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Natural Resources Technical Report

State Project #: 0220-044-052, P101; UPC: 110916
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NATURAL RESOURCES TECHNICAL REPORT

Martinsville Southern Connector Study

Route 220 Environmental Impact Statement

Federal Project Number STP-044-2(059)
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LIST OF ACRONYMS

BMPs	Best Management Practices
CCB	Center for Conservation Biology
CEDAR	Comprehensive Environmental Data and Reporting System
CFR	Code of Federal Regulations
CLOMR	Conditional Letters of Map Revision
COV	Code of Virginia
CWA	Clean Water Act
DMME	Virginia Department of Mines, Minerals, and Energy
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FCIR	Farmland Conversion Impact Rating
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
FY	Fiscal Year
GIS	Geographic Information System
GWMA	Groundwater Management Areas
HUC	Hydrologic Unit Code
IF	Impact Factor
IPaC	Information for Planning and Consultation
LF	Linear Feet
LOD	Illustrative Planning Level Limits of Disturbance
LOMR	Letters of Map Revision
MRDS	Mineral Resources Data System
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHD	National Hydrography Dataset
NHDE	Natural Heritage Data Explorer

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NLEB	Northern Long-eared bat
NMFS	National Marine Fisheries Service
NRCS	Natural Resource Conservation Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OFD	One Federal Decision
PEM	Palustrine Emergent
PFO	Palustrine Forested
POW	Palustrine Open Water
PSS	Palustrine Scrub-Shrub
RCI	Reach Condition Index
SDWA	Safe Drinking Water Act
SSA	Sole Source Aquifer
SYIP	Six Year Improvement Plan
TMDL	Total Maximum Daily Load
USC	United States Code
USDA	United States Department of Agriculture
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USM	Unified Stream Methodology
VAC	Virginia Administrative Code
VaFWIS	Virginia Fish and Wildlife Information Service
VaNLA	Virginia Natural Landscape Assessment
VDACS	Virginia Department of Agriculture and Consumer Services
VDCR	Virginia Department of Conservation and Recreation
VDCR-DNH	Virginia Department of Conservation and Recreation–Division of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDOF	Virginia Department of Forestry
VDOT	Virginia Department of Transportation
VEGIS	Virginia Environmental Geographic Information Systems
VGIN	Virginia Geographic Information Network
VMRC	Virginia Marine Resources Commission
VSMP	Virginia Stormwater Management Program
VWPP	Virginia Water Protection Permit
WERMS	Wildlife Environmental Review Map Service
WOUS	Waters of the United States
WPP	Wellhead Protection Program

1 INTRODUCTION

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the Federal Lead Agency and in cooperation with the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA), have prepared a Draft Environmental Impact Statement (EIS) for the Martinsville Southern Connector Study – Route 220 EIS (Martinsville Southern Connector Study). This study evaluates potential transportation improvements along the U.S. Route 220 (Route 220) corridor between the North Carolina state line and U.S. Route 58 (Route 58) in Henry County near the City of Martinsville (Martinsville), Virginia.

The Draft EIS and supporting technical documentation have been prepared pursuant to the National Environmental Policy Act of 1969 (NEPA), codified in 42 United States Code §4321-4347, as amended, and in accordance with FHWA regulations, found in 23 Code of Federal Regulations (CFR) §771. As part of the Draft EIS, the environmental review process has been carried out following the conditions and understanding of the *NEPA and Clean Water Act (Section 404) Merged Process for Highway Projects in Virginia* (merged process)¹. The Martinsville Southern Connector Study also follows the One Federal Decision (OFD) process, which was enacted by Executive Order (EO) 13807: *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects* (82 FR 163)².

The study area for the Martinsville Southern Connector Study is located south of Martinsville in Henry County, Virginia (see **Figure 1-1**). Positioned on the southern border of Virginia, the study area is located approximately 60 miles southeast of the City of Roanoke (Roanoke) via Route 220, 30 miles west of the City of Danville via Route 58, and 40 miles north of the City of Greensboro in North Carolina via Interstate 73 and Route 220.

The study area encompasses approximately seven miles of the Route 220 corridor, between the interchange of Route 220 with the William F. Stone Highway and the North Carolina state line. Within the study area, existing Route 220 consists of a four-lane roadway, with two travel lanes in each direction. The William F. Stone Highway is signed as Route 58 to the east of its interchange with Route 220; west of the interchange, Route 220 is collocated with Route 58, as both bypass Martinsville. For the purposes of consistency in this study, portions of the William F. Stone Highway east and west of the Route 220 interchange are herein referred to as Route 58. The study area also includes the interchange of Route 58 at Route 641 (Joseph Martin Highway), approximately 1.25 miles west of Route 220. Additionally, the study area encompasses the Town of Ridgeway (Ridgeway), where Route 220 connects with Route 87 (Morehead Avenue), approximately three miles south of Route 58.

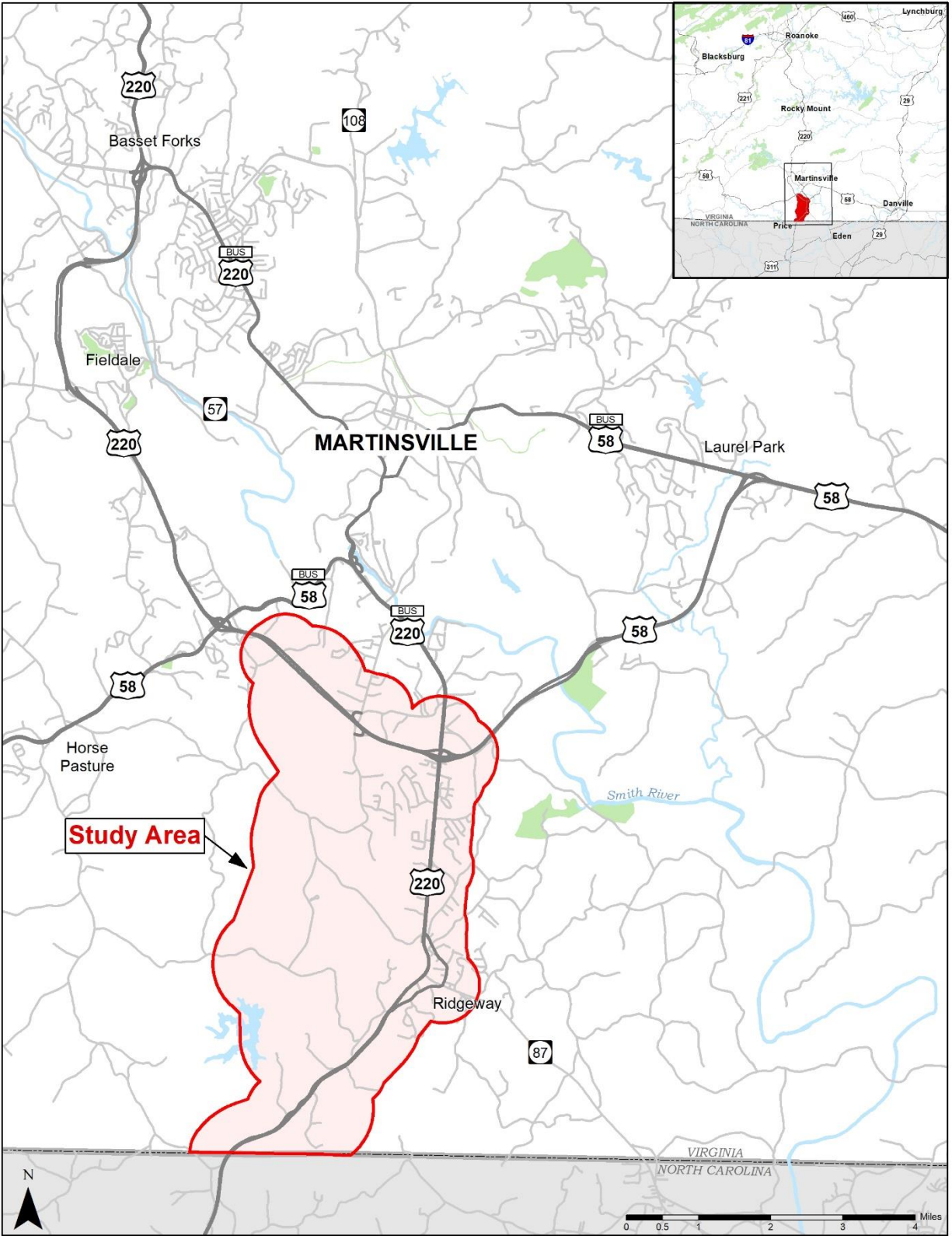
¹Established under a memorandum of understanding between VDOT, FHWA, USACE, EPA, and the U.S. Fish and Wildlife Service (USFWS), the merged process establishes a procedure for coordinated environmental review and development of documentation in Virginia that complies with the requirements of NEPA and provides sufficient information to support Federal regulatory decision-making, including FHWA approval or permits issued by other Federal agencies.

²The Martinsville Southern Connector Study is following the OFD process, subsequent to receiving OFD designation by FHWA. OFD requires that major infrastructure projects have a single permitting timetable for synchronized environmental reviews and authorizations: www.permits.performance.gov/permitting-projects/us-route-58220-bypass-north-carolina-state-line-limited-access-study.

Martinsville Southern Connector Study

Route 220 Environmental Impact Statement

Figure 1-1: Study Area



The study area boundary for the Martinsville Southern Connector Study has been developed to assist with data collection efforts and the evaluation of the alternatives retained for evaluation. The study area covers 12,873 acres and generally encompasses a one-half-mile buffer around the portion of existing Route 220, between the North Carolina state line and Route 58, and each alternative carried forward for evaluation. The study area was used in various instances during preliminary research and to establish an understanding of the potentially affected natural, cultural, and social resources that may be impacted by the improvements evaluated in the Draft EIS.

The purpose of this **Natural Resources Technical Report** is to identify and assess the natural resource effects of the alternatives retained for evaluation in the Draft EIS. Information in this report, described below, will support discussions presented in the Draft EIS.

1.1 PURPOSE AND NEED

Working with FHWA and the Cooperating and Participating Agencies, the Purpose and Need for the study was concurred upon in November 2018. The purpose of the Martinsville Southern Connector Study is to enhance mobility for both local and regional traffic traveling along Route 220 between the North Carolina state line and Route 58 near Martinsville, Virginia.

The Martinsville Southern Connector Study addresses the following needs:

- **Accommodate Regional Traffic** – current inconsistencies in access, travel speeds, and corridor composition along Route 220 inhibit mobility and creates unsafe conditions considering the high volume of truck and personal vehicle traffic traveling through the corridor to origins and destinations north and south of the study area;
- **Accommodate Local Traffic** – numerous, uncontrolled access configurations along Route 220, combined with high through traffic movement, create traffic delays and contribute to high crash rates for travelers within the corridor accessing residences, commercial buildings, and schools; and
- **Address Geometric Deficiencies and Inconsistencies** – current geometric conditions along Route 220, such as lane widths, horizontal curves, and stopping sight distances, are below current design standards and vary along the length of the corridor, resulting in safety concerns for all users.

1.2 ALTERNATIVES CARRIED FORWARD FOR EVALUATION

1.2.1 Alternatives Retained

VDOT, in coordination with FHWA, the Cooperating and Participating Agencies, and the general public, initially considered a broad range of alignment options to address the established Purpose and Need of the Martinsville Southern Connector Study. A number of these alignment options were not carried forward based on their inability to meet the Purpose and Need. Other alignment options were developed into alternatives for evaluation, but were not retained based on anticipated impacts to private property. As part of the public involvement process during the development of the Draft EIS, additional alternatives were suggested for evaluation. These options were similar to the alignment options initially considered and were not carried forward for evaluation based on their inability to address the identified Purpose and Need for the study.

The alternatives carried forward for evaluation and retained for detailed study in the Draft EIS are listed below:

- No-Build Alternative;
- Alternative A – New access-controlled alignment west of existing Route 220 with a new interchange with Route 58 to the west of Route 641 (Joseph Martin Highway) and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line;
- Alternative B – New access-controlled alignment west of existing Route 220 and west of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 58 and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line; and
- Alternative C – New access-controlled alignment west of existing Route 220 and east of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 58 and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line.

These alternatives are described in the sections that follow. Additional information is included in the Draft EIS and supporting **Alternatives Analysis Technical Report** (VDOT, 2020a), including the process used to identify and screen alignment options, alternatives carried forward, and alternatives retained for detailed study.

Based on the detailed study of the alternatives retained for evaluation, Alternative C has been identified in the Draft EIS as the Preferred Alternative.

1.2.1.1 No-Build Alternative

In accordance with the regulations for implementing NEPA [40 CFR §1502.14(d)], the No-Build Alternative has been included for evaluation as a basis for the comparison of future conditions and impacts. The No-Build Alternative would retain the Route 220 roadway and associated intersections and interchanges in their present configuration, allowing for routine maintenance and safety upgrades.

This alternative assumes no major improvements within the study area, except for previously committed projects that are currently programmed and funded in VDOT's *Six Year Improvement Plan (SYIP) for Fiscal Year (FY) 2020-2025* (VDOT, 2019) and Henry County's *Budget for FY 2019-2020* (Henry County, 2019). As these other projects are independent of the evaluated alternatives, they are not evaluated as part of the Draft EIS and supporting documentation.

1.2.1.2 Alternative A

Alternative A would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative A, access would be controlled and provided at three new interchanges. It is assumed that interchanges would be provided at both ends of the facility and one would be located along the corridor. For the purposes of the analyses in the Draft EIS and supporting documentation, it is assumed this third interchange would occur at Route 687 (Soapstone Road). The reconstructed portion of Route 220, along with the new alignment, would incorporate full access control.

Beginning at the North Carolina state line, Alternative A would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad. The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Route 689

(Reservoir Road) and Route 971 (J.B. Dalton Road). After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest crossing Patterson Branch. The alignment would then shift to the north, following a small ridge between Patterson Branch and a tributary to Marrowbone Creek, before crossing Marrowbone Creek east of Marrowbone Dam. The alignment would continue north and to the west of a large farm/open field, crossing tributaries of Marrowbone Creek. The alignment would shift eastward and cross over Route 688 (Lee Ford Camp Road), Stillhouse Run, and a floodplain. After crossing Stillhouse Run, the alignment would shift northward and continue for approximately one mile. The alignment would then continue north reaching Soapstone Road, where a new interchange would be provided, west of the intersection with Joseph Martin Highway. An interchange with Alternative A is proposed at Soapstone Road. The alignment would then turn to the northeast to cross three minor tributaries to Marrowbone Creek. The alignment continues in a northerly direction with a new interchange at Route 58, west of the interchange at Joseph Martin Highway.

1.2.1.3 Alternative B

Alternative B would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative B, access would be controlled and provided at two new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. For the purpose of this study, it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configurations would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative B would reconstruct Route 220 for approximately one mile, where it would shift eastward before turning to the north to cross over the Norfolk Southern railroad. The wide horizontal curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, as well as minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest prior to crossing Patterson Branch. The alignment would then gradually shift from the northwest to the northeast and cross three tributaries to Marrowbone Creek. The alignment would continue in a northeasterly direction over Lee Ford Camp Road, where it would pass to the east of the Marrowbone Plantation, shifting northwest to cross Marrowbone Creek. After crossing Marrowbone Creek, Alternative B would continue to the northwest, crossing Magna Vista School Road south of Magna Vista High School, then paralleling Magna Vista School Road west of the high school up to a new interchange with Soapstone Road. The new interchange at Soapstone Road would require the relocation of a portion of Magna Vista School Road. From the Soapstone Road interchange, the alignment would continue to the northeast and cross two minor tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at its interchange with Route 58, requiring modifications to the existing interchange configuration to provide a more direct connection between Route 58 and the new roadway. The reconstructed portion of Route 220 at the southern end, along with the new alignment, would be an access-controlled facility.

1.2.1.4 Alternative C (Preferred Alternative)

Alternative C would consist of a new roadway alignment that is primarily to the west of existing Route 220. Alternative C was developed as a modification of the initially considered Alignment Option 4C based on agency comments, with the primary changes occurring north of Soapstone Road. Alignment Option 4C originally included an interchange between Joseph Martin Highway and Route 220; however, adequate spacing could not be provided to accommodate all movements. Therefore, the alignment was shifted to tie in at the location of the existing Joseph Martin Highway interchange. Under Alternative C, access would be controlled and provided at two new interchanges and a modified interchange at Route 220/Route 58 and Joseph Martin Highway. For the purposes of the analyses in the Draft EIS it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative C would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad. The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would continue northward for approximately 1.5 miles, crossing White House Road and a tributary to Marrowbone Creek. The alignment would then shift to the northeast to cross Lee Ford Camp Road. Alternative C would then shift northward and continue east of Magna Vista High School and Marrowbone Creek and parallel the Pace Airport to the east. After passing Pace airport, the alignment would shift to the northeast and cross Soapstone Road to the east of Marrowbone Creek. A new interchange with Alternative C would be constructed at Soapstone Road. North of Soapstone Road, the alignment would shift west and cross Joseph Martin Highway. The alignment would continue to the northwest and cross two tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at the existing interchange location with Route 58. This would require modifications to the existing interchange to provide a more direct connection between Route 58 and the new roadway.

1.2.2 Alternatives Not Retained

As part of the alternatives development process for the Draft EIS, the following alternatives were carried forward for evaluation, but have not been retained for detailed study in the Draft EIS, based on their anticipated impacts to private properties. However, these alternatives were evaluated to a sufficient level of detail to eliminate them from further consideration and detailed study in the Draft EIS. In order to inform the alternatives development process for the Draft EIS, these alternatives have been included as part of the analysis included in this **Natural Resources Technical Report** and are summarized in the sections that follow.

- Alternative D – Reconstruct Route 220 as an access-controlled roadway, with a spur on new alignment north of Ridgeway and reconstruct the Joseph Martin interchange at Route 58; and
- Alternative E – Reconstruct Route 220 as an access-controlled roadway, consolidating access to interchanges at select locations.

These alternatives, as well as those previously described that have been retained for detailed analysis in the Draft EIS, are illustrated on **Figure 1-2**.

1.2.2.1 Alternative D

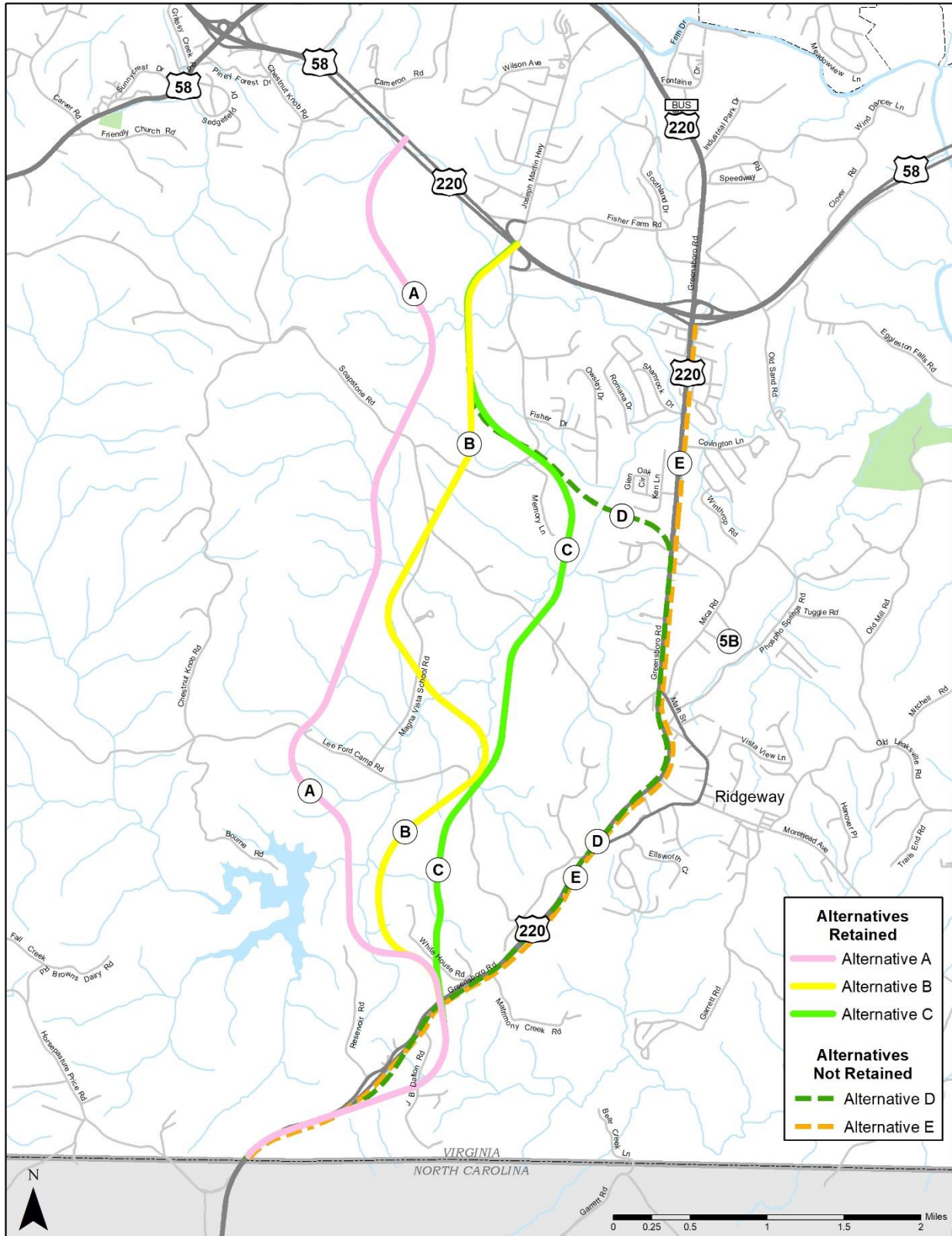
Alternative D would consist of reconstructing existing Route 220 as an access-controlled roadway for approximately 5.6 miles from the North Carolina state line where it would then divert to the west on a new access-controlled roadway just north of Water Plant Road. Under Alternative D, access would be controlled and provided at three new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. South of Water Plant Road, access to the new roadway would be made via frontage roads and new interchanges near Reservoir Road and at Morehead Avenue. A new structure providing access to Route 220 would be located at Lee Ford Camp Road/Church Street. At Water Plant Road an interchange is suggested where the new roadway branches from Route 220 to provide direct access between the new roadway and Route 220 to the north. From this interchange, the new alignment would proceed northwest, crossing Marrowbone Creek and then parallels a tributary of Marrowbone Creek to beyond Joseph Martin Highway. The alignment then shifts northward and follows the same alignments as Alternatives B and C just north of the Radial warehouse site to the tie-in location with Route 58. Modifications to the existing interchange at Route 58 and Joseph Martin Highway would be required with this alternative. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

1.2.2.2 Alternative E

Alternative E would consist of fully reconstructing existing Route 220 as an access-controlled roadway between the North Carolina state line and Route 58, removing all direct connections of existing driveways and side streets to Route 220.

Under Alternative E, access would be controlled and provided only at interchanges at various locations in the corridor. Existing residential and commercial driveways would be directed to frontage roads that parallel the roadway, ultimately connecting to Route 220 at interchanges. New interchanges to provide frontage road access to Route 220 are located at Reservoir Road and at Morehead Avenue. Structures over or under the new Route 220 roadway are included at Lee Ford Camp Road/Church Street and Soapstone Road/Main Street to provide east-west connectivity. The Route 220 interchange at Route 58 would be modified to provide direct access between the new roadway, Route 58, and Business Route 220 to the north.

