selected for the Project. Each Nebula-Raines route would cross US 1. Nebula-Raines Route 5 would also cross US 58 twice. VDOT and Mecklenburg County prefer perpendicular road crossings, which reduce the distance spanned and the visual impacts of a crossing. VDOT also prefers that transmission structures be placed outside of their rights-of-way to avoid conflicts with future road improvements. None of the route alternatives would impact planned future road projects.

Nebula-Raines Route 5 would require the most road crossings (13), including a crossing of US 1 and US 58 at an angle, followed by Nebula-Raines Route 1 (10) and Nebula-Raines Routes 3 and 4 (9). Crossings of US 1 by Nebula-Raines Routes 1, 3, and 5, and the second crossing of US 58 by Nebula-Raines Route 5 are all perpendicular.

Nebula-Raines Routes 3 and 4 would cross the smallest number of roads and would cross the major roadways at perpendicular angles as preferred by VDOT.

5.2 NATURAL RESOURCES

Each Nebula-Raines route alternative crosses natural resources, including wetlands, waterbodies, and habitat with natural vegetation (mainly forest), including areas ranked as ecological cores by the VDCR. Table 5.2-1 summarizes the natural resources that would potentially be impacted by each route alternative. Section 4.2 provides a more detailed description of these impacts.

TABLE 5.2-1 NATURAL RESOURCES CROSSED BY THE NEBULA-RAINES ROUTE ALTERNATIVES

Natural Resource	Unit	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5
Wetlands Total [a]	Acres	17.9	19.5	19.8	22.5
PFO [a]	Acres	16.1	16.9	17.3	15.8
PSS [a]	Acres	NA	0.3	0.3	0.6
Waterbodies Total	Number	26	25	25	32
Perennial Waterbodies	Number	11	10	10	11
Forested Lands	Acres	103.1	109.6	132.8	99.5
Ecological Cores	Acres	113.7	97.2	109.7	92.5
New Impacts on C2-Ranked Core 75315 [b]	Acres	15.8	15.8	20.6	1.2
Total Carolina Darter and Whitemouth Shiner VDCR-Predicted Suitable Habitat	Acres	11.5	11.6	15.2	10.5

NA = not applicable; PFO = palustrine forested; PSS = palustrine scrub-shrub.
[a] NA indicates not applicable due to absence of a wetland type within the Project footprint. A value of 0.0 indicates less than 0.05 acre of a wetland is present.
[b] Shows the amount of tree clearing required based on recent (2023) aerial imagery.

The impacts of Project construction on wetlands would generally be temporary, due to the use of temporary access roads and movement of installation equipment. Permanent direct impacts on wetlands would result from the placement of structures within wetlands (if unavoidable) and required tree clearing within the right-of-way of the selected Nebula-Raines route. Tree clearing within the maintained right-of-way would result in the conversion of PFO/PSS wetlands to PSS/PEM-type wetland, reducing or eliminating functions such as peak flow reduction, water filtration, and habitat diversity, eliminating riparian buffer and riparian buffer functions at waterbody crossings, eliminating forested habitat, and bisecting ecological cores.

5.2.1 WETLANDS

The Nebula-Raines Route 5 right-of-way would encompass the largest overall wetland acreage and the largest extent of PSS wetlands, while impacting the smallest extent of PFO wetlands. Nebula-Raines Route 1 would impact the smallest overall extent of wetlands and would not impact any PSS wetlands. Overall, Nebula-Raines Route 5 would have the least impact on wetlands and PFO/PSS wetlands.

5.2.2 WATERBODIES

Nebula-Raines Routes 3 and 4 would both cross the fewest total and the fewest perennial waterbodies, although Nebula-Raines Routes 1 and 5 would each cross one additional perennial waterbody. Nebula-Raines Route 5 would cross the most waterbodies, and the same number of perennial waterbodies as Nebula-Raines Route 1.

Of the routes, Nebula-Raines Routes 3 and 4 cross the fewest waterbodies and would require the clearing of the least amount of riparian buffer.

5.2.3 ECOLOGICAL CORES

Nebula-Raines Route 5 would impact the smallest acreage of ecological cores and by far the smallest net new acreage within the C2 (Very High)-ranked Core ID 75315.

All the Nebula-Raines route alternatives cross the same C2-ranked ecological core (Core 75315), however, Nebula-Raines Route 5 would cross the shortest distance of the core (1.6 miles). Of these 1.6 miles crossed, Nebula-Raines Route 5 would cross 0.9 mile of this core within the existing right-of-way of Dominion's existing Line #1041 and 0.7 mile of previously cleared land (based on recent (2023) aerial imagery), resulting in a total of approximately 0.1 mile (1.2 acres) of new impacts to Core 75315.

5.2.4 PROTECTED SPECIES

All Nebula-Raines route alternatives cross similar amounts of VDCR-predicted suitable habitat for the Carolina darter and the Whitemouth shiner, with Nebula-Raines Route 4 crossing the most by 3.6 acre, followed by Nebula-Raines Routes 1 and 3, with Nebula-Raines Route 5 crossing the least amount of habitat. Impacts on potentially suitable habitat would be limited to the clearing of riparian buffer and elimination of its functions adjacent to stream habitat. Nearly all the suitable habitat crossed by the routes is within forested areas, except for a 0.1-mile segment crossed by Routes 1 and 3, which is open field one side of the waterbody.

Of the routes, Nebula-Raines Route 5 would have the least impact on potential habitat for the Carolina darter and the Whitemouth shiner.

Forested habitat would also serve other protected species, such as the federally and state threatened NLEB and the federally potentially endangered and state endangered TCB, bald eagles, and other non-protected species. No impacts on these species are anticipated for any route alternative if trees are cleared during the winter according to VDWR TOYRs.

5.2.5 FOREST

The Nebula-Raines Route 4 right-of-way would impact the largest extent of forested acreage, while Nebula-Raines Route 5 would impact the smallest extent. The FCV data for the study area appear to be outdated, based on recent (2023) aerial imagery (e.g., the FCV data categorize some recently cleared land as FCV). This concern notwithstanding, Nebula-Raines Route 4 would impact the largest extent of FCV-ranked forest, while Nebula-Raines Route 5 would impact the smallest extent. Based on an assessment of aerial imagery, Nebula-Raines Route 4 would result in the greatest amount of forest fragmentation, while Nebula-Raines Routes 1 and 5 would have the smallest fragmentation impacts.

Overall, Nebula-Raines Route 5 would have the smallest impacts on forested land and habitat.

5.3 VISUAL RESOURCES

All Nebula-Raines route alternatives primarily cross forested areas, which limits potential views of the proposed infrastructure. The route alternatives would be most visible along US 58, where they cross and run parallel to public roads. Routes 1, 3, and 4 would cross the largest extent of agricultural land that lacks vegetative screening. Because it has the most forested and topographic screening, Nebula-Raines Route 5 would have the smallest overall visual impacts.

Where Project infrastructure would be clearly visible, the transmission line infrastructure would add prominent new forms and lines and would also increase the magnitude of visible modifications to the landscape. These impacts notwithstanding, vegetation and topography would screen most views of Project infrastructure. As a result, all Nebula-Raines route alternatives would have moderate visual impacts.

5.4 CULTURAL RESOURCES

Table 5.4-1 summarizes the number of known archaeological sites within the right-of-way of each Nebula-Raines route alternative, as well as the number of aboveground historic resources and architectural sites potentially impacted by each route alternative. None of the archaeological sites have been evaluated for the NRHP. Potential impacts on these sites would be determined by archaeological field investigations to be conducted along the route certificated by the SCC to support permitting of the Project. Nebula-Raines Route 1 would potentially impact the smallest number of archaeological and historic resources.

TABLE 5.4-1 CULTURAL RESOURCES POTENTIALLY IMPACTED BY THE NEBULA-RAINES ROUTE ALTERNATIVES [a]

Cultural Resource Type	Nebula-Raines Route 1	Nebula-Raines Route 3	Nebula-Raines Route 4	Nebula-Raines Route 5
Known Archaeological Sites Within the Right-of-way	1	5	6	5
Aboveground Historic Resources and Architectural Sites Potentially Impacted by the Route	3	5	8	4

a Routes are inclusive of the proposed Nebula Switching Station

Of the aboveground historic resources in the VDHR tiers, ERM recommends that:

- Nebula-Raines Route 1 would have no impact on one resource and a minimal impact on two resources.
- Nebula-Raines Route 3 would have no impact on two resources and a minimal impact on three resources.
- Nebula-Raines Route 4 would have no impact on four resources and a minimal impact on four resources.
- Nebula-Raines Route 5 would have no impact on three resources and a severe impact on one resource.

Of the route alternatives, Nebula-Raines Route 1 would have the least impact on aboveground cultural resources, followed by Routes 3 and 4, with Route 5 having the highest potential impact.

5.5 ENVIRONMENTAL JUSTICE

Potential impacts on EJ communities crossed by the route alternatives would be limited to temporary construction impacts (noise, dust, traffic impacts, and ground disturbance) and visual impacts. These impacts are anticipated to be minimal, because all route alternatives largely pass through undeveloped or minimally developed, forested areas. ERM's EJ assessment found that none of the route alternatives would result in a disproportionate, adverse, or significant impact on EJ communities.

6 CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation of each route alternative and the potential associated impacts on the human and natural environment within Mecklenburg County, ERM and the Company recommend the Cloud-Nebula Route and the Nebula-Raines Route 5 as the preferred alternatives for the Project.

Nebula-Raines Route 5 would be the shortest route and would have the smallest footprint of the route alternatives. It would also allow for the greatest extent of collocation, including 1.9 miles of collocation with US 58 and 0.9 mile of shared right-of-way with existing Lines #38/#1041 that would eliminate new impacts along 0.9 mile and approximately 10.9 acres of the route.

Nebula-Raines Route 1 would cross the fewest parcels, while Nebula-Raines Route 5 would cross the second fewest parcels, and would affect the fewest number of total landowners. Two of the parcels crossed by Nebula-Raines Route 5 would be crossed entirely within the right-of-way of existing Lines #38/#1041, and portions of a third parcel are located within the existing right-of-way, eliminating or reducing new impacts on these parcels.

Nebula Raines Routes 4 and 5 do not cross any planned developments. Routes 1 and 3 both cross a proposed wetland mitigation bank. Based on discussions with the developer of the mitigation bank, the Project would have no impacts on that development.

Nebula-Raines Route 5 would have fewer dwellings within 500 feet of its centerline (11) than Routes 1, 3, and 4 (15, 16, and 17 residences, respectively). Routes 3 and 5 both would have no residential dwellings within 250 feet of their centerlines, while Routes 1 and 4 would have 3 and 1 residence (respectively) within 250 feet.

All Nebula-Raines routes would cross the same five recreational trails; however, Routes 3 and 4 would have fewer total crossings (9 each), while Nebula-Raines Route 5 would have the most (15). Nebula-Raines Route 5 would also be adjacent to (although not visible from) the Park View Athletic Complex; therefore, Nebula-Raines Route 5 would have no impacts on the park.

The Nebula-Raines Route 3, 4, and 5 centerlines all pass within 500 feet of two of cemeteries, while the Nebula-Raines Route 1 centerline passes by one.

The Nebula-Raines Route 3 centerline does not pass within 500 feet of any places of worship, while the Routes 1 and 4 centerlines pass within 500 feet of one each, and the Nebula-Raines Route 5 centerline passes within 500 feet of two.

While Nebula-Raines Route 5 would cross the largest number of waterbodies, it would require the clearing of the smallest amount of PFO wetlands. It would also affect the smallest acreage of ecological cores and would have a significantly smaller impact on the C2-ranked Core ID 75315 (the only core ranked C2 or better in the study area) compared to the other route alternatives. Route 5 would have the smallest impacts on VDCR-predicted suitable habitat for the state-threatened Carolina darter and Whitemouth Shiner species. Nebula-Raines Routes 1, 3, and 5 would cross similar amounts of forested land, but Nebula-Raines Route 5 would have the smallest overall forest impact and would result in the smallest amount of forest fragmentation.

None of the Nebula-Raines route alternatives are expected to have more than moderate visual impacts on the surrounding VSRs; however, Nebula-Raines Route 5 would have the smallest visual impacts on residents and motorists due to the screening effects of vegetation and topography along the route.

Nebula-Raines Routes 1 would have the least impact on aboveground cultural resources, followed by Routes 3 and 4, with Route 5 having the highest potential impact. Nebula-Raines Route 5 would have no impact on three aboveground historic resources and a severe impact on one locally significant resource as it passes within 600 feet and would be visible from the resource.

The Cloud-Nebula Route is the only viable alternative route for the Cloud-Nebula Line. The Cloud-Nebula Route would be as short as possible, while reducing impacts to impacted parcels, by remaining adjacent to parcel lines and an existing development and the proposed Nebula Switching Station. Of the parcels crossed, one contains the existing Cloud Switching Station, and one is the location of the proposed Nebula Switching Station. This route would have no impacts on planned developments and the nearest residential dwelling are greater than 0.25 mile from the right-of-way. This route would have no impact on recreational resources or schools, cemeteries, or places of worship. The Cloud-Nebula Route would not be accessible or visible to the public and would have no visual impacts to the public.

The Cloud-Nebula Route would cross through managed timber, most of which appears to have been recently cleared based on 2024 aerial imagery (Google Earth LLC 2024). All 10.8 acres of this route would encompass a C2-ranked ecological core, however, based on the aerial imagery the route would result in no new impacts to the core. It crosses one NHD-mapped intermittent waterbody and approximately 0.7 acres of associated PFO and PEM type wetlands. This route would not cross any VDCR-predicted suitable habitat.

There are no known archaeological sites within the right-of-way of the Cloud-Nebula Route, and the one aboveground historic resource within the VDHR tiers of the route would not be impacted. Based on the routing study analysis, impacts on scenic assets, historic and cultural resources, and the environment would be minimized to the greatest extent practicable by the Cloud-Nebula Route.

None of the Project route alternatives would have a disproportionate, adverse, or significant impact on EJ communities.

In conclusion, after evaluating numerous routing constraints and opportunities identified through desktop study, stakeholder outreach, and fieldwork, ERM and the Company recommend the Cloud-Nebula Route and Nebula-Raines Route 5 as the preferred alternatives for this Project, because they avoid or reasonably minimize adverse impacts to the greatest extent reasonably practicable on the scenic assets, historic and cultural resources, and environment of the area concerned.

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APPENDIX A FIGURES

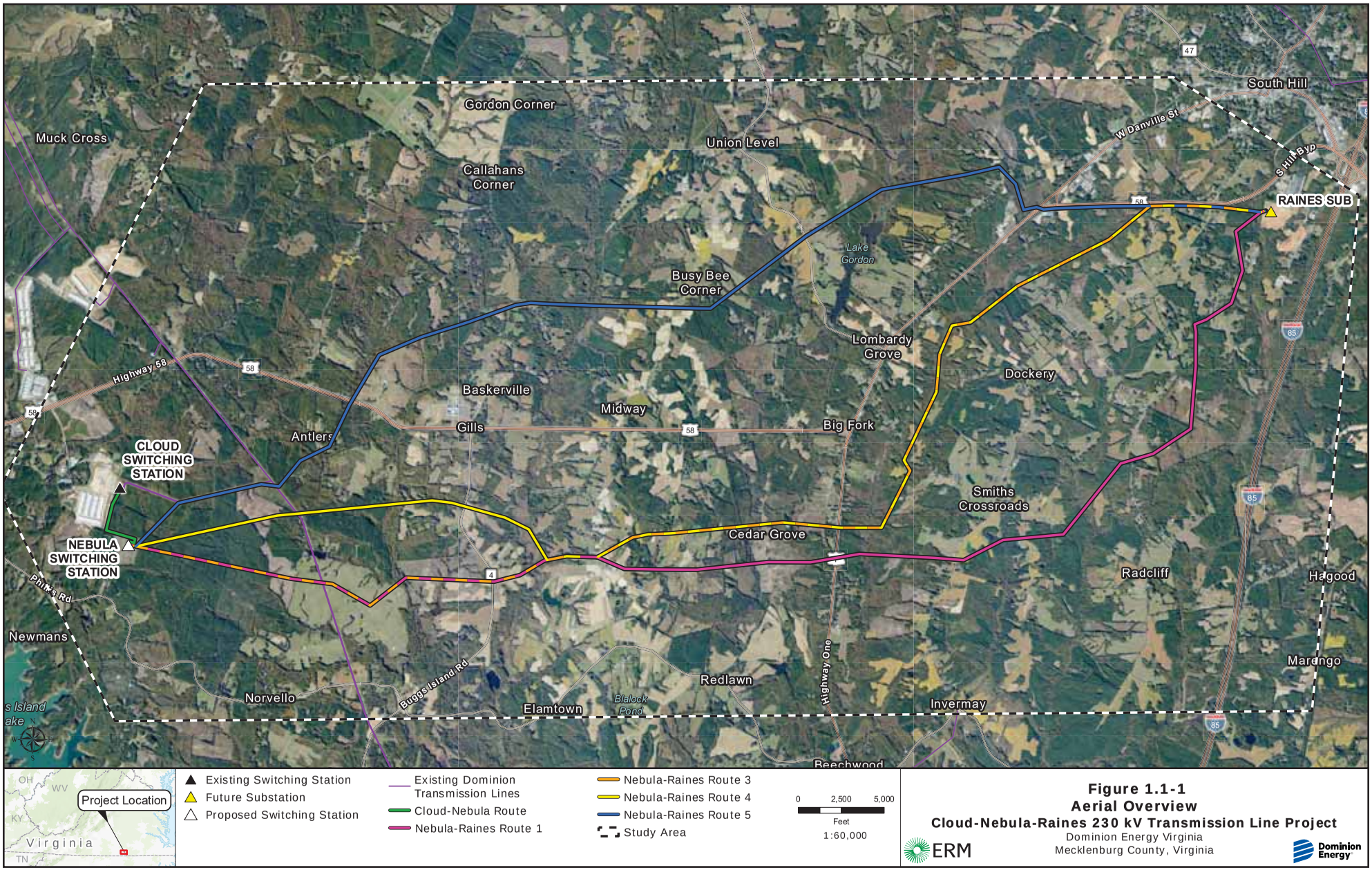


Figure 1.1-1
Aerial Overview
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

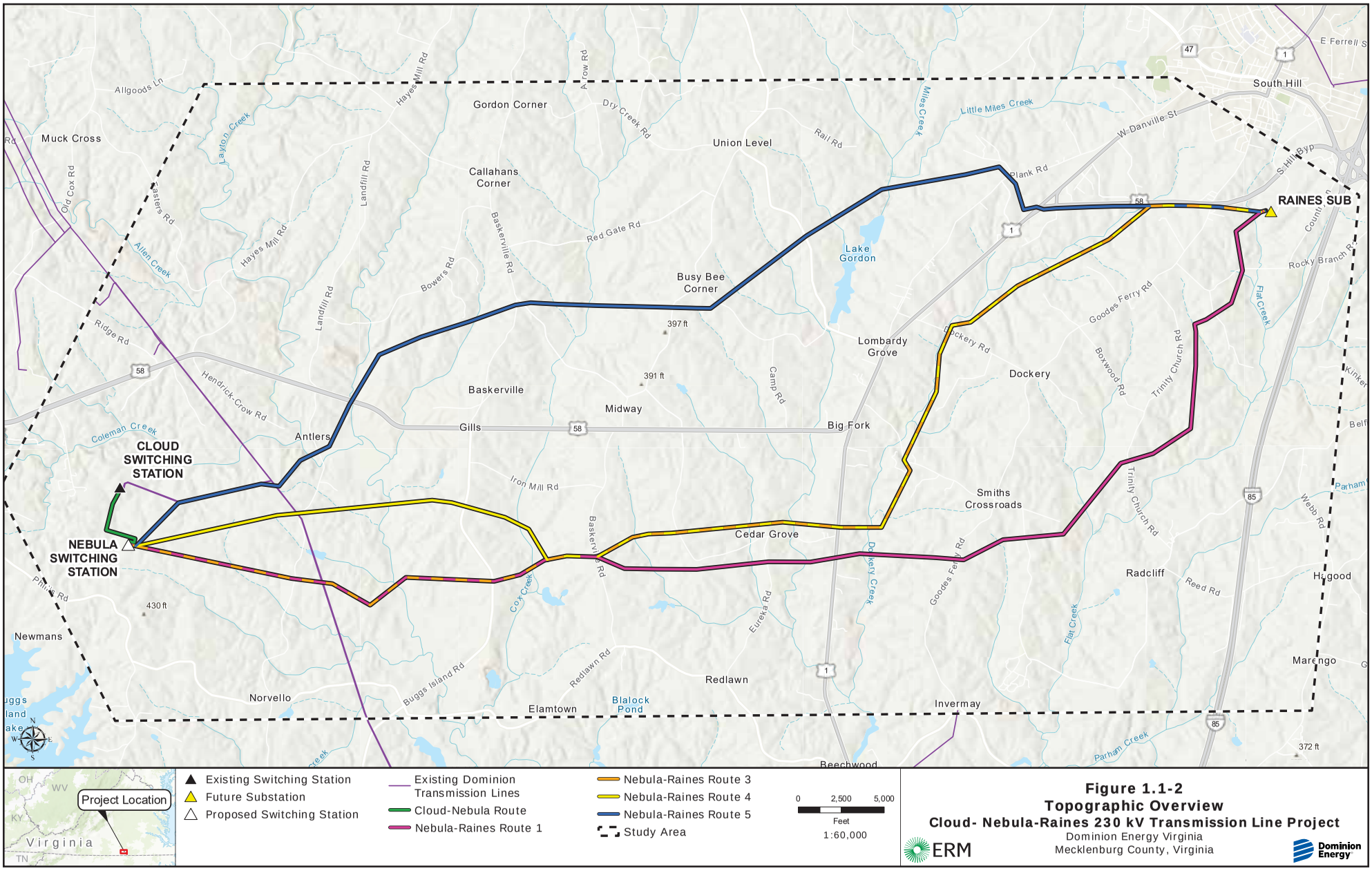


Figure 1.1-2
Topographic Overview
Cloud- Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

