Interstate 95 Express Lanes
Fredericksburg Extension Study

NATURAL RESOURCES TECHNICAL REPORT

VDOT Virginia Department of Transportation

U.S. Department of Transportation Federal Highway Administration

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NATURAL RESOURCES TECHNICAL REPORT

INTERSTATE 95 EXPRESS LANES FREDERICKSBURG EXTENSION STUDY

Prepared in support of the Revised Environmental Assessment

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LIST OF ACRONYMS

CBPA	Chesapeake Bay Preservation Act
CEDAR	Comprehensive Environmental Data and Reporting System
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
DO	Dissolved Oxygen
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
FE	Federally-Endangered
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FT	Federally-Threatened
GIS	Geographic Information System
GWMA	Groundwater Management Area
HOT	High Occupancy Toll
HUC	Hydrologic Unit Code
IPaC	Information Planning and Consultation
LOD	Limits of Disturbance
MCBQ	Marine Corps Base Quantico
MDE	Maryland's Department of the Environment
NB	Northbound
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHD	National Hydrography Dataset
NLEB	Northern Long-Eared Bat
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
PCB	Polychlorinated Biphenyl
PEM	Palustrine Emergent

PFO	Palustrine Forested
POW	Palustrine Open Water
PSS	Palustrine Scrub/Shrub
R3	Upper Perennial Stream
R4	Intermittent Stream
R6	Ephemeral Stream
RCI	Reach Condition Index
RMA	Resource Management Area
RPA	Resource Protection Area
SAV	Submerged Aquatic Vegetation
SB	Southbound
SDWA	Safe Drinking Water Act
SE	State-Endangered
SSA	Sole Source Aquifer
ST	State-Threatened
SWAP	Source Water Assessment Program
SWCB	State Water Control Board
SWP	Small Whorled Pogonia
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
US	United States
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VAC	Virginia Administrative Code
VCDR	Virginia Department of Conservation and Recreation
VDCR-DNH	Virginia Department of Conservation and Recreation-Department of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDOF	Virginia Department of Forestry

VDOT	Virginia Department of Transportation
VESCH	Virginia Erosion and Sediment Control Handbook
VFWIS	Virginia Fish and Wildlife Information Service
VIMS	Virginia Institute of Marine Science
VMRC	Virginia Marine Resources Commission
VRRM	Virginia Runoff Reduction Method
VSMP	Virginia Stormwater Management Program
VWPP	Virginia Water Protection Permit
WIP	Watershed Implementation Plan
WLA	Waste Load Allocation
WOUS	Waters of the United States

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the lead federal agency, is preparing a Revised Environmental Assessment (Revised EA) for the I-95 HOT Lanes Project, for which a Finding of No Significant Impact (FONSI) was issued by FHWA in 2011The Revised EA, which is being completed for the I-95 Express Lanes Fredericksburg Extension Study (or the "Fredericksburg Extension Study"), presents improvements identified in a portion of the 2011 FONSI-selected Alternative, from the I-95 / US 17 North interchange at Warrenton Road (Exit 133) to south of the I-95 / Russell Road interchange (Exit 148). The Revised EA also includes new access points along this portion of the 2011 FONSI-selected Alternative. As part of the current study, environmental resources along the corridor were updated according to the latest available data and information.

The purpose of this Technical Report is to analyze existing natural resources along the corridor and to identify potential impacts that could result from implementation of the Build Alternative. Information in this report, described below, provides an overview of methodology/regulations, existing conditions, and potential impacts to Natural Resource associated with the implementation of the Build Alternative, and will support discussions presented in the Revised EA.

1.1.1 Purpose and Need

The purpose and need for the proposed improvements remains the same as presented in the 2011 I-95 HOT Lanes Project EA:

- Reduce daily congestion and accommodate travel demands more efficiently. Existing traffic volumes exceed available highway capacity and the forecasts prepared using the regional travel demand models show continuing traffic growth in the corridor, with much of the Fredericksburg region's workforce continuing to commute north.
- Provide higher reliability of travel times. People place a high value on reaching their destinations in a timely manner, and in recent years, I-95 has become so congested that the existing I-95 facilities cannot provide reliable travel times during the peak periods.
- Expand travel choices by increasing the attractiveness and utility of ridesharing and transit usage while also providing an option for single-occupant vehicles to bypass congested conditions.

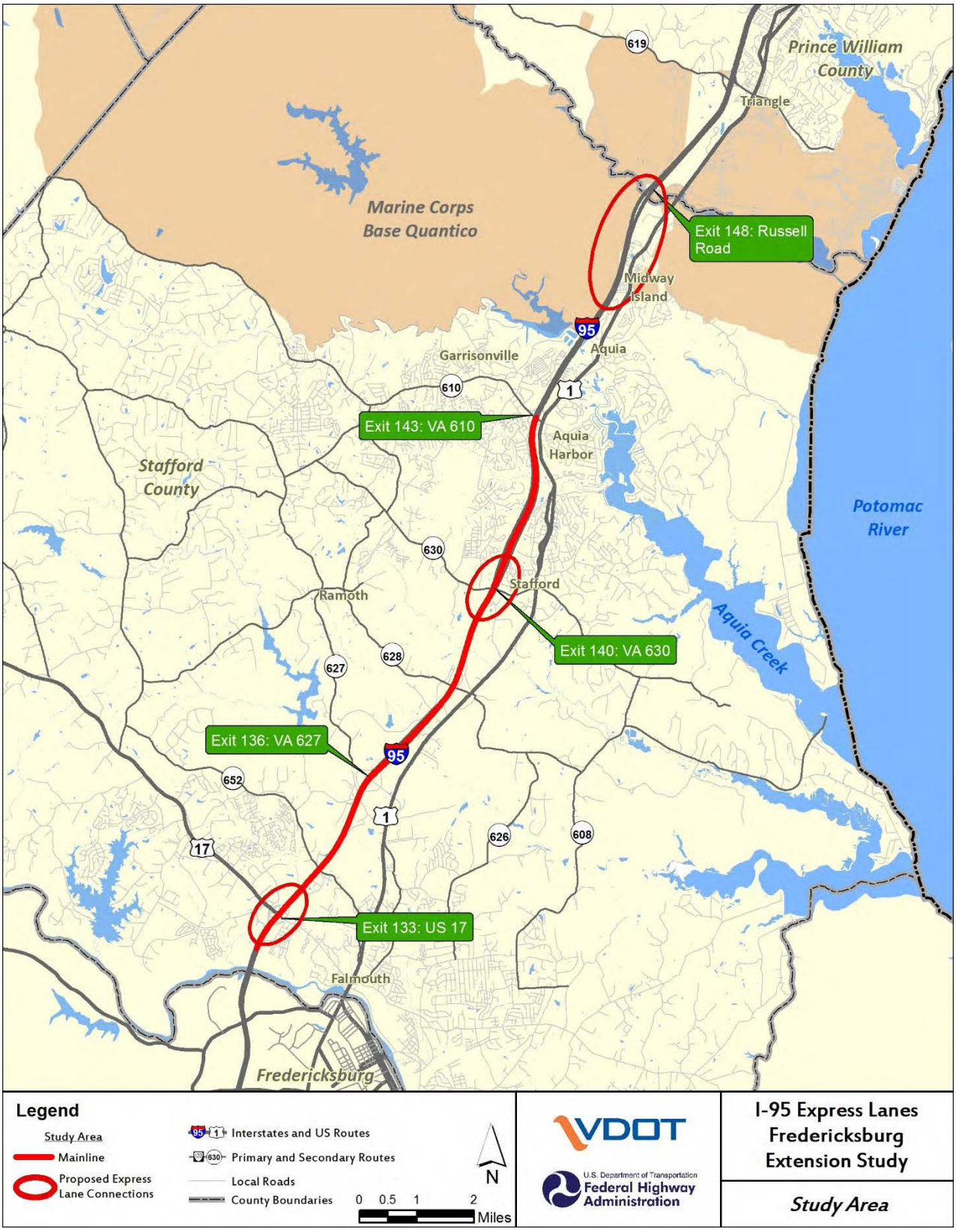
1.1.2 Alternatives

The proposed Build Alternative and the No-Build Alternative are under consideration. The proposed limits of the Build Alternative and areas identified for access improvements are shown on **Figure 1-1**. Additional information on the alternatives is included in the *Fredericksburg Extension Study Alternatives Technical Report* (VDOT, 2017b), and in the Revised EA (VDOT, 2017a).

The No-Build Alternative

Under the No-Build Alternative, the Express Lanes would not be extended beyond the southern terminus of the Southern Extension project, which is currently under construction south of VA 610 / Garrisonville Road (Exit 143). There would be no change to existing access points, and I-95 would remain in its present configuration. VDOT would continue maintenance and repairs of the existing roadway, as needed, with no substantial changes to current capacity or management activities. The No-Build Alternative was not identified as the Preferred Alternative in the 2011 EA and subsequent FONSI, but is

Figure 1-1: Study Area



retained as a baseline for comparison in this technical report.

The Build Alternative

The Build Alternative would extend two reversible Express Lanes in the median of I-95 from the vicinity of the I-95 / US 17 North Interchange at Warrenton Road (Exit 133) to south of the I-95 / VA 610 Interchange at Garrisonville Road (Exit 143) to tie into the Southern Extension Project. It would also provide Express Lane access in the vicinity of the I-95 / US 17 North Interchange at Warrenton Road (Exit 133), the I-95 / VA 630 Interchange at Courthouse Road (Exit 140), and the I-95 / Russell Road Interchange (Exit 148). The Build Alternative is consistent with the 2011 FONSI-selected alternative.

The Build Alternative has two typical sections: a narrow, closed section applied from the I-95 / US 17 interchange at Warrenton Road (Exit 133) to the vicinity of VA 628 / American Legion Road, and an open section, applied from the vicinity of VA 628 / American Legion Road to south of VA 610 / Garrisonville Road at Exit 143. The narrow typical section was applied in the southern half of the Build Alternative to avoid and minimize impacts to Waters of the United States (WOUS), which are more prevalent in that portion of the corridor. This effort led to avoidance of approximately 131 linear feet of streams, 0.2 acre of wetlands, 1.3 acre of resource protection areas, 0.8 acre of floodplains, and 0.1 acre of aquatic habitat.

2. INVENTORY OF EXISTING NATURAL RESOURCES

Natural Resources in the study area were identified based on agency input through the scoping process, review of existing available scientific literature, Geographic Information System (GIS) databases, and mapping and field reconnaissance of the study area, which occurred winter 2016 through spring 2017. The study area was established to fully capture potential impacts along the mainline of I-95 and its interchanges, and is referred to as the "inventory corridor" in the Revised EA. The study area does not represent the limits of disturbance (LOD) or limits of impacts. Database information was obtained from the following federal and state agencies regarding natural resources in the study area:

- Maryland Department of the Environment (MDE)-Maryland impaired waters
- Natural Resources Conservation Service (NRCS)-Study area soils and prime farmland soils in the study area
- United States Environmental Protection Agency (USEPA), Region III, Environmental Programs-Impaired waterways in the study area
- United States Fish and Wildlife Service (USFWS)-Federally-listed threatened or endangered species in the study area
- Virginia Department of Conservation and Recreation (VDCR)-Natural heritage resources in the study area
- Virginia Department of Environmental Quality (VDEQ)-Virginia impaired waters
- Virginia Department of Forestry (VDOF)-Forest cover in the study area
- Virginia Department of Game and Inland Fisheries (VDGIF)-State-listed threatened or endangered species waters, anadromous fish use areas, observed or potential state-listed threatened or endangered species in the study area, and potential non-protected species in the study area

In general, natural resources were inventoried within a 100-foot buffer beyond the existing right-of-way along the project corridor, or a 30-foot buffer beyond the LOD, whichever encompassed a larger area.

Specific information regarding data gathering sources and approach are presented within the discussion of each resource in the following sections.

2.1 WATER RESOURCES

2.1.1 Regulatory Context

Water Quality

In compliance with Sections 303(d), 305(b), and 314 of the Federal Water Pollution Control Act (i.e., 1972 Clean Water Act amended in 1977, or CWA) and the Safe Drinking Water Act, VDEQ has developed a prioritized list of waterbodies that currently do not meet state water quality standards. VDEQ monitors streams and waterbodies for a variety of water quality parameters including temperature; dissolved oxygen (DO) levels; pH; the presence of fecal coliform, *Escherichia coli*, and enterococci bacteria; total phosphorus and chlorophyll-a levels; benthic invertebrates; and metals and toxics in the water column, sediments, and fish tissues. By monitoring these parameters, the VDEQ determines which waterbodies have impaired water quality and how the type or extent of impairment affects the primary uses of the waterbody. The primary uses include:

- Aquatic Life: supports the propagation, growth, and protection of a balanced indigenous population of aquatic life that may be expected to inhabit a waterbody;
- Recreation: supports swimming, boating, and other recreational activities;
- Fish Consumption: supports game and marketable fish species that are safe for human health;
- Shellfishing: supports the propagation and marketability of shellfish (clams, oysters, and mussels);
- Public Water Supply: supports safe drinking water; and
- Wildlife: supports the propagation, growth, and protection of associated wildlife.

Virginia's water quality standards (9 VAC 25.260) define the water quality needed to support each of these uses by establishing numeric physical and chemical criteria. If a waterbody fails to meet the water quality standards, it would not support one or more of its designated uses, as described above. These waters are considered to be impaired and placed on the 303(d) list, as required by the CWA.

Once a waterbody has been identified as impaired due to human activities and placed on the 303(d) list, VDEQ is required to develop a Total Maximum Daily Load (TMDL) for the parameters that do not meet state water quality standards. The TMDL is a reduction plan that defines the limit of a pollutant(s) that a waterbody can receive and still meet water quality standards. A TMDL implementation plan, including Waste Load Allocations (WLA), is developed by VDEQ once the TMDL is approved by the USEPA. The ultimate goal of the TMDL Implementation Plan is to restore the impaired waterbody and maintain its water quality for its designated uses.

The Virginia Stormwater Management Program (VSMP) includes regulations (9 VAC 25-870) requiring water quality treatment, stream channel protection, and flood control standards for all new construction and redevelopment projects.

Streams

Water resources are federally regulated by the USEPA and the United States Army Corps of Engineers (USACE) under the CWA. The USEPA and USACE share responsibility for implementing Section 404 of the CWA. Section 404 of the CWA specifically regulates dredge and fill activities affecting WOUS, which can be defined as all navigable waters and waters that have been used for interstate or foreign commerce, their tributaries and associated wetlands, and any waters that if impacted, could affect the former.

Before the USACE issues a permit to impact WOUS under Section 404, the state must certify that state water quality standards would not be violated by the proposed work (Section 401 of the CWA). In Virginia, the VDEQ is the authority that provides the Section 401 certification through its Virginia Water Protection Permit (VWPP) Program (9 VAC 25-210) which gets its statutory authority from 62.1-44.15 of the Code of Virginia. State law requires that a VWPP be obtained before disturbing a stream or wetland by clearing, filling, excavating, draining, or ditching. The issuance of a state VWPP does not depend on the issuance of a federal Section 404 permit.

Work in non-tidal streams with drainage areas greater than five square miles also require a permit from the Virginia Marine Resources Commission (VMRC) under the authority of Chapter 12 of Title 28.2 of the Code of Virginia. The USACE, the US Coast Guard, the VDEQ, and the VMRC all issue permits for various activities in, under, and over WOUS.

The definition of what constitutes a WOUS was clarified on June 29, 2015 with publication of the Clean Water Rule (40 CFR §230.3). The rule made no change to the jurisdictional nature of navigable waters, interstate waters, territorial seas, and impoundments, but did provide changes to the jurisdictional nature of tributaries to the traditionally navigable waters, adjacent wetlands/waters, and isolated or "other" waters (USEPA, No Date). Following issuance of Executive Order (EO) 13778 on February 28, 2017, the U.S. Court of Appeals for the Sixth Circuit stayed the 2015-revised regulatory definition of WOUS. EO 13778 titled Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the United States" Rule stated:

- The Administrator of the USEPA and Assistant Secretary of the Army for Civil Works review the 2015 Clean Water Rule to ensure that the Nation's waters are free from pollutants while also promoting economic growth and minimizing regulatory uncertainty; and
- The definition of navigable waters in future rulemaking be as defined in 33 USC 1362(7), in a manner consistent with the opinion of Justice Antonin Scalia in Rapanos v. United States, 547 U.S. 715 (2006) (Office of the Press Secretary, 2017).

Wetlands

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

Wetlands are currently defined by the USACE (33CFR §328.3[b]) and the USEPA (40 CFR §230.3[t]) as:

> "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Aquifers/Water Supply

Congress enacted the Safe Drinking Water Act (SDWA) in 1974 and amended and reauthorized it in 1986 and 1996. It is the main federal law that ensures the quality of Americans' drinking water, and authorizes the USEPA to set national standards for drinking water to protect against health effects from exposure to naturally-occurring and man-made contaminants. These drinking water standards only apply to public water systems, and the USEPA works with states, localities, and water suppliers who maintain these standards.

VDEQ adopted a one-mile wellhead protection zone around all groundwater public sources (VDEQ, 2005). Code of Virginia, §15.2-2223 and §15.2-2283, include ground water protection provisions for local governments to consider when developing Comprehensive Plans and/or zoning ordinances. The selection of management methods to protect ground water is determined at the local level. The Virginia Department of Health (VDH) received USEPA approval for their Source Water Assessment Program (SWAP) and completed assessments and susceptibility evaluations on all public water supply systems in the Commonwealth in 2003.

The USEPA's Sole Source Aquifer (SSA) program (authorized by Section 1424(e) of the Safe Drinking Water Act of 1974 (Public Law 93-523, 42 U.S.C. 300 et. seq)) enables them to designate an aquifer as a sole source of drinking water and establish a review area (USEPA, 2016). USEPA defines a 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. USEPA has the authority to review proposed projects that both receive federal funding and are located within the review area.

The VDEQ, under the Ground Water Management Act of 1992, manages groundwater withdrawals in certain areas called Groundwater Management Areas (GWMA) (VDEQ, No Date a). As defined in 9VAC25-600-10, 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. The study area is located within the Eastern Groundwater Management Area.

Submerged Aquatic Vegetation

In Virginia, the VMRC has jurisdiction over subaqueous bottoms or bottomlands through Subtitle III of Title 28.2 of the Code of Virginia, and is directed to define existing beds of submerged aquatic vegetation (SAV) in consultation with the Virginia Institute of Marine Science (VIMS) (VA Code § 28.2-1204.1). SAV includes an assemblage of underwater plants found in shallow waters of the Chesapeake Bay and its river tributaries as well as coastal bays of Virginia. According to the Virginia Administrative Code (VAC), 4 VAC 20-337-30, any removal of SAV from State bottom or planting of nursery stock SAV for any purpose, other than pre-approved research or scientific investigation, would require prior approval by VMRC. Any request to remove SAV from or plant SAV upon State bottom shall be accompanied by a complete Joint Permit Application submitted to the VMRC (VMRC, 2017).

VIMS monitors and maintains a database for the presence and health of SAV in the Chesapeake Bay and its watershed (Orth et al., 2016). Since 2001, VIMS has been orthorectifying aerial images to annually document the extent of SAV beds as part of the Annual SAV Monitoring Program. VIMS also maintains an on-line interactive mapper which depicts SAV beds in the Chesapeake Bay region dating back to 1971, and this database was used to obtain current information on the presence of SAV in the study area.

2.1.2 Existing Conditions

Water Quality

Methodology

The water quality of some rivers/streams and waterbodies contained in, and downstream of, the study area was evaluated in the recent 303(d) and 305(b) integrated reports released by Virginia and Maryland. The *Final 2014 305(b)/303(d) Water Quality Assessment Integrated Report* was released by VDEQ on June 13, 2016. The report summarizes water quality conditions in Virginia from January 1, 2007 through December 31, 2012. Data from this report is available as GIS shapefiles and these were used to determine the location of impaired waters in relation to the study area (VDEQ, 2016). Maryland's MDE *Draft 2016 Integrated Report of Surface Water Quality* is through the public comment period and

supplants the Final 2014 Integrated Report identifying the impaired waters downstream of the study area (MDE, 2016).

Results

There are 24 streams/rivers or stream/river segments in, or downstream of, the study area that are designated "impaired waters" under Section 303(d) of the CWA (**Table 2-1** and **Figure 2-1**) (VDEQ, 2016; MDE, 2016). Only Falls Run, which is impaired for aquatic life, is within the inventory corridor.

Table 2-1: Impaired Waters in and Downstream of the Study Area

State ID	Assessed Water Unit	Impairment	Pollutant	Impairment Length in Study Area (Linear Feet)
POTOH1	Lower Potomac River-Oligohaline	Aquatic Life Open Water	Low DO Low DO	0.0
VAN-E20R FAL01A04	Falls Run	Aquatic Life	Benthic-Macroinvertebrate Bioassessments	1,090
VAN-E20E RPP03A02; VAN-E20E RPP02A02; VAN-E20E RPP01A02; VAN-E21E RPP05A02	Rappahannock River-Estuarine	Aquatic Life Fish Consumption Recreation	Low DO PCB in Fish Tissue *Escherichia coli*	0.0
VAN-E20R CLB01A00	Claiborne Run	Fish Consumption Recreation	PCB in Fish Tissue *Escherichia coli*	0.0
VAN-A29E POM20A04; VAN-A29E POM02A02; VAN-A29E POM03A08; VAN-A29E POM01A04	Potomac Creek-Estuarine	Fish Consumption	PCB in Fish Tissue	0.0
VAN-A29E POM01B06	Potomac Creek-Estuarine	Aquatic Life Fish Consumption	pH PCB in Fish Tissue	0.0
VAN-A29R POM02A06	Potomac Creek-Riverine	Recreation	*Escherichia coli*	0.0
VAN-A29R ACC01A00	Accokeek Creek	Recreation	*Escherichia coli*	0.0
VAN-A28R AUS02A06	Austin Run	Recreation	*Escherichia coli*	0.0
VAN-A28E AUA02A04; VAN-A28E AUA01D06; VAN-A28E AUA01C00; VAN-A28E AUA20A02; VAN-A28E AUA01B06; VAN-A28E AUA01A14	Aquia Creek-Estuarine	Fish Consumption	PCB in Fish Tissue	0.0
VAN-A26R XLF01A10	Unnamed Tributary to Potomac River	Recreation	*Escherichia coli*/pH	0.0
VAN-A26E_CHO01B06; VAN-A26E CHO01A04	Chopawamsic Creek-Estuarine	Fish Consumption	PCB in Fish Tissue	0.0

Notes: DO = dissolved oxygen; PCB = polychlorinated biphenyl.
Sources: VDEQ (2016); MDE (2016).

Streams

Methodology

Non-tidal streams were identified in the study area using the National Hydrography Dataset (NHD) from the US Geological Survey (USGS, 2017a; USGS, 2017b) and field reconnaissance. Streams in the study area were classified during the reconnaissance survey, which occurred winter 2016 through summer 2017, using Regulatory Guidance Letter 05-05 by the USACE (USACE, 2005) and investigated in accordance with the limits defined in 33 CFR Part 328. The boundaries of non-tidal waters are set at the ordinary high water mark (OHW). The OHW is determined in the field using physical characteristics established by the fluctuations of water (e.g., change in plant community, changes in the soil character, shelving). Stream conditions were evaluated using the Unified Stream Methodology (USM) for use in Virginia (USACE and VDEQ, 2007). USM data forms were completed at the upstream and downstream ends of accessed stream reaches. Stream channel, riparian buffer, instream habitat, and channel alteration conditional information were recorded for perennial and intermittent streams in the study area. The USM only requires evaluation of riparian buffer habitat condition for ephemeral streams. Other waters (including springs, streams, swales, ditches, and drainage culverts) were delineated based on the application of the hydrology parameter and the regulatory definition of OHW (33 CFR Part 328).

Results

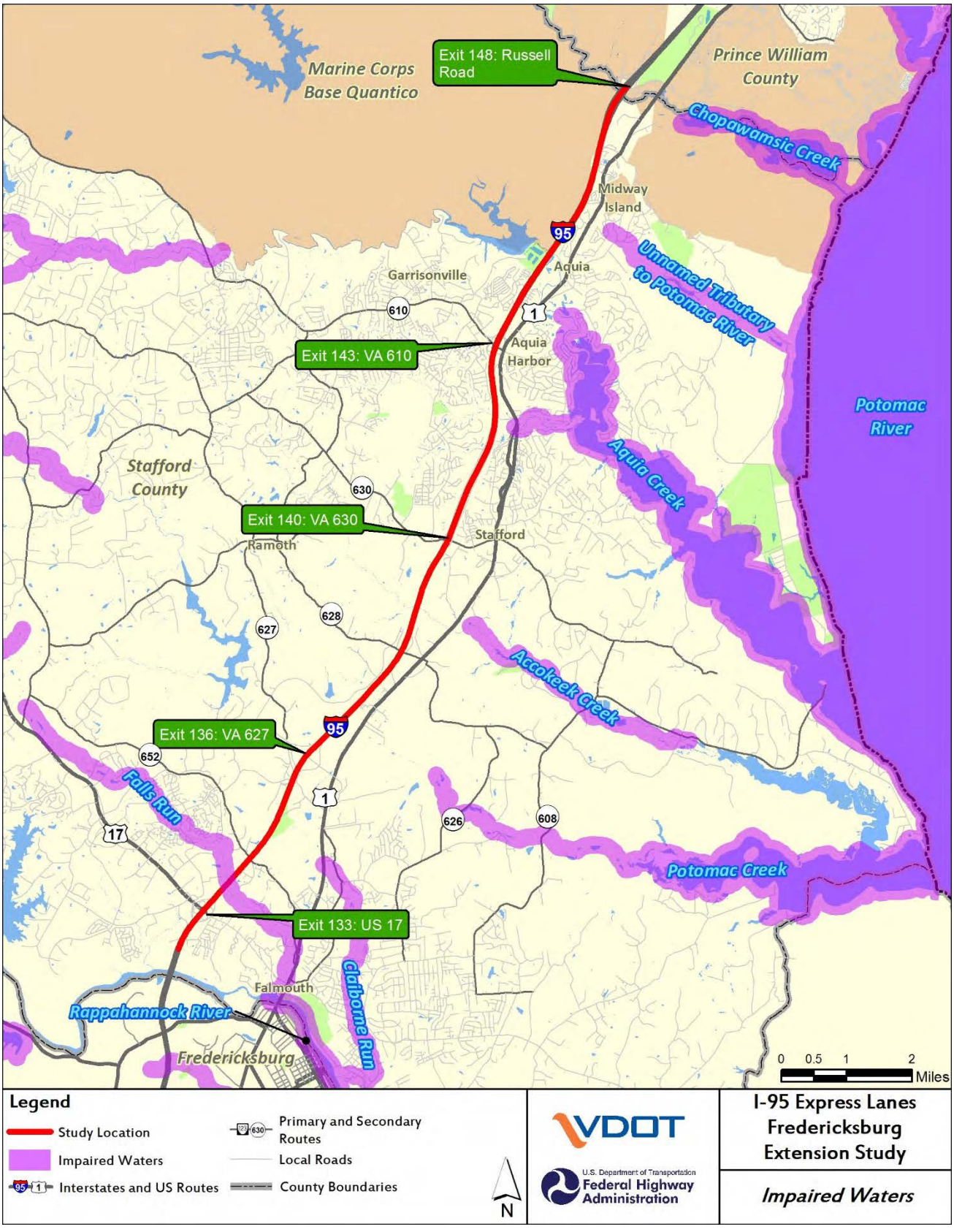
The majority of the study area lies within the Atlantic Slope watershed of the Lower Potomac River watershed (Hydrologic Unit Code [HUC] 02070011) with the southern end of the study area occurring within the Lower Rappahannock River watershed (HUC 02080104). The study area crosses the following sub-watersheds:

- Chopawamsic Creek (HUC 020700110105)
- Lower Aquia Creek (HUC 020700110203)
- Accokeek Creek (HUC 020700110204)
- Potomac Creek – Beaverdam Creek (HUC 020700110206)
- Rappahannock River – Hazel Run (HUC 020801040102)

The streams in the study area are located within the inner Coastal Plain Physiographic Province near the Fall Zone. The inner edge of the Coastal Plain roughly corresponds to the route of Interstate 95. The inner Coastal Plain is a broad upland, gently dissected by streams but quite rugged where short, high-gradient streams have incised steep ravine systems (Fleming et al., 2016).

During the survey, streams in the study area were classified as either ephemeral (R6), intermittent (R4), and upper perennial (R3). Ephemeral streams were generally located in areas with the smallest drainage area, or areas that had drainage diverted away from them. Flows in intermittent streams were dependent on a number of factors, including the groundwater table and the discharge from feeder streams. Perennial streams generally had a larger watershed or were spring-fed. Most stream channels

Figure 2-1: Impaired Waters



within the VDOT right-of-way and developed areas showed signs of historic alteration, including ditching or straightening, as well as areas of rip-rap. Streams in the study area, located outside of the VDOT right-of-way in undeveloped areas, were found to be relatively undisturbed while others appeared to be historically altered, but have since naturalized. Many of the streams identified are fragmented in nature, with upstream and downstream connections via culvert. All streams were found to have a significant nexus to offsite navigable waters and are therefore jurisdictional. In heavily developed areas or within the VDOT right-of-way, the nexus may be due to jurisdictional flow through underground pipes/culverts that discharge to the surface offsite. **Table 2-2** shows the total stream lengths in the study area for each of the two watersheds, categorized by flow persistence. Mapping provided in **Appendix A** shows the location of streams in the study area as identified in the field reconnaissance survey.

Table 2-2: Stream Lengths in Study Area Watersheds

Watershed	Ephemeral (R6) Linear Feet	Intermittent (R4) Linear Feet	Perennial (R3) Linear Feet	Total in Watershed (Linear Feet)
Lower Potomac River (02070011)	6,322	8,146	23,724	38,192
Lower Rappahannock River (02080104)	133	2,595	1,207	3,935
Total	**6,455**	**10,741**	**24,931**	**42,127**

Wetlands

Methodology

An investigation to determine the potential presence of WOUS was performed in accordance with the USACE's *Wetlands Delineation Manual*, Y-87-I (USACE, 1987) and *the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)* (USACE, 2012). Routine wetland determination methods were used to determine the presence and boundary of wetlands in the study area. Wetland Determination Data Forms were completed to document representative conditions in the delineated wetland and adjacent upland.

Results

Mapping provided in **Appendix A** shows the location of wetlands identified in the field reconnaissance survey. A total of 15.5 acres of wetlands have been identified in the study area (**Table 2-3**), primarily concentrated within the southern half of the corridor. The wetlands having been categorized based on vegetation type using the system defined by Cowardin et al. in *Classification of Wetlands and Deepwater Habitats of the United* States (Cowardin et al., 1979). The wetlands are further divided based on location in the two HUC eight-digit watersheds (02070011 and 02080104) that are represented in the study area boundary. Of these watersheds, the study area comprises approximately 0.09 percent of HUC 02080104's and 0.04 percent of HUC 02070011's overall watershed area.

All wetlands identified in the study area are palustrine wetlands, which are freshwater wetlands with salinities below 0.5 parts-per-thousand and maximum water depths of 6.6 feet. The majority of wetlands identified are Palustrine Forested wetlands (75 percent), followed by Palustrine Emergent wetlands (17 percent). Approximately 72 percent of the wetlands are located in the existing right-of-way with approximately 50 percent occurring between the divided lanes of the interstate.

VDOT and FHWA are committed to requesting a preliminary jurisdictional determination (JD) from USACE to confirm these wetland estimates. The JD would occur after the NEPA process but prior to procurement.

Aquifers/Water Supply

Methodology

The VDH reviews projects for their proximity to public drinking water sources. The USEPA's National Sole Source Aquifer (SSA) GIS Layer was used to determine the boundaries of SSAs and to plot these in relation to the study area (USEPA, 2017). Information on groundwater and underlying aquifers was obtained with assistance from VDEQ's Ground Water Withdrawal Permitting Program, Office of Water Supply. Nearby reservoirs were identified using VDEQ's What's in my Backyard Online Mapper (VDEQ, 2017).

Table 2-3: Study Area Wetland Acreage by Watershed

Watershed	PFO Acres	PSS Acres	PEM Acres	POW Acres	PUBx Acres	Study Area Acreage
Lower Potomac River (02070011)	10.7	0.3	2.6	0.8	0.0	14.4
Lower Rappahannock River (02080104)	0.9	0.0	0.0	0.2	0.0	1.1
Total	**11.6**	**0.3**	**2.6**	**1.0**	**0.0**	**15.5**

Notes: PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub, PEM = Palustrine emergent, POW = Palustrine Open Water, PUBx = Palustrine Unconsolidated Bottom Excavated

Results

Table 2-4 summarizes the public water search results. As noted in the table, no public water resources were found in the study area, but the study area is within the Eastern Groundwater Management Area in Virginia. Under the Ground Water Management Act of 1992, Virginia manages groundwater through a program regulating the withdrawals of groundwater within designated Groundwater Management Areas (GWMA). Any person or entity located within a declared GWMA must obtain a permit to withdraw 300,000 gallons or more of groundwater in any one month.

Table 2-4: Public Water Supplies in the Study Area

Public Water Resource	Result
Public Ground Water Wells	None in the study area
Public Surface Water Intakes	None in the study area
Public Springs	None in the study area
Sole Source Aquifers	None designated in the study area
Reservoirs	None in the study area

Submerged Aquatic Vegetation

Methodology

Shallow water areas, featuring SAV, provide protective aquatic habitat for many species. The SAV gives three-dimensional cover for juvenile and adult finfish and shellfish while filtering runoff and reducing wave energy and suspended sediment in the water. Its presence, or absence, can be indicative of water quality (National Oceanic and Atmospheric Administration [NOAA], No Date). GIS data containing the locations of SAV beds were obtained from the VIMS SAV program for their 2015 survey year (Orth et al., 2016). This data was overlain with the study area location to determine the location of previously identified SAV beds in relation to the study area.

Results

The VIMS SAV program recorded approximately 3,260 acres of SAV adjacent to the study area during their 2015 survey (**Figure 2-2**). The majority were located along the western bank of the Potomac River and within its tidal embayments. No SAV beds were located in the study area in the 2015 survey. The nearest beds to the study area occurred approximately 1.2 miles to the east in Austin Run (Orth et al., 2016).

2.1.3 Environmental Consequences

Potential impacts have been calculated using a planning level limits of disturbance (LOD) for the proposed alternatives. The planning level LOD is conservative in design and accommodates roadway improvements, drainage, stormwater management facilities, utilities, erosion and sediment control, and construction easements. Therefore, impact values presented for the evaluated resources represent the worst-case scenarios and assume complete impact to the resource occurring in the LOD. The resource impact values would be updated as design proceeds and would be included to obtain regulatory agency permit approval, if required. Recommendations for potential minimization and mitigation measures for unavoidable adverse impacts are provided.

Water Quality

No-Build Alternative

Although stormwater management along the I-95 corridor has been updated during the past with retrofitted and more modern systems as improvements have been made, there are still sections where stormwater management features are absent, or the features are outdated, and these areas would not be improved under the No-Build Alternative. Existing indirect effects to water quality associated with untreated or poorly treated stormwater runoff from these areas would continue.

Build Alternative

Approximately 1,090 feet of Falls Run, which is impaired for aquatic life, occurs in the planning level LOD. Benthic-macroinvertebrate surveys conducted along the stream indicate that the stream's health is compromised as the benthic survey scores resulting from the surveys are below the impairment threshold. Benthic-macroinvertebrate community health can be an indicator of water quality as species in this community respond to stressors with standards (e.g. DO levels), and those that do not have standards (e.g., nutrients and sedimentation) (VDEQ, 2016).

Potential impacts to the impaired water during construction include direct disturbance or alteration (e.g. placing of culverts or bridge widening), accidental spills, and sediment releases. Avoidance and

Figure 2-2: Submerged Aquatic Vegetation

minimization measures would be considered in the final design, as appropriate, to reduce the direct disturbance or alteration to the impaired stream. By following proper spill prevention and erosion and sediment control (ESC) procedures, the remaining potential construction-related direct impacts would be minimized.

Post construction, impacts, if any, would primarily result from the increase in impervious surface area in a location that contains impervious surfaces with the existing interstate facility. Runoff from roadways could contain heavy metals, salt, organic compounds, and nutrients. Modern temporary and permanent stormwater management (SWM) measures, including SWM ponds, sediment basins, vegetative controls, and other measures would be implemented, as appropriate, to minimize potential degradation of water quality due to increased impervious surface and drainage alteration. These measures would reduce or detain discharge volumes and remove many pollutants before discharging into the receiving impaired water.

Streams

No-Build Alternative

Stormwater management features are absent, or outdated, in portions of the study area. Existing indirect effects to streams associated with untreated or poorly treated stormwater runoff from these areas would continue under the No-Build Alternative.

