US ROUTE 460 DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

SUPPLEMENTAL NATURAL RESOURCES TECHNICAL REPORT

USACE FEDERAL PROJECT NUMBER: NAO-2008-03470 | FHWA FEDERAL PROJECT NUMBER: STP-000S (276)
STATE PROJECT NUMBER: 0460-969-059, P101, C501; UPC: 100432

JUNE 2016

PREPARED BY:

VDOT Virginia Department of Transportation

U.S. Department of Transportation Federal Highway Administration

US Army Corps of Engineers ®

ROUTE 460 LOCATION STUDY:
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June 2016

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PRINCE GEORGE, SUSSEX, SURRY, SOUTHAMPTON

AND ISLE OF WIGHT COUNTIES AND THE CITY OF SUFFOLK

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PREPARED FOR:

THE VIRGINIA DEPARTMENT OF TRANSPORTATION

June 2016

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1.0 INTRODUCTION

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA) and the United States Army Corps of Engineers (USACE), as joint lead federal agencies, has evaluated options for highway transportation improvements along the existing U.S. Route 460 (Route 460) corridor between Interstate 295 (I-295) in Prince George County and Holland Road (Route 58) in the City of Suffolk, Virginia.

In September 2014, the Draft Supplemental Environmental Impact Statement (SEIS) was issued to analyze five Build Alternatives and a No Build Alternative. Following the publication of the Draft SEIS, VDOT determined that none of the five Build Alternatives evaluated over the extent of the study corridor would be viable options based on public comments that were received, input from the resource and regulatory agencies regarding the estimated environmental impacts, including potential Council of Environmental Quality (CEQ) referral, and the cost opinions that had been developed. However, in addition to the Draft SEIS supporting the ability to select the alternatives studied or the No Build Alternative, it also supported combining sections of those alternatives, including the No Build Alternative, to form an alternative not individually evaluated as a standalone alternative in the Draft SEIS.

As a result, VDOT carefully reconsidered each of the Draft SEIS the alternatives – in whole, in parts, and in hybrid combination with one another – in order to identify a single alternative that would sufficiently address the identified project Purpose and Need, while minimizing environmental impacts and providing a cost effective project. VDOT, in close coordination with FHWA, developed a Preferred Alternative that would consist of a combination of alternatives evaluated in the Draft SEIS, including the No Build Alternative and Build Alternatives 4, 2N, 3, and 1 (from west to east). This FHWA/VDOT Preferred Alternative consists of implementing the No Build Alternative between I-295 and one mile west of Zuni, upgrading the existing Route 460 between one mile west of Zuni and two miles west of Windsor, and constructing a new four-lane divided highway from west of Windsor to a new Route 460/Route 58 interchange in Suffolk.

In February 2015 the Commonwealth Transportation Board (CTB) approved the location for the Route 460 corridor improvements, consistent with the FHWA/VDOT Preferred Alternative. Additionally, the USACE stated in January 2015[2] that it did not find reason to disagree with the assessment that FHWA/VDOT's Preferred Alternative appears to be the Least Environmentally Damaging Practicable Alternative (LEDPA), noting that the USACE comments do not constitute a final LEDPA determination or indication of a permit decision (Note: the Preferred Alternative identified in tables and figures throughout the Final SEIS and Technical Reports refers to the FHWA/VDOT Preferred Alternative).

Prepared in accordance with the implementing regulations of the National Environmental Policy Act (NEPA) at 23 CFR §771.130 and 40 CFR §1502.9(c), the Final SEIS addresses public and agency comments received on the September 2014 Draft SEIS, documents the FHWA and VDOT identified Preferred Alternative and the updated analysis associated with the FHWA/VDOT Preferred Alternative, and documents the action of the CTB.

[2] Olsen, Colonel Paul B. Letter to Aubrey Lane, Jr. 9 Jan. 2015. Norfolk, Virginia.

1.1 SUPPLEMENTAL NATURAL RESOURCES TECHNICAL REPORT

The purpose of this Supplemental Natural Resources Technical Report is to describe the results of the detailed analysis for natural resources from the Final SEIS. This analysis includes identifying the anticipated impacts and mitigation for those impacts in relation to the FHWA/VDOT Preferred Alternative presently under evaluation that have contributed to the development and selection of alternatives studied in the Draft SEIS, as well as the identification, recommendation, and refinement of the FHWA/VDOT Preferred Alternative identified in the Final SEIS.

1.2 BACKGROUND

In May 2005, FHWA published a Draft Environmental Impact Statement (DEIS) for the Route 460 Location Study that evaluated three candidate build alternatives (CBAs) as well as the No Build Alternative and Transportation System Management (TSM) Alternative. Following the publication of the 2005 DEIS, VDOT held two public hearings presenting the technical findings of the draft analysis. In November 2005, the CTB selected the new location alternative south of existing Route 460, with an alignment shift in Isle of Wight County to reduce residential and wetland impacts (referred to as Modified CBA 1) as the preferred alternative. A Final EIS (FEIS) was prepared that analyzed the environmental consequences of the preferred alternative in greater detail and was approved by FHWA in June 2008. FHWA issued a Record of Decision (ROD) in September 2008 selecting Modified CBA 1 to address the identified Purpose and Need. In November 2012, FHWA completed a NEPA Re-evaluation of the FEIS and in particular, Modified CBA 1, giving consideration to funding the project through the implementation of tolls. In reviewing the information presented in the 2008 Final EIS and the 2012 NEPA Re-evaluation, the USACE indicated that the Commonwealth's preferred alternative did not appear to be the LEDPA when compared to improving the existing road. Further development of additional information and analyses of the Commonwealth's preferred alternative resulted in an increase in the acreage of wetlands identified in the Modified CBA 1 corridor compared to the acreage of wetlands presented in the 2008 Final EIS. In 2013, FHWA and USACE determined that the preparation of a Supplemental EIS (SEIS) would be necessary in order to analyze new information with a bearing on the environmental impacts, particularly aquatic resource impacts. The SEIS also was determined to be necessary in order for the USACE to fulfill its statutory obligations under NEPA and as part of its decision making process to issue or deny authorization for impacts associated with the Route 460 corridor improvements.

The Draft SEIS was published in September 2014 and presented at three Location Public Hearings that took place in October 2014.

The Draft SEIS provided detailed analysis of five Build Alternatives (Alternatives 1-5) that met the Purpose and Need, including two alternatives on new alignment (Alternatives 1 and 3), one alternative with improvements to existing Route 460 (Alternative 4), alternatives that included a combination of new location alignment (with bypasses of the towns) with varying improvements to existing Route 460 between the towns (Alternatives 2N/S and 5N/S), and the No Build Alternative. The No Build Alternative included all planned and programmed transportation improvements in the study area that had been approved and adopted for implementation by 2040.

Following the publication of the Draft SEIS, VDOT determined that none of the five Build Alternatives evaluated over the extent of the study corridor would be viable options based on public comments that were received, input from the resource and regulatory agencies regarding the estimated environmental impacts including potential CEQ referral, and the cost opinions that had been developed. In order to identify a single alternative that was less impactful, as well as less costly, while sufficiently addressing the Purpose and Need, VDOT explored a combination of segments from the Draft SEIS alternatives in various configurations to develop hybrid alternatives. The goal of the hybrid development was to arrive at a recommendation for a preferred alternative that could be considered the LEDPA while sufficiently addressing the project's Purpose and Need and providing a cost effective solution. Refer to the ***Supplemental Alternatives Technical Report*** (VDOT, 2016e) for additional information regarding the hybrid development and refinement process.

In January 2015 VDOT, in close coordination with FHWA, reconsidered the alternatives studied in the Draft SEIS and developed a 52-mile FHWA/VDOT Preferred Alternative, which included the No Build Alternative over most of its length (36 miles), with portions of four alternatives from the Draft SEIS (4, 2N, 3, and 1) for 16 miles. Since the identification and approval of the location of the FHWA/VDOT Preferred Alternative, further refinements were applied in order to avoid and minimize impacts to the greatest extent practicable. The FHWA/VDOT Preferred Alternative, including these further refinements, has been carried forward for detailed evaluation in the Final SEIS.

1.3 PURPOSE AND NEED

The purpose of the improvements to the Route 460 corridor is to construct a facility that is consistent with the functional classification of the corridor, sufficiently addresses safety, mobility and evacuation needs, and sufficiently accommodates freight traffic along the Route 460 corridor between Petersburg and Suffolk, Virginia.

The following needs have been identified for the project:

- Address roadway deficiencies: Route 460 is based on outdated geometric standards.
- Improve safety: Fatality rates for Route 460 are higher than other comparable rural roadways in Virginia.
- Accommodate increasing freight shipments: Truck percentages for Route 460 are higher than national averages for rural roads with a similar functional classification. Truck volumes are also forecast to grow due to expansions at the Port of Virginia.
- Reduce Travel Delay: Future traffic volumes will result in increased travel delays on Route 460 due to capacity limitations at traffic signals and due to the current design deficiencies.
- Provide adequate emergency evacuation capability: Route 460 is a designated hurricane evacuation route for Southside Hampton Roads communities, yet during recent events, the road was closed due to effects caused by these storms.
- Improve strategic military connectivity: Route 460 is a designated part of the Strategic Highway Network (STRAHNET) by the Department of Defense (DOD) and FHWA.
- Support local economic development plans: In addition to statewide and regional economic development needs, jurisdictions along the Route 460 study area have identified economic development priorities related to transportation improvements.

Through the evaluation of hybrid alternatives, which is detailed in the ***Supplemental Alternatives Technical Report*** (VDOT, 2016e), the following were identified as key improvements necessary for addressing the Purpose and Need, even if these improvements involved a hybrid alternative less than the full length of the Route 460 corridor.

- Improvements are needed along Route 460 at the Blackwater River to address longstanding flooding issues associated with safety and evacuation concerns and roadway deficiency.
- Improvements are needed at Route 58/Route 460 to provide efficient traffic movements to decrease travel time, facilitate increased freight mobility, and better accommodate emergency evacuation.
- Improvements to the eastern portion of the corridor to improve safety, as this area has the largest number of conflict points compared to the rest of the corridor; enhancements to travel time, freight mobility, and evacuation from the coastal areas would be better realized with improvements to the eastern portion of the corridor.

Based on the identification of these key components necessary for addressing the Purpose and Need, geographic limits for the hybrid alternative were refined within the eastern portion of the study corridor, where these key project components were focused and the elements of need had been demonstrated in the Draft SEIS as more pronounced. In developing hybrids, it also was important to consider opportunities to minimize environmental impacts, such as displacements and aquatic resources, and costs. Following a detailed evaluation of hybrid alternatives that focused on the eastern portion of the study corridor, FHWA/VDOT Preferred Alternative was ultimately identified as the most effective improvement option for the 16 miles for which the improvements were considered; it best addresses the project's Purpose and Need, while balancing cost, displacements, and wetlands.

1.4 FINAL SEIS ALTERNATIVES

Two alternatives are included in the Final SEIS – the FHWA/VDOT Preferred Alternative and the No Build Alternative. Following is a description of each alternative.

1.4.1 No Build Alternative

The No Build Alternative has been included to serve as a baseline for comparison of future conditions and impacts. The No Build Alternative includes all planned and programmed transportation improvements within the study area that have been approved and adopted for implementation by 2040, as identified in the VDOT Six Year Improvement Program (SYIP). These planned and programmed improvements would be developed and implemented independent of the implementation of the FHWA/VDOT Preferred Alternative. The No Build projects within the study area and projects that have the potential to affect capacity within the study area are listed are shown in **Table 1-1**.

Table 1-1.4-1: No Build Projects within the Route 460 Study Area Jurisdictions

Locality	VDOT UPC / MPO ID	Description
Prince George	100499	Construction of added left turn lane on westbound Route 460 at Enterprise Drive (Route 657).
	82849	Construction of added left turn lanes on northbound Bull Hill Road (Route 630) onto Route 460 in Prince George County.
	105110	Construction of right turn lanes on Courthouse Road (Route 106) at its intersection with Prince George Drive (Route 616).
	104847	Construction of added left turn lane on Route 156.
Surry	107529	Improvements to Route 627 by widening, improving the drainage, and straightening the roadway.
Sussex	N/A	No projects listed.
Southampton	N/A	No projects listed.
Isle of Wight	58297	Construction of added left and right turn lanes on Courthouse Highway (Route 258) at its intersection with Scotts Factory Road (Route 620).
	103021	Construction of a right turn lane on Turner Drive (Route 644) at the intersection with Benns Church Boulevard (Route 10/32).
Suffolk	104333	Improvements to drainage and stormwater management facilities along Pruden Boulevard (Route 460).
	102994	Intelligent transportation system (ITS) improvements to 11.6 miles of the Suffolk Bypass (Route 58) from the City of Chesapeake to Holland Road.
	100937	Reconstruction with added capacity on Route 58/Holland Road between the Route 58/13/32 bypass to just west of Manning Bridge Road.
	102998	Intersection improvements to Suffolk Bypass Off-Ramp at Godwin Boulevard. Construction of a second exclusive right-turn lane and traffic signal improvements.
	104332	Improvements to the intersection of Godwin Boulevard (Route 10) and Kings Highway (Route 125).