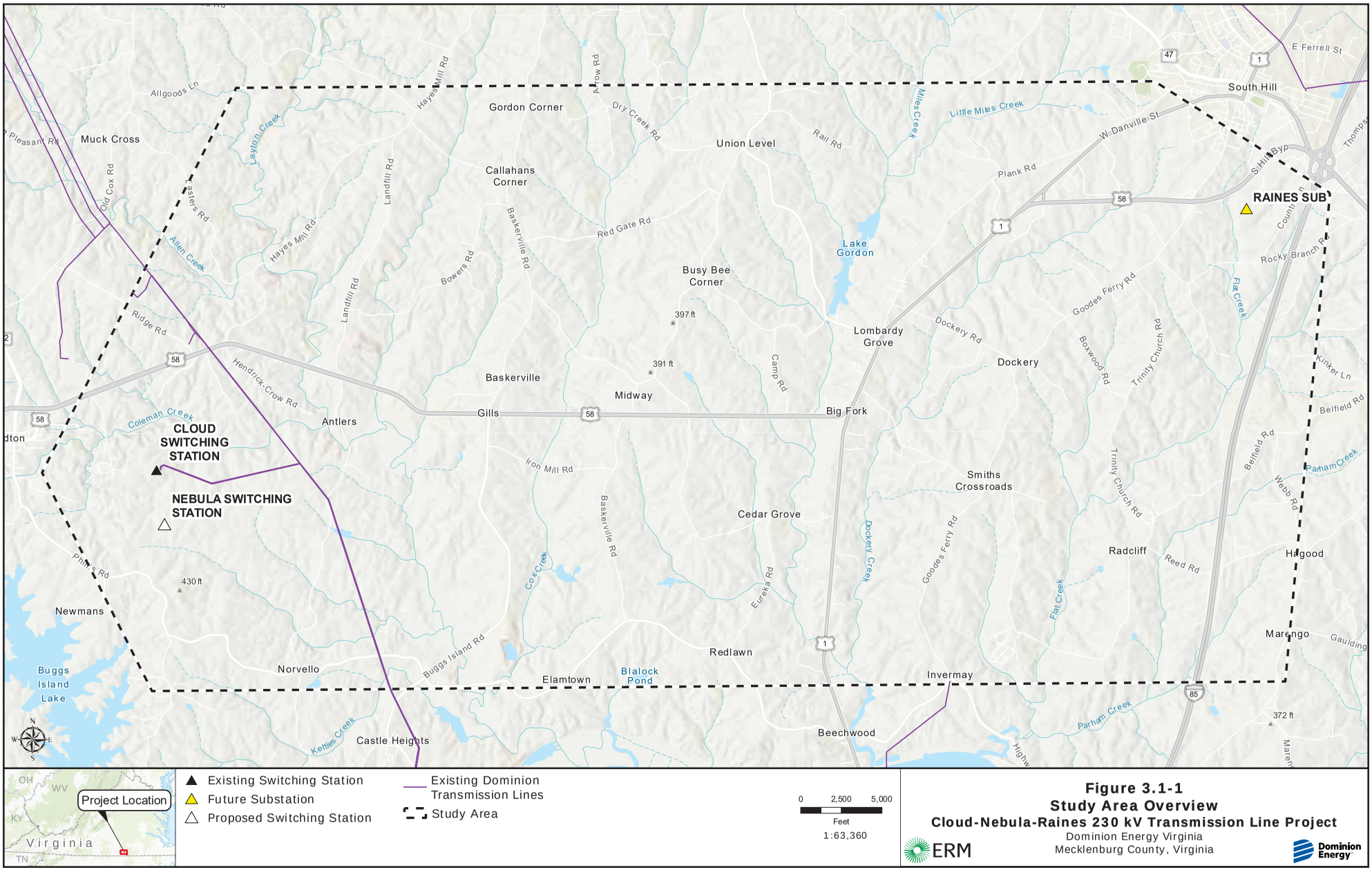


Figure 3.1-1
Study Area Overview
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

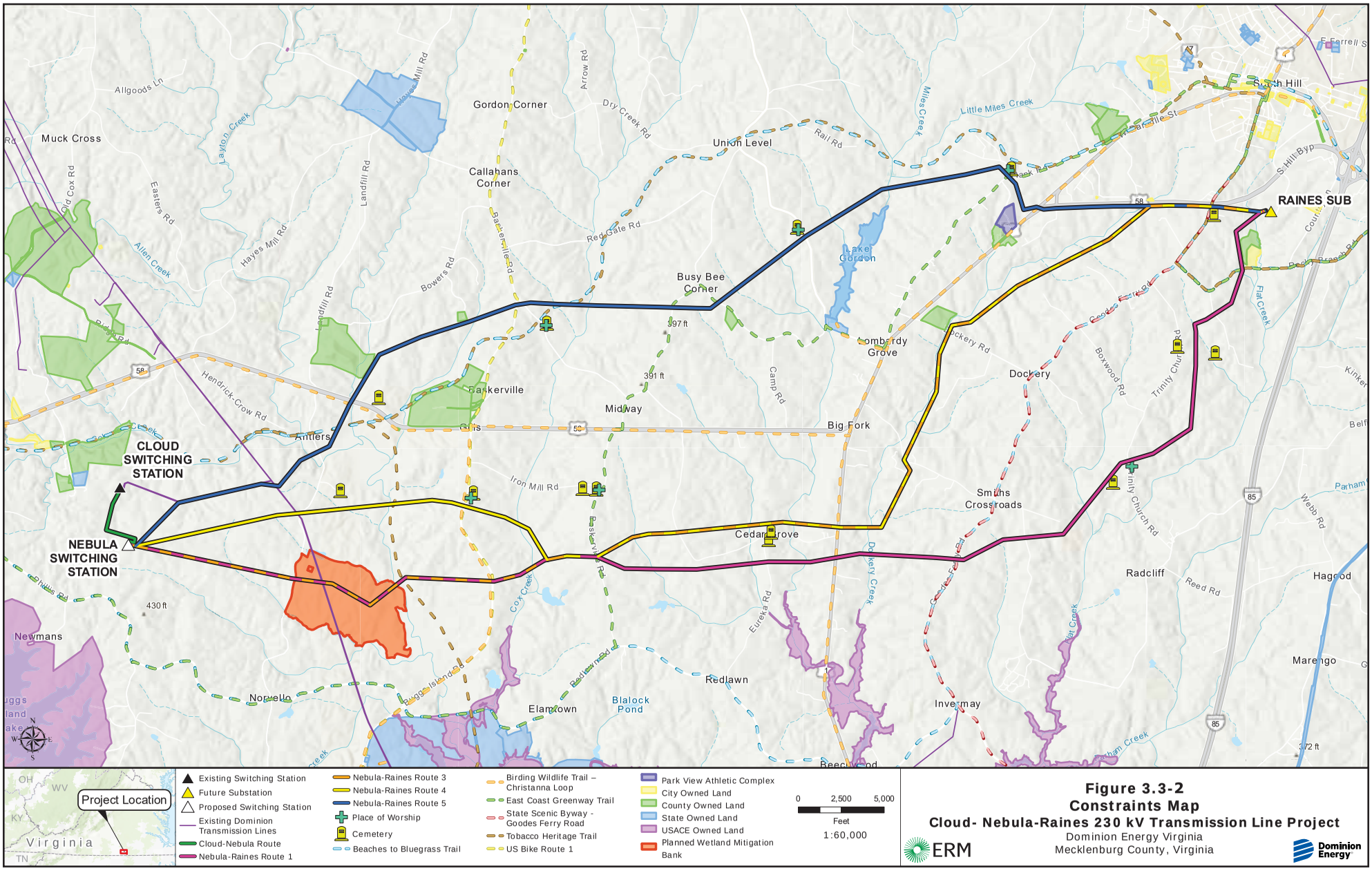


Figure 3.3-2
Constraints Map
Cloud- Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

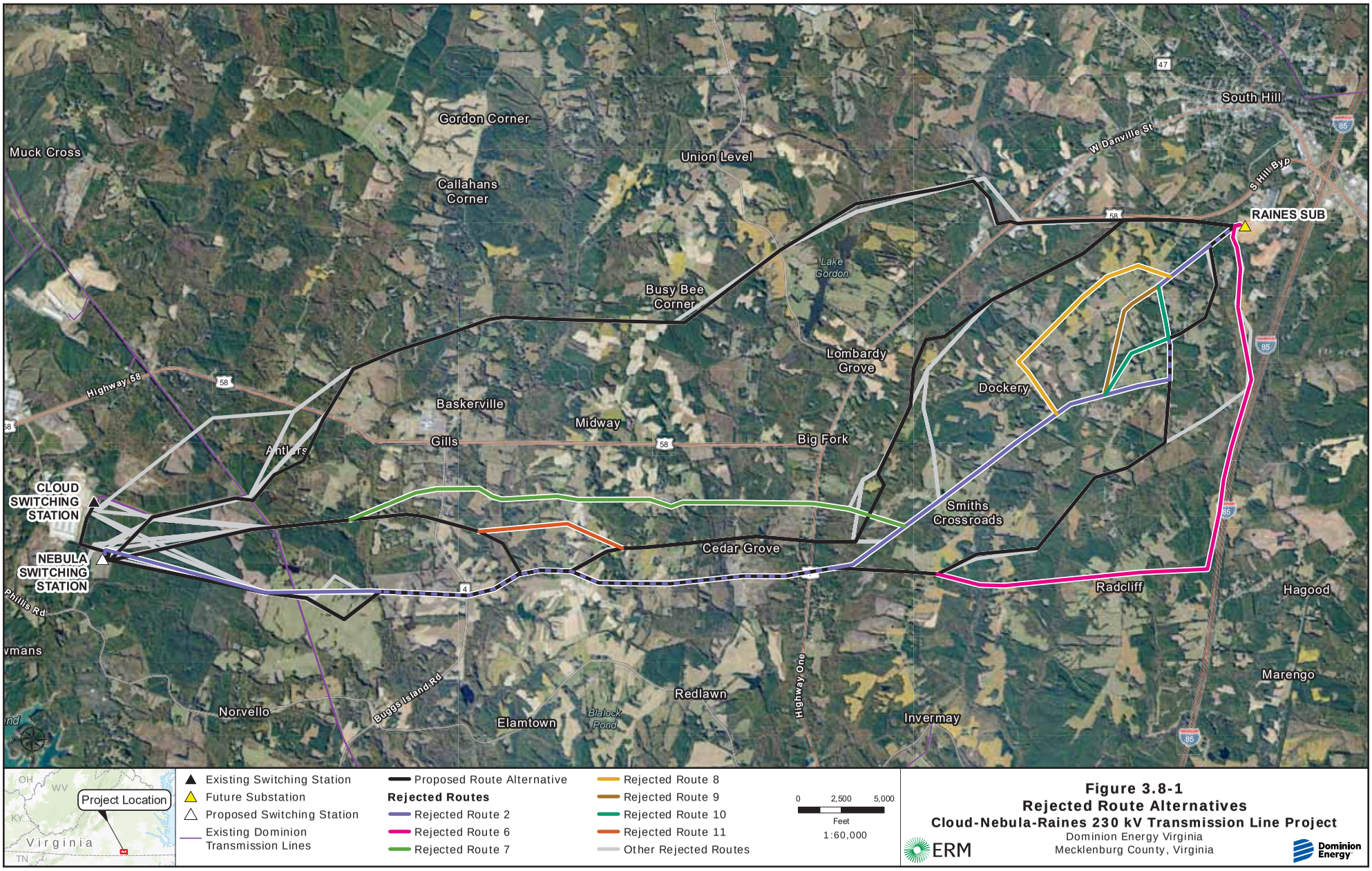


Figure 3.8-1
Rejected Route Alternatives
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

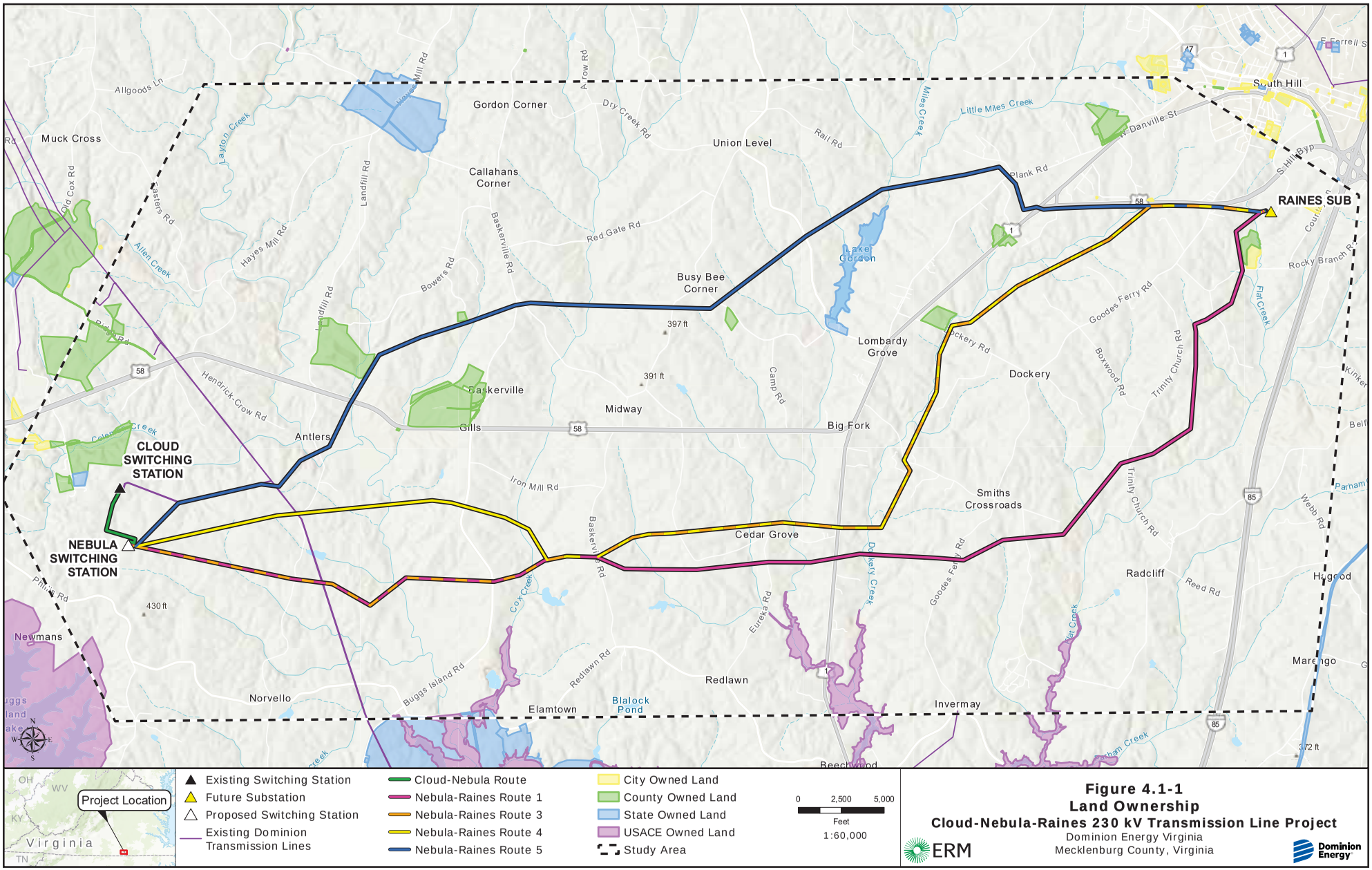
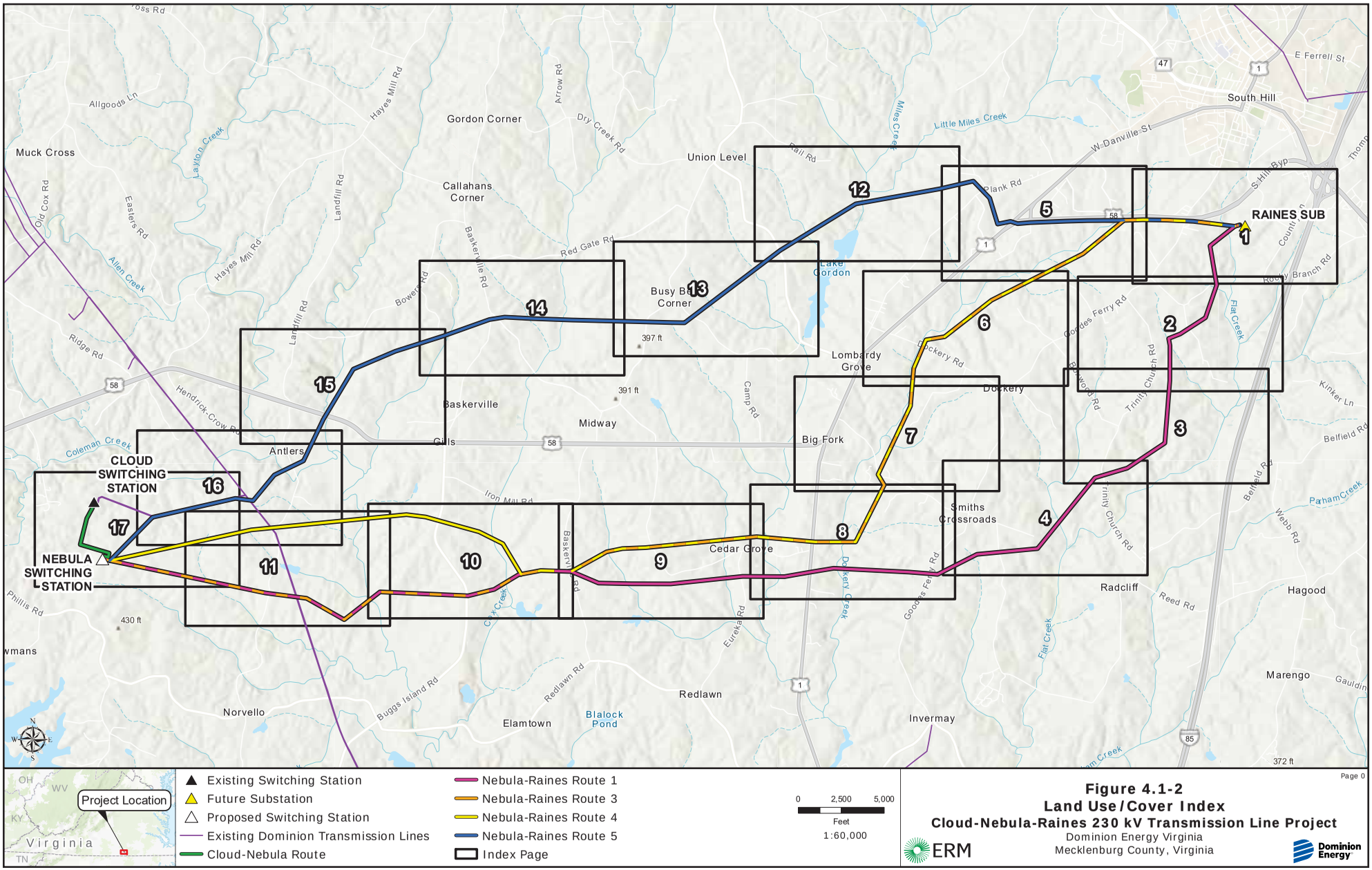


Figure 4.1-1
Land Ownership
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy



Page 0

Figure 4.1-2
Land Use/Cover Index
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