Build Alternative

Under the Build Alternative, potential impacts to ephemeral, intermittent, and perennial streams are unavoidable due to the necessity of the improvements to be adjacent and parallel to existing I-95. Impacts would occur primarily due to fill resulting from roadway widening and appurtenant features, culvert extensions, drainage improvements, bridge expansions, and interchange reconfiguration. The majority of potential impacts (approximately 76 percent) are associated with mainline improvements. The remaining potential stream impacts are located at interchange/connection areas.

Minimization efforts would be considered during final design, as appropriate, to reduce the amount of stream impacts. Efforts considered may include utilization of the steepest acceptable fill slopes in order to shorten the length of culverts and minimizing the length of stream impacts. Minor alignment shifts in localized areas could be employed to avoid lateral encroachments on particular streams; however, since the alternatives primarily involve expanding an existing roadway, opportunities are dependent upon the current positioning of the stream relative to the roadway crossing. Culverts could be countersunk and sized appropriately using VDOT criteria to minimize the effects to aquatic species. Employing erosion and sediment control measures and best management practices following the *Virginia Erosion and Sediment Control Handbook* (VESCH) such as silt fence installation, culvert inlet and outlet protection, diversion ditches, temporary sediment traps and basins, and vegetative and structural streambank stabilization, along with temporary and permanent seeding would prevent sedimentation and divert runoff away from receiving streams (VDEQ, 1992). Additional measures to minimize impacts include: blocking no more than 50 percent of the streamflow at any given time, ensuring groundwater recharge through the location of outfalls and infiltration trenches, and locating stormwater management facilities outside of WOUS, including streams and wetlands.

During the field reconnaissance survey, streams were assessed using Form 1 of the USACE/VDEQ Unified Stream Methodology to assign a Reach Condition Index (RCI) to each stream reach to determine potential mitigation requirements for unavoidable impacts. Parameters used to determine RCI include channel condition, riparian buffers, in-stream habitat/available cover, and channel alteration. RCI values range from 0.5 to 1.5 with the highest value assigned to streams exhibiting optimum channel, habitat,

and riparian buffer conditions as well as negligible channel alternation. **Table 2-5** and **Table 2-6** provide the length of streams delineated in the planning level LOD, and their RCI values, for the Lower Potomac and Lower Rappahannock River Watersheds, respectively.

Table 2-5: Streams Evaluated in the Lower Potomac Watershed Portion of the Planning Level LOD

Reach ID	Cowardin Classification	Reach Condition Index	Length of Stream (Linear Feet)
RK1.300.21	EPH	0.34	84.9
RK1.301.21	EPH	0.33	53.1
RK1.302.21	EPH	0.36	33.5
RK1.75.37A	R3	1.03	177.2
RK1.80.31	EPH	0.52	13.3
RK1.81.31	R4	0.84	47.3
RK1.89.32	EPH	0.55	38.4
RK4.169.21	EPH	0.37	247.3
ST3.001.27C	R3	1.13	942.0
ST3.002.28	R3	0.97	676.8
ST3.003.28	R3	1.30	171.4
ST3.004.28	R4	0.75	38.4
ST3.005.29	R3	1.16	182.4
ST3.008.29	R3	1.02	124.6
ST3.009.29	R4	0.94	185.1
ST3.011.30	R3	0.94	193.5
ST3.013.29	EPH	0.75	74.9
ST3.014.30	R3	0.98	225.6
ST3.018.30	R3	0.97	398.9
ST4.003.35	R3	0.96	47.0
ST4.022.31	R4	1.16	21.8
ST4.024.31	R3	1.01	322.4
ST4.025.32	R4	0.96	77.6
ST4.026.33	R3	1.05	47.2
ST4.027.33	R4	1.18	104.8
ST4.028.32	R4	1.14	60.8
ST4.029.34	R4	1.17	686.9
ST4.029.34	EPH	1.17	14.3
ST4.030.37C	R3	1.22	283.1

Reach ID	Cowardin Classification	Reach Condition Index	Length of Stream (Linear Feet)
ST4.031.37C	R3	1.07	829.2
ST4.032.37C	R3	0.94	288.2
ST4.033.37C	R4	0.96	130.4
ST4.070.37C	R4	1.02	85.6
ST9.17.22	R4	1.14	61.7
ST9.18.22	R4	1.13	102.4
		Total	**7,072.0**

Table 2-6: Streams Evaluated in the Lower Rappahannock Watershed Portion of the Planning Level LOD

Reach ID	Cowardin Classification	Reach Condition Index	Length of Stream (Linear Feet)
RK1.33.39	R3	1.14	71.4
ST10.002.40	R3	1.12	544.8
RK1.32.39	R4	0.96	46.3
RK1.31.39	R4	0.67	229.0
RK1.30.39	R6	0.60	65.8
ST4.019.39	R4	0.73	214.5
ST4.016.39	R4	0.96	276.9
		Total	**1,448.7**

Wetlands

No-Build Alternative

The No-Build Alternative would not improve I-95 in the study area, thus, no changes to wetlands would occur.

Build Alternative

Potential impacted wetlands occur predominately in the median, south of VA 630 / Courthouse Road and near Exit 148. The majority of potentially impacted wetlands are completely contained in the planning level LOD. Direct impacts from cut/fill would result in loss of wetland functions within the immediate footprint of these impacted wetlands. In a lesser amount, the remaining potentially impacted wetlands occur in, and have portions that extend outside of, the planning level LOD. Examples of potentially impact wetlands of this type occur immediately to the north and south of Potomac Creek. Depending on roadway design, cut/fill slope locations, and restoration and maintenance of vegetation following construction, the portions of these wetlands within the planning level LOD would either lose all wetland functions or have reduced functions due to a conversion in wetland type or hydraulic alteration/isolation. The magnitude of the effects to wetland functions directly and indirectly impacted by conversion and hydrologic alteration/isolation is generally less than the effects from cut/fill.

However, hydraulic alteration can remove all wetland function if the site is converted to an upland. The remaining portions of these wetlands, which extend outside of the planning level LOD, may be subject to indirect impacts if their hydrology is altered due to impacts occurring in the LOD. Impacts of this type may also contribute to habitat fragmentation. If hydrology is maintained to the portions outside of the planning level LOD, these wetlands should retain proper functions such as providing habitat, water quality benefits, and biogeochemical services.

Avoidance and minimization efforts would be coordinated through permitting during final design to reduce the amount of wetland impacts. **Table 2-7** provides the estimated wetland impacts in the planning level LOD and **Appendix A** contains mapping depicting delineated water resources.

Table 2-7: Estimated Wetland Impacts

Watershed	PFO Acres	PSS Acres	PEM Acres	POW Acres	Total in Watershed (Acres)
Lower Potomac River (02070011)	2.8	0.0	0.0	0.0	2.8
Lower Rappahannock River (02080104)	0.4	0.0	0.0	0.0	0.4
Total	**3.2**	**0.0**	**0.0**	**0.0**	**3.2**

Notes: PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub, POW = Palustrine Open Water

Aquifers/Water Supply

No-Build Alternative

No public water resources are located in the study area; therefore, no effects to aquifers or the public water supply would occur with implementation of the No-Build Alternative.

Build Alternative

Implementation of the Build Alternative would not affect aquifers/water supplies as there are no public groundwater wells, surface water intakes, springs, SSAs, or reservoirs in the study area and roadway cuts are not anticipated to encounter the groundwater table. Drainage and other required stormwater mitigation techniques would capture runoff before it reaches resources outside of the project area. A discussion of these indirect effects is included in the *I-95 Express Lanes Fredericksburg Extension Study Indirect and Cumulative Effects Technical Report* (VDOT, 2017c) and section in the Revised EA.

Submerged Aquatic Vegetation

No-Build Alternative

No SAV beds are located in the study area; therefore, no effects to SAV would occur with implementation of the No-Build Alternative.

Build Alternative

The Build Alternative would not directly impact SAV. However, areas of SAV are located downstream from the project corridor. Potential indirect affects to SAV resulting from sedimentation and water

quality alteration are not anticipated but are discussed in the *Interstate 95 Express Lanes Fredericksburg Extension Study Indirect and Cumulative Effects Technical Report* (VDOT, 2017c).

2.2 TERRESTRIAL RESOURCES

2.2.1 Regulatory Context

Floodplains

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, and US Department of Transportation 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 the Federal Emergency Management Agency (FEMA). In Virginia, the VDCR is responsible for coordination of all state floodplain programs. Development within floodplains is also regulated by local flood insurance programs administered by localities under the NFIP.

The VDCR floodplain management program and VDOT construction specifications for roadways also address roadway construction within floodplains. Sections 107 and 303 of VDOT's *Road and Bridge Specifications* require the use of stormwater management practices to address issues such as post-development storm flows and downstream channel capacity (VDOT, 2016). These standards require that stormwater management be designed to reduce stormwater flows to preconstruction conditions for up to a ten-year storm event. As part of these regulations, the capture and treatment of the first half inch of run-off in a storm event is required, and all stormwater management facilities must be maintained in perpetuity.

FEMA is required to identify and map the nation's flood-prone areas through the development of Flood Insurance Rate Maps (FIRMs). Digital floodplain data was obtained from the FEMA Flood Map Service Center and plotted in the study area to determine the extent of floodplain areas (FEMA, 2017).

Vegetation

The Virginia Department of Conservation and Recreation–Department of Natural Heritage (VDCR-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, 2017a). 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, the State of 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.

The VDCR-DNH, in association with the Virginia Native Plant Society, have 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.

Topography and Soils

Construction activities along steep slopes and those equal to or steeper than 3:1, require the use of soil stabilization or blankets in accordance with the standards and specifications of the VESCH. Locally, Stafford County generally requires that all land development projects that would disturb more than 40 acres of land use perform construction phasing to reduce impacts in areas with steep slopes. However, Stafford County does not require phasing on road projects.

Controlling erosion and sediment from land development protects local water quality and minimizes sediment and pollutants from entering streams, the Potomac River, and, eventually, the Chesapeake Bay. Highly erodible soil is defined by the Sodbuster, Conservation Reserve, and Conservation Compliance parts of the Food Security Act of 1985 and the Food, Agriculture, Conservation, and Trade Act of 1990. Determinations for highly erodible soil are based on an erodibility index, as defined in the National Food Security Act Manual. In Stafford County, highly erodible soils means soils (excluding vegetation) with an erodibility index from sheet and rill erosion equal to, or greater than, eight.

Soil composition determines the suitability of land for farming and construction (Stafford County, 2016a). Its physical and chemical properties establish its appropriateness for these uses. Some soils have the best combination of properties for agricultural use, while disturbance of others may cause unintended negative consequences for streams, water quality, and wildlife. Therefore, agricultural lands and some soil types are considered sensitive resources.

In preparing its report on each major state project, 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. Farmlands to consider include that underlain by prime, unique, and important farmland soils.

“Prime farmland,” as defined by the U.S. Department of Agriculture (USDA), is 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. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied.

"Unique farmland" is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to produce economically sustainable high yields of these crops when properly managed.

“Important farmland" is land other than prime or unique farmland, which is of statewide or local importance for the production of food, feed, fiber, forage, nursery, oilseed, or other agricultural crops, as determined by the appropriate state agency or local government agency, and that the USDA determines should be considered as farmland.

A potential environmental concern identified by Stafford County’s Interim County Administrator would be disturbance of Quantico slate, a rock formation in portions of Stafford County (Stafford County,

2016b). Road construction through this formation could result in acid rock drainage, which occurs when sulfide-bearing soil or rock is excavated and exposed to oxygen in the atmosphere and water. Problems associated with acid rock drainage include degradation of metal and concrete building materials (which accelerates the need for repairs and can compromise structural stability), weathering of fill material and precipitation of sulfates, damage to vegetation, impacts to surface water quality and aquatic life, and contamination of ground water. An example of this problem is evident in Stafford County along the west side of I-95 south of Chopawamsic Creek where there are several exposed areas on which it is difficult to grow stabilizing vegetation.

Resource Protection Areas

The Chesapeake Bay Preservation Act (CBPA) was enacted by the Virginia General Assembly in 1988 to protect and manage Virginia's "coastal zone". The CBPA balances state and local economic interests and water quality improvement by creating a unique cooperative partnership between state and Tidewater local governments to reduce and prevent nonpoint source pollution while still allowing for reasonable development to continue. The CBPA requires local governments in the coastal zone to include water quality protection measures in their zoning and subdivision ordinances and in their comprehensive plans (VDEQ, No Date b).

Within the Chesapeake Bay watershed of coastal counties, Resource Protection Areas (RPAs) include tidal wetlands, tidal shores, waterbodies with perennial flow, and non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or perennial water bodies, as well as a 100-foot vegetated buffer area located adjacent to and landward of these features. When preserved in their natural condition, RPAs protect water quality, filter and reduce the volume of runoff, prevent erosion, and perform other important biological and ecological functions (9 VAC 25-830-80). The establishment of RPAs creates protected habitat which serve as corridors for wildlife use and movement. These areas are subject to local CBPA requirements to minimize land disturbance, preserve indigenous vegetation, minimize impervious surfaces, control stormwater runoff, and implement erosion and sediment control plans for land disturbances. Activities within RPAs are further restricted to water dependent or redevelopment related activities.

Resource Management Areas (RMAs) include those lands contiguous to the inland boundary of the RPA, which if improperly used or developed, has the potential to degrade water quality or diminish functions of the RPA. RMAs include floodplains, highly erodible soils (including steep slopes), highly permeable soils, non-tidal wetlands not included in RPAs, and any other sensitive lands considered by the local government to be necessary to protect the quality of water resources (9 VAC 25-830-90). Areas of existing development and infill sites where little of the natural environment remains within Chesapeake Bay Preservation Areas may be designated as intensely developed areas by the local government (9 VAC 25-830-100).

Virginia Coastal Zone Management Areas

Federal projects occurring within any land or water use, or natural resource of a State's coastal zone, including cumulative and secondary impacts, must be consistent with the state's federally-approved Coastal Zone Management Program (CZMP) per Section 307 of the Federal Coastal Zone Management Act of 1972, as amended, and NOAA regulations (15 CFR Part 930). Such actions require a consistency determination that receives concurrence from the state. In Virginia, the VDEQ administers the CZMP and reviews consistency determinations.

The Virginia CZMP was established under EO in 1986 and its mission is to create more vital and sustainable coastal communities and ecosystems. The Virginia CZMP is known as a "networked program", which means to manage Virginia's coastal resources, and the program relies on a network of

state agencies and local governments to administer the enforceable laws and regulations that protect our wetlands, dunes, subaqueous lands, fisheries, and air and water quality within Virginia's coastal zone. The agencies involved in the CZMP include: VDEQ; VDCR; VMRC; VDGIF; VDH; Virginia Department of Agriculture and Consumer Services; VDOF; Virginia Department of Historic Resources; Virginia Department of Mines, Minerals, and Energy; VDOT; Virginia Economic Development Partnership; and VIMS. These agencies administer the enforceable laws, regulations, and advisory policies that protect our coastal resources and geographic areas of particular concern.

According to VDEQ, Virginia's coastal zone "encompasses the 29 counties, 17 cities, and 42 incorporated towns in 'Tidewater Virginia', as defined in the Code of Virginia 28.2-100" (VDEQ, 2016d). The entire study area is located within Virginia's coastal zone. As such, the project would be consistent with the applicable Enforceable Regulatory Programs that comprise Virginia's CZMP.

2.2.2 Existing Conditions

Floodplains

Methodology

Digital floodplain data from the National Flood Hazard Layer was obtained from the FEMA GeoPlatform and plotted in the study area to determine the location and extent of floodplain areas.

Results

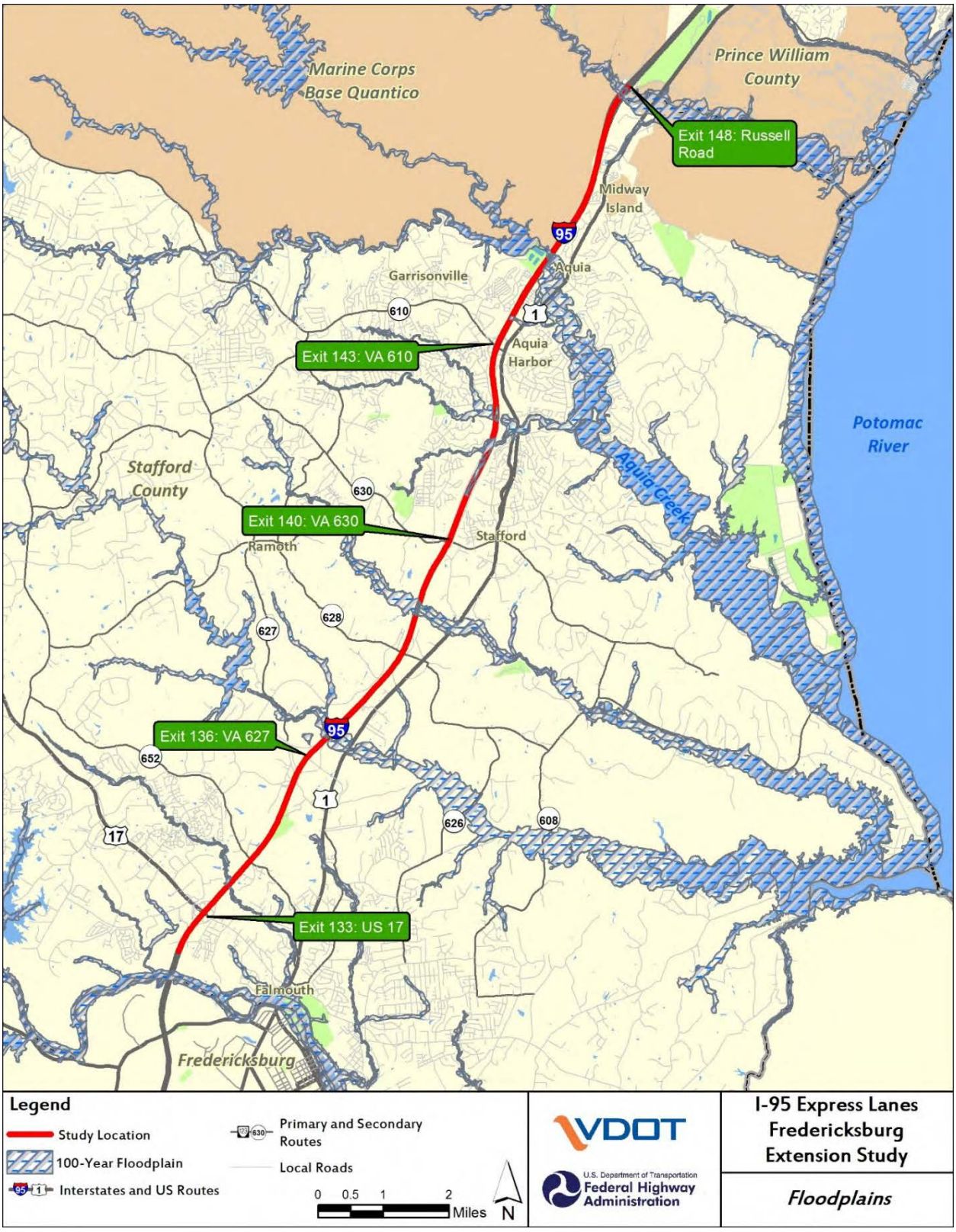
Approximately 78.7 acres of 100-year floodplains are located in the study area (FEMA, 2017) and are all associated with the waterways provided in **Table 2-8**. All six waterways and their associated tributaries are currently crossed by the existing I-95 interstate facilities. The approximate locations of the floodplain limits are provided in **Figure 2-3**. Each locality in the study area practices floodplain management and development within their floodplains is restricted to certain activities, such as private and public utilities, stormwater management facilities, and road crossings.

Table 2-8: 100-Year Floodplains in the Study Area

Waterway	Acreage
Falls Run	4.7
Potomac Creek	11.4
Accokeek Creek	7.6
Austin Run and Tributaries	40.7
Aquia Creek and Tributaries	10.3
Chopawamsic Creek	4.0
Total	**78.7**

Source: FEMA (2017).

Figure 2-3: 100-Year Floodplains in the Study Area



Vegetation

Methodology

The aerial extent of vegetation cover was identified using GIS data obtained from the VDOF 2005 Virginia Forest Cover dataset (VDOF, 2005). Vegetation species reported include those identified during the wetland delineation survey of the study area.

Results

The study area, and its vicinity, contains several types of terrestrial habitat including forested lands, agricultural lands, pasture, grasslands, and scrub/shrub lands (**Figure 2-4**). The composition of land cover directly affects the natural communities, wildlife, and biodiversity found within a given environment. Terrestrial lands with natural cover, including forests, account for approximately 17.3 percent (233.4 acres) of the study area (VDOF, 2005).

Vegetation identified during the field survey indicates that the study area is dominated by a mix of hardwood tree species with an understory containing shrub, herbaceous, and vine vegetation. Dominant tree and sampling species observed included American beech (*Fagus grandifolia*), green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), tulip tree (*Liriodendron tulipifera*), and willow oak (*Quercus phellos*). Dominant shrub species recorded included American holly (*Ilex opaca*) and highbush blueberry (*Vaccinium corymbosum*). Herbaceous species included Canada onion (*Allium canadense*), deertongue (*Dicanthelium clandestinum*), roundleaf goldenrod (*Solidago patula*), and whitegrass (*Leersia virginica*). Commonly observed vine species included poison ivy (*Toxicodendron radicans*) and roundleaf greenbrier (*Smilax rotundifolia*). Common plant invasive species observed in the study area includedmultiflora rose (*Rosa multiflora*), Japanese stilt grass (*Microstegium vimineum*), Japanese honeysuckle (*Lonicera japonica*), and English ivy (*Hedera helix*).

Topography and Soils

Methodology

Topographic contour data for Stafford and Prince William Counties were acquired from each county's respective GIS department. An evaluation conducted in GIS determined the topographic conditions in the study area for both counties.

Soils data for Stafford and Prince William Counties were acquired using the Natural Resources Conservation Service Web Soil Survey online database. An evaluation conducted in GIS determined the location and extent of soils, including farmland soils, in the study area.

Areas of Quantico slate within, and adjacent to, the study area were identified with use of a GIS data representation of the Integrated Geologic Map Database for the United States: Delaware, Maryland, New York, Pennsylvania, and Virginia from the USGS.

Results

Stafford and Prince William counties are in an area of rolling topography, rather deeply incised by the major drainage patterns flowing toward the Potomac River to the east (**Figure 2-5**). In areas of softer geologic formations, this has given rise to long, rather narrow ridges with steep-sided slopes. A wide area of level river terraces occurs along the Rappahannock River from the Falmouth area. Surface elevations in the counties range from less than 20 feet along the Potomac River in the east to about 470 feet in northwestern Stafford County (Prince William County, 2015; Stafford County, 2013). Generally, the land surface slopes gently to the southeast at an average of 20 feet to the mile. The drainage pattern is, in general, dendritic, but irregularly branched. The general fluvial cycle is in a stage of late youth or

Figure 2-4: Terrestrial Habitat in the Study Area

Figure 2-5: Topographic Map

early maturity. Most upland areas are well drained, with drainage ranging to excessive on the steeper slopes.

Soils in the study area are composed of a mix of cut/fill, alluvium and sandy loams, intermingled with portions of Caroline and Sassafras complexes (NRCS, 2017). Soils in the study area are included in **Table 2-9**. **Figure 2-6a** through **Figure 2-6f** show the study area soils.

Excluding lands designated as "urban areas" by the US Census Bureau, the study area contains the acreages of prime and statewide important farmland soils provided in **Table 2-10**. Approximately 60 percent and 38 percent of the prime and statewide important farmland soils identified in the study area occur in the existing right-of-way, respectively (NRCS, 2017). Although these soils feature the physical and chemical characteristics important for food and crop production, they are located in an area designated for transportation uses eliminating their potential use for agriculture. **Figure 2-7** shows the extent of these soils in the study area.

Table 2-9: Study Area Soils

Map Unit Symbol	Map Unit Name	Acre(s) in Study Area	Percent of Study Area
34C	Lunt loam, 7 to 15 percent slopes	0.1	0.0
54B	Urban land-Udorthents complex, 0 to 7 percent slopes	61.4	4.4
Ae	Alluvial land, wet	14.1	1.0
AfA	Altavista fine sandy loam, 0 to 2 percent slopes	0.3	0.0
AfB	Altavista fine sandy loam, 2 to 6 percent slopes	9.7	0.7
AnC2	Appling gravelly fine sandy loam, 6 to 10 percent slopes, eroded	0.2	0.0
AsD	Ashlar fine sandy loam, 6 to 15 percent slopes	0.6	0.0
AsF	Ashlar fine sandy loam, 25 to 35 percent slopes	2.1	0.1
Au	Augusta loam	0.4	0.0
AvB	Aura gravelly fine sandy loam, 2 to 6 percent slopes	9.0	0.6
AvC2	Aura gravelly fine sandy loam, 6 to 10 percent slopes, eroded	17.1	1.2
AvD2	Aura gravelly fine sandy loam, 10 to 18 percent slopes, eroded	3.9	0.3
AvE2	Aura gravelly fine sandy loam, 18 to 35 percent slopes, eroded	28.7	2.0
AwD	Aura-Galestown-Sassafras complex, 6 to 15 percent slopes	26.1	1.9
AwE	Aura-Galestown-Sassafras complex, 15 to 30 percent slopes	31.6	2.2

Map Unit Symbol	Map Unit Name	Acre(s) in Study Area	Percent of Study Area
BaA	Bertie very fine sandy loam, 0 to 3 percent slopes	0.2	0.0
Bb	Bibb fine sandy loam, 0 to 4 percent slopes	3.6	0.3
BmA	Bourne fine sandy loam, 0 to 2 percent slopes	3.5	0.3
BmB	Bourne fine sandy loam, 2 to 6 percent slopes	26.2	1.9
BmC2	Bourne fine sandy loam, 6 to 10 percent slopes, eroded	3.3	0.2
BnB	Bourne fine sandy loam, gravelly subsoil variant, 2 to 6 percent slopes	0.5	0.0
CaB2	Caroline fine sandy loam, 2 to 6 percent slopes, eroded	21.8	1.5
CaC2	Caroline fine sandy loam, 6 to 10 percent slopes, eroded	3.8	0.3
CaD2	Caroline fine sandy loam, 10 to 18 percent slopes, eroded	3.0	0.2
CcC3	Caroline clay loam, 6 to 10 percent slopes, severely eroded	12.2	0.9
CcD3	Caroline clay loam, 10 to 18 percent slopes, severely eroded	1.7	0.1
CdE	Caroline-Sassafras complex, 15 to 30 percent slopes	16.7	1.2
Ce	Cartecay fine sandy loam	5.1	0.4
Cn	Congaree loam	0.5	0.0
CrB	Craven loam, 2 to 6 percent slopes	0.1	0.0
Cw	Cut and fill land	979.5	69.4
DoA	Dogue loam, 0 to 2 percent slopes	0.5	0.0
GsF	Galestown-Sassafras complex, 30 to 45 percent slopes	0.4	0.0
Iu	Luka fine sandy loam, local alluvium, 0 to 4 percent slopes	3.3	0.2
KfB	Kempsville fine sandy loam, gravelly substratum, 2 to 6 percent slopes	9.9	0.7
KfC2	Kempsville fine sandy loam, gravelly substratum, 6 to 10 percent slopes, eroded	8.3	0.6
Ro	Roanoke silt loam, 0 to 2 percent slopes	4.9	0.4

Map Unit Symbol	Map Unit Name	Acre(s) in Study Area	Percent of Study Area
ScF	Sandy and clayey land, steep, Sassafras and Caroline materials	6.3	0.4
SfB	Sassafras fine sandy loam, 2 to 6 percent slopes	7.3	0.5
SfC2	Sassafras fine sandy loam, 6 to 10 percent slopes, eroded	13.5	1.0
SfD2	Sassafras fine sandy loam, 10 to 15 percent slopes, eroded	15.2	1.1
SfE2	Sassafras fine sandy loam, 15 to 35 percent slopes, eroded	7.5	0.5
StD	Stony rolling land	4.6	0.3
StE	Stony steep land	19.4	1.4
SuC	Susquehanna soils, 2 to 10 percent slopes	0.2	0.0
TeA	Tetotum fine sandy loam, 0 to 2 percent slopes	0.0	0.0
TeB	Tetotum fine sandy loam, 2 to 6 percent slopes	5.5	0.4
TeC2	Tetotum fine sandy loam, 6 to 10 percent slopes, eroded	0.3	0.0
WgD	Watt silt loam, gray surface variant, 10 to 15 percent slopes	2.2	0.2
WgE	Watt silt loam, gray surface variant, 15 to 35 percent slopes	8.7	0.6
Wh	Wehadkee very fine sandy loam, 0 to 2 percent slopes	3.3	0.2
WmB	Wichkam fine sandy loam, 2 to 6 percent slopes	2.2	0.2

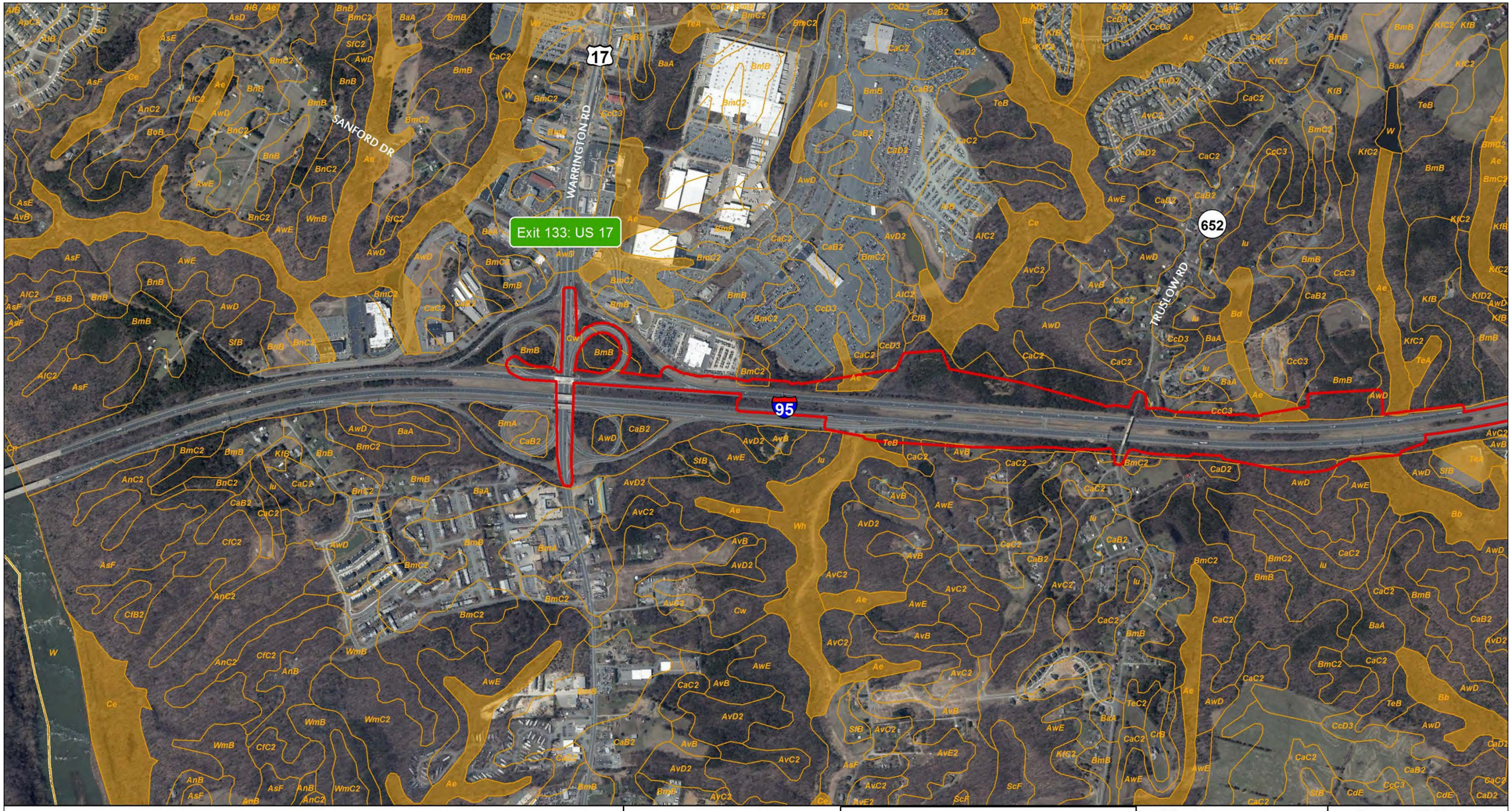
Source: NRCS (2017).

Table 2-10: Prime, Unique, or Important Farmland Soils in the Study Area

Soil	Acreage	Percentage in Existing Right-of-Way
Prime Farmland	37.7	58.9%
Unique Farmland	0.0	0.0%
Farmland of Statewide Importance	53.1	48.4%

Source: NRCS (2017).