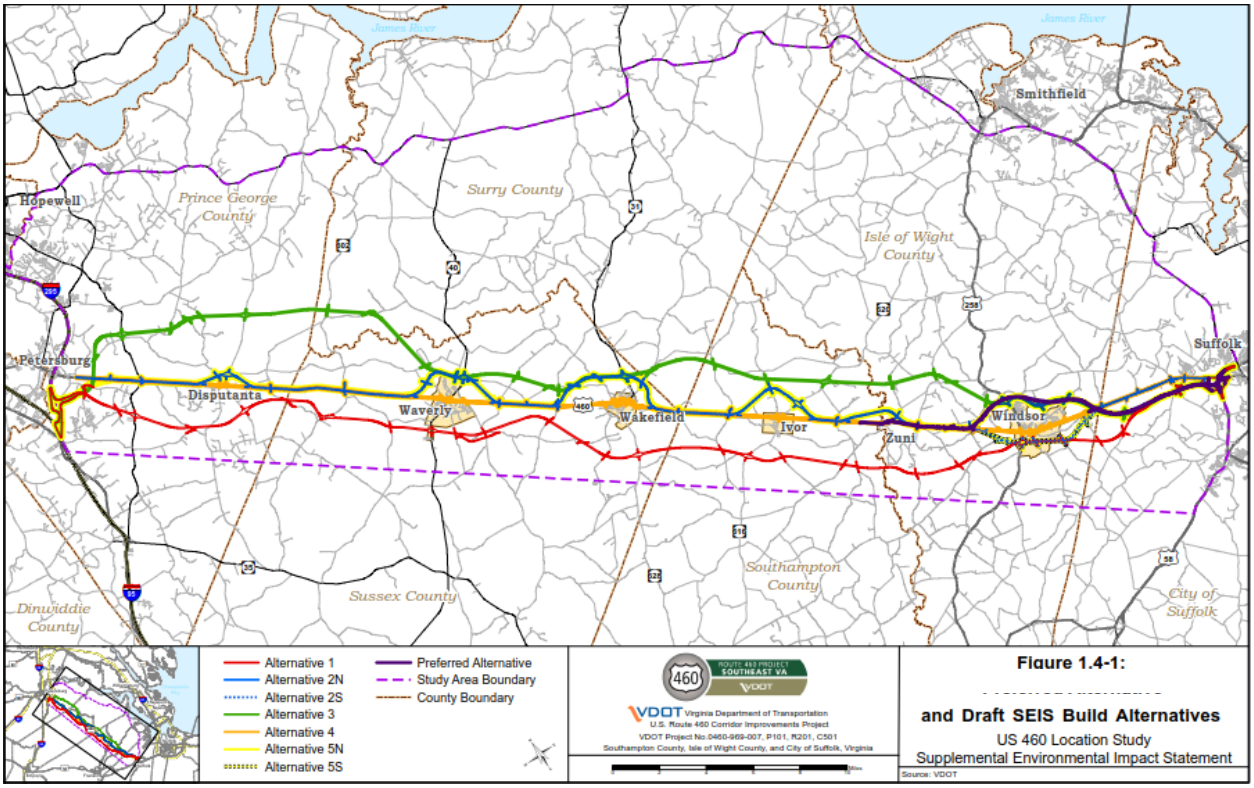
Source: Virginia Department of Transportation FY 2016 Final SYIP; Hampton Roads 2040 Long Range Transportation Plan: Committed and Candidate Transportation Projects, September 2014.

1.4.2 FHWA/VDOT Preferred Alternative

The FHWA/VDOT Preferred Alternative is a 52-mile corridor between I-295 in Prince George County and Route 58 in Suffolk. **Figure 1.4-1** illustrates the FHWA/VDOT Preferred Alternative compared to the Build Alternatives from the Draft SEIS. Following is a description of the FHWA/VDOT Preferred Alternative, from west to east:

- from I-295 to approximately one mile west of Zuni the No Build Alternative would be implemented (approximately 36 miles);
- from approximately one mile west of Zuni to two miles west of Windsor the existing US 460 would be upgraded to a four-lane divided highway and include a new bridge across the Blackwater River to eliminate long standing flooding problems (approximately 4 miles);
- from approximately two miles west of Windsor to the US 460/58 interchange in Suffolk, a new four-lane divided highway would be constructed, running north around Windsor, then east of Windsor running south of the existing US 460 (approximately 12 miles).

Figure 1.4-1: FHWA/VDOT Preferred Alternative and Draft SEIS Build Alternatives



1.4.3 Inventory Corridor and Design Corridor

In order to identify resources along the Build Alternatives analyzed in the Draft SEIS, a 500-foot wide Inventory Corridor was developed to identify resources within a reasonable proximity of each alignment. None of the alternatives were anticipated to impact all of the resources identified within their respective Inventory Corridors as these corridors did not reflect the actual impacts of each of the alternatives in comparison to one another. Instead the Inventory Corridors were developed for the purposes of providing greater flexibility to further avoid and minimize impacts as design advanced.

In order to estimate impacts and compare alternatives, the conceptual designs and typical sections were applied to each Build Alternative in the Draft SEIS to develop a Design Corridor to represent the likely "footprint" for each alternative. The reported impacts in the Draft SEIS were based upon the Design Corridor, which included roadway width, proposed right-of-way, and construction limits. The Design Corridor for each alternative was able to be shifted within the Inventory Corridor to avoid or minimize impacts to resources with knowledge of the consequences of those shifts. In addition, both the SEIS Inventory and Design Corridors were adjusted as necessary to account for design elements associated with each Alternative, including interchanges, at-grade intersections, side road overpasses, interface geometry with bypasses, etc. Details regarding the design elements that were factored into the development of each alternative and the typical sections developed for them are included within the appendices of the ***Alternatives Technical Report*** (VDOT, 2014e).

Design and engineering were advanced in order to develop the permit application for the FHWA/VDOT Preferred Alternative, which requires that the Design Corridor, a planning level design, be refined to understand the specific area to be impacted by the project, known as the Limits of Disturbance (LOD). As described in the sections that follow, the typical sections were refined to more accurately reflect the

anticipated LOD, which includes both temporary and permanent impacts, including stormwater management facilities and construction access. To the extent practicable, the LOD was developed to avoid and minimize impacts to resources, including wetlands and streams. This LOD has been used to calculate predicted impacts of the FHWA/VDOT Preferred Alternative.

2.0 REGULATORY CONTEXT

Construction of a new Route 460 would require coordination with and approval/clearances from a number of different regulatory and resource agencies during the final design and permitting phase of the project, as summarized below.

2.1.1 Applicable Federal Regulations and Guidance

Applicable federal regulations, statutes, Executive Orders and memoranda related to Natural Resources are provided in **Tables 2.1-1** and **2.1-2**.

Table 2.1-1.4-1: Regulatory Programs and Statutes Applicable to Natural Resources Permits/Approvals

Law or Regulation	Statutory Authority
National Environmental Policy Act of 1969	42 U.S.C. 4321-4347
Environmental Quality Improvement Act of 1970	42 U.S.C. 4371 et seq.
Clean Water Act of 1977, as amended	33 U.S.C. 1251 et seq.
Rivers and Harbors Act of 1899, as amended	33 U.S.C. 401 et seq. Sections 9 and 10 per 23 CFR 650, Subparts D & H, 33 CFR 114-115
The 1998 Transportation Equity Act for the 21st Century TEA21)	Public Law 105-178, 112 Stat. 107
The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)	Pub. L. 102-240, 105 stat. 1914
Safe Drinking Water Act of 1974, as amended through 1996	42 U.S.C. 300(f) et seq.
Coastal Zone Management Act of 1972, as amended through 1990	16 U.S.C. 145 et seq. (Sections 303 and 307 per 23 CFR 650.211)
Endangered Species Act of 1973, as amended through 1988	16 U.S.C. 1531-1543 7 CFR 355, 50 CFR 17, et. seq. 50 CFR Part 402--Interagency Cooperation
National Flood Insurance Act and Flood Disaster Protection Act	42 U.S.C. 4001-4128
Fish and Wildlife Act of 1956, as amended through 1986	16 U.S.C. 742a-754j-2
Fish and Wildlife Coordination Act, as amended through 1965	16 U.S.C. 661-667e
Magnuson-Stevens Fishery Conservation and Management Act, as amended through 1996	Public Law 94-265 16 U.S.C. 1801-1882
Sustainable Fisheries Act of 1996, as amended 1997	Public Law 104-297 16 U.S.C 971c
Bald and Golden Eagle Protection Acts	16 U.S.C. 668-668d
Emergency Wetlands Resources Act of 1986, as amended through 1992.	16 U.S.C. 3901-3932
Migratory Bird Treaty Act	16 U.S.C. 703-711
Bridge Locations and Clearances, Bridge Construction Permit, U.S. Coast Guard	33 CFR 115
ISTEA: Wetlands Mitigation Banks, Sections 1006-1007	23 U.S.C. 103(i)13 and 23 U.S.C. 133(b)11
Water Bank Act, as amended through 1994	Public Law 91-559 16 U.S.C. 1301-1311
Water Resources Development Act of 1990	Public Law 101-640
Wild and Scenic Rivers Act of 1968	Public Law 90-542 16 U.S.C. 1271-1287

Table 2.1-1.4-2: Other Regulatory Authority for Natural Resources Permits and Approvals

Dictate	Name of Document	Effective Date
Executive Order 13274	Environmental Stewardship and Transportation Infrastructure Project Reviews	September 18, 2002
Executive Order 11990	Protection of Wetlands	May 24, 1977, implemented by DOT Order 5660.1A, dated August 24, 1978.
Executive Order 11988	Floodplain Management	May 24, 1977, implemented by DOT Order 5650.2, dated April 23, 1979, as amended by Executive Order 12148 (23 CFR 650, Subpart A, and 23 CFR 771)
Executive Order 11514	Protection and Enhancement of Environmental Quality	As amended by Executive Order 11991, May 24, 1977
Executive Order 13186	Responsibilities of Federal Agencies to Protect Migratory Birds	January 10, 2001
Executive Order 13112	Invasive Species	February 3, 1999
Executive Order 12962	Recreational Fisheries	June 9, 1995 Fed. Reg. Vol. 60, No. 111
FEMA Regulations	Significant Encroachment of Floodway Finding	Letter of Map Amendment
FHWA Memorandum	Guidance Implementing Executive Order of Invasive Species	August 18, 1999
FHWA Memorandum	Management of the Endangered Species Act (ESA) Environmental Analysis and Consultation Process	February 20, 2002
FHWA Memorandum	Guidelines for the Consideration of Highway Project Impacts on Fish and Wildlife Resources	October 30, 1989
FHWA Program Manual 6-7-3-2	Location and Hydraulic Design for Encroachments on Floodplains	November 15, 1979
FHWA Memorandum	Cooperative Agreement Between the Nature Conservancy and the FHWA Regarding Research on Biodiversity Conservation and Transportation Planning	July 8, 1997
FHWA Memorandum	Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds	April 26, 1994
FHWA Memorandum	Guidance on Implementing Executive Memorandum on Landscaping	November 2, 1995

USACE administers regulations for activities affecting waters of the United States (WOUS) and navigable waters pursuant to Section 404 of the Clean Water Act (CWA) of 1977, as amended, and Section 10 of the Rivers and Harbors Act of 1899, respectively. Section 9 of the Rivers and Harbors Act of 1899, (33 U.S.C. 401) pertains to bridges and causeways, but the authority of the Secretary of the Army and USACE with

respect to bridges and causeways was transferred to the Secretary of Transportation under the Department of Transportation Act of October 1966, and is administered by the U.S. Coast Guard (USCG).

Section 404 of the CWA prohibits the discharge of dredged or fill material into WOUS if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem. Per Section 404 (b)(1) of the CWA, the U.S. Environmental Protection Agency (EPA) issued guidelines that the USACE must follow when issuing Section 404 permits, known as the Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (33 U.S. Code Annotated §1344 et seq.; 40 CFR §230). During permit coordination with regulatory agencies, an alternatives analysis is generally required to identify less damaging alternatives that might be available. **Chapter 2.0** (**Sections 2.4 and 2.5**) of the **Final SEIS** and the ***Supplemental Alternatives Technical Report*** (VDOT, 2016e) contain detailed documentation of the alternative analysis that led to the identification of the FHWA/VDOT Preferred Alternative. The analysis included input from the USACE and EPA throughout the process.

The CWA delegates authority to EPA and USACE to define the term "waters of the United States", which has been defined as follows:

> (1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
> (2) All interstate waters including interstate wetlands;
> (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
> (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
> (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
> (iii) Which are used or could be used for industrial purpose by industries in interstate commerce;
> (4) All impoundments of waters otherwise defined as waters of the United States under the definition;
> (5) Tributaries of waters identified in paragraphs (a) (1) through (4) of this section;
> (6) The territorial seas;
> (7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section.
> (8) Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

Under USACE regulations (33 CFR §329) as applied to the study area, navigable waters are determined by the USACE District Engineer and are made for all waters that are "presently used or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce". The USACE general definition of navigable waters of the United States is "those waters subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity." This definition includes all tidal waterbodies including streams/rivers and wetlands.

2.1.2 Applicable State Regulations and Guidance

In addition to regulations administered by USACE, several state agencies have jurisdiction over surface waters. Virginia Department of Environmental Quality (VDEQ) administers the Virginia Water Protection Permit program (9 VAC 25-210), Section 401 of the CWA, and the State Water Control Law for activities affecting jurisdictional wetlands, streams, and other water bodies. In July 2000, VDEQ authority was modified by the Virginia General Assembly to develop a non-tidal wetlands program and to provide regulations to protect fish and wildlife resources. Section 401 of the CWA requires any applicant for a federal license or permit for any activity that may result in a discharge into waters to obtain a certification that discharge will not adversely affect water quality from the state in which the discharge will occur. Section 401 requires certification by Virginia that prospective permits comply with the state's applicable effluent limitations and water quality standards. While waters that are considered "isolated" do not fall under federal CWA permitting, they are regulated by VDEQ.

The Virginia Marine Resources Commission (VMRC) is authorized to permit activities in, on, or over state-owned subaqueous lands in Virginia (Code of Virginia Chapter 2, Title 62.1). Through this regulatory framework, activities requiring permits include building, dumping, or otherwise trespassing upon or over, encroach upon, take or use any material from the beds of the bays, oceans, and jurisdictional rivers, streams, or creeks. In addition, VMRC is responsible for managing and regulating the use of Virginia's tidal wetlands and coastal primary sand dunes in conjunction with Virginia's local wetlands boards, where established. VMRC also protects and regulates those areas designated as non-vegetated and vegetated tidal wetlands and state-owned subaqueous bottom land.

Virginia's state waters, including wetlands, are also regulated under the Virginia Wetlands Act and through Subtitle III of Title 28.2 of the Code of Virginia. Through this framework, each county's local wetlands board regulates activities in tidal wetlands within their counties. Though tidal wetlands are present in a small portion of the northeast corner of the study area, no tidal wetlands occur within the Inventory Corridor. Since tidal wetlands do not occur within the Inventory Corridor, the local wetlands boards do not have jurisdiction.

The federal and state guidelines require that no discharge of dredged or fill material in WOUS be permitted unless appropriate and practicable steps have been taken to minimize adverse impacts associated with the discharge. Additional federal and state guidance and policy documentation assist in defining the requirements for mitigation (which includes avoidance, minimization, and compensation). Compliance with these requirements is an essential environmental safeguard to verify that CWA objectives for the protection of streams and wetlands are achieved.