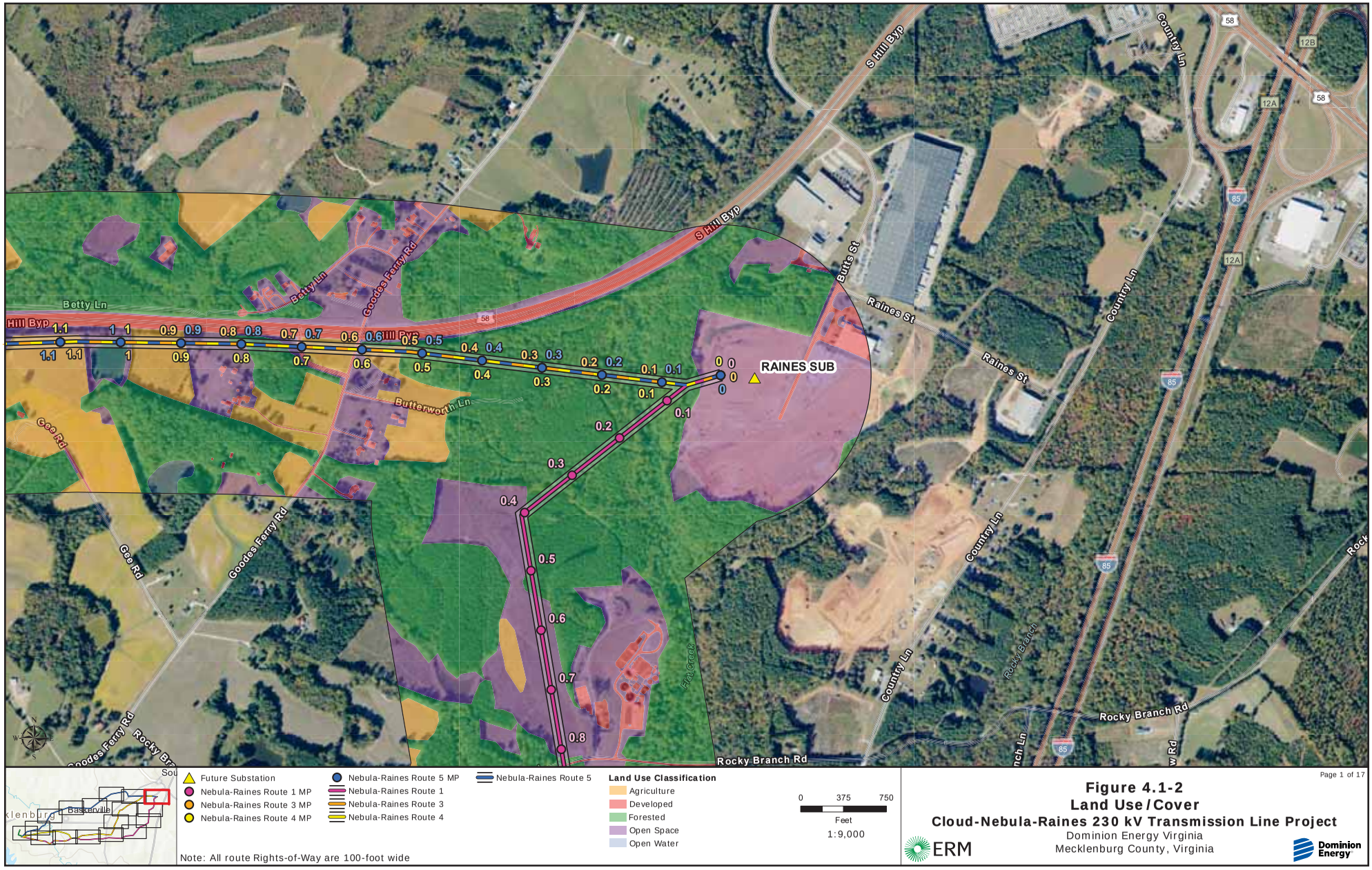


Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

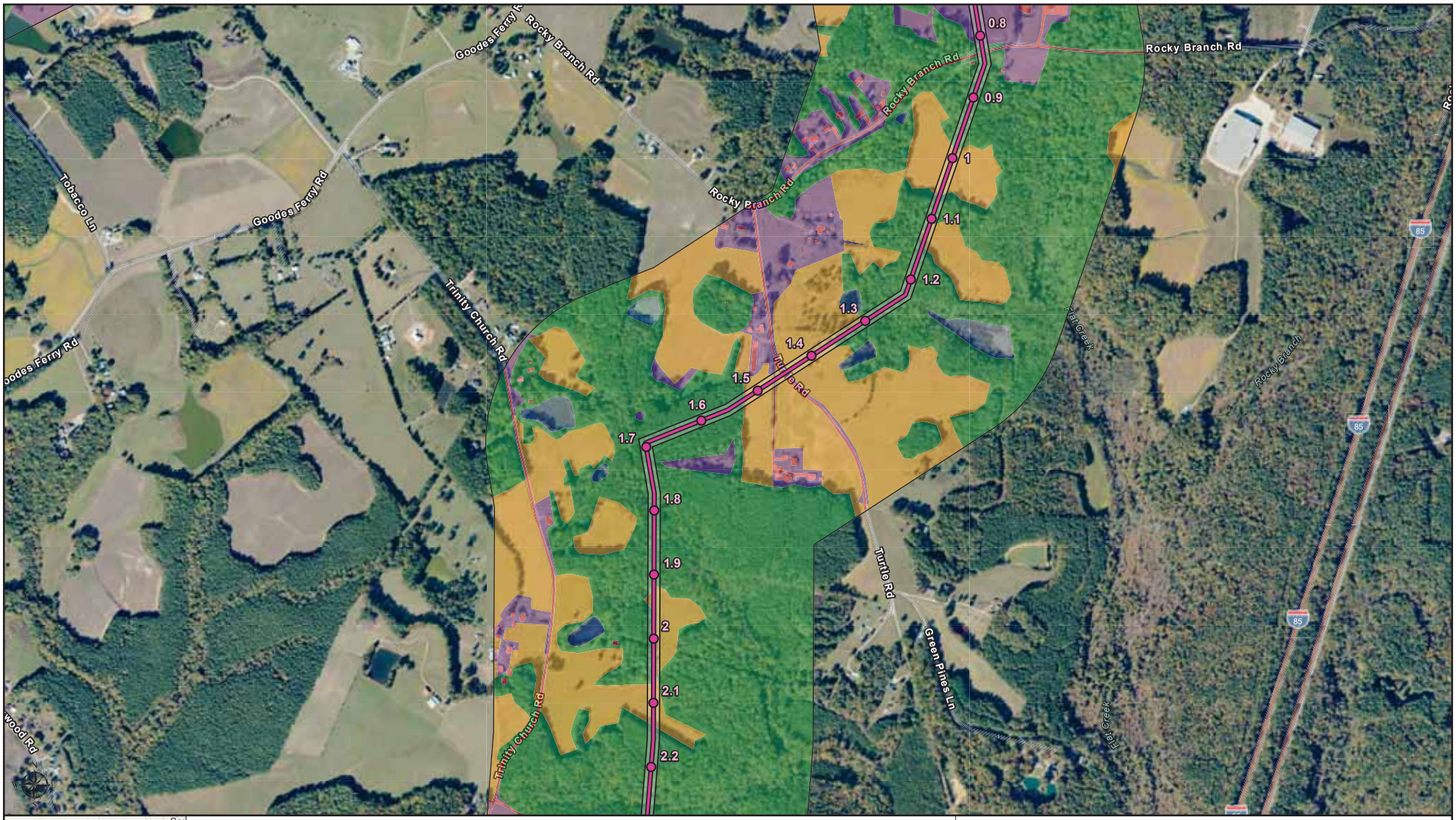


Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

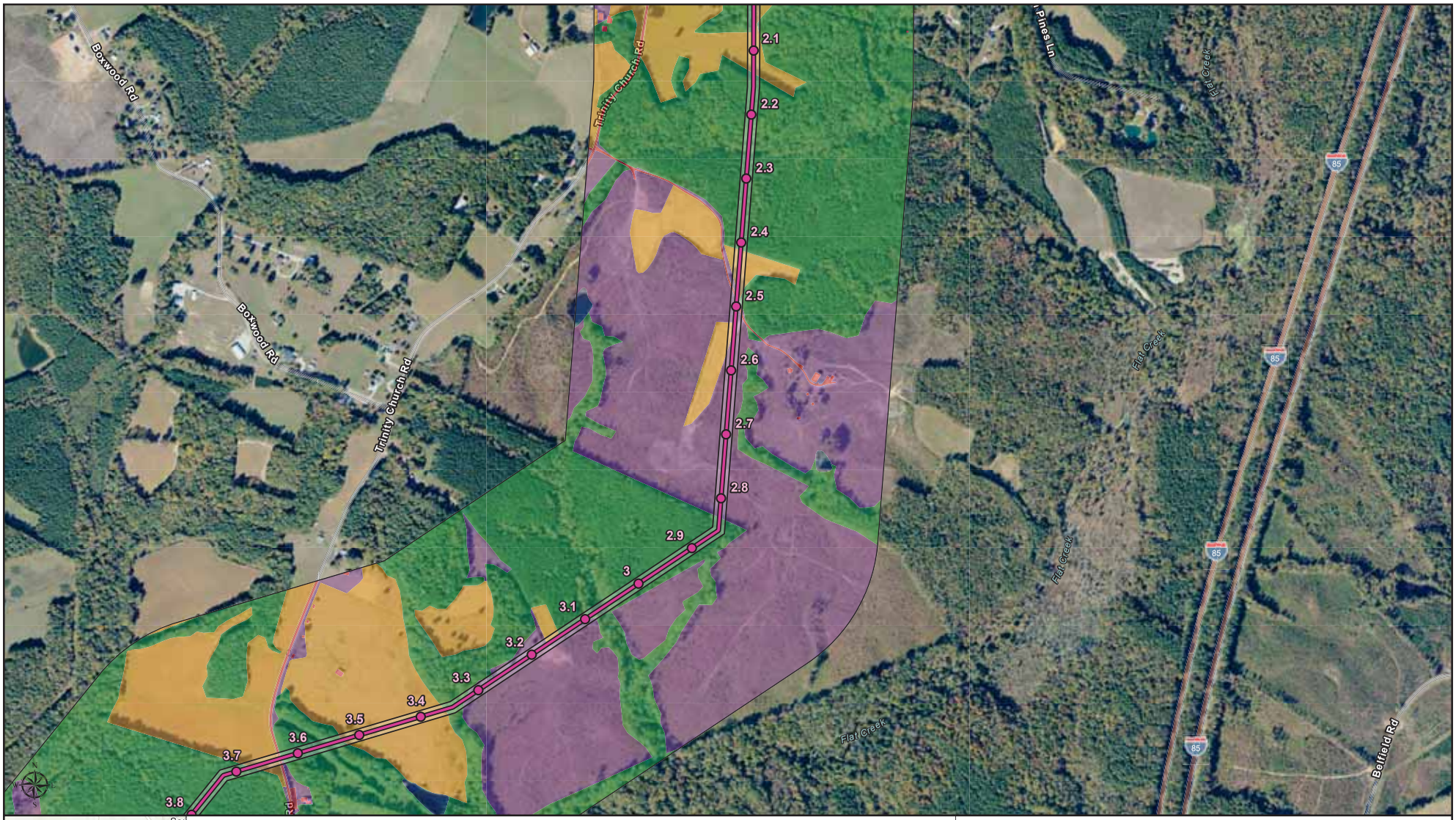


Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

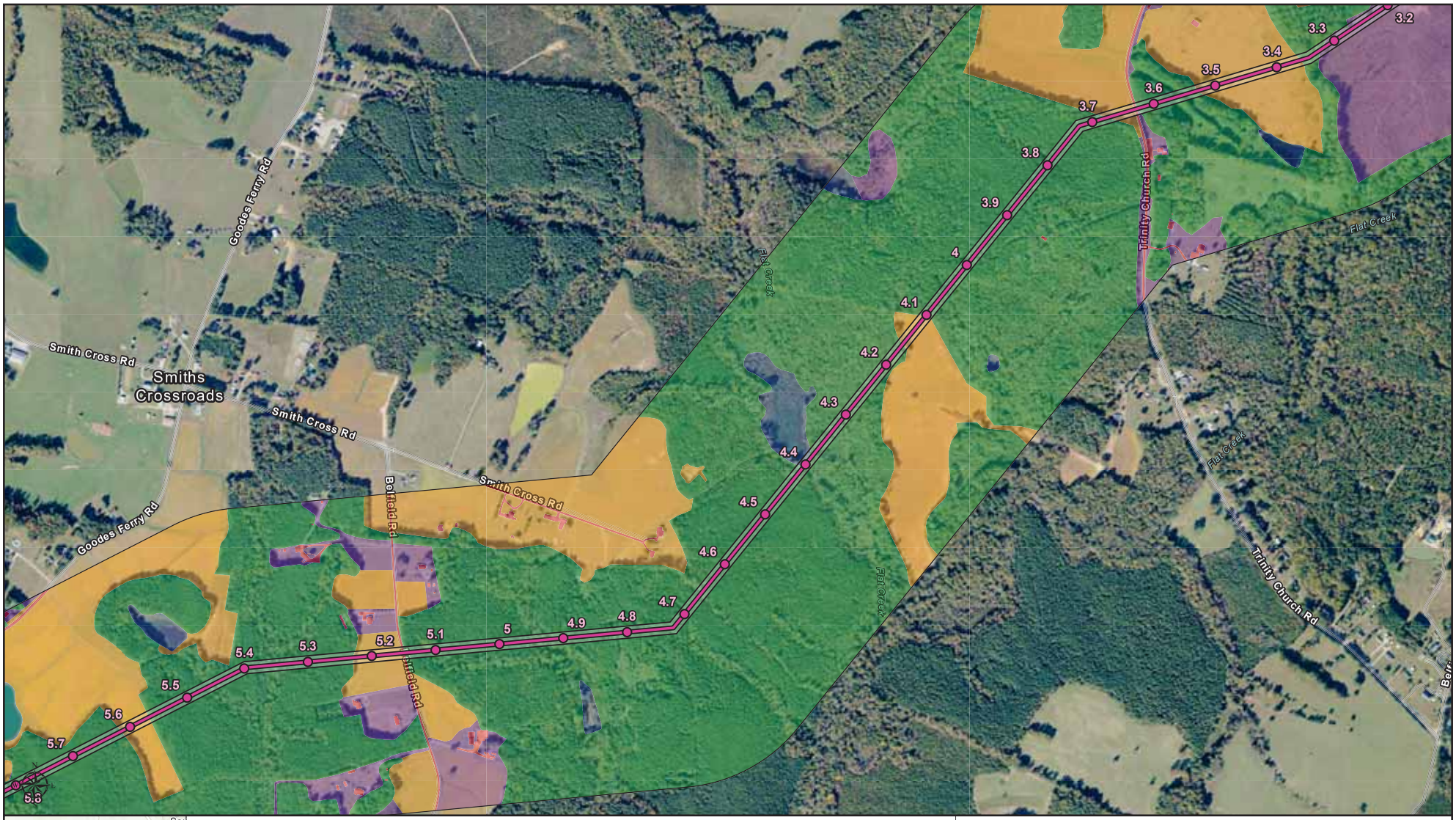


Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

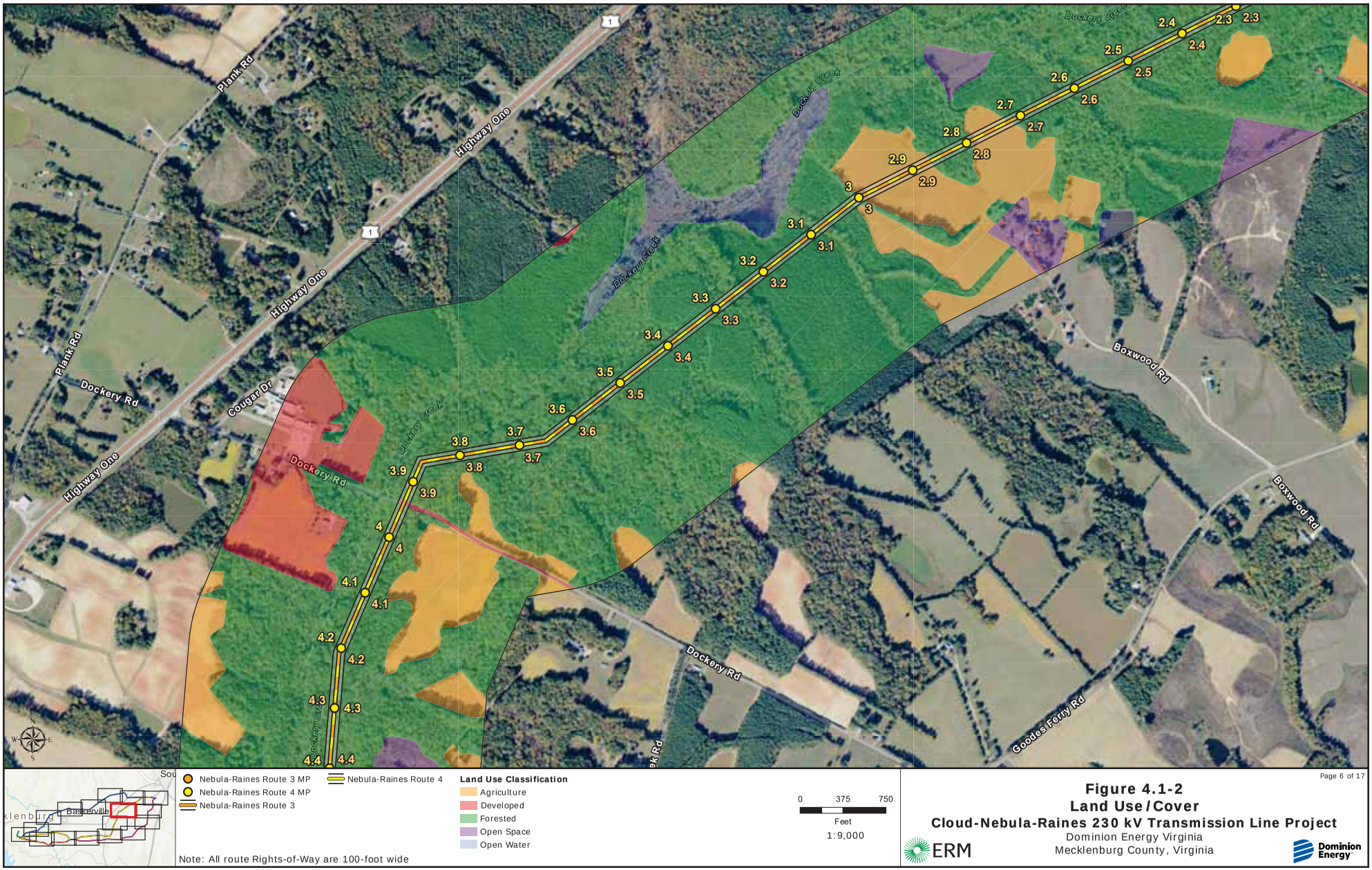


Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

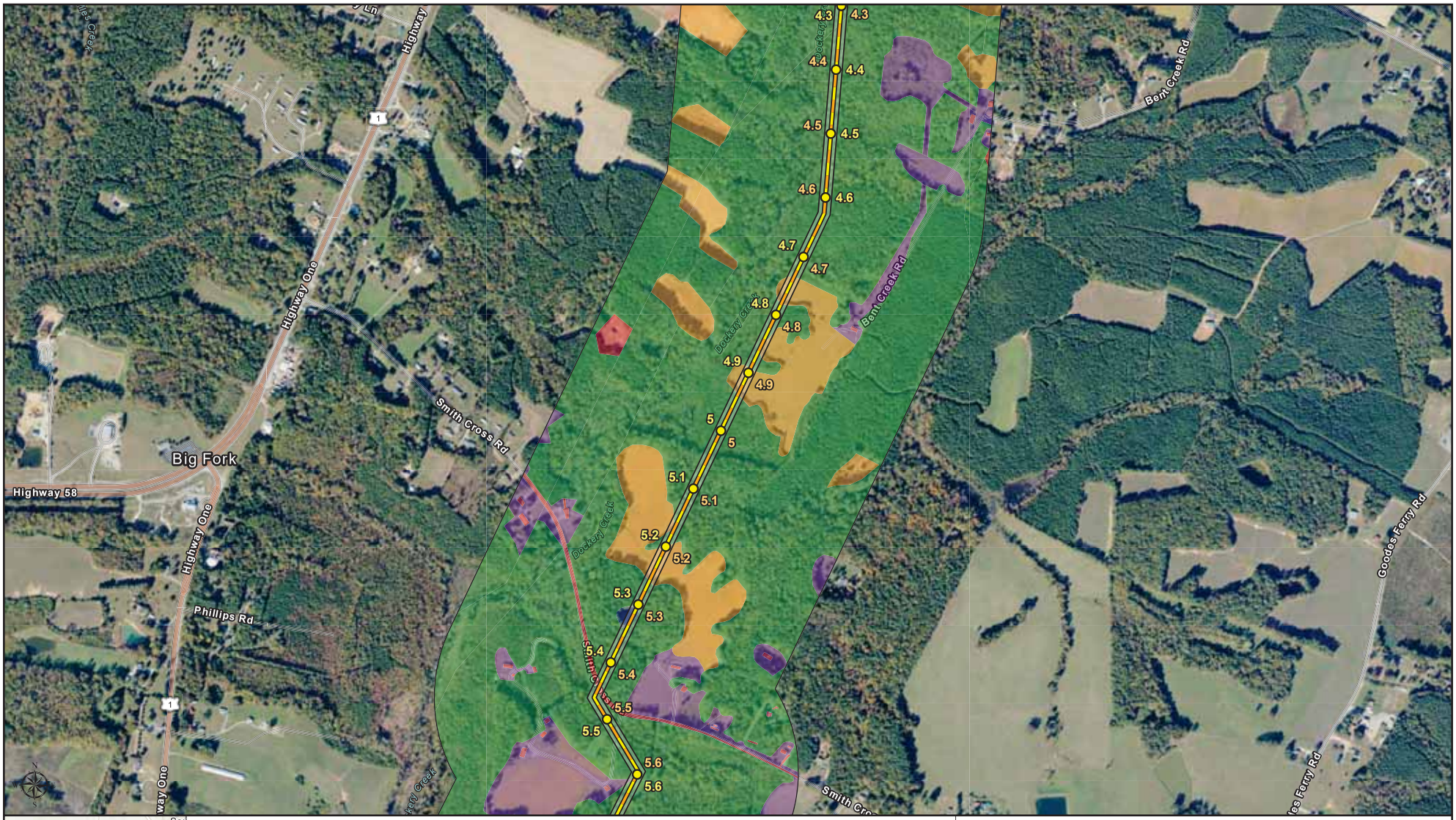


Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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Dominion Energy