Figure 2-6a: Study Area Soils



Legend

Limits of Disturbance
Soils
Hydric Soils
County Boundaries

0 200 400 800 1,200 1,600 Feet

1 2 3 4 5 6

U.S. Department of Transportation
Federal Highway Administration
VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Study Area Soils

Figure 2-7b: Study Area Soils

Figure 2-8c: Study Area Soils

Figure 2-9d: Study Area Soils

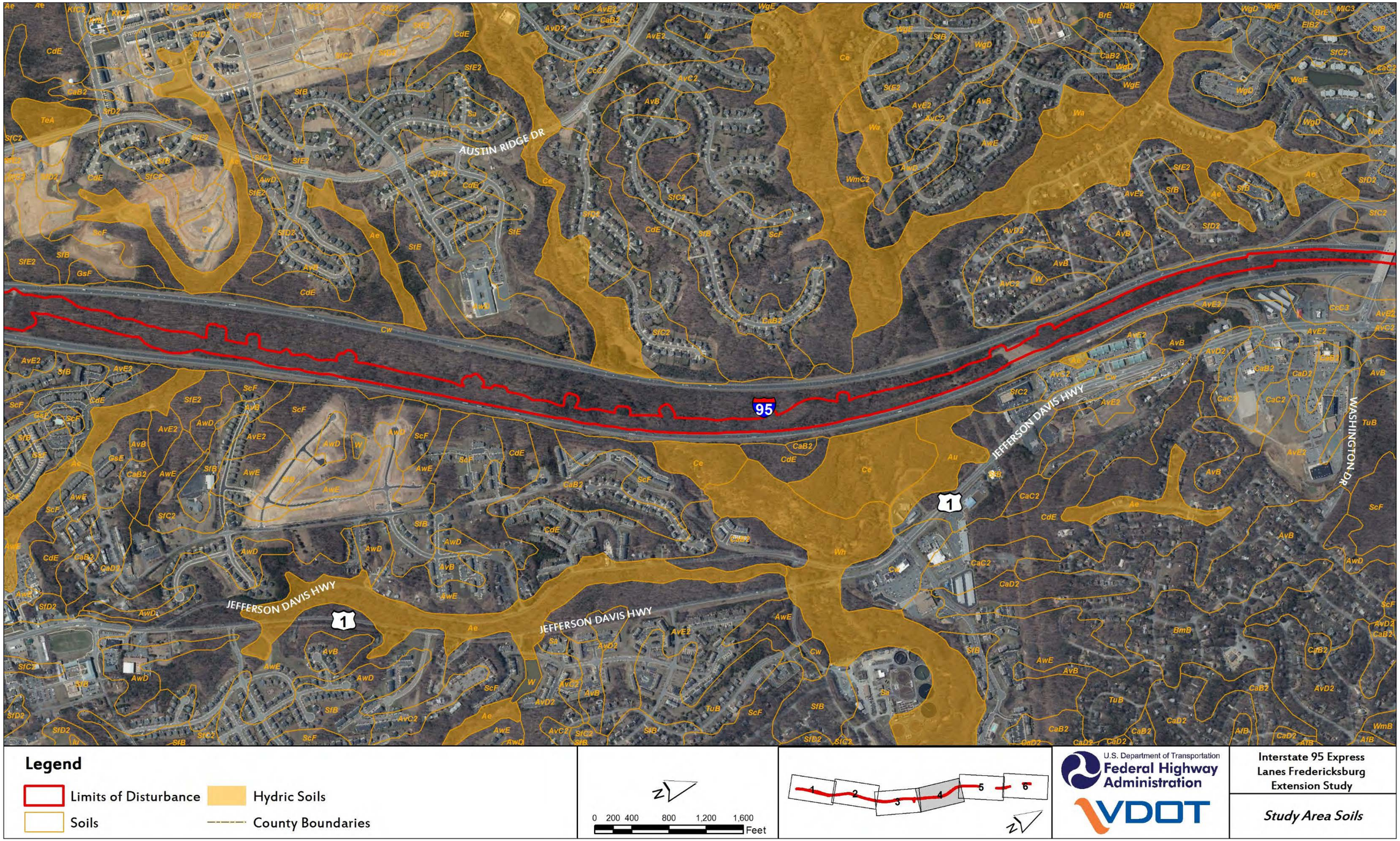


Figure 2-10e: Study Area Soils

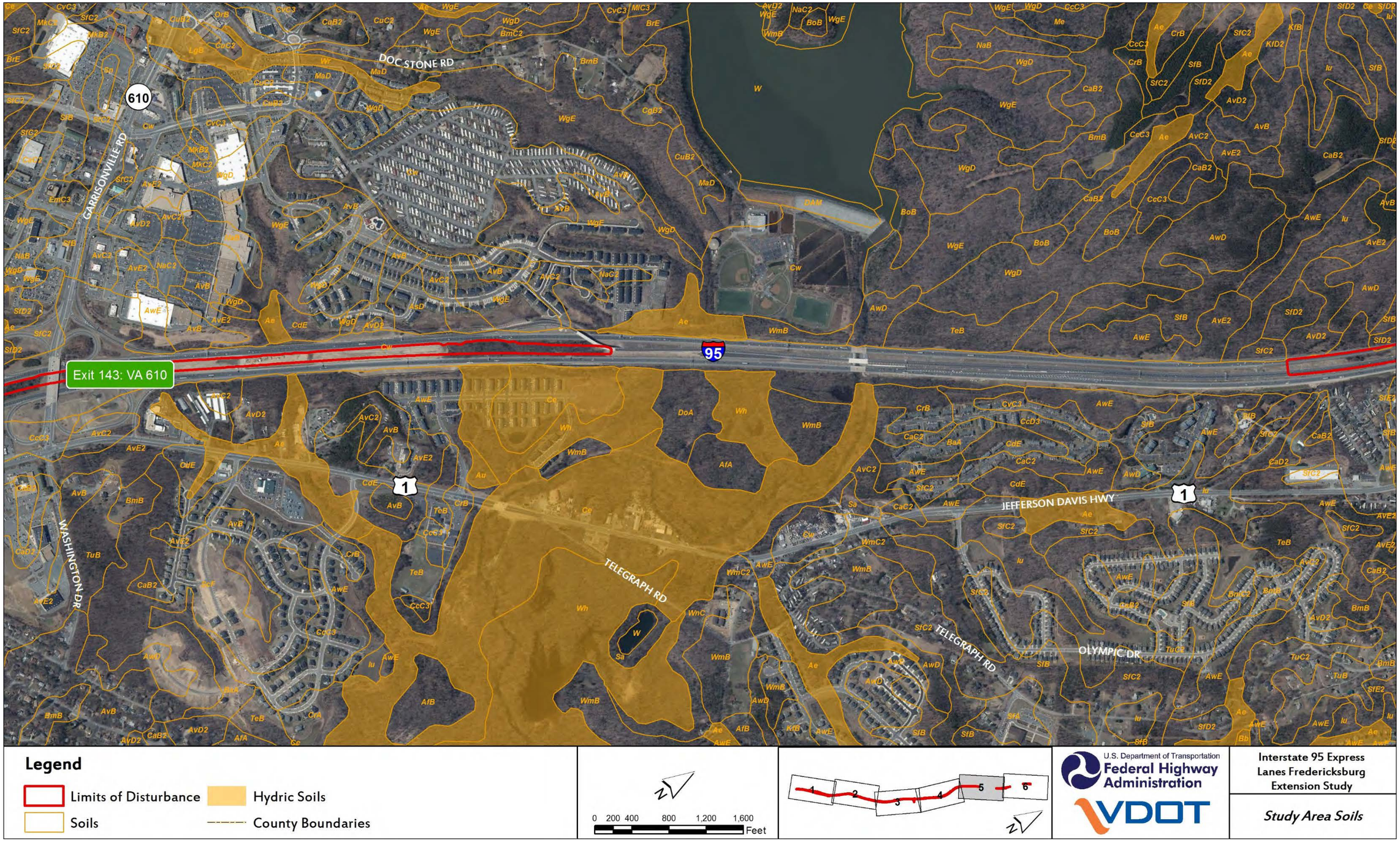


Figure 2-11f: Study Area Soils

Approximately 91 acres of Quantico slate are located in the study area (US Geological Survey, 2005). The majority of the slate areas adjacent to the study area are located west of I-95 and in southwest Stafford County and northern Spotsylvania County (**Figure 2-7**).

Resource Protection Areas

Methodology

Resource Protection Area data for Stafford and Prince William Counties were acquired from each county's respective GIS department. An evaluation conducted in GIS determined the location and extent of RPAs in the study area.

Results

According to available data, there are approximately 102 acres of RPA lands in 12 existing crossings in the study area (Prince William County, 2016; Stafford County, 2014). The existing crossings are associated with the waterways provided in **Table 2-11** and shown in **Figure 2-8**. As discussed previously, lands contained in designated RPAs are afforded protections restricting their development. The RPAs preserve water quality by removing excess sediment, nutrients, and potentially harmful substances from groundwater and surface water prior to their entrance into the Chesapeake Bay watershed. The RPAs also serve as protected habitat and corridors for wildlife use and movement.

Table 2-11: Resource Protection Areas in the Study Area

Waterway	Acreage
Falls Run	5.4
Claiborne Run and Tributaries	7.4
Potomac Creek	7.0
Accokeek Creek	8.9
Austin Run and Tributaries	59.2
Aquia Creek and Tributaries	8.7
Chopawamsic Creek	5.2
Total	**101.8**

Sources: Prince William County (2016); Stafford County (2014).

Figure 2-12: Farmland Soils and Quantico Slate

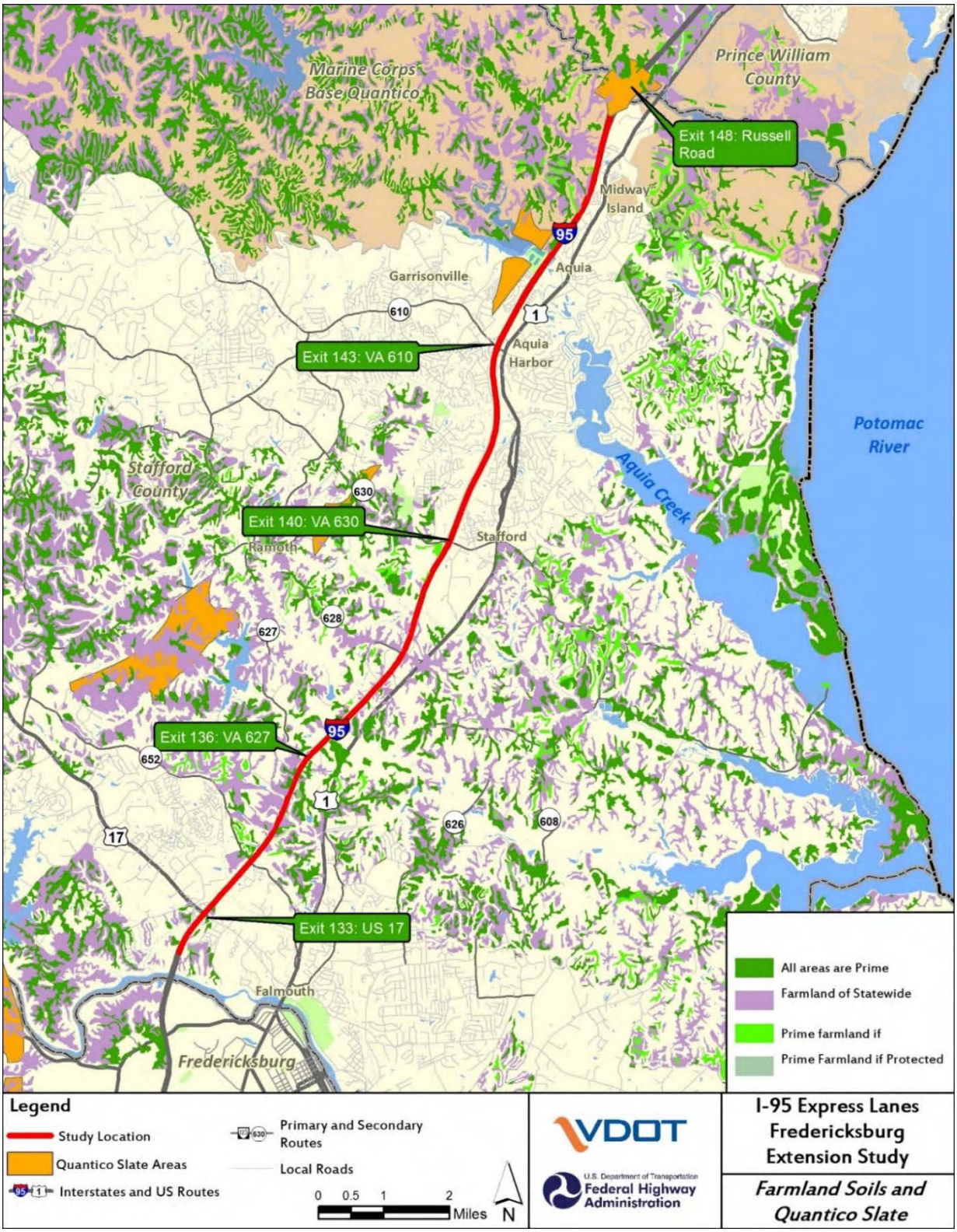
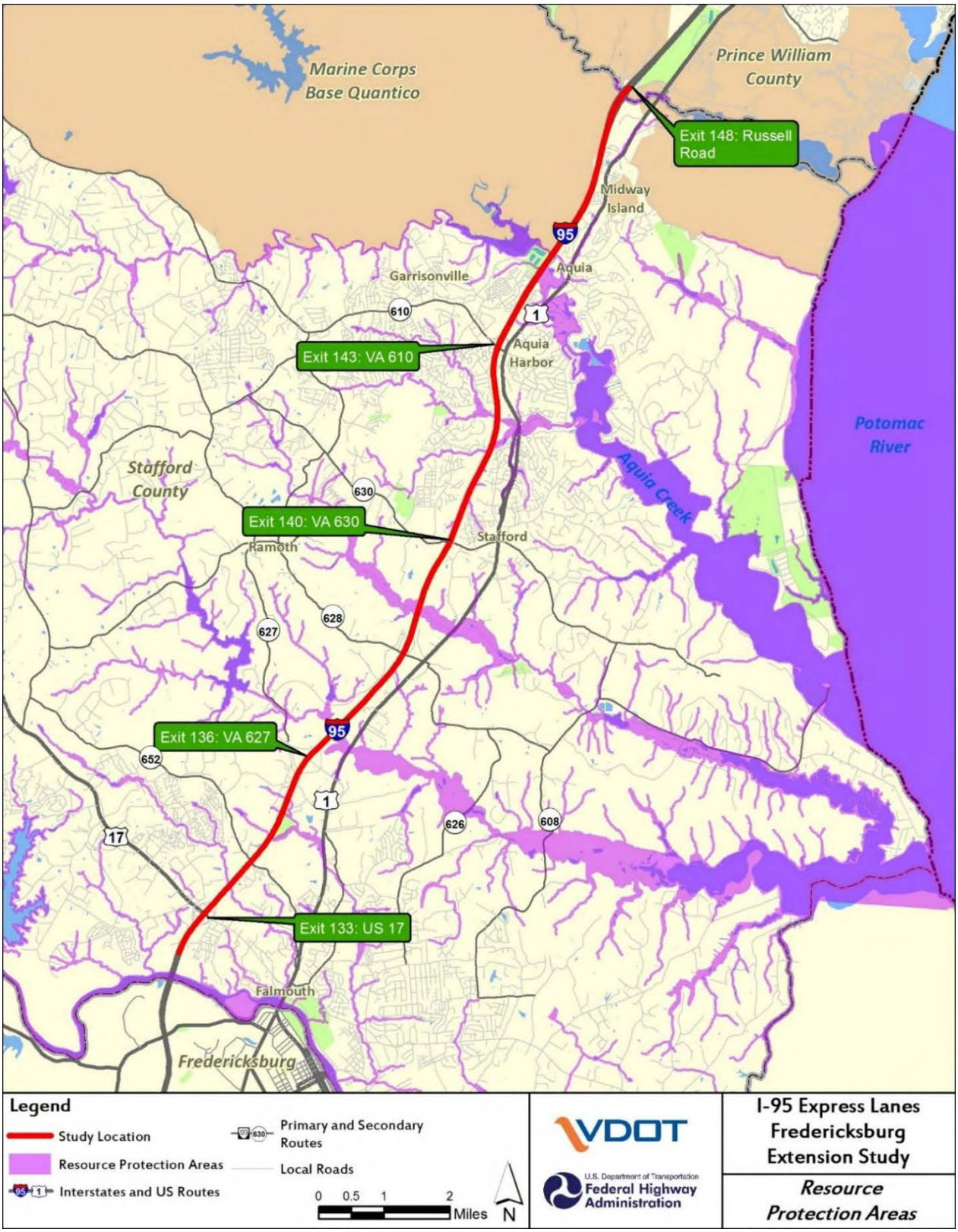


Figure 2-13: Resource Protection Areas



2.2.3 Environmental Consequences

Floodplains

No-Build Alternative

Under the No-Build Alternative, no project-related construction would occur; therefore, no changes to floodplains would result.

Build Alternative

Filling floodplains could result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion (FEMA, 2016). The Build Alternative would include approximately 21 acres of floodplain impacts along the waterways listed in **Table 2-12**. However, the Build Alternative would not have significant adverse impacts on natural and beneficial floodplain values, as any impacts would occur over floodplains already impacted by the existing roadway. Efforts to minimize floodplain encroachment would be considered during design to avoid or minimize impacts on natural and beneficial floodplain values.

Individual impacts to any one floodplain would be relatively small in size and severity. The majority of floodplain encroachments from the Build Alternative would be from the perpendicular crossing of floodplains, not from longitudinal encroachments. Perpendicular crossings would result in less floodplain fill, maximizing floodwater conveyance and storage compared to longitudinal encroachments.

Table 2-12: 100-Year Floodplain Impacts in the Planning Level LOD

Waterway	Impact in the LOD (Acres)	Impact Type
Falls Run	4.3	Construction of ramps adjacent to existing culverted crossing
Potomac Creek	3.4	Construction of bridge crossing for travel lanes in median adjacent to existing bridged crossing
Accokeek Creek	2.6	Construction of additional travel lanes in median adjacent to existing culverted crossing
Austin Run and Tributaries	9.8	Construction of additional travel lanes in median adjacent to existing culverted crossing
Aquia Creek and Tributaries	0.6	Construction of bridge crossing for travel lanes in median adjacent to existing bridged crossing

Source: FEMA (2017).

Vegetation

No-Build Alternative

Under the No-Build Alternative, no project-related construction would occur; therefore, no changes to vegetation would result.

Build Alternative

Approximately 83 acres of forested land will be converted to transportation use in the planning level LOD (VDOF, 2005). These forested areas occur mainly in the median of the divided interstate and in lesser amounts along the outside edges of the existing lanes to accommodate proposed ramps and stormwater management facilities.

Vegetation cleared in the median of the divided lanes would not appreciatively contribute to fragmentation of forest resources as these areas are currently separated from contiguous forested areas by the existing travel lanes. Vegetation cleared along the outside edges of the current travel lanes will be removed in small strips. Fragmentation will not occur in these areas, as the cleared right-of-way will simply be expanded into the forested areas. Forested land will not be newly separated from contiguous forests.

Topography and Soils

No-Build Alternative

Under the No-Build Alternative, no project-related construction would occur; therefore, no changes to topography, soils (farmland or otherwise), or Quantico slate would result.

Build Alternative

Construction activities involving earthmoving, clearing vegetation, grubbing, and grading would disturb soils and increase the potential for soil erosion and sedimentation within wetlands and waterways. Other activities such as the placement of culverts, construction of stormwater retention/detention basins, movement of construction vehicles and machinery, movement and stockpiling of excavated soils, and the placement of fill throughout the study area would cause additional soil disturbances. These soil disturbances are expected to be generally minor, short-term, and localized.

Activities occurring in steeply sloped areas and in highly erodible soils present the greatest potential for erosion and stormwater pollution during construction. The extent and permanence of affects from erosion and stormwater pollution are dependent on the measures used for sedimentation and erosion control. Strict adherence to erosion and sediment control measures and plans would be required throughout all construction practices.

The Farmland Protection Policy Act requires that Federal agencies review impacts to these prime, unique, or important farmlands when providing financial or technical assistance for state highway construction projects. However, projects with direct and indirect impacts totaling less than ten acres per linear mile are exempt from adherence to the Farmland Protection Policy Act. There are approximately 5 acres of prime farmland or farmland of statewide importance in the planning level LOD. As the acreage of prime or important farmland expected to experience direct effects is below the small acreage threshold presented in the Farmland Protection Policy Act, no mitigation is proposed for impacts to farmland soils.

Table 2-13: Prime, Unique, or Important Farmland Soils in the Planning Level LOD

Soil	Acreage	Percentage Outside of Existing Right-of-Way
Prime Farmland	0.2	3.9%
Unique Farmland	0.0	0.0%
Farmland of Statewide Importance	4.9	96.1%

Source: NRCS (2017).

Approximately 3.9 acres of Quantico slate occur in the planning level LOD, near the proposed Russel Road ramp. Acid rock in this area has previously been impacted with construction of the current I-95 travel lanes. Impacts to water quality and aquatic habitat may result from further disturbance of acid rock in this area. Potential problems associated with disturbance of the acid rock can be mitigated by several possible methods:

- Neutralize the acid by applying pulverized agricultural lime or soda ash;
- Encapsulate the materials to segregate them from exposure to air; and/or
- Remove and dispose at another location.

The appropriate method of dealing with potential acid drainage problems would be identified during the design process, part of which would include acquisition of geotechnical borings to identify potential problem areas for use in design of foundations and road substructure. Special provisions would be developed as needed for inclusion in the construction plans.

Resource Protection Areas

No-Build Alternative

Under the No-Build Alternative, no project-related construction would occur; therefore, no changes to resource protection areas would result.

Build Alternative

Table 2-14 provides the acreages of RPA impacts, along study area waterways, anticipated for disturbances occurring in the planning level LOD. Although the RPAs are protected resources, public roads and their appurtenant structures are conditionally exempt from regulation under 8VAC25-830-150. Public roads are defined as a publicly-owned road designed and constructed in accordance with water quality protection criteria at least as stringent as requirements applicable to the VDOT, and in accordance with the Erosion and Sediment Control Law (§62.1-44.15:51 et seq. of the Code of Virginia) and the Stormwater Management Act (§62.1-44.15 et seq. of the Code of Virginia). This includes those roads where the VDOT exercises direct supervision over the design or construction activities, or both, and cases where secondary roads are constructed or maintained, or both, by a local government in accordance with the standards of that local government. The exemption of public roads is further conditioned on the optimization of the road alignment and design, consistent with other applicable requirements, to prevent or otherwise minimize encroachment in the RPA and adverse effects on water quality. Since the Build Alternative would meet the exemption conditions, its construction would not be under the CBPA purview. Therefore, if the above conditions are met, no additional avoidance or minimization for CBPA areas is necessary.

Table 2-14: Resource Protection Area Impacts in the Planning Level LOD

Waterway	RPA Impacts (Acres)
Falls Run	4.8
Claiborne Run and Tributaries	4.0
Potomac Creek	1.2
Accokeek Creek	1.2
Austin Run and Tributaries	13.3
Chopawamsic Creek	0.0
Total	**24.5**

Sources: Prince William County (2016); Stafford County (2014).

2.3 WILDLIFE

2.3.1 Regulatory Context

Habitat and Wildlife

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. Their role in these procedures is to determine likely impacts upon fish and wildlife resources and habitats, and to recommend appropriate measures to avoid, reduce, or compensate for those impacts (VDGIF, 2017a). The Threatened and Endangered Species section of this report contains regulatory specifics pertaining to threatened and endangered species.

The federal Magnuson-Steven Fisheries Conservation and Management Act of 1976, as amended, provides for the conservation and management of the nation's fishery resources through the preparation and implementation of fishery management plans. Federal agencies are required to consult with the National Marine Fisheries Service (NMFS) on proposed actions that may affect Essential Fish Habitat (EFH); that is, waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The Fish and Wildlife Coordination Act, as amended in 1964, requires that all federal agencies consult with NOAA Fisheries, USFWS, and state wildlife agencies when proposed actions might result in modification of a natural stream or body of water. Federal agencies must consider the impacts that these projects would have on fish and wildlife development and provide for improvement of these resources in the study area.

Anadromous Fish

Virginia is a member of the Atlantic States Marine Fisheries Commission. A duty of the Commission is to prevent the depletion and physical waste of the marine, shell, and anadromous fisheries of the Atlantic seaboard. Anadromous fish are born in freshwater, migrate to the ocean, and return to freshwater streams and rivers to spawn. Historical records indicate anadromous fish species such as herring and shad migrated through the fall zone into the upper reaches of all major drainages in Virginia (VDGIF, 2017b). While there is not a regulatory mandate to protect anadromous fish, the VDGIF and VMRC, in combination with 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.

Threatened or Endangered Species

The federal Endangered Species Act of 1973 and subsequent amendments and regulations define basic protections for federally-listed wildlife and plants that are considered threatened, endangered, or species of greatest conservation need. The law also affords protection to prescriptive habitat critical for protected species' survival, and applies to all federal, state, and privately-authorized projects or actions. The USFWS and the NMFS are responsible for listing, protecting, and managing federally-listed threatened and endangered species.

The Virginia Endangered Species Act of 1972 and the Endangered Plant and Insect Species Act of 1979 protect the species that are listed as threatened or endangered. VDGIF and the Virginia Department of Agriculture and Consumer Services (VDACS) are responsible for administering and enforcing the endangered species regulations. In addition, a cooperative agreement with the USFWS, signed in 1976, recognizes VDGIF as the designated state agency with regulatory and management authority over federally-listed animals and provides for federal/state cooperation regarding the protection and management of those species. VDACS holds authority to enforce regulations pertaining to plants and insects.

The VDCR-DNH conserves Virginia's natural resources through programs such as biological inventories, natural community inventory and classification, and the creation of Natural Area Preserves throughout the Commonwealth. In addition to Natural Area Preserves, VDCR-DNH identifies Conservation Sites, which represent key areas of the landscape worthy of protection and stewardship action because of the natural heritage resources and habitat they support (VDCR, 2016a). Conservation Sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain on a scale of B1-B5, with B1 being most significant (VDCR, 2016b).

Although bald eagles (*Haliaeetus leucocephalus*) are no longer federally or state listed, bald eagles currently are protected under the Bald and Golden Eagle Protection Act. The bald eagle can forage in the river and large water body-type habitats near the study area. Nesting sites are commonly located in large forested areas adjacent to marshes, on farmland, or in seed tree cutover areas. Threats to the bald eagle include habitat destruction, electrocution, poisoning, wind farms, and pesticides. For projects that have blasting or other loud noise components, the buffer distance around eagle nests is 2,640 feet or up to 5,280 feet in open areas. For projects without blasting or other loud noise components, the buffer distance around nests is 660 feet. If a project may disturb nesting bald eagles, an Eagle Act permit from the USFWS may be necessary.

Another environmental concern in the study area is the potential for the presence of migratory birds at existing bridges along the interstate. The Migratory Bird Treaty Act makes it illegal for anyone to harass, harm, pursue, kill, or collect, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. Coordination with state and federal agencies would be required if one or more of the species listed in 50 CFR §10.13 are present during certain times of the year in the study area.

2.3.2 Existing Conditions

Habitat and Wildlife

Methodology

Habitat descriptions were developed through review of remote resources including aerial imagery and forest cover data obtained from the VDOF, and were obtained during the field survey. The VDGIF Virginia Fish and Wildlife Information Service (VFWIS) was used to obtain a list of species confirmed as being present within two miles of the study area. The complete list of species confirmed within two miles of the study area is provided in **Appendix B**.

Results

Land use within the study area corridor is a mix of residential, commercial, and federally-owned land (MCBQ), with the majority of it being existing VDOT right-of-way. Study areas outside of the maintained VDOT right-of-way consist primarily of forested land, as well as areas of cleared and maintained land, to a lesser degree. Locust Shade Park, Smith Lake Park, and Chichester Park are natural areas occurring adjacent to the study area which feature a mix of forestlands and recreational facilities. No wildlife refuges or wildlife management areas are located in the study area.

Terrestrial habitat is present in the study area, especially in the southern section. However, there are areas of habitat fragmentation as residential, commercial, industrial, and government/military land uses are adjacent to the highway. The forestlands are typical of Oak-Hickory Forest or Oak-Hickory Woodlands and Savannas Associations.

Fragmentation in the developed areas has resulted in low quality edge habitat (**Figure 2-3**). The interstate poses a virtually impenetrable barrier to crossings by terrestrial species due to vehicle strikes and the presence of fence lines that bound the interstate preventing wildlife from entering the facility. Approximately 84 percent of the study area is contained in the existing right-of-way, including the median, areas interior to interchange loops, and the paved interstate facilities. The edge habitat along the interstate in the right-of-way, in interchange loops, and the area in the median, are poor habitat for wildlife due to access restrictions posed by the travel lanes.

The wildlife species most capable of adapting to habitat fragmentation outside of the fence line of the interstate include, but are not limited to: rabbits (*Sylvilagus floridanus malurus*), whitetail deer (*Odocoileus virginianus*), eastern gray squirrels (*Sciurus carolinensis carolinensis*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor lotor*), striped skunk (*Mephitis mephitis*), and many common non-migratory bird species (VDGIF, 2015).

The barren lands in the area are devoid of natural cover and do not provide suitable habitat. Wildlife habitat associated with agricultural lands is comparatively limited due to the lack of plant diversity and the relatively high frequency of disturbance (i.e., plowing, planting, fertilizing, grazing, and routine maintenance), and fragmentation into non-continuous patches. Despite these factors, agricultural lands are used by wildlife on a limited basis.

The forested areas in the provide habitat for many of the typical terrestrial urban wildlife species inhabiting this region. Larger terrestrial species confirmed within two miles of the study area include mammals such as whitetail deer, common gray fox (*Urocyon cinereoargenteus cinereoargenteus*), and coyote (*Canis latrans*) (VDGIF, 2017c).

Medium-sized mammals known to occur within two miles of the study area include the northern gray squirrel (*Sciurus carolinensis pennsylvanicus*), southern flying squirrel (*Glaucomys volans volans*), and eastern fox squirrel (*Sciurus niger vulpinus*). Smaller mammals include several species of shrew (*Blarina*

sp.) and mice (*Peromyscus* sp.), meadow vole (*Microtus pennsylvanicus pennsylvanicus*), big brown bat (*Eptesicus fuscus fuscus*), and common eastern chipmunk (*Tamias striatus striatus*) (VDGIF, 2017c).

Reptiles known to inhabit the forested areas include the woodland box turtle (*Terrapene carolina carolina*), eastern hog-nosed snake (*Heterodon platirhinos*), northern watersnake (*Nerodia sipedon sipedon*), and eastern ratsnake (*Pantherophis alleghaniensis*). Amphibians found in the forested areas have included the American toad (*Anaxyrus americanus americanus*), wood frog (*Lithobates sylvaticus*), upland chorus frog (*Pseudacris feriarum*), red-spotted newt (*Notophthalmus viridescens viridescens*), eastern red-backed salamander (*Plethodon cinereus*), and eastern mud salamander (*Pseudotriton montanus montanus*) (VDGIF, 2017c).

The VFWIS search results indicate that no insect species tracked by the VDGIF have been confirmed for the area of land located within two miles of the study area. However, insects likely to inhabit the area include the field cricket (*Gryllus pennsylvanicus*), eastern tiger swallowtail butterfly (*Papilio glaucus*), caddisfly (Heteroplectron americanum), crane fly (*Antocha saxicola*), blue-fronted dancer damselfly (*Argia apicalis*), dobsonfly (*Corydalus cornutus*), common green darner dragonfly (*Anax junius*), twin-spotted spiketail dragonfly (*Cordulegaster maculata*), giant water bug (*Lethocerus uhleri*), and Japanese beetle (*Popillia japonica*) (VDGIF, 2017c). In Virginia, insect species are considered natural heritage resources and are regulated by the VDCR-DNH.

Some of the common forest bird species known to occur within two miles of the study area, and which might be found among mature forest stands, include the cedar waxwing (*Bombycilla cedrorum*), red-eyed vireo (*Vireo olivaceus*), tufted titmouse (*Baeolophus bicolor*), scarlet tanager (*Piranga olivacea*), and ovenbird (*Seiurus aurocapilla*) (VDGIF, 2017c). These, as well as other bird species confirmed in the study area such as the American woodcock (*Scolopax minor*), ash-throated flycatcher (*Myiarchus cinerascens*), Canada goose (*Branta canadensis*), chimney swift (*Chaetura pelagica*), mallard (Anas platyrhynchos), scarlet tanager (*Piranga olivacea*), white-breasted nuthatch (*Sitta carolinensis*), and wood thrush (*Hylocichla mustelina*), are protected under the Migratory Bird Treaty Act of 1918. The roadway bridges in the study area may provide nesting habitat for species such as the Canada goose, barn swallow (*Hirundo rustica*), and peregrine falcon (*Falco peregrinus*) as well as for owls, cormorants, and gulls. The flat decks under roadway bridges, vertical structures, structural cavities, and pier footings provide locations for nest building or egg laying. The eggs and nests of these species are protected under the Migratory Bird Treaty Act and take is prohibited without a federal permit.

Fish species recorded in streams in the area have included the American eel (*Anguilla rostrate*), common carp (*Cyprinus carpio*), white sucker (*Catostomus commersonii*), green sunfish (*Lepomis cyanellus*), pumpkinseed (*Lepomis gibbosus*), redbreast sunfish (*Lepomis auritus*), blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), golden shiner (*Notemigonus crysoleucas*), longnose dace (*Rhinichthys cataractae*), tessellated darter (*Etheostoma olmstedi*), and rosyside dace (*Clinostomus funduloides*) (VDGIF, 2017a). Game fish species observed include the white perch (*Morone americana*), striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), and yellow perch (*Perca flavescens*) (VDGIF, 2017c).

A review of data obtained from the NMFS indicates that EFH exists in the Potomac River for adult and juvenile summer flounder (*Paralichthys dentatus*), scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), and bluefish (*Pomatomus saltatrix*) (NOAA, 2017). However, the data indicates that no EFH exists in the study area (NOAA, 2017). Generally, these four species inhabit coastal oceans, bays, and estuarine waters. The streams and rivers occurring in the study area do not meet the habitat requirements for the larvae, juvenile, or adult stages of these fish (Atlantic States Marine Fisheries Commission 2015a; 2015b; 2015c; 2015d).

Anadromous Fish

Methodology

VDGIF documents both confirmed and potential Anadromous Fish Use Areas and maintains a database with this information. The presence of both confirmed and potential Anadromous Fish Use Areas was obtained using VDOT's Comprehensive Environmental Data and Reporting System (CEDAR) GIS Database. The CEDAR database contains the VDGIF's anadromous fish information from their Virginia Fish and Wildlife Information Service (VFWIS) database (VDOT, 2017d). The location of confirmed and potential Anadromous Fish Use Areas, in relation to the study area, was determined in GIS.

Results

Anadromous Fish Use Areas are areas that are being used, or potentially could be used, by anadromous fish. Confirmed Anadromous Fish Use Areas in, or adjacent to, the study area includes portions of the Rappahannock River, Potomac Creek, Accokeek Creek, Aquia Creek, Chopawamsic Creek, and the Potomac River. **Appendix C** contains the VDGIF anadromous fish reports and mapping obtained from the VFWIS for the study area. **Figure 2-9** shows the relation of Aquia Creek, the only Anadromous Fish Use Area to occur in the study area.

Threatened or Endangered Species

Methodology

Species and location information was collected from queries of the USFWS Information for Planning and Conservation (IPaC) (USFWS, 2017a), VFWIS (VDGIF, 2017c), and the VDCR-DNH (VDCR, 2017b) online databases. Potential habitat for listed species was evaluated and catalogued during the field survey. Habitat acreages were produced in GIS for species where potential habitat was observed in the field survey area.

Results

The information obtained from review of these databases is summarized below in **Table 2-15**. The table presents the species that are currently listed, or proposed, as threatened or endangered that are known to occur, or have the potential to occur, within the vicinity of the study area along with each species' listed status and source of its listing. More specific information regarding data gathering sources and approach used are presented within the discussion of each resource in a separate *Rare, Threatened, And Endangered Species Technical Report* contained in **Appendix D**. Based upon an understanding of the life histories of potentially present species, and a result of the offsite and field analysis performed, potential habitat was verified in the study area for the species found in **Table 2-15**.

This information was utilized as a general framework for the habitat evaluation to determine the presence of habitat, affected environment, and environmental consequences of the proposed activities in the study area. Additionally, a discussion is included for those species that were determined to have potentially suitable habitat in the study area. No critical habitat has been designated by USFWS in the study area. The database search results did not indicate the presence of the state-endangered little brown bat (*Myotis lucifigus*) or tri-colored bat (*Perimyotis subflavus*). However, per VDGIF protocols, the VDGIF's bat's winter habitat and roost tree application were reviewed. The study area is not within the vicinity of known hibernacula or maternity roosts and per VDGIF protocols, no habitat assessment was required for the little brown bat or the tri-colored bat in the study area.

Figure 2-14: Anadromous Fish Use Areas

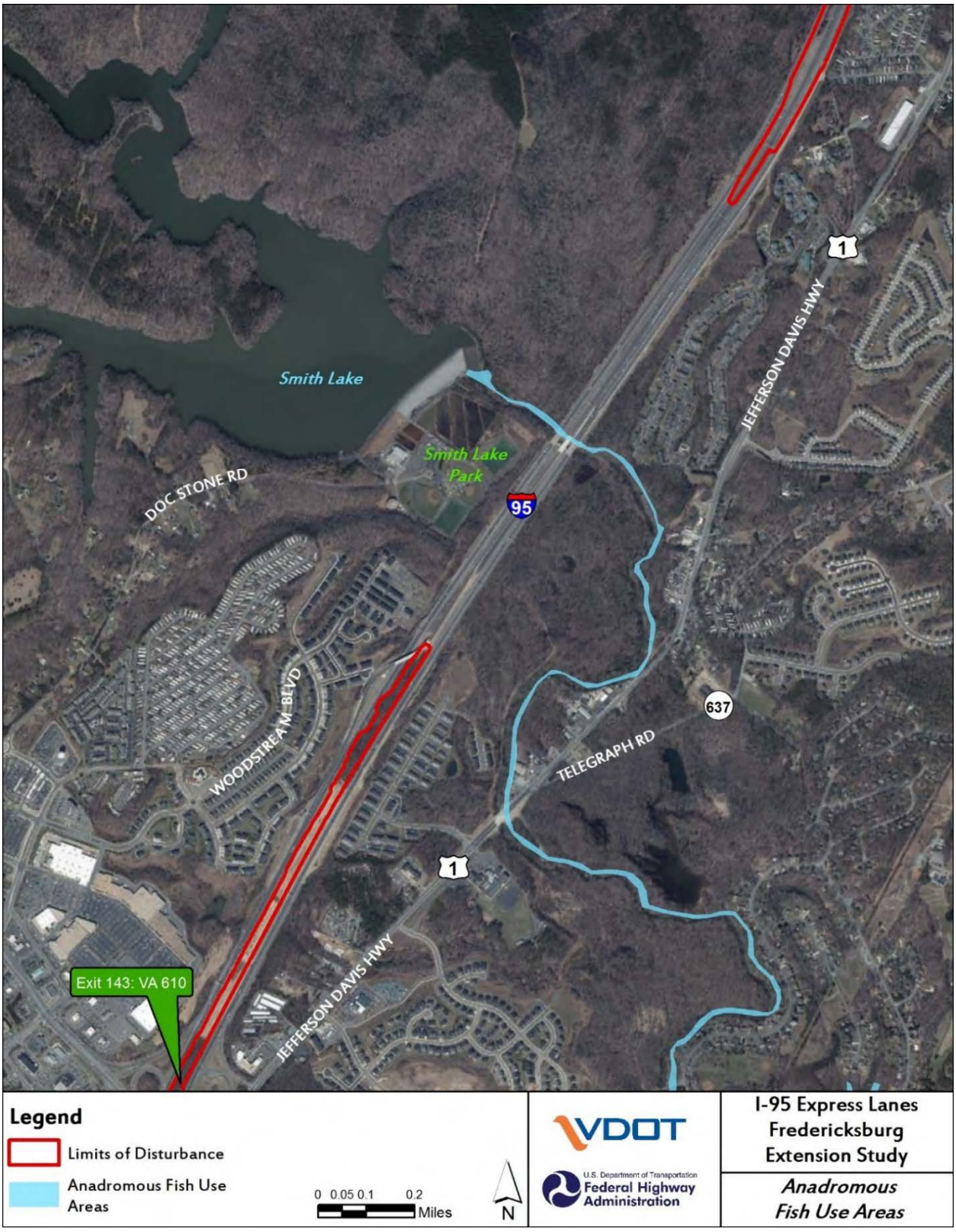


Table 2-15: Threatened or Endangered Species Mapped in the Vicinity of the Study Area

Species	Status	Source of Listing
Dwarf Wedgemussel (*Alasmidonta heterodon*)	FESE	IPaC, VFWIS, DCR-DNH
Harperella (*Ptilimnium nodosum*)	FE	IpaC
Small Whorled Pogonia (*Isotria medeoloides*)	FT	IPaC, DCR-DNH
Yellow Lance (*Elliptio lanceolata*)	Proposed FT[1]	IPaC
Northern Long-eared Bat (*Myotis septentrionalis*)	FTST	IPaC, VFWIS
Brook Floater (*Alasmidonta varicosa*)	SE	VFWIS
Green Floater (*Lasmigona subviridis*)	ST	VFWIS, DCR-DNH

Notes: 1=Proposed as a federally-threatened species on April 5, 2017; FE = federally-endangered; SE = state-endangered; FT= federally-threatened; ST = state-threatened.