The Chesapeake Bay Preservation Act (Bay Act), administered by VDEQ, regulates development in the Chesapeake Bay watershed. The Chesapeake Bay Preservation Areas consist of Resource Protection Areas (RPAs) and Resource Management Areas (RMAs). RPAs consist of environmentally sensitive lands along shorelines or perennial streams that serve as "filters" by removing pollutants from runoff before they enter the Chesapeake Bay and its tributaries. RMAs are contiguous to the entire inland boundary of the RPA and if improperly used or developed, have the potential for causing water quality degradation or for diminishing the functional value of the RPA. Regulations limit development activities from encroaching into the RPAs due to the important functions these areas perform in water quality protection. Title 9 of the VAC (9VAC10-20-150B) allows public roads to be located within RPAs subject to certain conditions. Construction, installation, operation, and maintenance of public roads and their appurtenant structures are exempt if:

- The roadway is constructed in accordance with an erosion and sediment control plan consistent with regulations promulgated pursuant to the Erosion and Sediment Control Law (§10.1-560 et seq. of the Code of Virginia).
- The roadway is constructed in compliance with the Stormwater Management Act (§10.1-603.1 et seq. of the Code of Virginia) and a stormwater management plan is approved by VDEQ.
- The road is designed and constructed to prevent or minimize otherwise minimal encroachment in the RPA and minimize water quality impacts.

2.1.3 Federal and State Permitting Requirements

2.1.3.1 Water Related Permits and Clearances

In order for USACE to make a permit decision for any project, a jurisdictional determination of the boundaries of wetlands and WOUS must be obtained from USACE. Wetlands and WOUS are delineated according to methodology outlined in the 1987 USACE Wetland Delineation Manual, the appropriate Regional Supplement to the 1987 Manual, and subsequent guidance. USACE reviews the delineation and issues its determination regarding the extent of jurisdictional waters in the project area. Subsequently, the type and quantity of impacts to jurisdictional surface waters can be assessed and a Joint Permit Application (JPA) can be prepared.

It is important to have the defined construction limits finalized prior to completing the permit application to address the appropriate impacts, thus avoiding the need to change either the permit application or the actual issued permit in the future if changes occur. Any changes after the initial JPA submittal increase the agencies' review times and may require an additional public notice and a modification to a permit if the permit is already issued. An accurate determination of impacts is of particular importance since the actual amount of land disturbance and/or impacts determines the type of permit(s), and subsequent requirements, necessary. The VMRC serves as the "clearinghouse" for the JPAs, distributing the applications to the appropriate regulatory and resource agencies.

Coordination with USACE, VDEQ, and VMRC is necessary during the permitting phase of any project to determine the jurisdictional limits of surface waters and to make a final determination of the need for and type of permits. Permanent, conversion, secondary, and temporary impacts to jurisdictional wetland and stream systems require a permitting decision from these agencies. The permits required for the Route 460 project, based on the scale of the project and the multiple individual impact area crossings, will include a Section 404 and Section 10 Individual Permit from USACE, a Virginia Water Protection Individual Permit from VDEQ (which serves as the Section 401 certification), and a subaqueous bottomland permit from VMRC for impacts to systems with drainage areas greater than five square miles. According to a March 5, 2010, guidance from the USACE, the Blackwater River is navigable, and thus subject to Section 10 of the Rivers and Harbors Act, from its mouth to Route 620 (Broadwater Road), which is approximately 5 river miles north of the Route 460 crossing[4]. A permit would be required from USACE in accordance with Section 10 of the Rivers and Harbors Act for impacts to the Blackwater River.

The federal and state permit programs rely on the use of compensatory mitigation to offset unavoidable aquatic impacts by replacing lost functions with replicated functions elsewhere. Appropriate mitigation is

[4] http://www.nao.usace.army.mil/Portals/31/docs/regulatory/guidance/section_10_determinations.pdf

determined by the agencies and is conducted on a case-by-case basis; however, the process is based on established policies, guidelines, and regulations.

Compensatory mitigation will be required for permanent impacts to streams and wetlands resulting from the implementation of the FHWA/VDOT Preferred Alternative. Compensatory mitigation is typically required in the same or adjacent HUC within the same watershed and physiographic province as the impact. As part of the permitting process, mitigation options were investigated using the various agency resources including the July 2004 Joint USACE and VDEQ "Recommendations for Wetland Compensatory Mitigation: Including Site Design, Permit Conditions, Performance Criteria, and Monitoring Criteria" and the associated Mitigation Checklist, as well as the USACE and DEQ March 2008 Offsite Mitigation Guidelines (USACE, 2008). Of greatest significance, in April, 2008, new regulations providing guidance for compensatory mitigation were jointly issued by USACE and EPA. The new Mitigation Rule, which became effective June 2008, established a national framework and hierarchy of preferences regarding how compensatory mitigation is accomplished for project impacts to jurisdictional surface waters. This Mitigation Rule does not address when or how much compensation is required.

The Mitigation Rule provides the following preference for compensatory mitigation options:

1) Purchase of compensatory mitigation bank credits.
2) Purchase of an approved in-lieu fee fund credits.
3) Watershed approach based mitigation by the permittee.
4) On-site mitigation/in-kind mitigation by the permittee.
5) Off-site mitigation/out-of-kind mitigation by the permittee.

This hierarchy has been adopted as general guidelines for providing compensatory mitigation for permanent impacts to jurisdictional surface waters.

The current typical compensatory mitigation to impact ratios in Virginia for non-tidal forested, scrub-shrub, and emergent wetlands are 2:1, 1.5:1, and 1:1, respectively. The compensatory mitigation to impact ratio for certain high quality wetlands, such as Bald Cypress and Tupelo dominated swamps, is determined on a case-by-case basis.

Compensatory mitigation is not typically required for open water impacts (e.g., piers in open waters) but this requirement is reviewed on a case-by-case basis. In addition, compensatory mitigation is typically required for unavoidable stream impacts to greater than 300 linear feet of stream at a crossing. Although this determination is made on a project-by-project basis, due to the scale of the FHWA/VDOT Preferred Alternative, compensatory mitigation will be required for all stream impacts. The approved assessment methodology to determine the required stream compensation was included as part of a compensatory mitigation plan (CMP) during the Section 404 permitting process. Currently, the approved assessment methodology in Virginia is the Unified Stream Methodology (USM). All potentially impacted channels were assessed and the USM forms were completed in full to determine the compensatory mitigation requirements for the FHWA/VDOT Preferred Alternative.

In accordance with the existing regulations and standard permit conditions, all areas with temporary impacts will be required to be restored to their original contours and re-vegetated with the same or similar species. Additional compensatory mitigation other than previously stated for small temporary impacts is typically not required through the permitting process, but may be required for larger temporary impacts or if a site is converted to a different wetland type.

Impaired waters in Virginia are listed by VDEQ in their 305(b)/303(d) Integrated Report (VDEQ, 2012). A number of listed stream channels are located in the vicinity of the study area. Appropriate regulations and requirements including the strict adherence to appropriate erosion and sediment control measures, the appropriate use of fertilizers, limiting clearing practices, and the implementation of stormwater management plans designed specifically to address the particular condition, as appropriate, need to be followed as part of construction.

All impacts to groundwater wells, impacts to public water distribution systems or sanitary sewage collection systems must be verified by the local utility prior to construction practices. Further investigations to determine the presence, operational status, and location of individual wells will be performed as part of property acquisition and right-of-way management for project construction. Closures and/or relocation of any well, if required, will be completed by following the Virginia Waterworks Regulation and other applicable VDOT or locality standards. Closures and relocations of private wells, if required, will be completed by using the Virginia Private Well Regulation and other applicable VDOT standards or locality standards.

2.1.3.2 Habitat and Species Permits and Clearances

Additional federal and state agencies have statutory responsibility by serving as resource and commenting entities in the permit review process. Their involvement is generally conducted through the permit process, as summarized in the following sections.

As detailed below, a number of federal and state agencies regulate and protect listed threatened and endangered species. Due to the presence of federal- and state-listed threatened and endangered species and/or habitat documented within the vicinity of the FHWA/VDOT Preferred Alternative, construction time-of-year restrictions may be required, as well as modifying construction techniques in valuable habitats. Mitigation measures will be developed following additional coordination with the Virginia Department of Game and Inland Fisheries (DGIF) and U.S. Fish and Wildlife Service (USFWS) prior to construction of the FHWA/VDOT Preferred Alternative. Consultation will occur before the permit decision, as any mitigation measures, conditions, or restrictions determined necessary by the USFWS would be conditions of any permit issued. Habitat assessments and presence/absence surveys have been completed to inform the development of mitigation measures. These species surveys were completed by approved specialists.

The U.S. Fish and Wildlife Service (USFWS) and NOAA National Marine Fisheries Service (NMFS) regulate and protect federally listed threatened and endangered species under the Endangered Species Act (ESA) of 1973 with the primary goal of conserving and recovering listed species. The ESA, with few exceptions, prohibits activities affecting threatened and endangered species unless authorized by a permit. The legal federal status of a species is determined by USFWS and NMFS. In addition to threatened and endangered species coordination, NMFS will also provide comments regarding Essential Fish Habitat (EFH) within the vicinity of the Inventory Corridor. Coordination with both federal agencies will continue as the FHWA/VDOT Preferred Alternative moves forward in the design phase.

In addition to the federal oversight, threatened and endangered species are also regulated at the state level by a number of different agencies and organizations. The agencies have adopted the federal list as well as a state list of endangered and threatened species, with the primary focus of managing Virginia's wildlife to maintain optimum populations of all species and conserve biodiversity. Coordination with these agencies is conducted through the permit process.

The DGIF implements regulations to protect the game and freshwater fisheries of the Commonwealth, and during permit coordination, determines likely impacts on game, fish and wildlife resources and habitats, and state-listed threatened and endangered animal species (exclusive of insects). DGIF also issues recommendations for mitigation measures for projects in order to avoid, minimize, and mitigate for impacts to natural resources. DGIF has the authority to limit construction in and around trout streams and other streams used by anadromous fish or threatened and endangered species by recommending certain time-of-year restrictions to protect spawning, fry dispersal, and/or fish stocking activities, and has special powers to prevent and control aquatic invasive species.

The Virginia Department of Agriculture and Consumer Services (VDACS) is charged with the conservation, protection, and management of endangered and threatened species of plants and insects (Endangered Plant and Insect Species Act, Va. Code, Chapter 39 §3.1-1020 through 1030, as amended). The Virginia Endangered Plant and Insect Species Program cooperates with USFWS, the Virginia Department of Conservation and Recreation (VDCR), and other agencies and organizations on the recovery, protection, or conservation of listed threatened or endangered species and designated plant and insect species that are rare throughout their worldwide ranges. In those instances where recovery plans are available, adherence to the plans is followed to the maximum extent possible. Under a Memorandum of Agreement established between VDACS and VDCR, VDCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

VDCR is charged with conserving Virginia's natural and recreational resources. The Department has five programmatic divisions which manage state parks, soil and water conservation, natural heritage, recreation planning, dam safety, and floodplain management. Also included are oversight regulations by advisory bodies including the Board of Conservation and Recreation, Virginia Cave Board, Board on Conservation and Development of Public Beaches, and the Virginia Soil and Water Conservation Board. Within this agency, the Natural Heritage Program's mission is to conserve Virginia's biodiversity through inventory, protection, and stewardship, as enacted in the 1989 Virginia Natural Area Preserves Act (Va. Code §10.1-209 through 217). VDCR's Division of Natural Heritage (VDCR-DNH) is designated to conduct a statewide biological inventory, maintain a statewide database for conservation planning and project review to enhance land protection for the conservation of biodiversity, and the protection and ecological management of natural heritage resources (the habitats of rare, threatened, and endangered species, significant natural communities, geologic sites, and other natural features). This mission is carried out through implementation of five major programs: Natural Area Inventory, Information Management, Environmental review, Natural Area Protection, and Natural Area Stewardship.

Both DGIF and VDCR recommend contacting the Center for Conservation Biology (CCB) at the College of William and Mary to obtain the updated information regarding bald eagle (*Haliaeetus leucocephalus*) issues. Although bald eagles are currently de-listed under the federal ESA, they are still recognized as a threatened species at the state level and are protected by the federal Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

2.1.3.3 Erosion and Sediment Control

Effective July 2, 2013, VDEQ took over stormwater permitting responsibilities previously handled by VDCR. The Virginia Stormwater Management Program (VSMP) includes both erosion and sediment control as well as stormwater management. Erosion and sediment control is handled primarily by localities, which issue land disturbance permits for construction activities. Stormwater is regulated by federally-approved programs at the state level. Since 2005, VDEQ has administered the Virginia Pollutant Discharge

Elimination System (VPDES) industrial activity stormwater permitting, and VDCR handled construction stormwater permitting and municipal separate storm sewer system (MS4) permitting. Effective July 2, 2013 by legislation, the General Assembly made VDEQ the lead agency responsible for the Virginia Stormwater Management Act, Virginia Erosion and Sediment Control Act, and Chesapeake Bay Preservation Act (CBPA). This legislation concerned only the movement of management responsibilities for nonpoint source pollution (e.g. stormwater) programs from VDCR to VDEQ; it makes no new express policies, regulations, or laws regarding stormwater (Daniel, Martin, and Rhode, 2013).

Virginia is an authorized state under the federal National Pollutant Discharge Elimination System (NPDES) stormwater permitting programs. VDEQ administers this through the VPDES permitting program for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Regulations (9VAC25 Chapter 870). Assuming the FHWA/VDOT Preferred Alternative is advanced to detailed design and construction, land-disturbing activities greater than 2,500 square feet must comply with the most current version of the VDOT erosion and sediment control annual specifications approved by the VDEQ Erosion and Sediment Control Law and Regulations and the most current version of the Virginia Erosion & Sediment Control Handbook. All regulated land-disturbing activities must have a project specific erosion and sediment control plan developed in accordance with the VDEQ, approved VDOT erosion and sediment control annual specifications. All regulated land-disturbing activities associated with the project, including on and off site access roads, staging areas, borrow areas, stockpiles, and soil intentionally transported from the project must be covered by the project specific erosion and sediment control plan.