Figure 1-2: Route 220 Alternative Alignment Map



2 SURFACE WATER RESOURCES

2.1 WATER QUALITY

2.1.1 Regulatory Context

As directed by Section 305(b) of the Clean Water Act (CWA), the Virginia Department of Environmental Quality (VDEQ) monitors water quality in state waters, identifying impairments and sources of impairments, and developing and implementing Total Maximum Daily Load (TMDL) reports for impaired waters (§ 62.1-44.19:5 and § 62.1-44.19:7). A TMDL report is a study to determine the amount of a pollutant that the impaired water can assimilate and still meet water quality standards.

When surface waters fail to meet water quality standards sufficient to support designated use categories, the waters are classified as impaired waters under Section 303(d) of the CWA. Freshwater rivers and surface waters in Virginia are evaluated biennially on the water's ability to support the following six designated use categories: Recreation, Aquatic Life, Fish Consumption, Shellfish Harvest, Public Water Supply, and Wildlife. These regulations are relevant for this analysis because the Build Alternatives could result in impacts to water quality.

2.1.2 Methodology

Water quality was evaluated within the watersheds intersected by the Alternative Inventory Corridors using VDEQ's *Draft 2018 305(b)/303(d) Water Quality Assessment Integrated Report* (VDEQ, 2019a). VDEQ released this report on January 22, 2019. The 2018 Integrated Report is a summary of the water quality conditions in Virginia from January 1, 2011, through December 31, 2016 (VDEQ, 2019a). The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2019 agency meeting (see **Section 6.2: Agency Coordination** in the Draft EIS for additional information).

2.1.3 Affected Environment

The Martinsville Southern Connector study area is located within the Upper Dan River subbasin (hydrologic unit code [HUC] 03010103, more specifically, the Lower Smith River watershed (HUC 0301010308) and the Dan River-Matrimony Creek watershed (HUC 0301010305) (VDCR 2019). The majority of the study area is located in the Lower Smith River watershed. Within these two larger watersheds, there are two subwatersheds within the Alternative Inventory Corridors: Marrowbone Creek (HUC 030101030802) and Matrimony Creek (HUC 030101030505) (**Figure 2-1**). All drainage within the study area flows to the Dan River, which flows to the Roanoke River, and ultimately to the Albemarle Sound. Surface waters in the Alternative Inventory Corridors consist of Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, other perennial, intermittent, and ephemeral streams, open waters, and wetlands. **Table 2-1** is a summary of HUCs for the study area.

Figure 2-1: Watersheds

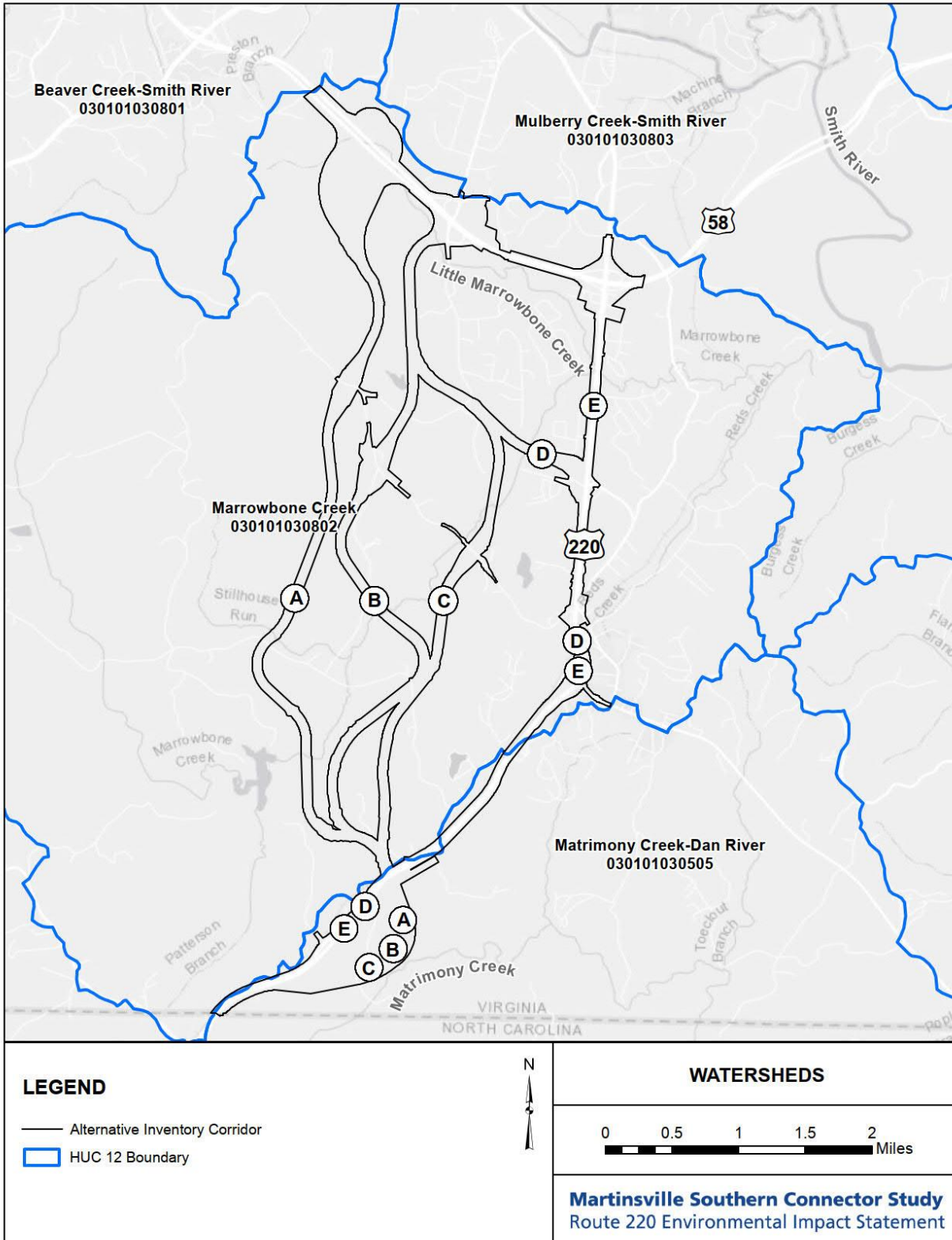


Table 2-1: Summary of Hydrologic Unit Codes (HUC) for the Study Area

Subbasin (HUC 8)	Watershed (HUC 10)	Sub-Watershed (HUC 12)	Tributaries
Upper Dan River (03010103)	Lower Smith River (0301010308)	Marrowbone Creek (030101030802)	Little Marrowbone Creek
			Marrowbone Creek
			Stillhouse Run
	Dan River-Matrimony Creek (0301010305)	Matrimony Creek (030101030505)	Matrimony Creek

2.1.3.1 Marrowbone Creek Watershed

The Marrowbone Creek watershed encompasses most of the study area. Land cover is primarily forest and agriculture throughout, except along the major transportation corridor (Route 220). Moving away from the Route 220 corridor, the watershed becomes increasingly less developed with forested land eventually becoming the dominant land cover. Observations made in the field identified areas where recent (within the last 20 years) timber harvests have occurred. It was determined Alternative Inventory Corridors A, B, C, D, and E each have tracts of land that had been logged for timber. Specifically, there is an area of recent timber harvest at the Route 58 interchange as well as another harvested area, that is regenerating, just north of the northern interchange with existing Route 220 and Route 58. Stream quality is greatly affected by timber harvesting and logging operations in the watershed. Disturbance to the surrounding landscape caused by forest operations such as timber harvests, road and skid trail construction, landing construction, skidding of logs, and movement of machinery in and out of different operating sites create conditions that increase runoff, increase raindrop erosion, and reduced canopy cover. The streams suffer the effects of frequent clearcutting timber harvests with minimal to no erosion and sediment control measures. Incised stream channels and bank instability, caused by increased volumes of water in the streams, are evidence of these effects and are documented in Unified Stream Methodology (USM) forms (**Appendix B**).

The first 4.5 river miles of Marrowbone Creek is currently not meeting Virginia’s water quality standard for Recreational Use, due to high levels of bacteria (*E. coli*). VDEQ has included Marrowbone Creek on Virginia’s 2018, 303d list for bacterial impairment. This reach extends from its confluence with Smith River, continuing upstream, stopping short of Soapstone Road. The impaired reach terminates east (downstream) of the Alternative Inventory Corridors. Failed septic systems, straight pipes, livestock direct instream loading, as well as agricultural and urban nonpoint sources are the identified sources for impairment (VDEQ, 2019a). VDEQ’s Virginia Environmental Geographic Information Systems (VEGIS) map service shows that VDEQ developed a TMDL that was approved by EPA in 2008.

2.1.3.2 Matrimony Creek Watershed

The Matrimony Creek Watershed encompasses a relatively small area at the southern extent of the study area. Like Marrowbone Creek, land cover is primarily forest and agriculture throughout. Matrimony Creek is not included on Virginia’s 303d list. VDEQ’s VEGIS map service indicates that Matrimony Creek Mainstem is fully supporting its designated uses; however, there is not enough current data to characterize its upstream tributaries.

2.1.4 Environmental Consequences

2.1.4.1 No-Build

The No-Build conditions are consistent with the existing predevelopment conditions. Existing infrastructure has impacted water quality (e.g. construction of roads, timber harvesting, surrounding development, etc.). In the absence of modern stormwater management system improvements that would be associated with construction of one of the Build Alternatives, potential impacts to water quality would be anticipated to continue under the No-Build Alternative.

2.1.4.2 Alternative A

Alternative A would intersect approximately 70 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of the Alternative A stream reaches are classified as VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to e.coli from septic systems and agricultural sources, and not transportation sources, implementation of Alternative A is unlikely to worsen existing impaired waters.

Alternative A would introduce approximately 8.3 miles of impervious surface to a low-development area. If left untreated, long-term minor water quality impacts could occur as a result of increases in impervious surfaces. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surface can significantly increase ambient temperatures in receiving streams. Paved surfaces transfer significant amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing Virginia Stormwater Management Program (VSMP) regulations (9VAC25-870), Alternative A would maintain water quality and quantity post-development equal or better than pre-development. Alternative A would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces of the six roads that intersect with the illustrative planning level limits of disturbance (LOD). During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater Best Management Practices (BMPs) would be designed as improvements advance and would be implemented to minimize the negative impacts of various

pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

2.1.4.3 Alternative B

Alternative B would intersect approximately 60 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of the Alternative B stream reaches are classified as VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to e.coli from septic systems and agricultural sources, and not transportation sources, implementation of Alternative B is unlikely to worsen existing impaired waters.

Alternative B would introduce approximately 7.7 miles of impervious surface to a low-development area. If left untreated, long-term minor water quality impacts could occur as a result of increases in impervious surfaces. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surface can significantly increase ambient temperatures in receiving streams. Paved surfaces transfer significant amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), Alternative B would maintain water quality and quantity post-development equal or better than pre-development. Alternative B would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces of the eight roads that intersect with the LOD. During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater BMPs would be designed as improvements advance from the study and would be implemented to minimize the negative impacts of various pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

2.1.4.4 Alternative C

Alternative C would intersect approximately 60 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the

potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of the Alternative C stream reaches are classified as VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to e.coli from septic systems and agricultural sources, and not transportation sources, implementation of Alternative C is unlikely to worsen existing impaired waters.

Alternative C would introduce approximately 7.4 miles of impervious surface to a low-development area. If left untreated, long-term minor water quality impacts could occur as a result of increases in impervious surfaces. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surface can significantly increase ambient temperatures in receiving streams. Paved surfaces transfer significant amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), Alternative C would maintain water quality and quantity post-development equal or better than pre-development. Alternative C would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces of the eight roads that intersect with the LOD. During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater BMPs would be designed as improvements advance from the study and would be implemented to minimize the negative impacts of various pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

2.1.4.5 Alternative D

Alternative D would intersect approximately 60 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of the Alternative D stream reaches are classified as VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to e.coli from septic systems and agricultural sources, and not transportation sources, implementation of Alternative D is unlikely to worsen existing impaired waters.

Alternative D would introduce approximately 7.4 miles of impervious surface to an area that is already used for transportation purposes. These waters currently experience degraded water quality due to adjacent roadways and developments. If the water is left untreated, surrounding water quality could worsen. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surface can significantly increase ambient temperatures in receiving streams. Paved surfaces transfer significant amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), Alternative D would maintain water quality and quantity post-development equal or better than pre-development. Alternative D would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces within the LOD. During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater BMPs would be designed as improvements advance from the study and would be implemented to minimize the negative impacts of various pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

2.1.4.6 Alternative E

Alternative E would intersect approximately 50 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of the Alternative E stream reaches are classified as VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to e.coli from septic systems and agricultural sources, and not transportation sources, implementation of Alternative E is unlikely to worsen existing impaired waters.

Alternative E would introduce approximately 7.4 miles of impervious surface an area that is already used for transportation purposes. These waters currently experience degraded water quality due to adjacent roadways and developments. If the water is left untreated, surrounding water quality could worsen. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could

amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surface can significantly increase ambient temperatures in receiving streams. Paved surfaces transfer significant amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), Alternative E would maintain water quality and quantity post-development equal or better than pre-development. Alternative E would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces within the LOD. During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater BMPs would be designed as improvements advance from the study and would be implemented to minimize the negative impacts of various pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

2.1.5 Mitigation

Post-construction impacts to water quality would be minimized and avoided through implementation of stormwater management plans. In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), implementation of any Build Alternative would maintain water quality and quantity post-development equal or better than pre-development. Stormwater control measures would be designed to treat or store polluted stormwater before entering nearby streams. Design of stormwater control measures would take into account any projected increase in stormwater runoff so that the speed of treated runoff entering nearby streams would be the same as the runoff rate that was entering the stream before development.

Stormwater management BMPs would be implemented to avoid and minimize water quality impacts. These BMPs would be designed using the VSMP requirements and VDEQ standards for Virginia Runoff Reduction Method practices, coupled with VDOT BMP Standards and Special Provisions. Erosion and sediment control measures and post-construction stormwater treatment would minimize impacts from increases in impervious surfaces, mitigate increases in runoff volume, and satisfy requirements to reduce pollutant loads below existing baseline conditions, as required by the VSMP regulations and Chesapeake Bay TMDL. This would minimize any increases in contaminants which could cause impairment of the area waterbodies.

The stormwater management plans would include certain common elements. As required under the current VSMP stormwater management criteria and new BMP standards, stormwater management measures would not only treat newly developed lands but would also treat and reduce phosphorus loads from existing lands by 20 percent, including impervious surfaces not previously addressed under previous regulations. Newly developed lands would be treated by

stormwater management measures such that the post-development phosphorus load does not exceed 0.41 pounds/acre/year. Due to the limited options for stormwater management on bridge structures and the limited land within the right of way along the surface roadways, these areas may be treated through offsite options, such as nutrient trading.

2.2 WATERS OF THE U.S. INCLUDING WETLANDS

2.2.1 Regulatory Context

EO 11990, Protection of Wetlands, established a national policy and mandates that each Federal agency take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance their natural value.

USACE exerts regulatory authority over activities involving the discharge of dredged or fill material into Waters of the U.S. (WOUS) pursuant to Section 404 of the CWA of 1977, as amended (33 USC 1344). The VDEQ administers the Virginia Water Protection Permit (VWPP) Program for impacts to surface waters (9 VAC §25-210 and Section 401 of the CWA). The Virginia Marine Resources Commission (VMRC) regulates encroachment into state-owned submerged lands (4 VAC §20). These regulations are relevant for this analysis because the Build Alternative could result in impacts to WOUS.

2.2.2 Methodology

In order to identify the potential WOUS, including wetlands, that could be present within the study area, an in-office review of available resource information was conducted. Data reviewed included: the USFWS' National Wetlands Inventory (NWI) mapping (USFWS, 2017); the National Hydrography Dataset (NHD) and 7.5-minute topographic quadrangles prepared by the United States Geographical Survey (USGS) (USGS 2017); U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soils mapping and survey reports (USDA-NRCS, 2018); and natural color aerial imagery. WOUS that were identified as a result of this desktop review were used as the basis to compare potential WOUS impacts among alternatives. Mapping of the desktop inventory was provided for public and agency review prior to requesting Cooperating Agency concurrence on the alternatives retained for evaluation.

Following agency concurrence on the range of alternatives to be retained for evaluation, a formal field delineation of WOUS within the Alternative Inventory Corridors, was conducted between February and May of 2019 to provide a more refined estimate of potential WOUS impacts associated with each alternative. WOUS were field-delineated within the Alternative Inventory Corridors for each alternative, following the methods described in the 1987 USACE *Wetland Delineation Manual (1987 manual)* (USACE, 1987) and in the 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)* (USACE, 2012). During the development of the Final EIS, a preliminary Jurisdictional Determination will be obtained so that a Joint Permit Application can be prepared and submitted to VDEQ and USACE.

2.2.2.1 Wetland Functions and Values Determination

A qualitative assessment of wetland functions and values, consistent with the *Highway Methodology Workbook Supplement: Wetland Functions and Values – A Descriptive Approach*, referred to herein as the Highway Methodology, was prepared using desktop resources and information gathered in the field (USACE, 2015).

Wetland functions and values describe the services that a wetland performs that benefit the wetland, the watershed within which the wetland is located, and the surrounding ecosystem.

Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society and result from both living and non-living components of a specific wetland. These include all processes necessary for self-maintenance of the wetland ecosystem such as primary production and nutrient cycling. Values are the benefits that derive from either one or more function and the physical characteristics associated with a wetland (USACE, 1999).

The Highway Methodology was used to evaluate wetland functions and values within each Alternative Inventory Corridor. This methodology was concurred upon by the Cooperating Agencies early in the planning stages of the study. This descriptive approach uses qualitative characteristics to determine the functions and values of each wetland. A pre-established list of considerations or qualifying criteria based on those outlined in the Highway Methodology served as guidance in determining the suitability of each function and value. The functions and/or values evaluated include those that serve an important physical component of a wetland ecosystem and/or are considered of special value to society from a local, regional, and/or national perspective. Wetland functions and values within the study area were determined based on best professional judgement using existing literature and mapping including Federal Emergency Management Agency (FEMA) floodplain, NWI, NRCS soil surveys, and threatened and endangered species mapping, as well as field data collected during the wetland delineation.

This method evaluates 13 functions and values, including groundwater recharge/discharge, flood-flow alteration, fish and shellfish habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export (nutrient), sediment/shoreline stabilization, wildlife habitat, recreation (consumptive and non-consumptive), educational/scientific, uniqueness/heritage, visual quality/aesthetics, and threatened or endangered species habitat (USACE, 1999).

A description of the functions and values that have been considered is provided below:

- *Groundwater Recharge/Discharge:* This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. Recharge should relate to the potential for the wetland to contribute water to an aquifer. Discharge should relate to the potential for the wetland to serve as an area where groundwater can be discharged to the surface.
- *Flood-Flow Alteration:* This function considers the effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events.
- *Fish and Shellfish Habitat:* This function considers the effectiveness of seasonal or permanent waterbodies associated with the wetland in question for fish and shellfish habitat.
- *Sediment/Toxicant/Pathogen Retention:* This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens.
- *Nutrient Removal/Retention/Transformation:* This function relates to the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.
- *Production Export (Nutrient):* This function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms.

- *Sediment/Shoreline Stabilization*: This function relates to the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.
- *Wildlife Habitat*: This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered. Species lists of observed and potential animals should be included in the wetland assessment report.
- *Recreation (Consumptive and Non-consumptive)*: This value considers the effectiveness of the wetland and associated watercourses to provide recreational opportunities such as canoeing, boating, fishing, hunting, and other active or passive recreational activities. Consumptive activities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland, whereas non-consumptive activities do not.
- *Educational/Scientific Value*: This value considers the effectiveness of the wetland as a site for an outdoor classroom or as a location for scientific study or research.
- *Uniqueness/Heritage*: This value relates to the effectiveness of the wetland or its associated waterbodies to produce certain special values. Special values may include such things as archaeological sites, unusual aesthetic quality, historical events, or unique plants, animals, or geologic features.
- *Visual Quality/Aesthetics*: This value relates to the visual and aesthetic qualities of the wetland.
- *Threatened or Endangered Species Habitat*: This value relates to the effectiveness of the wetland or associated waterbodies to support threatened or endangered species.

2.2.2.2 Unified Stream Methodology

Streams were qualitatively assessed using the 2007 USM that was developed for use in Virginia by USACE and the VDEQ. The USM provides a rapid method to assess stream compensatory mitigation requirements for proposed projects seeking authorization to impact jurisdictional streams, as well as the number of credits generated by proposed mitigation projects. The first step in USM is to define the existing condition of the study stream by calculating a Reach Condition Index (RCI). The RCI is based on condition indices of four factors, each of which is scored according to categorical or ordinal descriptions provided: (1) Channel condition (based on channel evolutionary stage; morphological response following perturbation); (2) Riparian buffer (weighted average percent cover of various vegetative cover types within 100 feet of stream reach); (3) In-stream habitat (relative quantity and variety of natural physical structures in the stream that provide habitat for aquatic organisms); and (4) Channel alteration (direct impacts to the stream as a result of anthropogenic activities). Descriptions provided in the USM of each parameter and condition class thereof are augmented with color photographs representing each condition class. Scoring of the Channel condition factor of the RCI is weighted 2X any other single factor to reflect the importance of physical stability on overall channel condition. Scores for each of the above referenced four factors are summed and then divided by five (5) to obtain the RCI. The RCI is then multiplied by a categorical Impact Factor (IF) that increases with the perceived severity of stream impact type, and the linear length of stream impact in order to determine the compensation requirements necessary to offset proposed impacts.

2.2.3 Affected Environment

The delineated WOUS within the Alternative Inventory Corridors are comprised of streams and vegetated floodplain wetlands. Wetlands that are contiguous or adjacent to streams occur in areas of poor drainage and as seeps along the toe of steep slopes. Surface waters in the Alternative Inventory Corridors consist of Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, unnamed perennial, intermittent, and ephemeral streams, open waters, and wetlands. The wetland systems (which are predominantly forested and emergent systems) within the study area are located along stream channels. See **Figure 2-2 (Sheets 1-3)** for mapping of wetlands and waterways. The total linear feet (lf) of streams delineated within the Alternative Inventory Corridors is 146,603. The total acres of wetlands delineated within the Alternative Inventory Corridors is 33.8. More detailed WOUS mapping for the Preferred Alternative will be provided and a preliminary Jurisdictional Determination will be obtained during the permitting process in conjunction with the preparation of the Final EIS.

2.2.3.1 Wetlands

Wetlands were delineated within the Marrowbone Creek and Matrimony Creek watersheds. Wetlands were identified primarily within the active floodplains associated with Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, and Matrimony Creek and their tributaries with a relatively even distribution within these watersheds. The wetland delineation findings are included in **Appendices A and C** of this report. Wetland data provided include data forms and functional assessments.

The wetlands delineated within the Alternative Inventory Corridors can be further classified as palustrine emergent (PEM) wetlands, palustrine scrub shrub (PSS) wetlands, palustrine forested (PFO) wetlands, and palustrine open water (POW) wetlands.

2.2.3.2 Functions and Values of Delineated Wetlands

Functions and values of wetlands are influenced by many factors including, but not limited to, size and proximity of wetlands to ongoing development activity, geologic setting, soil characteristics, presence and duration of hydrology, landscape position, vegetation cover type, and dominant ecological community type. **Table 2-2** summarizes the most common functions for wetlands identified within the inventory corridors for the Build Alternatives carried forward and the subsequent subsections that follow discuss the functions and values of the wetlands delineated within the Alternative Inventory Corridors.