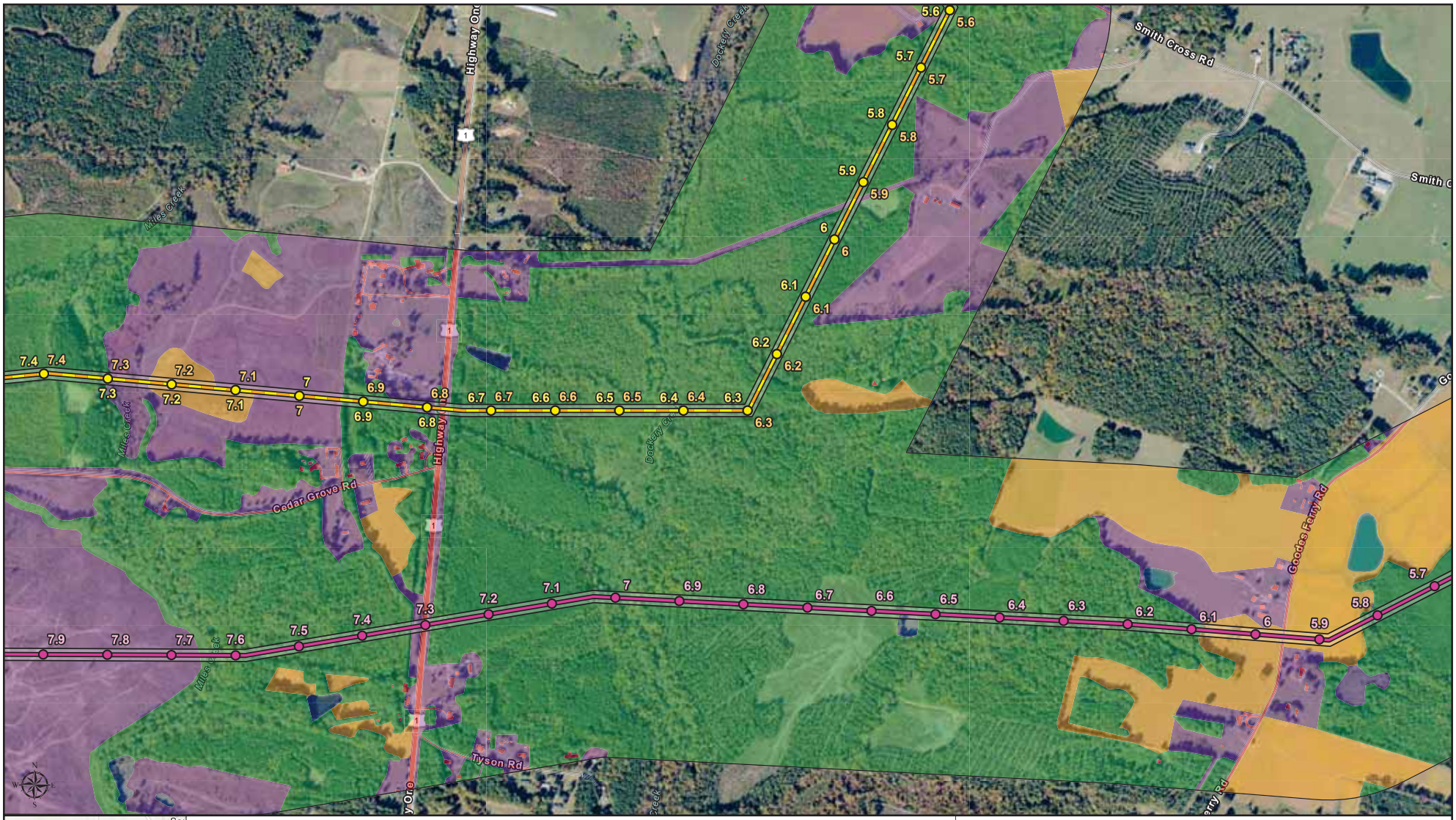

Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

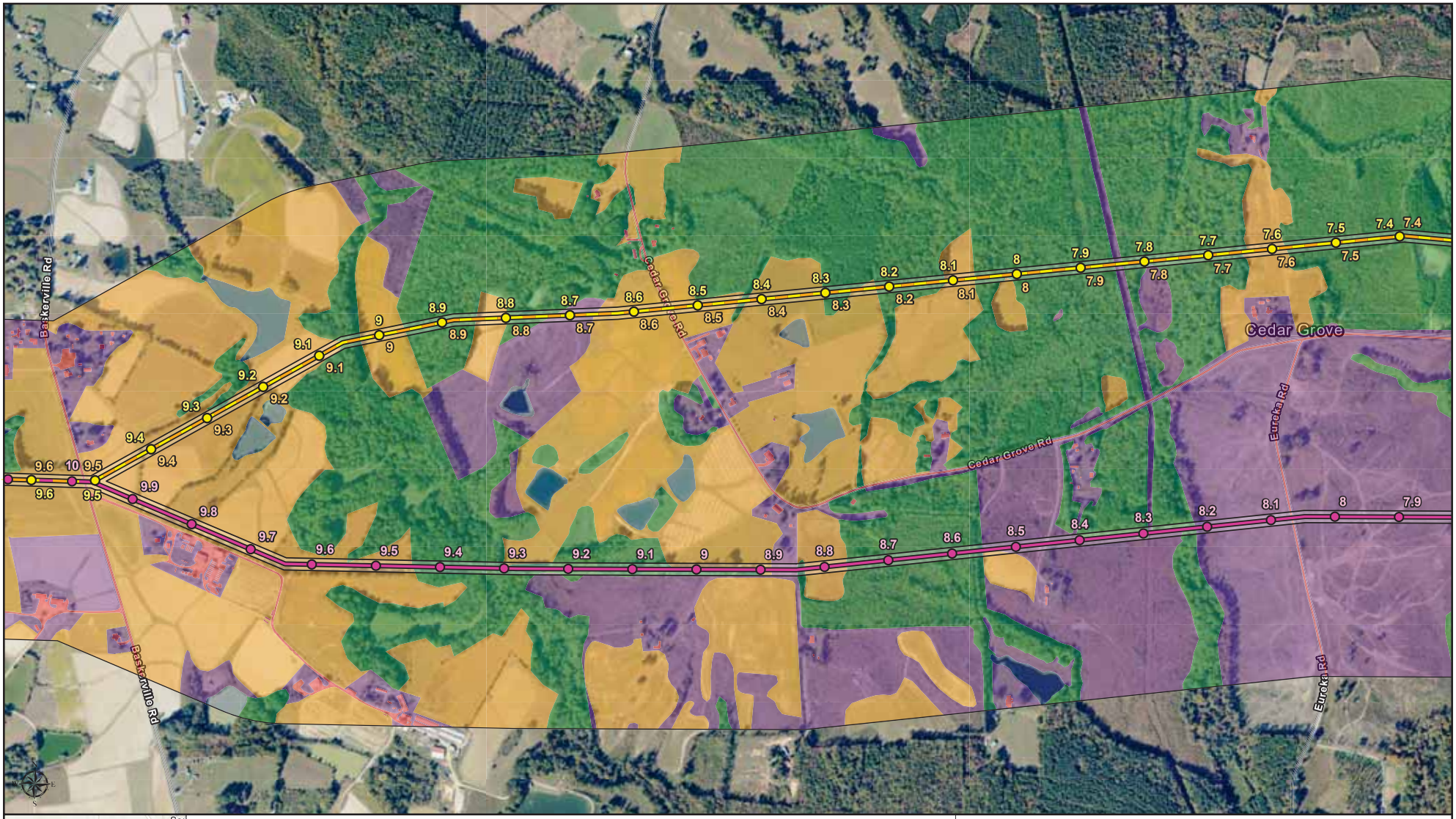

Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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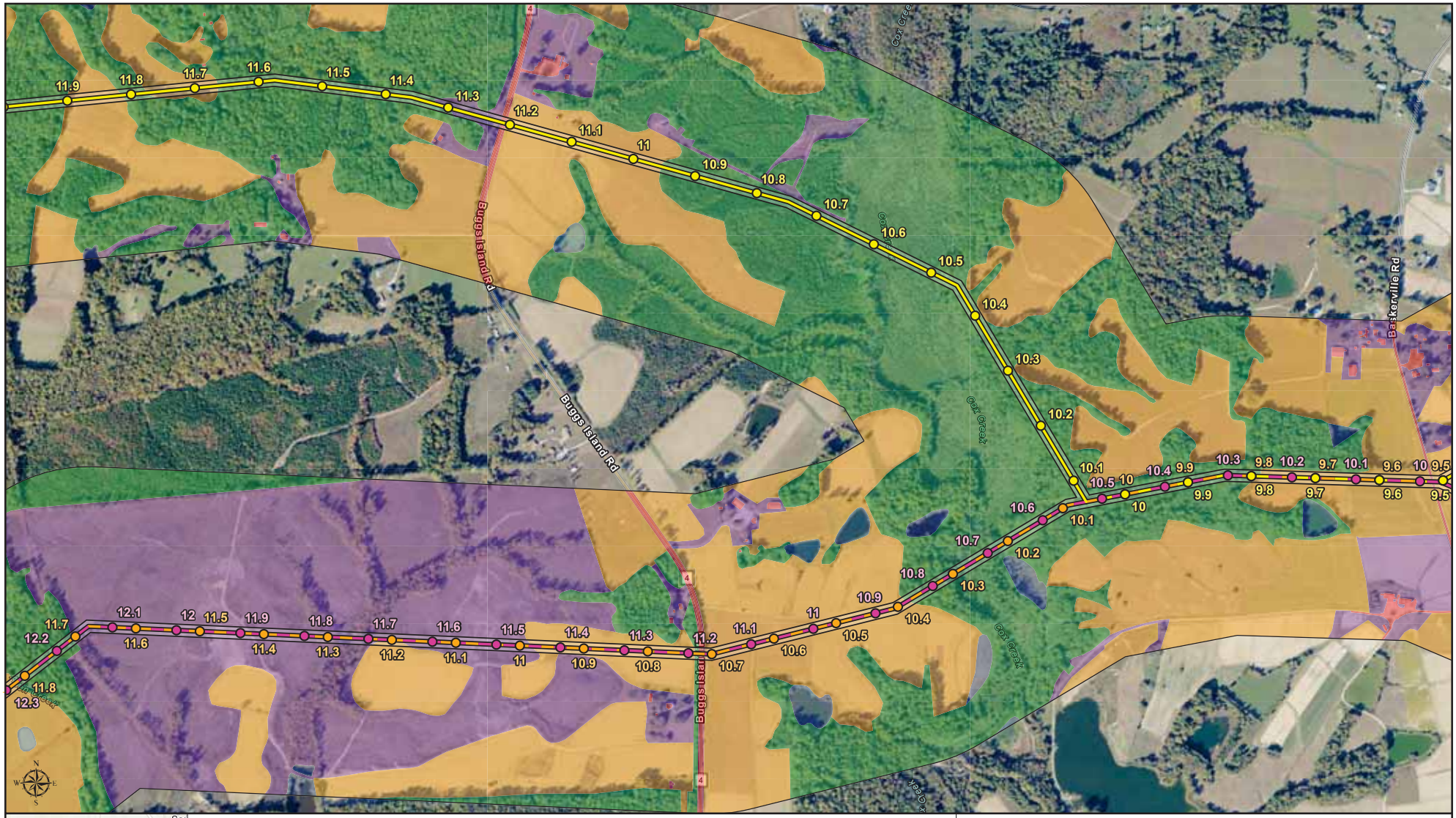

Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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Dominion Energy

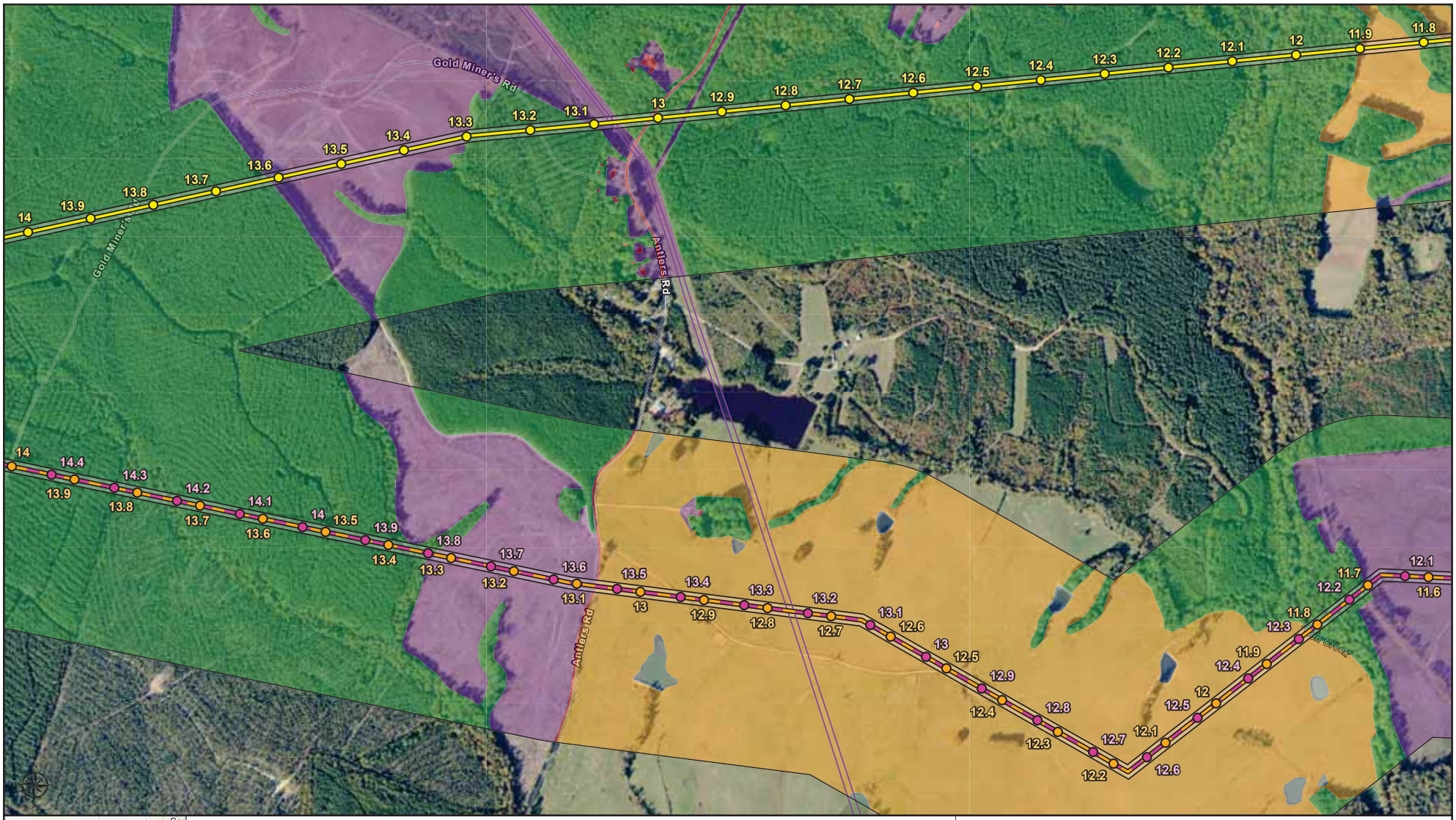

Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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Dominion Energy

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Mecklenburg County, Virginia

ERM

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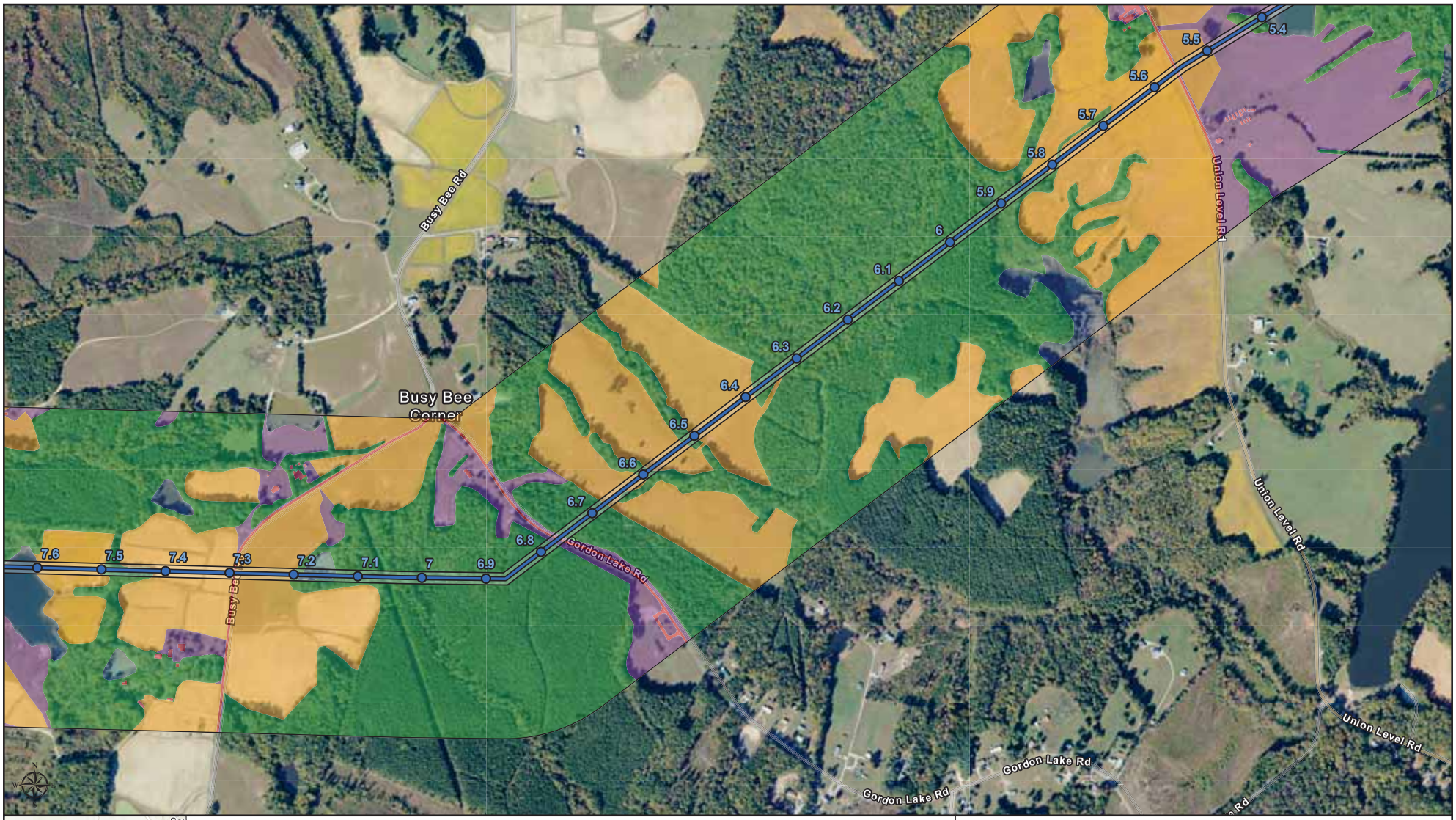