The following describes the results of the habitat assessment for terrestrial and aquatic species and the conditions of the potential habitat present within study area.

Suitable foraging and summer roosting habitat for the northern long-eared bat (NLEB) is present throughout the study area. For the purposes of this study, all forested areas were considered a potential summer roosting habitat. Acreages were quantified based upon coverage on aerial photography and reconciled with areas that were identified as currently deforested during the field assessment. The total acreage of estimated NLEB summer roosting habitat is included in **Table 2-16**.

Mapping obtained from the USFWS' Virginia Field Office indicates that most of the Potomac River shoreline to the east of the study area is considered a bald eagle concentration area for the yearly periods extending May 15th to August 31st and December 15th to March 15th (USFWS, 2017b). These dates represent the time-of-year-restrictions for activities within the mapped concentration areas. For projects that have blasting or other loud noise components, the buffer distance from the concentration area is 2,640 feet or up to 5,280 feet in open areas. For projects with activities within areas with noise buffers extending into concentration areas, an Eagle Act permit from the USFWS may be necessary.

The Center for Conservation Biology VA Eagle Nest Locator was used to identify and map known eagle nest locations in the study area. Results from this service indicate that there are no known nest locations in the study area (**Appendix E**) (Center for Conservation Biology, 2017). The nests are located predominately along the shoreline of the Potomac River and its embayments.

Potential small whorled pogonia (SWP) habitat was identified in the study area within forested areas along the northbound and southbound lanes of I-95 as well as the median. Suitable habitat areas are depicted on the Threatened and Endangered Species Habitat Map (**Appendix D**). The estimated total acreage of this potential SWP habitat is included in **Table 2-16**.

Table 2-16: Potential Terrestrial Threatened or Endangered Species Habitat in Study Area

Species	Habitat Acreage
Northern Long-eared Bat	605.8
Small Whorled Pogonia	66.1

Potential habitat for mussels was found in various perennial streams in the study area, as depicted on the Threatened and Endangered Species Habitat Maps (**Appendix D**). These streams include Aquia Creek, Chopawamsic Creek, Austin Run, and Potomac Creek, as well as unnamed perennial streams. The acreage and linear feet of habitat for the aquatic threatened or endangered species is provided in **Table 2-17**. For the purposes of this study, the range of favorable habitat conditions preferred by any of the four mussel species was considered in the habitat evaluation and designation of streams as potential habitat. Intermittent and ephemeral stream channels were categorized as unsuitable habitat and were not evaluated.

Potential habitat for harperella is present in four perennial stream channels in the study area, including Aquia Creek, Chopawamsic Creek, Austin Run, and one unnamed perennial stream, as depicted on the Threatened and Endangered Species Habitat Map (**Appendix D**).

Table 2-17: Potential Aquatic Threatened or Endangered Species Habitat in Study Area

Species	Linear Feet of Aquatic Habitat	Habitat Acreage
Brook Floater	14,274	5.9
Dwarf Wedgemussel	14,274	5.9
Green Floater	14,274	5.9
Yellow Lance[1]	14,274	5.9
Harperella	10,233	3.7

Note: 1=Proposed as a federally-threatened species on April 5, 2017.

2.3.3 Environmental Consequences

Habitat and Wildlife

No-Build Alternative

Stormwater management features are absent, or outdated, in portions of the study area. Existing indirect effects to habitat and wildlife associated with untreated or poorly treated stormwater runoff from these areas would continue under the No-Build Alternative.

Build Alternative

The vast majority of the planning level LOD occurs in the existing right-of-way resulting in no increased width to the barrier preventing wildlife movement. The barrier width is increased in four limited areas. The largest increase occurs north of the Warrenton Road interchange where the barrier will be increased for approximately 0.6 mile along the southbound lanes out to a maximum distance of approximately 245 feet from the existing edge of the right-of-way. However, increasing the width of the roadway corridor in this and the other areas would not likely exacerbate the problems posed to wildlife movement as the interstate facility and other barriers currently exist preventing terrestrial wildlife from crossing the travel lanes.

The bridges in the planning level LOD may provide habitat for bats, as well as migratory birds protected under the Migratory Bird Treaty Act. Potential impacts to bats are further discussed in the Threatened or Endangered Species Section of this report. The VDGIF institutes a time-of-year restriction for certain activities for listed species occurring between March 15 and August 15 of each year. If nests of birds protected under the Migratory Bird Treaty Act are located in the LOD, appropriate coordination would occur with state and federal agencies prior to construction. Disturbance, destruction, and removal of

active nests would be avoided during the nesting season. In addition, the collection, capture, relocation, or transport of migratory birds, eggs, young, or active nests would not occur without a permit.

Anadromous Fish

No-Build Alternative

Stormwater management features are absent, or outdated, in portions of the study area. Existing indirect effects to anadromous fish associated with untreated or poorly treated stormwater runoff from these areas would continue under the No-Build Alternative.

Build Alternative

No potential or confirmed Anadromous Fish Use Areas occur in the planning level LOD. Therefore, no direct impacts to anadromous fish are anticipated with the Build Alternative. Indirect effects to Anadromous Fish Use Areas located downstream of the planning level LOD are discussed in the *Interstate 95 Express Lanes Fredericksburg Extension Study Indirect and Cumulative Effects Technical Report* (VDOT, 2017b).

Threatened or Endangered Species

No-Build Alternative

Stormwater management features are absent, or outdated, in portions of the study area. Existing indirect effects to threatened or endangered species associated with untreated or poorly treated stormwater runoff from these areas would continue under the No-Build Alternative.

Build Alternative

Potential summer roosting habitat has been confirmed for NLEB in the planning level LOD. Potential habitat was observed in forested areas located in the median of the divided lanes extending throughout approximately 53 percent of the planning level LOD. Potential habitat was also observed where the planning level LOD extends outside of the current right-of-way near the Warrenton Road and Courthouse Road interchanges.

Forest clearing along the edge of the existing right-of-way would result in minimal reduction in forested cover and quality of forested habitat. Clearing of forested habitat within interchanges and smaller fragmented forested areas within the median would result in the removal of sub-optimal habitat that has a low potential for roosting and generally does not provide suitable commuting and foraging corridors for bats. Larger tracts of contiguous forest within the median provide suitable summer roosting habitat and foraging in areas. However, the areas are still fragmented from the surrounding landscape by a three-lane heavily trafficked highway. Clearing of these forested areas would not result in the removal of optimal habitat for NLEB. No confirmed maternity roosts or hibernacula are located within a two-mile radius of the study area, further limiting the potential effects on the species. Prior to construction, additional coordination would be undertaken with the appropriate agencies.

Potential SWP habitat was confirmed in the planning level LOD in the median of the divided interstate. However, an IPaC official species list obtained from the USFWS does not list the SWP as a species of concern in the planning level LOD. If the species does occur in the planning level LOD, impacts from forest clearing along the eastern and western edge of the existing right-of-way would render these areas as unsuitable as well as some adjacent habitat areas due to increased plant densities from edge effects of the clearing. Forest clearing within the median also would likely render all habitat unsuitable either from forested conversion or fragmentation of the suitable habitat that would lead to unsuitable habitat conditions from an increased density of understory and herbaceous growth due to edge effects.

Coordination with appropriate agencies and a survey to determine the presence of the species in the area would be conducted prior to construction.

Table 2-18: Potential Terrestrial Threatened or Endangered Species Habitat in Planning Level LOD

Species	Habitat Acreage
Northern Long-eared Bat	177.0
Small Whorled Pogonia	32.5

The quality of suitable harperella habitat within Aquia Creek, Chopawamsic Creek, and Austin Run should not be significantly impacted if the areas remain bridged and hydrologic conditions do not change as a result of construction activities. The remaining potential habitat within the median would likely be rendered unsuitable due to direct impacts or possible alterations in hydrology and water quality.

The quality of suitable mussel habitat within Chopawamsic Creek, Austin Run, and Potomac Creek should not be significantly impacted if the areas remain bridged and hydrologic conditions and water quality do not change as a result of construction activities. Suitable habitat within the median would likely be rendered unsuitable due to direct impacts or possible alterations in hydrology and water quality. Efforts to avoid and or minimize direct instream impacts and any downstream indirect or cumulative impacts can be made by adhering to strict erosion and sediment control and performing all instream construction activities behind cofferdams.

Table 2-19: Potential Aquatic Threatened or Endangered Species Habitat in Planning Level LOD

Species	Linear Feet of Aquatic Habitat	Habitat Acreage
Brook Floater	795.2	0.3
Dwarf Wedgemussel	795.2	0.3
Green Floater	795.2	0.3
Yellow Lance[1]	795.2	0.3
Harperella	951.5	0.3

Note: 1=Proposed as a federally-threatened species on April 5, 2017

According to mapping obtained from the USFWS' Virginia Field Office and Center for Conservation Biology VA Eagle Nest Locator, the planning level LOD does not contain bald eagle concentration areas nor bald eagle nests. These databases would be reviewed again when a federal permit is requested for the project. If an eagle nest were located in the design level LOD, at that time, coordination would occur to determine if an Eagle Act permit from the USFWS would be required.

To reduce potential impacts to terrestrial threatened and endangered species and their habitat, efforts to minimize the construction footprint would be considered. Construction practices would avoid the removal of existing vegetation to the greatest extent possible and include the implementation of best management practices for erosion and sediment control as well as stormwater management to reduce potential impacts to adjacent habitats and properties. Practices such as silt fence and straw bales, diversion ditches, sediment traps and basins, culvert outlet protection, vegetative streambank stabilization, dewatering structures, temporary and permanent seeding, and flagging or fencing of areas not to be disturbed would minimize impacts to both terrestrial and aquatic species.

Due to the potential presence of the species where suitable habitat is present, performing presence/absence surveys may be required by the agencies. If presence of any species is confirmed, the agencies may recommend a time-of-year restriction for activities within occupied habitat and these restrictions would be determined through the permitting process. A summary of current applicable VDGIF time-of-year restrictions for specific species currently listed, or proposed, as threatened or endangered is provided in **Table 2-18**.

Table 2-20: Threatened and Endangered Species Time-of-Year Restrictions

Species	Time-of-Year Restrictions
Northern Long-eared Bat	April 15 – Sep 15 for tree removal activities
Dwarf Wedgemussel	March 15 – May 31; August 15 – October 15
Brook Floater/Green Floater	April 15 – June 15; August 15 – September 30
Yellow Lance[1]	May 15 – July 31

Note: 1=Proposed as a federally-threatened species on April 5, 2017

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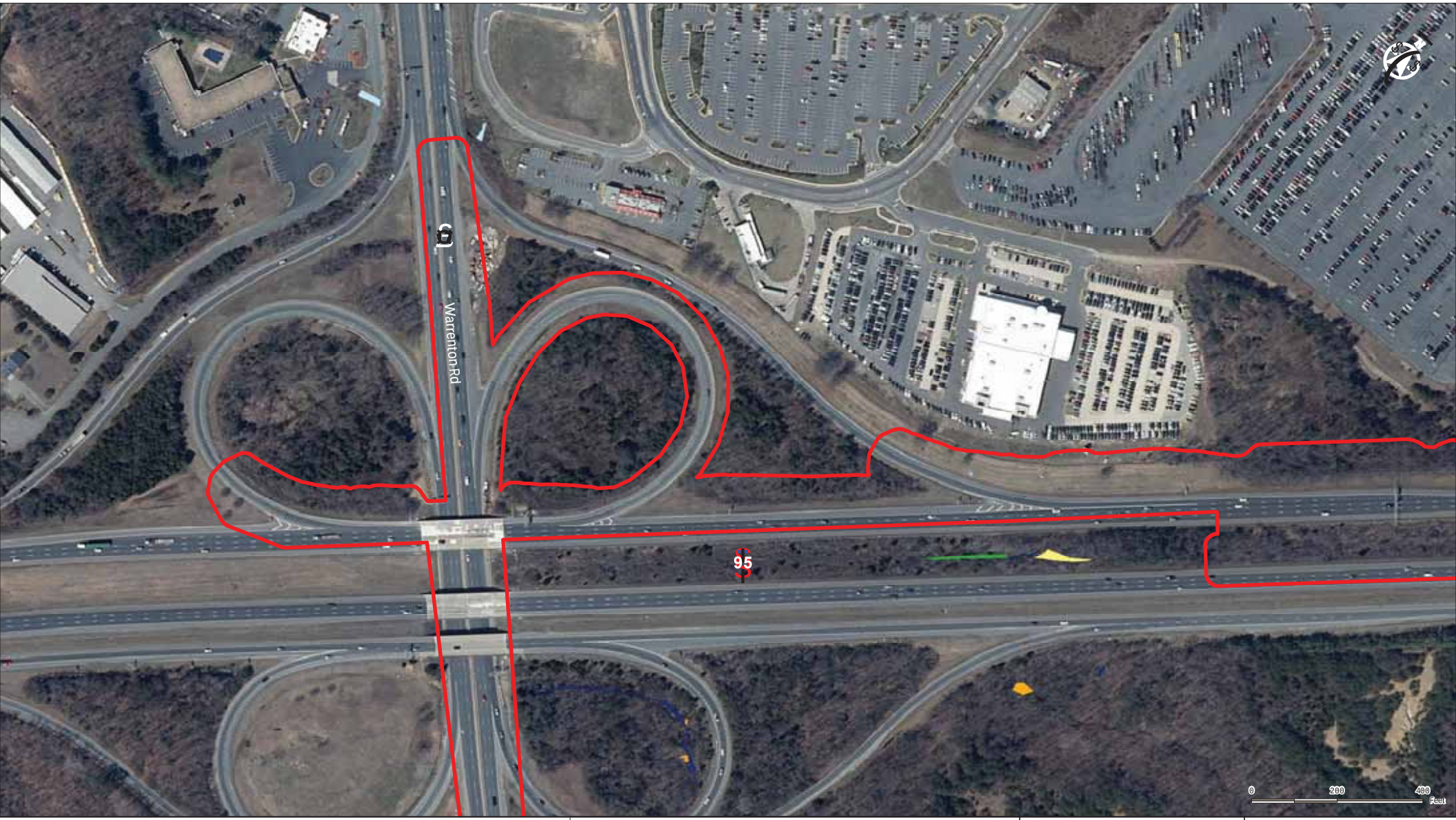
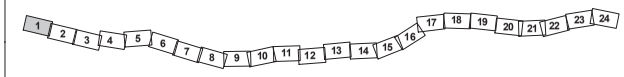
Appendix A:
Water Resources Mapping



Legend

- Limits of Disturbance
- Approximate Palustrine Emergent Wetland Limits (PEM)
- Approximate Palustrine Scrub-Shrub Wetland Limits (PSS)
- Approximate Palustrine Forested Wetland Limits (PFO)
- Approximate Jurisdictional Ditch Limits (PUBx)
- Approximate Upper Perennial Stream Channel (R3) Limits
- Approximate Intermittent Stream Channel (R4) Limits
- Approximate Ephemeral Stream Channel Limits
- Approximate Tidal Stream Channel (R1) Limits
- Open Water



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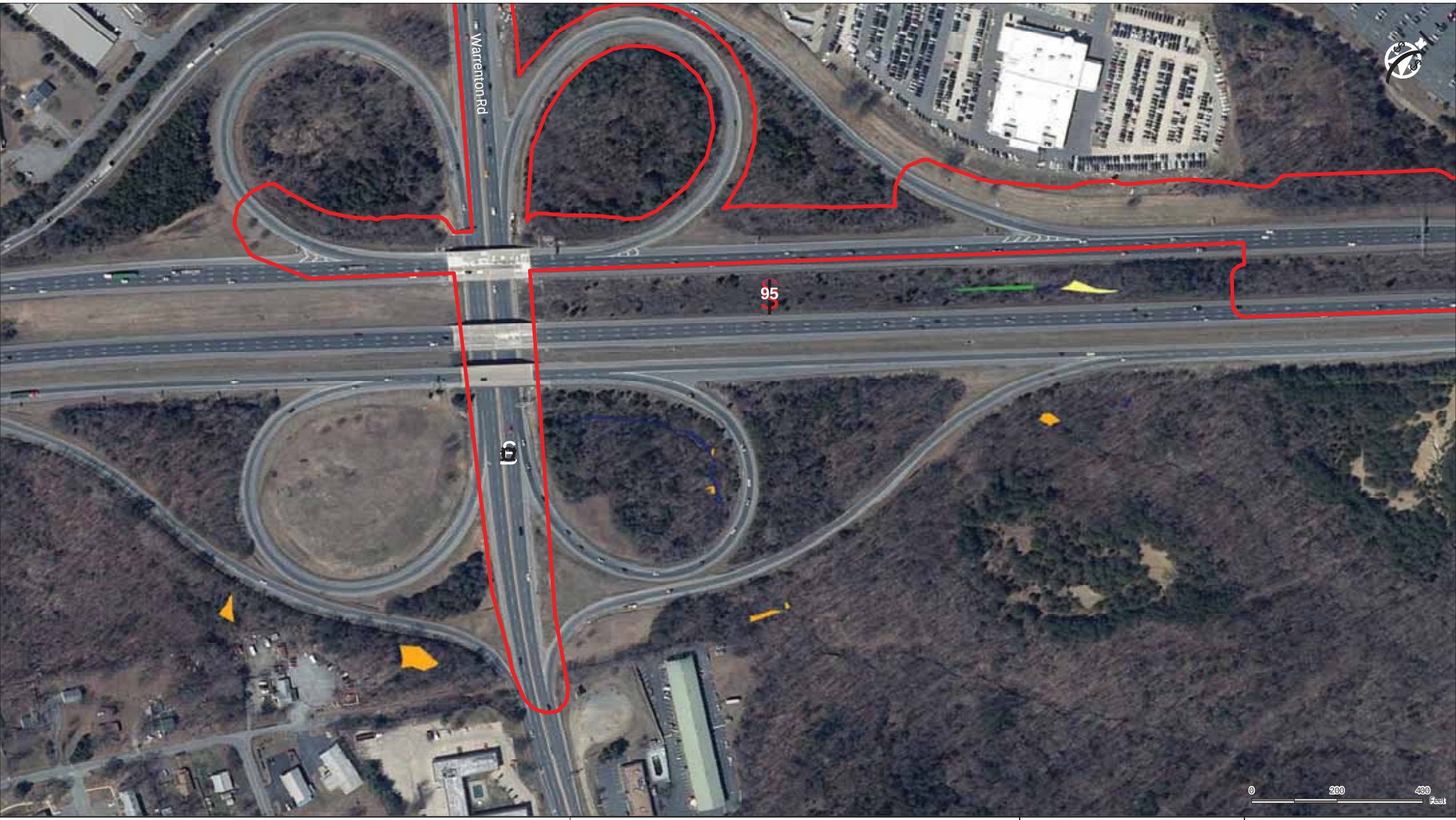

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- Approximate Ephemeral Stream Channel Limits
- Approximate Tidal Stream Channel (R1) Limits
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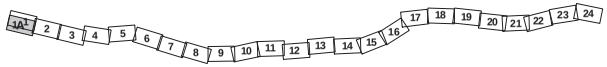

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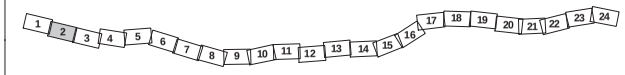

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I-95 Express Lanes
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Water Resources

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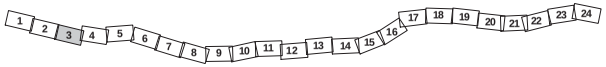

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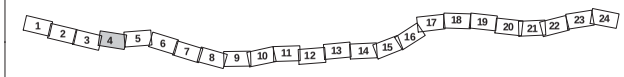

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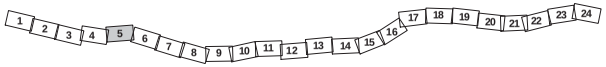

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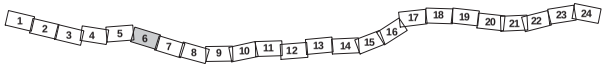

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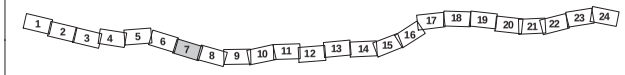

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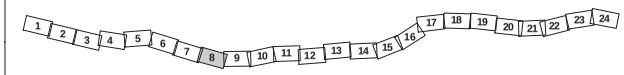

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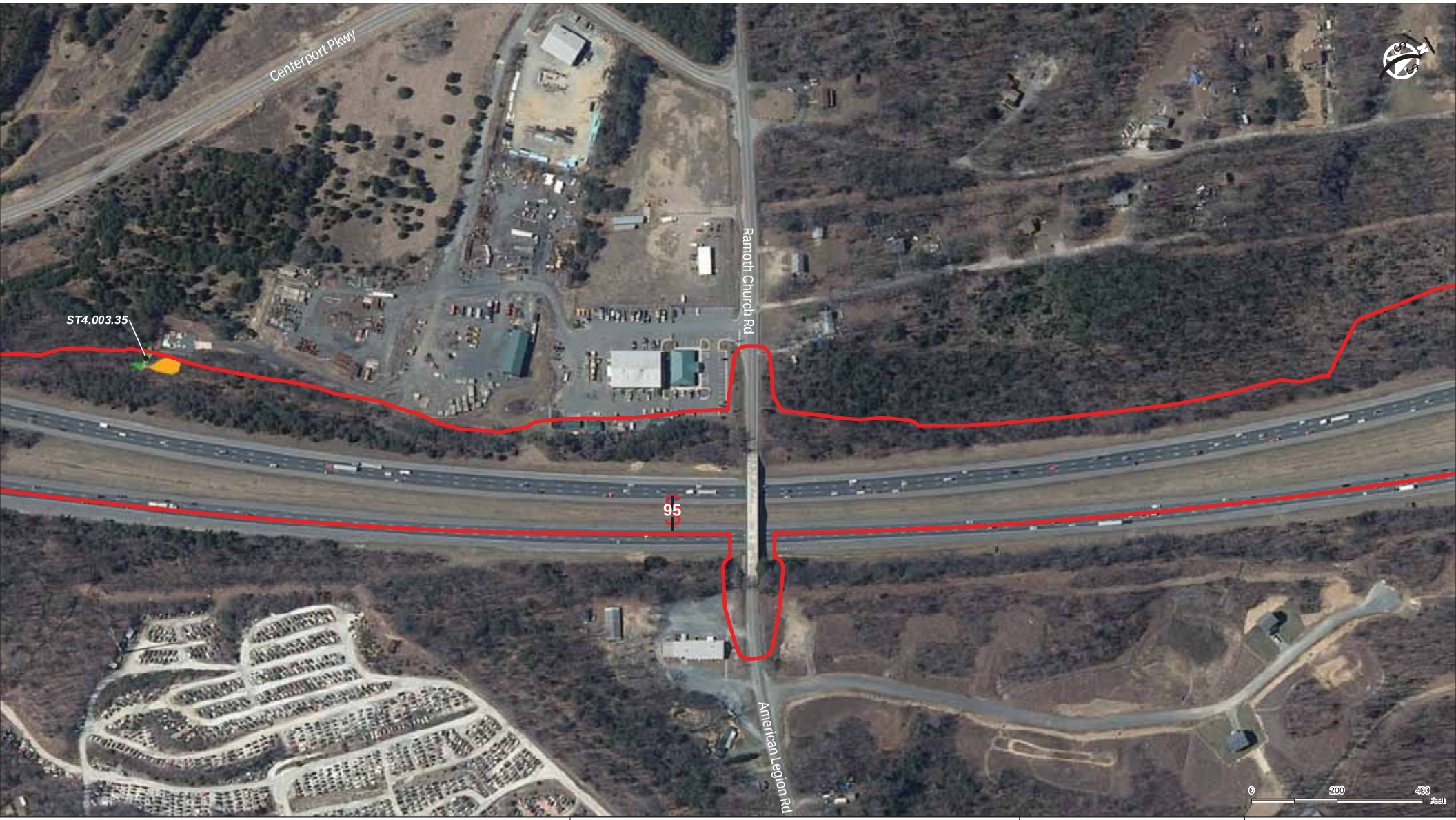

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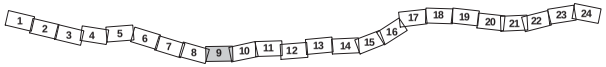

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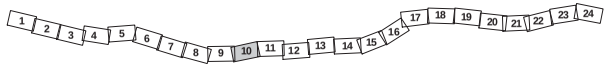

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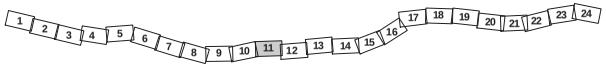

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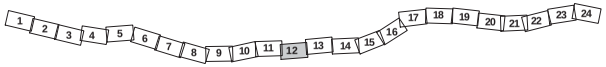

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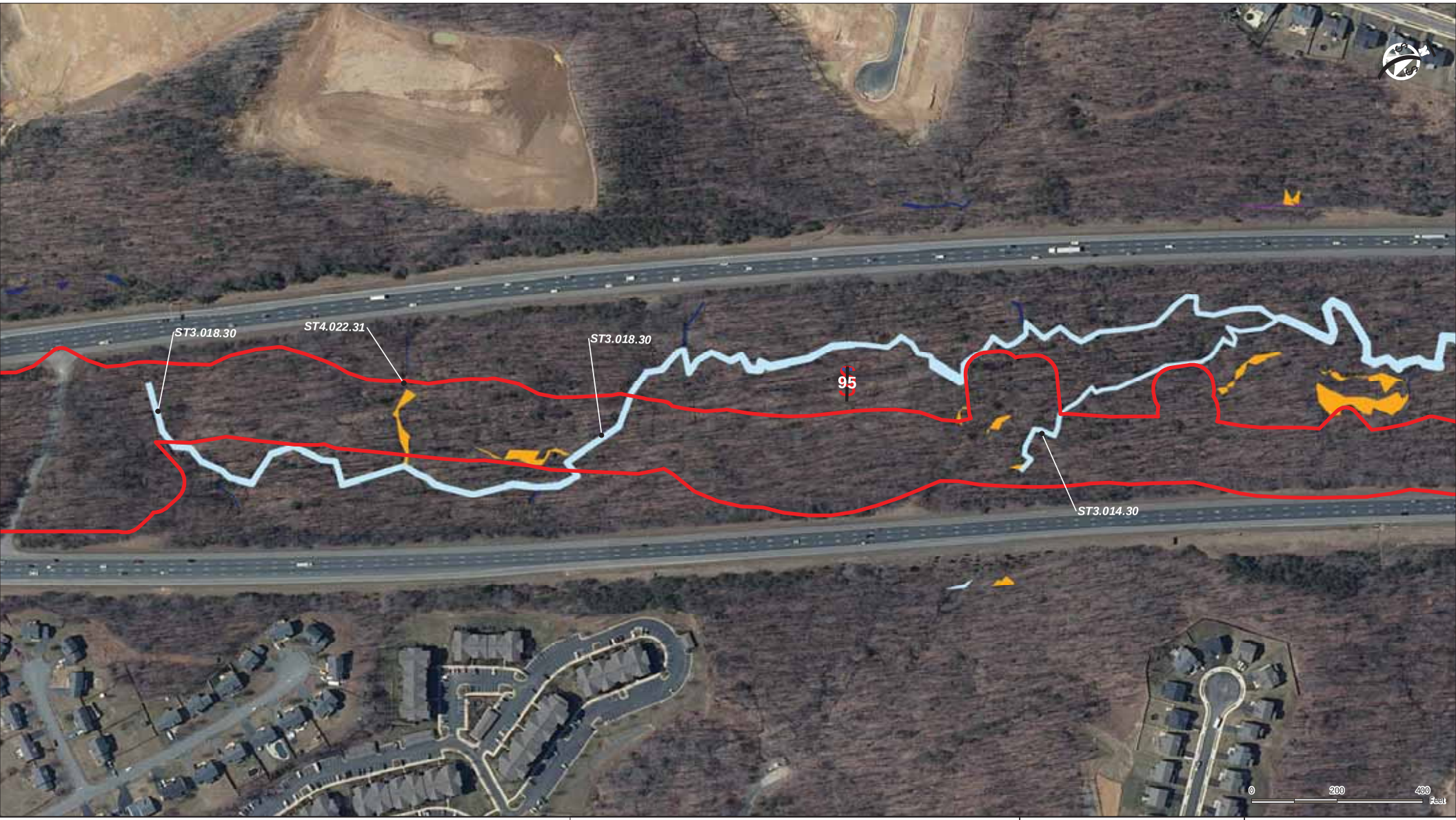

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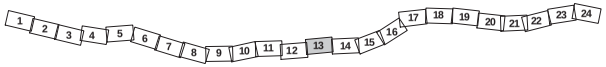

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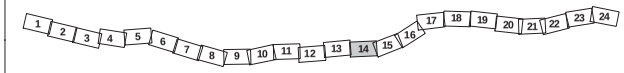

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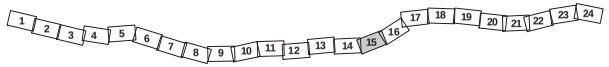

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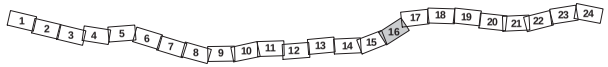

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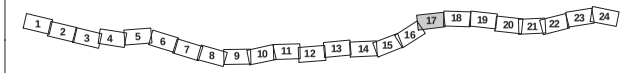

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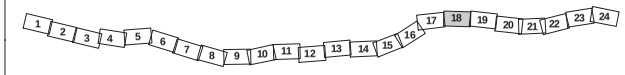

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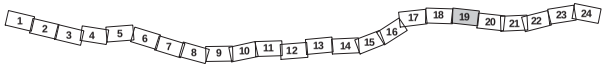

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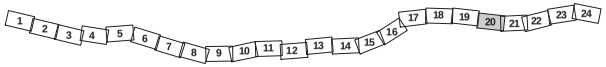

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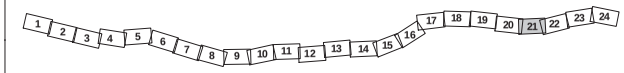

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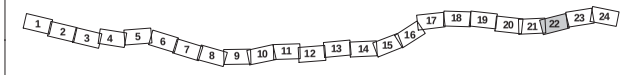

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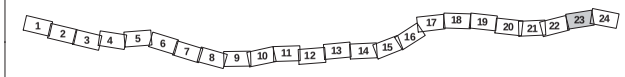

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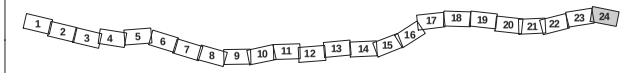

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Appendix B:

Virginia Department of Game and Inland Fisheries Virginia Fish and Wildlife Information Service Search Report

Virginia Department of Game and Inland Fisheries

5/31/2017 12:21:56 PM

Fish and Wildlife Information Service

VaFWIS Search Report Compiled on 5/31/2017, 12:21:56 PM

Help

Known or likely to occur within a **2 mile buffer around polygon; center 38.5244000 -77.3696899**
in **153 Prince William County, 177 Spotsylvania County, 179 Stafford County, 630 Fredericksburg City, VA**

View Map of Site Location

612 Known or Likely Species ordered by Status Concern for Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060003	FESE	Ia	Wedgemussel, dwarf	Alasmidonta heterodon	Yes	BOVA,TEWaters,Habitat,HU6
010032	FESE	Ib	Sturgeon, Atlantic	Acipenser oxyrinchus	Yes	BOVA,TEWaters
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus lucifugus		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
060006	SE	Ib	Floater, brook	Alasmidonta varicosa		BOVA
040096	ST	Ia	Falcon, peregrine	Falco peregrinus		BOVA,HU6
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
040379	ST	Ia	Sparrow, Henslow's	Ammodramus henslowii		BOVA
060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes	BOVA,TEWaters,Habitat,HU6
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030063	CC	IIIa	Turtle, spotted	Clemmys guttata		BOVA,HU6
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus		BOVA,HU6
010077		Ia	Shiner, bridle	Notropis bifrenatus	Yes	BOVA,Habitat,SppObs,HU6
040306		Ia	Warbler, golden-winged	Vermivora chrysoptera		BOVA
100248		Ia	Fritillary, regal	Speyeria idalia idalia		BOVA,HU6

040213		Ic	Owl, northern saw-whet	Aegolius acadicus		BOVA,HU6
040052		IIa	Duck, American black	Anas rubripes	Potential	BOVA,BBA,HU6
040036		IIa	Night-heron, yellow-crowned	Nyctanassa violacea violacea		BOVA
040181		IIa	Tern, common	Sterna hirundo		BOVA,HU6
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA,HU6
040140		IIa	Woodcock, American	Scolopax minor	Yes	BOVA,BBA,SppObs,HU6
060029		IIa	Lance, yellow	Elliptio lanceolata		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans	Potential	BOVA,Habitat,HU6
060175		IIb	Slabshell, Roanoke	Elliptio roanokensis		BOVA
010131		IIIa	Eel, American	Anguilla rostrata	Yes	BOVA,SppObs,HU6
020005		IIIa	Frog, carpenter	Lithobates virgatipes		BOVA
030068		IIIa	Turtle, woodland box	Terrapene carolina carolina	Yes	BOVA,SppObs,HU6
040037		IIIa	Bittern, least	Ixobrychus exilis exilis		BOVA,HU6
040100		IIIa	Bobwhite, northern	Colinus virginianus	Potential	BOVA,BBA,HU6
040202		IIIa	Cuckoo, yellow-billed	Coccyzus americanus	Potential	BOVA,BBA,HU6
040099		IIIa	Grouse, ruffed	Bonasa umbellus	Potential	BOVA,BBA,HU6
040094		IIIa	Harrier, northern	Circus cyaneus		BOVA,HU6
040035		IIIa	Night-heron, black-crowned	Nycticorax nycticorax hoactii		BOVA
040204		IIIa	Owl, barn	Tyto alba pratincola		BOVA,HU6
040180		IIIa	Tern, Forster's	Sterna forsteri		BOVA,HU6
040333		IIIa	Warbler, Kentucky	Geothlypis formosa	Potential	BOVA,BBA,HU6
040215		IIIa	Whip-poor-will, Eastern	Antrostomus vociferus	Potential	BOVA,BBA,HU6
100079		IIIa	Butterfly, monarch	Danaus plexippus		BOVA
040220		IIIb	Kingfisher, belted	Ceryle alcyon	Potential	BOVA,BBA