The operator or owner of construction activities involving land disturbing activities equal to or greater than 2,500 square feet in areas subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the CBPA are required to register for coverage under the VDEQ General Permit for Discharges of Stormwater from Construction Activities and develop a project Specific Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the general permit and must address water quality and quantity in accordance with the VSMP Permit Regulations. Any additional coordination with the counties is required for compliance with their individual regulations, including the obtainment of a County land disturbance permit, if necessary.

2.1.3.4 Navigation

The USCG requires a permit for the construction of a new bridge or causeway, or reconstruction or modification of an existing bridge or causeway across navigable waters of the United States. This authority is derived from the General Bridge Act of 1946, as amended, the Rivers and Harbors Act of 1899, as amended, and the Act of March 23, 1906, as amended, all of which require that the location and plans of bridges and causeways across navigable waters of the United States be submitted to and approved by the Secretary of Homeland Security prior to construction. The purpose of the Bridge Permit is to preserve the public right of navigation and to prevent interference with interstate and foreign commerce. Should the FHWA/VDOT Preferred Alternative advance to more detailed design, the USCG will review any proposed bridges over the Blackwater River. Per 33CFR Part 115.70, The USCG Commandant has given advanced approval to the location and plans of bridges to be constructed across reaches of waterways navigable in law, but not actually navigated other than by logs, log rafts, rowboats, canoes and small motorboats. In such cases, the clearances provided for high water stages will be considered adequate to meet the reasonable needs of navigation. The term “small motorboats” is defined as rowboats, canoes and other similar craft

with outboard motors. It does not include sailing or cabin cruiser craft. The Blackwater River at the location of the Route 460 crossing meets the above definition; therefore, the proposed bridge replacement over the Blackwater River would have advanced approval from the USCG.

2.1.3.5 Coastal Zone Management Act

The Coastal Zone Management Act of 1972 (CZMA) and federal consistency regulations (15 CFR §930, Subpart D, §930.50 et seq.) stipulate that activities in Virginia's Coastal Management Area (CMA) that have a federal component (e.g. those requiring federal permits, funding, licenses or approval) and can affect a Virginia coastal use or resource must be consistent with the enforceable policies of the Virginia Coastal Zone Management Program (CZMP). The CZMA requires certification for impacts to coastal resources including all biological or physical resources that are found within a state's coastal zone on a regular or cyclical basis. One county and one city in the vicinity of the Inventory Corridor are in the CMA: the County of Isle of Wight and the City of Suffolk.

2.1.4 Other Applicable Federal Guidance

Executive Orders 11514 and 11991 (Protection and Enhancement of Environmental Quality) were issued to federal agencies so they could develop policies, plans, and programs to meet national goals for the protection and enhancement of the environment through pollution control. This is accomplished through programmatic implementation, public outreach and education, and information accessibility and distribution.

Executive Order 11988 (Floodplain Management) requires avoidance of long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct or indirect support of floodplain development whenever there is a practicable alternative. Practicable alternatives could include bridging floodplains versus the placement of fill, shifting alignments to minimize impacts, or other measures that reduce or minimize significant encroachments where they occur.

Executive Order 11990 (Protection of Wetlands) requires that federal agencies evaluate the practicability of incorporating measures to avoid, minimize, and mitigate wetland impacts resulting from the proposed action. Executive Order 11990, among other directives, mandates that all federal agencies proactively minimize the destruction, loss, or degradation of wetlands, preserve, enhance, and restore the natural and beneficial values of wetlands, and avoid direct or indirect support of new construction in wetlands unless there are no practicable alternatives to such construction and the proposed action includes all practicable measures to minimize harm to wetlands.

Executive Order 12962 (Recreational Fisheries) requires that federal agencies improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunities in the United States. This is accomplished by generally promoting aquatic resource conservation through partnering (including state and private cost-sharing), identification of fishing opportunities, restoration, public outreach, assistance, and accessibility, and regulatory programmatic oversight. One of the primary responsibilities includes the requirement to evaluate the effects of federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of EO 12962.

Executive Order 13112 (Invasive Species) requires federal agencies to prevent the introduction of plants and animals that are not indigenous to the United States, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause. This is executed by a program

that, in addition to the creation of federal leadership committees and councils, identifies, monitors, controls, and restores habitats adversely affected by invasive species. In addition, provisions are established to conduct research and disseminate educational materials. Compliance with the order restricts federal agencies from using allocated funds for construction, rehabilitation, re-vegetation, enhancement or landscaping that includes use of nuisance, noxious, and invasive plants and animals.

In addition to compliance with ancillary federal statutes (Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended (16 U.S.C. 4701 *et seq*.), Lacey Act, as amended (18 U.S.C. 42), Federal Plant Pest Act (7 U.S.C. 150aa *et seq*.), and Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 *et seq*.)), the Virginia Seed Law (Va. Code §3.1-262) serves as an official noxious weed list for plants in the Commonwealth.

Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) directs federal agencies to take actions to further implement the Migratory Bird Treaty Act by approving a Memorandum of Understanding (MOU) with USFWS to promote conservation of migratory birds. The promotion of migratory bird conservation is accomplished by avoiding or minimizing to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions, and by integrating bird conservation principles, measures, and practices into agency activities. Further goals, as practicable, are to restore and enhance the habitat of migratory birds, eliminate or control pollution or detrimental alteration of the natural environment for the benefit of migratory birds and design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resource, land management, and environmental quality planning), and to coordinate with other agencies and nonfederal partners in planning efforts. Agencies must ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. The agency must also inventory and monitor bird habitat and populations within the agency's capabilities and authorities to the extent feasible to facilitate decisions about the need for and effectiveness of conservation efforts.

Executive Order 13274 (Environmental Stewardship and Transportation Infrastructure Project Reviews) provides a plan for federal actions to promote environmental stewardship for the national transportation system and to expedite environmental reviews of high-priority transportation infrastructure projects in a timely and environmentally responsible manner. Of particular focus are the planning, development, operation, and maintenance of transportation facilities and services for priority projects, which must be reviewed and expedited to the maximum extent practicable.

FHWA Memoranda and Guidance must also be considered in the EIS process for a NEPA document, in accordance with U.S. DOT regulations for NEPA documents. The primary guidance for this consideration is the 1987 *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (Technical Document 6640.8A, Federal Highway Administration, Washington, DC).

3.0 WATER RESOURCES AND AQUATIC ECOLOGY

3.1 SURFACE WATER RESOURCES

3.1.1 Introduction

Virginia has an estimated 51,021 miles of streams and rivers divided into nine major river basins. This estimate represents mileage determined by the United States Geological Survey National Hydrography Dataset (USGS 2014). The nine major river basins in Virginia are:

- Potomac/Shenandoah
- James
- Rappahannock
- Roanoke/Yadkin
- Albemarle/Chowan
- Tennessee/Big Sandy
- Chesapeake Bay/Small Coastal
- York
- New

Two of the major river basins, the James and the Albemarle-Chowan, are located in the vicinity of the Inventory Corridor.

3.1.1.1 James River Basin

The James River Basin occupies the central portion of Virginia and covers 10,265 square miles, or approximately 24 percent of the Commonwealth's total land area. The James River Basin is made up of the Upper, Middle, and Lower James River sub-basins as well as the Appomattox River sub-basin. The James River Basin is divided into eight USGS eight digit hydrologic units (designated by Hydrologic Unit Codes – HUC) as follows: HUC 02080201 –Upper James, HUC 02080202 – Maury, HUC 02080203 – Upper Middle James, HUC 02080204 – Rivanna, HUC 02080205 – Lower Middle James, HUC 02080206 – Lower James, HUC 02080207 – Appomattox, and HUC 02080208 – Hampton Roads (or Elizabeth). The eight hydrologic units are further divided into 109 ten digit HUC watersheds and 298 twelve digit HUC sub-watersheds.

The eastern portion of the Inventory Corridor is contained within the James River Basin (see **Figure 3.1-1**). Approximately 2.5 square miles (approximately 0.02 percent) of the James River Basin lie within the Inventory Corridor boundaries within the Hampton Roads sub-basin (HUC 02080208). Portions of the Inventory Corridor lying within the James River Basin fall within the following hydrologic sub-watersheds:

- The Cohoon Creek Hydrological Unit (HUC 020802080102)
- The Lake Prince Hydrological Unit (HUC 020802080103)

3.1.1.2 Albemarle-Chowan Basin

The Albemarle/Chowan Basin is located in the southeastern portion of Virginia and covers 4,220 square miles, or approximately 10 percent of the Commonwealth's total area. The Albemarle/Chowan Basin is divided into five USGS eight digit hydrologic units as follows: HUC 03010201 – Nottoway; HUC 03010202 – Blackwater; HUC 03010203 – Chowan; HUC 03010204 – Meherrin; and HUC 03010205 –

Albemarle Sound. The five hydrologic units are further divided into 42 ten digit HUC watersheds and 127 twelve digit sub-watersheds.

The western portion of the Inventory Corridor is contained within the Albemarle/Chowan Basin (see **Figure 3.1-1**). Approximately 1.0 square mile (approximately 0.02 percent) of the Albemarle/Chowan Basin lies within the Inventory Corridor boundaries within the Blackwater sub-basin (HUC 03010202). Portions of the Inventory Corridor lying within the Albemarle/Chowan Basin fall within the following hydrologic sub-watershed:

- The Blackwater River – Antioch Swamp Hydrological Unit (HUC 030102020304)

The Inventory Corridor contains a large number of named and unnamed perennial, intermittent, and ephemeral streams. Of these, the Blackwater River is the most prominent and longest stream course. The major surface water impoundments of Lake Burnt Mills, Lake Prince, Western Branch Reservoir, Lake Cahoon, and Lake Meade are located near the easternmost portion of the Inventory Corridor. In addition, the Inventory Corridor contains numerous small ponds and lakes, all of which are man-made.

3.1.2 Methodology

Surface water resources were identified using available published data sources, online sources, and aerial photo-interpretation. Baseline water quality information and impaired waters information were obtained from the 2012 305(b)/303(d) Integrated Report (VDEQ, 2014a), as well as other online resources and published sources (VDEQ, 2014b). Information on surface drinking water supplies was obtained from the Cities of Norfolk (City of Norfolk, 2014), Portsmouth (City of Portsmouth, 2012), and Suffolk (City of Suffolk, 2012), which operate the Inventory Corridor's major water supply reservoirs.

3.1.3 Findings

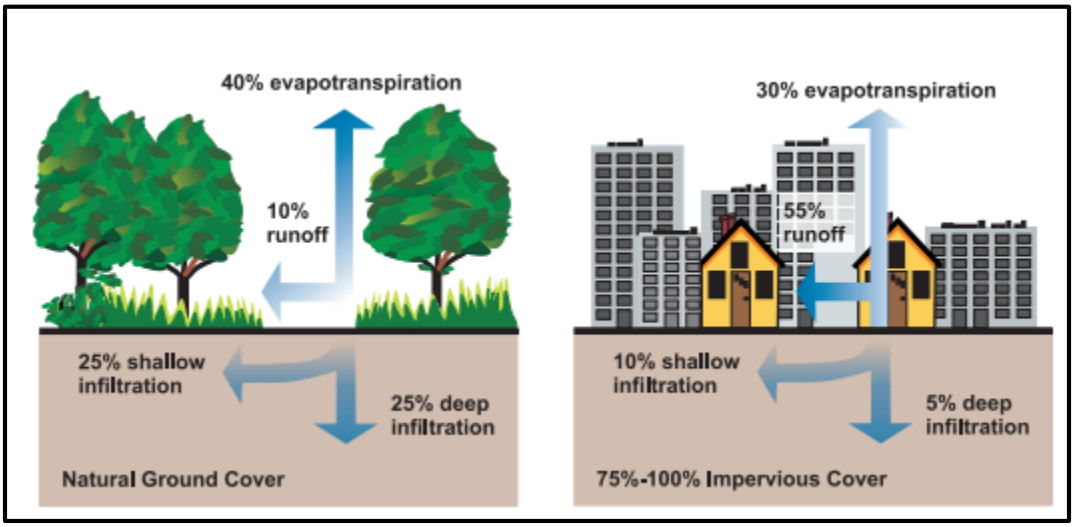
3.1.3.1 Baseline Water Quality

To characterize existing water quality in the Inventory Corridor, baseline water quality data of surface water resources were compiled and assessed for highway-related contaminants using data from the most recent VDEQ 305(b)/303(d) report (VDEQ, 2014a). As directed by Section 305(b) of the CWA, VDEQ monitors water quality in the state's waters, identifying impairments and sources of impairments, and developing and implementing Total Maximum Daily Load (TMDL) reports for those impaired waters (VDEQ 2014d). TMDLs are the allowable loadings or loading strategies for waterbodies classified as water quality limited. A TMDL Report is a special study to determine the amount of a pollutant that the impaired water can assimilate and still meet water quality standards.

Highways, whether in urban or rural systems, are a major part of impervious cover in watersheds. As little as a 10% impervious cover increase in a watershed can result in stream degradation (EPA, 2003). Stream degradation can be physical, chemical, and biological. The most common contaminants in highway runoff are heavy metals, inorganic salts, aromatic hydrocarbons, and suspended solids that accumulate on the road surface as a result of regular highway operation and maintenance activities. These materials are often washed off the highway by stormwater runoff during events of rainfall or snowmelt (FHWA, 2012).

A basic diagram of urbanized land versus natural ground depicts the relationship between impervious cover (i.e., roads, roofs, parking lots) and surface runoff. Runoff in urban systems is elevated by 45% when compare to natural systems (**Figure 3.1 2**).

Figure 3.1-2: Relationship Between Impervious Cover and Surface Runoff



Source: EPA, 2003

Baseline water quality was documented from four state-maintained stream monitoring stations in the vicinity of the Inventory Corridor (see **Figure 3.1-3**). These four stations were selected based on both their proximity to the Inventory Corridor and their period of record regarding relevant water quality parameters.

The water quality monitoring data provided by VDEQ are presented in **Tables 3.1-1** and **3.1-2**. However, these data provide limited insight into the contribution of highway-related contaminants to overall baseline water quality in the Inventory Corridor because the data collected at these stations do not include analysis for inorganic salts or aromatic hydrocarbons, two of the most common contaminants associated with highway runoff. These data do include some heavy metals and total suspended solids data, but highway runoff is only one contributing source for some of those contaminants. **Table 3.1-3** provides information on common stormwater runoff pollutants and their potential sources.