Table 2-2: Principal Functions and Values of Wetlands within Alternative Inventory Corridors

Principal Function/Value	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Groundwater Recharge/Discharge	✓	X	X	X	X
Floodflow Alteration	X	X	X	X	X
Fish and Shellfish Habitat	✓	✓			
Sediment/Toxicant Retention	✓	✓	✓	X	✓
Nutrient Removal	✓	✓	✓		✓
Production Export		✓			
Sediment/Shoreline Stabilization					✓
Wildlife Habitat	X	✓	✓	✓	✓

Principal Function/Value	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation					
Educational/Scientific Value		✓	✓		
Uniqueness/Heritage		✓			
Visual Quality/Aesthetics		✓			
Endangered Species Habitat					
Other					

Note: Bold X indicates the most common principal functions.

The principal wetland functions and values based on the “The Highway Methodology Workbook Supplement” within Alternatives A, B, C, D and E included Groundwater Recharge/Discharge, Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal, and Wildlife Habitat. Additional functions within Alternative A included Fish and Shellfish Habitat; Alternative B included Fish and Shellfish Habitat, Production Export, Educational/Scientific Value, Uniqueness/Heritage, and Visual Quality/Aesthetics; Alternative C included Educational/Scientific Value; and Alternative E included Sediment/Shoreline Stabilization.

The most common principal functions for wetlands within Alternative A were Floodflow Alteration and Wildlife Habitat; within Alternatives B, C and E were Groundwater Recharge/Discharge and Floodflow Alteration; and within Alternative D were Groundwater Recharge/Discharge, Floodflow Alteration, and Sediment/Toxicant Retention.

Groundwater Recharge/Discharge

Most wetlands serve a role in groundwater recharge/discharge due to the integral relationship between wetlands, aquifers, and water table fluctuations. Groundwater discharge within the Alternative Inventory Corridors may be found in muck, loam, and clay loam soils. Wetland and stream discharge typically occurs when the water table is high relative to the elevation of the waterbody. Groundwater recharge in the Alternative Inventory Corridors is driven by direct precipitation onto the land, seepage, and subsurface flow. Wetlands in the Alternative Inventory Corridors that contribute to groundwater discharge and recharge typically show signs of variable water table levels, including redoximorphic features in the soil, saturation, ponded water, and water stained leaves. Because most Alternative Inventory Corridor wetlands contain the features listed above, groundwater recharge/discharge is considered a principal function of Alternative Inventory Corridor wetlands. Examples of Groundwater Recharge/Discharge characteristics were exhibited in representative wetlands including W-T, W-83, and W-211. For more information see **Appendix C**.

Figure 2-2: Delineated Resource Map

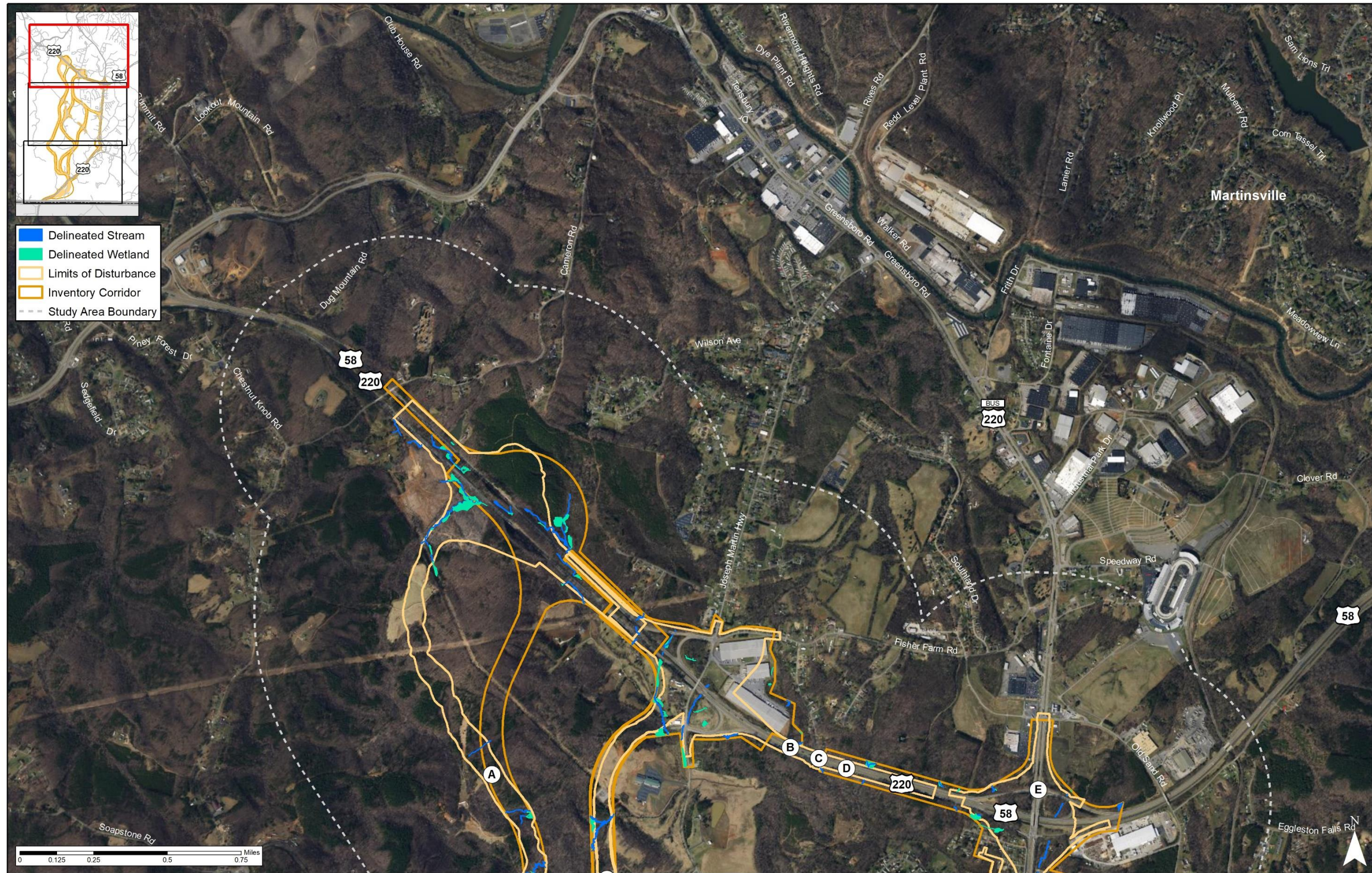


Figure 2-2: Delineated Resource Map (cont.)

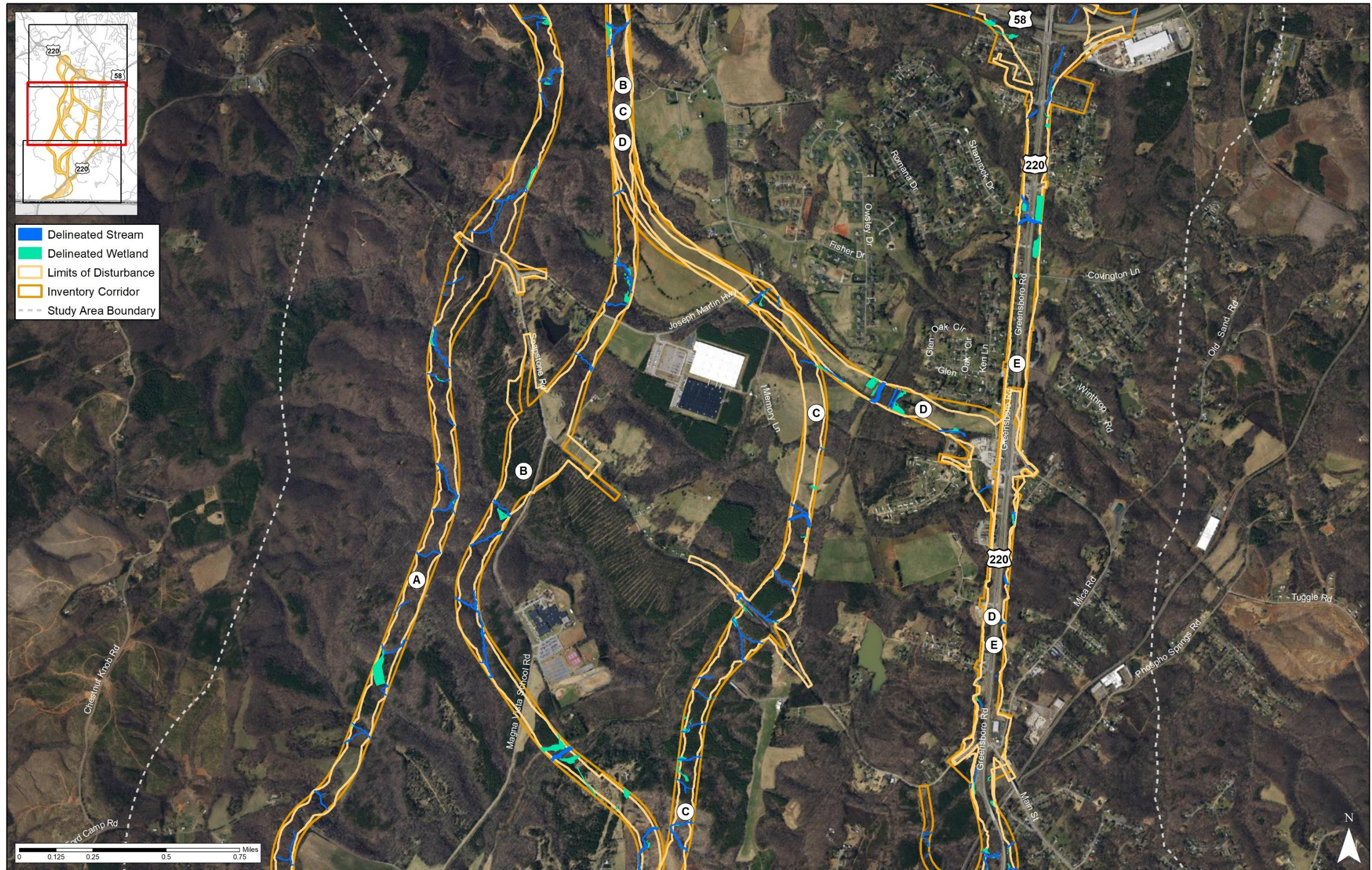
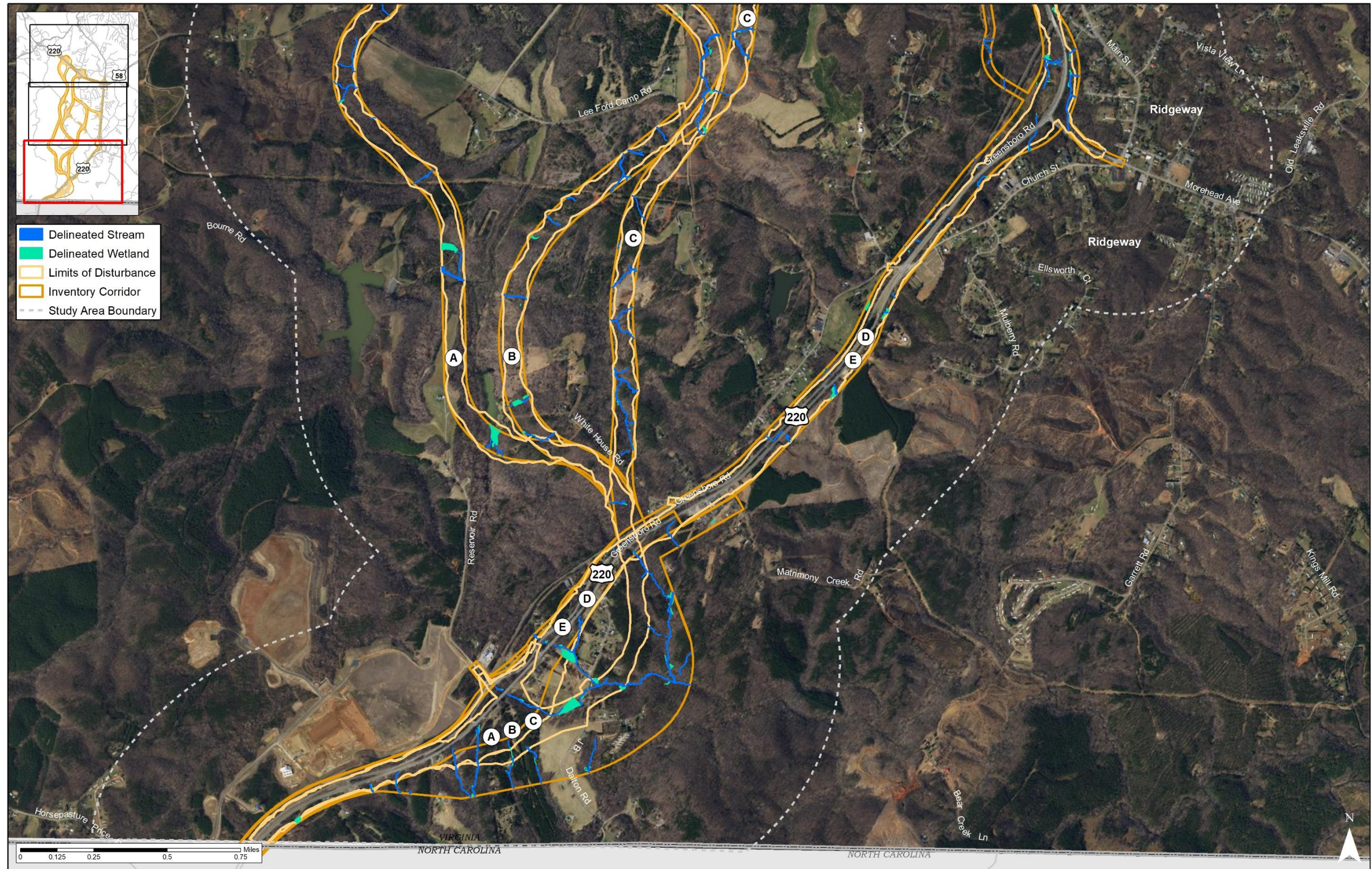


Figure 2-2: Delineated Resource Map (cont.)



Flood-flow Alteration

Wetlands connected to floodplains have the ability to affect downslope flood-flow through attenuation of stormwater flows. There are many wetlands adjacent to waterbodies within the Alternative Inventory Corridors. Flood-flow alteration is considered a principal function for wetlands in the Alternative Inventory Corridors and is one of the most recorded functions. Examples of Flood-flow Alteration were exhibited in representative wetlands including W-BQ, W-166, W-170, and W-241 associated with intermittent and perennial streams. For more information see **Appendix C**.

Sediment/Toxicant/Pathogen Retention

Wetlands within the Alternative Inventory Corridors retain excessive sediments, toxicants, and pathogens. Slowly-drained fine-grained soils hold pollutants. Dense vegetation commonly found in the PFO and PEM wetlands assists in trapping sediment. PUBs retain sediment, toxicants, and pathogens. These wetland features prevent sediment, toxicants, and pathogens from downstream transport, and thus should be considered a principal function. Examples of Sediment/Toxicant/Pathogen Retention were exhibited in representative wetlands including W-83, W-84, and W-255 associated with intermittent and perennial streams. For more information see **Appendix C**.

Nutrient Removal/Retention/Transformation

Wetlands within the Alternative Inventory Corridors are suitable for nutrient removal/ retention/ transformation. These wetlands share many characteristics that also assist in the function of sediment/toxicant/pathogen retention, including ponded water, slowly-drained fine-grained soils, and dense herbaceous vegetation. Vegetation allows for uptake, retention, and transformation of nutrients in wetland systems. Nutrient removal/retention/transformation is important in helping reduce the input of excess nutrients to downstream waterbodies. Consequently, nutrient removal/retention/transformation should be considered a principal function of the wetlands found in the Alternative Inventory Corridors. Examples of Nutrient Removal/Retention/Transformation were exhibited in representative wetlands including W-I, W-DC, and W-228. For more information see **Appendix C**.

Production Export

Wetlands typically have high productivity levels and are generally associated with providing food for wildlife and other living organisms. High trophic level wildlife consume and export vegetation, invertebrates, and/or other wildlife for use by lower trophic levels within the wetland. Wetlands within the Alternative Inventory Corridors are composed of relatively homogenous ecological systems. PFO wetlands generally contain green ash, American sycamore, red maple, pawpaw, and spicebush, which are food sources for wildlife. PEM wetlands may serve this function because of the use of flowering plants by nectar and pollen-gathering insects. The ponded and seasonally inundated wetlands within the Alternative Inventory Corridors may serve as breeding grounds for insects that are consumed by bats, birds, and other insects. Production export is considered a principal function of the wetlands found within the Inventory Corridor. Examples of Production Export were exhibited in representative wetlands including W-217, W-228, and W-113. For more information see **Appendix C**.

Sediment/Shoreline Stabilization

Most wetlands that border perennial/intermittent streams function in sediment/shoreline stabilization. Nearly all wetlands associated with Alternative Inventory Corridor streams have an unmaintained buffer comprised of woody vegetation that absorbs energy during flood events. The unmaintained buffer stabilizes stream banks from erosive forces. Although some of the stream banks are vertical and lack vegetation, the root systems of mature trees near the streams serve to keep banks stable. Sediment/shoreline stabilization is considered a principal function of the wetlands located adjacent to, or upstream of, the streams within the Alternative Inventory Corridors. Maintained wetlands or wetlands not adjacent to streams do not have sediment/shoreline stabilization as a principal function. Examples of Sediment/Shoreline Stabilization were exhibited in representative wetlands including W-T, W-W, and W-218/W-219. For more information see **Appendix C**.

Wildlife Habitat

Wetlands within the Alternative Inventory Corridors contain habitat for a variety of wildlife species. Wildlife habitat is considered a principal function of wetlands within the Inventory Corridor. For more information on wildlife habitat see **Section 5**. Examples of Wildlife Habitat were exhibited in representative wetlands including W-8, W-13, and W-60. For more information see **Appendix C**.

Recreation

Wetlands can provide opportunities for enjoyment to the community. The wetlands within the Alternative Inventory Corridors do not have public access or parking. Because of this, recreation is not considered a principal value for Alternative Inventory Corridor wetlands. Examples of Recreation were exhibited in representative wetlands including W-224, W-228, and W-79. For more information see **Appendix C**.

Educational/Scientific Value

The wetlands within the Alternative Inventory Corridors are located primarily on private property without public access or parking; however, there is a relatively large wetland within Alternative B that is near Magna Vista High School, easily accessible from Magna Vista Road and meets this functions and values criteria. Apart from this wetland near Magna Vista High School, wetlands within the Alternative Inventory Corridors have little educational/scientific value. Examples of Educational/Scientific Value were exhibited in representative wetlands including i.e., W-217, W-228, and W-BT. For more information see **Appendix C**.

Uniqueness/Heritage

As evidenced by the current field delineations, wetlands within the Alternative Inventory Corridors do not contain unique vegetation. There are no architecture or archaeological resources within Alternative Inventory Corridor wetlands. Therefore, uniqueness/heritage is not considered a principal value for the wetlands within the Inventory Corridor. Examples of Uniqueness/Heritage were exhibited in representative wetlands including W-217, W-141, and W-217. For more information see **Appendix C**.

Visual Quality/Aesthetics

The wetlands within the Alternative Inventory Corridors meet some of the criteria for visual quality/aesthetics, however, they lack publicly-accessible viewing locations and are not easily accessed. Therefore, visual/aesthetics is not considered a principal value for the wetlands within the Alternative Inventory Corridors. Examples of Visual Quality/Aesthetics were exhibited in representative wetlands including W-228, W-CO, and W-241. For more information see **Appendix C**.

Threatened or Endangered Species Habitat

In general, wetlands can provide habitat for numerous species, including state and Federal threatened or endangered species. Please see **Section 6** for information on threatened or endangered species. Examples of Threatened or Endangered Species Habitat were exhibited in representative wetlands including W-AO, W-237, and W-64. For more information see **Appendix C**.

2.2.3.3 Streams

Stream were delineated within the Marrowbone Creek and Matrimony Creek watersheds. Streams were primarily associated with Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, and Matrimony Creek. The stream delineation findings and USM forms are included in **Appendix A** and **Appendix B**, respectively. The delineated streams are also shown on **Figure 2-2**. The total lf of streams delineated within the Alternative Inventory Corridors is 146,603.

Stream reaches within the Alternative Inventory Corridors were assessed using the January 2007 USM for use in Virginia that was developed jointly by the USACE Norfolk District and VDEQ. Streams were assessed using Form 1 (perennial/and intermittent streams) and Form 1a (ephemeral streams) of the USACE/VDEQ USM to assign a RCI to each stream reach. Parameters used to determine RCI include channel condition, riparian buffers, instream habitat/available cover, and channel alteration.

The average scores for channel condition were in the marginal category. Riparian buffer scores are between suboptimal and optimal for the most western alternatives (A and B); however, average scores decrease the closer the alternative is to Route 220. Channel alteration scores are between minor to negligible. Optimal and suboptimal is the average overall RCI throughout all the alternatives, suggesting that the streams are in relatively good health. Qualitative habitat data was collected within Marrowbone Creek as part of the threatened and endangered habitat surveys (see **Section 6**). Observations of the domination of silt and sand provide further confirmation of channel degradation within the Alternative Inventory Corridors. For instream habitat, Alternative A had the highest average score and Alternative E had the lowest. Average instream habitat scores steadily decline the closer to Route 220. This suggests that, overall, the streams would generally be able to support aquatic organisms; however, there may be localized disrupting influences that are damaging habitat. Disrupting influences identified during field surveys include clear cut logging and agricultural fields that have no stream buffer present.

2.2.4 Environmental Consequences

2.2.4.1 No-Build Alternative

The No-Build Alternative conditions are consistent with the existing predevelopment conditions. Existing infrastructure has impacted WOUS (e.g. construction of roads, timber harvesting, surrounding development, etc.). The current impacts to WOUS would be anticipated to continue under the No-Build Alternative.

2.2.4.2 Alternative A

Construction of Alternative A would result in the loss of approximately 7.8 acres of wetlands and 28,998 lf of streams (impacts assume no bridging), (see **Table 2-3**). The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. Overall, the wetlands associated with Alternative A are primarily PFO wetlands 3.3 acres. The greatest impact to wetlands and streams would occur at the northern extent of the alternative (Route 58 interchange) and the areas south of Soapstone Road. Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of temporary construction and conversion impacts would be completed once more detailed phases of project development and construction methods are developed as required by the CWA permit process. The majority of wetlands along this alternative are providing a high degree of floodflow alteration, groundwater recharge/discharge, sediment retention, wildlife habitat, and nutrient removal. Alternative A would impact approximately 1.4 acres of POW. These systems typically provide high amounts of flood relief and nutrient/sediment storage. However, the full effect of this impact is not yet known.

Table 2-3: Estimated Impacts to Water Resources within the LOD

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Streams					
Length (lf)	28,998	20,548	21,882	8,017	7,934
Wetlands					
PEM (acres)	2.3	1.3	1.0	0.9	0.8
PSS (acres)	0.8	0.7	0.2	0.2	0.2
PFO (acres)	3.3	2.7	1.6	1.6	0.0
POW (acres)	1.4	1.2	0.9	0.0	0.0
Total acres	7.8	5.9	3.7	2.7	1.0

Sources: NWI, NHD, and field reconnaissance, 2019.

2.2.4.3 Alternative B

Construction of Alternative B would result in the loss of approximately 5.9 acres of wetlands and 20,548 lf of streams (impacts assume no bridging), respectively (see **Table 2-3**). The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. Overall, most of the impacts associated with Alternative B would occur south of Soapstone Road. However, the evaluated Route 58 and Route 220 interchanges would contribute to a number of localized impacts to both streams and wetlands. Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of temporary construction and conversion impacts would be completed more detailed phases of

project development and construction methods are developed as required by the CWA permit process. Most of the wetlands are providing a high degree of floodflow alteration, groundwater recharge/discharge, and wildlife habitat. There is one wetland within Alternative B that can provide educational or scientific value. This wetland is located within 200 feet of Magna Vista Road, has both PFO and PEM wetland classifications, is easily visible from primary viewing locations, and is approximately 1,800 feet away from Magna Vista High School. Alternative B would impact approximately 1.2 acres of POW. These systems typically provide high amounts of flood relief and nutrient/sediment storage. However, the full effect of this impact is not yet known.