040372		IIIc	Crossbill, red	Loxia curvirostra		BOVA
040247		IIIc	Swallow, bank	Riparia riparia	Potential	BOVA,BBA
100150		IIIc	Butterfly, mottled duskywing	Erynnis martialis		BOVA
010038		IVa	Herring, alewife	Alosa pseudoharengus	Yes	BOVA,SppObs,HU6
010045		IVa	Herring, blueback	Alosa aestivalis	Yes	BOVA,SppObs,HU6
010040		IVa	Shad, American	Alosa sapidissima	Yes	BOVA,SppObs,HU6
010052		IVa	Trout, brook	Salvelinus fontinalis		BOVA,HU6
020069		IVa	Salamander, eastern mud	Pseudotriton montanus montanus	Yes	BOVA,SppObs,HU6
020058		IVa	Siren, greater	Siren lacertina		BOVA
030045		IVa	Ribbonsnake, common	Thamnophis sauritus sauritus		BOVA,HU6
030017		IVa	Scarletsnake, northern	Cemophora coccinea copei		BOVA
030033		IVa	Snake, queen	Regina septemvittata	Yes	BOVA,SppObs,HU6
030065		IVa	Turtle, northern map	Graptemys geographica		BOVA
040272		IVa	Catbird, gray	Dumetella carolinensis	Yes	BOVA,BBA,SppObs,HU6
040337		IVa	Chat, yellow-breasted	Icteria virens virens	Potential	BOVA,BBA,HU6
040142		IVa	Dowitcher, short-billed	Limnodromus griseus		BOVA,HU6
040173		IVa	Gull, laughing	Leucophaeus atricilla		BOVA
040229		IVa	Kingbird, eastern	Tyrannus tyrannus	Potential	BOVA,BBA,HU6
040344		IVa	Meadowlark, eastern	Sturnella magna	Potential	BOVA,BBA,HU6
040054		IVa	Pintail, northern	Anas acuta acuta		BOVA,HU6
040065		IVa	Scaup, greater	Aythya marila		BOVA,HU6
040391		IVa	Sparrow, field	Spizella pusilla	Potential	BOVA,BBA,HU6
040378		IVa	Sparrow, grasshopper	Ammodramus savannarum pratensis	Potential	BOVA,BBA,HU6
040273		IVa	Thrasher, brown	Toxostoma rufum	Potential	BOVA,BBA,HU6
040375		IVa	Towhee, eastern	Pipilo erythrophthalmus	Potential	BOVA,BBA,HU6

040302		IVa	Warbler, black-and-white	Mniotilta varia	Potential	BOVA,BBA,HU6
040269		IVa	Wren, marsh	Cistothorus palustris	Potential	BOVA,BBA,HU6
050029		IVa	Bat, eastern red	Lasiurus borealis borealis		BOVA
050030		IVa	Bat, hoary	Lasiurus cinereus cinereus		BOVA
050025		IVa	Bat, silver-haired	Lasionycteris noctivagans		BOVA
060137		IVa	Creeper	Strophitus undulatus	Yes	BOVA,SppObs,HU6
060157		IVa	Floater, Alewife	Anodonta implicata	Yes	BOVA,SppObs,HU6
060074		IVa	Mucket, tidewater	Leptodea ochracea		HU6
060026		IVa	Mussel, Carolina slabshell	Elliptio congaraea		BOVA,HU6
060005		IVa	Mussel, triangle floater	Alasmidonta undulata	Yes	BOVA,SppObs,HU6
030050		IVb	Turtle, snapping	Chelydra serpentina	Yes	BOVA,SppObs,HU6
040349		IVb	Blackbird, rusty	Euphagus carolinus		BOVA,HU6
040221		IVb	Flicker, northern	Colaptes auratus	Potential	BOVA,BBA
040028		IVb	Heron, green	Butorides virescens	Potential	BOVA,BBA,HU6
040243		IVb	Pewee, eastern wood	Contopus virens	Potential	BOVA,BBA,HU6
040217		IVb	Swift, chimney	Chaetura pelagica	Yes	BOVA,BBA,SppObs,HU6
040277		IVb	Thrush, wood	Hylocichla mustelina	Yes	BOVA,BBA,SppObs,HU6
040340		IVb	Warbler, Canada	Cardellina canadensis		BOVA,HU6
060184		IVb	Mussel, northern lance	Elliptio fisheriana		BOVA,HU6
010359		IVc	Lamprey, American brook	Lampetra appendix	Yes	BOVA,SppObs,HU6
010001		IVc	Lamprey, least brook	Lampetra aepyptera	Yes	BOVA,SppObs,HU6
010128		IVc	Madtom, tadpole	Noturus gyrinus		BOVA
010173		IVc	Sunfish, mud	Acantharchus pomotis		BOVA,HU6

020061		IVc	Spadefoot, eastern	Scaphiopus holbrookii		HU6
030024		IVc	Snake, eastern hog-nosed	Heterodon platirhinos	Yes	BOVA,SppObs,HU6
040248		IVc	Swallow, northern rough-winged	Stelgidopteryx serripennis	Potential	BOVA,BBA,HU6
060159		IVc	Lance, Carolina	Elliptio angustata	Yes	BOVA,SppObs,HU6
060176		IVc	Spike, Atlantic	Elliptio producta		BOVA
070104		IVc	Crayfish, Allegheny	Orconectes obscurus		BOVA
100223		IVc	Butterfly, frosted elfin	Callophrys irus		BOVA
010049			Anchovy, bay	Anchoa mitchilli		BOVA
010188			Bass, largemouth	Micropterus salmoides	Yes	BOVA,SppObs
010175			Bass, rock	Ambloplites rupestris	Yes	BOVA,SppObs
010186			Bass, smallmouth	Micropterus dolomieu	Yes	BOVA,SppObs
010187			Bass, spotted	Micropterus punctulatus		BOVA
010168			Bass, striped	Morone saxatilis	Yes	BOVA,SppObs
010167			Bass, white	Morone chrysops		BOVA
010183			Bluegill	Lepomis macrochirus	Yes	BOVA,SppObs
010034			Bowfin	Amia calva		BOVA
010121			Bullhead, black	Ameiurus melas		BOVA
010123			Bullhead, brown	Ameiurus nebulosus	Yes	BOVA,SppObs
010122			Bullhead, yellow	Ameiurus natalis		BOVA
010062			Carp, common	Cyprinus carpio	Yes	BOVA,SppObs
010390			Catfish, blue	Ictalurus furcatus		BOVA
010125			Catfish, channel	Ictalurus punctatus	Yes	BOVA,SppObs
010130			Catfish, flathead	Pylodictis olivaris		BOVA
010120			Catfish, white	Ameiurus catus		BOVA
010066			Chub, bluehead	Nocomis leptocephalus	Yes	BOVA,SppObs
010103			Chub, creek	Semotilus atromaculatus	Yes	BOVA,SppObs
010067			Chub, river	Nocomis micropogon	Yes	BOVA,SppObs

010106			Chubsucker, creek	Erimyzon oblongus	Yes	BOVA,SppObs
010190			Crappie, black	Pomoxis nigromaculatus	Yes	BOVA,SppObs
010189			Crappie, white	Pomoxis annularis		BOVA
010250			Croaker, Atlantic	Micropogonias undulatus		BOVA
010101			Dace, blacknose	Rhinichthys atratulus	Yes	BOVA,SppObs
010102			Dace, longnose	Rhinichthys cataractae	Yes	BOVA,SppObs
010060			Dace, mountain redbelly	Chrosomus oreas	Yes	BOVA,SppObs
010366			Dace, rosyside	Clinostomus funduloides	Yes	BOVA,SppObs
010193			Darter, fantail	Etheostoma flabellare	Yes	BOVA,SppObs
010204			Darter, glassy	Etheostoma vitreum	Yes	BOVA,SppObs
010191			Darter, greenside	Etheostoma blennioides		BOVA
010196			Darter, longfin	Etheostoma longimanum		BOVA
010192			Darter, rainbow	Etheostoma caeruleum		BOVA
010213			Darter, shield	Percina peltata	Yes	BOVA,SppObs
010211			Darter, stripeback	Percina notogramma	Yes	BOVA,SppObs
010397			Darter, tessellated	Etheostoma olmstedi	Yes	BOVA,SppObs
010104			Fallfish	Semotilus corporalis	Yes	BOVA,SppObs
010176			Flier	Centrarchus macropterus		BOVA
010033			Gar, longnose	Lepisosteus osseus		BOVA
010059			Goldfish	Carassius auratus	Yes	BOVA,SppObs
010312			Hogchoker	Trinectes maculatus		BOVA
010143			Killifish, banded	Fundulus diaphanus	Yes	BOVA,SppObs
010002			Lamprey, sea	Petromyzon marinus	Yes	BOVA,SppObs
010424			Madtom, Genus = Noturus	Noturus spp.		BOVA
010129			Madtom, margined	Noturus insignis	Yes	BOVA,SppObs

010432			Madtom, spotted-margin	Noturus insignis ssp 1		BOVA
010043			Menhaden, Atlantic	Brevoortia tyrannus		BOVA
010099			Minnow, bluntnose	Pimephales notatus		BOVA
010063			Minnow, cutlips	Exoglossum maxillingua	Yes	BOVA,SppObs
010408			Minnow, eastern silvery	Hybognathus regius	Yes	BOVA,SppObs
010100			Minnow, fathead	Pimephales promelas		BOVA
010367			Minnow, silverjaw	Ericymba buccatus	Yes	BOVA,SppObs
010148			Mosquitofish, eastern	Gambusia holbrooki	Yes	BOVA,SppObs
010054			Mudminnow, eastern	Umbra pygmaea	Yes	BOVA,SppObs
010144			Mummichog	Fundulus heteroclitus		BOVA
010163			Perch, pirate	Aphredoderus sayanus sayanus	Yes	BOVA,SppObs
010166			Perch, white	Morone americana	Yes	BOVA,SppObs
010206			Perch, yellow	Perca flavescens	Yes	BOVA,SppObs
010056			Pickerel, chain	Esox niger	Yes	BOVA,SppObs
010055			Pickerel, redfin	Esox americanus americanus	Yes	BOVA,SppObs
010364			Pike, northern	Esox lucius		BOVA
010182			Pumpkinseed	Lepomis gibbosus	Yes	BOVA,SppObs
010441			pumpkinseed x green sunfish	Lepomis gibbosus x cyanellus		BOVA
010374			Quillback	Carpiodes cyprinus		BOVA
010114			Redhorse, golden	Moxostoma erythrurum		BOVA
010116			Redhorse, shorthead	Moxostoma macrolepidotum	Yes	BOVA,SppObs
010283			Sculpin, mottled	Cottus bairdii		BOVA
010407			Sculpin, Potomac	Cottus girardi		BOVA
010041			Shad, gizzard	Dorosoma cepedianum	Yes	BOVA,SppObs
010039			Shad, hickory	Alosa mediocris	Yes	BOVA,SppObs

010042			Shad, threadfin	Dorosoma petenense		BOVA
010072			Shiner, comely	Notropis amoenus	Yes	BOVA,SppObs
010080			Shiner, common	Luxilus cornutus	Yes	BOVA,SppObs
010453			Shiner, Genus = Cyprinella	Cyprinella sp.		BOVA
010068			Shiner, golden	Notemigonus crysoleucas	Yes	BOVA,SppObs
010074			Shiner, rosefin	Lythrurus ardens		BOVA
010466			shiner, rosyface	Notropis rubellus	Yes	BOVA,SppObs
010073			Shiner, satinfin	Cyprinella analostana	Yes	BOVA,SppObs
010091			Shiner, spotfin	Cyprinella spiloptera		BOVA
010082			Shiner, spottail	Notropis hudsonius	Yes	BOVA,SppObs
010086			Shiner, swallowtail	Notropis procne	Yes	BOVA,SppObs
010303			Silverside, Atlantic	Menidia menidia		BOVA
010302			Silverside, inland	Menidia beryllina		BOVA
010458			Snakehead, northern	Channa argus	Yes	BOVA,SppObs
010246			Spot	Leiostomus xanthurus		BOVA
010156			Stickleback, fourspine	Apeltes quadracus	Yes	BOVA,SppObs
010058			Stoneroller, central	Campostoma anomalum		BOVA
010108			Sucker, northern hog	Hypentelium nigricans	Yes	BOVA,SppObs
010105			Sucker, white	Catostomus commersonii	Yes	BOVA,SppObs
010178			Sunfish, bluespotted	Enneacanthus gloriosus	Yes	BOVA,SppObs
010454			Sunfish, Genus = Lepomis	Lepomis sp.		BOVA
010181			Sunfish, green	Lepomis cyanellus	Yes	BOVA,SppObs
010180			Sunfish, redbreast	Lepomis auritus	Yes	BOVA,SppObs
010185			Sunfish, redear	Lepomis microlophus	Yes	BOVA,SppObs
010051			Trout, brown	Salmo trutta		BOVA

010216			Walleye	Sander vitreus vitreus		BOVA
010177			Warmouth	Lepomis gulosus	Yes	BOVA,SppObs
020004			Bullfrog, American	Lithobates catesbeianus	Yes	BOVA,SppObs
020003			Frog, Brimley's chorus	Pseudacris brimleyi		BOVA
020012			Frog, eastern cricket	Acris crepitans	Yes	BOVA,SppObs
020008			Frog, green	Lithobates clamitans	Yes	BOVA,SppObs
020013			Frog, pickerel	Lithobates palustris	Yes	BOVA,SppObs
020016			Frog, southern leopard	Lithobates sphenocephalus utricularius		BOVA
020018			Frog, upland chorus	Pseudacris feriarum	Yes	BOVA,SppObs
020019			Frog, wood	Lithobates sylvaticus	Yes	BOVA,SppObs
020065			Newt, red-spotted	Notophthalmus viridescens viridescens	Yes	BOVA,SppObs
020071			Peeper, spring	Pseudacris crucifer	Yes	BOVA,SppObs
020043			Salamander, eastern red-backed	Plethodon cinereus	Yes	BOVA,SppObs
020029			Salamander, four-toed	Hemidactylium scutatum	Yes	BOVA,SppObs
020035			Salamander, marbled	Ambystoma opacum	Yes	BOVA,SppObs
020038			Salamander, northern dusky	Desmognathus fuscus	Yes	BOVA,SppObs
020070			Salamander, northern red	Pseudotriton ruber ruber	Yes	BOVA,SppObs
020053			Salamander, northern two-lined	Eurycea bislineata	Yes	BOVA,SppObs
020050			Salamander, southern two-lined	Eurycea cirrigera		BOVA
020049			Salamander, spotted	Ambystoma maculatum	Yes	BOVA,SppObs
020051			Salamander, three-lined	Eurycea guttolineata	Yes	BOVA,SppObs
020080			Salamander, white-spotted slimy	Plethodon cylindraceus		BOVA

020059			Toad, eastern American	Anaxyrus americanus americanus	Yes	BOVA,SppObs
020060			Toad, eastern narrow-mouthed	Gastrophryne carolinensis		BOVA
020062			Toad, Fowler's	Anaxyrus fowleri	Yes	BOVA,SppObs
020006			Treefrog, Cope's gray	Hyla chrysoscelis	Yes	BOVA,SppObs
020007			Treefrog, gray	Hyla versicolor	Yes	BOVA,SppObs
020009			Treefrog, green	Hyla cinerea	Yes	BOVA,SppObs
030041			Brownsnake, northern	Storeria dekayi dekayi	Yes	BOVA,SppObs
030059			Cooter, eastern river	Pseudemys concinna concinna	Yes	BOVA,SppObs
030057			Cooter, northern red-bellied	Pseudemys rubriventris		BOVA
030016			Copperhead, northern	Agkistrodon contortrix mokasen	Yes	BOVA,SppObs
030022			Cornsnake, red	Pantherophis guttatus		BOVA
030049			Earthsnake, eastern smooth	Virginia valeriae valeriae		BOVA
030044			Gartersnake, eastern	Thamnophis sirtalis sirtalis	Yes	BOVA,SppObs
030078			Gecko, Mediterranean	Hemidactylus turcicus		BOVA
030038			Greensnake, northern rough	Opheodrys aestivus aestivus	Yes	BOVA,SppObs
030026			Kingsnake, eastern	Lampropeltis getula		BOVA
030027			Kingsnake, mole	Lampropeltis calligaster rhombomaculata		BOVA
030002			Lizard, eastern fence	Sceloporus undulatus	Yes	BOVA,SppObs
030029			Milksnake, eastern	Lampropeltis triangulum		BOVA
030018			Racer, northern black	Coluber constrictor constrictor	Yes	BOVA,SppObs
030008			Racerunner, eastern six-lined	Aspidoscelis sexlineata sexlineata		BOVA
030023			Ratsnake, eastern	Pantherophis alleghaniensis	Yes	BOVA,SppObs

030006			Skink, broad-headed	Plestiodon laticeps		BOVA
030004			Skink, common five-lined	Plestiodon fasciatus	Yes	BOVA,SppObs
030007			Skink, little brown	Scincella lateralis	Yes	BOVA,SppObs
030005			Skink, southeastern five-lined	Plestiodon inexpectatus		BOVA
030077			Slider, red-eared	Trachemys scripta elegans		BOVA
030042			Snake, northern red-bellied	Storeria occipitomaculata occipitomaculata		BOVA
030020			Snake, northern ring-necked	Diadophis punctatus edwardsii	Yes	BOVA,SppObs
030052			Turtle, eastern musk	Sternotherus odoratus	Yes	BOVA,SppObs
030060			Turtle, eastern painted	Chrysemys picta picta	Yes	BOVA,SppObs
030051			Turtle, southeastern mud	Kinosternon subrubrum subrubrum		BOVA
030034			Watersnake, northern	Nerodia sipedon sipedon	Yes	BOVA,SppObs
030019			Wormsnake, eastern	Carphophis amoenus amoenus	Yes	BOVA,SppObs
040116			Avocet, American	Recurvirostra americana		BOVA
040038			Bittern, American	Botaurus lentiginosus	Potential	Habitat,HU6
040346			Blackbird, red-winged	Agelaius phoeniceus	Potential	BOVA,BBA
040282			Bluebird, eastern	Sialia sialis	Yes	BOVA,BBA,SppObs
040343			Bobolink	Dolichonyx oryzivorus		BOVA
040068			Bufflehead	Bucephala albeola		BOVA
040361			Bunting, indigo	Passerina cyanea	Potential	BOVA,BBA
040401			Bunting, snow	Plectrophenax nivalis nivalis		BOVA
040064			Canvasback	Aythya valisineria		BOVA
040357			Cardinal, northern	Cardinalis cardinalis	Potential	BOVA,BBA

040258			Chickadee, Carolina	Poecile carolinensis	Potential	BOVA,BBA
040214			Chuck-will's-widow	Antrostomus carolinensis		BOVA,HU6
040113			Coot, American	Fulica americana		BOVA
040024			Cormorant, double-crested	Phalacrocorax auritus	Potential	BOVA,BBA
040023			Cormorant, great	Phalacrocorax carbo		BOVA
040353			Cowbird, brown-headed	Molothrus ater	Potential	BOVA,BBA
040264			Creeper, brown	Certhia americana		BOVA,HU6
040373			Crossbill, white-winged	Loxia leucoptera		BOVA
040255			Crow, American	Corvus brachyrhynchos	Potential	BOVA,BBA
040256			Crow, fish	Corvus ossifragus	Potential	BOVA,BBA
040364			Dickcissel	Spiza americana		BOVA
040198			Dove, mourning	Zenaida macroura carolinensis	Potential	BOVA,BBA
040069			Duck, long-tailed	Clangula hyemalis		BOVA
040076			Duck, ruddy	Oxyura jamaicensis		BOVA
040061			Duck, wood	Aix sponsa	Potential	BOVA,BBA
040093			Eagle, bald	Haliaeetus leucocephalus	Yes	BOVA,Habitat,BBA,SppObs,BAEANests,HU6
040030			Egret, cattle	Bubulcus ibis		BOVA
040032			Egret, great	Ardea alba egretta		BOVA
040367			Finch, house	Haemorhous mexicanus	Potential	BOVA,BBA
040366			Finch, purple	Haemorhous purpureus		BOVA
040239			Flycatcher, Acadian	Empidonax virescens	Potential	BOVA,BBA
040235			Flycatcher, ash-throated	Myiarchus cinerascens	Yes	BOVA,SppObs
040234			Flycatcher, great crested	Myiarchus crinitus	Potential	BOVA,BBA
040240			Flycatcher, willow	Empidonax traillii	Potential	BOVA,BBA,HU6
040053			Gadwall	Anas strepera		BOVA

040284			Gnatcatcher, blue-gray	Polioptila caerulea	Potential	BOVA,BBA
040371			Goldfinch, American	Spinus tristis	Potential	BOVA,BBA
040045			Goose, Canada	Branta canadensis	Yes	BOVA,BBA,SppObs
040049			Goose, lesser snow	Chen caerulescens caerulescens		BOVA
040410			Goose, snow	Chen caerulescens		BOVA
040352			Grackle, common	Quiscalus quiscula	Potential	BOVA,BBA,HU6
040008			Grebe, pied-billed	Podilymbus podiceps		BOVA
040360			Grosbeak, blue	Guiraca caerulea caerulea	Potential	BOVA,BBA
040365			Grosbeak, evening	Coccothraustes vespertinus		BOVA
040358			Grosbeak, rose-breasted	Pheucticus ludovicianus		BOVA,HU6
040165			Gull, great black-backed	Larus marinus		BOVA
040167			Gull, herring	Larus argentatus		BOVA
040164			Gull, Iceland	Larus glaucoides		BOVA
040408			Gull, ivory	Pagophila eburnea		BOVA
040170			Gull, ring-billed	Larus delawarensis		BOVA
040089			Hawk, broad-winged	Buteo platypterus	Yes	BOVA,BBA,SppObs
040086			Hawk, Cooper's	Accipiter cooperii	Potential	BOVA,BBA
040088			Hawk, red-shouldered	Buteo lineatus lineatus	Yes	BOVA,BBA,SppObs
040087			Hawk, red-tailed	Buteo jamaicensis	Potential	BOVA,BBA
040090			Hawk, rough-legged	Buteo lagopus johannis		BOVA
040085			Hawk, sharp-shinned	Accipiter striatus velox		BOVA
040027			Heron, great blue	Ardea herodias herodias	Yes	BOVA,BBA,CWB
040034			Heron, tricolored	Egretta tricolor		BOVA
040218			Hummingbird, ruby-throated	Archilochus colubris	Potential	BOVA,BBA

040252			Jay, blue	Cyanocitta cristata	Potential	BOVA,BBA
040387			Junco, dark-eyed	Junco hyemalis		BOVA
040098			Kestrel, American	Falco sparverius sparverius	Potential	BOVA,BBA
040119			Killdeer	Charadrius vociferus	Potential	BOVA,BBA
040231			Kingbird, western	Tyrannus verticalis		BOVA
040285			Kinglet, golden-crowned	Regulus satrapa		BOVA
040286			Kinglet, ruby-crowned	Regulus calendula		BOVA
040245			Lark, horned	Eremophila alpestris	Potential	BOVA,BBA
040001			Loon, common	Gavia immer		BOVA
040051			Mallard	Anas platyrhynchos	Yes	BOVA,BBA,SppObs
040251			Martin, purple	Progne subis	Potential	BOVA,BBA
040078			Merganser, common	Mergus merganser americanus		BOVA
040077			Merganser, hooded	Lophodytes cucullatus		BOVA
040079			Merganser, red-breasted	Mergus serrator serrator		BOVA
040097			Merlin	Falco columbarius		BOVA
040271			Mockingbird, northern	Mimus polyglottos	Potential	BOVA,BBA
040112			Moorhen, common	Gallinula chloropus cachinnans		BOVA
040216			Nighthawk, common	Chordeiles minor		BOVA
040263			Nuthatch, brown-headed	Sitta pusilla		HU6
040262			Nuthatch, red-breasted	Sitta canadensis		BOVA
040261			Nuthatch, white-breasted	Sitta carolinensis	Yes	BOVA,BBA,SppObs
040348			Oriole, Baltimore	Icterus galbula	Potential	BOVA,BBA
040347			Oriole, orchard	Icterus spurius	Potential	BOVA,BBA
040095			Osprey	Pandion haliaetus carolinensis	Potential	BOVA,BBA

040330			Ovenbird	Seiurus aurocapilla	Yes	BOVA,BBA,SppObs,HU6
040209			Owl, barred	Strix varia	Yes	BOVA,BBA,SppObs
040206			Owl, great horned	Bubo virginianus	Potential	BOVA,BBA
040210			Owl, long-eared	Asio otus		BOVA
040211			Owl, short-eared	Asio flammeus		BOVA
040312			Parula, northern	Setophaga americana	Potential	BOVA,BBA,HU6
040101			Pheasant, ring-necked	Phasianus colchicus		BOVA
040236			Phoebe, eastern	Sayornis phoebe	Potential	BOVA,BBA
040197			Pigeon, rock	Columba livia	Potential	BOVA,BBA
040287			Pipit, American	Anthus rubescens		BOVA
040254			Raven, common	Corvus corax		BOVA
040062			Redhead	Aythya americana		BOVA
040341			Redstart, American	Setophaga ruticilla	Potential	BOVA,BBA
040275			Robin, American	Turdus migratorius	Potential	BOVA,BBA
040132			Sandpiper, solitary	Tringa solitaria		BOVA
040134			Sandpiper, spotted	Actitis macularia		BOVA
040129			Sandpiper, upland	Bartramia longicauda		BOVA
040225			Sapsucker, yellow-bellied	Sphyrapicus varius		BOVA
040066			Scaup, lesser	Aythya affinis		BOVA
040075			Scoter, black	Melanitta nigra americana		BOVA
040073			Scoter, white-winged	Melanitta fusca deglandi		BOVA
040205			Screech-owl, eastern	Megascops asio		BOVA
040060			Shoveler, northern	Anas clypeata		BOVA
040370			Siskin, pine	Spinus pinus		BOVA
040141			Snipe, Wilson's	Gallinago delicata		BOVA
040388			Sparrow, American tree	Spizella arborea		BOVA

040389			Sparrow, chipping	Spizella passerina	Potential	BOVA,BBA
040395			Sparrow, fox	Passerella iliaca		BOVA
040342			Sparrow, house	Passer domesticus	Potential	BOVA,BBA
040396			Sparrow, Lincoln's	Melospiza lincolnii		BOVA
040377			Sparrow, savannah	Passerculus sandwichensis		BOVA
040398			Sparrow, song	Melospiza melodia	Potential	BOVA,BBA
040397			Sparrow, swamp	Melospiza georgiana		BOVA
040383			Sparrow, vesper	Pooecetes gramineus		BOVA
040393			Sparrow, white-crowned	Zonotrichia leucophrys		BOVA
040394			Sparrow, white-throated	Zonotrichia albicollis		BOVA
040294			Starling, European	Sturnus vulgaris	Potential	BOVA,BBA
040249			Swallow, barn	Hirundo rustica	Potential	BOVA,BBA
040250			Swallow, cliff	Petrochelidon pyrrhonota pyrrhonota		BOVA
040246			Swallow, tree	Tachycineta bicolor		BOVA
040043			Swan, mute	Cygnus olor		BOVA
040044			Swan, tundra	Cygnus columbianus columbianus		BOVA
040355			Tanager, scarlet	Piranga olivacea	Yes	BOVA,BBA,SppObs,HU6
040356			Tanager, summer	Piranga rubra	Potential	BOVA,BBA
040057			Teal, blue-winged	Anas discors orphna		BOVA
040056			Teal, green-winged	Anas crecca carolinensis		BOVA
040189			Tern, Caspian	Sterna caspia		BOVA
040280			Thrush, gray-cheeked	Catharus minimus		BOVA
040278			Thrush, hermit	Catharus guttatus		BOVA
040279			Thrush, Swainson's	Catharus ustulatus	Yes	BOVA,SppObs
040260			Titmouse, tufted	Baeolophus bicolor	Yes	BOVA,BBA,SppObs

040102			Turkey, wild	Meleagris gallopavo silvestris	Potential	BOVA,BBA
040281			Veery	Catharus fuscescens		BOVA
040298			Vireo, blue-headed	Vireo solitarius	Potential	BOVA,BBA
040300			Vireo, Philadelphia	Vireo philadelphicus		BOVA
040299			Vireo, red-eyed	Vireo olivaceus	Yes	BOVA,BBA,SppObs
040301			Vireo, warbling	Vireo gilvus gilvus	Potential	BOVA,BBA
040295			Vireo, white-eyed	Vireo griseus	Potential	BOVA,BBA
040297			Vireo, yellow-throated	Vireo flavifrons	Potential	BOVA,BBA,HU6
040081			Vulture, black	Coragyps atratus	Potential	BOVA,BBA
040080			Vulture, turkey	Cathartes aura	Potential	BOVA,BBA
040316			Warbler, black-throated blue	Setophaga caerulescens		BOVA
040319			Warbler, black-throated green	Setophaga virens		BOVA
040321			Warbler, blackburnian	Setophaga fusca		BOVA
040325			Warbler, blackpoll	Setophaga striata		BOVA
040307			Warbler, blue-winged	Vermivora cyanoptera		BOVA
040323			Warbler, chestnut-sided	Setophaga pensylvanica		BOVA
040338			Warbler, hooded	Setophaga citrina	Potential	BOVA,BBA
040314			Warbler, magnolia	Setophaga magnolia		BOVA
040311			Warbler, Nashville	Oreothlypis ruficapilla		BOVA
040329			Warbler, palm	Setophaga palmarum		BOVA
040326			Warbler, pine	Setophaga pinus	Potential	BOVA,BBA
040328			Warbler, prairie	Setophaga discolor	Potential	BOVA,BBA,HU6
040303			Warbler, prothonotary	Protonotaria citrea	Potential	BOVA,BBA,HU6
040339			Warbler, Wilson's	Cardellina pusilla		BOVA
040305			Warbler, worm-eating	Helmitheros vermivorus	Potential	BOVA,BBA,HU6

040313			Warbler, yellow	Setophaga petechia	Potential	BOVA,BBA,HU6
040317			Warbler, yellow-rumped	Setophaga coronata		BOVA
040322			Warbler, yellow-throated	Setophaga dominica	Potential	BOVA,BBA
040332			Waterthrush, Louisiana	Parkesia motacilla	Potential	BOVA,BBA,HU6
040331			Waterthrush, northern	Parkesia noveboracensis		BOVA
040290			Waxwing, cedar	Bombycilla cedrorum	Yes	BOVA,BBA,SppObs
040059			Wigeon, American	Anas americana		BOVA
040058			Wigeon, Eurasian	Anas penelope		BOVA
040227			Woodpecker, downy	Picoides pubescens medianus	Potential	BOVA,BBA
040226			Woodpecker, hairy	Picoides villosus	Potential	BOVA,BBA
040222			Woodpecker, pileated	Dryocopus pileatus	Potential	BOVA,BBA
040223			Woodpecker, red-bellied	Melanerpes carolinus	Potential	BOVA,BBA
040224			Woodpecker, red-headed	Melanerpes erythrocephalus	Potential	BOVA,BBA
040268			Wren, Carolina	Thryothorus ludovicianus	Potential	BOVA,BBA
040265			Wren, house	Troglodytes aedon	Potential	BOVA,BBA
040270			Wren, sedge	Cistothorus platensis		BOVA,HU6
040266			Wren, winter	Troglodytes troglodytes		BOVA
040336			Yellowthroat, common	Geothlypis trichas	Potential	BOVA,BBA
050028			Bat, big brown	Eptesicus fuscus fuscus		BOVA
050033			Bat, evening	Nycticeius humeralis humeralis		BOVA
050069			Beaver, American	Castor canadensis		BOVA
050051			Bobcat	Lynx rufus rufus		BOVA
050056			Chipmunk, common eastern	Tamias striatus striatus	Yes	BOVA,SppObs

050055			Chipmunk, Fisher's eastern	Tamias striatus fisheri	Yes	BOVA,SppObs
050103			Cottontail, eastern	Sylvilagus floridanus mallurus		BOVA
050125			Coyote	Canis latrans	Yes	BOVA,SppObs
050108			Deer, white-tailed	Odocoileus virginianus	Yes	BOVA,SppObs
050050			Fox, common gray	Urocyon cinereoargenteus cinereoargenteus	Yes	BOVA,SppObs
050049			Fox, red	Vulpes vulpes fulva		BOVA
050085			Lemming, Stone's southern bog	Synaptomys cooperi stonei		BOVA
050042			Mink, common	Neovison vison mink		BOVA
050017			Mole, eastern	Scalopus aquaticus aquaticus		BOVA
050019			Mole, star-nosed	Condylura cristata cristata		BOVA
050077			Mouse, common golden	Ochrotomys nuttalli aureolus		BOVA
050074			Mouse, common white-footed	Peromyscus leucopus leucopus	Yes	BOVA,SppObs
050071			Mouse, eastern harvest	Reithrodontomys humulis virginianus		BOVA
050098			Mouse, house	Mus musculus musculus	Yes	BOVA,SppObs
050099			Mouse, meadow jumping	Zapus hudsonius americanus	Yes	BOVA,SppObs
050073			Mouse, northern white-footed	Peromyscus leucopus noveboracensis	Yes	BOVA,SppObs
050124			Mouse, prairie deer	Peromyscus maniculatus bairdii		BOVA
050093			Muskrat, large-toothed	Ondatra zibethicus macrodon		BOVA
050001			Opossum, Virginia	Didelphis virginiana virginiana		BOVA

050045			Otter, northern river	Lontra canadensis lataxina	Yes	BOVA,SppObs
050038			Raccoon	Procyon lotor lotor		BOVA
050039			Raccoon	Procyon lotor maritimus		BOVA
050079			Rat, hispid cotton	Sigmodon hispidus virginianus		BOVA
050078			Rat, marsh rice	Oryzomys palustris palustris		BOVA
050095			Rat, Norway	Rattus norvegicus norvegicus		BOVA
050014			Shrew, Dismal Swamp short-tailed	Blarina brevicauda telmalestes	Yes	BOVA,SppObs
050013			Shrew, Kirtland's short-tailed	Blarina brevicauda kirtlandi	Yes	BOVA,SppObs
050015			Shrew, least	Cryptotis parva parva		BOVA
050012			Shrew, northern short-tailed	Blarina brevicauda churchi		BOVA
050010			Shrew, pygmy	Sorex hoyi winnemana	Yes	BOVA,SppObs
050007			Shrew, southeastern	Sorex longirostris longirostris	Yes	BOVA,SppObs
050047			Skunk, striped	Mephitis mephitis nigra		BOVA
050048			Skunk, striped	Mephitis mephitis mephitis		BOVA
050063			Squirrel, eastern fox	Sciurus niger vulpinus	Yes	BOVA,SppObs
050057			Squirrel, eastern gray	Sciurus carolinensis carolinensis		BOVA
050058			Squirrel, northern gray	Sciurus carolinensis pennsylvanicus	Yes	BOVA,SppObs
050065			Squirrel, southern flying	Glaucomys volans volans	Yes	BOVA,SppObs
050059			Squirrel, talkative red	Tamiasciurus hudsonicus loquax		BOVA

050087			vole, common Gapper's red-backed	Clethrionomys gapperi gapperi		BOVA
050082			Vole, meadow	Microtus pennsylvanicus pennsylvanicus	Yes	BOVA,SppObs
050091			Vole, pine	Microtus pinetorum scalopsoides	Yes	BOVA,SppObs
050040			Weasel, least	Mustela nivalis allegheniensis		BOVA
050041			Weasel, long-tailed	Mustela frenata noveboracensis		BOVA
050054			Woodchuck	Marmota monax monax		BOVA
060016			Campeloma, pointed	Campeloma decisum		BOVA
060189			Carolina spike	Elliptio raveneli		BOVA
060177			Clam, Asian	Corbicula fluminea	Yes	BOVA,SppObs
060127			Clam, Atlantic rangia	Rangia cuneata		BOVA
060225			Clam, Unknown Fingernail - Genus = Sphaerium	Sphaerium sp.		BOVA
060223			Elliptio complex	Elliptio sp.	Yes	BOVA,SppObs
060012			Floater, eastern	Pyganodon cataracta	Yes	BOVA,SppObs
060156			Floater, Giant	Pyganodon grandis		BOVA
060232			Japanese mysterysnail	Bellamya japonicus	Yes	SppObs
060224			lanceolate Elliptio	Elliptio sp.		BOVA
060025			Mussel, eastern elliptio	Elliptio complanata	Yes	BOVA,SppObs
060013			Mussel, paper pondshell	Utterbackia imbecillis		BOVA
060077			Mussel, plain pocketbook	Lampsilis cardium		BOVA
060228			Physa, Unknown - Genus = Physella	Physella sp.		BOVA
060063			Snail, ash gyro	Gyraulus parvus		BOVA