The only group of stormwater pollutants primarily associated with highway runoff are oil and grease, organic chemicals associated with petroleum, and the hydrocarbon compounds that form during the breakdown of petroleum products. All other stormwater pollutant groups have multiple potential sources other than highway runoff.

3.1.3.2 Impaired Waters

The VDEQ oversees surface water assessments of both coastal plain and non-coastal plain streams within the Commonwealth under its CWA Section 305(b)/303(d) integrated process. When surface waters fail to meet water quality standards sufficient to support designated use categories, they are classified as "impaired waters" under Section 303(d) of the CWA. Freshwater rivers and surface waters in Virginia are evaluated every two years on their ability to support six designated use categories: Recreation, Aquatic Life, Fish Consumption, Shellfish Harvest, Public Water Supply, and Wildlife. The VDEQ has identified additional sub-uses associated with the Chesapeake Bay. The VDEQ utilizes the "percent method" to assess conventional pollutant impacts in surface waters for two uses listed above: recreational use and aquatic life use. An exceedance threshold of 10.5 percent is used to determine either full support or impairment for conventional parameters (i.e., pH, dissolved oxygen, nutrients, and temperature). A greater than 10.5 percent exceedance rate with at least two exceedances will result in an "impaired" listing for the assessed waters.

Impaired waters within the Inventory Corridor fall into six different categories:

- 3A waters are waters where no data are available within the data window of the current assessment to determine if any designated use is still attained and the water was not previously listed as impaired.
- 4A waters are waters that are impaired or threatened for one or more designated uses, but do not require the development of a TMDL because the TMDL for specific pollutants is complete and EPA approved.
- 4C waters are waters that are impaired or threatened for one or more designated uses, but do not require the development of a TMDL because the impairment is not caused by a pollutant and/or is determined to be caused by natural conditions.
- 5A waters mean the water quality standard is not attained and is impaired or threatened for one or more designated uses by a pollutant and requires a TMDL.
- 5D waters indicate that the water quality standard is not attained where TMDLs for a pollutant have been developed but one or more pollutants are still causing impairment requiring additional TMDL development.
- 5F waters are waters where the water quality standard is attained for a pollutant with a TMDL and 303(d) delisting is approved, but the water remains impaired for additional pollutants requiring TMDL development (VDEQ, 2014b).

During VDEQ's 2012 Monitoring, roughly 8,148 miles of streams in the James River Basin and the Albemarle-Chowan Basin were assessed. Of those, roughly 1,140 miles were designated as impaired for one or more of the designated uses. **Table 3.1-4** lists streams and other surface waters within the Inventory Corridor presently included on the Virginia 303(d) Priority List of Impaired Waters.

Table 3.1-1 Recent Water Quality Data – Physical and Chemical Parameters Associated with Stormwater Runoff (TP, TS, SS, BOD, TOC)

STREAM	STATION	YEAR	MEDIAN CONCENTRATION OF POLLUTANT (mg/L)				
			TP	TS	SS	BOD5	TOC
Blackwater River	5ABLW040.22	2003	0.06	79.8	4.30	--	--
		2007	0.06	130.50	3.0	--	--
		2010	0.06	127.50	5.0	--	--
Lake Meade	2-LMD002.07	2003	0.05	88.6	4.29	2.71	--
		2007	0.04	--	--	--	--
Water quality parameter abbreviations are as follows: TP = total phosphorous; TS = total solids; SS = total suspended solids; BOD5 = biological oxygen demand; TOC = total organic carbon							

Source: VDEQ, 2012b

Table 3.1-2: Recent Water Quality Data – Physical and Chemical Parameters Associated with Stormwater Runoff (NH^3, CDM, CRS, CUS, PBS, NIS, ZNS, FEM)

STREAM	STATION	YEAR	MEDIAN CONCENTRATION OF POLLUTANT (mg/L)	(mg/kg)						
			NH^3	CDM	CRS	CUS	PBS	NIS	ZNS	FEM
Blackwater River	5ABKR003.68	2003	0.04	--	--	--	--	--	--	--
		2004	0.04	--	--	--	--	--	--	--
Lake Meade	2-LMD002.07	2001	0.04	1.0	8.6	13.0	15.4	5.0	35.8	7760
		2007	0.04	--	--	--	--	--	--	--
Water quality parameter abbreviations are as follows: NH^3 = ammonia; CDM = cadmium in mud; CRS = chromium in sediment; CUS = copper in sediment; PBS = lead in sediment; NIS = nickel in sediment; ZNS = zinc in sediment; FEM = iron in sediment										

Source: VDEQ, 2014a

Table 3.1-3: Common Sources of Stormwater Pollutants

Pollutants	Potential Sources
Gross Solids, Sediment, and Floatables	Streets, lawns, driveways, roads, construction activities, atmospheric deposition, drainage channel erosion
Pesticides and Herbicides	Residential lawns and gardens, roadsides, utility right-of-ways, commercial and industrial landscaped areas, soil wash-off
Organic Materials/Oxygen Demanding Substances	Residential lawns and gardens, commercial landscaping, animal wastes
Metals	Automobiles, bridges, atmospheric deposition, industrial areas, soil erosion, corroding metal surfaces, combustion processes
Oil and Grease/Organics Associated with Petroleum	Roads, driveways, parking lots, vehicle maintenance areas, gas stations, illicit dumping to storm drains, automobile emissions
Bacteria and Viruses	Lawns, roads, soil erosion, leaky sanitary sewer lines, sanitary sewer cross connections, animal waste, septic systems
Nitrogen, Phosphorus, and Other Nutrients	Lawn fertilizers, atmospheric deposition, automobile exhaust, soil erosion, animal waste, detergents

Source: EPA, 1999

Table 3.1-4: Impaired Waters Near the Inventory Corridor

Water name	ID305B	Miles	Location	Impairment Cause	Category
Blackwater River – Middle	VAT-K33R_BLW02A04	0.92	From Route 460 bridge crossing, river mile 40.22 to downstream	E. coli, Dissolved Oxygen, Mercury in Fish Tissue	5A
Carbell Swamp – Upper	VAT-G14R_CRL01A08	2.55	Upstream tributary to the northwest branch of Lake Prince (near Holly Grove Church)	Benthics, pH	5A
Carbell Swamp – Lower	VAT-G14R_CRL02A08	2.87	Upstream tributary to the northwest branch of Lake Prince (near Holly Grove Church)	E. coli, Dissolved Oxygen	5A
Burnt Mills Swamp	VAT-K33R_BMS01A12	5.03	At confluence of Antioch Swamp to Route 258	Benthics, Mercury in Fish Tissue	5A
Unsegmented rivers	VAT-K33R_ZZZ01A00	83.14	Evaluated non-segmented rivers/swamps in K33	Mercury in Fish Tissue	5A
Unsegmented rivers	VAT-G14R_ZZZ01A00	30.43	Unsegmented rivers in G14R (PWS)	Not Assessed/Shown as Impaired Crossing	3A

Source: VDEQ, 2012b

Figure 3.1-3 shows the selected locations of state-listed impaired waters and surface water quality monitoring stations near the Inventory Corridor. According to the 305(b)/303(d) Integrated Report (VDEQ, 2014a), the largest causes of impairments within the James River Basin are bacteria (74%), benthics (18%), and dissolved oxygen (12%). The largest causes of impairment within the Albemarle-Chowan Basin are mercury in fish tissue (55%), dissolved oxygen (47%), and bacteria (36%). The complete list of categories of impairments for these river basins is provided in **Table 3.1-5**.

Table 3.1-5: Significant Causes of Impairment Ranked by Percentage of Impaired Water Size

James River		Albemarle-Chowan	
Documented Cause	**%**	**Documented Cause**	**%**
Bacteria	74	Mercury in Fish Tissue	55
Benthics	18	Dissolved Oxygen	47
Dissolved Oxygen	12	Bacteria	36
PCBs in Fish Tissue	9	Benthics	7
pH	8	pH	4
Temperature	5	PCBs in Fish Tissue	1

Source: VDEQ, 2012b

Within the James River Basin, the major suspected sources of the impairments were determined to be from nonpoint sources (51%), wildlife (37%), and unknown sources (30%), whereas in the Albemarle-Chowan Basin, the major suspected sources were from unknown sources (70%), natural conditions (43%), and atmospheric deposition (30%). The complete list of suspected sources for these river basins is provided in **Table 3.1-6**.

Table 3.1-6: Suspected Sources of Impairment Ranked by Percentage of Impaired Water Size

James River		Albemarle-Chowan	
Suspected Source	**%**	**Suspected Source**	**%**
Nonpoint Sources	51	Unknown Sources	70
Wildlife other than Waterfowl	37	Natural Conditions	43
Unknown Sources	30	Atmospheric Deposition (Toxics)	29
Agriculture	21	Nonpoint Sources	17
Livestock Grazing or Feeding Operations	18	Wildlife other than Waterfowl	10
Unspecified Domestic Waste	18	Municipal Point Source Discharges	10

Source: VDEQ, 2014a

The relationships between causes of impairment and suspected sources of impairment are not always clearly apparent. Impairment due to high bacterial concentrations can be the result of contamination from a wide variety of sources; including native wildlife, livestock operations, and domestic waste/sewage. Impairment due to low dissolved oxygen can be the result of natural conditions (i.e., high water temperatures, low pH, high biological oxygen demand), or nutrient enrichment (agricultural or residential fertilizer runoff, septic system overflows, municipal sewer system discharges). Impairment due to mercury in fish tissue can be

the result of contamination from atmospheric deposition or from point source discharges from industrial operations.

The interrelationships between causes of impairment are also complex, and one cause of impairment can also result in other impairments. For example, high bacterial concentrations can lead to high biological oxygen demand, which can then cause dissolved oxygen impairment, which in turn can cause impairment of the benthic community. These relationships complicate the implication of certain sources as the cause of impairments, which may be one reason that 70% of the suspected sources of impairments in the Albemarle-Chowan Basin were classified as unknown sources in VDEQ's 2012 assessment.

The James River Basin is the largest basin lying within the Inventory Corridor. The single largest cause of impairment in this basin is bacteria. Potential sources of bacteria include lawns, roads, soil erosion, leaky sanitary sewer lines, sanitary sewer cross connections, animal waste, livestock, and septic systems. There are no known point sources of bacteria within the vicinity of the Inventory Corridor.

The Albemarle-Chowan Basin also lies within the Inventory Corridor. The single largest cause of impairment in this basin is mercury in fish tissue. One of the key factors that influences the bioaccumulation of mercury in fish tissue is the presence of mercury in the form of methylmercury. Elemental or inorganic mercury can be converted into methylmercury by certain species of bacteria that are naturally found in sediment or soil. Once converted into methylmercury, it becomes readily bioavailable and is taken up by aquatic plants which are then fed upon by aquatic insects and crustaceans. Concentrations of mercury can increase or magnify as it passes up the food chain, with top predator fish such as bass, pickerel or bowfin often having the highest concentrations of methylmercury in their tissue. Certain environmental conditions appear to favor the specific bacteria that convert elemental or inorganic mercury into methylmercury and can result in the increased bioaccumulation of mercury in fish. These environmental conditions include low pH (acidic conditions), high levels of organic matter, and lower dissolved oxygen levels. These conditions are often associated with swamps and wetlands, as well as ponds and lakes. Some research suggests that sulfate-reducing bacteria are important mediators of the methylation process in aquatic systems, and sulfate-deposition may stimulate methylmercury production by activating sulfate-reducing bacteria in sediments (Gilmour and Henry, 1991).

The swamps and wetlands within the vicinity of the Inventory Corridor are likely to possess all of the environmental conditions that favor the conversion of inorganic mercury into methylmercury, making it readily bioavailable to aquatic life. Waters in the nearby Great Dismal Swamp have an average pH of approximately 3.5 to 4 (ECSU, 1998), and water in the swamps of the Inventory Corridor would be expected to have similar pH levels. Also, the VDEQ 305(B)/303(d) data indicate that many of the waters of the Inventory Corridor are impaired by low dissolved oxygen levels and pH.

There are no known point sources of mercury within the vicinity of the Inventory Corridor. The majority of the mercury contamination is believed to be the result of atmospheric deposition. Atmospheric deposition is a process in which precipitation particles, aerosols, and gases move from the atmosphere to the earth's surface. Atmospheric deposition of mercury has been documented widely around the world, and two thirds of the present mercury fluxes are directly or indirectly from anthropogenic origins (Mason, Fitzgerald, and Morel, 1994). Sources of anthropogenic atmospheric mercury are coal combustion, waste incineration, and metal processing. Increases in deposition are expected in the Eastern U.S. due to climate change and will be based on rainfall changes as related to climate change (Megaritis, et al., 2014).

Highway stormwater runoff is not known to be a source of mercury additions to streams and wetlands; however, highway stormwater does deliver large quantities of runoff that are mixed with both wet and dry atmospheric deposition particles from the roadway surface.

Highway stormwater runoff falls into the general classification of nonpoint source pollution. This category is the top suspected source of impairment in the James River Basin and the fourth highest suspected source of impairment in the Albemarle-Chowan Basin; however, highway stormwater runoff represents only a portion of nonpoint source pollution.

EPA defines nonpoint source pollution as any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the CWA (EPA, 2012a).

The legal definition states: *The term "point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture*.

Besides highway stormwater runoff, sources of nonpoint source pollution can include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas;
- Oil, grease, and toxic chemicals from urban runoff and energy production;
- Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks;
- Salt from irrigation practices and acid drainage from abandoned mines;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems; and
- Atmospheric deposition and hydromodification.

3.1.3.3 Surface Drinking Water Supplies

The Inventory Corridor contains portions of surface water drainage areas determined by the Virginia Department of Health (VDH) to be important to the protection of public drinking water supplies. These drainage areas and the localities to which they are important are shown on **Figure 3.1-4** and are listed in **Table 3.1-7**.