2.2.4.4 Alternative C

Construction of Alternative C would result in the loss of approximately 3.7 acres of wetlands and 21,882 lf of streams (impacts assume no bridging), respectively (see **Table 2-3**). The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. Overall, most of the impacts associated with Alternative C would occur south of Soapstone Road. Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of temporary construction and conversion impacts would be completed more detailed phases of project development and construction methods are developed as required by the CWA permit process. The primary wetland functions and values of the wetlands that would be affected within this alternative include groundwater recharge/discharge and floodflow alteration. Most wetlands within Alternative C are relatively small and receive surface water input from periodic flooding of Marrowbone Creek and its tributaries. Alternative C would impact approximately 0.9 acre of POW. These systems typically provide high amounts of flood relief and nutrient/sediment storage. However, the full effect of this impact is not yet known.

2.2.4.5 Alternative D

Construction of Alternative D would result in the loss of approximately 2.7 acres of wetlands and 8,017 lf of streams (impacts assume no bridging), respectively (see **Table 2-3**). Overall, most impacts associated with Alternative D would occur from widening and various existing roadway improvements. The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of temporary construction and conversion impacts would be completed more detailed phases of project development and construction methods are developed as required by the CWA permit process. Approximately 75 percent of the alternative consists of the existing Route 220 roadway corridor. A substantial amount of impacts to streams and wetlands occur along Marrowbone Creek as Alternative D veers west of Route 220. The primary wetland functions within Alternative D is floodflow alteration and sediment/toxicant retention. Alternative D would not impact any POW.

2.2.4.6 Alternative E

Construction of Alternative E would result in the loss of approximately 1.0 acre of wetlands and 7,934 lf of streams, respectively (see **Table 2-3**). The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. All impacts associated with Alternative E would be from the reconstruction and interchange improvements to Route 220. In general, impacts associated with this alternative would be to wetlands and streams previously impacted due to the construction and maintenance of Route 220. Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of

temporary construction and conversion impacts would be completed more detailed phases of project development and construction methods are developed as required by the CWA permit process. The wetlands adjacent to the existing Route 220 bridge over Marrowbone Creek are of higher quality than others within this alternative and provide more water quality benefits due to their size and location in the watershed. These larger vegetated wetland systems provide a variety of wetland functions and values such as floodflow alteration, sediment/ toxicant retention, nutrient removal, and wildlife habitat. Alternative E would not impact any POW.

2.2.5 Mitigation

As the design and engineering of the Preferred Alternative, advances, minor alignment shifts and consideration of bridges could be evaluated to avoid and minimize impacts to wetlands and streams. These considerations could be undertaken during development of the Final EIS and associated permit application or during more detailed phases of project development. **Table 2-3** shows the estimated stream impacts for each of the Build Alternatives. During the permitting process, stream compensation credits would be calculated using the USM. Estimated wetland mitigation credits are provided in **Table 2-4**. At this time, it is estimated that Alternative A would require the most credits and Alternative E would require the least.

Table 2-4: Estimated Wetland Mitigation Credits Needed

Sub-basin (HUC 8)	Wetland Type (Compensation Ratio)	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E	
		Ac.	Credits	Ac.	Credits	Ac.	Credits	Ac.	Credits	Ac.	Credits
Upper Dan River	PEM (1:1)	2.3	2.3	1.3	1.3	1	1	2.1	2.1	1.5	1.5
	PSS (1.5:1)	0.8	1.2	0.7	1.1	0.2	0.3	0.2	0.3	0.2	0.3
	PFO (2:1)	3.3	6.6	2.7	5.4	1.6	3.2	2.4	4.8	2.8	5.6
	POW (0.5:1)	1.4	0.7	1.2	0.6	0.9	0.5	0	0	0	0
Total		7.8	10.8	5.9	8.4	3.7	5	4.7	7.2	4.5	7.4

Unavoidable impacts to wetlands and streams would be mitigated in accordance with the 2008 final Federal regulations entitled *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (33 CFR §325 and 332; 40 CFR §230). This Final Rule, which has been adopted by both the USACE Norfolk District and the VDEQ, emphasizes a watershed approach to compensatory mitigation and presents the following preference hierarchy for compensatory mitigation (in order of preference):

1. Purchase of compensatory mitigation bank credits (mitigation banking);
2. Purchase of an approved in-lieu fee fund credits through Virginia Aquatic Resources Trust Fund (VARTF); or
3. On- or off-site mitigation by the permittee (permittee-responsible mitigation).

Within the primary service area of the study, there are three mitigation banks that have credits available for purchasing:

- Banister Bend: approximately 2,400 stream credits; 33 wetland credits
- Graham and David: approximately 25,000 stream credits
- Roanoke River: approximately 11,000 stream credits

On September 4, 2019, USACE and EPA provided their concurrence with FHWA and VDOT that credit purchase would be the preferred method of mitigation, contingent upon the number of credits available and standard mitigation ratios at the time of construction for any improvements that advance from the Martinsville Southern Connector Study. Whether mitigation is accomplished through mitigation banks, in-lieu fee, and/or permittee-responsible mitigation, VDOT and FHWA would develop a conceptual mitigation plan for the Preferred Alternative that would be documented in the Final EIS and permit application and refined as necessary as the design and engineering of improvements from the study advance towards construction.

3 FLOODPLAINS

3.1 REGULATORY CONTEXT

Several Federal directives regulate construction in floodplains to ensure that consideration is given to avoidance and mitigation of adverse effects to floodplains. These Federal directives include the National Flood Insurance Act of 1968, EO 11988 (May 24, 1977), EO 13690 (January 30, 2015), and U.S. Department of Transportation (USDOT) Order 5650.2, entitled *Floodplain Management and Protection*. The National Flood Insurance Act of 1968 established the National Flood Insurance Program (NFIP), which is administered by FEMA. In Virginia, the Virginia Department of Conservation and Recreation (VDCR) is responsible for coordination of all state floodplain programs. Local flood insurance programs administered by localities under the NFIP also regulate development within floodplains.

The 100-year flood, or base flood, is the area covered by a flood that has a one percent chance of occurring in any given year; this is commonly referred to as the 100-year floodplain. The 100-year floodplain includes the floodway, which is the area that encounters the deepest water and the highest velocities. The floodplain also includes the flood fringe, which is located just outside the floodway. The 500-year floodplain is the area covered by a flood that has a 0.2 percent chance of occurring in any given year.

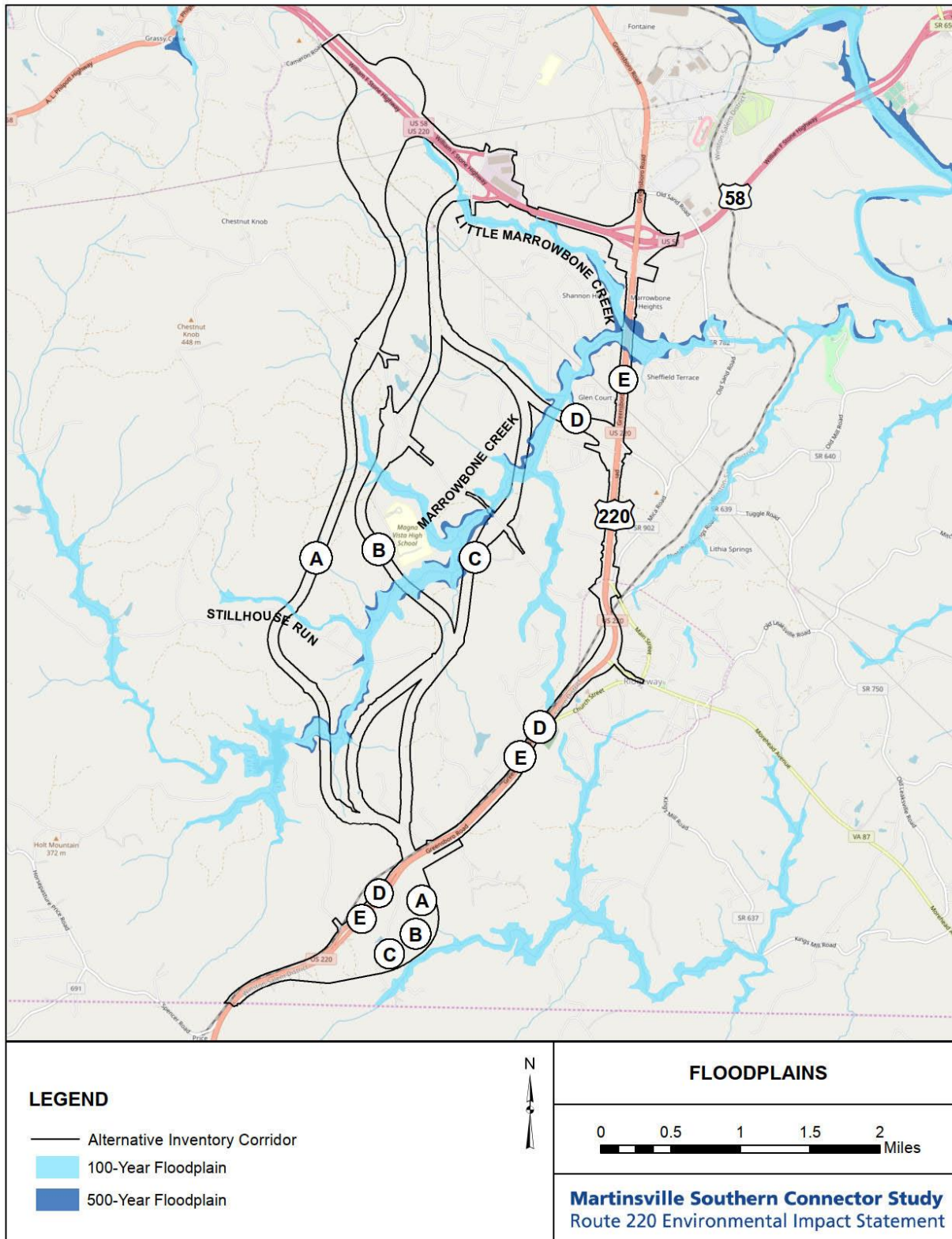
3.2 METHODOLOGY

Digital floodplain data were obtained from FEMA and overlaid in Geographic Information System (GIS) to determine the acreage of 100-year and 500-year floodplains in the study area. The floodplain areas identified are land areas susceptible to being inundated by floodwaters from any source.

3.3 AFFECTED ENVIRONMENT

Floodplains identified within the study area are shown in **Figure 3-1**. Within the study area, FEMA-designated 100-year floodplains occur along Little Marrowbone Creek, Marrowbone Creek, and Stillhouse Run. Five 100-year floodplains occur along Little Marrowbone Creek and Marrowbone Creek. There are several locations in the study area where 100-year floodplains are currently impacted by existing roads (see **Figure 3-1**). The roads that intersect floodplains include Lee Ford Camp Road, Magna Vista School Road (three crossings), and Soapstone Road (two crossings).

Figure 3-1: Floodplains



3.4 ENVIRONMENTAL CONSEQUENCES

3.4.1 No-Build Alternative

The No-Build Alternative conditions are consistent with the existing predevelopment conditions. Existing infrastructure has impacted floodplains (e.g. construction of roads, timber harvesting, surrounding development, etc.). The current level of impacts to floodplains would be anticipated to continue under the No-Build Alternative.

3.4.2 Alternative A

Alternative A would cross two 100-year floodplains associated with Marrowbone Creek and Stillhouse Run. From south to north, Alternative A crosses the 100-year floodplain of Marrowbone Creek and then the 100-year floodplain of Stillhouse Run, resulting in approximately 7.0 acres of 100-year floodplain impact (**Table 3-1**). Additionally, approximately 8.7 acres of 500-year floodplain could be impacted. The majority of floodplain impact from Alternative A would be from crossings of the floodplains, not from longitudinal encroachments. Crossings would result in less floodplain fill, maximizing floodwater conveyance and storage compared to longitudinal encroachments.

Table 3-1: Summary of Direct Floodplain Impacts

Alternative	Total 100-year Floodplain Impact (acres)	Total 500-year Floodplain Impact (acres)
No-Build Alternative	0	0
Alternative A	7.0	8.7
Alternative B	13.7	14.4
Alternative C	7.5	10.8
Alternative D	6.8	7.8
Alternative E	7.5	11.7

3.4.3 Alternative B

Alternative B would cross three 100-year floodplains associated with Little Marrowbone Creek and Marrowbone Creek. From south to north, Alternative B would cross three 100-year floodplains associated with Little Marrowbone Creek and Marrowbone Creek, resulting in approximately 13.7 acres of 100-year floodplain impact (see **Table 3-1**). Additionally, approximately 14.4 acres of 500-year floodplain could be impacted. The majority of floodplain impact from Alternative B would be from crossings of the floodplains, not from longitudinal encroachments. Crossings would result in less floodplain fill, maximizing floodwater conveyance and storage compared to longitudinal encroachments.

3.4.4 Alternative C

Alternative C would cross two 100-year floodplains associated with Little Marrowbone Creek and Marrowbone Creek. From south to north, Alternative C crosses the 100-year floodplain of Marrowbone Creek and Little Marrowbone Creek, resulting in approximately 7.5 acres of disturbance in the 100-year floodplain (see **Table 3-1**). Additionally, approximately 10.8 acres of 500-year floodplain could be impacted. The majority of floodplain impact from Alternative C would be from crossings of the floodplains, not from longitudinal encroachments. Crossings would result

in less floodplain fill, maximizing floodwater conveyance and storage compared to longitudinal encroachments.

3.4.5 Alternative D

Alternative D would cross two 100-year floodplains associated with Little Marrowbone Creek and Marrowbone Creek. From south to north, Alternative D crosses the 100-year floodplain of Marrowbone Creek and then the 100-year floodplain of Little Marrowbone Creek, resulting in approximately 6.8 acres of 100-year floodplain impact (see **Table 3-1**). Additionally, approximately 7.8 acres of 500-year floodplain could be impacted. The majority of floodplain impact from Alternative D would be from crossings of the floodplains, not from longitudinal encroachments. Crossings would result in less floodplain fill, maximizing floodwater conveyance and storage compared to longitudinal encroachments.

3.4.6 Alternative E

Alternative E crosses one floodplain associated with Marrowbone Creek. Because Alternative E is on existing alignment, the floodplain is already impacted by the existing 220 bridge over Marrowbone Creek. Alternative E would reconstruct the existing 220 bridge at Marrowbone Creek, resulting in approximately 7.5 acres of 100-year floodplain impact (see **Table 3-1**). Additionally, approximately 11.8 acres of 500-year floodplain could be impacted. The majority of floodplain impact from Alternative E would be from crossings of the floodplains, not from longitudinal encroachments. Crossings would result in less floodplain fill, maximizing floodwater conveyance and storage compared to longitudinal encroachments.

3.5 MITIGATION

Regardless of the Build Alternative selected, the design for any improvements that advance from the Martinsville Southern Connector Study will be consistent with Federal policies and procedures for the location and hydraulic design of highway encroachments on floodplains contained in 23 CFR §650 Subpart A. The Build Alternatives would not, therefore, increase flood levels and would not increase the probability of flooding or the potential for property loss and hazard to life. Further, these alternatives would not be expected to have substantial effects on natural and beneficial floodplain values. Any improvements would be designed so as not to encourage, induce, allow, serve, support, or otherwise facilitate incompatible base floodplain development.

It is anticipated that the potential floodplain encroachments would not be a significant encroachment [as defined in 23 CFR §650.105(q)] because:

- It would pose no significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or that provides a community's only evacuation route;
- It would not pose significant flooding risks; and
- It would not have significant adverse impacts on natural and beneficial floodplain values.

During more detailed design, a hydrologic and hydraulic analysis would be conducted to ensure adequate design of the hydraulic openings of culverts and bridges. This would ensure proper conveyance of floodwaters and minimize potential impacts to the floodplain and floodplain hazards. The design would ensure that no substantial increase in downstream flooding would occur and/or would document the need for any Letters of Map Revision (LOMR) or Conditional Letters of Map Revision (CLOMR) and that all encroachments would conform with all applicable state and local floodplain protection standards.

4 GROUNDWATER RESOURCES

4.1 REGULATORY CONTEXT

The VDEQ, under the Ground Water Management Act of 1992, manages groundwater withdrawals in certain areas called Groundwater Management Areas (GWMA). As defined in 9 VAC 25-600-10, a GWMA is a geographically defined groundwater area in which the State Water Control Board has deemed the levels, supply, or quality of groundwater to be adverse to public welfare, health, and safety.

Public drinking water systems are protected by the Safe Drinking Water Act (SDWA) of 1974, as amended and reauthorized in 1986 and 1996, respectively. The SDWA also authorizes the EPA to designate sole source aquifers (SSA) and establish a review area. EPA defines an SSA as one where 1) the aquifer supplies at least 50 percent of the drinking water for its service area; and 2) there are no reasonably available alternative drinking water sources should the aquifer become contaminated. EPA has the authority to review projects that both receive Federal funding and are located within the review area.

Groundwater wells are protected under EPA's Wellhead Protection Program (WPP), a community-based approach for the protection of groundwater that supplies drinking water to public water wells and wellfields. Public drinking water systems, as defined by EPA, may be publicly or privately owned and serve at least 25 people or 15 service connections for at least 60 days per year. Wellhead protection areas are defined as the surface and subsurface areas surrounding a water well or wellfield supplying a public water system through which contaminants are reasonably likely to move toward and reach such water well or wellfield. The Virginia Wellhead Protection Plan (VDEQ, 2005) specifies a 1,000-foot wellhead protection radius and the Virginia Waterworks Regulations (VR 355-18-000) specifies a 100-foot wellhead setback zone for public groundwater supply wells.

4.2 METHODOLOGY

The VDH reviews projects for their proximity to public drinking water sources and provided input for the study as part of the scoping request. The EPA's National SSA GIS layer was used to determine the boundaries of SSAs. Nearby reservoirs were identified using VDEQ's *What's in my Backyard Online Mapper* (VDEQ, 2019c). The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** in the **Draft EIS** for additional information).

4.3 AFFECTED ENVIRONMENT

The study area is located in the southern Piedmont physiographic province. Groundwater in the southern Piedmont province and study area occurs under water table conditions in secondary fractures of igneous and metamorphic rocks, overlying saprolite and residuum, and in alluvial deposits along the major surface water drainages. Groundwater is generally available in moderate quantities from shallow and deep wells but can vary greatly across the province.

Based on EPA's SSA GIS layer there are no SSAs in Henry County. Based on VDH's review for public groundwater wells, there are no public groundwater wells within the Alternative Inventory Corridors. There are four public groundwater wells located near the Alternative Inventory

Corridors; two of these public groundwater wells are located within 1,000 feet of Alternative D and three of these public groundwater wells are located within 1,000 feet of Alternative E (see **Figure 4-1**). There is a reservoir, Marrowbone Reservoir, located immediately west of Alternative A; however, it is not a drinking water supply. The reservoir was created for flood control and is privately owned (USDA, 2003).

Outside of the service areas for publicly and privately-owned licensed waterworks, residential and agricultural properties, and some public, commercial/retail, and industrial facilities rely on private wells for potable and non-potable water use. The type and construction of private wells vary depending on water demand and the site specific hydrogeologic conditions.

4.4 ENVIRONMENTAL CONSEQUENCES

4.4.1 No-Build Alternative

The No-Build Alternative conditions are consistent with the existing predevelopment conditions. No changes to groundwater resources are anticipated to occur.

4.4.2 Alternative A

Alternative A does not contain and is not within 1,000 feet of SSAs or public groundwater wells. No impacts to public groundwater supply are anticipated.

4.4.3 Alternative B

Alternative B does not contain and is not within 1,000 feet of SSAs or public groundwater wells. No impacts to public groundwater supply are anticipated.

4.4.4 Alternative C

Alternative C does not contain and is not within 1,000 feet of SSAs or public groundwater wells. No impacts to public groundwater supply are anticipated.

4.4.5 Alternative D

Alternative D does not contain a SSA, but is within 1,000 feet of two public groundwater wells: Ridgeway Trailer Park Wells No. 1 and 2. These wells are in close proximity to the existing 220, and therefore, are already exposed to transportation-related contaminants. The primary potential groundwater impact that could be anticipated from the implementation of Alternative D is an increase in hydrocarbon contamination of wells in shallow and deep aquifers from an increase automobile exhaust and asphalt surfaces. Other impacts could include potentially measurable increases in dissolved metals and chloride, increased risks of spills during construction, and contamination should pollutants be suddenly released as a result of a traffic accident. Aquifers are susceptible to contamination depending on drainage patterns, depth, and distance from the alignment.

However, VDEQ considers roadways a low risk to groundwater, according to Appendix F of the 2005 VDEQ WPP (VDEQ, 2005). It is likely that Alternative D would result in minimal adverse impacts to groundwater, due to the topography of the land surface. Additionally, most potable and non-potable water supply is obtained from wells between 50-150 feet deep. The depth of the wells and the aquifers would insulate them from any hydrologic or water quality changes that may occur as a result of roadway construction, normal operation, and maintenance of the road.

4.4.6 Alternative E

Alternative E does not contain a SSA, but is within 1,000 feet of three public groundwater wells: Virginia Glass Products Corp Well No. 2 and Ridgeway Trailer Park Wells No. 1 and 2. These

wells are in close proximity to the existing 220, and therefore, are already exposed to transportation-related contaminants. The primary potential groundwater impact that could be anticipated from the implementation of Alternative E is an increase in hydrocarbon contamination of wells in shallow and deep aquifers from an increase in automobile exhaust and asphalt surfaces. Other impacts could include potentially measurable increases in dissolved metals and chloride, increased risks of spills during construction, and contamination should pollutants be suddenly released as a result of a traffic accident. Aquifers are susceptible to contamination depending on drainage patterns, depth, and distance from the alignment.