060134			Snail, crested mudalia	Leptoxis carinata	Yes	BOVA,SppObs
060095			Snail, European physa	Physella acuta		BOVA
060065			Snail, marsh rams-horn	Planorbella trivolvis		BOVA
060119			Snail, mimic lymnaea	Pseudosuccinea columella		BOVA
060009			Snail, mud amnicola	Amnicola limosus		BOVA
060061			Snail, Piedmont elimia	Elimia virginica	Yes	BOVA,SppObs
060064			Snail, two-ridge rams-horn	Helisoma anceps	Yes	BOVA,SppObs
070099			Crayfish	Fallicambarus uhleri		BOVA
070102			Crayfish, Common	Cambarus bartonii bartonii		BOVA
070095			Crayfish, devil	Cambarus diogenes diogenes		BOVA
070126			Crayfish, Digger	Fallicambarus fodiens		BOVA
070094			Crayfish, no common name	Cambarus acuminatus		BOVA
070098			Crayfish, spiny cheek	Orconectes limosus		BOVA
070120			Crayfish, White River	Procambarus acutus		BOVA
100043			Armyworm	Pseudaletia unipuncta		BOVA
100041			Borer, European corn	Ostrinia nubilatis		BOVA
100220			Butterfly, American copper	Lycaena phlaeas		BOVA
100262			Butterfly, American lady	Vanessa virginiensis		BOVA
100245			Butterfly, American snout	Libytheana carinenta		BOVA
100274			Butterfly, Appalachian brown	Satyrodes appalachia		BOVA
100232			Butterfly, banded hairstreak	Satyrium calanus		BOVA
100092			Butterfly, black swallowtail	Papilio polyxenes		BOVA

				asterius		
100196			Butterfly, Brazilian skipper	Calpodes ethlius		BOVA
100179			Butterfly, broad-winged skipper	Poanes viator		BOVA
100137			Butterfly, brown elfin	Callophrys augustinus		BOVA
100205			Butterfly, cabbage white	Pieris rapae		BOVA
100167			Butterfly, carus skipper	Polites carus		BOVA
100159			Butterfly, clouded skipper	Lerema accius		BOVA
100094			Butterfly, clouded sulphur	Colias philodice		BOVA
100213			Butterfly, cloudless sulphur	Phoebis sennae eubule		BOVA
100165			Butterfly, cobweb skipper	Hesperia metea		BOVA
100265			Butterfly, common buckeye	Junonia coenia		BOVA
100157			Butterfly, common sootywing	Pholisora catullus		BOVA
100277			Butterfly, common wood-nymph	Cercyonis pegala		BOVA
100144			Butterfly, confused cloudywing	Thorybes confusis		BOVA
100230			Butterfly, coral hairstreak	Satyrium titus		BOVA
100168			Butterfly, crossline skipper	Polites origenes		BOVA
100184			Butterfly, Dion skipper	Euphyes dion		BOVA
100147			Butterfly, dreamy duskywing	Erynnis icelus		BOVA
100185			Butterfly, Dun skipper	Euphyes vestris		BOVA

100188			Butterfly, dusted skipper	Atrytonopsis hianna		BOVA
100258			Butterfly, eastern comma	Polygonia comma		BOVA
100225			Butterfly, eastern pine elfin	Callophrys niphon		BOVA
100238			Butterfly, eastern tailed-blue	Everes comyntas		BOVA
100093			Butterfly, eastern tiger swallowtail	Papilio glaucus		BOVA
100161			Butterfly, European skipper	Thymelicus lineola		BOVA
100209			Butterfly, falcate orangetip	Anthocharis midea		BOVA
100162			Butterfly, fiery skipper	Hylephila phyleus		BOVA
100139			Butterfly, golden-banded skipper	Autochton cellus		BOVA
100228			Butterfly, gray hairstreak	Strymon melinus		BOVA
100249			Butterfly, great spangled fritillary	Speyeria cybele		BOVA
100270			Butterfly, hackberry emperor	Asterocampa celtis		BOVA
100145			Butterfly, Hayhurst's scallopwing	Staphylus hayhurstii		BOVA
100224			Butterfly, Henry's elfin	Callophrys henrici		BOVA
100141			Butterfly, hoary edge	Achalarus lyciades		BOVA
100149			Butterfly, Horace's duskywing	Erynnis horatius		BOVA
100148			Butterfly, Juvenal's duskywing	Erynnis juvenalis		BOVA
100160			Butterfly, least skipper	Ancyloxypha numitor		BOVA
100163			Butterfly, Leonard's skipper	Hesperia leonardus		BOVA

100175			Butterfly, little glassywing	Pompeius verna		BOVA
100279			Butterfly, little wood-satyr	Megisto cymela		BOVA
100217			Butterfly, little yellow	Eurema lisa		BOVA
100252			Butterfly, meadow fritillary	Boloria bellona		BOVA
100090			Butterfly, mourning cloak	Nymphalis antiopa		BOVA
100173			Butterfly, northern broken dash	Wallengrenia egeremet		BOVA
100143			Butterfly, northern cloudywing	Thorybes pylades		BOVA
100272			Butterfly, northern pearly-eye	Enodia anthedon		BOVA
100197			Butterfly, Ocola skipper	Panoquina ocola		BOVA
100236			Butterfly, olive juniper hairstreak	Callophrys gryneus gryneus		BOVA
100211			Butterfly, orange sulphur	Colias eurytheme		BOVA
100257			Butterfly, pearl crescent	Phyciodes tharos		BOVA
100359			Butterfly, Peck's skipper	Polites peckius		BOVA
100200			Butterfly, pipevine swallowtail	Battus philenor		BOVA
100259			Butterfly, question mark	Polygonia interrogationis		BOVA
100264			Butterfly, red admiral	Vanessa atalanta		BOVA
100235			Butterfly, red-banded hairstreak	Calycopis cecrops		BOVA
100268			Butterfly, red-spotted purple	Limenitis arthemis astyanax		BOVA
100174			Butterfly, sachem	Atalopedes campestris		BOVA
100082			Butterfly, silver-spotted skipper	Epargyreus clarus		BOVA

100255			Butterfly, silvery checkerspot	Chlosyne nycteis		BOVA
100146			Butterfly, sleepy duskywing	Erynnis brizo		BOVA
100142			Butterfly, southern cloudywing	Thorybes bathyllus		BOVA
100202			Butterfly, spicebush swallowtail	Papilio troilus		BOVA
100239			Butterfly, spring azure	Celastrina ladon		BOVA
100234			Butterfly, striped hairstreak	Satyrium liparops		BOVA
100158			Butterfly, swarthy skipper	Nastra lherminier		BOVA
100269			Butterfly, tawny emperor	Asterocampa clyton		BOVA
100169			Butterfly, tawny-edged skipper	Polites themistocles		BOVA
100247			Butterfly, variegated fritillary	Euptoieta claudia		BOVA
100266			Butterfly, viceroy	Limenitis archippus		BOVA
100227			Butterfly, white M hairstreak	Parrhasius m-album		BOVA
100153			Butterfly, wild indigo duskywing	Erynnis baptisiae		BOVA
100180			Butterfly, Zabulon skipper	Poanes zabulon		BOVA
100204			Butterfly, zebra swallowtail	Eurytides marcellus		BOVA
100026			Deerfly	Chrysops vittatus vittatus		BOVA
100042			Earworm, corn	Heliathis zea		BOVA
100016			Gnat	Culicoides stellifer		BOVA
100290			Moth, buck	Hemileuca maia		BOVA
100295			Moth, Carolina sphinx	Manduca sexta		BOVA
100100			Moth, catalpa sphinx	Ceratomia catalpae		BOVA

100040			Moth, codling	Cydia pomonella		BOVA
100296			Moth, Five-spotted hawk	Manduca quinquemaculata		BOVA
100047			Moth, gypsy	Lymantria dispar		BOVA
100312			Moth, hummingbird clearwing	Hemaris thysbe		BOVA
100283			Moth, imperial	Eacles imperialis		BOVA
100096			Moth, Io	Automeris io		BOVA
100095			Moth, Luna	Actias luna		BOVA
100289			Moth, pinkstriped oakworm	Anisota virginiensis		BOVA
100098			Moth, Polyphemus	Antheraea polyphemus		BOVA
100284			Moth, regal	Citheronia regalis		BOVA
100286			Moth, rosy maple	Dryocampa rubicunda		BOVA
100310			Moth, small-eyed sphinx	Paonias myops		BOVA
100101			Moth, snowberry clearwing	Hemeris diffinis		BOVA
100307			Moth, Southern pine sphinx	Lapara coniferarum		BOVA
100287			Moth, spiny oakworm	Anisota stigma		BOVA
100311			Moth, walnut sphinx	Laothoe juglandis		BOVA
100300			Moth, waved shinx	Ceratomia undulosa		BOVA
100294			Moth, whitelined sphinx	Hyles lineata		BOVA
100193			Roadside-skipper, common	Amblyscirtes vialis		BOVA
110230			Tick, American dog	Dermacentor variabilis		BOVA
110232			Tick, brown dog	Rhipicephalus sanguineus		BOVA
110228			Tick, lone star	Amblyomma americanum		BOVA
110231			Tick, rabbit	Haemaphysalis leporispalustris		BOVA

110229			Tick, winter	Dermacentor albipictus		BOVA

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

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

Compiled on 5/31/2017, 12:21:56 PM I829041.0 report=1 searchType= P dist= 3218 poi= 38.5244000 -77.3696899

PixelSize=64; Anadromous=0.058211; BBA=0.100432; BECAR=0.038082; Bats=0.025858; Buffer=1.097971; County=0.133198; HU6=0.178446; Impediments=0.048395; Init=1.439229; PublicLands=0.078343; Quad=0.098349; SppObs=0.617774; TEWaters=0.058761; TierReaches=0.101042; TierTerrestrial=0.172732; Total=3.489493; Tracking_BOVA=0.176734; Trout=0.049908; huva=0.101344

audit no. 829041 5/31/2017 12:21:56 PM Virginia Fish and Wildlife Information Service

Appendix C:

Virginia Department of Game and Inland Fisheries Anadromous Fish Use Stream Reports and Mapping

Anadromous Aquia creek

37,15,57.0 -79,59,53.0 is **Item Proximity**

Item Location is at map center

Show Position Rings

Yes No

1 mile and 1/4 mile at the **Item Location**

Base Map Choices

Topography

Map Overlay Choices

Current List: Observation

Map Overlay Legend

Anadromous Fish Reach

Confirmed

Selected Confirmed

Potential

Selected Potential

Impediment

Data

Observation Site

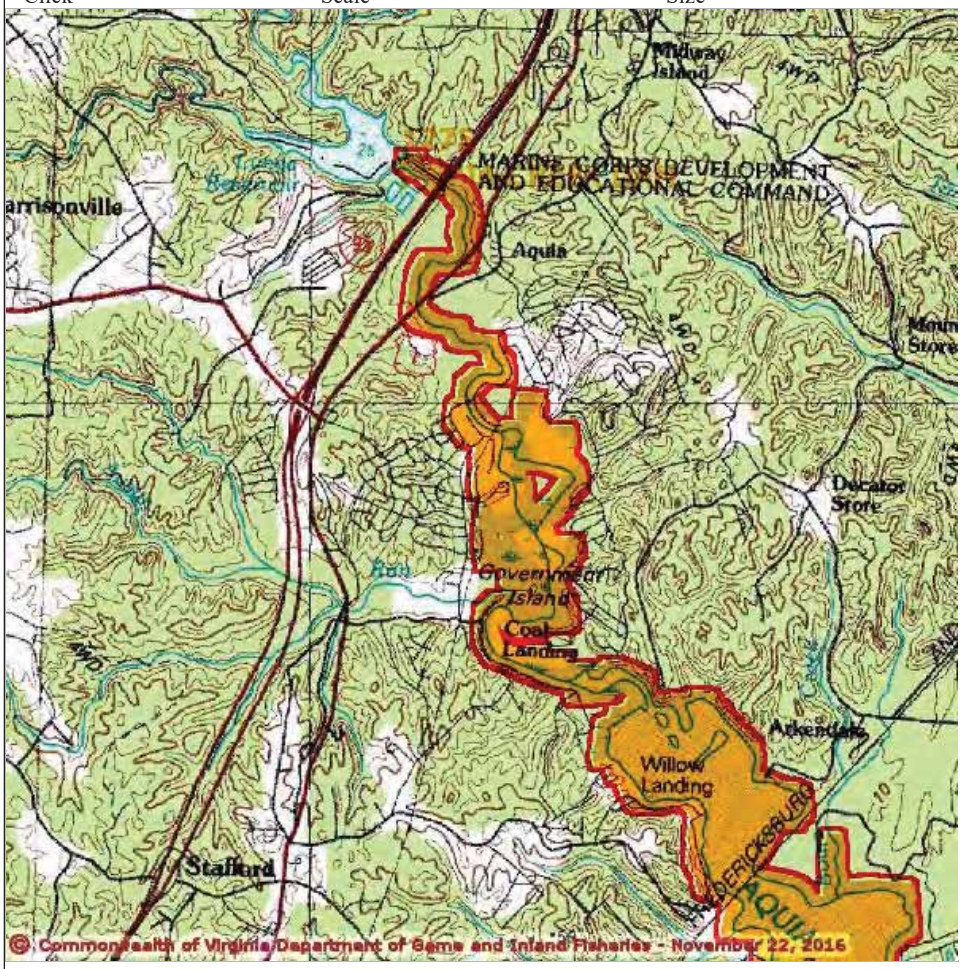
Refresh Browser Page

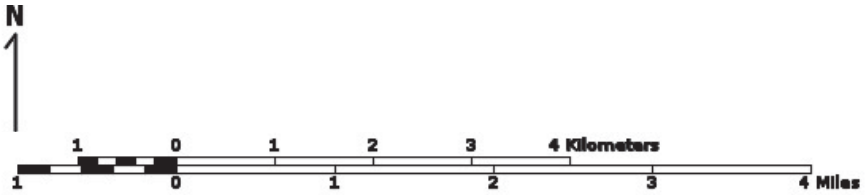
Map Click Pan To M

Map Scale In Zoom Out

Screen Size Small Size Big

Help





Point of Interest 37,15,57.0 -79,59,53.0

Map Location 38,27,30.0 -77,23,10.0

Select **Coordinate System:**

- Degrees,Minutes,Seconds Latitude - Longitude
- Decimal Degrees Latitude - Longitude
- Meters UTM NAD83 East North Zone
- Meters UTM NAD27 East North Zone

Base Map source: USGS 1:100,000 topographic maps (see Microsoft terraserver-usa.com for details)

Map projection is UTM Zone 18 NAD 1983 with left 287003 and top 4264167. Pixel size is 16 meters . Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixles. The map display represents 9600 meters east to west by 9600 meters north to south for a total of 92.1 square kilometers. The

map display represents 31501 feet east to west by 31501 feet north to south for a total of 35.5 square miles.

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

map assembled 2016-11-22 11:35:50 (qa/qc March 21, 2016 12:20 - tn=784102.1 dist=0 I)
$poi=37.2658333 -79.9980556$query=select xy from vafwis_tables.dbo.cvAnadromous_xy where anadromous = 'C4'

Anadromous Fish Use Report

Stream ID **C4** View Map

Show record ID: C4

Stream Name **Aquia creek**
Major Drainage **Potomac**
Upstream Boundary **Aquia Ck. dam, conf. w/ Beaverdam Run**
Different Anadromous Species **4**
Highest Anadromous TE* N/A
Highest Anadromous Tier** **IV**
City / County **(179) Stafford**
USGS Hydrologic Unit **(02070011) Mid Atlantic Region: Lower Potomac River**
USDA NRCS Hyrdologic Unit **(A26) POTOMAC RIVER/QUANTICO CREEK/CHOPAWAMSIC CREEK**
(A28) LOWER AQUIA CREEK
USGS 6th Order Hyrdologic Unit **(PL57) Lower Aquia Creek**
(PL61) Potomac River-Passapatanzy Creek

Confirmed Species for Anadromous Fish Use reach **Aquia creek:**

BOVA CODE	Status*	Tier**	Common Name	Scientific Name
010045		IVa	Herring, blueback	*Alosa aestivalis*
010040		IVa	Shad, American	*Alosa sapidissima*
010206			Perch, yellow	*Perca flavescens*
010068			Shiner, golden	*Notemigonus crysoleucas*

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

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

Anadromous Rappahannock river 1

38,18,35.9 -77,28,40.5
is **Item Proximity**

Item Location is at map center

Show Position Rings
Yes No
4 miles and 1 mile at the **Item Location**

Base Map Choices
Topography

Map Overlay Choices
Current List: Position, Observation

Map Overlay Legend

Anadromous Fish Reach
Confirmed
Selected Confirmed
Potential
Selected Potential
Impediment
Position Rings 4 miles and 1 mile at the Item Location
Data Observation Site

back | Refresh Browser Page | Help

Map Click: Pan To M
Map Scale: In Zoom Out
Screen Size: Small Size Big

Point of Interest 38,18,35.9 -77,28,40.5
Map Location 38,15,00.0 -77,22,29.9

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

Base Map source: USGS 1:250,000 topographic maps (see Microsoft terraserver-usa.com for details)

Map projection is UTM Zone 18 NAD 1983 with left 272979 and top 4255421. Pixel size is 64 meters . Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixles. The map display represents 38400 meters east to west by 38400 meters north to south for a total of 1474.5 square kilometers.

The map display represents 126005 feet east to west by 126005 feet north to south for a total of 569.5 square miles.

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

map assembled 2016-11-22 11:10:37 (qa/qc March 21, 2016 12:20 - tn=784093.1 dist=0 I)
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Anadromous Fish Use Report

Stream ID	**C69** View Map
Stream Name	**Rappahannock river 1**
Major Drainage	**Rappahannock**
Upstream Boundary	**Embrey Dam**
Different Anadromous Species	**6**
Highest Anadromous TE*	N/A
Highest Anadromous Tier**	**IV**
City / County	**(033) Caroline** **(057) Essex** **(630) Fredericksburg City** **(099) King George** **(103) Lancaster** **(119) Middlesex** **(159) Richmond** **(177) Spotsylvania** **(179) Stafford** **(193) Westmoreland**
USGS Hydrologic Unit	**(02080101) Mid Atlantic Region: Lower Chesapeake Bay** **(02080102) Mid Atlantic Region: Great Wicomico-Piankatank Riv** **(02080104) Mid Atlantic Region: Lower Rappahannock River**
USDA NRCS Hyrdologic Unit	**(E19) RAPPAHANNOCK RIVER/MOTTS RUN** **(E20) RAPPAHANNOCK RIVER/MASSAPONAX CREEK** **(E21) RAPPAHANNOCK RIVER/MILL CREEK/GOLDENVALE CREEK** **(E22) RAPPAHANNOCK RIVER/OCCUPACIA CREEK/PEEDEE CREEK** **(E23) RAPPAHANNOCK RIVER/CATPOINT CREEK/PISCATAWAY CREEK** **(E24) RAPPAHANNOCK RIVER/TOTUSKEY CREEK** **(R01) CHESAPEAKE BAY** **(C01) CHESAPEAKE BAY/GREAT WICOMICO RIVER** **(E25) RAPPAHANNOCK RIVER/LAGRANGE CREEK/LANCASTER CREEK** **(E26) LOWER RAPPAHANNOCK RIVER/CORROTOMAN RIVER** **(R01) CHESAPEAKE BAY**
USGS 6th Order Hyrdologic Unit	**(CB05) Lower Chesapeake Bay-Fleets Bay** **(CB12) Lower Chesapeake Bay-Milford Haven** **(CB47) Lower Chesapeake Bay** **(RA46) Rappahannock River-Hazel Run** **(RA47) Massaponax Creek** **(RA48) Rappahannock River-Muddy Creek** **(RA49) Rappahannock River-Mount Creek** **(RA50) Mill Creek** **(RA51) Rappahannock River-Goldenvale Creek** **(RA52) Rappahannock River-Portobago Creek** **(RA53) Elmwood Creek** **(RA54) Rappahannock River-Peedee Creek** **(RA55) Occupacia Creek** **(RA56) Rappahannock River-Brockenbrough Creek** **(RA58) Cat Point Creek-Menokin Bay** **(RA59) Mount Landing Creek** **(RA60) Hoskins Creek** **(RA61) Piscataway Creek** **(RA62) Rappahannock River-Little Carter Creek** **(RA64) Totuskey Creek**

Show record ID: C69

(RA65) Farnham Creek
(RA66) Rappahannock River-Cedar Creek
(RA67) Lancaster Creek
(RA68) Rappahannock River-Parrotts Creek
(RA69) Rappahannock River-Lagrange Creek
(RA72) Corrotoman River-Taylor Creek
(RA73) Rappahannock River-Carter Creek
(RA74) Rappahannock River-Locklies Creek

Confirmed Species for Anadromous Fish Use reach **Rappahannock river 1:**

BOVA CODE	Status*	Tier**	Common Name	Scientific Name
010038		IVa	Herring, alewife	*Alosa pseudoharengus*
010045		IVa	Herring, blueback	*Alosa aestivalis*
010040		IVa	Shad, American	*Alosa sapidissima*
010206			Perch, yellow	*Perca flavescens*
010039			Shad, hickory	*Alosa mediocris*
010068			Shiner, golden	*Notemigonus crysoleucas*

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

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

Appendix D:
Threatened and Endangered Species Technical Report

THREATENED AND ENDANGERED SPECIES TECHNICAL REPORT

INTERSTATE 95 EXPRESS LANES FREDERICKSBURG EXTENSION STUDY

Prepared in support of the Revised Environmental Assessment

VDOT Project #: 0095-969-739

UPC#: 110527

June 2017

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1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the lead federal agency, is preparing a Revised Environmental Assessment (Revised EA) for the Interstate 95 (I-95) HOT Lanes Project, for which a Finding of No Significant Impact (FONSI) was issued by FHWA in 2011. The Revised EA, which is being completed for the I-95 Express Lanes Fredericksburg Extension Study (or the "Fredericksburg Extension Study"), presents improvements identified in a portion of the 2011 FONSI-selected Alternative, from the I-95 / US 17 North interchange at Warrenton Road (Exit 133) to south of the I-95 / Russell Road interchange (Exit 148). The Revised EA also includes new access points along this portion of the 2011 FONSI-selected Alternative. As part of the current study, environmental resources along the corridor were updated according to the latest available data and information.

The purpose of this Technical report is to identify the presence of habitat for threatened and endangered species within the Study Area Corridor. Information in this report, described below, will support discussions presented in the Revised EA.

- Section 1 provides an overview of the study and outlines the methods used to assess habitat for threatened and endangered species.
- Section 2 provides an overview of the regulatory context for the threatened and endangered species habitat assessment.
- Section 3 provides the results of the habitat assessment for each species.
- Section 4 assesses the potential impact of the project on the threatened and endangered species.

1.1.1 Purpose and Need

The purpose of the Fredericksburg Extension Study is to:

1. Reduce daily congestion and accommodate travel demands more efficiently. Existing traffic volumes exceed available highway capacity, and the forecasts prepared using the regional travel demand models show continuing traffic growth in the corridor, with much of the Fredericksburg region's workforce continuing to commute north.
2. Provide higher reliability of travel times. People place a high value on reaching their destinations in a timely manner, and in recent years, I-95 has become so congested that the existing I-95 facilities cannot provide reliable travel times during the peak periods.
3. Expand travel choices by increasing the attractiveness and utility of ridesharing and transit usage while also providing an option for single-occupant vehicles to bypass congested conditions.

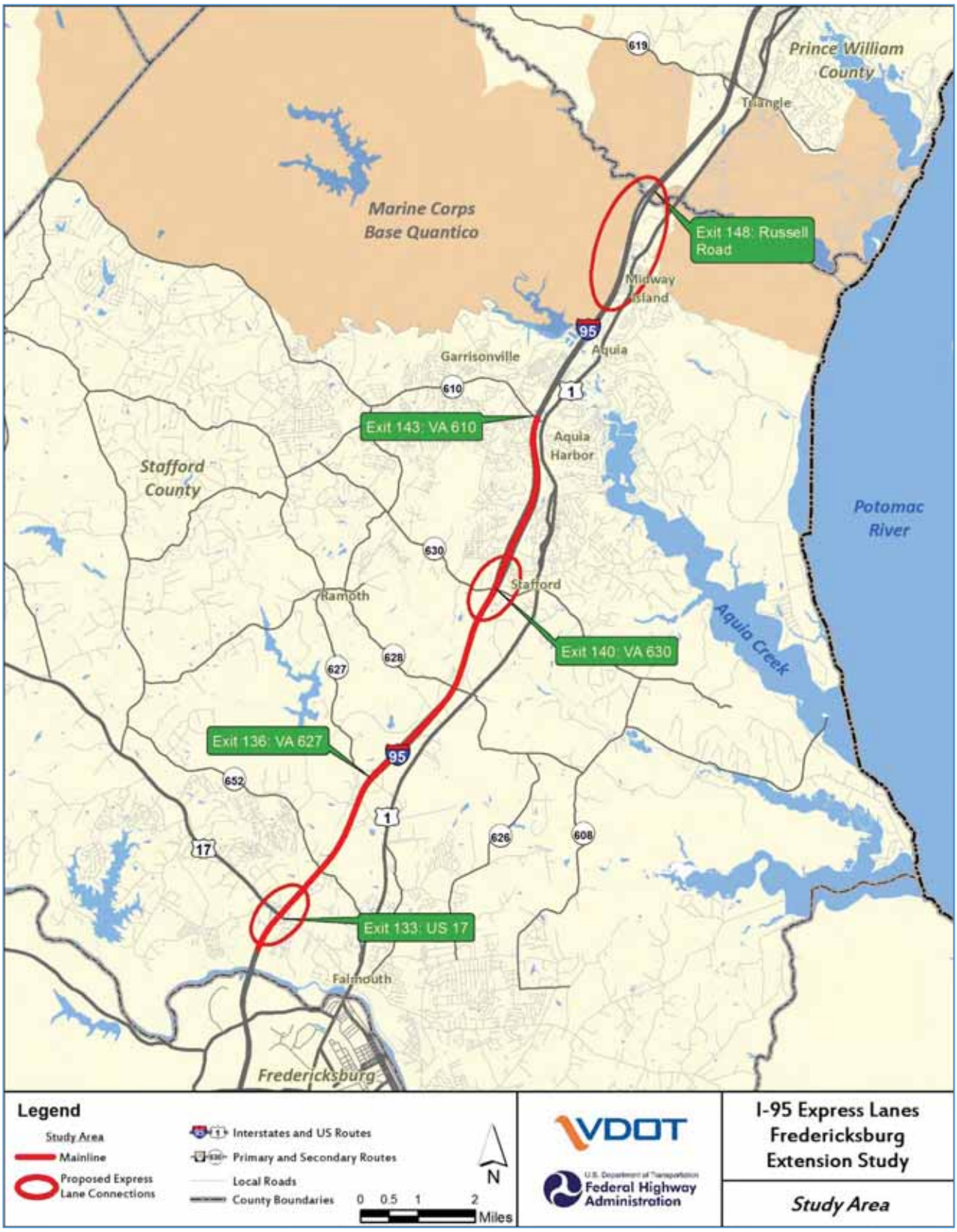
1.1.2 Alternatives

The proposed Build Alternative and the No-Build Alternative are under consideration. The proposed limits of the Build Alternative are shown on **Figure 1-1**.

No-Build Alternative

Under the No-Build Alternative, the Express Lanes would not be extended beyond the southern terminus of the Southern Extension project, which is currently under construction south of VA 610 / Garrisonville Road (Exit 143). There would be no change to existing access points, and I 95 would remain in its present configuration. VDOT would continue maintenance and repairs of the existing roadway, as needed, with no substantial changes to

Figure 1-1: Study Area



current capacity or management activities. The No-Build Alternative was not identified as the Preferred Alternative in the 2011 EA and subsequent FONSI, but is retained as a baseline for comparison in this technical report.

Build Alternative

The Build Alternative would extend two reversible Express Lanes in the median of I-95 from the vicinity of the I-95 / US 17 North Interchange at Warrenton Road (Exit 133) to south of the I-95 / VA 610 Interchange at Garrisonville Road (Exit 143) to tie into the Southern Extension Project. It would also provide Express Lane access in the vicinity of the I-95 / US 17 North Interchange at Warrenton Road (Exit 133), the I-95 / VA 630 Interchange at Courthouse Road (Exit 140), and the I-95 / Russell Road Interchange (Exit 148). The Build Alternative is consistent with the 2011 FONSI-selected alternative.

1.2 METHODOLOGY

For the purposes of this threatened and endangered species habitat analysis, the Study Area Corridor is defined as 50 feet on either side of the I-95 right-of-way and proposed Express Lane access point areas, with additional allowances for stormwater management areas.

Threatened and endangered species that may occur within the Study Area Corridor were identified based on agency input through the scoping process, Geographic Information System (GIS) databases and mapping, and field reconnaissance of the Study Area Corridor. The following federal and state agencies were consulted for information regarding federal and state listed species that might occur within the Study Area Corridor:

- United States Fish & Wildlife Service (USFWS)
- Virginia Department of Conservation and Recreation - Division of Natural Heritage (VDCR-DNH)
- Virginia Department of Game and Inland Fisheries (VDGIF)

A summary of species identified from the database searches and agency coordination are summarized in **Table 3-1**. To evaluate the potential impact of the project to these species, areas of potential habitat for the listed species were assessed and documented. Field notes were recorded and representative photographs were taken for both suitable and unsuitable habitat. Habitat boundaries were mapped in the field to accurately depict the extent of potential suitable habitat for individual species. For the purposes of this study, all forested habitat was considered suitable for the northern long-eared bat (NLEB). Areas depicted as forested on the most recent available aerials were confirmed in the field and any areas that were found to be deforested were excluded as habitat.

The quantity of potential habitat within the Study Area Corridor was determined by performing a GIS overlay of the areas identified through the onsite and offsite assessments as having suitable habitat.

More specific information regarding data gathering sources and approach are presented within the discussion of each resource in Section 3, and references are listed in Section 6.

2. REGULATORY CONTEXT

Endangered species are defined as those species in danger of extinction throughout all or a significant portion of their range. Threatened species are defined as those species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. The USFWS regulates and protects federally listed threatened and endangered species under the Endangered Species Act (ESA) of 1973 (16 USC 1531-1544) with the primary goal of conserving and recovering listed species.

Compliance with the ESA is required for projects that have the potential to impact federally listed threatened or endangered species or their habitat. The ESA, 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, as this project is, the permitting process is conducted through Section 7 consultation. Section 7 of the ESA requires federal agencies to consult with USFWS 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, 2013).

A December 2012 Memorandum of Understanding between VDOT and FHWA titled "Compliance with Section 7 of the Endangered Species Act in Relation to the National Environmental Policy Act Process" documents the timing of compliance with Section 7 of the ESA. In some situations, where a project may adversely affect a threatened or endangered species, the design and construction details needed to consult with USFWS and complete a biological assessment may not be available until further along in the project development process. On January 14, 2016, the USFWS published a final 4(d) Rule that defines prohibitions for purposeful and incidental take of northern long-eared bat (NLEB) (USFWS, 2016c). A December 2016 range-wide programmatic agreement between USFWS and FHWA, Federal Railroad Administration (FRA), and Federal Transit Administration (FTA) for the Indiana bat and NLEB can be utilized for these species in lieu of formal Section 7 consultation, if the project adheres to the scope and criteria of the range-wide Biological Assessment (BA) and Programmatic Biological Opinion (BO) dated May 20, 2016 (BO). The Intra-Service Programmatic BO on the final 4(d) Rule for the NLEB may be used for projects only affecting the NLEB that do not include the Indiana bat (USFWS, 2016d). In lieu of concluding the Section 7 consultation process during the development of the revised EA, this section documents the Section 7 efforts that have been accomplished to date, and the following commitments are being made:

- Section 7 consultation will be completed before any irreversible or irretrievable commitments of resources are made expressly for construction activities;
- FHWA's anticipated location decision represented by its NEPA approval would not change based on the results of the Section 7 consultation process; and
- Additional steps to complete the Section 7 process prior to construction will be taken. These steps would likely include:
    - Update the database searches to list current species;
    - Perform Informal consultation with the USFWS to determine if the species or critical habitat is potentially present;
        - Conduct habitat assessments for any new species and update habitat assessments for the species they've been previously conducted;
        - Determine what effect the project may have on the species or its habitat;
        - Conduct presence/absence surveys if necessary;
        - Submit project information to USFWS to determine whether the project adheres to the scope and criteria of the range-wide BA for the Indiana and northern long-eared bat, and the Intra-Service Programmatic BO on the Final(d) Rule for the NLEB, if necessary; and
        - Prepare the Biological Assessments for any species to support Section 7 formal consultation, if necessary.

In addition to the federal oversight, threatened and endangered species are also regulated at the state level. The VDGIF has adopted the federal list as well as a state list of endangered and threatened species, with the primary

focus of managing Virginia's wildlife (Virginia Code §29.1-563-570). In addition, the Virginia Department of Agriculture and Consumer Services (VDACS) regulates threatened and endangered plant and insect species (Virginia Code §3.2-1000-1011). Through a Memorandum of Agreement established between the Virginia Department of Conservation and Recreation (VDCR) and VDACS, the VDCR represents VDACS in comments regarding potential impacts to state-listed threatened and endangered plants and insect species. The legal state status is determined by the VDGIF (all animals except insects) and the VDACS (plants and insects).

3. AFFECTED ENVIRONMENT

State and federally listed species that are reported to occur or potentially occur within the vicinity of the Study Area Corridor were identified through the USFWS's Information for Planning and Conservation database (IPaC), VDGIF's Virginia Fish and Wildlife Information Service database (VaFWIS), VDGIF bat winter habitat and roost tree applications, and VDCR's DNH database.

Table 3-1 provides a summary of the species that were identified as potentially occurring within the Study Area Corridor based on the following information:

- Database search results.
- Correspondence from VDCR-DNH.
- Correspondence from VDGIF.

Table 3-1: Threatened and Endangered Species Mapped within the Vicinity of Study Area Corridor

Species	Status	Source of Listing
Dwarf Wedgemussel (*Alasmidonta heterodon*)	FE/SE	IPaC, VFWIS, DCR-DNH
Harperella (*Ptilimnium nodosum*)	FE	IPaC
Small Whorled Pogonia (*Isotria medeoloides*)	FT	IPaC, DCR-DNH
Northern Long-eared Bat (*Myotis septentrionalis*)	FT/ST	IPaC, VFWIS
Brook Floater (*Alasmidonta varicosa*)	SE	VFWIS
Green Floater (*Lasmigona subviridis*)	ST	VFWIS, DCR-DNH
Yellow Lance (*Elliptio lanceolata*)	PFT	IPaC

Source and notes: FE = Federally Endangered. FT = Federally Threatened. PFT – Proposed Federally Threatened (April 5, 2017). SE = State Endangered. ST = State Threatened. IpaC = USFWS Information for Planning and Conservation, January 2016 and May 2017. VFWIS = Virginia Fish and Wildlife Information Service, November 2016. DCR-DNH = Virginia Department of Conservation and Recreation – Division of Natural Heritage, December 2016.

The following sections provide a brief summary of the natural history and distribution of the species listed in **Table 3-1**. This information was utilized as a general framework for the habitat evaluation to determine the presence of habitat, affected environment, and environmental consequences of the proposed activities within the Study Area Corridor. Additionally, a discussion is included for those species that were determined to have potentially suitable habitat within the Study Area Corridor. No critical habitat has been designated by USFWS within the Study Area Corridor. The database search results did not indicate the presence of the state endangered little brown bat (*Myotis lucifigus*) or tri-colored bat (*Perimyotis subflavus*). However, per VDGIF protocols, the VDGIF bat winter habitat and roost tree application was reviewed. The Study Area Corridor is not within the vicinity of known

hibernacula or maternity roosts and no habitat assessment was required for the little brown bat or the tri-colored bat within the Study Area Corridor, per VDGIF protocols.

3.1 FEDERALLY ENDANGERED (FE) SPECIES INFORMATION

Dwarf Wedgemussel (*Alasmidonta heterodon*) –The dwarf wedgemussel is relatively small and inhabits creeks and rivers with a slow to moderate current and a sand, gravel, or muddy bottom (USFWS, 2011). The reproductive cycle of the dwarf wedgemussel is similar to that of other native mussels. Males release sperm into the water and the eggs are fertilized (usually in early fall) when the females take in the sperm through their siphons during feeding and respiration (USFWS, 2011; VDGIF, 2017). The fertilized eggs are retained in the gills of the females until the larvae (glochidia) are fully developed. Once the glochidia are fully developed, they are released (usually by mid-spring) into the water and must attach to the gills or fins of appropriate fish species, which include the tesselated darter (*Etheostoma olmstedi*), Johnny darter (*Etheostoma nigrum*), and mottled sculpin (*Cottus bairdi*) (USFWS, 2011; USFWS, 2015). Poor water quality and loss of suitable habitat conditions have resulted in the decline and loss of dwarf wedgemussel populations and continue to threaten remaining populations (USFWS, 2011). Toxic effects from industrial, domestic and agricultural pollution are the primary threats to the dwarf wedgemussels' survival (USFWS, 2015). In addition, short life spans (maximum age 12 years), low fecundity, high degree of host specificity, limited dispersal ability of its primary host, and low population densities, coupled with the threats facing this species, likely all contribute to the endangered status of the dwarf wedgemussel (USFWS, 2015). It was believed to have been extirpated from the state by 1989, but was rediscovered in Aquia Creek and in the upper Nottoway River in 1990 (VDGIF 2017).