Note: All route Rights-of-Way are 100-foot wide

Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

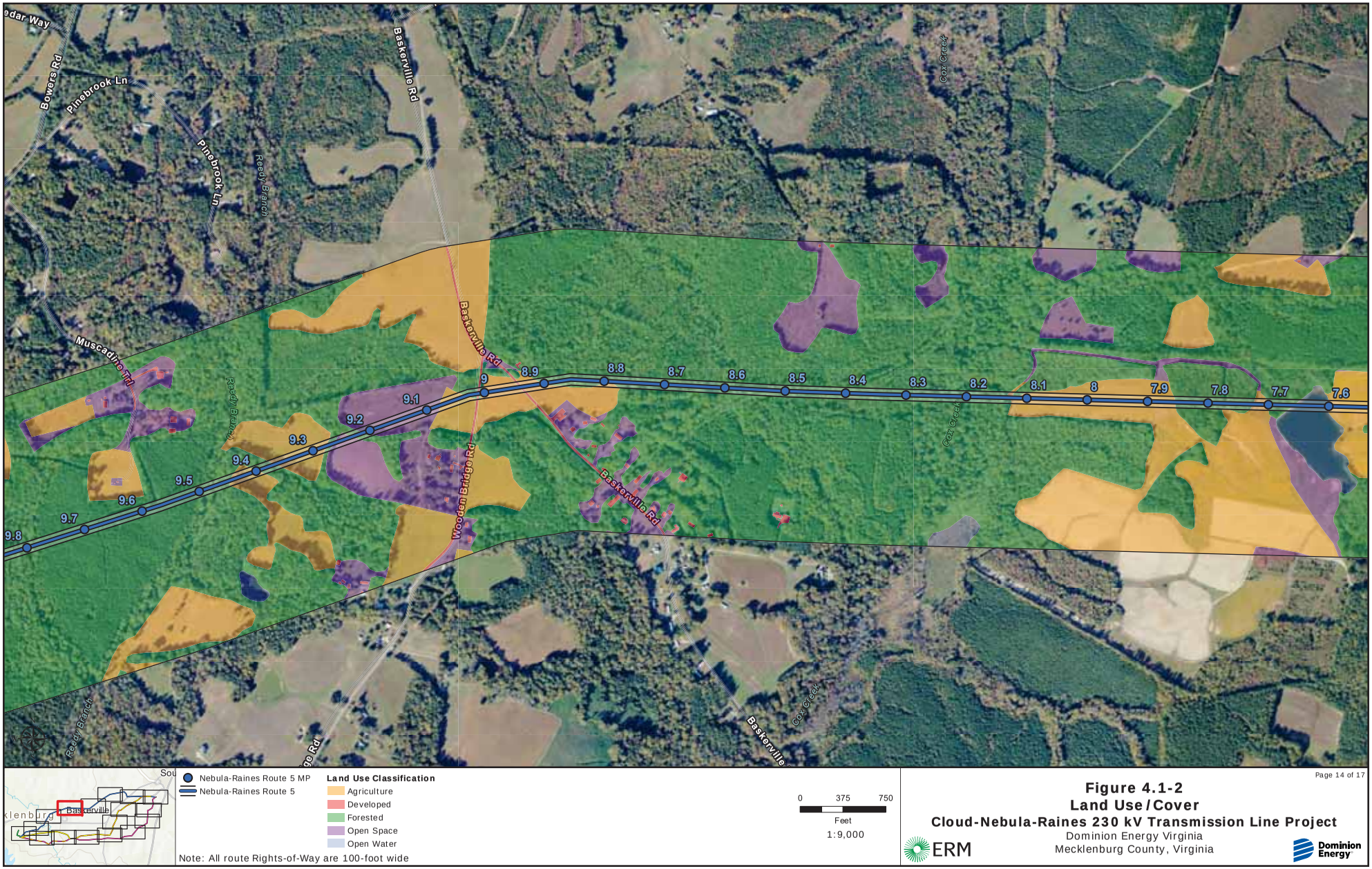
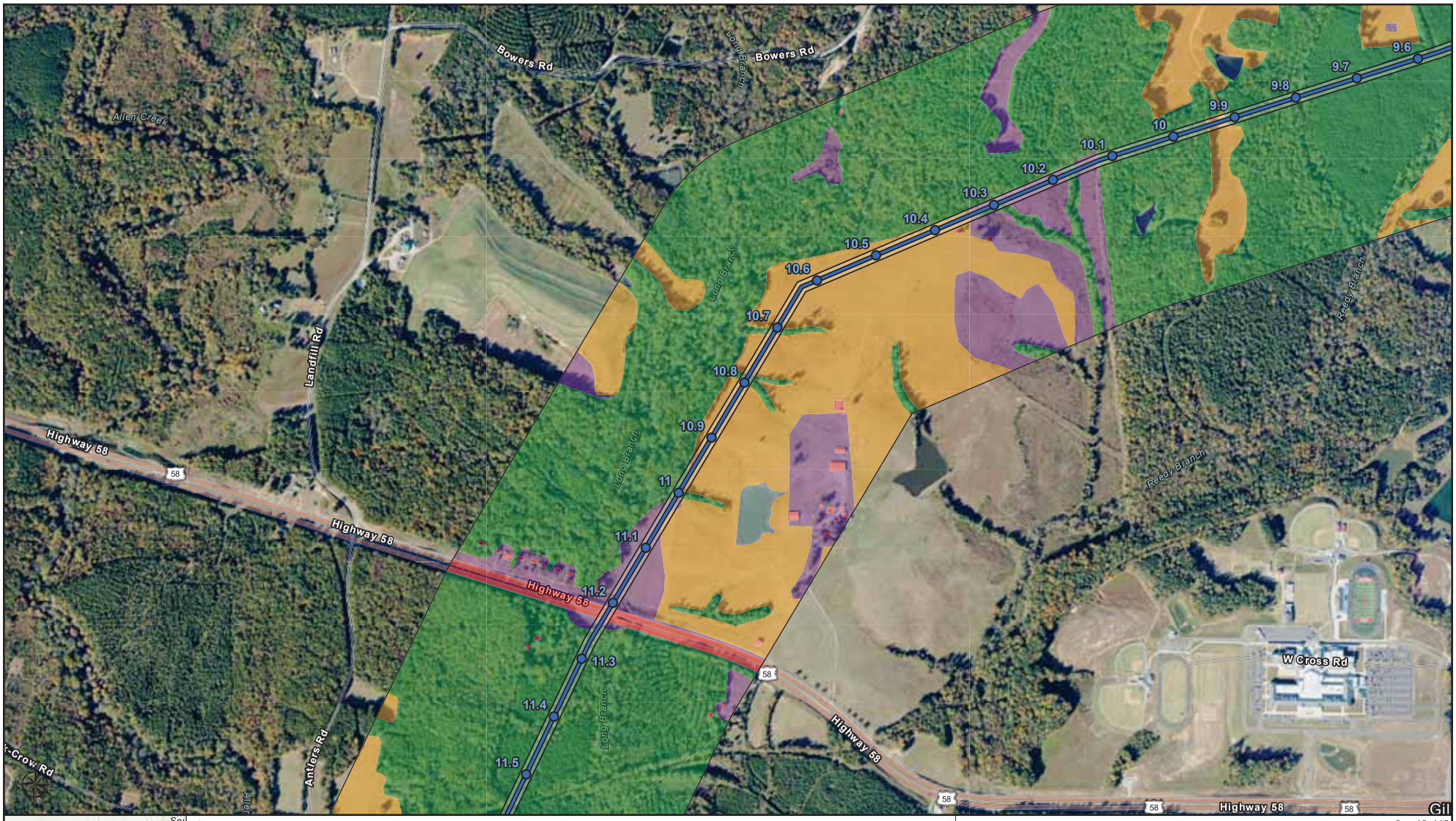


Figure 4.1-2
Land Use/Cover
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy



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Land Use/Cover
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Dominion Energy Virginia
Mecklenburg County, Virginia

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Dominion Energy

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Land Use/Cover
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Mecklenburg County, Virginia

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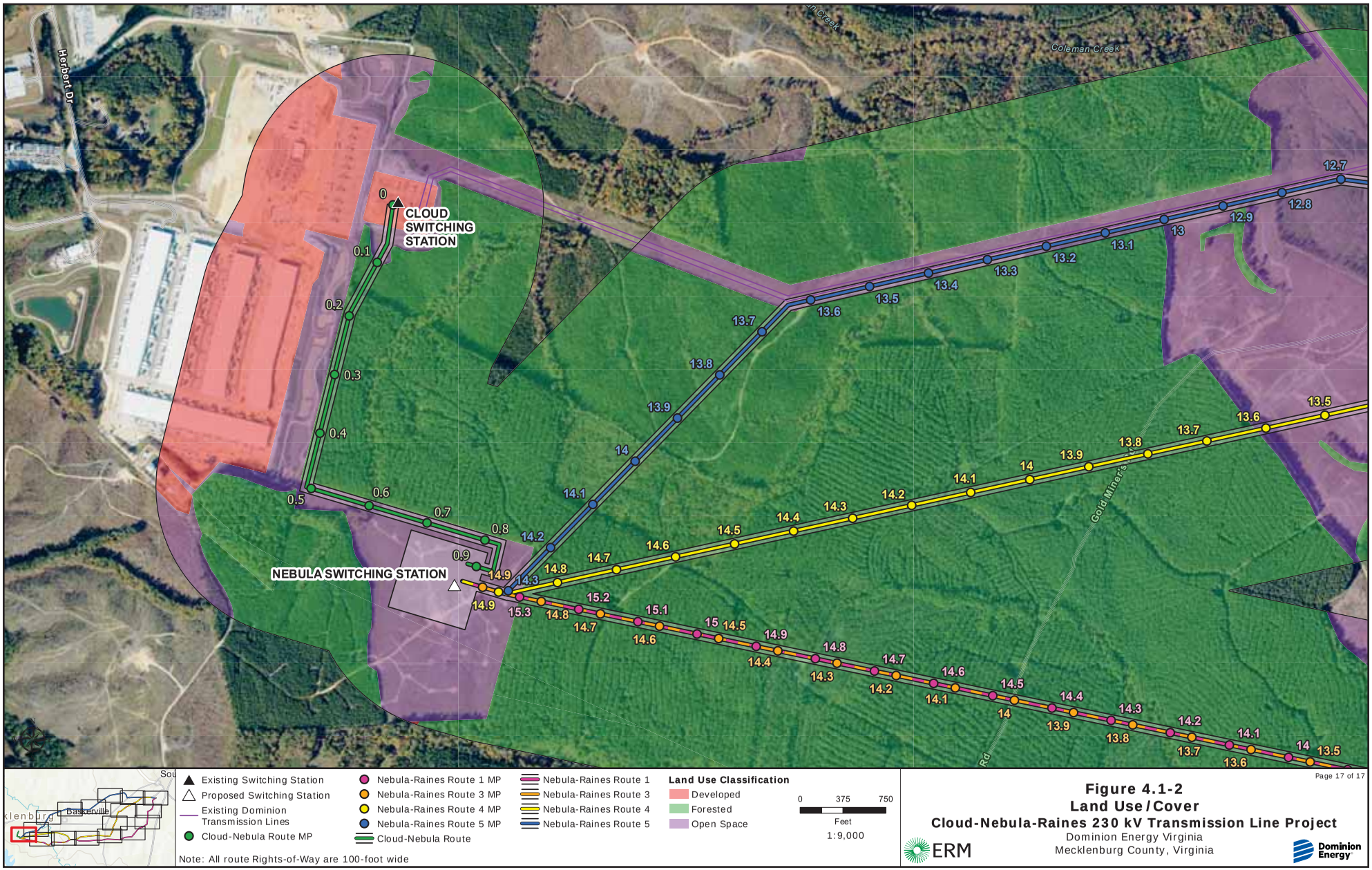

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Cloud-Nebula-Raines 230 kV Transmission Line Project
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Mecklenburg County, Virginia

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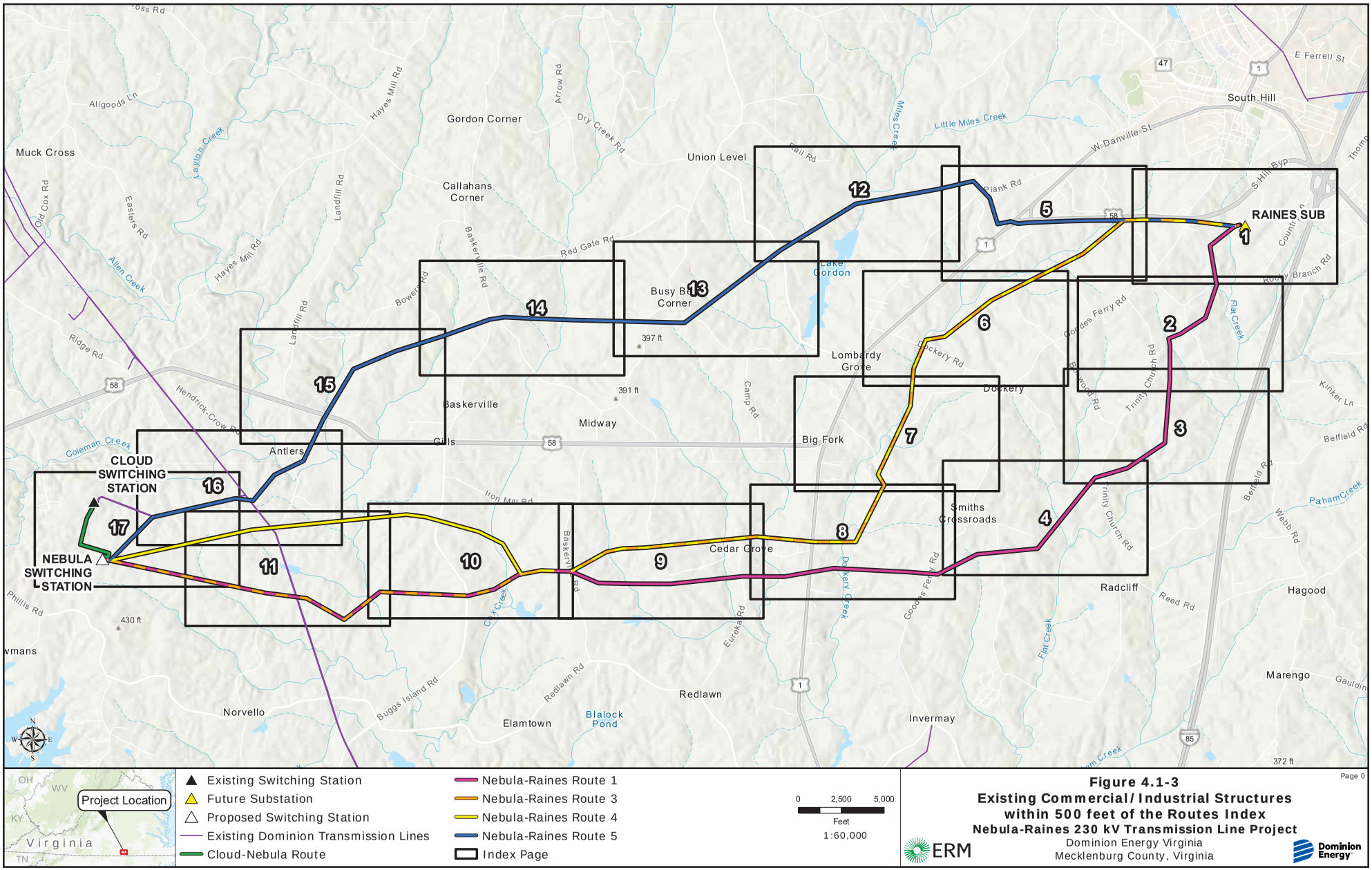
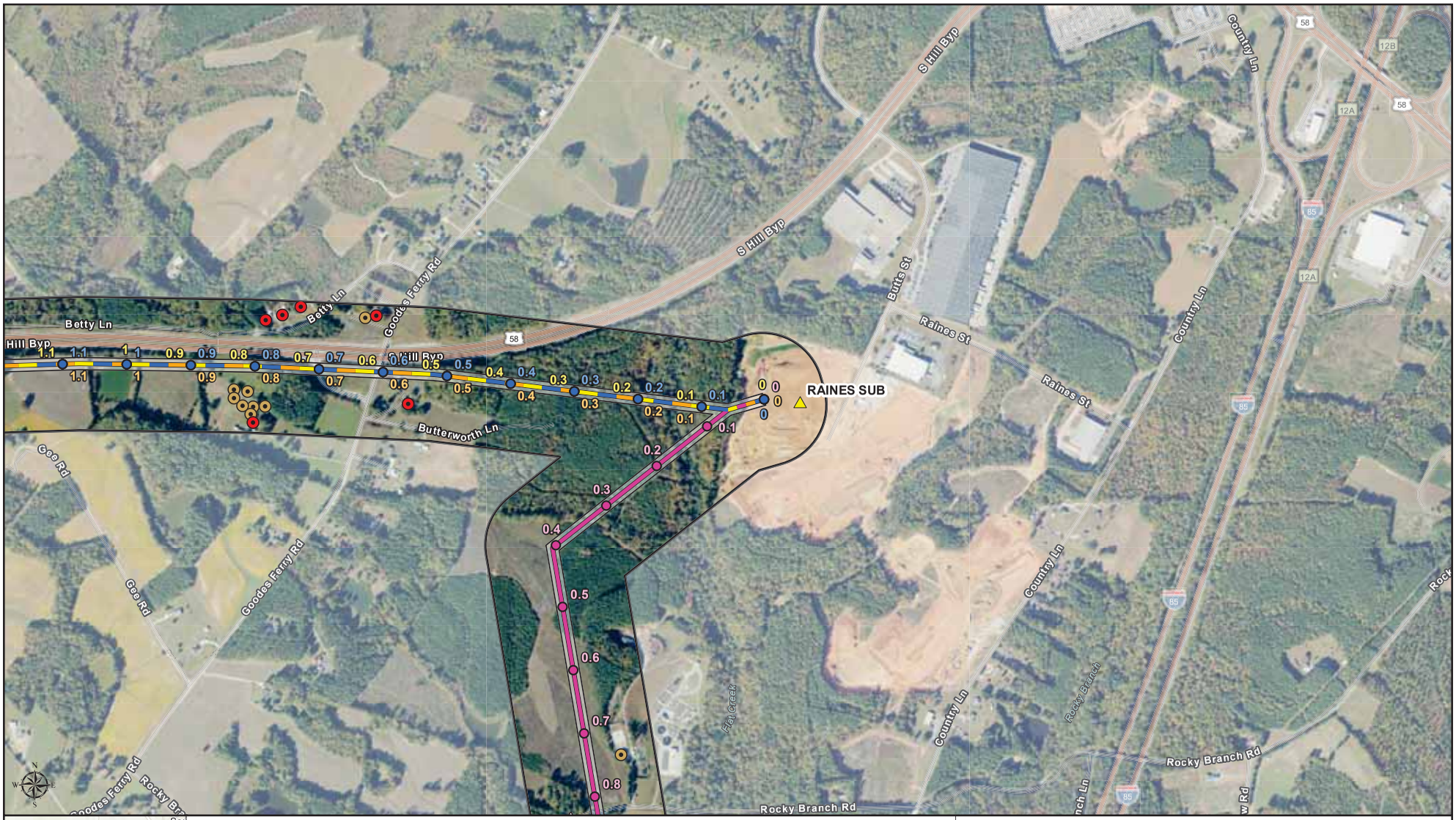


Figure 4.1-3
Existing Commercial/ Industrial Structures within 500 feet of the Routes Index
Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy



Page 1 of 17

Figure 4.1-3
Existing Residential and Non-Residential Structures within 500 feet of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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Dominion Energy

Figure 4.1-3
Existing Residential and Non-Residential Structures within 500 feet of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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Dominion Energy

Figure 4.1-3
Existing Residential and Non-Residential Structures within 500 feet of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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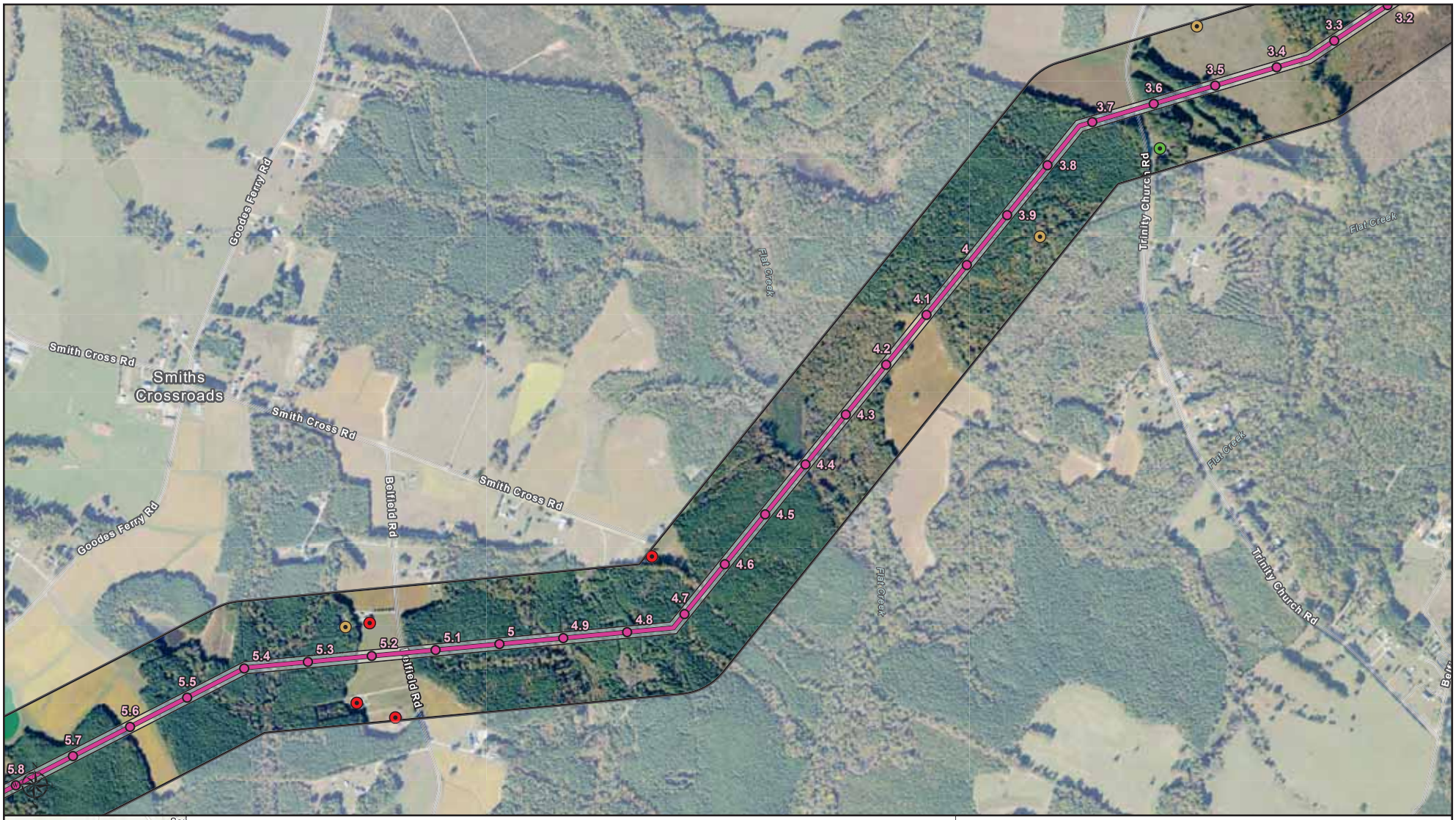
Dominion Energy