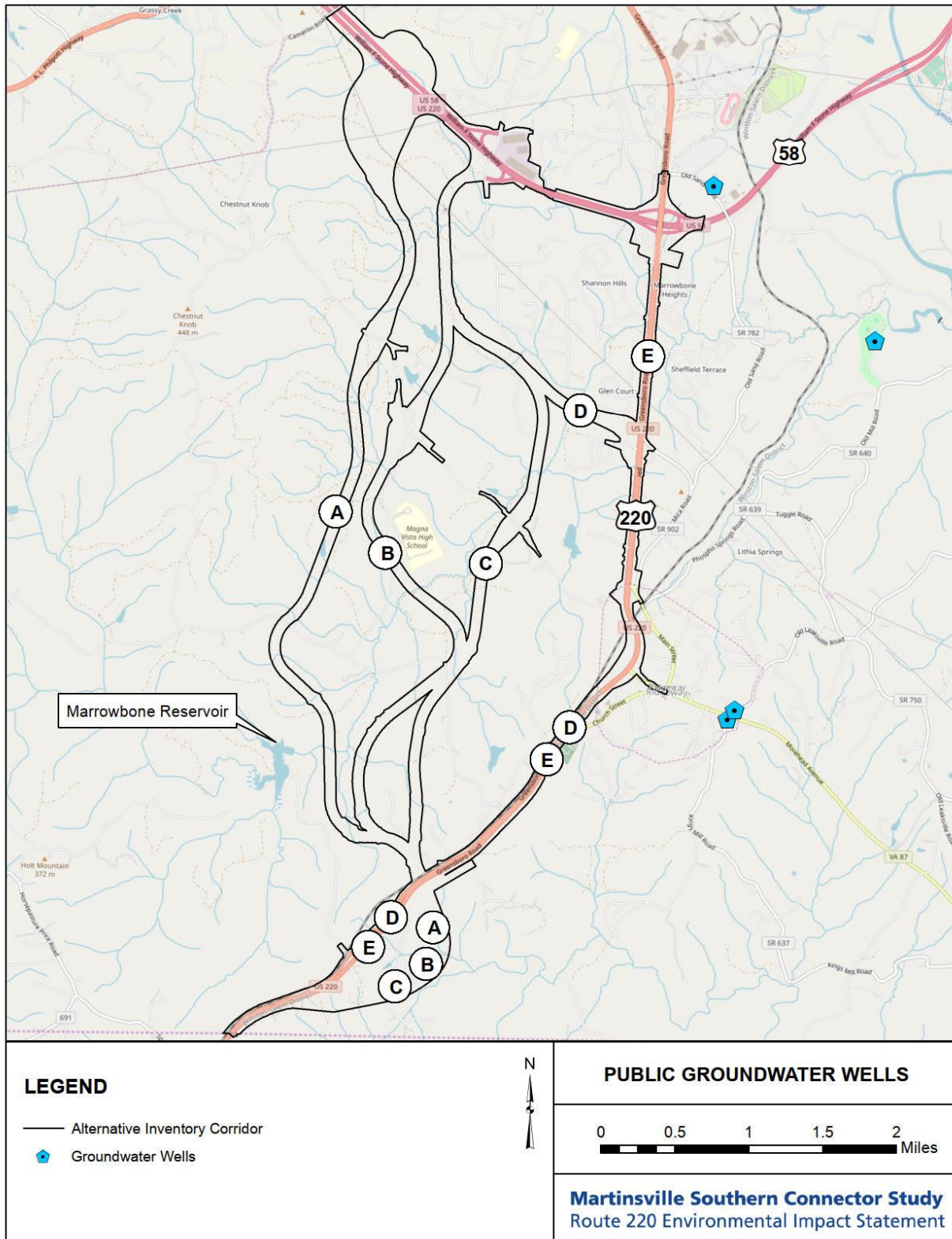
However, VDEQ considers roadways a low risk to groundwater, according to Appendix F of the 2005 VDEQ WPP (VDEQ, 2005). It is likely that Alternative E would result in minimal adverse impacts to groundwater, due to the topography of the land surface. Additionally, most potable and non-potable water supply is obtained from wells between 50-150 feet deep. The depth of the wells and the aquifers would insulate them from any hydrologic or water quality changes that may occur as a result of roadway construction, normal operation, and maintenance of the road.

4.5 MITIGATION

During more detailed phases of project development, all private wells located in the right of way would be identified, and measures for their protection from contamination would be implemented in accordance with VDOT's Road and Bridge Specifications (VDOT, 2018).

Measures to be evaluated by VDOT during later design phases to avoid or minimize effects to groundwater supplies include (1) pollution prevention plans implemented during critical phases of construction, and (2) design of stormwater drainage systems to prevent the infiltration of liquid contaminants or contaminated runoff. Measures that VDOT would consider to protect nearby groundwater supply wells include (1) routing runoff laden with deicing agents away from well recharge zones, (2) stormwater management facilities developed during later design phases to optimize free ion retention through use of organic soil linings or other measures, and (3) development of Spill Prevention Control and Countermeasure plans. Plans would be developed in accordance with Virginia Waterworks Regulations and any wellhead protection ordinances developed by local governments and service authorities. To mitigate temporary construction impacts, an erosion and sediment control plan developed in accordance with the *Virginia Sediment and Erosion Handbook* and VDOT's *Annual Erosion and Sediment Control and Stormwater Management Standards and Specifications* (as approved by VDCR) would be implemented.

Figure 4-1: Public Groundwater Wells



5 WILDLIFE HABITAT

5.1 REGULATORY CONTEXT

5.1.1 Anadromous Fish Use

Under the Fish & Wildlife Coordination Act (16 U.S.C. 661-667e), the VDGIF and VMRC, in combination with National Oceanic and Atmospheric Administration (NOAA) Fisheries, oversee anadromous fish in Virginia. NOAA Fisheries has jurisdiction over anadromous fish listed under the Endangered Species Act through their Office of Protected Resources. The VDGIF restricts instream work in designated anadromous fish use areas during certain times of the year. VMRC – Fisheries Management is charged with regulation of fisheries resources in tidal and marine environments.

5.1.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (as amended by the Sustainable Fisheries Act of 1996) requires all federal agencies to consult with the National Marine Fisheries Service (NMFS), NOAA division, on all actions or proposed actions that are permitted, funded, or undertaken by the federal agency which may adversely affect essential fish habitat (EFH). Any Federal agency that takes an action that could adversely affect EFH by reducing the quantity or quality of habitat must work with NMFS to identify impacts and steps for conserving the habitat and reducing the impact of that action. As defined by NOAA, EFH includes all types of aquatic habitat – wetlands, coral reefs, seagrasses, rivers – where fish spawn, breed, feed, or grow to maturity. The review for EFH considers all lifecycle stages including adults, juvenile, larvae, and eggs.

5.1.3 Invasive Species

The VDCR's Department of Natural Heritage (DNH) defines invasive species as a non-native (alien, exotic, or non-indigenous) plant, animal, or disease that causes or is likely to cause ecological and/or economic harm to the natural system (VDCR, 2019b). In accordance with EO 13112, Invasive Species, as amended, no Federal agency can authorize, fund, or carry out any action that it believes is likely to cause or promote the introduction or spread of invasive species. Other regulations in governing invasive species include the Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990 (as amended), Lacey Act of 1900 (as amended), Plant Protection Act of 2000, Federal Noxious Weed Act of 1974 (as amended), and the Endangered Species Act of 1973 (as amended). Likewise, Virginia acted in 2003 to amend the Code of Virginia by adding the Nonindigenous Aquatic Nuisance Species Act, which, among other things, addresses the development of strategies to prevent the introduction of, to control, and to eradicate invasive species.

5.1.4 Trout Streams

Trout streams are managed through land conservation initiatives as well as fishing laws. Additionally, based on the review of the VDGIF's cold water stream GIS data, there are no natural or stocked trout streams within the study area.

5.1.5 Terrestrial and Aquatic Habitat/Wildlife

Terrestrial habitat and wildlife are managed through The United States Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. §661 et seq), the Migratory Bird Treaty Act (16 U.S.C. §703-711), conservation initiatives, and hunting laws.

The USFWS and VDGIF act as consulting agencies under the United States Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and provide environmental

analysis of projects or permit applications coordinated through the Federal Energy Regulatory Commission, the USACE, and other state or Federal agencies.

The Migratory Bird Treaty Act (16 U.S.C. 703-711) makes it unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, or kill migratory birds. The law applies to the removal of nests (such as swallow nests on bridges) occupied by migratory birds.

The Fish and Wildlife Coordination Act (16 U.S.C. 661-666) applies to any federal project where the waters of any stream or other body of water are impounded, diverted, deepened, or otherwise modified. The Act requires that a project proponent, such as VDOT, consult with the USFWS, VDGIF, and VDCR.

5.2 METHODOLOGY

5.2.1 Anadromous Fish Use

The VDGIF maintains a GIS database that identifies reaches that are confirmed or potential migration pathways, spawning grounds, or nursery areas for anadromous fish. The species included in this database are alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), American shad (*A. sapidissima*), hickory shad (*A. mediocris*), striped bass (*Morone americana*), and some populations of yellow perch (*Perca flavescens*). Upstream boundaries were established at impediments or where habitat becomes unsuitable. The VDGIF GIS database was used to determine if anadromous fish utilize streams within the Alternative Inventory Corridors to complete their life stages.

5.2.2 Essential Fish Habitat

NOAA Fisheries maintains an online interactive mapping application (NOAA EFH Mapper) (NOAA, 2019). This application provides the public and other resource managers with an interactive platform for viewing a spatial representation of EFH or those habitats that NMFS and the regional fishery management councils have identified and described as necessary to fish for spawning, breeding, feeding, or growth to maturity. This application was used to determine the presence or absence of EFH within the Alternative Inventory Corridors.

5.2.3 Invasive Species

The VDCR-DNH, in association with the Virginia Native Plant Society, has identified and listed invasive plant species that are known to currently threaten Virginia's natural populations. To date, they have listed approximately 90 invasive plant species on the Virginia Invasive Plant Species List. The list is divided into three regions: Coastal Plain, Piedmont, and Mountains. This list also classifies each species by level of invasiveness, including High, Medium, and Occasional. Highly invasive species generally disrupt ecosystem processes and cause major alterations in plant community and overall structure. They can easily establish themselves in undisturbed habitats and colonize disturbed areas rapidly under the appropriate conditions. While plants with medium and low invasiveness can become management problems, they tend to have less adverse effects on natural systems and are more easily managed.

In addition to the VDCR-DNH list, the presence of invasive species was documented during the field inventory efforts within the Alternative Inventory Corridors. This data was used to provide a general discussion of how the proposed actions might influence the spread of invasive species throughout the Alternative Inventory Corridors.

5.2.4 Trout Streams

Digital cold water stream data was obtained from VDGIF and overlaid in GIS to identify mapped wild (Class I-IV) or stockable (Class V and VI) trout streams in the Alternative Inventory Corridors.

5.2.5 Terrestrial and Aquatic Habitat/Wildlife

Native wildlife, including migratory birds, wildlife refuges, and management areas in the study area were evaluated using data obtained from state (VDGIF, VDCR) and Federal (USFWS, NMFS) wildlife agencies concerning the location, preferred habitat type, and time-of-year during which terrestrial species might typically be found within the study area. Additionally, the potential for terrestrial wildlife habitat within the study area was assessed using available resources such as literature review of the EPA's Ecoregions and the most recent version of the Land Cover Database from Virginia Geographic Information Network (VGIN). The VGIN land cover data was modified based on field observations and recent (2019) aerial imagery. The VDCR-DNH Biotics 5 Data System was searched for occurrences of natural heritage resources, including Conservation Sites, located within the vicinity of the study area. All research was supplemented by field observations in the Alternative Inventory Corridors. Land cover types are shown in **Figure 5-1**.

5.3 AFFECTED ENVIRONMENT

5.3.1 Anadromous Fish Use

The VDGIF anadromous fish GIS database indicates that the Alternative Inventory Corridors are not used by anadromous fish. As there is no use by anadromous fish in the study area, this resource is not further addressed in this analysis or in the Draft EIS.

5.3.2 Essential Fish Habitat

According to NOAA's EFH Mapper, no EFH is located within the Alternative Inventory Corridors. As there is no EFH in the study area, this resource is not further addressed in this analysis or in the Draft EIS.

5.3.3 Invasive Species

The study area is located within the Piedmont region. Some of the highly invasive plant species listed for this region likely to occur include tree-of-heaven (*Ailanthus altissima*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), mile-a-minute (*Persicaria perfoliata*), garlic mustard (*Alliaria petiolata*), Chinese Lespedeza (*Lespedeza cuneata*), Chinese Privet (*Ligustrum sinense*), kudzu (*Pueraria montana var. lobata.*), Japanese stiltgrass (*Microstegium vimineum*), amur honeysuckle (*Lonicera maackii*), and autumn olive (*Elaeagnus umbellata*).

Observations made in the field identified areas where recent (within the last 20 years) timber harvests have occurred. It was determined Alternative Inventory Corridors A, B and C each have tracts of land that had been logged for timber. The locations of recent timber harvesting are shown in **Figure 5-2**. Past logging activities have caused disturbance to the surrounding landscape through forest operations such as timber harvests, road and skid trail construction, landing construction, skidding of logs, and movement of machinery in and out of different operating sites which created conditions and opportunities for invasive plants to invade or spread within a site or from site to site. These forest operations have caused soil disturbance where mineral soil is exposed, which created conditions favorable for invasive plant species. These invasive species have spread due to moving equipment from one logging site to another or moving equipment that has operated in areas that have invasive plants established providing a vehicle where seeds or other plant parts can be transported into areas without invasive species.

Figure 5-1: Land Cover

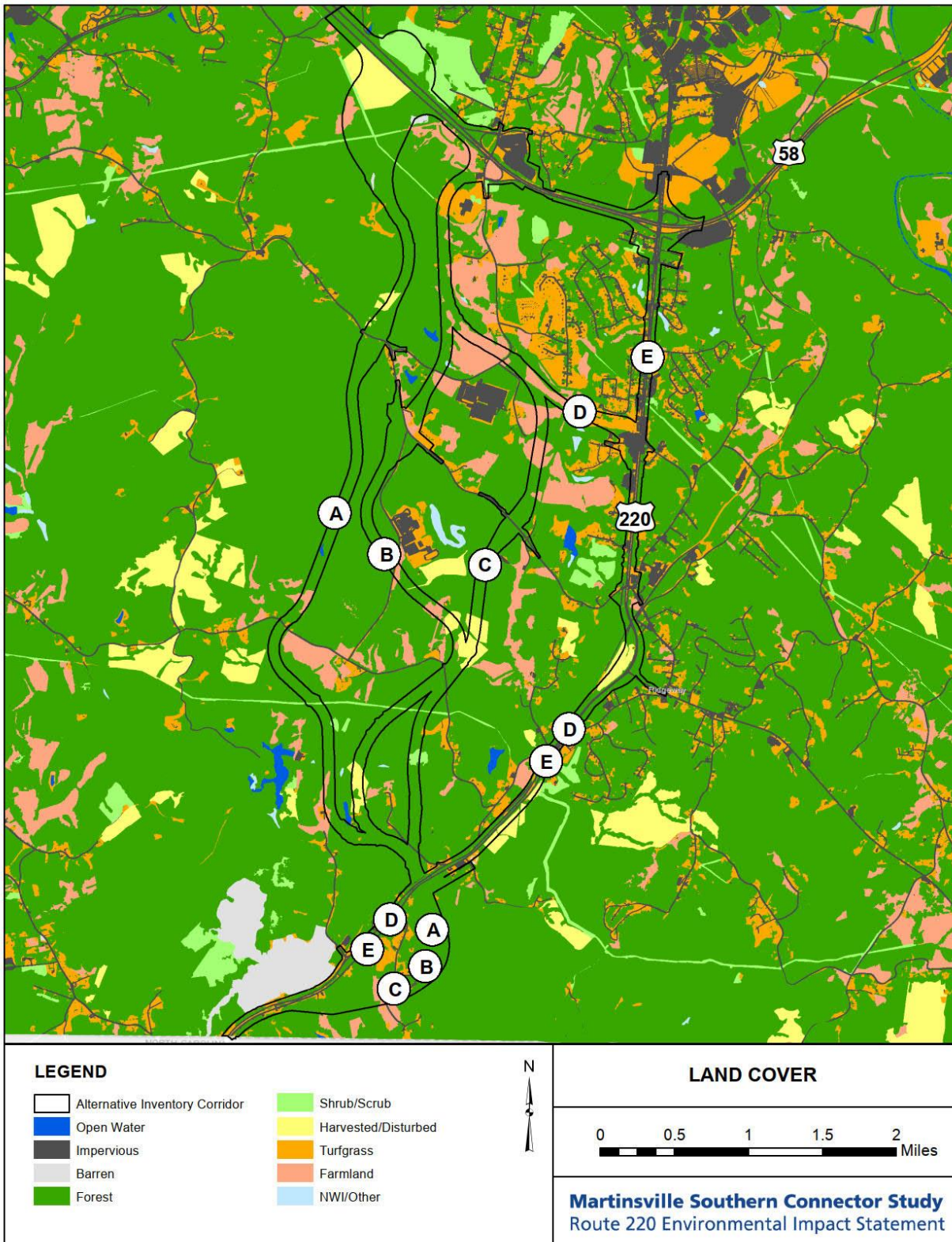
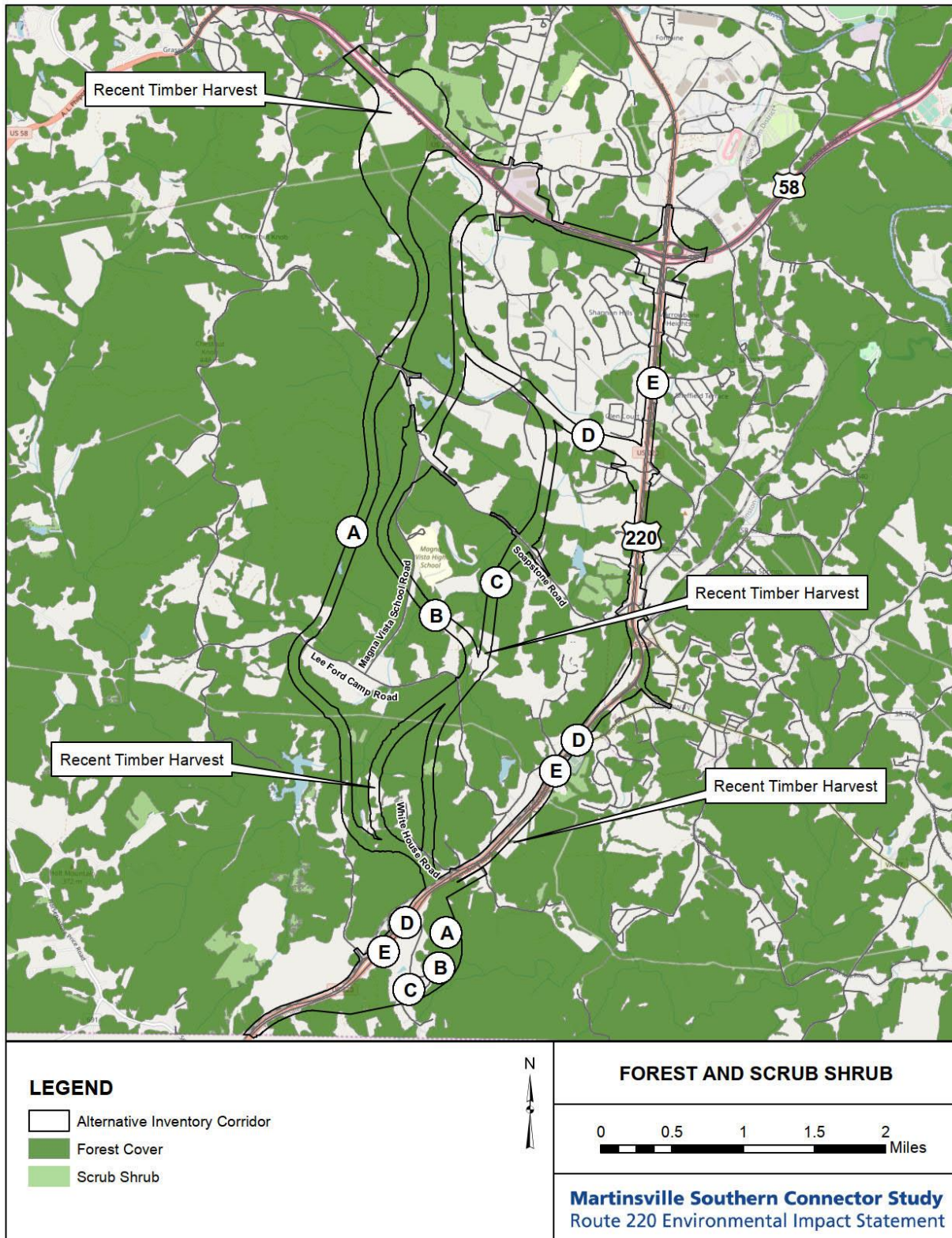


Figure 5-2: Forest and Scrub Shrub Habitat



Many non-native aquatic and terrestrial animal species threaten the native plant and animal communities in Virginia by outcompeting for resources. The VAC (4VAC15-20-160) designates the following as nuisance species in Virginia, however, none of these species were directly observed during field investigations. These species include the house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), black rat (*Rattus rattus*), coyote (*Canis latrans*), nutria (*Myocastor coypus*), woodchuck (*Marmota monax*), European starling (*Sturnus vulgaris*), English sparrow (*Passer domesticus*), pigeon (*Columba livia*), and other non-native species as defined in the Migratory Bird Treaty Reform Act of 2004 and regulated under 50 CFR 10.13.

Likewise, the VDCR-DNH has identified invasive species which threaten Virginia's wildlife and plant systems such as the emerald ash borer (*Agrilus planipennis*), northern snakehead fish (*Channa argus*), rapa welk (*Rapana venosa*), and the imported fire ant (*Solenopsis invicta*). These species are listed as established in Virginia. In addition, the VDCR-DNH has also identified the Zebra mussel (*Dreissena polymorpha*), Sirex woodwasp (*Sirex noctilio* F.), rusty crayfish (*Orconectes rusticus*), and the Chinese mitten crab (*Eriocheir sinensis*) as species that may threaten Virginia's wildlife and plant systems; however, they are not well established in Virginia.

5.3.4 Trout Streams

According to VDGIF's cold water streams GIS data, there are no natural or stocked trout streams within the study area. As there are no trout streams in the study area, this resource is not further addressed in this analysis or in the Draft EIS.

5.3.5 Terrestrial Habitat/Wildlife

The study area is located in Ecoregion 45e (Northern Inner Piedmont) of the EPA's Level IV Ecoregions (Woods et al. 1999). Typical topography for this area consists of dissected upland composed of hills, irregular plains, and isolated ridges and mountains (Woods et al. 1999). Rivers and drainages typically run southeastward in relatively narrow floodplains.

The study area has experienced noticeable alternations over the past several hundred years, primarily due to human activity. Land development of the mid-late twentieth century, including housing, agriculture, roadways, and timber harvesting have encroached into and fragmented various wildlife habitats found within the study area. Existing Route 220 is located in a north-south orientation and inhibits wildlife movement east and west. Route 58 is located in an east-west orientation and inhibits wildlife movement north and south. A majority of the residential development exists near the Route 58 and Route 220 interchange which could impede wildlife passage. Rural roads, agricultural activities, and timber harvest areas fragment some of the habitat in the study as well. Large tracts of habitat exist on the western side of the study area and west of the study area itself.

Based on VDCR-DNH's review of the study, there are no natural heritage areas or conservation sites within the Alternative Inventory Corridors (**Appendix D**). In addition, there are no natural habitat and ecosystem diversity areas and the predicted suitable habitat is identified as low for the study area. VGIN's land cover dataset identifies the following land cover types within the Alternative Inventory Corridors: Open Water, Impervious, Barren, Forest, Scrub/Shrub, Harvested/Disturbed, Turf Grass, Farmland and NWI/Other. Currently, at the Route 58 interchange, there is an area of recent timber harvest. Additionally, another harvested area that is regenerating (currently scrub/shrub) just north of the northern interchange with existing Route 220 and Route 58. West of Route 220, within the Alternative Inventory Corridors A, B, C, and a portion of D, the predominant land cover is Forest and Farmland. Within the southern part of Alternative Inventory Corridor D and all of Alternative Inventory Corridor E, the predominant land

cover is impervious (Route 220 and adjacent commercial/residential development) and forest. **Figure 5-2** shows the forest and scrub-shrub habitat within the Alternative Inventory Corridors.