Harperella (*Ptilimnium nodosum*) – Harperella is a small member of the carrot family. The riverine form of the plant is generally perennial or biennial (USFWS, 1990). Broad clusters of small white flowers bloom mostly in July and August (NatureServe 2017). The plant can occur on rocky/gravelly shoals or cracks in bedrock outcrops in clear, swift moving streams. Harperella occurs in a narrow range of depths and is intolerant of deep water or conditions that are too dry. The plants readily tolerate periodic and moderate flooding, which also serves as a method of seed dispersal. Threats to the species include alterations of natural hydrologic regimes, siltation and erosion, and water quality reductions. This species was found in 2002 within Aquia Creek, just upstream from the Fall Line and northwest of Garrisonville, within fissures of a bedrock outcrop in the channel shelf (SABS 2004).

3.2 FEDERALLY THREATENED (FT) SPECIES INFORMATION

Small Whorled Pogonia (*Isotria medeoloides*) – Small whorled pogonia (SWP) is a self-pollinating perennial orchid (Family: Orchidaceae), four to twelve inches in height, with a characteristic whorl of five to seven leaves at the summit of a singular, hollow, pale green stem with one or two pale yellowish-green irregular flowers (Mehrhoff, 1983; Gleason and Cronquist, 1991; Vitt and Campbell 1997). SWP flowers from mid-May to mid-June, with the flowers (one to two per plant) lasting only a few days to a week

SWP occupies a very specific habitat type within its range. In particular, the species seems to require the following conditions: mature, mixed hardwood, upland forests; generally open understory conditions with minimal aggressive ground level species; generally level to moderately sloping land within shallow upland draws often, but not always, of northerly or easterly exposure; scattered ground-level sunlight; and, acidic, sandy loam soils (Ware, 1991; Gleason and Cronquist, 1991; Weakley, 2006). In addition, many professionals have noted a prevalence of decaying logs and a well-developed detritus layer on the forest floor. These attributes tend to be present with the species when found, although the exact mechanisms associated with each affinity are not understood (Ware 1991). Certain indicator species, among others, may also be helpful in identifying SWP habitat, such as large whorled pogonia, strawberry bush (*Euonymus americanus*), tick trefoil (*Desmodium* spp.), and wintergreen (*Chimaphila* spp.). Such species are considered associates, and occur frequently near documented SWP colonies.

Habitat loss and degradation due to the development of SWP habitat for urban expansion is the main threat to the SWP. Some forestry practices can permanently eliminate habitat. Also, degradation of habitat or loss of individual plants may result from recreational activities (i.e., trampling by hikers) (USFWS, 2016).

Northern Long-Eared Bat (*Myotis septentrionalis*) - The northern long-eared bat (NLEB) is a medium-sized bat in the genus Myotis that can be found throughout the eastern and midwestern U.S. and southern Canada. The NLEB uses a wide variety of forested habitats for roosting, foraging and traveling, and may also utilize some adjacent and interspersed non-forested habitat such as emergent wetlands and edges of fields. This species has also been found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable). The bats emerge at dusk to forage in upland and lowland woodlots and tree-lined corridors, feeding on insects, which they catch while in flight using echolocation. This species also feeds by gleaning insects from vegetation and water surfaces (VDGIF, 2017).

Roosting habitat includes forested areas with live trees and/or snags with a diameter at breast height (dbh) of at least 3 inches with exfoliating bark, cracks, crevices and/or other cavities. Trees are considered suitable if they meet those requirements, and are located within 1,000 feet of the nearest suitable roost tree, woodlot, or wooded fencerow. Maternity habitat is defined as suitable summer habitat that is used by juveniles and reproductive females. The summer maternity season in Virginia is April 1 through September 30. Winter habitat includes underground caves and cave-like structures such as abandoned or active mines and railroad tunnels. The NLEB migrate between their winter hibernacula and summer habitat, typically between mid-March and mid-May, and mid-August and mid-October. They are considered a short-distance migrant (typically 40 - 50 miles), although their known migratory distances can vary greatly between 5 and 168 miles (VDGIF, 2017).

The primary threat to NLEB is white-nose syndrome (WNS) which is caused by the fungus *Pseudogymnoascus destructans.* WNS is responsible for unprecedented mortality in some hibernating insectivorous bats in the northeastern U.S., including dramatic and rapid population declines in NLEB populations up to 99 percent from pre-WNS levels. Impacts to hibernacula, summer habitat, and mortality during migration are also threats to the species (USFWS, 2016c).

Yellow Lance (*Elliptio lanceolata*) – Proposed – The yellow lance was proposed as a federally threatened species on April 5, 2017 (USFWS, 2017). The mussel is bright yellow and elongate, with a shell twice as long as tall. Like most freshwater mussels, the yellow lance relies on fish hosts for successful reproduction. Two species of minnow have been confirmed to host yellow lance development in a laboratory setting; the white shiner (*Luxilus albeolus*) and pinewoods shiner (*Lythrurus matuntinus*) (USFWS, 2017). The yellow lance is often found buried deep in clean, coarse to medium sand, and sometimes in gravel substrates. The species depends on clean, moderate flowing water with high dissolved oxygen in streams varying from large stream systems down to streams approximately 3.3 feet across. Pollutants, sedimentation and dams are threats to the species. The yellow lance was identified in the Rappahannock River in 2011, although only three individuals were observed during the survey (USFWS, 2017a).

3.3 STATE ENDANGERED (SE) SPECIES INFORMATION

Brook Floater (*Alasmidonta varicosa*) - This species is a small mussel usually found in fast-flowing, clean water in substrates that contain relatively firm rubble, gravel, and sand substrates swept free from siltation. They are buried in the substrate in shallow riffle and shoal areas. This species requires a fish host and balanced environment to complete its life cycle. Potential hosts identified for the brook floater include: blacknose dace (*Rhinichthys atratulus*), longnose dace (*Rhinichthys cataractae*), golden shiner (*Notemigonus crysoleucas*), pumpkinseed (*Lepomis gibbosus*), slimy sculpin (*Cottus cognatus*), yellow perch (*Perca flavescens*), and margined madtom (*Noturus insignis*) (Bogan 2002; Nedeau 2000). This species is most likely extirpated from VA as it has not been seen live for over 15 years now and is the rarest mussel in the Atlantic Slope in VA (VDGIF, 2017). The primary locations for the species is/was the Shenandoah River watershed and the Potomac River watershed. Broad Run in

the Potomac used to harbor a population but heavy urban development has impacted this stream. The only live specimens that have been found recently include those in the mainstem Potomac River.

3.4 STATE THREATENED (ST) SPECIES INFORMATION

Green Floater (*Lasmigona subviridis*) - The green floater is a locally rare to common mussel in its range and populations have declined dramatically in Virginia (Kitchel, 1998). The green floater is a hermaphroditic species. Dispersal occurs during the larval stage and glochidia are parasitic on a fish host, which has not yet been identified (VDGIF, 2017). Water quality and habitat degradation with siltation are threats to the green floater (Kitchel, 1998).

Habitat suitability is based on the preferred very small to small streams and quiet pools or eddies with clean water, gravel and sand bottoms that are sediment free (USFWS, 1998; Kitchel, 1988). The green floater buries in the substrate in shallow riffle and shoal areas in depths of one to four feet (VDGIF, 2017; NatureServe, 2017). The species is also more likely to be found in hydrologically stable streams that are not prone to flooding and drying. The green floater is able to occupy very small creeks and streams, places where other mussels are not often found. Good water quality is also important for the species.

Based upon an understanding of the life histories discussed above, and a result of the offsite and field analysis performed, potential habitat was verified within the Study Area Corridor for all listed species found in **Table 3-1**. Their potential habitats are shown on the Threatened and Endangered Species Habitat Map in **Appendix A**, excluding the NLEB, as detailed in the Methodology Section 1.2.

The following sections describe the results of the habitat assessment for terrestrial and aquatic species and the conditions of the potential habitat present within Study Area Corridor. Representative photographs of threatened and endangered species habitat are included in **Appendix B.**

Table 3-2: Terrestrial Threatened and Endangered Species Habitat within Study Area Corridor

Species	Habitat Acreage
Northern Long-Eared Bat	605.77
Small Whorled Pogonia	66.08

Northern Long-eared Bat

Suitable foraging and summer roosting habitat for NLEB is present throughout the Study Area Corridor. For the purposes of this study, all forested areas were considered potential summer roosting habitat. Acreages were quantified based upon coverage on aerial photography and reconciled with areas that were identified as currently deforested during the field assessment. The total acreage of estimated NLEB summer roosting habitat is included in **Table 3-2**. Smaller fragmented areas of forest and individual trees may provide suitable roosting habitat, but in general would be considered suboptimal habitat. Aquatic resources provide sources of water for the bats and habitat for insects used as forage. Forested areas, easements, road edges, and waterways can provide corridors for movement between habitat areas. Fragmented communities surrounded by development are generally less suitable for use by the bats. Trees of 3" dbh or greater with suitable sized cavities may provide suitable habitat for maternity roosts. These areas may also provide suitable day and night roosts for bats. Bridges over wetlands or aquatic areas with sufficient prey are frequently utilized as night roosts for foraging. Representative photos of suitable habitat areas are included in **Appendix B**.

Small Whorled Pogonia

Suitable SWP habitat was identified in the Study Area Corridor within forested areas along the northbound and southbound lanes of I-95 as well as the median. Suitable habitat areas are depicted on the Threatened and Endangered Species Habitat Map (**Appendix A**). The total acreage of estimated SWP habitat is included in **Table 3-2.** The forest community in suitable habitat areas is typically mature with multi-tiered sapling composition, and understory competition is reduced. The forest floor in these areas have scattered well-decomposed woody debris, a well-developed detritus layer (~0.5" – 1.5"), and loam to sandy loam in the upper soil horizons. There are also intermittent gaps in the canopy and little evidence of recent disturbance. Common species in the overstory include American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), white oak (*Quercus alba*), and tulip poplar (*Liriodendron tulipifera*). The understory layer in suitable habitat areas is generally reduced and includes saplings of overstory species, American holly (*Ilex opaca*), and southern low blueberry (*Vaccinium pallidum*). Herbaceous cover is also reduced and includes strawberry bush (*Euonymus americanus*), striped wintergreen (*Chimaphila maculata*), catbrier (*Smilax glauca*), and partridge berry (*Mitchella repens*).

The remainder of the Study Area Corridor is considered unsuitable SWP habitat, due to one or more limiting factors including: the absence of forested communities; agricultural land use; high density pine-dominated forests; immature forest communities; invasive species; significant historic alterations of ground surface in forested areas; and wetland habitats. Representative photographs of suitable and unsuitable SWP habitat are included in **Appendix B.**

Table 3-3: Aquatic Threatened and Endangered Species Habitat within Study Area Corridor

Species	Linear Feet of Aquatic Habitat	Acreage of Aquatic Habitat
Brook Floater	14,274	5.91
Dwarf Wedgemussel	14,274	5.91
Green Floater	14,274	5.91
Yellow Lance	14,274	5.91
Harperella	10,233	3.67

Mussels

Potential habitat for mussels was found in various perennial streams within the Study Area Corridor, as depicted on the Threatened and Endangered Species Habitat Map (**Appendix A**). These streams include Aquia Creek, Chopawamsic Creek, Austin Run, and Potomac Creek, as well as unnamed perennial streams. For the purposes of this study, the range of favorable habitat conditions preferred by any of the four mussel species was considered in the habitat evaluation and designation of streams as potential habitat. The yellow lance was not proposed as a federally threatened species at the time of the assessment and habitat for the species was not evaluated in the field. But suitable habitat identified for the other species encompassed areas that would be categorized as suitable habitat for the yellow lance. Intermittent and ephemeral stream channels were categorized as unsuitable habitat and were not evaluated. Suitable habitat was characterized by perennial streams that were relatively stable, with low levels of sediment accumulation, and displayed no signs of recent disturbance. Substrates varied between a mix of gravel, cobble, and sand. Stable point bars were present in some locations. No visible pollutants were observed within stream reaches designated as suitable habitat. The total linear feet of suitable mussel habitat within the Study Area Corridor is summarized in **Table 3-3**.

Unsuitable streams were characterized by a combination of heavy sediment accumulation and embeddedness, unstable channel structure, and visible pollutants. Evidence of frequent flooding and impacts from roadside draining were also visible in unsuitable habitat. Man-made impoundments and piping of stream channels through culverts were present in some unsuitable habitat areas. Unsuitable habitat was observed in Accokeek Creek and Falls Run mainly due to significant sediment accumulation in the reaches within the Study Area Corridor.

Although many streams within the Study Area Corridor display suitable habitat characteristics, it is unlikely that any of the mussel species are present within the extent of the Study Area Corridor due to historic disturbance, altered hydrologic conditions, and reduced habitat quality within the current right of way. Representative photographs of suitable and unsuitable SWP habitat are included in **Appendix B**.

Harperella

Potential habitat for harperella is present in four perennial stream channels within the Study Area Corridor, including Aquia Creek, Chopawamsic Creek, Austin Run, and one unnamed perennial stream, as depicted on the Threatened and Endangered Species Habitat Map (**Appendix A**). Suitable habitat characteristics include stable point bars, bedrock outcrops, and rocky and gravelly shoals in moderately to swiftly flowing streams. Evidence of periodic flooding and a hydrologic regime that has not been significantly altered by construction activities and stormwater management was also present within the suitable habitat areas. The total linear feet of suitable harperella habitat within the Study Area Corridor is summarized in **Table 3-3**. Unsuitable habitat is characterized by unstable and deeply incised stream channels that lack rocky/gravelly shoals. Hydrologic regimes are typically significantly altered and evidence of frequent flooding is evident in unsuitable habitat areas. Representative photographs of suitable and unsuitable harperella habitat are included in **Appendix B**.

4. ENVIRONMENTAL CONSEQUENCES

Summer roosting habitat has been confirmed for NLEB within the Study Area Corridor along the northbound and southbound lanes of I-95 as well as the median and interchanges. Forest clearing along the edge of the existing right of way will result in minimal reduction in forested cover and quality of forested habitat. Clearing of forested habitat within interchanges and smaller fragmented forested areas within the median will result in the removal of sub-optimal habitat that has a low potential for roosting and generally does not provide suitable commuting and foraging corridors for bats. Larger tracts of contiguous forest within the median provide suitable summer roosting habitat and foraging in areas. However, the areas are still fragmented from the surrounding landscape by a three lane heavily trafficked highway. Clearing of these forested areas would not result in the removal of optimal habitat for NLEB. No confirmed maternity roosts or hibernacula are located within a two mile radius of the Study Area Corridor, further limiting the potential effects on the species. Foraging habitat for bats is present within the Study Area Corridor, but effects of the proposed construction activities on food and aquatic resources can be minimized utilizing proper erosion and sediment control measures such as flagging or fencing to demarcate areas not to be disturbed, silt fence and straw bale installation, dust control, and vegetative streambank stabilization.

Small whorled pogonia habitat has been confirmed within the Study Area Corridor along the northbound and southbound lanes of I-95 as well as the median. Forest clearing along the eastern and western edge of the existing ROW will render these areas as unsuitable as well as some adjacent habitat areas due to increased plant densities from edge effects of the clearing. Forest clearing within the median would likely render all habitat unsuitable either from forested conversion or fragmentation of the suitable habitat that would lead to unsuitable habitat conditions from an increased density of understory and herbaceous growth due to edge effects. Invasive control efforts should be implemented within the vicinity of suitable habitat during construction and stabilization activities.

The quality of suitable harperella habitat within Aquia Creek, Chopawamsic Creek and Austin Run should not be significantly impacted if the areas remain bridged and hydrologic conditions do not change as a result of construction activities. The remaining habitat within the median will likely be rendered unsuitable due to direct impacts or possible alterations in hydrology and water quality. Indirect or cumulative impacts within and downstream of the Study Area Corridor can be minimized or avoided by adhering to strict erosion and sediment control measures. In addition, efforts should be made to prevent colonization of invasive species within the vicinity of suitable habitat as a result of construction and stabilization activities.

The quality of suitable mussel habitat within Chopawamsic Creek, Austin Run, and Potomac Creek should not be significantly impacted if the areas remain bridged and hydrologic conditions and water quality do not change as a result of construction activities. Suitable habitat within the median will likely be rendered unsuitable due to direct impacts or possible alterations in hydrology and water quality. Efforts to avoid and or minimize direct instream impacts and any downstream indirect or cumulative impacts can be made by adhering to strict erosion and sediment control and performing all instream construction activities behind cofferdams.

The presence of federal and state threatened or endangered species within the project would require special consideration and coordination with various federal and state agencies. Through the coordination with these agencies, potential impacts to species and their habitats can be evaluated and minimized by implementing various practices as part of the design. Every attempt should be made to incorporate the preliminary recommendations into the design as much as possible. However, certain recommendations may not be practicable. Specific agency coordination should be conducted during the final design and permitting stage of the project, at which time more detailed agency recommendations would be determined.

To reduce potential impacts to terrestrial threatened and endangered species and their habitat, efforts to minimize the construction footprint would be considered. Construction practices would avoid the removal of existing vegetation to the greatest extent possible and include the implementation of best management practices for erosion and sediment control as well as stormwater management to reduce potential impacts to adjacent habitats and properties. Practices such as silt fence and straw bales, diversion ditches, sediment traps and basins, culvert outlet protection, vegetative streambank stabilization, dewatering structures, temporary and permanent seeding, and flagging or fencing of areas not to be disturbed would minimize impacts to both terrestrial and aquatic species.

Upon final project design, additional coordination would be required with the appropriate agencies for all species identified within a two mile radius of the Study Area Corridor. Due to the potential presence of the species where suitable habitat is present, performing presence/absence surveys may be required by the agencies. If presence of any species is confirmed, the agencies may recommend a time of year restriction (TOYR) for activities within occupied habitat and these restrictions would be determined through the permitting process. A summary of current applicable TOYRs for specific species currently listed as threatened or endangered is provided in **Table 4-1**.

Table 4-1: Threatened and Endangered Species Time of Year Restrictions

Species	Time of Year Restrictions
Northern Long-eared Bat [1]	15 Apr – 15 Sep for tree removal activities.
Dwarf Wedgemussel [2]	15 March – 31 May; 15 August – 15 October
Brook Floater/Green Floater [2]	15 April – 15 June; 15 August – 30 September

Source and notes: VDGIF, 2016c. 1. TOYR for avoidance of incidental take in summer roosting habitat. USFWS IPaC Online Project Review Step 7b - Northern long-eared bats in Virginia. 2. VDGIF TOYR Restrictions Table (4/1/16)

5. ACRONYM AND ABBREVIATION LIST

The following is the list of acronyms and abbreviations that will be used in the EA.

BA	Biological Assessment
BO	Biological Opinion
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DBH	Diameter at Breast Height
DEQ	Virginia Department of Environmental Quality
DHR	Virginia Department of Historic Resources
DRPT	Department of Rail and Public Transportation
EA	Environmental Assessment
ESA	Endangered Species Act
FHWA	US Federal Highway Administration
FONSI	Finding of No Significant Impacts
FRA	Federal Railroad Administration
FTA	US Federal Transit Administration
GIS	Geographic Information Systems
HOT	High-Occupancy Toll Lanes
HOV	High-Occupancy Vehicle Lanes
IPaC	USFWS Information for Planning and Consultation
LOD	Limit of Disturbance
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NLEB	Northern Long-eared Bat
SWP	Small Whorled Pogonia
TOYR	Time of Year Restriction
USDOT	US Department of Transportation
USFWS	US Fish and Wildlife Service
VaFWIS	Virginia Fish and Wildlife Information System
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
VDGIF	Virginia Department of Game and Inland Fisheries
VDOT	Virginia Department of Transportation

WNS	White-nose Syndrome
WOUS	Waters of the US

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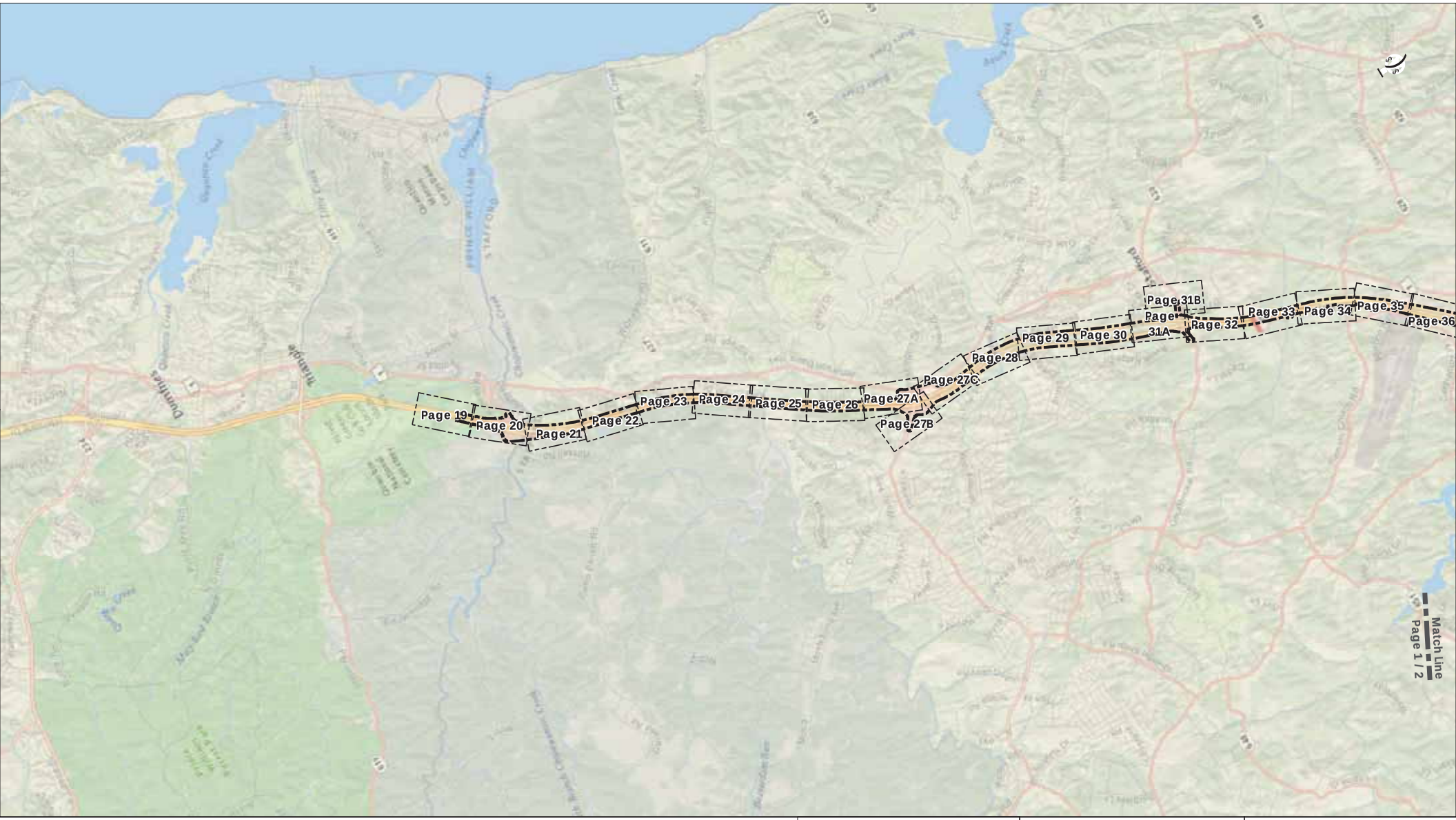
APPENDIX A:

THREATENED AND ENDANGERED SPECIES HABITAT MAP



Legend

- Study Area Corridor
- Page Index

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1:60,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 StatePlane Virginia North FIPS 4501 Feet
2. The limits of waters of the U.S., including wetlands, shown on this map have been field located by means of sub-meter GPS technology and are for planning purposes only.
3. Topography produced with data provided by Virginia Geographic Information Network (VGIN)
4. Orthoimagery © Bing Maps and base map © National Geographic
5. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

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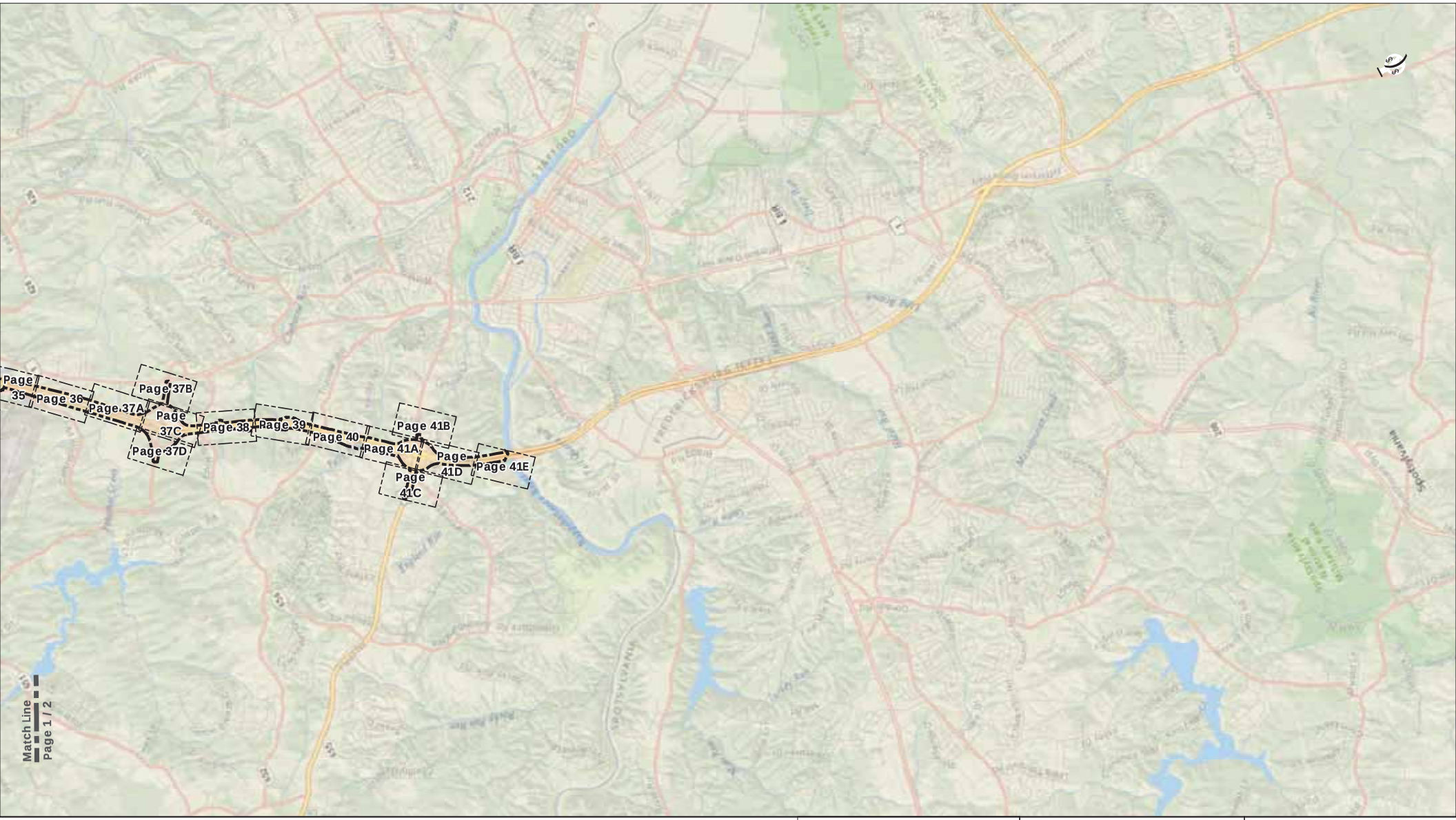
I-95 Express Lanes
Fredericksburg Extension Study

Threatened and Endangered Species Habitat Map

Page 1



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Threatened and Endangered Species Habitat Map

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Legend

- Study Area Corridor
- Mussel (MUS)
- Mussel & Harperella (HAR)
- Small Whorled Pogonia (SWP)
- Approximate Palustrine Emergent Wetland Limits (PEM)
- Approximate Palustrine Scrub-Shrub Wetland Limits (PSS)
- MUS/HAR
- SWP/NLEB (Northern Long Eared Bat)
- 2-Foot Contours
- Approximate Palustrine Forested Wetland Limits (PFO)
- Approximate Jurisdictional Ditch Limits (PUBx)
- Approximate Upper Perennial Stream Channel (R3) Limits
- Approximate Intermittent Stream Channel (R4) Limits
- Approximate Ephemeral Stream Channel Limits
- Open Water

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Notes
1. Coordinate System: NAD 1983 StatePlane Virginia North FIPS 4501 Feet
2. The limits of waters of the U.S., including wetlands, shown on this map have been field located by means of sub-meter GPS technology and are for planning purposes only.
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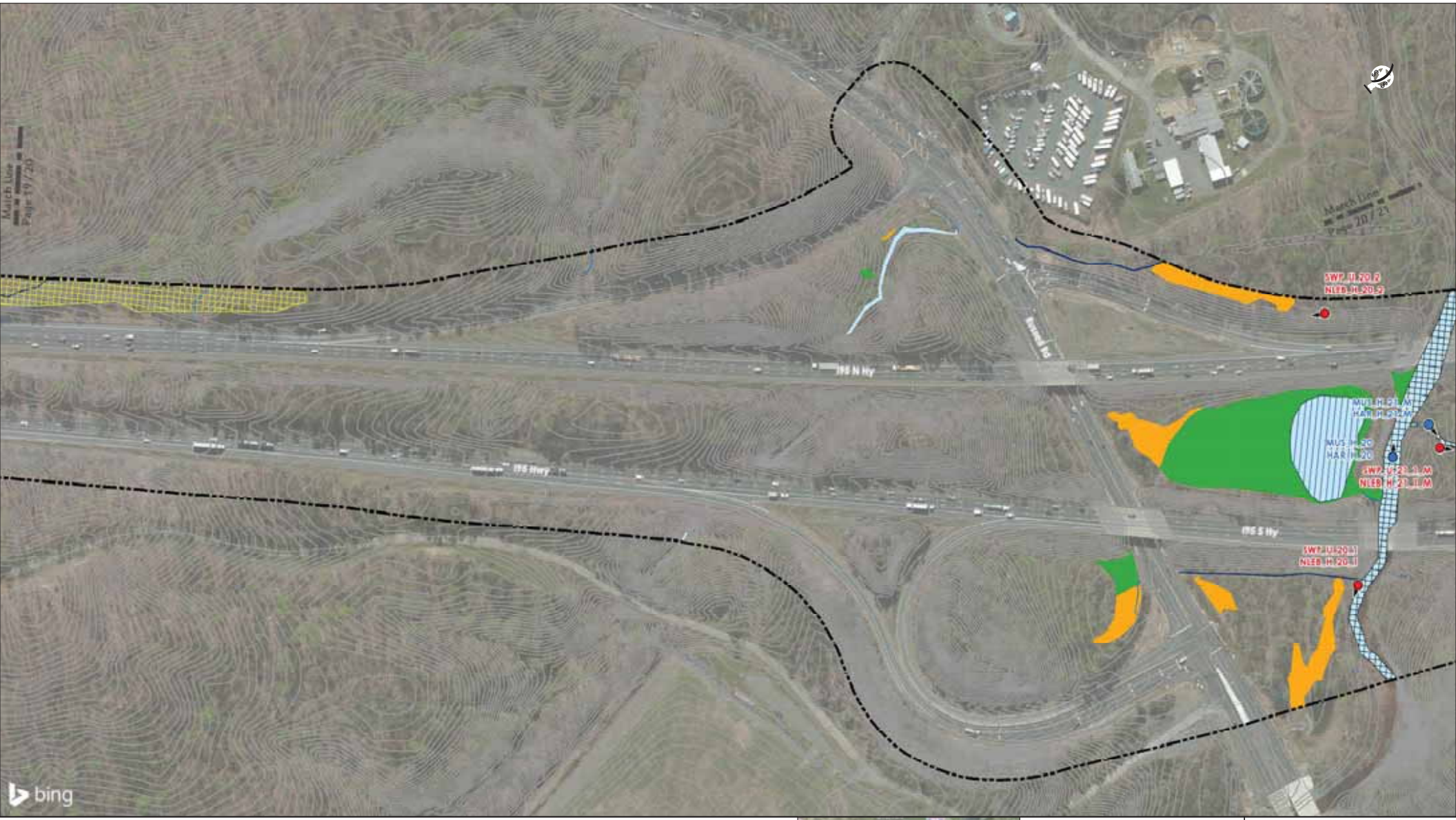
Threatened and Endangered Species Habitat Map



Legend

- Study Area Corridor
- Mussel (MUS)
- Mussel & Harperella (HAR)
- Small Whorled Pogonia (SWP)
- Approximate Palustrine Emergent Wetland Limits (PEM)
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- Approximate Intermittent Stream Channel (R4) Limits
- Approximate Ephemeral Stream Channel Limits
- Open Water

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Legend

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- SWP/NLEB (Northern Long Eared Bat)
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- Approximate Jurisdictional Ditch Limits (PUBx)
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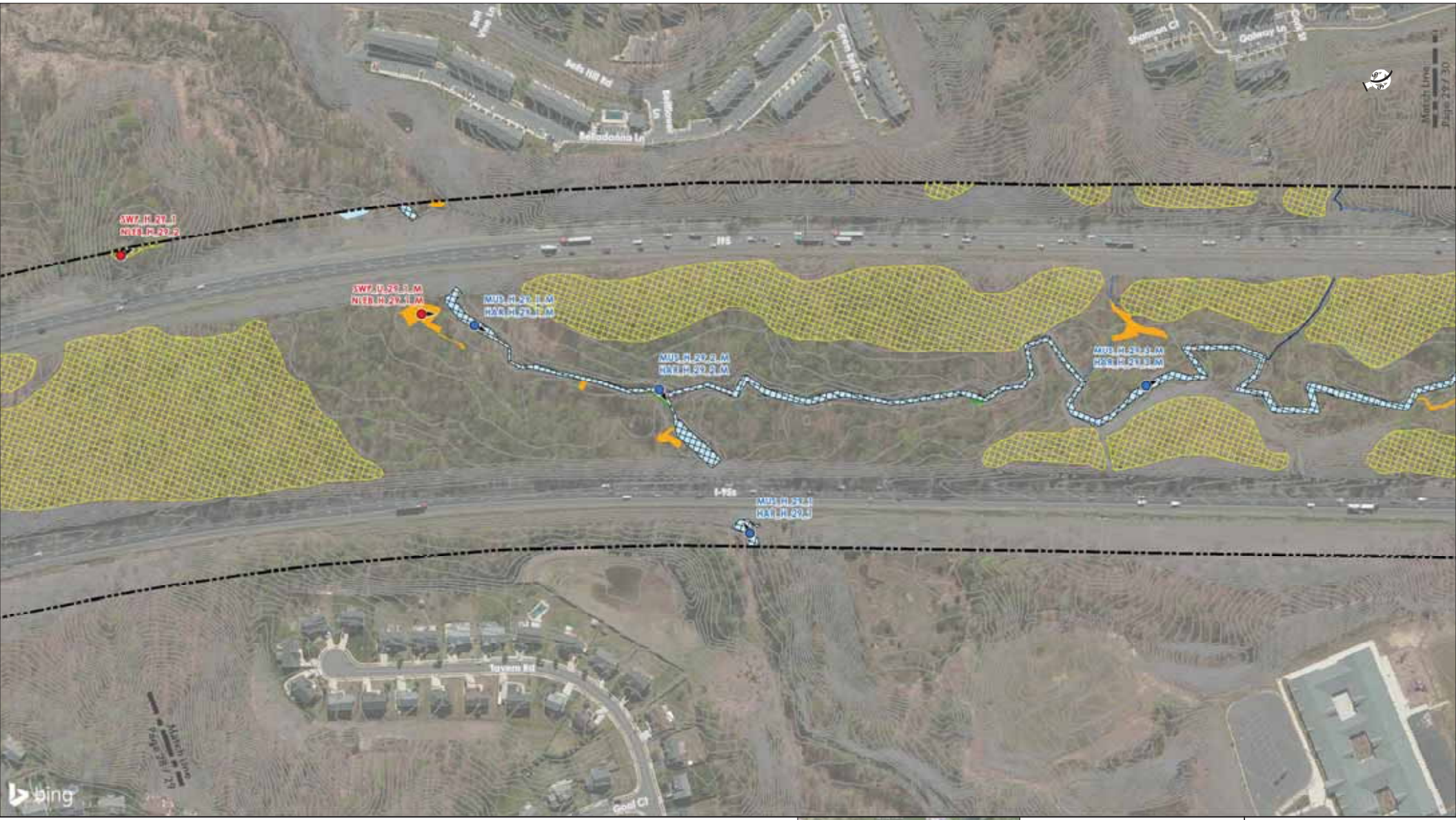