Table 3.1-7: Drainage Areas Determined by VDH to be Important to Public Drinking Water Supplies

Drainage Area Name	Associated Locality
Corrowaugh Swamp-Blackwater River	City of Norfolk (high flow augmentation)
Lake Prince	City of Norfolk
Western Branch	City of Norfolk
Chuckatuck Creek	City of Suffolk
Speights Run-Lake Kilby	City of Portsmouth
Lake Meade	City of Portsmouth

Source: VDOT, 2013

The City of Norfolk owns and operates two surface drinking water supplies and intakes near the easternmost portion of the Inventory Corridor - the Lake Prince and Western Branch Reservoir public water supplies (City of Norfolk, 2014). Just south of the study area, the City of Norfolk owns an intake off the Blackwater River for high flow augmentation. The City of Portsmouth owns and maintains two surface drinking water supplies immediately east of (downstream of) the Inventory Corridor - the Lake Kilby and the Lake Meade public water supplies (City of Portsmouth, 2013). The City of Portsmouth also owns and operates an intake and water treatment plant just above the Lake Kilby dam. In addition, within the eastern portion of the study area and immediately east of the study area, the City of Suffolk owns and operates two Millpond public water supply intakes, which withdraw waters from an impoundment on Chuckatuck Creek (City of Suffolk, 2012).

The Inventory Corridor includes a portion of the Lake Meade watershed which has been deemed by VDH to be important to public water supplies owned by the City of Portsmouth. The Inventory Corridor also contains a headwater portion of the Lake Prince watershed which has been deemed by VDH to be important to public water supplies owned by the City of Norfolk.

3.1.4 Impacts

3.1.4.1 Water Quality

Construction of the FHWA/VDOT Preferred Alternative would result in a permanent increase of impervious road surface in the Inventory Corridor, and would result in an increase in traffic volumes. A major factor that determines concentrations of pollutants in highway stormwater runoff is the volume of traffic carried by a particular segment of roadway. Runoff of standard highway contaminants such as heavy metals, inorganic salts, herbicides, aromatic hydrocarbons, and suspended solids could be expected to increase when construction is complete and the roadway is in operation. Temporary impacts can also be realized during roadway construction activities through increased sedimentation from land disturbing activities and occurrences of fuel spills or hydraulic spills from construction equipment.

The magnitude of stormwater pollutant loading attributed to a particular construction activity along with the proximity of that activity to sensitive waters (such as public water supplies and special aquatic habitat) can factor into overall water quality. Primary factors that will influence the effect of highway runoff pollutant loading within any particular surface water body include the type and size of the receiving water body, the potential for dispersion, the size of the catchment area, the biological diversity of the receiving water body, and relative effectiveness of proposed mitigation measures (VDOT, 2005a). With respect to highway projects, stormwater pollutant loading is the quantity of pollutants that are transported off the road surface and reach a body of water. This can be reduced through the implementation of stormwater management facilities. If not addressed through appropriate stormwater management, the increase in runoff of these pollutants could contribute to degradation of water quality in the receiving waterbodies. However, VDOT is committed to implementing applicable stormwater management and pollution control measures as part of the project. VDOT submits its standards and specifications for erosion and sediment control and stormwater management annually for VDEQ approval, as provided in the ***Instructional and Informational Memorandum Number: IIM-LD-195.8, VDOT – Location and Design Division*** (VDOT, 2014r). The program serves to implement a stormwater management and long-term monitoring program that maintains water quality and quantity, as nearly as practicable, equal or better than pre-development runoff characteristics which adheres to the Virginia Stormwater Management Act and the Virginia Stormwater Management Program (VSMP) Regulations.

With respect to short-term effects, clearing and grubbing, earth moving and grading, and other construction-related activities can lead to erosion of soils. If unchecked, these activities can lead to the deposition of eroded sediments within nearby waterways and water bodies. Without implementation of appropriate mitigation measures, short-term effects to surface waters (i.e., during and immediately following construction) may include (1) a temporary increase in turbidity and sedimentation during and immediately following nearby land disturbances and (2) an increased risk of contamination associated with the presence of heavy equipment fluids (fuels, lubricants, etc.) and construction-related chemicals (paints, concrete additives, etc.).

3.1.4.2 Impaired Waters

Impaired waters impacts were calculated using the 2012 VDEQ 305(b) Assessed and 303(d) Impaired Waters geodatabase (VDEQ, 2014b). Potential impacts were evaluated by 12 digit HUC subwatersheds. **Figure 3.1-3** shows the locations of impaired water crossings of the FHWA/VDOT Preferred Alternative LOD. Although the FHWA/VDOT Preferred Alternative crosses three subwatersheds - one is in the Albermarle-Chowan Basin, and two are in the James River Basin, all of the impaired waters crossed are located in the Antioch Swamp – Blackwater River sub-basin of the Albermarle-Chowan Basin. The total linear feet of impaired waters crossed by the Inventory Corridor is approximately 3,500 feet, of which approximately 854 linear feet would be crossed by the LOD of the Preferred Alternative. **Table 3.1-8** provides a summary of the total lengths of impaired waters crossed within the Inventory Corridor.

It is important to note that the waters already crossed by Route 460 would be expected to experience minimal change in runoff effects to downstream waters compared to what is already experienced under the No Build Alternative. A wider road and increase in traffic volumes would increase the potential for contaminants; however, contaminant inputs to waterways would be expected to be less than they are today due to the implementation of stormwater management measures that do not currently exist on the corridor. The bypass and the new alignment would introduce new sources of roadway runoff; however, they do not cross any impaired waters.

Generally, impacts to impaired streams are considered minimal adverse effects due to measures taken by VDOT during construction and post construction. The largest impairments to streams in the Albemarle-Chowan Basin are mercury and dissolved oxygen, and in the James River Basin it is bacteria (see **Table 3.1-5**). Mercury is typically released from burning coal, municipal waste incineration, manufacturing plants and mineral ore deposits (VDH, 2013). Potential sources of bacteria include lawns, roads, soil erosion, leaky sanitary sewer lines, sanitary sewer cross connections, animal waste, livestock, and septic systems. Low dissolved oxygen can be an indirect result of highway runoff since algal blooms can be caused by nutrient loading (from the roadway and DOT maintained vegetation) and cause low dissolved oxygen conditions following the algal bloom, although a recent study of bridge runoff at numerous bridges in North Carolina (Wagner, et.al., 2011) suggests that runoff from roadways/bridges is not a major contributor to nutrient pollution in receiving waters.

VDOT would consider minimizing or restricting the use of nutrient-bearing fertilizers within the right-of-way or would make use of stormwater management facilities that effectively prohibit nutrient loading of receiving waters for alternative crossings in the vicinity of streams heavily impaired due to low oxygen.

Of particular concern are impacts to Category 5 streams, which currently have a TMDL or will be developing a TMDL. Due to the increased impervious surface of the roadway, storm water runoff may be greater and has the potential to carry higher levels of heavy metals, salts, organics and nutrients into the

impaired waters. This potential increased pollution could impact the TMDL and alter any TMDL implementation plan already established.

Table 3.1-8: Impaired Waters Crossed by the Inventory Corridor

HUC 12 Watershed	Stream Segments	Length of Impaired Waters Crossed by the Inventory Corridor	Cause(s) of Impairment	Source(s) of Impairment
030102020304 (Antioch Swamp-Blackwater River)	Blackwater River – Middle (Middle portion of Blackwater River within watershed, from Rt 460 bridge crossing, RM 40.22 to downstream approx.. halfway between Station 5ABLW040.22 and Station 5ABLW038.69)	1646 feet	Escherichia coli, Dissolved Oxygen, Mercury in Fish Tissue	Source Unknown, Natural Conditions – Water Quality Standards Use Attainability Analyses Needed
030102020304 (Antioch Swamp-Blackwater River)	Blackwater River – Upper (Upper portion of Blackwater R. in K33. Starts at the Rt 617 crossing (Walls Bridge, RM 58.22) downstream to above Rt 460 crossing @ Zuni (RM 40.23))	836 feet	Benthic – Macroinvertebrate Bioassessments, Escherichia coli, Dissolved Oxygen, Mercury in Fish Tissue	Source Unknown, Natural Conditions – Water Quality Standards Use Attainability Analyses Needed
030102020304 (Antioch Swamp-Blackwater River)	Burnt Mills Swamp (At confluence of Antioch Swamp to Route 258.)	515 feet	Benthic – Macroinvertebrate Bioassessments, Mercury in Fish Tissue	Source Unknown
030102020304 (Antioch Swamp-Blackwater River)	Unsegmented rivers in K33R (Evaluated non-segmented rivers/swamps in K33)	501 feet	Mercury in Fish Tissue	Source Unknown

Source: VDEQ, 2014b and VDOT, 2015

3.1.4.3 Surface Drinking Water Supplies

Potential surface water impacts, including surface drinking water supplies, were determined for the FHWA/VDOT Preferred Alternative. Two waterways forming the headwaters of Lake Prince are proposed to be crossed with bridges within the Lake Prince watershed including a bridge over Ennis Pond. Five water supply watersheds were identified near the Inventory Corridor (see **Figure 3.1-4**). Approximately 350 acres of the Lake Meade and Lake Prince watersheds are located within the Inventory Corridor. The Preferred Alternative also has the potential to affect two municipal water supply intakes for the Cities of Portsmouth and Norfolk. The closest Portsmouth intake, located on Lake Meade, is approximately 1.4 miles away when measured over land and 1.9 miles downstream when measured via water surface. However, the intakes are on another arm of the lake and are not immediately downstream of the FHWA/VDOT Preferred Alternative alignment; therefore, no direct impacts would be expected. Additionally, with more than a mile separating the project footprint and the intake, the potential for any effects is negligible. The closest Norfolk intake, located on Lake Prince, is approximately four miles downstream. The potential for any effects is negligible due to the distance between the two features. As a

measure to prevent degradation of water quality, runoff from bridges will be routed into stormwater management ponds and not discharged directly into the underlying waterbody.

3.1.4.4 Chesapeake Bay Preservation Act

The FHWA/VDOT Preferred Alternative will be compliant with the Bay Act because it will be designed and constructed in accordance with Virginia Department of Transportation's (VDOT) annual erosion and sediment control and stormwater management standards and specifications. VDOT's annual standards and specifications are approved by VDEQ.

3.1.5 Mitigation

3.1.5.1 Water Quality

Highway runoff is considered a nonpoint source and can be managed effectively by employing proper stormwater best management practices (BMPs) and managing for the major causes of a particular stream/watershed's impairment. These practices provide means of avoiding or minimizing the negative impacts of various pollutants that can be carried by rainfall into the groundwater and receiving waters. These pollutants include materials discharged by vehicles using the highway system, pesticides and fertilizers from adjacent landscapes, and particulates from breakdown of pavement (TRB, 2006).

Direct impacts have been reduced by bridging over the larger streams and reducing the footprint width and extending bridge lengths. Implementation of strict erosion and sediment control measures as outlined in Chapter 10 of VDOT's Drainage Manual (VDOT, 2012) during construction will minimize temporary impacts to surface waters. Control measures that will be incorporated include sediment traps, sediment basins, silt fences, etc. Under the regulatory framework of the Virginia Pollution Discharge Elimination System (VPDES) and Virginia Erosion and Sediment Control and Stormwater Control laws, VDOT will employ stormwater management control features, including use of BMPs during construction and post construction, to minimize temporary and permanent, and direct and indirect impacts to surface waters. These BMP's have been proven to be an effective means of capturing and treating highway runoff to remove heavy metals and nutrients. Properly managed BMP's can intercept runoff and store nonpoint pollutants like sediment, nutrients, and certain heavy metals. Vegetation also can slow runoff and dissipate its energy; therefore, temporarily disturbed areas will be revegetated.

Additionally, design and construction techniques that reduce water quality impacts and protect aquatic species, as described in the Virginia Stormwater Management BMP Clearinghouse, will be incorporated into the project. Techniques include stabilization of slopes, channels, swales, and embankments after construction activities are completed; minimization of excavation; and installation of turbidity barriers around the area of construction.

Direct impacts to fish and macroinvertebrates will be avoided or minimized through various project design considerations, such as bridging, countersinking of culverts, and minimizing the roadway footprint and median; reducing such direct impacts should also reduce the potential for indirect impacts. Bridging protects the natural stream bottom and general hydrologic conditions, thus accommodating aquatic organisms. While culverts do not retain the natural stream bottom, they will be countersunk to allow normal and high flows and to provide for adequate passage for aquatic organisms and natural stream bottom materials will collect in the pipe. Long-term impacts to water quality from contaminant loadings will be reduced through the design for the FHWA/VDOT Preferred Alternative that will incorporate runoff pre-treatment, including vegetated medians and swales, stormwater BMPs, and forebays.

VDOT's hazardous materials program works with state and federal environmental agencies and other stakeholders to ensure that appropriate precautions for all hazardous materials are employed in all phases of project development, construction and maintenance. In addition, as part of the SWPPP that will be prepared prior to submission of the registration statement for coverage under the VSMP construction general permit, the pollution prevention plan will be developed. The pollution prevention plan will describe all of the pollution prevention measures that will be employed during construction and include minimizing discharge of pollutants from activities such as vehicle washing, painting, and concrete washout; minimizing exposure to hazardous materials such as pesticides, fuels, and construction materials and leak prevention and spill response procedures.

3.1.5.2 Impaired Waters

BMPs and other stormwater techniques will be employed to minimize further impacts on impaired waters. As stated in **Section 3.1.5.1**, VDOT will use construction techniques designed to reduce water quality impacts. Minimizing or restricting the use of fertilizers and using proper stormwater management BMPs to treat nutrient laden runoff would be employed. Clearing practices would be limited to the areas within the LOD which will serve to minimize clearing around impaired waters.

3.1.5.3 Surface Drinking Water Supplies

Stormwater management facilities will be designed in accordance with specifications set forth in Section 3.14 of the Virginia Erosion and Sediment Control Handbook (1992) and VDOT's Annual Erosion and Sediment Control and Stormwater Management Standards and Specifications, as approved by VDCR. Detention/retention basins will be designed to function as temporary basins for sediment and erosion control during the construction of the project. After construction is complete, most basins will be restored to their original depth or converted into permanent stormwater management facilities. The locations and abatement capacities of stormwater management facilities have been determined and they are not located in wetlands or streams. Stormwater management facilities have been designed to retain and discharge stormwater runoff to pre-development levels at non erosive velocities and the outfall locations will include rip rap as necessary to prevent scouring. The stormwater management facilities will also provide water quality control by treating impervious surfaces..