Nebula-Raines Route 1 MP
Nebula-Raines Route 1

Structure Type

Commercial - Religious Building
Outbuilding
Residential
500-Foot Buffer

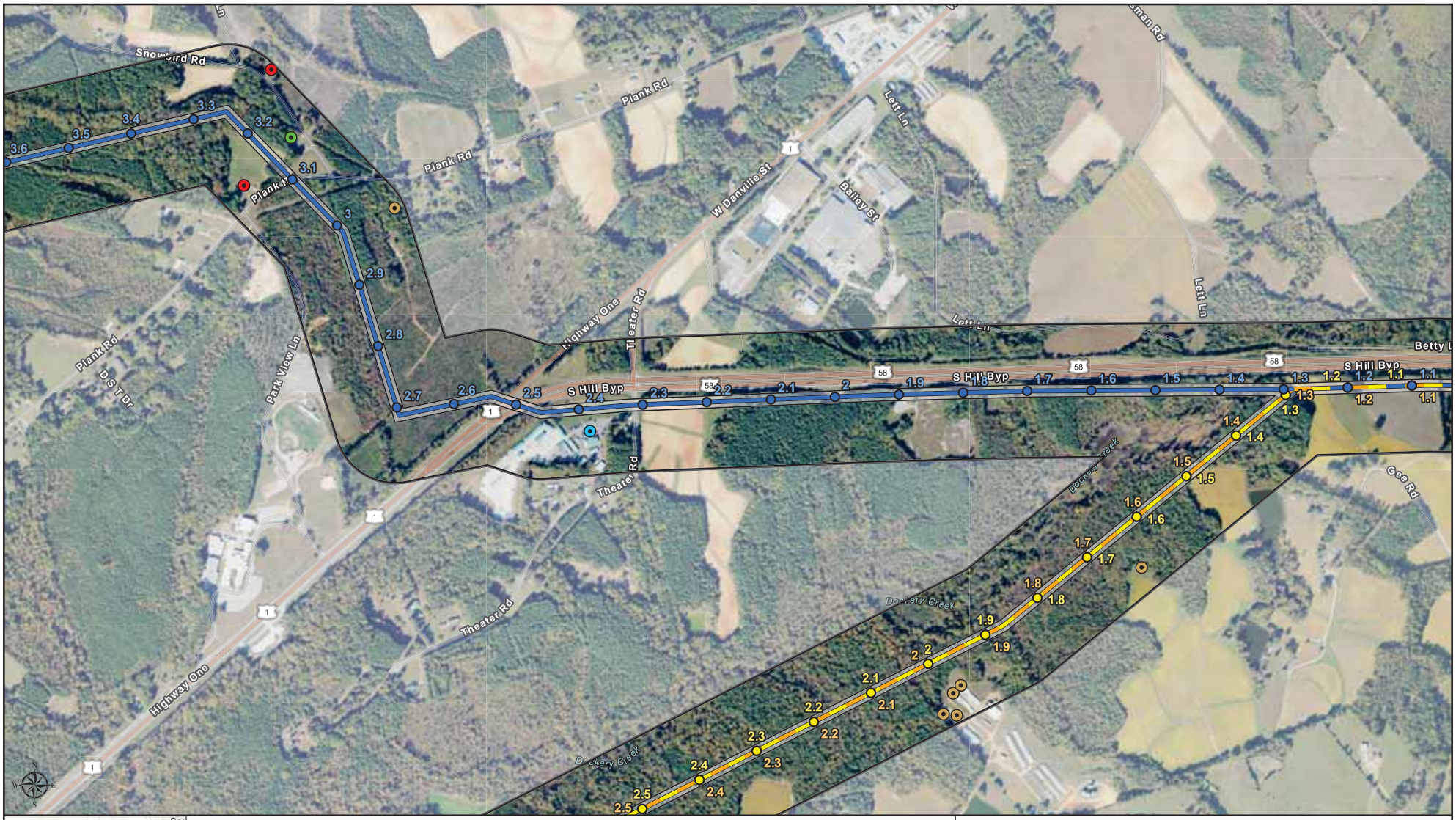
Note: All route Rights-of-Way are 100-foot wide

0 375 750
Feet
1:9,000

Figure 4.1-3
Existing Residential and Non-Residential Structures within 500 feet of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy



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Existing Residential and Non-Residential Structures within 500 feet of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

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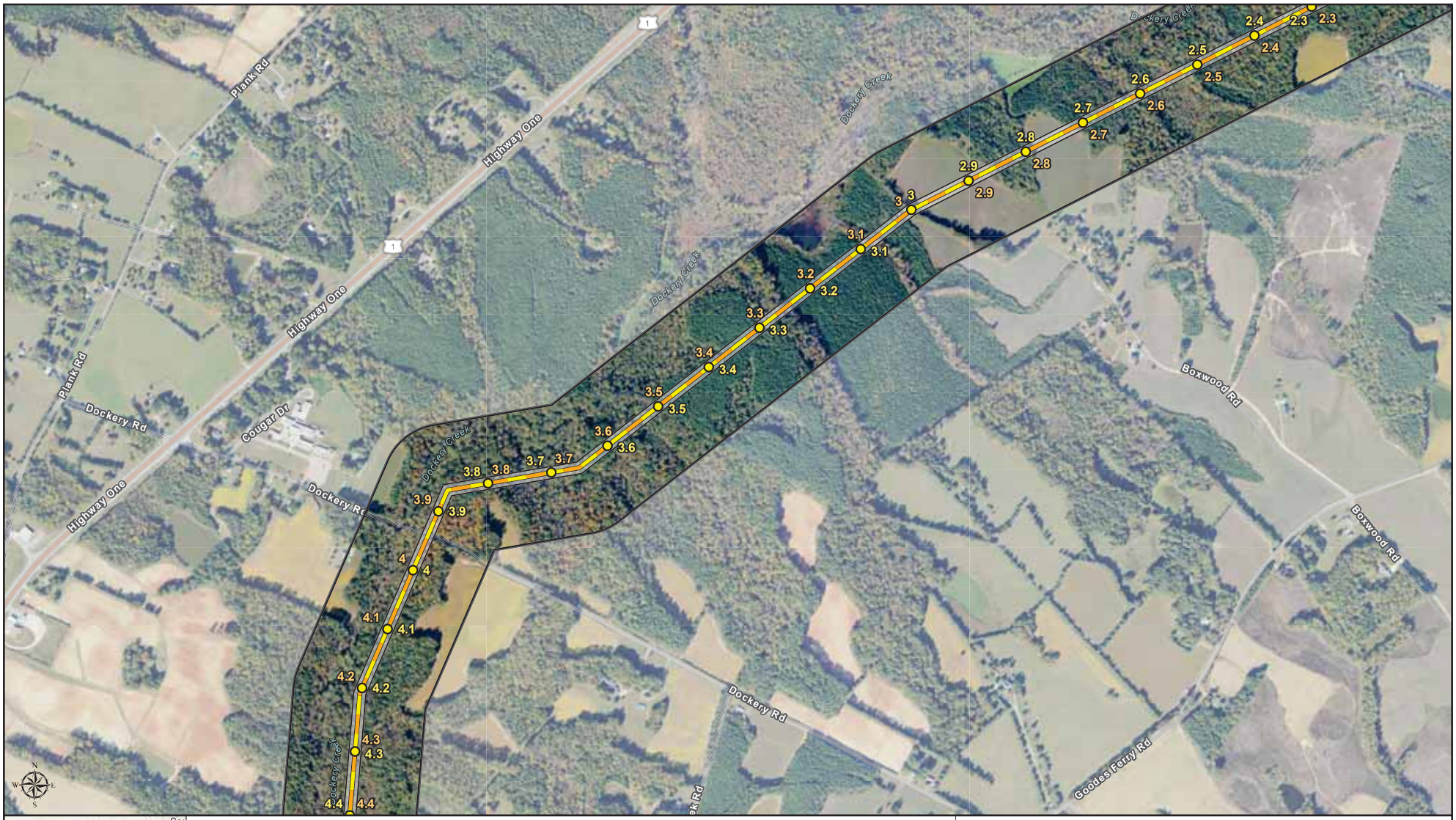

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Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

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Mecklenburg County, Virginia

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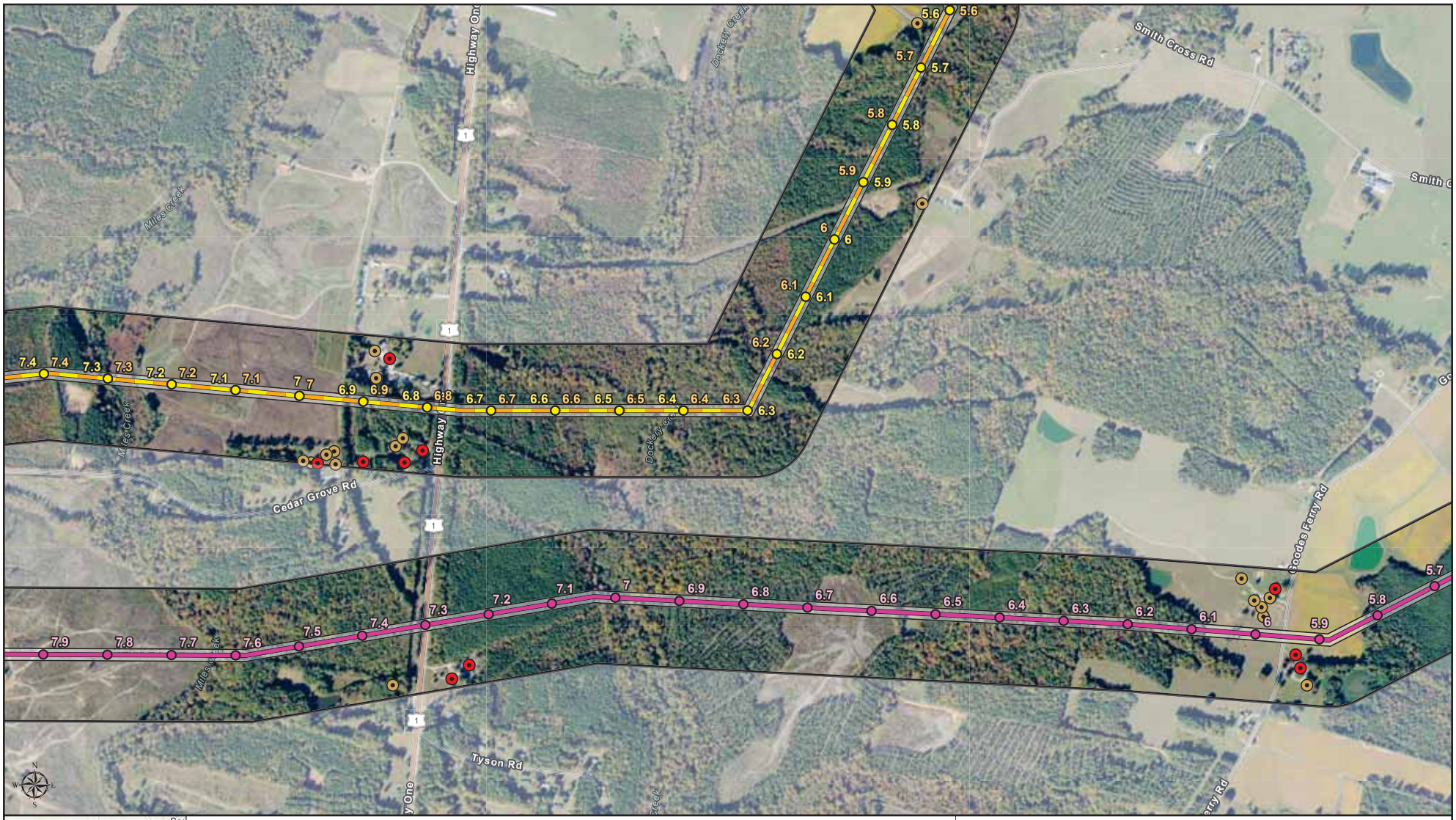

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Mecklenburg County, Virginia

ERM

Dominion Energy

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Mecklenburg County, Virginia

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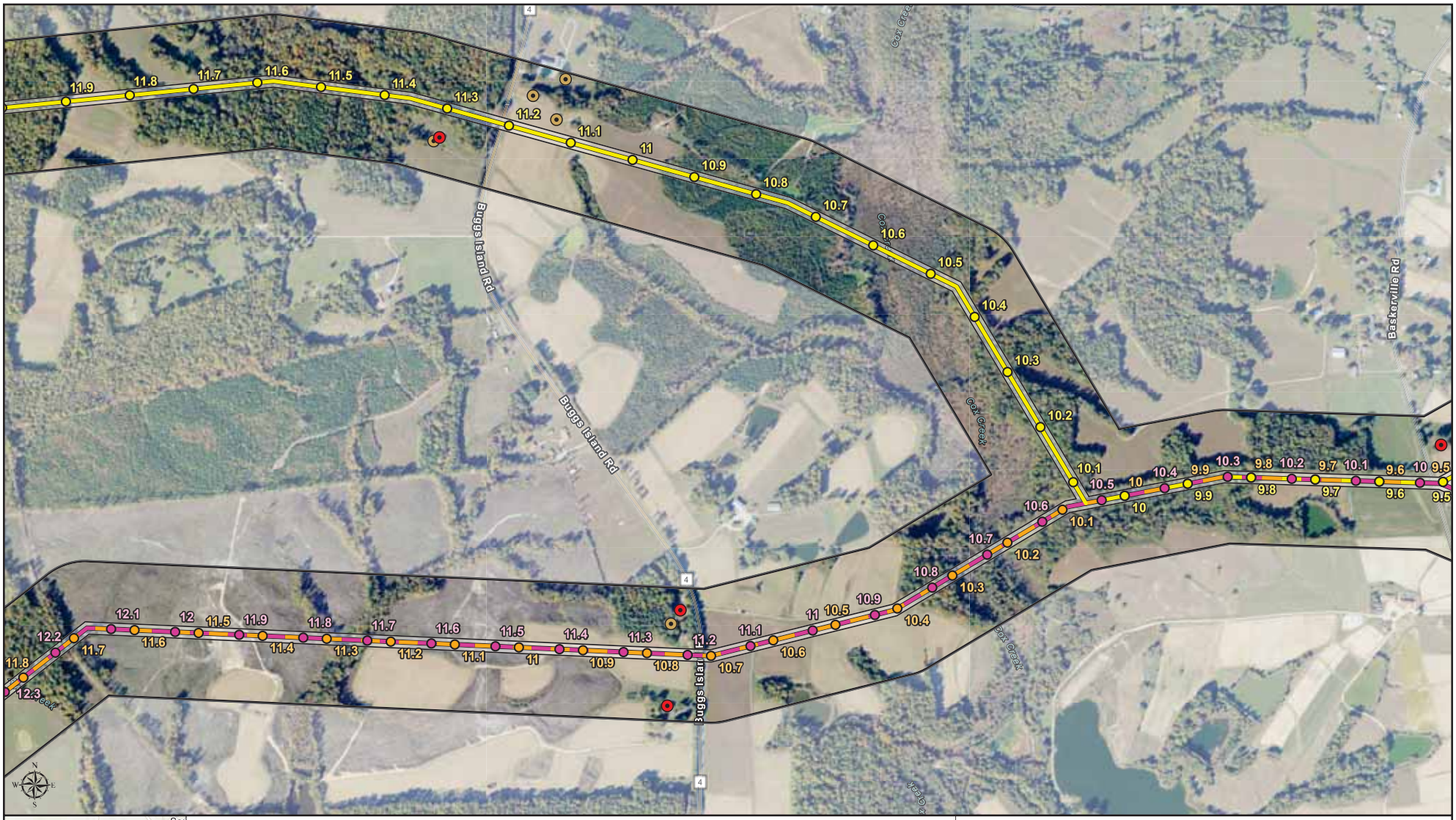

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Dominion Energy Virginia
Mecklenburg County, Virginia

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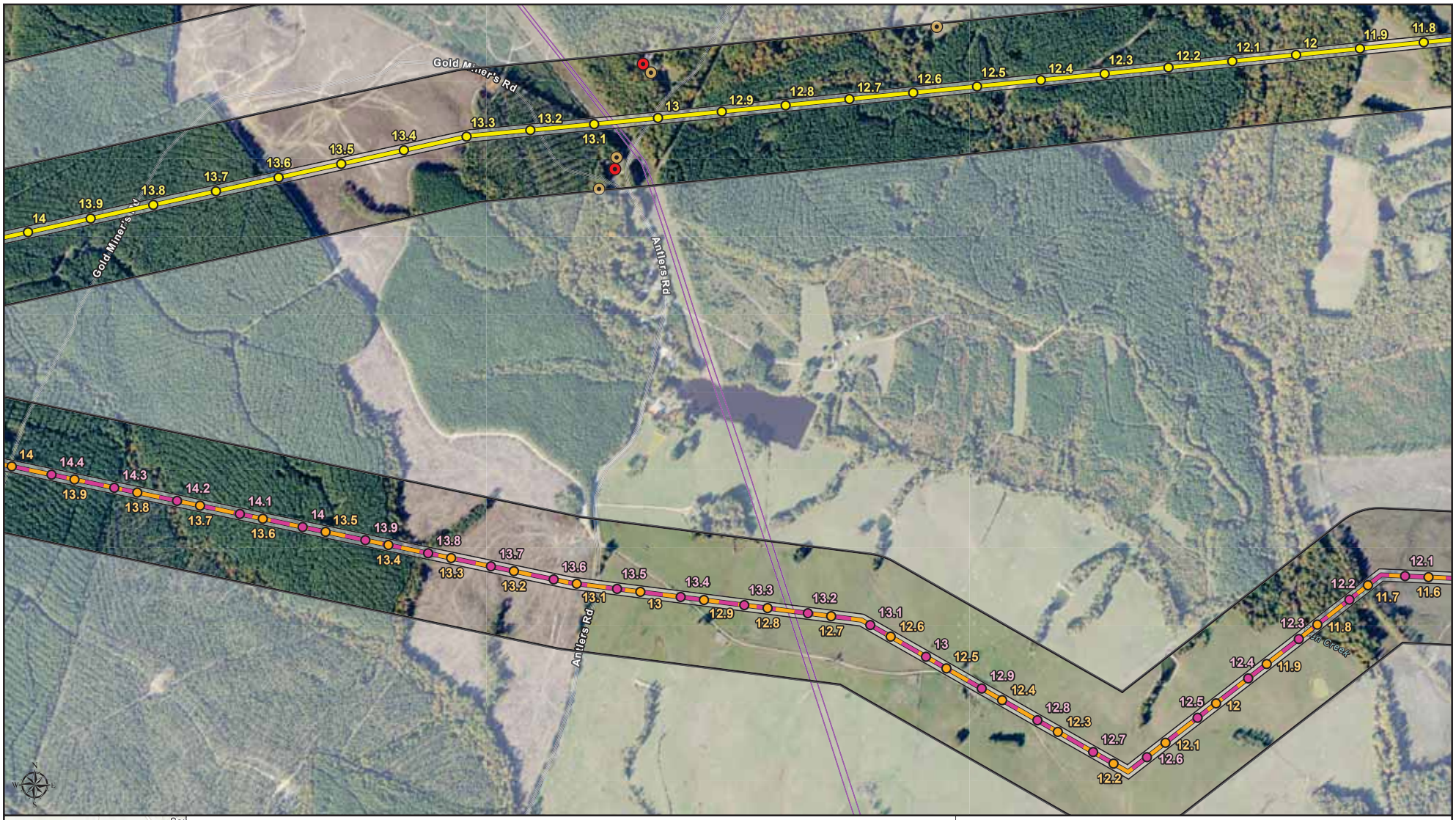

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Existing Residential and Non-Residential Structures within 500 feet of Routes
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Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

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Mecklenburg County, Virginia

ERM

Dominion Energy

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Mecklenburg County, Virginia

ERM

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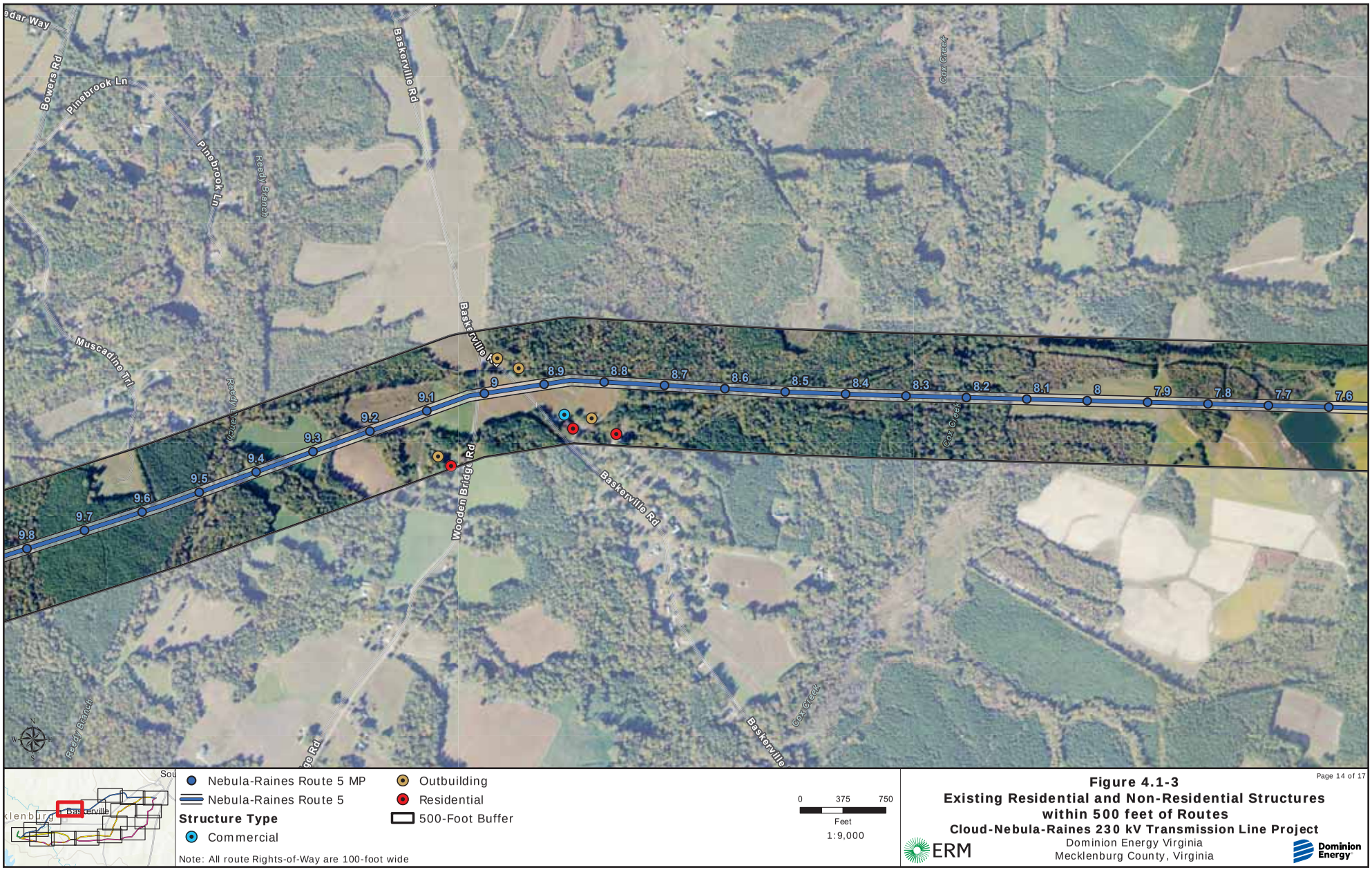