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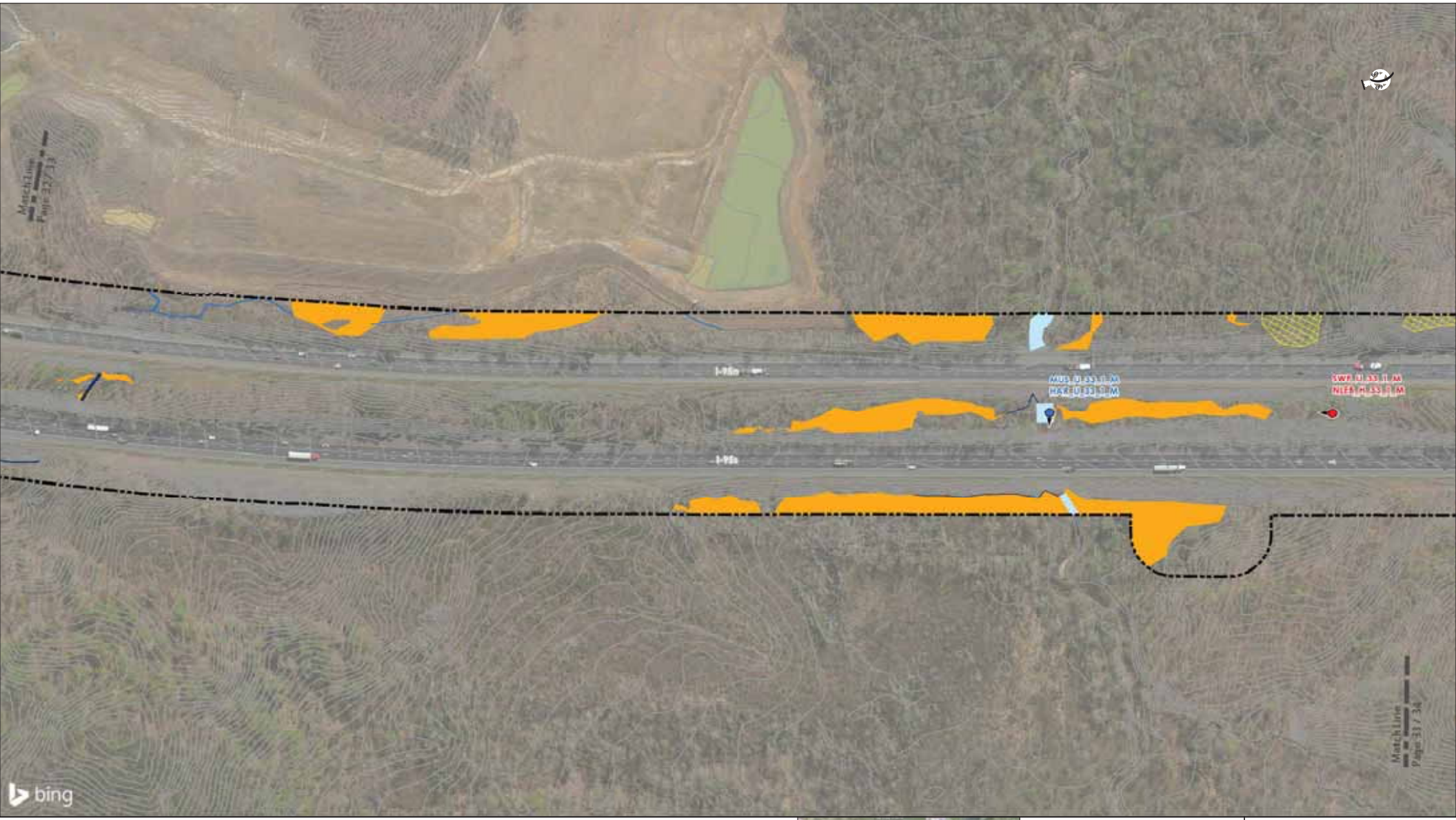

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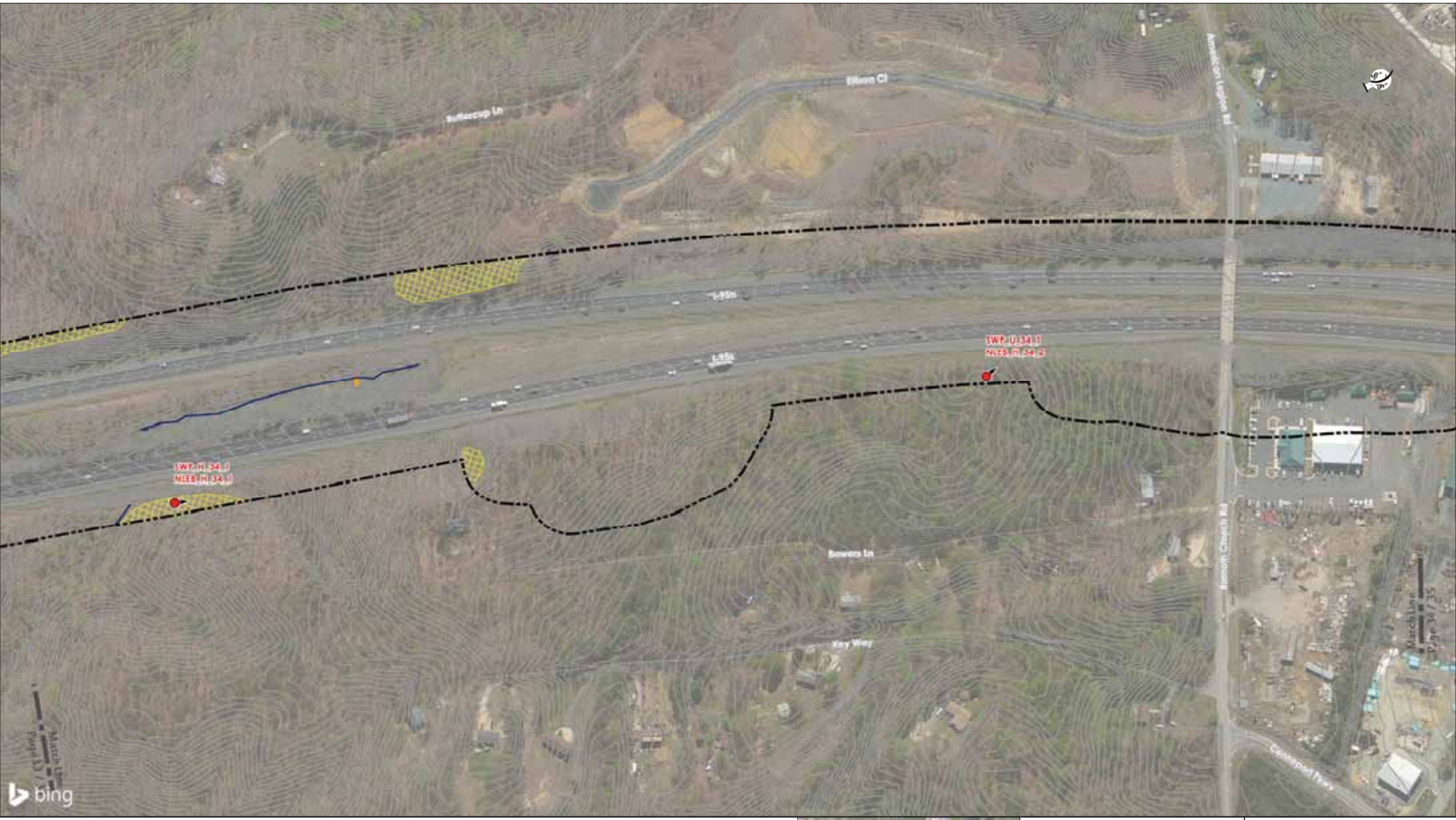

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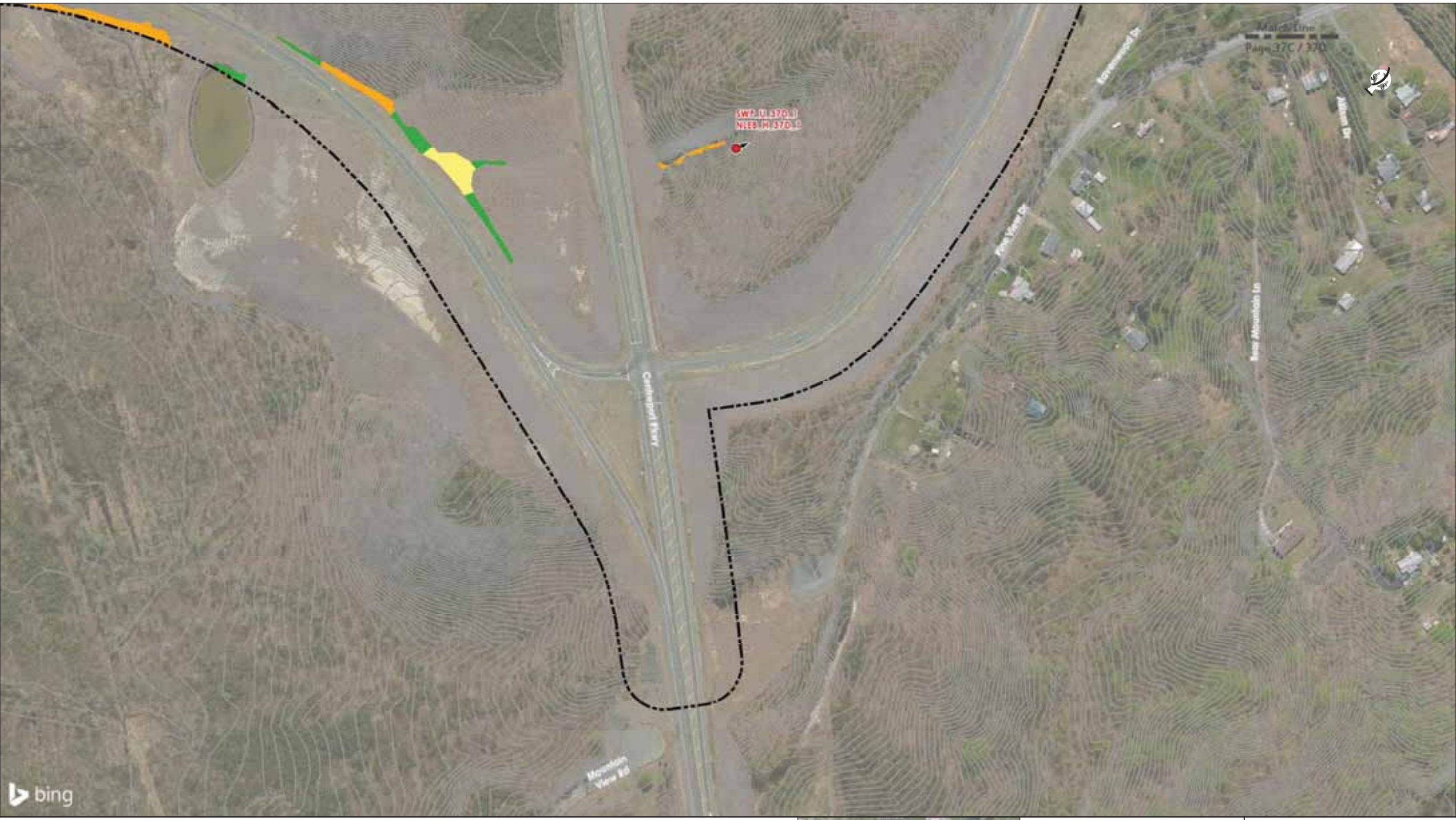

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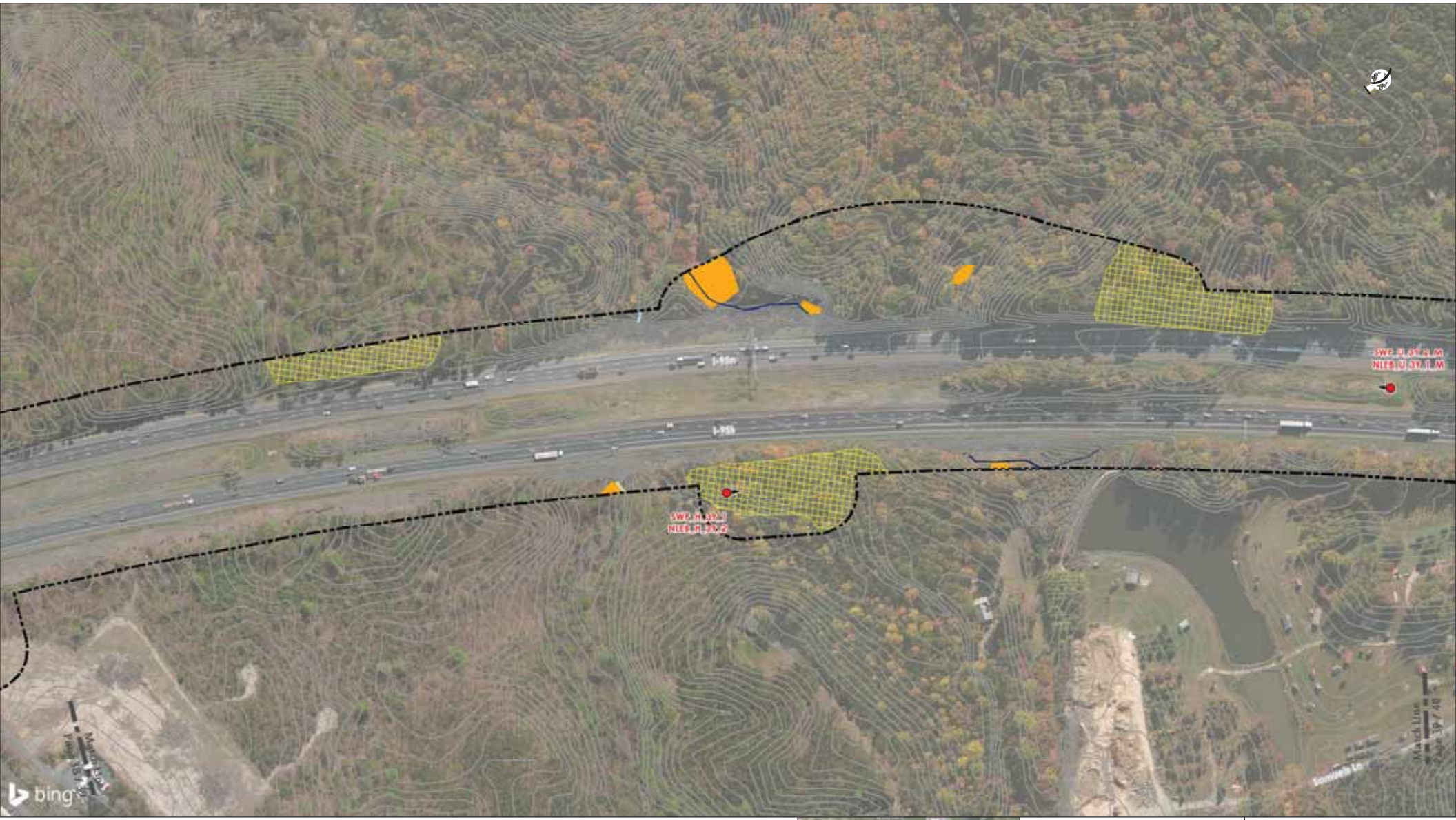

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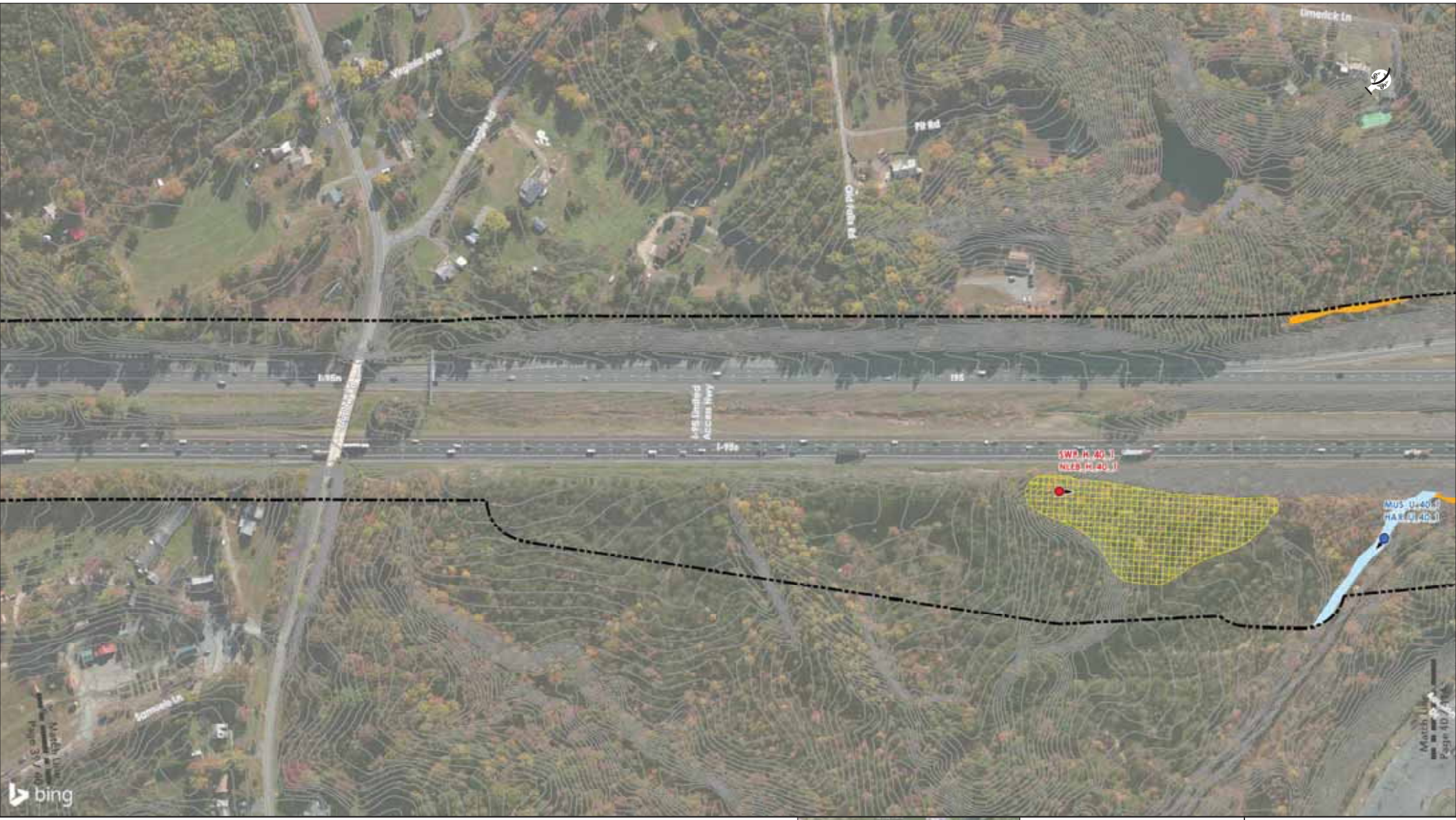

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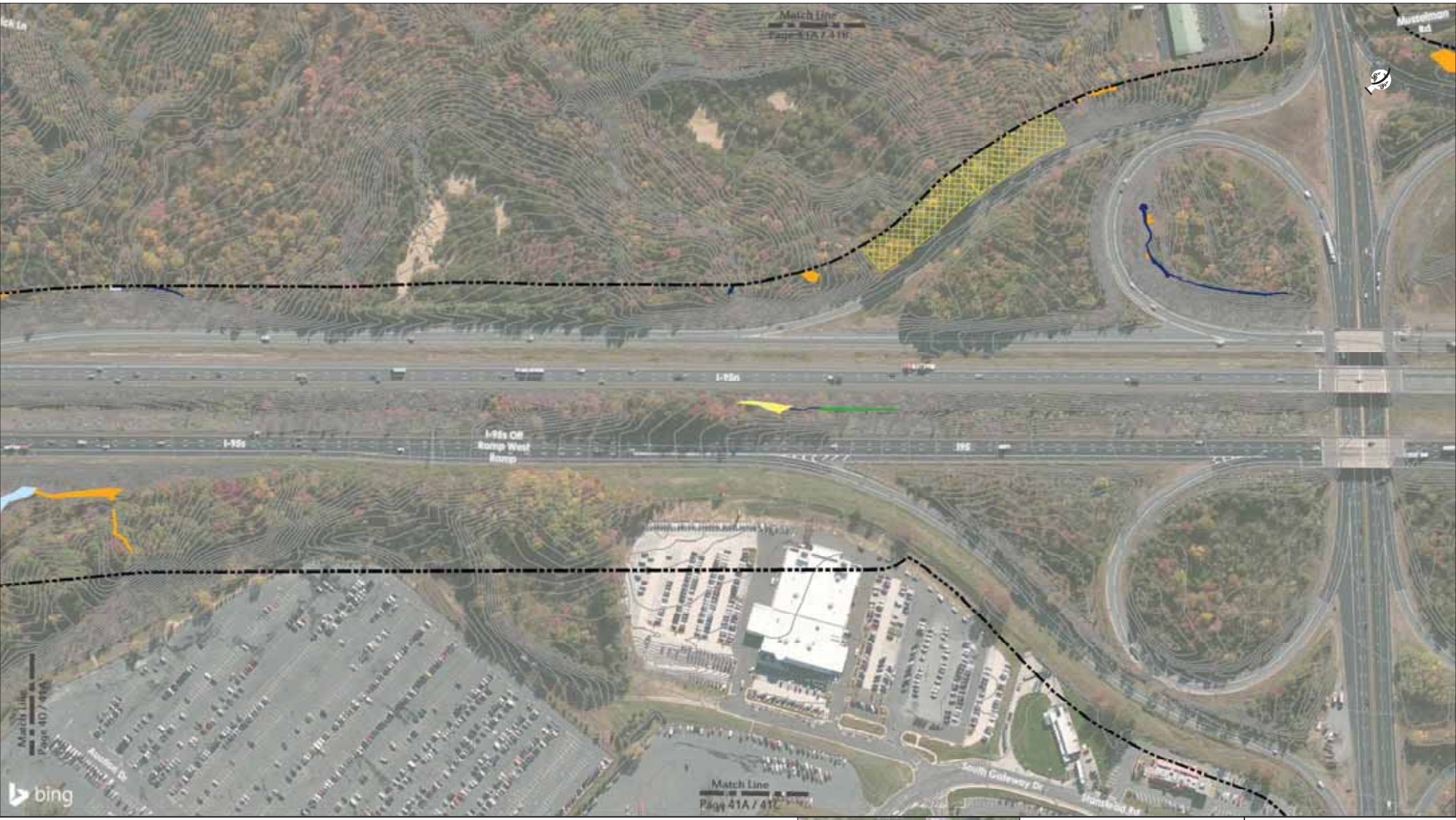

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APPENDIX B:

REPRESENTATIVE PHOTOS

		**Photo 1:** **SWP_U_20_1** **NLEB_H_20_1** **Mixed hardwoods, 8-20" dbh, stream corridor provides suitable water and foraging area, thick undergrowth with dense sub-canopy layer**
		**Photo 2:** **SWP_U_20_2** **NLEB_H_20_2** **Mixed hardwoods, 5-16" dbh, edge effect and flashy sheet flow near roadside rules out SWP.**
		**Photo 3:** **SWP_U_21_1_M** **NLEB_H_21_1_M** **Recent construction activity with edge effect, mixed hardwoods, 6-20" dbh, snags in area.**
		**Photo 4:** **SWP_U_21_1** **NLEB_H_21_1** **Mixed hardwoods, 5-20" dbh, snags present, aggressive vine and understory cover.**

		**Photo 5:** **SWP_H_22_1** **NLEB_H_22_1** **Mixed hardwoods, 10-24" dbh, southeast facing aspect, limited understory cover, 75-80% canopy closure.**
		**Photo 6:** **SWP_U_22_1** **NLEB_H_22_2** **Immature pine and hardwood forest, 5-10" dbh, edge effect from highway rules out SWP habitat.**
		**Photo 7:** **SWP_U_23_1** **NLEB_H_23_1** **Mixed hardwoods and pines, 8-18" dbh, edge effect from highway, dense understory.**
		**Photo 8:** **SWP_U_24_1** **NLEB_H_24_1** **Mixed hardwoods, 10-30 dbh", aggressive understory, open canopy providing lots of sunlight to understory.**

		**Photo 9:** **SWP_H_25_1** **NLEB_H_25_1** **Mixed mature hardwoods, 10-22" dbh, semi-open canopy, open understory.**
		**Photo 10:** **SWP_U_25_1** **NLEB_H_25_2** **Mixed hardwoods, 8-18" dbh, aggressive herbaceous cover, edge effect from highway shoulder.**
		**Photo 11:** **SWP_U_26_1** **NLEB_H_26_1** **Mixed hardwood fragmented forest, 8-18" dbh, recent disturbance due to residential construction.**
		**Photo 12:** **SWP_U_27A_1** **NLEB_H_27A_1** **Immature pine and hardwood forest, 4-12" dbh, edge effect from highway, aggressive understory growth.**

		**Photo 13:** **SWP_U_27B_1_M** **NLEB_U_27B_1_M** **Active construction in median. Representative picture shows construction from sheet 26 to 27C in median.**
		**Photo 14:** **SWP_H_28_1** **NLEB_H_28_1** **Mixed hardwoods, 10-24" dbh, loam soils, varied aspect with 80% canopy closure wit open understory.**
		**Photo 15:** **SWP_H_28_1_M** **NLEB_H_28_1_M** **Mature mixed hardwoods, 10-24" dbh, well developed detritus layer, with open understory.**
		**Photo 16:** **SWP_H_29_1** **NLEB_H_29_2** **Mixed hardwoods, 10-18" dbh, loamy soils, 75% canopy closure, southeast facing aspect.**

		**Photo 17:** **SWP_U_29_1_M** **NLEB_H_29_1_M** **Mixed hardwoods, 10-24" dbh, area received frequent standing water, rules out SWP.**
		**Photo 18:** **SWP_U_30_1_M** **NLEB_H_30_1_M** **Mixed hardwoods, 10-20" dbh, dense canopy, historic disturbance in area.**
		**Photo 19:** **SWP_H_30_4** **NLEB_H_30_4** **Mixed hardwoods, 10-22" dbh, open understory, loamy soils.**
		**Photo 20:** **SWP_H_31A_1_M** **NLEB_H_31A_1_M** **Mature mixed hardwoods, 10-22" dbh, 60-75% canopy closure, loamy soils.**

		**Photo 21:** **SWP_U_31A_1** **NLEB_H_31A_1** **Mixed hardwoods and pine, immature forest stand, 6-10”dbh, area receives overland flow water, edge effect from roadside.**
		**Photo 22:** **SWP_U_32_1_M** **NLEB_H_32_1_M** **Mature mixed hardwoods, 8-20” dbh, some standing dead trees, edge effect from highway, aggressive ground cover from** *Rubus argutus* **and** *Lonicera japonica*.
		**Photo 23:** **SWP_U_33_1_M** **NLEB_H_33_1_M** **Mixed hardwoods, 10-18” dbh, aggressive herbaceous cover due to edge effect from highway in median.**
		**Photo 24:** **SWP_H_34_1** **NLEB_H_34_1** **Mixed hardwoods, 10-22” dbh, loamy soils, 60-75% canopy closure.**

		**Photo 25:** **SWP_U_34_1** **NLEB_H_34_2** **Mixed hardwoods, 8-16" dbh, thick canopy cover with dense understory consisting primarily of American Holly.**
		**Photo 26:** **SWP_U_35_1** **NLEB_H_35_1** **Immature pines, 5-8' dbh, thick canopy cover with dense understory.**
		**Photo 27:** **SWP_H_35_1_M** **NLEB_H_35_2_M** **Mature mixed hardwoods, 8-22" dbh, 70% canopy closure, soils are fine sandy loams.**
		**Photo 28:** **SWP_U_35_1_M** **NLEB_U_35_1_M** **Cleared area with sapling tree cover less than 3" dbh. Highly manipulated.**

		**Photo 29:** **SWP_H_36_1_M** **NLEB_H_36_1_M** **Mature mixed hardwoods, 10-24" dbh, generally open understory, soils are loam to sandy loam.**
		**Photo 30:** **SWP_U_36_1_M** **NLEB_H_36_2_M** **Mature mixed hardwoods, 10-24" dbh, generally open understory with dense vines and edge effect from highway, soils are loam to sandy loam.**
		**Photo 31:** **SWP_U_37A_1_M** **NLEB_H_37A_1_M** **Dense understory, aggressive understory for SWP. Mixed semi-mature hardwood forest with snags present.**
		**Photo 32:** **SWP_U_37C_1_M** **NLEB_H_37C_1_M** **Mixed hardwoods, 8-18" dbh, stream corridor provides flyway habitat, semi-dense understory and herbaceous cover.**

		**Photo 33:** **SWP_U_37D_1** **NLEB_H_37D_1** **Mixed immature hardwoods,4-8" canopy dbh, thick canopy with aggressive undergrowth.**
		**Photo 34:** **SWP_U_38_1** **NLEB_H_38_1** **Edge effect from southbound lanes, aggressive understory. Mixed semi-mature hardwood forest, 8-18" dbh.**
		**Photo 35:** **SWP_H_39_1** **NLEB_H_39_2** **Mixed mature hardwoods, 10-22" dbh, loamy soils, generally NW aspect.**
		**Photo 36:** **SWP_U_39_2_M** **NLEB_U_39_1_M** **Maintained median in highway depicted on aerial as forested.**

		**Photo 37:** **SWP_H_40_1** **NLEB_H_40_1** **Mixed hardwoods, 10-18" dbh, some standing dead trees, loamy soils.**
		**Photo 38:** **SWP_U_41E_1** **NLEB_H_41E_1** **Semi-mature pine and hardwoods, 5-16" dbh, dense canopy and understory, recent disturbance, steep slopes.**

		**Photo 1:** **MUS_H_20_1_M** **HAR_H_20_1_M** **Chompawamsic Creek, significant gravel and cobble bed formation, and point bars.**
		**Photo 2:** **MUS_H_21_1_M** **HAR_H_21_1_M** **Unnamed tributary to Chompawamsic Creek, varied substrate with moderate point bar formations.**
		**Photo 3:** **MUS_U_21_1_M** **HAR_U_21_1_M** **Unnamed tributary to Chompawamsic Creek, incised stream channel with flashy flow and no stable point bars.**
		**Photo 4:** **MUS_U_25_1** **HAR_U_25_1** **Unnamed tributary to Aquia Creek, poor water quality and lack of rocky or sandy point bars.**

		**Photo 5:** **MUS_H_25_1** **HAR_H_25_1** **Aquia Creek, cobble and rocky substrate with point bar formations.**
		**Photo 6:** **MUS_U_28_1_M** **HAR_U_28_1_M** **Unnamed tributary to Austin Run, incised stream channel with significant erosion and lack of point bars.**
		**Photo 7:** **MUS_H_28_1_M** **HAR_H_28_1_M** **Austin Run, significant gravel bed formation, stable point bars, and varied substrate.**
		**Photo 8:** **MUS_H_29_1_M** **HAR_H_29_1_M** **Unnamed stream, significant gravel point bar formation and varied substrate.**

		**Photo 9:** **MUS_H_29_1** **HAR_H_29_1** **Unnamed stream, clean gravel/cobble riffle and point bars, no visible pollutants.**
		**Photo 10:** **MUS_H_29_2_M** **HAR_H_29_2_M** **Unnamed stream, moderate gravel bar formation and varied substrate.**
		**Photo 11:** **MUS_H_29_3_M** **HAR_H_29_3_M** **Unnamed stream, moderate gravel and sand point bar formation, varied substrate.**
		**Photo 12:** **MUS_H_30_1_M** **HAR_U_30_1_M** **Unnamed stream, sand and gravel substrate, no point bar development.**

		**Photo 13:** **MUS_H_30_2_M** **HAR_U_30_2_M** **Tributary to unnamed stream primarily sand and gravel substrate, no point bar formation.**
		**Photo 14:** **MUS_H_30_3_M** **HAR_H_30_1_M** **Unnamed stream, moderate gravel point bar formation, substrate primarily gravel and sand, good in-stream structure**
		**Photo 15:** **MUS_H_30_4_M** **HAR_H_30_2_M** **Unnamed stream, moderate gravel point bar formation, substrate primarily sand and gravel, moderate in-stream structure.**
		**Photo 16:** **MUS_H_31_1_M** **HAR_U_31_1_M** **Unnamed stream, gravel and finer substrate, no point bars present.**

		**Photo 17:** **MUS_U_31_1_M** **HAR_U_31_2_M** **Unnamed stream, significant silt and embeddedness, lack of rocky/sandy shoals.**
		**Photo 18:** **MUS_U_33_1_M** **HAR_U_33_1_M** **Accokeek Creek, unstable and highly disturbed, and often flooded point bars.**
		**Photo 19:** **MUS_H_37A_1_M** **HAR_U_37A_1_M** **Potomac Creek, gravel and cobble substrate, poor point bar formation.**
		**Photo 20:** **MUS_H_37C_1_M** **HAR_U_37C_1_M** **Unnamed stream, marginal habitat with sand and gravel substrate, no point bars.**

		**Photo 21:** **MUS_U_40_1** **HAR_U_40_1** **Falls Run, impounded water flow causes significant silt and embeddedness.**
		**Photo 22:** **MUS_U_41C_1** **HAR_U_41C_1** **Unnamed stream, fragmented stream and poor in-stream structure.**
		**Photo 23:** **MUS_U_38_2** **HAR_U_38_2** **Unnamed stream with significant silt accumulation, frequent flooding and unstable point bars.**

Appendix E:

Center for Conservation Biology Eagle Nest Location Maps

CCB Mapping Portal

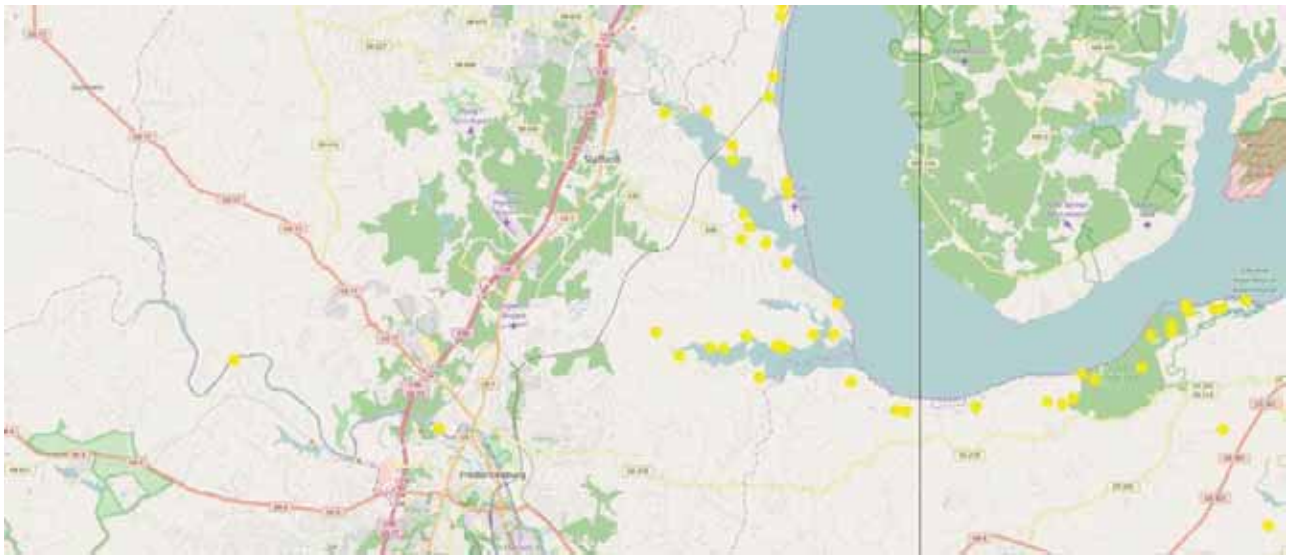
Layers: VA Eagle Nest Locator, VA Eagle Nest Buffers

Map Center [longitude, latitude]: [-77.32164000626653, 38.51977858415893]

Map Link:
http://www.ccbbirds.org/maps/#layer=VA+Eagle+Nest+Locator&layer=VA+Eagle+Nest+Buffers&zoom=12&lat=38.51977858415893&lng=-77.32164000626653&legend=legend_tab_7c321b7e-e523-11e4--aa0-0e0c41326911&base=Street+Map+%28OSM%29

Report Generated On: 05/04/2017

CCB Mapping Portal



Layers: VA Eagle Nest Locator, VA Eagle Nest Buffers

Map Center [longitude, latitude]: [-77.40966794779524, 38.3838934090573]

Map Link:
http://www.ccbbirds.org/maps/#layer=VA+Eagle+Nest+Locator&layer=VA+Eagle+Nest+Buffers&zoom=12&lat=38.3838934090573&lng=-77.40966794779524&legend=legend_tab_7c321b7e-e523-11e4--aa0-0e0c41326911&base=Street+Map+%28OSM%29

Report Generated On: 05/04/2017