Certain components of the FHWA/VDOT Preferred Alternative are close enough to, or over, public surface water supplies as to require special mitigation measures, both during and following construction. To protect public drinking water supplies, bridge runoff will be collected and treated at stormwater management facilities rather than running directly off the bridges into underlying waters. Stormwater management basins located near public water supplies will be designed with adequate detention time to allow spilled contaminants to be pumped out before they can enter the water supply. Although a spill consisting of the entire contents of a tanker truck would be unlikely, in the event of a spill, local spill response personnel would contain the spill and prevent its spread through the use of absorbent booms and pads.

A VSMP Permit from VDCR will be required for construction activities affecting greater than one acre, as well as an approved erosion and sediment control plan. During and immediately following construction, multiple measures (such as erosion and sediment controls, a phased plan to limit the amount of exposed soil, and oversight by a full-time erosion and sediment control inspector) will be implemented in the vicinity of surface waters critical to public water supplies or special aquatic habitat. With implementation of appropriate mitigation measures and BMPs, the long-term operation and maintenance of the FHWA/VDOT Preferred Alternative is not expected to result in adverse impacts to water supplies.

3.2 GROUNDWATER RESOURCES

3.2.1 Introduction

The purpose of this section is to assess potential impacts to groundwater resources that may result from the FHWA/VDOT Preferred Alternative. Groundwater resources, which are stored in aquifers, are used for many purposes including public water supply and irrigation within southeastern Virginia. In the Inventory Corridor, primary groundwater resources are derived from deep wells screened within Cretaceous-age sands. Wells screened within shallower Tertiary-age and Pleistocene-age sediments are also capable of providing somewhat lower yielding groundwater supplies.

A sole source aquifer, as defined under Section 1424(e) of the Safe Drinking Water Act, is an aquifer that has been designated as the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health. There are two designated sole source aquifers in Virginia, but neither is located within the Inventory Corridor.

Groundwater wells, which are present in the Inventory Corridor, are protected under EPA's Wellhead Protection Program (WPP), a community-based approach for the protection of groundwater that supplies drinking water to public water wells and wellfields. Public drinking water systems, as defined by EPA, may be publicly or privately owned and serve at least 25 people or 15 service connections for at least 60 days per year. Wellhead protection areas are defined as the surface and subsurface areas surrounding a water well or wellfield supplying a public water system through which contaminants are reasonably likely to move toward and reach such water well or wellfield. The Virginia Wellhead Protection Plan (VDEQ, 2005) specifies a 1,000-foot wellhead protection radius and the Virginia Waterworks Regulations (VR 355-18-000) specifies a 100-foot wellhead setback zone for public groundwater supply wells. Virginia's WPP was approved by EPA in 2005 (VDH, 2011), and is documented within the aforementioned Wellhead Protection Plan.

3.2.2 Methodology

Groundwater information was obtained through a review of existing literature. Virginia Department of Health (VDH) records were searched to identify groundwater supply wells within the study area. To evaluate potential impacts, the FHWA/VDOT Preferred Alternative was assessed to determine whether it would be located within a 1,000-foot wellhead protection radius set forth in the Virginia Wellhead Protection Plan (VDEQ, 2005) or a 100-foot wellhead setback zone specified in Virginia Waterworks Regulations (VR 355-18-000) for public groundwater supply wells.

3.2.3 Findings

The Inventory Corridor falls within the Eastern Virginia Ground Water Management Area , regulated under the Virginia Ground Water Management Act of 1992 (Code of Virginia, Title 62.1, Chapter 25), as well as 9VAC25-600-10 et seq. and 9VAC25-610-10 et seq. (VDEQ, 2014c). The purpose of this Act is to "recognize and declare that the right to reasonable control of all ground water resources within this Commonwealth belongs to the public and that in order to conserve, protect and beneficially utilize the ground water of this Commonwealth and to ensure the public welfare, safety and health, provision for management and control of ground water resources is essential" (Code of Virginia §62.1-254). VDH has no records of municipal public groundwater supply wells or community/institutional public groundwater supply wells within the Inventory Corridor. Public groundwater resources within a three-mile buffer of the Inventory Corridor are shown in **Figure 3.2-1**. **Table 3.2-1** summarizes the encroachments of the FHWA/VDOT Preferred Alternative into 1,000-foot wellhead protection radii.

Table 3.2-1: Groundwater Public Water Supply Wells

User Type	PWS ID #	County/City
Municipal	3093950	Isle of Wight
Business	3800303	Suffolk
Community	3093220	Isle of Wight
Municipal	3093900	Isle of Wight

Source: VDH Community / Institutional Public Groundwater Supply Well GIS Data (VDOT, 2013)

3.2.4 Impacts

The primary potential groundwater impact that could be anticipated from the implementation of the FHWA/VDOT Preferred Alternative is hydrocarbon contamination of private wells in shallow and deep aquifers from automobile exhaust and asphalt surfaces. Other impacts could include potentially measurable increases in dissolved metals and chloride, increased risks of spills during construction, and contamination should pollutants be suddenly released as a result of a traffic accident. Aquifers are susceptible to contamination depending on drainage patterns, depth, and distance from the alignment.

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

3.2.5 Mitigation

During the design phase of the project, all private or public wells located in the right-of-way will be identified, and measures for their protection from contamination will be implemented in accordance with VDOT's Road and Bridge Specifications.

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

3.3 FLOODWAYS AND 100 YEAR FLOODPLAINS

3.3.1 Introduction

The purpose of this section is to assess potential impacts to floodways and 100-year floodplains that may result from the FHWA/VDOT Preferred Alternative. Executive Order 11988, as amended (Floodplain

Management), EO 13690 (Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input), and the regulations of the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA) require avoidance of impacts associated with the occupancy and modification of floodplains. As defined in Executive Order 11988, a floodplain is "the lowland and relatively flat area adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year", an area identified for planning purposes as the 100-year floodplain. Development in floodplains reduces the ability of these areas to detain floodwaters, thereby reducing flood storage capacity and placing development in the floodplain and downstream properties at risk.

The regulatory floodplain is the area covered by a flood that has a one percent chance of occurring in any given year, often referred to as the "100-year flood event". The floodplain includes the floodway, which is the area that experiences the deepest water and the highest velocities. The floodplain also includes the flood fringe, which is located just outside the floodway.

Floodplains provide natural means of detaining floodwaters and thus protect downstream properties from damage. Development in floodplains reduces flood storage capacity and places development in the floodplain and downstream properties at risk. Federal policy requires avoidance of effects associated with the modification of and development in floodplains if a practicable alternative (such as shifting alignments to reduce or avoid the floodplains) exists to the proposed action. Federal standards also limit increases in base flood levels to less than 1.0 foot above pre-development levels, provided that hazardous velocities are not produced.

3.3.2 Methodology

Locations of designated floodplains and floodways were determined using Flood Boundary and Floodway Maps published by FEMA. For areas where digitized FEMA Q3 data were unavailable, floodplain encroachments were identified by transposing FEMA-published flood boundaries onto 1:24,000 topographic maps showing the FHWA/VDOT Preferred Alternative. For areas where digitized FEMA Q3 data were available, floodplain encroachments were identified by electronically overlaying the FHWA/VDOT Preferred Alternative onto FEMA digitized maps using ArcMap® GIS software.

3.3.3 Findings

The Route 460 Inventory Corridor lies within the Atlantic Coastal Plain province of Virginia. Land elevations range from sea level (in Suffolk) to 86 feet (in Isle of Wight).

Areas within the Inventory Corridor are vulnerable to flooding from major storms, commonly referred to as hurricanes and nor'easters. Both storms produce winds that push large volumes of water against the shore and may produce flooding within the floodplains within the Inventory Corridor. Hurricanes, with their high winds and heavy rainfall, are the most severe storms to which the Inventory Corridor is subjected. While hurricanes may affect the area from May through November, nearly 80 percent occur during the months of August, September, and October, with approximately 40 percent occurring during September. The Inventory Corridor has experienced major storms since the early settlement of the area. Historical accounts of severe storms in the area date back several hundred years (FEMA, 2013 and 2014).

Flooding on tributaries of the Blackwater River and other streams may be caused by heavy rains occurring any time of the year. Flood heights on these streams can rise from normal to extreme flood peaks in a

relatively short period of time. During all major floods, high-velocity flood flows and hazardous conditions exist in the main stream channel (FEMA, 2013 and 2014).

FEMA identifies the floodways along rivers and streams, where the channel of the stream and any adjacent floodplain areas must be kept free of encroachments to prevent substantial increases in flood height. FEMA mapping has identified one regulated floodway along the Blackwater River. The Inventory Corridor crosses one floodway (along the Blackwater River) and six 100-year floodplains, which are subject to inundation by the 1-percent-annual-chance flood event (see **Figure 3.3-1**).

There are no existing flood control structures that provide protection during major floods within the Inventory Corridor.

3.3.4 Impacts

Table 3.3-1 presents floodplain and floodway impacts. The LOD of the FHWA/VDOT Preferred Alternative would cross six floodplains and one floodway, resulting in an additional encroachment into 11 acres of floodplain and one acre of floodway. The location of the piers will be developed during final design; however they will be located so that the elevation of the floodways will not be affected, and floodplain elevations will not be altered within an established FEMA Floodplain with Base Flood Elevations.

Table 3.3-1: Route 460 FHWA/VDOT Preferred Alternative Floodplain and Floodway Impacts

Preferred Alternative LOD Impacts				LOD Crossings (including bridged crossings)	
100-year Floodplain*		Floodway		Floodplain	Floodway
Sq Feet	Acreage	Sq Feet	Acreage	Count	Count
680,472	11	34,632	1	6	1

* Floodplain acreage includes the floodway areas.
Source: FEMA Digital FIRM maps: DFIRM ID: 510156, 51093C, 51093C, 51149C, 51175C, 51181C, 51183C

For the proposed Route 460 crossing over the Blackwater River, the new bridge has a greater span length than the existing bridge at a higher profile. The existing bridge span is approximately 175 feet long and the new bridge span will be approximately 340 feet long. The existing downstream Norfolk and Southern Railroad Bridge over the Blackwater River controls upstream flood elevations for all major storm events including water surface elevations downstream and upstream of the proposed Route 460 Bridge. However, the new Route 460 bridge over the Blackwater River will have a more efficient bridge opening and the flood elevations upstream of this new bridge will be less than or equal to existing conditions.

At other wetland crossing locations along the project corridor, the proposed bridges, including abutments, span the entire width of the wetland and do not create a constriction to flood flows. During the final design, the hydraulic impacts will be further evaluated to ensure there are no adverse impacts on upstream floodplains.

3.3.5 Mitigation

As the FHWA/VDOT Preferred Alternative advances to more detailed design, continued focus will be on avoiding and minimizing floodplain encroachment to ensure that the FHWA/VDOT Preferred Alternative meets the goals of Executive Order 11998, as amended, Executive Order 13690, and FHWA policy as set forth in 23 CFR §650. Encroachments have been minimized and avoided during engineering and design of

the roadway prism through use of steeper-than-conventional road embankments, use of vertical retaining walls, alignment adjustments, and crossing floodplains and floodways at a perpendicular angle (e.g., the Blackwater River crossing is perpendicular). Because of the linear nature and location of the FHWA/VDOT Preferred Alternative, crossing major drainages and associated 100-year floodplains and floodways is the only practicable alternative. In particular, the location of the Blackwater River crossing is dictated by the location of existing Route 460; therefore, there is no practicable alternative to this particular crossing location. The alternative to placing fill in the 100-year floodplains and floodways would be to construct bridges. Bridge crossings are being proposed at four locations (including the Blackwater River) that will result in reduced encroachment into 100-year floodplains and floodways.

Alternatives that were considered in the Draft SEIS would have resulted in impacts to floodplains and floodways ranging from 49.5 to 131.4 acres for floodplains and from 5.6 to 13.2 acres for floodways. These impacts are reported in Table 3.4-13 of Chapter 3 of the Draft SEIS. Through avoidance and minimization, impacts to floodplains and floodways has been reduced significantly. The FHWA/VDOT Preferred Alternative will result in impacts to 11 acres of floodplains and 1 acre of floodways.

The proposed new bridge over the Blackwater River has a greater span length and higher profile than the existing bridge and will also have a more sufficient bridge opening. The existing bridge span is approximately 175 feet long and the new bridge span will be approximately 340 feet long. As a result, the flood elevations upstream of the Blackwater River bridge will be less than or equal to existing conditions.

VDOT will construct bridge crossings using the minimum number of piers to ensure structural stability within floodways. Breastwalls and fill placed within floodplains for bridge abutments will be minimized. Based on engineering analysis of bridge construction methods for the project, VDOT has determined that bridges can be constructed over streams and wetlands without the use of temporary fill causeways. Therefore, in order to avoid impacts from temporary fill, VDOT will not use temporary causeways to construct bridges over wetlands and streams. VDOT will use a “top down” approach or similar method for the construction of bridge structures over wetlands.

In addition to mitigation measures designed to reduce the amount of floodplain encroachment, Sections 107 and 303 of VDOT’s Highway Construction Specifications require implementation of stormwater management practices to address concerns such as post-development runoff associated with storm events and downstream channel capacity. These standards require that stormwater management facilities be designed to reduce stormwater flows to pre-construction conditions for up to a 10-year storm event. VDOT and its construction contractors will adhere to the specifications to prevent an increase in flooding risks associated with any highway construction.

During final design, a detailed hydraulic survey and hydrology study will evaluate the effect of the proposed roadway improvements on stormwater discharge. The hydraulic study will ensure that no substantial increase in downstream flooding would occur and/or would document the need for any Letters of Map Revision (LOMR) or Conditional Letters of Map Revision (CLOMR) and that all encroachments will conform with all applicable State and local floodplain protection standards.

3.4 WETLANDS AND OTHER WATERS OF THE U.S.

3.4.1 Introduction

Existing agency regulations broadly define "Waters of the United States" (WOUS) as traditional navigable waters, interstate waters, all other waters that could affect interstate or foreign commerce, impoundments of waters of the United States, tributaries, the territorial seas, and adjacent wetlands (33 CFR 328.3; 40 CFR 230.3(s)). The 1987 USACE Wetland Delineation Manual states that the term 'Waters of the United States' has broad meaning and incorporates both deep-water aquatic habitats and special aquatic sites, including wetlands (EPA, 2014c), as follows:

a. The territorial seas with respect to the discharge of fill material.

b. Coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including their adjacent wetlands.

c. Tributaries to navigable waters of the United States, including adjacent wetlands.

d. Interstate waters and their tributaries, including adjacent wetlands.

e. All others waters not identified above, such as isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not a part of a tributary system to interstate waters or navigable waters of the United States, the degradation or destruction of which could affect interstate commerce.