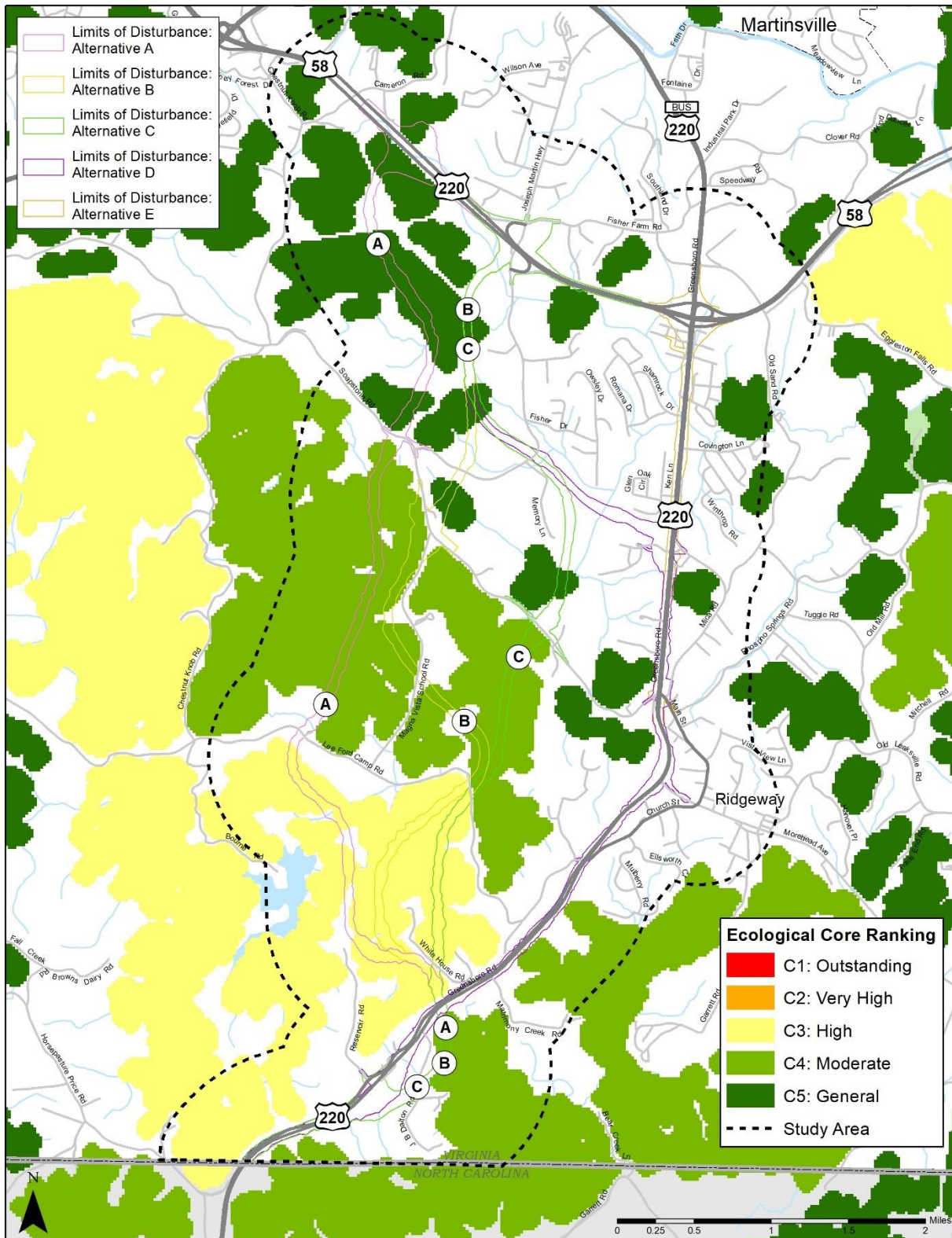
Although agricultural activities and urbanization have resulted in forest tract fragmentation throughout the region, several larger contiguous forest tracts exist throughout the study area (see **Figure 5-2**). These larger forest tracts provide an important contribution to regional biodiversity. Of the five Alternative Inventory Corridors, A and B are located within the largest contiguous forest tract located between Lee Ford Camp Road and Soapstone Road. This forest tract is approximately 1,836 acres in size and relatively unfragmented. All other alternatives traverse forested tracts that are fragmented by farmed land, recent timber harvest, utility corridors, residences, and local roads. Large forested tracts provide suitable habitat for a variety of forest-nesting bird species (e.g., wood thrush, scarlet tanager, red-eyed vireo, broad-winged hawk, barred owl) that are sensitive to the fragmentation and edge effects. Smaller forest tracts have a larger edge to forest interior ratio, and therefore provide more habitat for edge-dwelling species.

The larger number of smaller fragmented forest tracts dispersed throughout the Alternative Inventory Corridors cumulatively contributes to regional biodiversity, particularly those connected by riparian corridors along major watercourses. The patchwork of forested and non-forested land coverage encountered across other portions of the Alternative Inventory Corridors provide a certain degree of landscape diversity and edge habitat – a situation that also contributes to regional biodiversity. Small fragmented forest tracts primarily occur within Alternative Inventory Corridors C and the northern portion of D; interspersed by open agricultural fields which are providing extensive edge habitat. Species that commonly flourish in this type of habitat type include: snakes, foxes, raccoons, opossums, skunks and blue jays. The richness and density of generalist bird species usually increases along forest edges because of the variety of vegetation and abundance of food. However, migratory bird populations may decline and the numbers of some habitat specific species may decrease near edges. Increases in nest predation by small mammals, snakes, ravens, and crows are a commonly cited cause of these declines (Wilcove, 1987). The wide diversity of wildlife habitat occurring in the study area provides for an abundance of terrestrial species. Due to the mobility of certain wildlife species, especially during periods of habitat stress, overlapping distributions may occur.

VDCR's Virginia Natural Landscape Assessment (VaNLA), a landscape-scale geospatial analysis, identifies large patches of natural land cover (habitat cores) within the Alternative Inventory Corridors. The ecological integrity of the cores in the VaNLA are ranked on a scale of 1 to 5, with 1 exhibiting outstanding integrity and 5 exhibiting general integrity. In the area of the Alternative Inventory Corridors, VDCR's ecological core rankings are rated 3 (High), 4 (Moderate), and 5 (General) (see **Figure 5-3**). In general, larger, more biologically diverse areas are given lower scores. Scores are enhanced if the core is part of a larger complex of natural lands. Scores also are improved for those cores that contribute to water quality enhancement.

Based on VDCR-DNH's review of the study and a coordination response letter from them, there are no natural heritage areas or conservation sites within the Alternative Inventory Corridors.

Figure 5-3: Ecological Core Rankings



5.3.6 Aquatic Habitat

As described in **Section 2.1**, the construction of Alternative A, B, C, D, or E could require 70, 60, 60, 60, or 50 stream crossings, respectively. Streams and wetlands within the Alternative Inventory Corridors provide habitat for a variety of aquatic species. The Alternative Inventory Corridors include 146,603 lf of stream and 33.8 acres of wetlands. The streams are in relatively good health; however, there may be localized disrupting influences that are damaging to aquatic species and their habitat. Examples of disrupting influences include uncontrolled storms flows from adjacent roads which contribute to erosion and sedimentation of streams, thereby reducing habitat. For more information on water quality, refer to **Section 2.1**.

According to the VDGIF Fish and Wildlife Information Service search report (see **Appendix D**), a wide array of wildlife species are present within the forest lands of the study area. Large game species include the white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), and eastern wild turkey (*Meleagris allopavo*). Small game species and fur-bearing species include the gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes fulva*). Small forest-dwelling mammals are also common. These small mammals include mice, moles, and shrews. Amphibians inhabiting the forest lands of the study area include the American toad (*Bufo americanus*), upland chorus frog (*Pseudacris triseriata*), gray treefrog (*Hyla versicolor*), Cope's gray treefrog (*Hyla chrysoscelis*), northern redback salamander (*Plethodon cinereus*), northern spring salamander (*Gyrinophilus porphyriticus*), southern two-lined salamander (*Eurycea bislineata cirrigera*), white-spotted slimy salamander (*Plethodon glutinosus*), northern dusky salamander (*Desmognathus fuscus fuscus*), northern red salamander (*Pseudotriton ruber*), spotted salamander (*Ambystoma maculatum*), and Wehrle's salamander (*Plethodon wehrlei*). Reptiles inhabiting the forest lands of the study area include eastern box turtle (*Terrapene carolina*), eastern fence lizard (*Sceloporus undulatus*), five-lined skink (*Eumeces fasciatus*), northern black racer (*Coluber constrictor*), corn snake (*Elaphe guttata*), eastern garter snake (*Thamnophis sirtalis*), eastern worm snake (*Carphophis amoenus*), rough green snake (*Opheodrys aestivus*), eastern hognose snake (*Heterodon platyrhinos*), black rat snake (*Elaphe obsoleta*), northern copperhead (*Agkistrodon contortrix*), mole kingsnake (*Lampropeltis sp.*), and northern ringneck snake (*Diodophis punctatus*). Forest birds include a variety of wrens (*Troglodytidae*), warblers (*Muscicapidae*), thrushes (*Turdinae*), vireos (*Virionidae*), woodpeckers (*Picidae*), and flycatchers (*Tyrannidae*). Birds of prey inhabiting forest lands of the study area include red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), and great horned owl (*Bubo virginianus*).

5.4 ENVIRONMENTAL CONSEQUENCES

5.4.1 No-Build Alternative

No construction or changes to the natural environment, other than those from committed projects that are currently programmed and funded in VDOT's *SYIP for FY 2020-2025* (VDOT, 2019b) and Henry County's *Budget for FY 2019-2020* (County of Henry, 2019), would occur under the No-Build Alternative. Thus, no changes to wildlife and habitat would occur.

5.4.2 No-Build Alternative A

5.4.2.1 Anadromous Fish Use

There are no resources in the study area, therefore no impacts would occur.

5.4.2.2 Essential Fish Habitat

There are no resources in the study area, therefore no impacts would occur.

5.4.2.3 Invasive Species

Alternative A has a potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the planning level LOD. The total area of disturbance for Alternative A is 492 acres. Most of that disturbance occurs within undeveloped, vegetated areas west of Route 220 that could result in the introduction of invasive species. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

5.4.2.4 Trout Streams

There are no resources in the study area, therefore no impacts would occur.

5.4.2.5 Terrestrial Habitat/Wildlife

Construction of Alternative A would result in some effect to the general ecology of the roadway's surroundings (see **Table 5-1**). Alternative A would affect wildlife communities and habitat through conversion of existing land cover to paved road surfaces and maintained right-of-way. This alternative would fragment two large contiguous forests located to the north of Lee Ford Camp Road and continue north to the conceptual interchange of Alternative A with Route 58. In locations where this alternative bisects large forests, it would create smaller forested tracts and more edge habitat. An estimated 3.8 percent (489 acres) of the existing land cover within the study area would be converted for transportation use. This conversion would result in loss of wildlife habitat and could affect existing wildlife migration patterns as a result of the new north south road barrier, inhibiting wildlife movement east and west. The potential crossings of the Norfolk Southern Railroad, Patterson Branch, Marrowbone Creek, and other tributaries would prevent full habitat fragmentation by providing wildlife passages. This change in habitat would alter the wildlife assemblage by decreasing the number of forest-interior dwelling species and increasing the number of edge habitat species. Construction of Alternative A would result in the loss of 247 acres of forest land cover that has a ranking for ecological integrity under the VaNLA. This total area consists of 74 acres of High (3) ranking; 82 acres of Moderate (4) ranking; and 91 acres of General (5) ranking land cover that has ecological integrity.

5.4.2.6 Aquatic Habitat

Alternative A would impact approximately 28,998 lf of streams and 7.8 acres of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative A has the potential to carry roadway pollutant that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

Table 5-1: Land Cover

Land Cover Type	Total Acres within Study Area	Alt. A	Alt. B	Alt. C (Preferred)	Alt. E	Alt. D
Open Water	56.9	2.0	0.2	0.2	0.0	0.0
Developed, Open	1,202.3	53.8	61.2	58.7	102.5	105.8
Developed, Low	597.8	29.8	62.3	62.5	116.2	110.7
Developed, Medium	174.6	0.4	10.4	10.4	31.3	37.0
Developed, High	101.0	0.0	7.0	7.0	13.5	4.0
Barren Land	0.2	0.0	0.0	0.0	0.0	0.0
Deciduous Forest	5,816.3	257.8	163.1	133.5	111.2	89.2
Evergreen Forest	969.2	40.8	67.5	41.2	9.2	8.9
Mixed Forest	1,513.3	61.7	45.3	46.2	21.0	10.5
Grasslands/Herbaceous	587.9	1.8	5.0	16.0	1.2	2.6
Pasture/Hay	1,229.6	22.0	10.5	9.9	12.7	3.9
Cultivated Crops	29.0	18.5	40.3	55.3	72.4	27.3
Shrub/Scrub	562.6	0.0	0.0	0.0	0.0	0.0
Woody Wetlands	31.8	0.0	0.0	0.0	2.4	0.0
Emergent Herbaceous	0.6	0.0	0.0	0.0	0.0	0.0
TOTAL	12,879	488.5	472.9	440.9	493.6	399.9

Source: National Land Cover Dataset (2011).

5.4.3 Alternative B

5.4.3.1 Anadromous Fish Use

There are no resources in the study area, therefore no impacts would occur.

5.4.3.2 Essential Fish Habitat

There are no resources in the study area, therefore no impacts would occur.

5.4.3.3 Invasive Species

Alternative B would have the potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the LOD. The total area of disturbance for Alternative B is 480 acres. Most of that disturbance would occur within undeveloped, vegetated areas west of Route 220 that could result in the introduction of invasive species. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

5.4.3.4 Trout Streams

There are no resources in the study area, therefore no impacts would occur.

5.4.3.5 Terrestrial Habitat/Wildlife

Alternative B would impact an estimated 3.7 percent (473 acres) of the existing land cover within the study area due to the conversion to transportation use. This alternative would fragment a large contiguous forest to the north of Lee Ford Camp Road. The alternative also impacts a large forested tract west of Magna Vista School Road; however, the alternative stays relatively close to

Magna Vista School Road which is the eastern edge of the forested tract. Further north, the alternative impacts smaller forested tracts and the edges of existing forests. The potential crossings of the Norfolk Southern Railroad, Patterson Branch, Marrowbone Creek, other tributaries, and Little Marrowbone Creek would prevent full habitat fragmentation by providing wildlife passages. In general, wildlife communities and habitat would be impacted in a similar manner as Alternative A. Alternative B direct impacts to land cover are included in **Table 5-1**. In locations where this alternative bisects large forests, it would create smaller forested tracts and more edge habitat. This change in habitat would alter the wildlife assemblage by decreasing the number of forest-interior dwelling species and increasing the number of edge habitat species. Construction of Alternative B would result in the loss of 196 acres of forest land cover that has a ranking for ecological integrity under the VaNLA. This total area consists of 72 acres of High (3) ranking; 96 acres of Moderate (4) ranking; and 28 acres of General (5) ranking land cover with ecological integrity.

5.4.3.6 Aquatic Habitat

Alternative B would impact approximately 20,548 lf of streams and 5.9 acres of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative B has the potential to carry roadway pollutant that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

5.4.4 Alternative C

5.4.4.1 Anadromous Fish Use

There are no resources in the study area, therefore no impacts would occur.

5.4.4.2 Essential Fish Habitat

There are no resources in the study area, therefore no impacts would occur.

5.4.4.3 Invasive Species

Alternative C would have the potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the LOD. The total area of disturbance for Alternative C is 447 acres. Most of that disturbance would occur within undeveloped, vegetated areas west of Route 220 that could result in the introduction of invasive species. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

5.4.4.4 Trout Streams

There are no resources in the study area, therefore no impacts would occur.

5.4.4.5 Terrestrial Habitat/Wildlife

Alternative C would impact an estimated 3.4 percent (441 acres) of the existing land cover within the study area due to the conversion to transportation use. This alternative would fragment a large forest between White House Road and Lee Ford Camp Road and another between Lee Ford

Camp Road and Soapstone Road. Further north, the alternative impacts smaller forested tracts and the edges of existing forests. The potential crossings of the Norfolk Southern Railroad, various tributaries, and Little Marrowbone Creek prevent full habitat fragmentation by providing wildlife passages. In general, wildlife communities and habitat would be impacted in a similar manner as Alternative A and B. Alternative C direct impacts to land cover are included in **Table 5-1**. In locations where this alternative bisects large forests, it would create smaller forested tracts and more edge habitat. This change in habitat would alter the wildlife assemblage by decreasing the number of forest-interior dwelling species and increasing the number of edge habitat species. Construction of Alternative C would result in the loss of 144 acres of forest land cover that has a ranking for ecological integrity under the VaNLA. This total area consists of 54 acres of High (3) ranking; 64 acres of Moderate (4) ranking; and 26 acres of General (5) ranking land cover with ecological integrity.

5.4.4.6 Aquatic Habitat

Alternative C would impact approximately 21,882 lf of streams and 3.7 acres of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative C has the potential to carry roadway pollutant that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

5.4.5 Alternative D

5.4.5.1 Anadromous Fish Use

There are no resources in the study area, therefore no impacts would occur.

5.4.5.2 Essential Fish Habitat

There are no resources in the study area, therefore no impacts would occur.

5.4.5.3 Invasive Species

Alternative D would have the potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the LOD. The total area of disturbance for Alternative D is 497 acres. Some of that disturbance would occur within undeveloped, vegetated areas west of Route 220 that could result in the introduction of invasive species. However, most of the disturbance occurs along existing Route 220, which has already been disturbed and contains invasive species. A large distribution of species considered to be highly invasive (kudzu and multiflora rose) (VDCR 2019a) were identified along Route 220 during field investigations. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

5.4.5.4 Trout Streams

There are no resources in the study area, therefore no impacts would occur.

5.4.5.5 Terrestrial Habitat/Wildlife

Alternative D would impact an estimated 3.8 percent (494 acres) of the existing land cover within the study area due to the conversion to transportation use. The southern part of this alternative is along Route 220 and the forest impact is confined to the existing roadside edge forest habitat. In the northern part of this alternative where it veers west of Route 220, the alternative crosses smaller forested tracts and the edges of existing forest. The potential crossings various tributaries and Little Marrowbone Creek prevent full habitat fragmentation by providing wildlife passages. Construction of Alternative D would result in the loss of 28 acres of forest land cover that has a ranking for ecological integrity under the VaNLA. This total area consists of 0.75 acres of Moderate (4) ranking and 27 acres of General (5) ranking land cover with ecological integrity.

5.4.5.6 Aquatic Habitat

Alternative D would impact approximately 8,017 lf of streams and 2.7 acres of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative D has the potential to carry roadway pollutant that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

5.4.6 Alternative E

5.4.6.1 Anadromous Fish Use

There are no resources in the study area, therefore no impacts would occur.

5.4.6.2 Essential Fish Habitat

There are no resources in the study area, therefore no impacts would occur.

5.4.6.3 Invasive Species

Alternative E would have the potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the LOD. The total area of disturbance for Alternative E is 401 acres. This disturbance would occur along existing Route 220, which has already been disturbed and contains invasive species. A large distribution of species considered to be highly invasive (kudzu and multiflora rose) (VDCR 2019a) were identified along Route 220 during field investigations. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

5.4.6.4 Trout Streams

There are no resources in the study area, therefore no impacts would occur.

5.4.6.5 Terrestrial Habitat/Wildlife

Alternative E would impact an estimated 3.1 percent (400 acres) of the existing land cover within the study area due to the conversion to transportation use. Alternative E would remove the least amount of forest land out of the build alternatives. This alternative is along existing Route 220 and the forest impact is to existing roadside edge forest habitat. Construction of Alternative E would

result in the loss of 1.3 acres of forest land cover that has a ranking for ecological integrity under the VaNLA. This total area consists of 0.75 acres of Moderate (4) ranking and 0.5 acres of General (5) ranking land cover with ecological integrity.

5.4.6.6 Aquatic Habitat

Alternative E would impact approximately 7,934 lf of streams and 1.0 acre of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative E has the potential to carry roadway pollutant that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

5.5 MITIGATION

In accordance with EO13112, Invasive Species, the spread of invasive species would be minimized by following provisions in VDOT's Road and Bridge Specifications. These provisions require prompt seeding of disturbed areas with mixes that are tested in accordance with the Virginia Seed Law and VDOT's standards and specifications. Specific seed mixes that are free of noxious or invasive species may be required for environmentally sensitive areas and would be determined during the design and permitting process. In addition, in order to prevent the introduction of new invasive species and to prevent the spread of existing populations, additional BMPs could be followed, including erosion and sediment control, abatement of pollutant loading, washing machinery before it enters the area, minimizing ground disturbance, and prompt reseeded of disturbed areas. While the right-of-way is vulnerable to colonization by invasive plant species from adjacent properties, implementation of the stated provisions would reduce the potential for the establishment and proliferation of invasive species within highway right-of-way.

While each of the Build Alternatives would have the potential for impacts to terrestrial habitat and associated wildlife, coordination and concurrence with various agencies would be required through all stages of the project implementation. During design of the Preferred Alternative, the request for a CWA Section 401/404b permit would automatically initiate coordination with those agencies having jurisdiction over terrestrial wildlife and habitat, such as VDGIF and USFWS. This coordination, along with the necessary permitting, would help to avoid and minimize potential impacts to these resources through a collaborative process of determining specific mitigation such as applicable design changes and techniques and construction methods to be used during implementation.

6 THREATENED AND ENDANGERED SPECIES

6.1 REGULATORY CONTEXT

Threatened, endangered, and special status species are protected primarily by the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C §1531-1543 et seq. and 50 CFR §17; §402). The USFWS and NOAA - NMFS regulate and protect Federally listed threatened, endangered, and special status species under the ESA with the primary goal of conserving and recovering listed species. The ESA, with few exceptions, prohibits activities affecting threatened, endangered, and special status species unless authorized by a permit. The legal Federal status of a species is determined by USFWS and NMFS.

Compliance with the Endangered Species Act is required for projects that have the potential to impact Federally listed threatened or endangered species or their habitat. The Endangered Species Act, with few exceptions, prohibits activities affecting threatened and endangered species unless authorized by a permit. Anyone who is conducting otherwise-lawful activities that will result in the “incidental take” of a listed wildlife species needs a permit. If a project is Federally funded or authorized or carried out by a Federal agency, the permitting process is conducted through Section 7 consultation. Section 7 of the Endangered Species Act request Federal agencies to consult with USFWS and/or NOAA Fisheries to ensure that any Federal Action authorized, funded, or carried out is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or modification of critical habitat, unless granted an exemption for such action (USFWS, 2019a).

In addition to Federal oversight, threatened, endangered, and special status species are also regulated at the state level by the Virginia Endangered Species Act (Code of Virginia [COV] §29.1-563 to -570), and the Virginia Endangered Plant and Insect Species Act (COV§3.2-1000 to 3.2-1011). State agencies have adopted the Federal list as well as a state list of threatened, endangered, and special status species, with the primary focus of managing Virginia’s wildlife to maintain optimum populations of all species and conserve biodiversity. The VDGIF is responsible for game, fish, and wildlife resources and habitats, and state-listed threatened, endangered, and special status animal species (exclusive of insects). The Virginia Department of Agriculture and Consumer Services (VDACS) is responsible for threatened, endangered, and special status species of plants and insects. The VDCR-DNH maintains a statewide database for conservation planning and project review.

Under the Federal and state ESA laws, the bald eagle (*Haliaeetus leucocephalus*) was removed from the Federal list of threatened and endangered species in 2007 and removed from the Virginia list of threatened and endangered species in 2013. However, the bald eagle still receives Federal protection under the Bald and Golden Eagle Protection Act (16 U.S.C. §668-668) and the Migratory Bird Treaty Act (16 USC §§ 703–712).

6.2 METHODOLOGY

In October, 2019, the VDGIF’s VaFWIS database (six-mile search radius), the VDGIF Wildlife Environmental Review Map Service (WERMS) database, the USFWS Information for Planning and Consultation (IPaC) database, the VDCR-DNH online searchable database and Natural Heritage Data Explorer (NHDE), VDOT’s Comprehensive Environmental Data and Reporting system (CEDAR), the Center for Conservation Biology (CCB) Mapping Portal, and the USFWS Virginia Field Office’s Bald Eagle Map Tool were queried to identify threatened, endangered, and

special status species that may potentially be affected by the Build Alternatives. Additional background data were collected through aerial imagery, NRCS soils data, USGS topographic mapping, NWI mapping, and NHD. Further coordination with resource and regulatory agencies occurred during monthly NEPA Programs Agency Coordination meetings to identify state and Federally-listed species that need to be evaluated in this study. Additionally, threatened and endangered species database searches of both the VaFWIS database and USFWS IPaC database will be re-evaluated at the time of the Final EIS and Joint Permit Application. USFWS has been an active participant in these coordination meetings and has provided data for this study on threatened and endangered species.