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Existing Residential and Non-Residential Structures within 500 feet of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

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Dominion Energy Virginia
Mecklenburg County, Virginia

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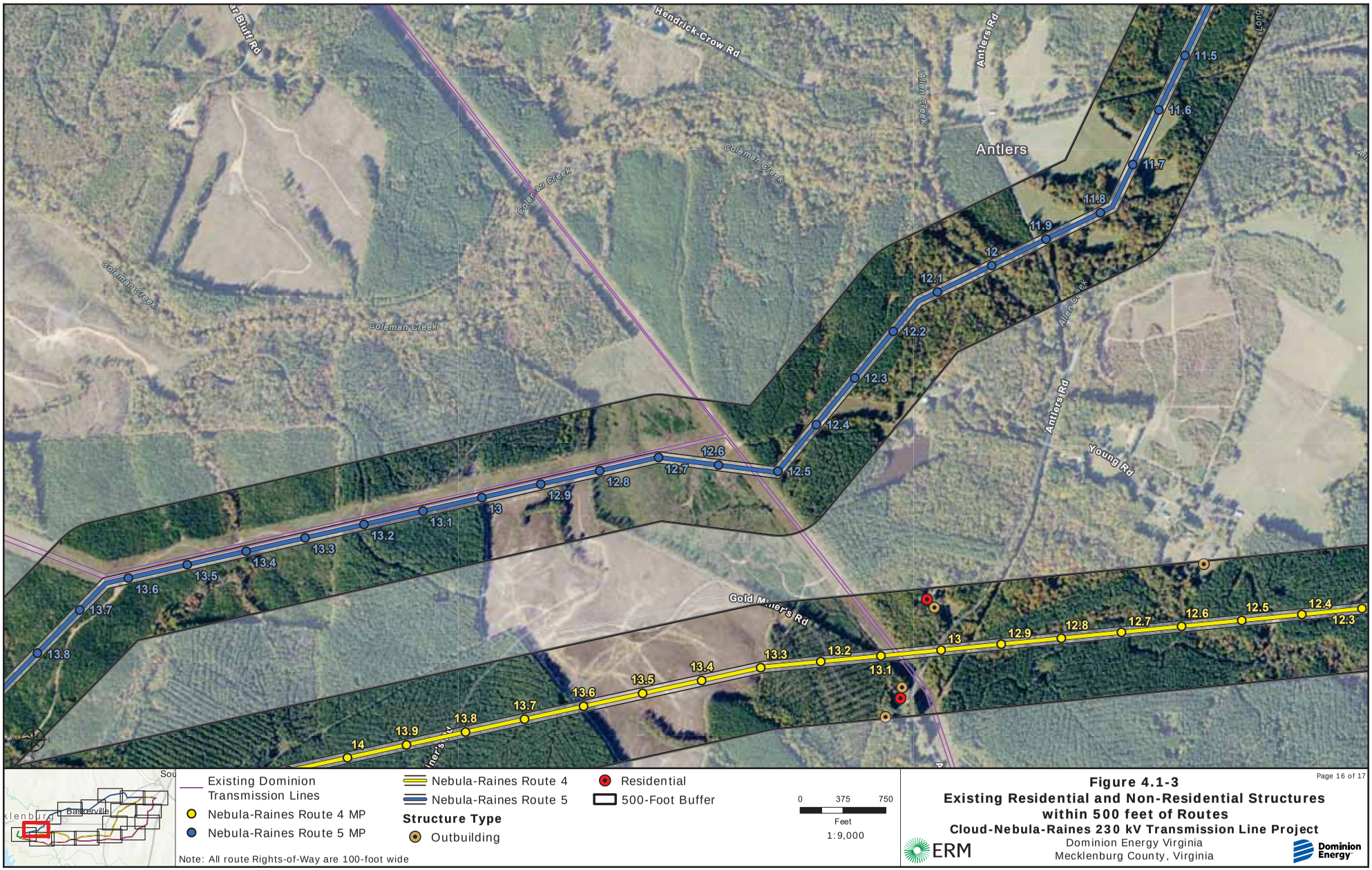

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Dominion Energy Virginia
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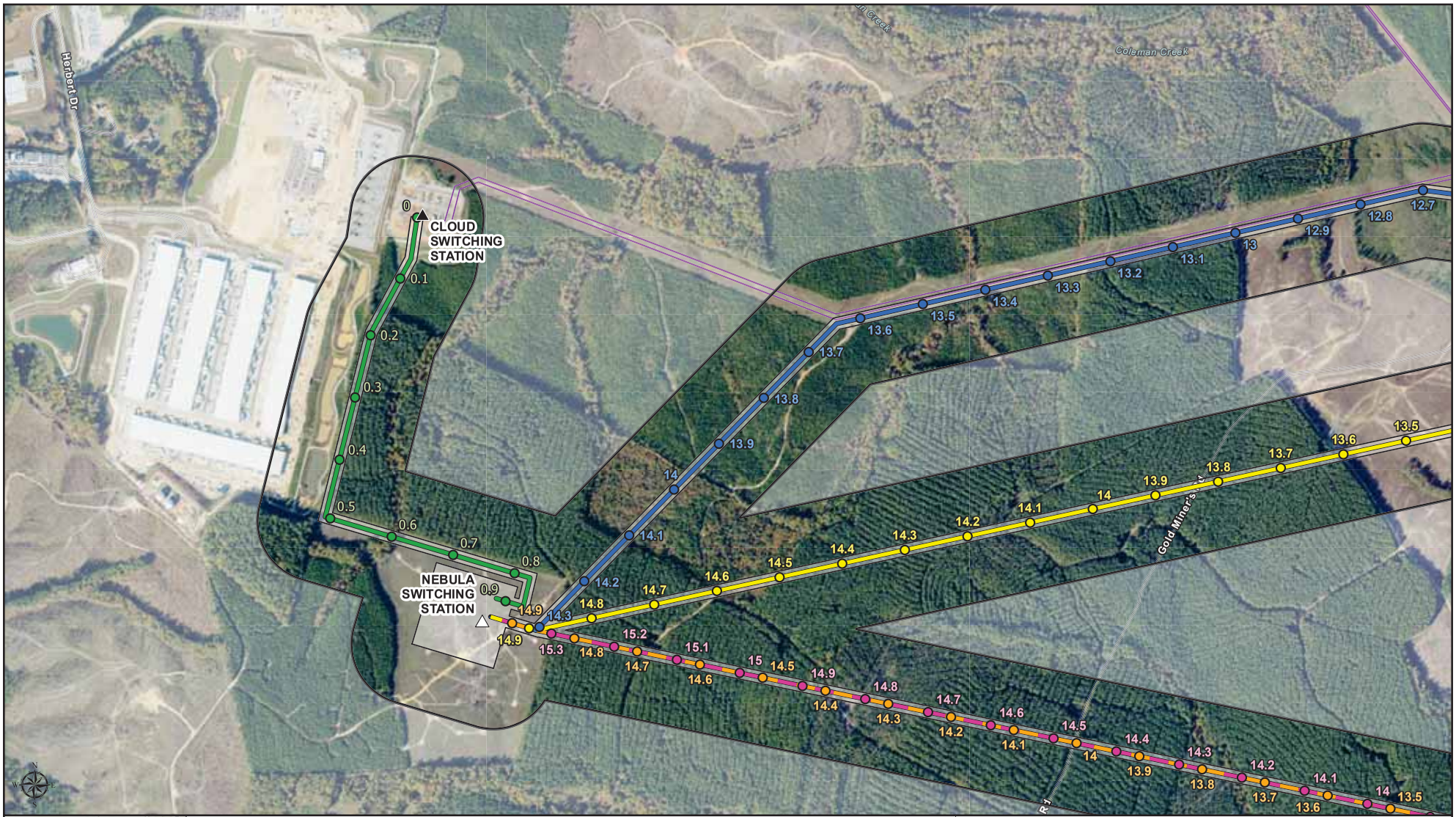

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Existing Residential and Non-Residential Structures within 500 feet of Routes
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Dominion Energy Virginia
Mecklenburg County, Virginia

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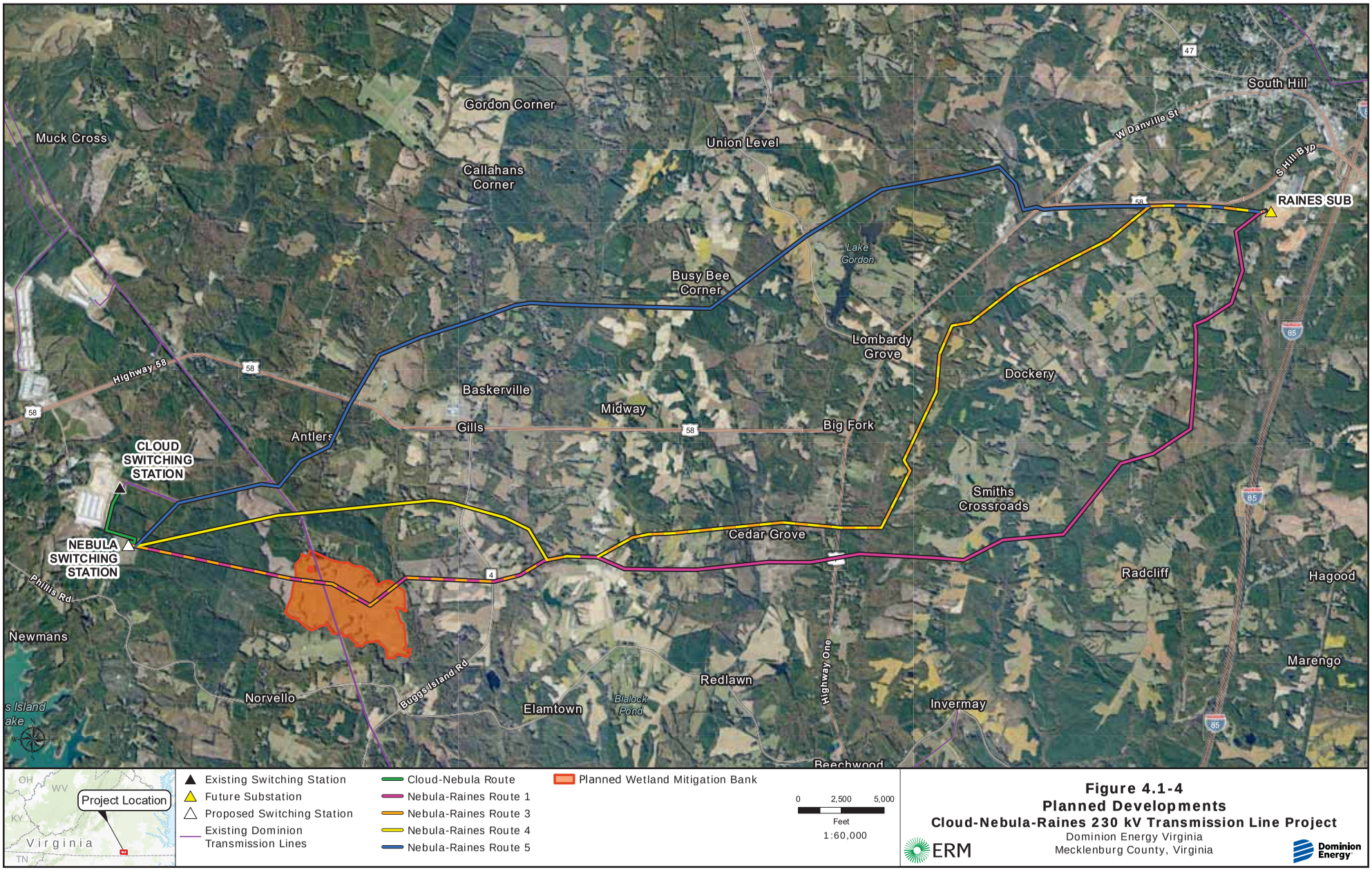

Figure 4.1-4
Planned Developments
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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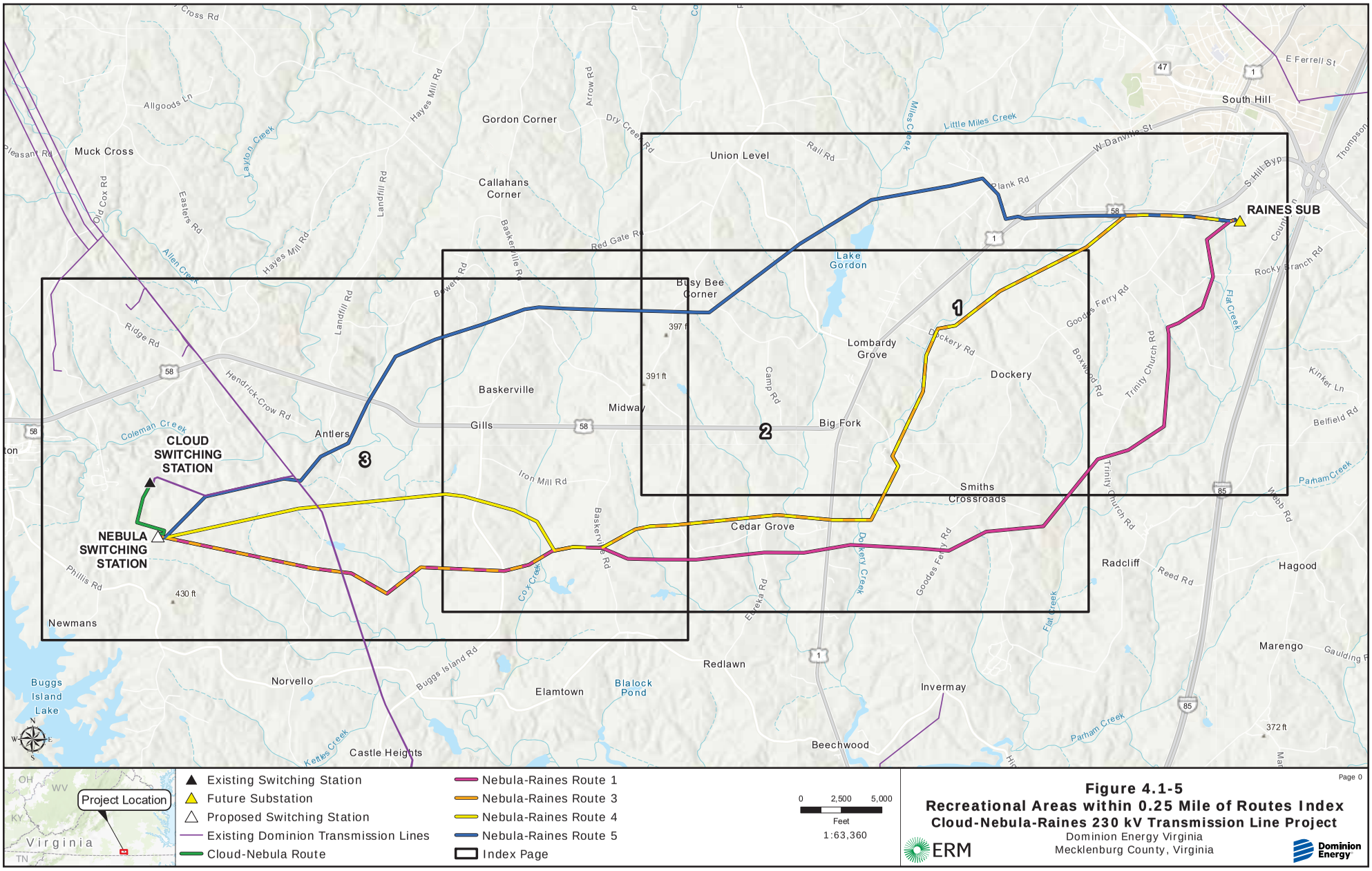
Dominion Energy

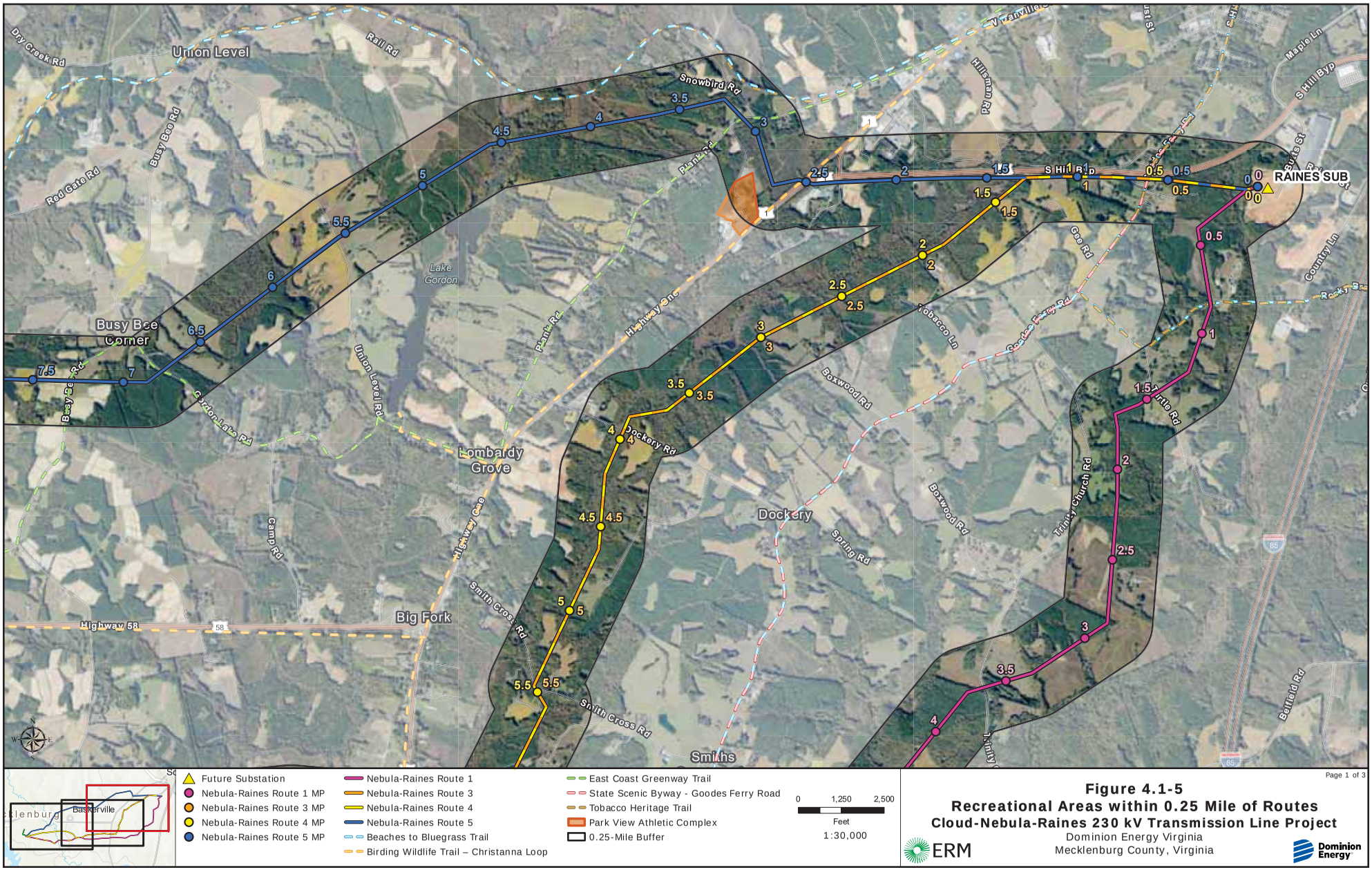


Page 0

Figure 4.1-5
Recreational Areas within 0.25 Mile of Routes Index
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy



Page 1 of 3

Figure 4.1-5
Recreational Areas within 0.25 Mile of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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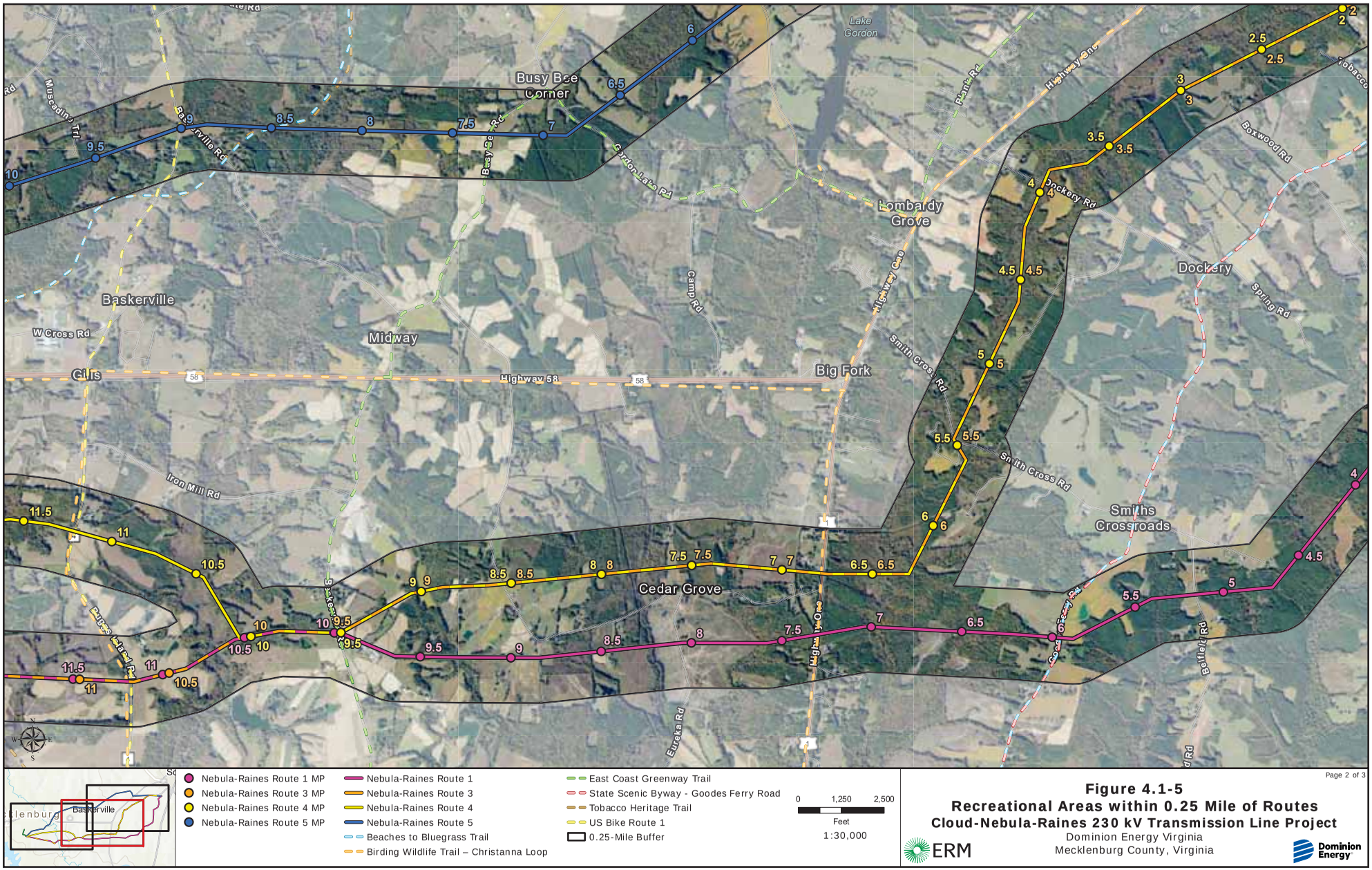

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Recreational Areas within 0.25 Mile of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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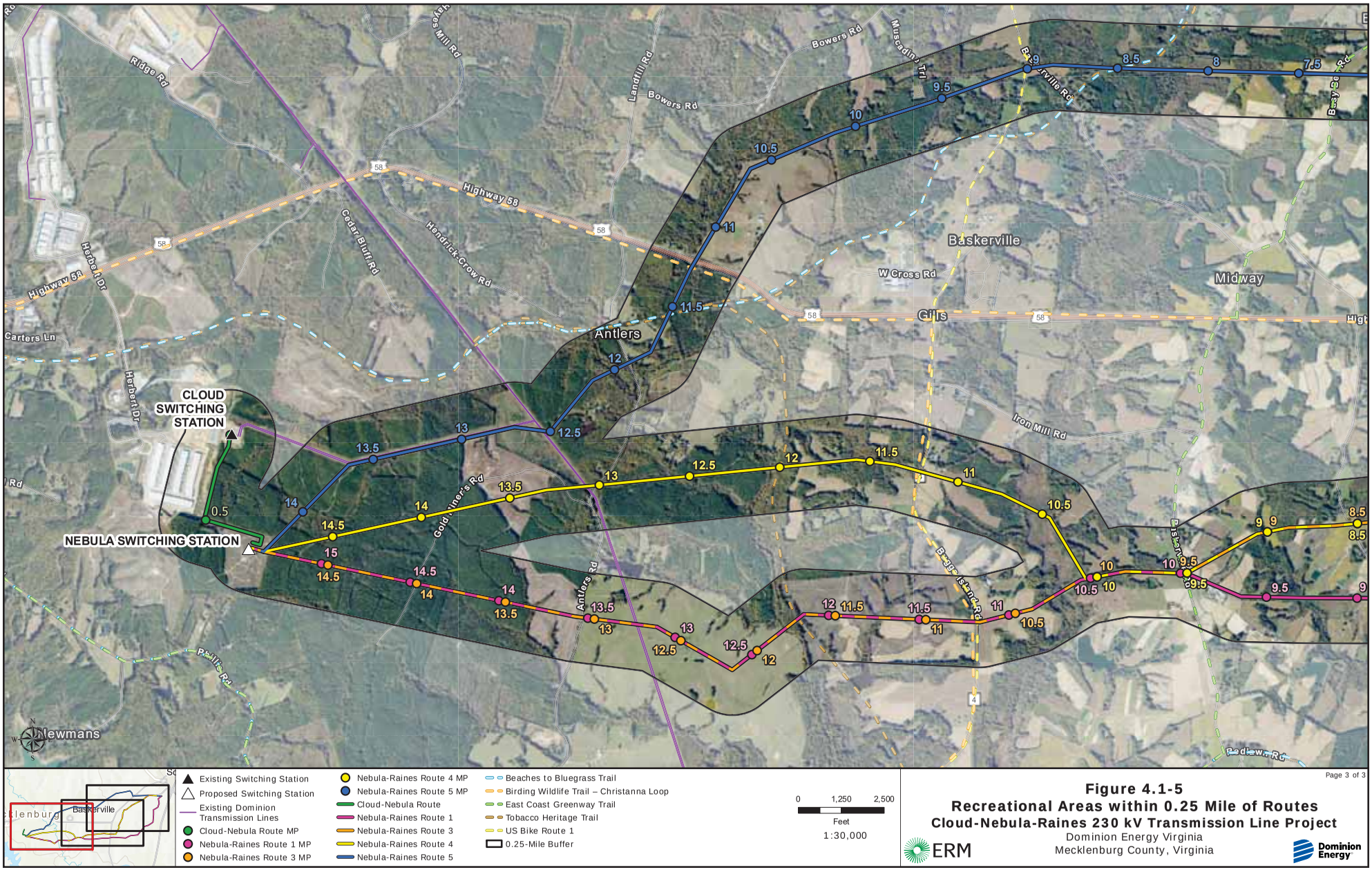

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Recreational Areas within 0.25 Mile of Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

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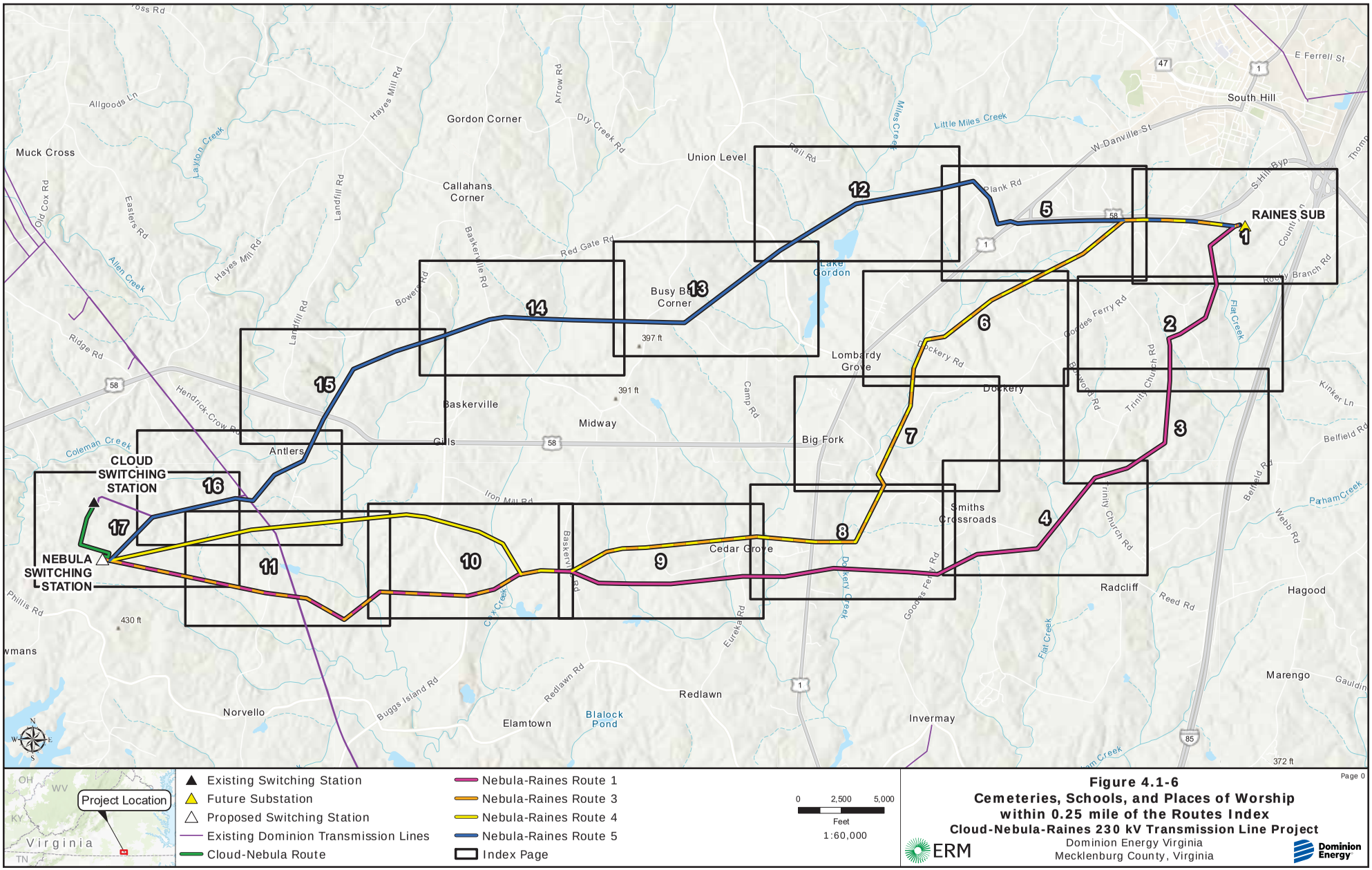
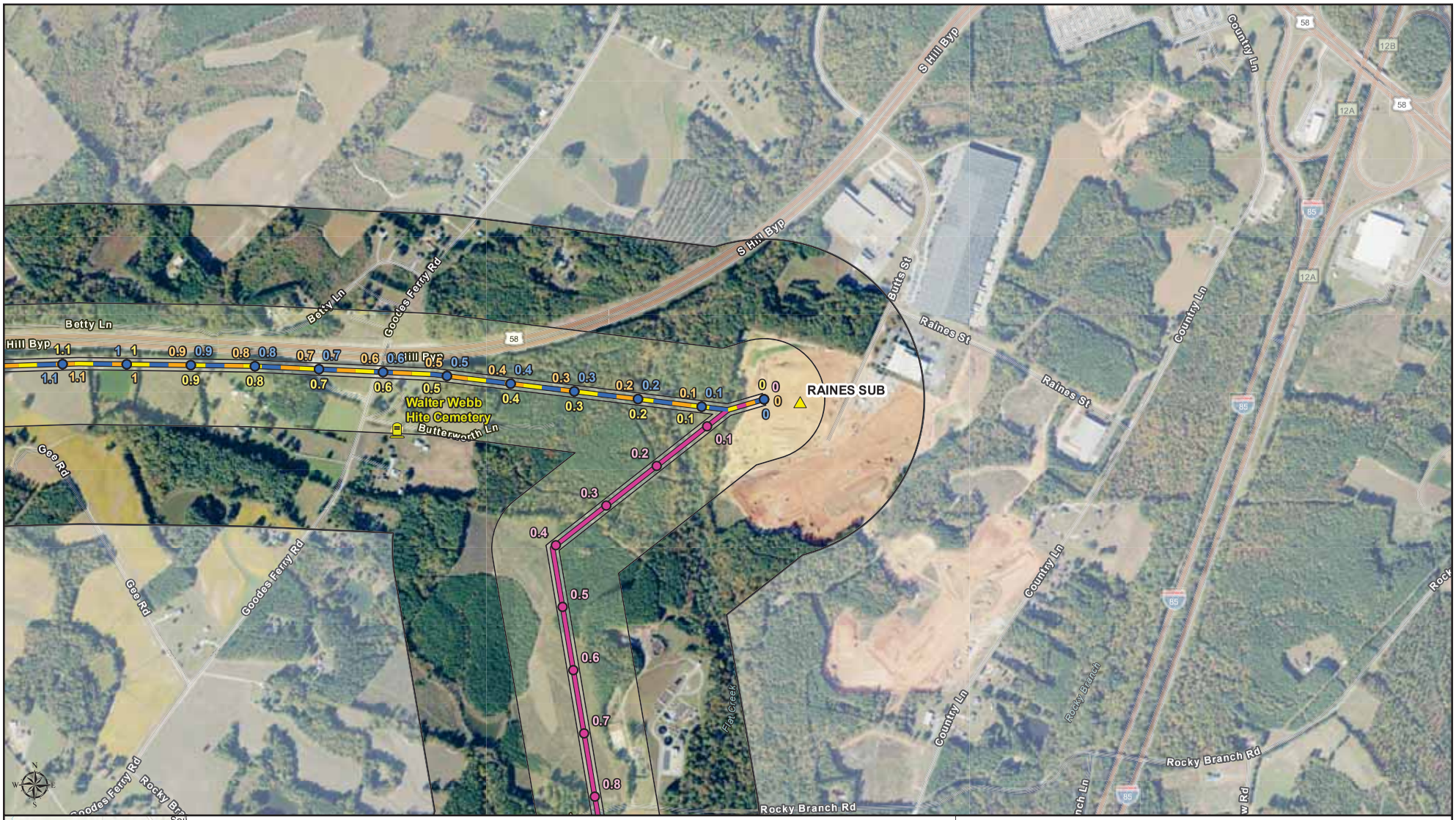


Page 0

Figure 4.1-6
Cemeteries, Schools, and Places of Worship within 0.25 mile of the Routes Index
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy



Page 1 of 17

Figure 4.1-6
Cemeteries, Schools, and Places of Worship within 0.25 mile of the Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

Dominion Energy

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Dominion Energy Virginia
Mecklenburg County, Virginia

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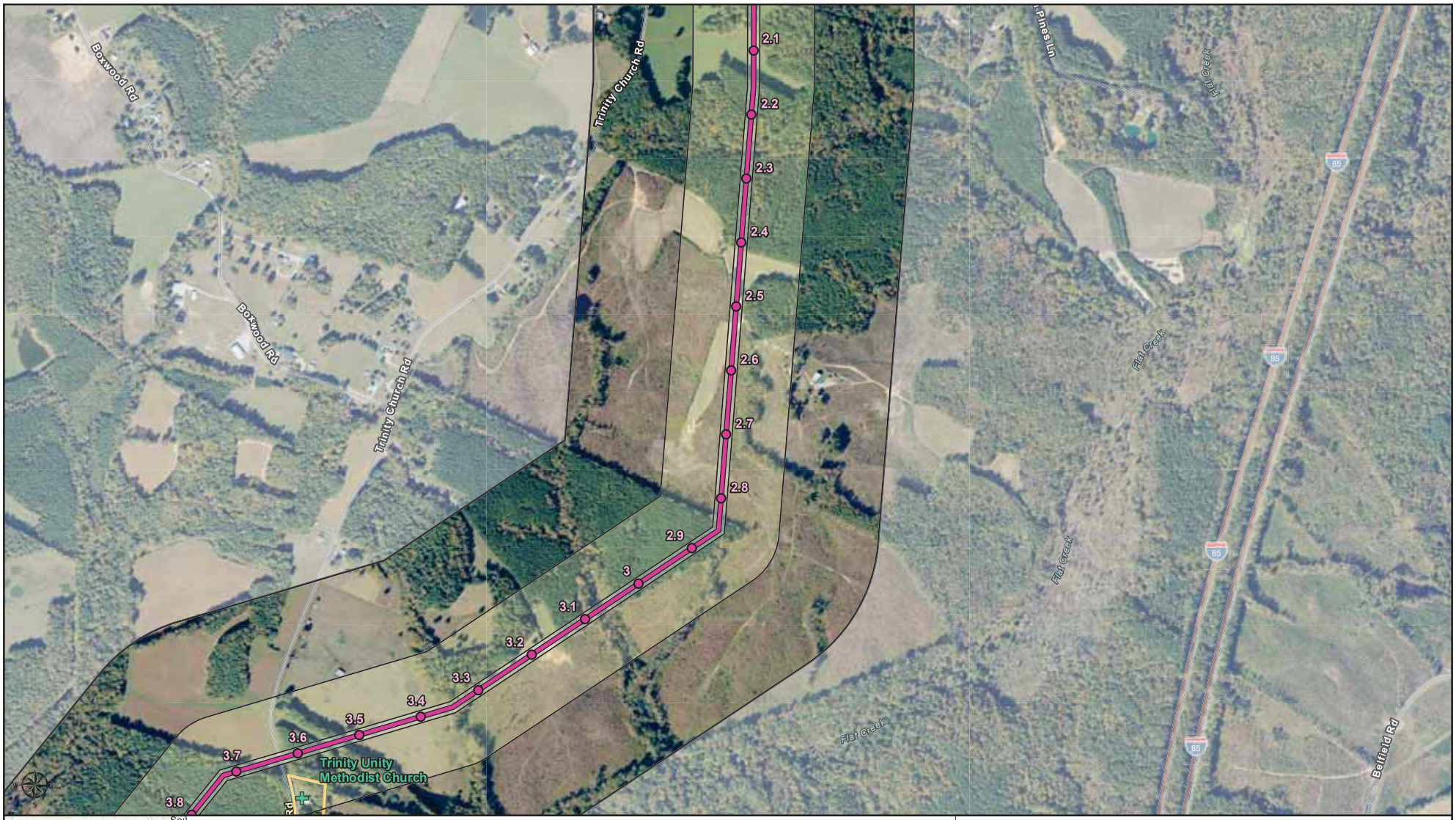

Note: All route Rights-of-Way are 100-foot wide

Figure 4.1-6
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Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

ERM

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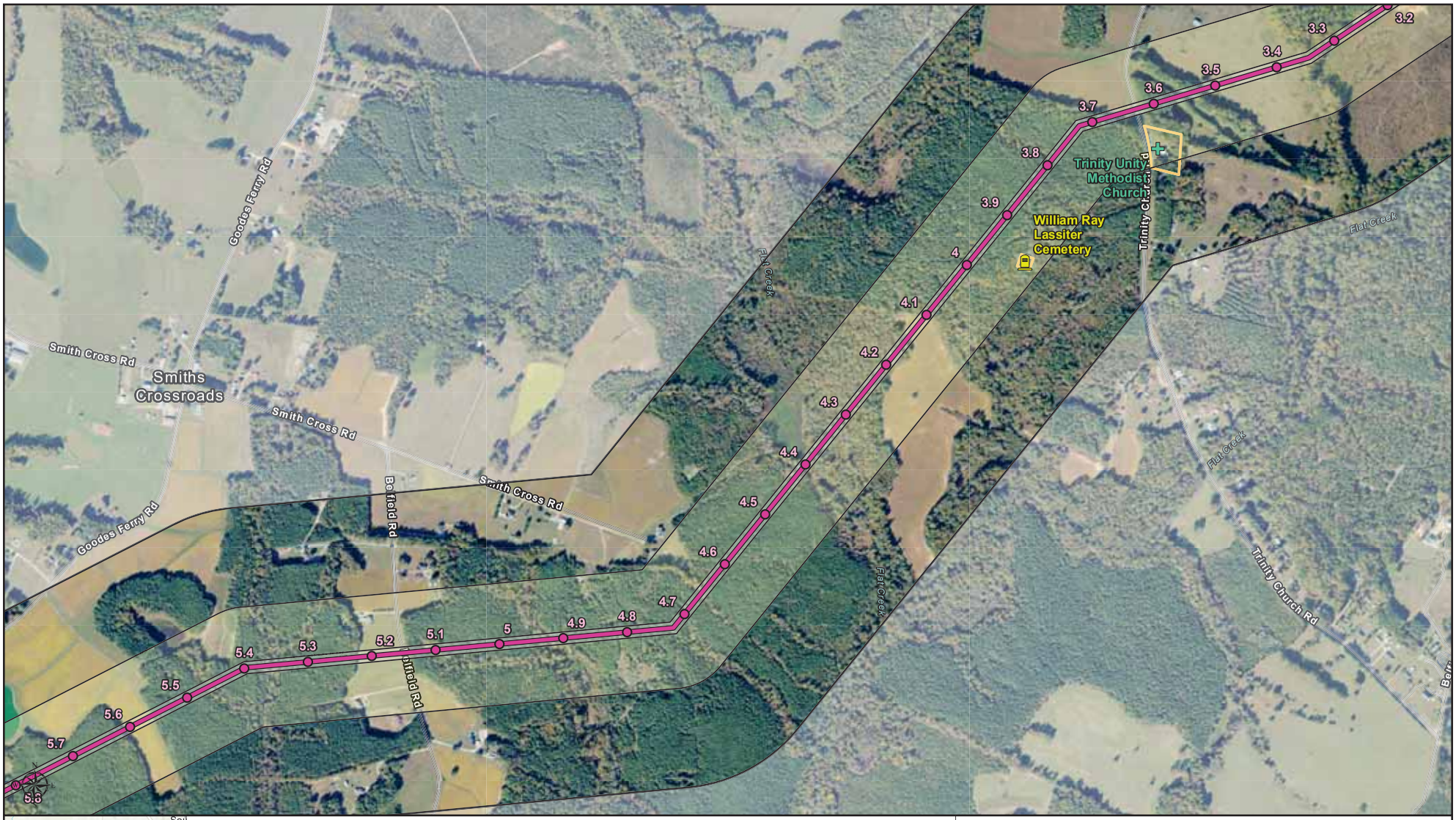

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Cemeteries, Schools, and Places of Worship within 0.25 mile of the Routes
Cloud-Nebula-Raines 230 kV Transmission Line Project
Dominion Energy Virginia
Mecklenburg County, Virginia

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