Biologists from the Virginia Polytechnic Institute and State University (Virginia Tech) – Department of Fish and Wildlife Conservation conducted habitat assessment surveys for fish and mussel species identified by VDGIF. Bat inventories were completed for all existing structures (e.g., culverts and bridges) along the Build Alternatives. Detailed data sheets and information on habitat assessments and bat inventories can be found in **Appendix E**. The Northern long-eared bat (NLEB) determination was completed on December 19, 2019 using IPaC. It was determined that the each of the Build Alternatives is consistent with the activities analyzed in the USFWS January 5, 2016, Programmatic Biological Opinion. In the absence of any response from the USFWS within 30 days of the aforementioned date, this concludes ESA consultation responsibilities with respect to the NLEB. For more information regarding the Section 7 consultation, refer to **Appendix D**.

6.3 AFFECTED ENVIRONMENT

According to desktop and database research, and coordination with state and Federal agencies, a total of seven potential threatened and endangered species were identified and require evaluation for this study. No bald eagle nest sites were identified within or near the Alternative Inventory Corridors. In a response to VDOT’s scoping letter, dated April 27, 2018, DCR-DNH stated that the study would not affect any documented state-listed plant or insect species. The following Federally listed species occur on the study’s IPaC Official Species List (per query on October 3, 2019) (see **Appendix D**).

Table 6-1: Potential Threatened and Endangered Species within the Study Area

Common Name	Scientific Name	Status ¹
Roanoke logperch	<i>Percina rex</i>	FE; SE
Northern Long-Eared Bat	<i>Myotis septentrionalis</i>	FT; ST
James Spiny mussel	<i>Pleurobema collina</i>	FE; SE
Atlantic Pigtoe	<i>Fusconaia masoni</i>	Proposed FT; ST
Eastern Black Rail	<i>Laterallus jamaicensis</i>	Proposed FT
Green floater	<i>Lasmigona subviridis</i>	ST
Orange-fin madtom	<i>Noturus gilberti</i>	ST

¹ FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened

6.3.1 Roanoke logperch (Federally Endangered; State Endangered)

The Roanoke logperch (*Percina rex*) is a freshwater fish species that is currently listed as endangered by both the USFWS and VDGIF. The Roanoke logperch is endemic to the Roanoke River and Chowan River drainage basins, where it is encountered in relatively small numbers. These watersheds encompass the southern portion of Virginia and the northern portion of North Carolina and drain towards the Albemarle Sound and the Atlantic Ocean. Populations located to date are separated from one another by long segments of rivers or by large impoundments. The Roanoke logperch inhabits medium and large rivers with warm and moderately clear waters and moderate to relatively low gradients (Jenkins and Burkhead 1994). Individuals of all life stages avoid moderately and heavily silted areas except during winter months of inactivity (Jenkins and Burkhead 1994). Populations of the Roanoke logperch are threatened by instream channelization, impoundment, and dewatering activities, and by activities within the watershed that lead to pollution and increased siltation of receiving waters.

Populations of the Roanoke logperch are reported to occur in the Smith River upstream of the City of Martinsville (Terwilliger and Tate 1995). The USFWS, through coordination for the study, confirmed the Smith River has potential Roanoke logperch populations, although the Roanoke logperch does not appear on the IPaC Official Species List. The Smith River is also designated by VDGIF as a Threatened and Endangered Species Water, containing documented occurrences of the Roanoke logperch. As a result, Marrowbone Creek, which is a tributary to Smith River that runs through the study area, was evaluated for potential Roanoke logperch habitat.

Roanoke logperch habitat assessments were conducted within Marrowbone Creek by Virginia Tech's Department of Fish and Wildlife Conservation on May 15-17, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations are dominated by silt and sand and therefore are not suitable habitat for Roanoke logperch. Therefore, there are no documented occurrences or potential habitat for the Roanoke logperch within the Alternative Inventory Corridors. The full report and mapping are available in **Appendix E**.

6.3.2 Northern Long-Eared Bat (Federally Threatened, State Threatened)

The NLEB (*Myotis septentrionalis*), identified on the IPaC Official Species list, is currently listed as threatened by both the USFWS and VDGIF. Home range for the NLEB is widely but patchily distributed in the eastern and north-central United States and adjacent southern Canada, and southward to southern Texas, Louisiana, Alabama, Georgia, and Florida, and westward in the United States generally to the eastern margin of the Great Plains region (VDCR, 2019c). In the winter, they hibernate in caves, mines, and tunnels with relatively constant and cool temperatures, high humidity, and no air currents. In the summer, they roost in old-growth forests with uneven forest structure, single and multiple tree-fall gaps, standing snags, and woody debris. Major threats to the species existence include wind energy development, white-nose syndrome, and habitat modification (USFWS, 2019b).

All of Henry County is within the range of the NLEB and in the White-Nose Syndrome Zone per Final 4(d) Rule from the USFWS (USFWS, 2019c). VDGIF's NLEB winter habitat and roost trees mapper indicates that there are no known hibernacula (overwintering shelters) or roost trees within 50 miles of the study area (VDGIF, 2019c). However, the surrounding mixed scrub and forest habitat still represents potential roosting habitat.

Based upon an analysis of land cover data, deciduous forest, evergreen forest, mixed forest, scrub shrub, and woody wetlands were identified as potential suitable roosting habitat for the species within the Alternative Inventory Corridors. **Figure 5-2** shows forested and scrub shrub areas that may contain suitable habitat for maternity roosts. Forested areas, easements, road edges, and waterways can provide corridors for movement between habitat areas. Trees with suitable sized cavities, buildings, and bridges may provide suitable habitat for maternity roosts.

In addition to evaluating potential habitat for NLEB, a total of ten structures (bridges or major culverts) along existing roads within the Alternative Inventory Corridors were checked for signs of bat use and documented with VDOT's Bat Inventory Form. None of the structures had signs of bat use.

6.3.3 James Spiny mussel (Federally Endangered; State Endangered)

The James spiny mussel is a freshwater mussel that is classified as endangered by the USFWS and Virginia. The species' range includes the Upper James and Dan River Basins. The species' preferred habitat includes free-flowing streams with a variety of flow regimes and low levels of silt. The principal threats to the James spiny mussel are habitat loss, degradation (e.g., increased turbidity and sewage discharge), the presence of invasive bivalves (e.g., the Asiatic clam, *Corbicula fluminea*), and agricultural runoff (USFWS, 2017).

Mussel habitat assessments were conducted within Marrowbone Creek by Virginia Tech – Department of Fish and Wildlife Conservation on May 20-21, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations contained deeply incised channels with loose, fine sand and silt with patches of fine gravel that are unsuitable for mussels. Therefore, there are no documented occurrences or potential habitat for the James spiny mussel within the Alternative Inventory Corridors. The full report and mapping are available in **Appendix E**.

6.3.4 Atlantic Pigtoe (Proposed Listing as Federally Threatened; State Threatened)

The Atlantic pigtoe is a freshwater mussel that is classified as proposed threatened by the USFWS and threatened in Virginia. Historically, this species ranged from the James and Chowan River basins in Virginia and the Roanoke, Tar, Neuse, Cape Fear, Pee Dee, and Catawba River basins in North Carolina. The species has been known to occur in the counties of Henry and Rockingham. The preferred habitat of the Atlantic pigtoe consists of coarse sand and gravel. Previously, the best populations were found in creeks and rivers with excellent water quality and silt-free substrates. Threats to this species include water quality issues caused by pollution and sedimentation as well as damming (USFWS, 2019d).

Mussel habitat assessments were conducted within Marrowbone Creek by Virginia Tech – Department of Fish and Wildlife Conservation on May 20-21, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations contained deeply incised channels with loose, fine sand and silt with patches of fine gravel that are unsuitable for mussels. Therefore, there are no documented occurrences or potential habitat for the Atlantic pigtoe within the Alternative Inventory Corridors. The full report and mapping are available in **Appendix E**.

6.3.5 Eastern Black Rail (Proposed Listing as Federally Threatened)

The eastern black rail is a small, secretive marsh bird that has been declining in the eastern United States for over a century resulting in a retraction of its breeding range, an overall reduction in the number of breeding locations within its core range, and a loss of individuals within historic

strongholds. Over the past 10-20 years, some reports indicate that populations have declined 75% or greater and have become dangerously low (USFWS, 2019e). Recent evidence suggests that eastern black rails may only breed in a dozen or fewer places in each state along the Atlantic and Gulf coasts (USFWS, 2019e). The eastern black rail can occur in tidally or non-tidally influenced habitat and range in salinity from salt to brackish to fresh.

As of October 9, 2018, the USFWS published a proposed rule announcing a petition finding to list the eastern black rail as a Federally threatened species. No occurrence records for the species were identified by the VaFWIS database or IPaC database at the time of the study. The USFWS has not designated critical habitat at this time and has not determined if the study area is within the range of the eastern black rail. Through coordination with USFWS, it was determined in October 2019 that the study does not intersect potential suitable habitat and will have no effect on the black rail (see email dated October 1, 2019).

6.3.6 Green Floater (State Threatened)

The green floater (*Lasmigona subviridis*), state-threatened in Virginia, is a small freshwater mussel, typically less than 5.1 centimeters (2 inches). The green floater has a trapezoidal to subovate shape and is yellow-green in color. This species mainly occurs in stagnant pools and other calm-water pockets 0.3 to 1.2 meters (1 to 4 feet) in depth. It is native to many drainage basins in the United States, including the Smith River basins. The species is typically found in clear pool habitats of streams of varying sizes with substrates of gravel and sand (VAFWIS, 2019).

Mussel habitat assessments were conducted within Marrowbone Creek by Virginia Tech – Department of Fish and Wildlife Conservation on May 20-21, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations contained deeply incised channels with loose, fine sand and silt with patches of fine gravel that are unsuitable for mussels. Therefore, there are no documented occurrences or potential habitat for the green floater within the Alternative Inventory Corridors. The full report and mapping are available in **Appendix E**.

6.3.7 Orangefin Madtom (State Threatened)

The orangefin madtom (*Noturus gilberti*) is a freshwater fish species of the catfish family that is presently listed as threatened in Virginia. The orangefin madtom is native to the upper Roanoke River drainage basin in Virginia and North Carolina. The species occupies a narrow range of habitat in medium-sized intermontane and upper Piedmont streams (moderate to strong riffles and runs having little or no silt and moderate gradients). The orangefin madtom is an intersticine species typically found in or near cavities formed by rubble and boulders. The largest populations occupy generally clear waters (Jenkins and Burkhead 1994). Siltation and bait-seining are threats to remaining populations of the orangefin madtom. The species is short-lived and has low reproductive potential. Only five isolated indigenous populations of the orangefin madtom are known to exist in the Roanoke River drainage basin (NatureServe Explorer, 2019).

Orangefin madtom habitat assessments were conducted within Marrowbone Creek by Virginia Tech's Department of Fish and Wildlife Conservation on May 15-17, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations are dominated by silt and sand and therefore are not suitable habitat for orangefin madtom. Consequently, there are no documented occurrences or potential habitat for the orangefin madtom within the Alternative Inventory Corridors. The full report and mapping are available in **Appendix E**.

6.4 ENVIRONMENTAL CONSEQUENCES

6.4.1 Roanoke logperch (Federally Endangered; State Endangered)

There are no known occurrences or potential habitat for the Roanoke logperch within streams crossed by the Alternative Inventory Corridors. Therefore, there would be no effect to Roanoke logperch.

6.4.2 Northern Long-Eared Bat (Federally Threatened, State Threatened)

According to the VDGIF NLEB Winter Habitat and Roost Trees Application, no confirmed maternity roost trees or hibernacula are located within 50 miles of the study area (VDGIF 2019b). There were no signs of bat use within the bridges/culverts evaluated in the study area. There is potential NLEB roosting habitat within each alternative based on a review of forested and scrub shrub habitat. Potential habitat impacts are described by alternative below.

6.4.2.1 No-Build Alternative

No impacts on Federally or state listed threatened or endangered species would occur for the No-Build Alternative. Therefore, there would be no effect to this species.

6.4.2.2 Alternative A

Construction of Alternative A improvements could potentially impact approximately 318 acres of NLEB roosting habitat (**Table 6-2**). There is a relatively large tract of unfragmented forest that Alternative A traverses which is approximately 1.7 miles long from north of Lee Ford Camp Road to Soapstone Road. However, most of the forest clearing for Alternative A would occur within fragmented areas of forested habitat interspersed by farmed land, recent timber harvest, utility corridors, and local roads (see **Figure 5-2**). Alternative A may affect the NLEB; however, any take that may occur as a result of Alternative A would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*.

Table 6-2: Threatened and Endangered Species Potential Habitat Impacts within the LOD

Common Name	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)	Alternative E (acres)
Northern Long-Eared Bat ¹	318	261	224	114	78

¹ Represents acreage of suitable summer roosting habitat, based on forested and scrub shrub habitat.

6.4.2.3 Alternative B

Construction of Alternative B improvements could potentially impact approximately 261 acres of NLEB roosting habitat (**Table 6-2**). Most of the forest clearing for Alternative B would occur within fragmented areas of forested habitat interspersed by farmed land, recent timber harvest, utility corridors, and local roads (see **Figure 5-2**). Alternative B may affect the NLEB; however, any take that may occur as a result of Alternative B would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*.

6.4.2.4 Alternative C

Construction of Alternative C improvements could potentially impact approximately 224 acres of NLEB roosting habitat (**Table 6-2**). Most of the forest clearing for Alternative C would occur within fragmented areas of forested habitat interspersed by farmed land, recent timber harvest, utility

corridors, and local roads (see **Figure 5-2**). Alternative C may affect the NLEB; however, any take that may occur as a result of Alternative C would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*.

6.4.2.5 Alternative D

Construction of Alternative D improvements could potentially impact approximately 114 acres of NLEB roosting habitat (**Table 6-2**). Most of the forest clearing for Alternative D would occur within the existing, disturbed Route 220 corridor or within fragmented areas of forested habitat interspersed by farmed land, residential/commercial development, utility corridors, and local roads (see **Figure 5-2**). Alternative D may affect the NLEB; however, any take that may occur as a result of Alternative D would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*.

6.4.2.6 Alternative E

Construction of Alternative E improvements could potentially impact approximately 78 acres of NLEB roosting habitat (**Table 6-2**). Most of the forest clearing for Alternative E would occur within the existing, disturbed Route 220 corridor (see **Figure 5-2**). Alternative E may affect the NLEB; however, any take that may occur as a result of Alternative E would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*.

6.4.3 James Spiny mussel (Federally Endangered; State Endangered)

There are no known occurrences or potential habitat for the James spiny mussel within streams crossed by the Alternative Inventory Corridors. Therefore, there would be no effect to James spiny mussel.

6.4.4 Atlantic Pigtoe (Proposed Listing as Federally Threatened; State Threatened)

There are no known occurrences or potential habitat for the Atlantic pigtoe within streams crossed by the Alternative Inventory Corridors. Therefore, there would be no effect to Atlantic pigtoe.

6.4.5 Eastern Black Rail (Proposed Listing as Federally Threatened)

There are no known occurrences or potential habitat for the eastern black rail within the Alternative Inventory Corridors. Therefore, there would be no effect to eastern black rail.

6.4.6 Green Floater (State Threatened)

There are no known occurrences or potential habitat for the green floater within streams crossed by the Alternative Inventory Corridors. Therefore, there would be no effect to green floater.

6.4.7 Orangefin Madtom (State Threatened)

There are no known occurrences or potential habitat for the orangefin madtom within streams crossed by the Alternative Inventory Corridors. Therefore, there would be no effect to orangefin madtom.

6.5 MITIGATION

Should any transportation improvements advance from the Martinsville Southern Connector Study, further coordination and final Section 7 effect determinations would be conducted with applicable resource agencies, including the USFWS, during the Section 404/401 permitting process.

Alternatives A, B, C, D, and E are not anticipated to affect Roanoke logperch, James spiny mussel, Atlantic pigtoe, green floater, eastern black rail, or orangefin madtom. Therefore, no mitigative actions are necessary for these species.

During the design process of any Build Alternative, impacts to the NLEB and clearing of vegetated habitat would be avoided and minimized.

Conservation and protection measures for the NLEB would be in accordance with the final 4(d) rule and the Programmatic Biological Assessment for Transportation Projects in the Range of the Indiana Bat and Northern Long-eared Bat. Additional conservation measures may be implemented depending on the outcome of agency coordination.

7 FARMLANDS

7.1 REGULATORY CONTEXT

The Farmland Protection Policy Act (FPPA), Public Law 97-98, is administered by the USDA and minimizes the extent to which Federal programs contribute to the unnecessary and irreversible conversion of important farmland to nonagricultural uses, while encouraging alternative actions. It assures that Federal programs are operated in a manner that, to the extent practicable, will be compatible with state, local government, and private programs that protect farmland. The Agricultural and Forestal Districts Act, Virginia Code Sections 15.2-4300 through 15.2-4314, declares that it is the policy of Virginia to conserve, protect, and encourage the development and improvement of the state's agricultural and forestal products. To that end, the Code of Virginia enables localities and landowners to conserve and protect valuable agricultural and forestal lands by mutually agreeing to form agricultural and forestal districts.

As required in Article 2 (§10.1-1188 et seq.) of Chapter 11.1 of Title 10.1 of the Code of Virginia, each state agency shall demonstrate that it has considered the impact that a project would have on farm and forest lands as required in §3.2-205 and has adequately considered alternatives and mitigating measures. The VDEQ, in conducting its review of each major State project, shall ensure that such considerations are demonstrated and shall incorporate its evaluation of the effects that the project would have on farm and forestlands.

The FPPA of 1981 (7 USC 4201) is administered by USDA NRCS and is intended to minimize the impact of Federal programs on unnecessary and irreversible conversion of farmland to nonagricultural uses. This regulation is relevant for this analysis because the Build Alternatives may result in impacts to farmland.

Under the FPPA, farmland is defined as:

- Prime farmland - land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses;
- Unique farmland - land other than prime farmland that is used for production of specific high-value food and fiber crops; and
- Farmland other than prime or unique - farmland that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Prime farmland can be cropland, pastureland, forestland, or other land, but not urban land or water. Land designated as prime farmland has the soil quality, growing season, and moisture supply to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods.

7.2 METHODOLOGY

The FPPA Manual was reviewed to determine if lands covered by the Act are present within the study area. Lands not covered by the Act include:

1. Lands that receive a combined score of less than 160 points from the Land Evaluation and Site Assessment criteria;
2. Lands identified as an urbanized area on U.S. Census Bureau maps;
3. Land with a tint overprint on the USGS topographical map;
4. Areas shown as white (not farmland) on USDA Important Farmland Maps;

5. Areas shown as urban-built up on USDA Important Farmland Maps;
6. Land in water storage, including lands that have been acquired or planned for water storage prior to August 5, 1984;
7. Lands that are used for national defense; and
8. Private land where no Federal funds or technical assistance is utilized.

Additional resources, such as the 2010 US Census Bureau urbanized area maps, NRCS Web Soil Survey, NRCS cropland data, and agricultural and forested districts, were also utilized for review. Web Soil Survey was developed to identify land that can be used for the production of the Nation’s food supply. This database classifies soils based upon their properties, qualities, and suitability for farming. Urban areas, built up areas, water areas, as well as other areas that are not suitable for farming are classified as not prime farmland. Areas with soils that are suitable and available for farming are classified as prime farmland, farmland of statewide importance, or farmland of unique importance.

7.3 AFFECTED ENVIRONMENT

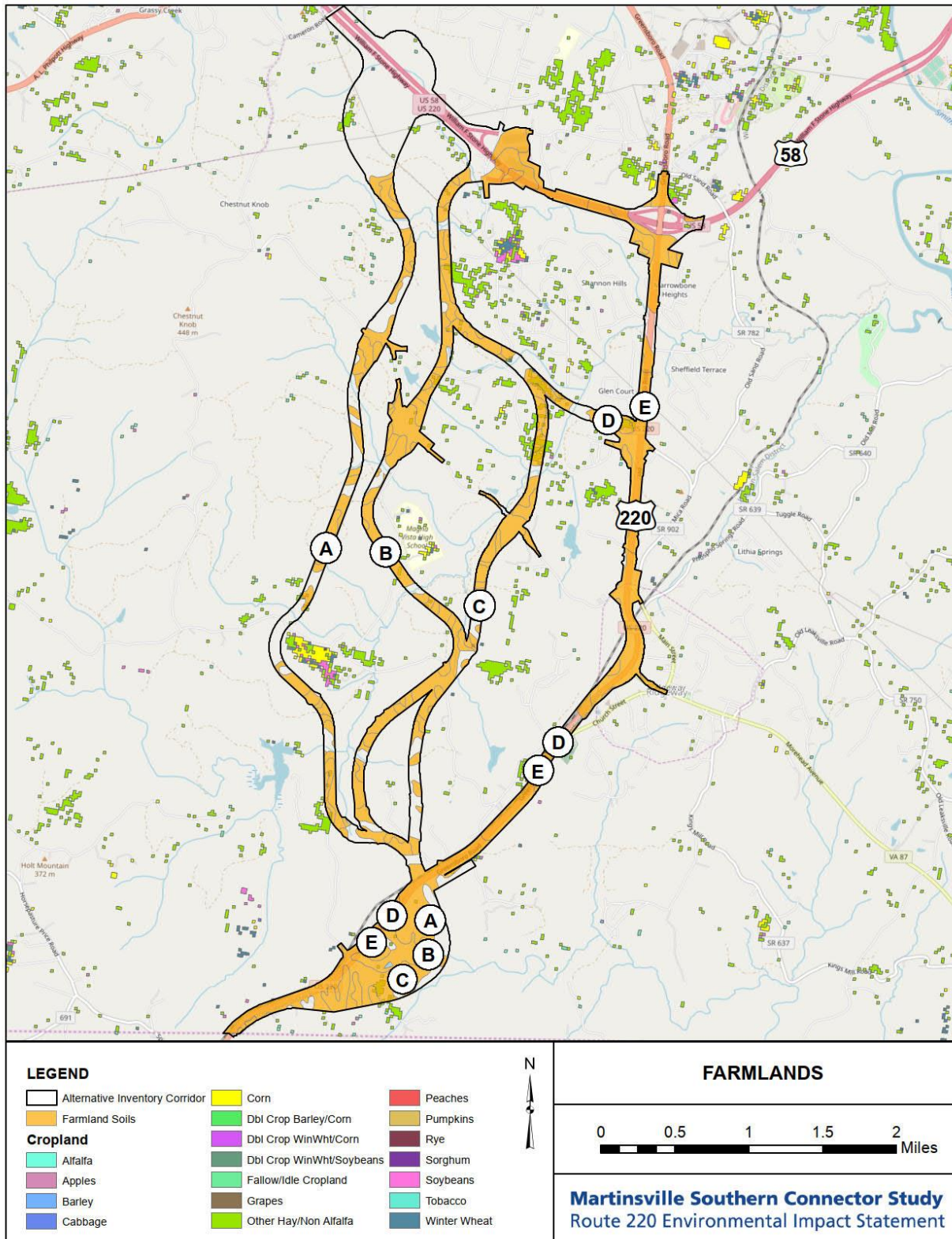
Statewide data provided by the Virginia Department of Forestry (VDOP) indicates there are no agricultural or 3-109 forestal districts within the Alternative Inventory Corridors. Land Evaluation and Site Assessment criteria have been applied to each alternative through completion of Farmland Conversion Impact Rating Forms and were submitted to USDA NRCS for review (see **Appendix D**). According to NRCS Web Soil Survey, there are 11 Prime and farmland of statewide importance soil series or named complexes within the Alternative Inventory Corridors that are subject to FPPA compliance (see **Table 7-1**). Farmland soils within the Alternative Inventory Corridors are shown in **Figure 7-1**.

Table 7-1: Prime and Unique Farmland Soil within the Alternative Inventory Corridors

Soil Series (Symbol)	Soil Series	Farmland Classification
4B	Clifford sandy loam, 2 to 7 percent slopes	Prime Farmland
4C	Clifford sandy loam, 7 to 15 percent slopes	Farmland of Statewide Importance
4D	Clifford sandy loam, 15 to 25 percent slopes	Farmland of Statewide Importance
7B	Creedmoor fine sandy loam, 1 to 4 percent slopes	Farmland of Statewide Importance
14B	Minnieville loam, 2 to 7 percent slopes	Prime Farmland
14C	Minnieville loam, 7 to 15 percent slopes	Farmland of Statewide Importance
14D	Minnieville loam, 15 to 25 percent slopes	Farmland of Statewide Importance
16B	Orenda sandy loam, 2 to 7 percent slopes	Prime Farmland
17C	Orenda-Spriggs complex, 7 to 15 percent slopes	Farmland of Statewide Importance
17D	Orenda-Spriggs complex, 15 to 25 percent slopes	Farmland of Statewide Importance
21B	Woolwine-Clifford complex, 2 to 7 percent	Prime Farmland

Source: USDA 2019

Figure 7-1: Farmland Soils



There is farmland soil present within the study area and in all Alternative Inventory Corridors. Of particular interest is that almost the entire existing Route 220 and adjacent residences and commercial properties have been developed in farmland soils. Most existing development in the study area has occurred on prime farmland soils; removing those areas from potential agricultural production.

7.4 ENVIRONMENTAL CONSEQUENCES

7.4.1 No-Build Alternative

The No-Build Alternative conditions are consistent with the existing pre-development conditions. Existing infrastructure has impacted farmlands (e.g. construction of roads and development of the surrounding area). The current level of impacts to farmland would be anticipated to continue under the No-Build Alternative.

7.4.2 Alternative A

According to the data obtained using the NRCS cropland data layer, 30.8 acres of croplands are identified within the LOD of Alternative A. There are approximately 264 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. The breakdown of cropland impacts is shown in **Table 7-2**. There are approximately 264 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS Farmland Conversion Impact Rating (FCIR) for Corridor Type Projects form, there are 9.71 acres of prime farmland and 258 acres of statewide and local important farmland within the Alternative A LOD. The Farmland Conversion Impact Rating is 95 and therefore, does not meet the threshold (160) for additional mitigation.

7.4.3 Alternative B

According to the data obtained using the NRCS cropland data layer, 38.9 acres of croplands are identified within the LOD of Alternative B. The breakdown of cropland impacts is shown in **Table 7-2**. There are approximately 346 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS FCIR form, there are 66 acres of prime farmland and 336.4 acres of statewide and local important farmland within the Alternative B LOD. The Farmland Conversion Impact Rating is 99 and therefore, does not meet the threshold (160) for additional mitigation.

7.4.4 Alternative C

According to the data obtained using the NRCS cropland data layer, 53.4 acres of croplands are identified within the LOD of Alternative C. The breakdown of cropland impacts is shown in **Table 7-2**. There are approximately 298 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS FCIR form, there are 52.7 acres of prime farmland and 302 acres of statewide and local important farmland within the Alternative C LOD. The Farmland Conversion Impact Rating is 98, and therefore, does not meet the threshold (160) for additional mitigation.

7.4.5 Alternative D

According to the data obtained using the NRCS cropland data layer, 54.6 acres of croplands are identified within the LOD of Alternative D. The breakdown of cropland impacts is shown in **Table 7-2**. There are approximately 246 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS FCIR form, there are 37.4 acres of prime farmland and 385.7 acres of statewide and local important farmland within the Alternative C LOD. The Farmland Conversion Impact Rating is 88, and therefore, does not meet the threshold (160) for additional mitigation.

7.4.6 Alternative E

According to the data obtained using the NRCS cropland data layer, 21.7 acres of croplands are identified within the LOD of Alternative E. The breakdown of cropland impacts is shown in **Table 7.2**. There are approximately 197 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS FCIR form, there are 4.6 acres of prime farmland and 338.5 acres of statewide and local important farmland within the Alternative C LOD. The Farmland Conversion Impact Rating is 87, and therefore, does not meet the threshold (160) for additional mitigation.

Table 7-2: Cropland, Prime Farmland and Farmland of Statewide Importance Impacts

Impacts Within Alternative LOD (acres)					
Soil	A	B	C	D	E
Total Cropland	30.8	38.9	53.4	54.6	21.7
Corn	0	0	0	0	0.1
Winter Wheat/Soybean	0	0.2	0.2	0.2	0.2
Pasture	24.1	33.6	41.3	41.2	20.7
Hay/Non-Alfalfa	6.5	5.1	11.2	12.7	0.3
Soybeans	0	0	0	0	0.4
Winter Wheat	0.2	0	0.7	0.5	0
Prime Farmland and Farmland of Statewide Importance Soils	264	346	298	246	197

7.5 MITIGATION

USDA NRCS Farmland Conversion Impact Rating forms have been completed and reviewed by USDA to determine the impact ratings to prime farmland soils and farmland soils of statewide and local importance. Per the FPPA, if USDA NRCS determines that the Alternative(s) have a Farmland Conversion Impact Rating exceeding a total score of 160, then additional mitigative actions may be required. As the Build alternatives were determined to have impact ratings of 95, 99, 98, 88, and 87, respectively, none of the Build Alternatives were given further consideration for protection, and thus no further action is recommended to mitigate farmland conversion.

8 SOILS, MINERAL RESOURCES AND UNIQUE GEOLOGY

8.1 REGULATORY CONTEXT

Soils, mineral resources, and unique geology are regulated through several mechanisms including the Virginia Erosion and Sediment Control Law, construction general permits, and the Surface Mining Control and Reclamation Act of 1977. These laws and regulatory mechanisms are relevant for this analysis because the potential improvements could result in impacts to soils, mineral resources, and unique geology.

8.2 METHODOLOGY

Soils, mineral resources, and unique geology throughout the study area were assessed by reviewing available publications and digital mapping datasets. Soil data was obtained from the USDA-NRCS to identify and characterize the physical properties of soil types and define their uses and vulnerability. The USDA Web Soil Survey (USDA, 2019) was used to evaluate soil characteristics within the study area. Geology of the study area was reviewed to gain an understanding of the types and structures of rocks present. Such information is important for assessing potential geologic impacts and for evaluating interrelationships between geology, surface water, and groundwater. Geology, mining, and mineral resources were evaluated from maps, publications, and data obtained from the USGS Mineral Resources Data System (MRDS) and Virginia Department of Mines, Minerals, and Energy (DMME) Online Mapping Tool.

Physical properties of soils within the study area influence the evaluation of the Alternatives as they relate to the stability of slopes as well as potential impacts caused by erosion, sedimentation, soil/ground settlement, subsidence, and the potential for wetlands. Using a GIS, soil types considered to be highly erodible or hydric (generally wetland), were digitally overlaid onto Alternatives mapping to calculate potential impacts to these areas. Highly erodible soils (without vegetation) are those that have an erodibility index of eight or above. An erodibility index can be used to evaluate the physical and chemical properties of the soil and climatic conditions of the area.

Soil erodibility as applied to soils under construction site conditions is an environmental analysis consideration with respect to its relationship with proper management of construction activities. Poor or inadequate soil management can result in excessive erosion and sedimentation of water resources. Erodibility is affected by factors including texture (relative proportion of sand, silt, and clay), rock content, permeability, structure, and slope. For this reason, qualitative and quantitative soil erodibility indices were reviewed to determine which erosion-sensitive soil types exist within the study area, and which of those soils, classified as having a high or severe soil erodibility hazard ratings, are intersected by the various Alternatives. These soil series are compared against those soils having only moderate erodibility hazard, whose limitations are much easier to manage with standard engineering and construction practices. In this way, the major relative soil erodibility construction constraints for each alternative can be quantitatively assessed.

8.3 AFFECTED ENVIRONMENT

8.3.1 Soils

The study area is located within the Piedmont Physiographic Province, which is dominated by igneous and metamorphic rock (William and Mary, 2019). The predominant soil parent material includes gneiss, schist, and granite, of which quartz, feldspar, and mica are the dominant primary minerals. Historically, much of the Piedmont region was cleared and farmed intensively, causing

extreme erosion over much of the region. Before modern soil fertility and managerial practices were adapted to these soils, agricultural production diminished, and most farms reverted back to forests (Baker, 2000).

A review of the Soil Survey data indicates that there are nine soil series occurring within the study area. These include the Clifford, Codorus, Colvard, Dyke, Elsinboro, Minnieville, Orenda, Udorthents, and Woolwine series. Within these series, a total of 21 soil mapping units are present.

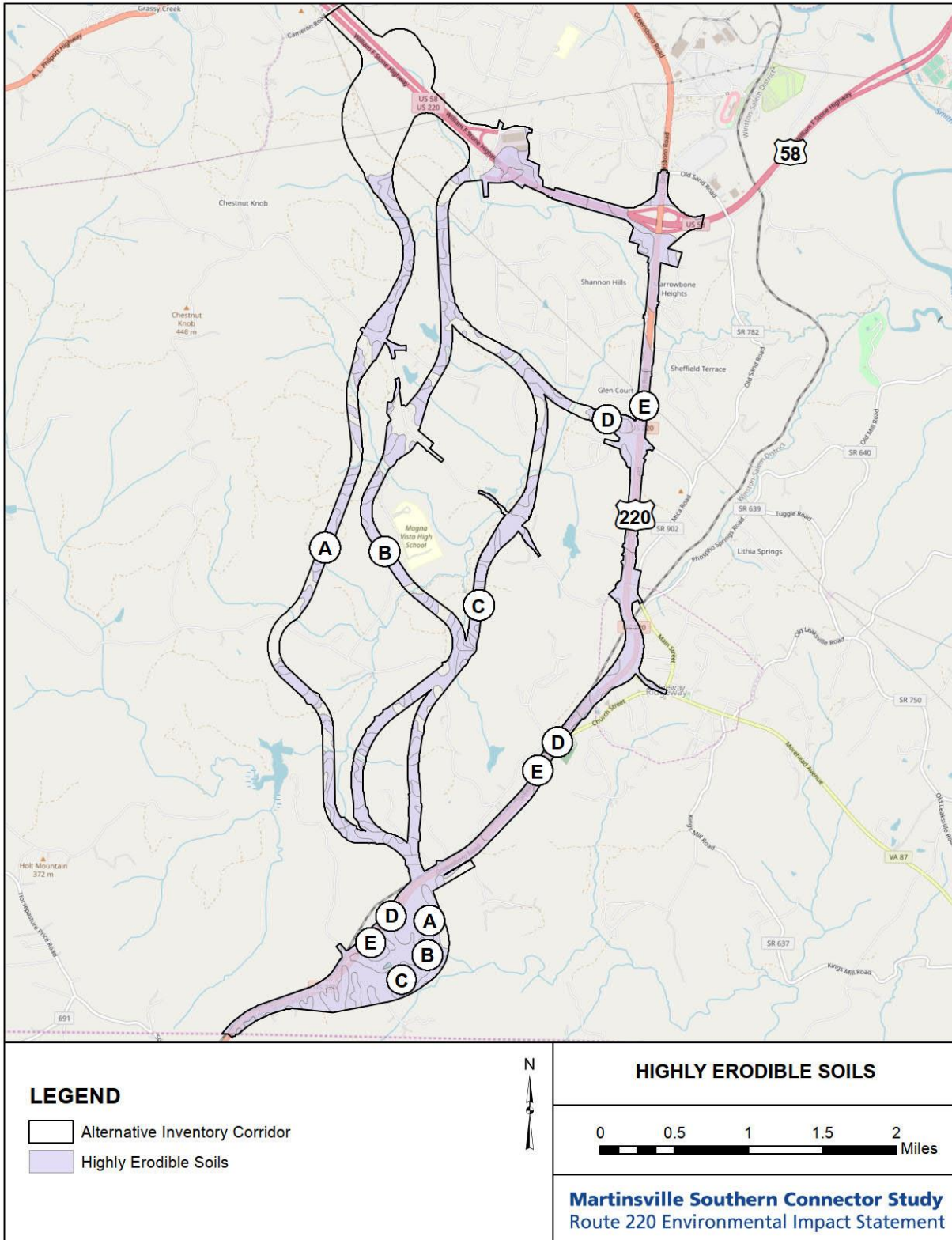
Eight highly erodible soils occur within the Alternative Inventory Corridors (**Figure 8-1**) (USDA, 2019). **Table 8-1** lists the soil mapping units within the Alternative Inventory Corridors and identifies the highly erodible soil mapping units.

Table 8-1: Potential Soil Limitations Within the Alternative Inventory Corridors

Soil Mapping Unit (Symbol)	Soil Mapping Unit	Highly Erodible
4B	Clifford sandy loam, 2 to 7 percent slopes	No
4C	Clifford sandy loam, 7 to 15 percent slopes	Yes
4D	Clifford sandy loam, 15 to 25 percent slopes	Yes
4E	Clifford sandy loam, 25 to 45 percent slopes	Yes
5A	Codorus loam, 0 to 2 percent slopes, frequently flooded	No
6A	Colvard fine sandy loam, 0 to 2 percent slopes, occasionally flooded	No
7B	Creedmoor fine sandy loam, 1 to 4 percent slopes	No
10A	Elsinboro fine sandy loam, 0 to 4 percent slopes, rarely flooded	No
14B	Minnieville loam, 2 to 7 percent slopes	No
14C	Minnieville loam, 7 to 15 percent slopes	Yes
14D	Minnieville loam, 15 to 25 percent slopes	Yes
16B	Orenda sandy loam, 2 to 7 percent slopes	No
17C	Orenda-Spriggs complex, 7 to 15 percent slopes	Yes
17D	Orenda-Spriggs complex, 15 to 25 percent slopes	Yes
17E	Orenda-Spriggs complex, 25 to 45 percent slopes	Yes
19	Udorthents-Urban land complex, 2 to 15 percent slopes	No
20	Udorthents, loamy	No
21B	Woolwine-Clifford complex, 2 to 7 percent	No
21C	Woolwine-Clifford complex, 7 to 15 percent slopes	No
21D	Woolwine-Clifford complex, 15 to 25 percent slopes	No
21E	Woolwine-Clifford complex, 25 to 45 percent slopes	No

Based on the AASHTO Soil Classification System, these eight soil types generally have a high percentage of silt and clay material throughout their soil profiles. Intended specifically for use in highway construction, the AASHTO Classification System rates soils for their suitability for support of roadway pavements. The group classification ranges from A-1 (best soils) to A-8 (worst soils). Soil Survey (USDA, 2019) data identifies these soil types as having low soil strength and not being compatible with steep slopes.

Figure 8-1: Highly Erodible Soils



8.3.2 Mineral Resources

Mineral resources of economic importance within the study area include crushed stone for road construction and concrete, dimension stone for building construction (granite), sand, biotite gneiss, mica, schist, alumina, emery, feldspar, and iron (magnetite).

Crushed stone is, by value, the leading non-fuel mineral in Virginia, accounting for about 59% of the total non-fuel mineral production value. In 2008, Construction gravel and sand was the second leading non-fuel mineral, followed by Portland cement, lime, and zirconium concentrates.

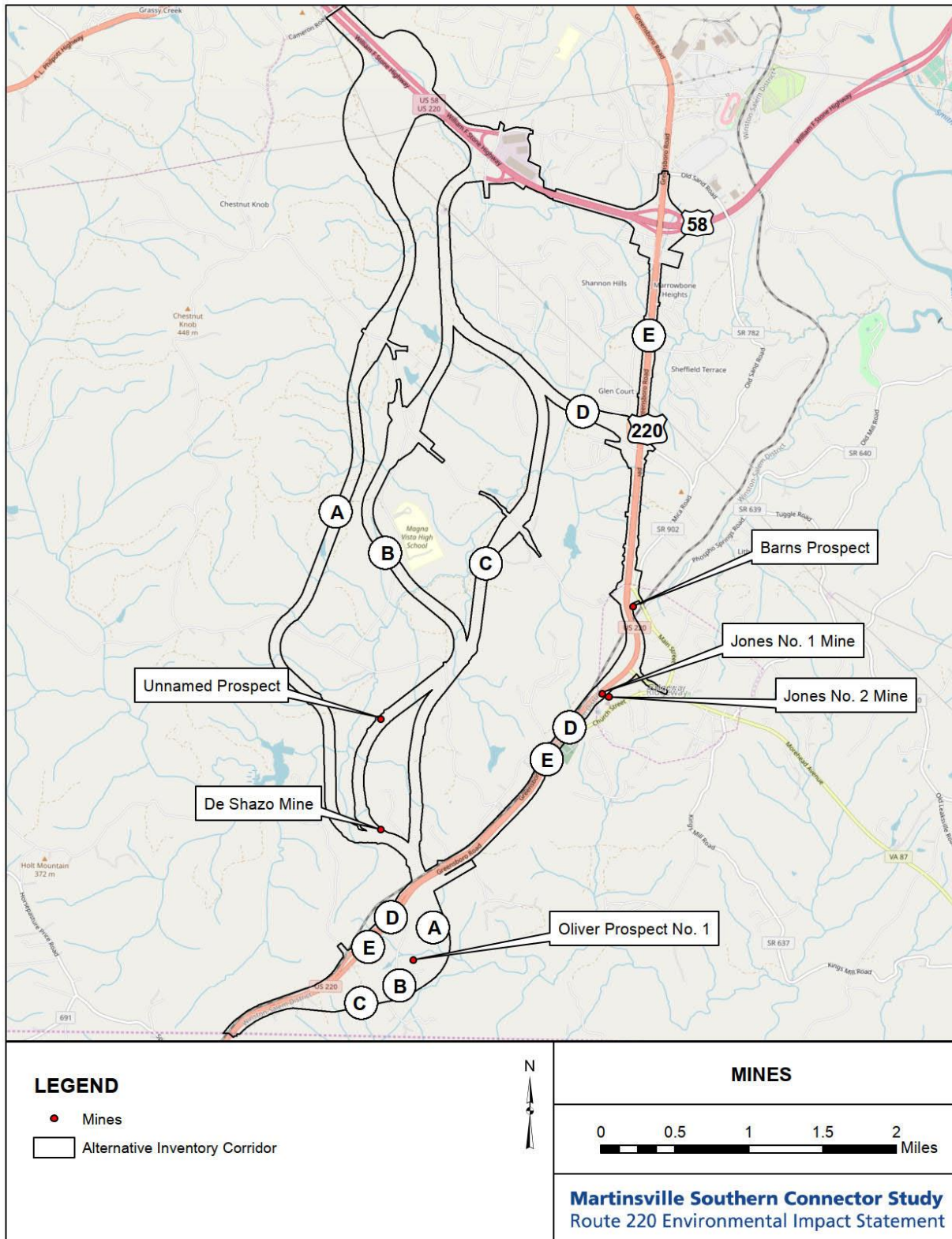
Based on a review of the USGS MRDS online database, there are 6 listed mining sites within the Alternative Inventory Corridors; of which 5 are named (See **Figure 8-2**). The Virginia Department of Mines, Minerals and Energy online database show only orphaned mines within the Alternative Inventory Corridors and are not included here. The named mines are:

- Barns Prospect – primary commodity Mica
- Jones No. 1 Mine – primary commodity Mica
- Jones No. 2 Mine – primary commodity Mica
- Unnamed Prospect – primary commodity Mica
- De Shazo Mine – primary commodity Mica
- Oliver Prospect No. 1 – primary commodity Mica

8.3.3 Unique Geology

The Ridgeway fault is located towards the southern portion of the study area, near the Town of Ridgeway, Virginia. The Ridgeway fault has a dip to the northwest along the southeastern side of the allochthon in Henry County and is truncated against the Bowens Creek fault on the surface at the northeastern end of Chestnut Mountain in Pittsylvania County. As previous noted, the Ridgeway fault is probably truncated by the Bowens Creek fault in the subsurface beneath the Smith River allochthon in the northwestern part of Henry County and is truncated along the Chatham fault to the southeast. The Ridgeway fault zone is extensively intruded by alaskite and mica-bearing pegmatites in some areas and these intrusions have obscured the actual location of the fault line within the Ridgeway mica mining district in the southwestern part of the county (Virginia Division of Mineral Resources, 1996). Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County).

Figure 8-2: Mines



8.4 ENVIRONMENTAL CONSEQUENCES

8.4.1 No-Build Alternative

The No-Build Alternative conditions are consistent with the existing predevelopment conditions. Existing infrastructure has impacted soils, mineral resources, and unique geology through construction of roads, harvesting timber, mining, and development of the surrounding area. The current impacts to soils would be anticipated to continue under the No-Build Alternative.

8.4.2 Alternative A

8.4.2.1 Soils

Construction of Alternative A would result in impacts to approximately 298 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative A. Construction of Alternative A would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

8.4.2.2 Mineral Resources

Construction of Alternative A would not impact mineral operations at Oliver Prospect No. 1 and De Shazo Mine. According to DMME, these mines are long abandoned.

8.4.2.3 Unique Geology

Alternative A traverses the Ridgeway fault at its southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later stages of project design.

8.4.3 Alternative B

8.4.3.1 Soils

Construction of Alternative B would result in impacts to approximately 358 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative B. Construction of Alternative B would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

8.4.3.2 Mineral Resources

Construction of Alternative B would not impact mineral operations at Oliver Prospect No. 1, De Shazo Mine and the Unnamed Prospect. According to DMME, these mines are long abandoned.

8.4.3.3 Unique Geology

Alternative B traverses the Ridgeway fault at its' southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types

or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later states of project design.

8.4.4 Alternative C

8.4.4.1 Soils

Construction of Alternative C would result in impacts to approximately 343 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative C. Construction of Alternative C would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

8.4.4.2 Mineral Resources

Construction of Alternative C would not impact mineral operations at Oliver Prospect No. 1. According to DMME, this mine is long abandoned.

8.4.4.3 Unique Geology

Alternative C traverses the Ridgeway fault at its' southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later stages of project design.

8.4.5 Alternative D

8.4.5.1 Soils

Construction of Alternative D would result in impacts to approximately 405 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative D. Construction of Alternative D would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

8.4.5.2 Mineral Resources

Construction of Alternative D would not impact mineral operations at Jones No.1 Mine, Jones No. 2 Mine and Barns Prospect. According to DMME, these mines are long abandoned.

8.4.5.3 Unique Geology

Alternative D traverses the Ridgeway fault at its' southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later states of project design.

8.4.6 Alternative E

8.4.6.1 Soils

Construction of Alternative E would result in impacts to approximately 352 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative E. Construction of Alternative E would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

8.4.6.2 Mineral Resources

Construction of Alternative E would not impact mineral operations at Jones No.1 Mine, Jones No. 2 Mine and Barns Prospect. According to DMME, these mines are long abandoned.

8.4.6.3 Unique Geology

Alternative E traverses the Ridgeway fault at its' southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later states of project design.

8.5 MITIGATION

Certain soil types, such as highly erodible soils, may require geotechnical analyses to identify their specific properties and to design site-specific construction techniques to ensure proper management of soils. Soils within the construction limits would be protected by erosion and sediment controls devices during construction and then stabilized per VDEQ Erosion and Sediment Control Handbook (VDEQ, 2019b) and VDOT's *Road Design Manual* (VDOT, 2018).

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