Wetlands are low-lying lands, flooded or saturated by surface or groundwater for varying periods of time during the growing season. For jurisdictional purposes, USACE defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (USACE, 1987). As transitional areas between uplands and open waters, they constitute a vital element in ecosystems. Wetlands can provide many functions including, helping to regulate flooding and maintain hydrology of rivers and streams by temporarily storing surface water and maintaining subsurface hydrology, cycling of nutrients and carbon, removing and sequestering elements and compounds (including pollutants), retaining particulates (including sediment), exporting organic carbon, maintaining important plant communities, and providing habitat for wildlife.

The USACE administers regulations for activities affecting WOUS and navigable waters pursuant to Section 404 of the CWA, as amended, and Section 10 of the Rivers and Harbors Act of 1899. WOUS are legally defined by USACE and EPA regulations and described generically in EPA's 404 (b)(1) guidelines as rivers, streams, ponds, and special aquatic sites (e.g., sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes). Within the Inventory Corridor, WOUS include waterways (perennial streams, intermittent streams, and certain ephemeral streams), water bodies (reservoirs and certain ponds), wetlands, and deepwater habitat (those portions of waterways and water bodies deeper than 6.6 feet).

3.4.2 Methodology

3.4.2.1 Identification of Wetlands and Other Waters of the U.S.

During the development of the 2014 Draft SEIS, wetlands within the Inventory Corridor for each alternative evaluated were identified using photointerpretation, review of ancillary data sources, and limited field

review of selected areas. The photointerpretation methodology is described in detail in the ***Route 460 Photointerpretation Mapping Report*** (VDOT, 2014).

Since the publication of the 2014 Draft SEIS, a comprehensive wetland delineation was conducted to locate the limits of jurisdictional WOUS within the Inventory Corridor of the FHWA/VDOT Preferred Alternative. WOUS (including wetlands) were delineated pursuant to the USACE Wetland Delineation Manual, Technical Report Y-87-1 (1987 Manual), the USACE November 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region Version 2.0 (USACE, 2010), and subsequent regulatory guidance. Wetland delineation fieldwork and USACE confirmation site visits were conducted from April 2015 through July 2015.

Surface waters within the vicinity of the Inventory Corridor were classified as WOUS using the USACE / EPA regulatory guidance. 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 ordinary high water (33 CFR §328), and in accordance with new jurisdictional determination guidance wrought by the June 5, 2007 Rapanos court decision and subsequent regulatory guidance.

Deepwater habitats are permanently flooded lands lying below the deepwater boundary of wetlands (Cowardin, et.al. 1979). The boundary between wetland and deepwater habitat is generally considered to be at a depth of two meters (6.6 feet) below low water.

Palustrine waters with unconsolidated bottom are waterbodies less than 20 acres in size and less than two meters in depth at low water (Cowardin, et.al. 1979). These waters are permanently to periodically flooded and have a substrate of sand, gravel, mud, or cobble. These waters are located in areas of low energy and have the potential for being unstable due to a lack of large surfaces for plant growth.

Jurisdictional ditches were identified in the field based on the presence of an ordinary high water mark and if they were continuous upstream and/or downstream with other waters of the US. If an ordinary high water mark was obscured by the presence of hydrophytic vegetation, an ordinary high water mark was assumed to be present. If hydrophytic vegetation in the ditch was emergent, the ditch was assumed to be regularly maintained as a ditch and was determined to be a jurisdictional ditch. If hydrophytic vegetation in the ditch was scrub-shrub or forested, the ditch was assumed to have been abandoned and was considered to be a jurisdictional wetland.

3.4.2.2 Assessing Wetland Functions

VDOT, in collaboration with USACE, EPA, and VDEQ, engaged in a functional assessment of each wetland impacted along 16 miles of improvements. The purpose of this functional assessment was to provide an understanding of and to document the functions of wetlands that may be impacted by the proposed project. This functional assessment also helped to guide the proposed Compensatory Mitigation Plan in order that compensatory mitigation adequately replaces similar lost or impaired wetland functions.

Because project wetlands can be logically divided into subclasses based on geomorphic setting, dominant water source, and dominant hydrodynamics, it was decided that applying a hydrogeomorphic (HGM) approach for assessing wetlands functions would provide the most effective and relevant assessment of wetland functions for wetlands that may be impacted by the project. The HGM approach is a way of assessing wetland functions that places emphasis on geomorphology and hydrodynamics, unlike other models that focus on biotic characteristics or subjective human value (NRCS, 2008).

In order to assess the functions of project wetlands accurately, it was decided that modifications of two published hydrogeomorphic assessment methodologies (HGM) would be appropriate. "A regional guidebook for assessing the functions of low gradient, riverine wetlands in western Kentucky," by W.B. Ainslie et al., served as the basis for assessing project bottomland hardwoods and cypress/tupelo swamps and "A regional guidebook for applying the hydrogeomorphic approach to assessing wetland functions of wet hardwood flats on mineral soils in the Mid-Atlantic Coastal Plain," by K.J. Havens et al., was used as the basis for assessing wet flatwoods. Both methodologies were modified for the specific region where the project is being constructed and to be practicable within the constraints of the project schedule and available resources. In addition, modifications to the model variables were necessary to minimize additional field data collection while still preserving the intended purpose. For example, "Overbank Flood Frequency" (V_{FREQ}), which represents the frequency at which water from a stream overtops its banks and inundates riverine wetlands on the floodplain, was measured using NRCS soils data to infer flooding frequency in lieu of collecting field data. "Woody Debris Biomass" (V_{WD}), which represents the volume of down and dead woody stems ≥0.25 in. in diameter that are no longer attached to living plants, was measured using a combination of estimated age class derived from available site photos and woody debris/log biomass tables developed using data generated by the U.S. Forest Service EVALIDator Version 1.6.0.02 (a part of the Forest Inventory and Analysis National Program).

Examples of model variables that were not modified and were measured as prescribed by the methods include "Wetland Tract" (V_{TRACT}), which is the area of low gradient, riverine wetland that is contiguous and directly accessible to wildlife from the area being assessed, and "Interior Core Area" (V_{CORE}), which represents the interior portion of a wetland tract with at least a 300 meter buffer separating it from adjacent non-forested habitat.

Functional Capacity Index (FCI) formulas were not altered.

The bottomland hardwood and cypress/tupelo functions that were assessed for the LOD include the following:

Temporarily Store Surface Water – This function is defined as the capacity of a riverine wetland to temporarily store and convey floodwaters that inundate riverine wetlands during overbank flood events. Most of the water that is stored and conveyed originates from an adjacent stream channel. However, other potential sources of water include: (a) precipitation, (b) surface water from adjacent uplands transported to the wetland via surface channels or overland flow, and (c) subsurface water from adjacent uplands transported to the wetland as interflow or shallow groundwater and discharging at the edge or interior of the floodplain.

Maintain Characteristic Subsurface Hydrology – This function is defined as the capacity of a riverine wetland to store and convey subsurface water. Potential sources of subsurface water are direct precipitation, interflow, groundwater, and overbank flooding.

Cycle Nutrients – This function is defined as the ability of the riverine wetland to convert nutrients from inorganic forms to organic forms and back through a variety of biogeochemical processes such as photosynthesis and microbial decomposition.

Remove and Sequester Elements and Compounds – This function is defined as the ability of the riverine wetland to permanently remove or temporarily immobilize nutrients, metals, and other elements and compounds that are imported to the riverine wetland from upland sources and via overbank flooding. In a

broad sense, elements include macronutrients essential to plant growth and other elements such as heavy metals that can be toxic at high concentrations. Compounds include pesticides and other imported materials. The term "removal" means the permanent loss of elements and compounds from incoming water sources, and the term "sequestration" means the short- or long-term immobilization of elements and compounds.

Retain Particulates – This function is defined as the capacity of a wetland to physically remove and retain inorganic and organic particulates >0.45 µm from the water column. The particulates may originate from either onsite or off-site sources.

Export Organic Carbon – This function is defined as the capacity of the wetland to export the dissolved and particulate organic carbon produced in the riverine wetland. Mechanisms include leaching of litter, flushing, displacement, and erosion.

Maintain Characteristic Plant Community – This function is defined as the capacity of a riverine wetland to provide the environment necessary for a characteristic plant community to develop and be maintained. In assessing this function, one must consider both the extant plant community as an indication of current conditions and the physical factors that determine whether or not a characteristic plant community is likely to be maintained in the future.

Provide Habitat for Wildlife – This function is defined as the ability of a riverine wetland to support the wildlife species that utilize riverine wetlands during some part of their life cycles. The focus of attention, however, is on the avifauna component of habitat based on the assumption that, if conditions are appropriate to support the full complement of avian species found in reference standard wetlands, the requirements of other animal groups (e.g., mammals, reptiles, and amphibians) will be met.

The wet flatwood functions that were assessed for the LOD include the following:

Maintain Characteristic Habitat – This function reflects the capacity of a wetland to maintain the characteristic attributes of plant and animal communities normally associated with natural hardwood mineral flat ecosystems. Community attributes include presence of woody debris, tree density, component plant species such as those important as a food resource, and amount of natural area (water, forest, wetland) surrounding the site.

Maintain Characteristic Plant Community – This function reflects the capacity of a wetland assessment area to maintain the characteristic attributes of plant communities normally associated with natural hardwood mineral flat ecosystems. Community attributes include relative importance of component species (including percent target species, density) and the effects that alterations have on plant communities in hardwood mineral flats utilizing a FQAI.

Maintain Characteristic Water Level Regime – This function reflects the capacity of a hardwood mineral flat to maintain variations in water level characteristic of the ecosystem, including variations in depth, duration, frequency, and season of flooding or ponding. The function models the effects that alterations to hydrologic regime have on fluctuations in water level. The model assumes that a hardwood mineral flat will maintain its characteristic water level fluctuations if it is not hydrologically modified.

Maintain Characteristic Carbon Cycling Processes – This function reflects the capacity of a hardwood mineral flat to maintain carbon cycling processes at the rate, magnitude, and timing characteristic of the ecosystem, including export of dissolved organic constituents. This function models the effects that

alterations have on biogeochemical processes and assumes that hardwood mineral flats will maintain characteristic carbon cycling processes if not altered.

Because impacted wetlands were assessed using modified versions of previously published methodologies, it was important to field test and adjust the model variables and assumptions based on local field data. In this way, the HGM functional assessment methodologies would be as relevant as possible to the project. The modified HGM functional assessment methodologies were field tested at reference standard wetlands. Reference standard wetlands are wetlands that are considered to be in the best condition and least disturbed within the geographic area. These reference standard wetlands provide functional comparisons to impacted wetlands within the FHWA/VDOT Preferred Alternative's LOD.

Prior to fieldwork, potential reference standard wetlands were identified from the desktop utilizing aerial imagery, topographic maps, public lands databases, National Wetlands Inventory (NWI) maps, and hydric soil mapping. Then, field visits were conducted to determine which sites should be used as reference standard wetlands. Factors including disturbance regime, species composition, diameter of trees, basal area, treefall, snags, soils, and hydrology were examined. VDOT, in close coordination with EPA, USACE, and VDEQ reviewed the potential reference wetlands and determined five of them to be representative of the highest quality in the region and thus worthwhile reference standard wetlands. A workshop was conducted in August 2015 where representatives from VDOT, EPA, USACE, and VDEQ reviewed reference standard wetland scores and provided input on modified model variables.

Functions of the wetlands located within the project LOD depend on their physical, geographic, and environmental characteristics. Influencing factors can include size and proximity of wetlands to ongoing development activity, geologic setting, soil characteristics, presence and duration of hydrology, landscape position, vegetation cover type, and dominant ecological community type, all of which were assessed with the modified "western Kentucky" method and "wet flatwoods" method. Functions of impacted wetlands were evaluated within 96 wetland assessment areas that corresponded to preliminary impact areas based on preliminary conceptual design. Approximately 27 acres of wetlands were assessed using the modified "western Kentucky" method and approximately 25 acres of wetlands were assessed using the modified "wet flatwoods" method.

3.4.3 Findings

3.4.3.1 Wetlands and Other Waters of the U.S.

Wetlands and other waters are present within the Inventory Corridor, including a total of 47,833 linear feet of stream (46,030 linear feet of intermittent/perennial stream (R4/R3/R2) and 1,803 linear feet of ephemeral stream (RE)) and 317 acres of vegetated wetlands (265 acres of palustrine forested (PFO) wetland, 14 acres of palustrine scrub-shrub (PSS) wetland, and 38 acres of palustrine emergent (PEM) wetland). Other waters that are present include approximately 18 acres of palustrine open water (POW) and 38,584 linear feet of jurisdictional ditch. Approximately 80 acres of the total 265 acres of PFO wetlands within the Inventory Corridor are comprised of "high value wetlands", as defined in Virginia's wetland regulations when 10 percent or more (singly or in combination) in a vegetative stratum of Atlantic white cedar (*Chamaecyparis thyoides*), bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), or overcup oak (*Quercus lyrata*) are present.

All of the streams and all but six of the wetlands delineated within the Inventory Corridor appear to have significant nexus connections to "navigable waters" and would, therefore, be regulated by the USACE. Six

wetlands do not meet the significant nexus test, and, therefore, have been determined to be isolated due to the absence of a connection to jurisdictional waters regulated by the USACE. These "isolated" wetlands may be regulated by the Commonwealth of Virginia. An Approved Jurisdictional Determination (AJD) confirming the isolated nature of these six wetlands was issued by the USACE on August 26, 2015 (NAO-2008-03470). These isolated wetlands are located on parcels in the City of Suffolk and Isle of Wight County, Virginia with the following county parcel numbers: 24*28A, 25*70*1, 25*70B, and 25*56 in Suffolk, and 45A-01-007 in Isle of Wight. These isolated wetlands total approximately 1.41 acres and consist of 0.07 acres of PFO, 0.69 acres of PSS, and 0.64 acres of PEM. Other isolated waters that are present under this AJD include 0.19 acres of POW.

Portions of the Inventory Corridor were previously delineated by others. One portion, City of Suffolk parcel 25*57A, has a current Jurisdictional Determination issued by the USACE. A Preliminary Jurisdictional Determination (PJD) was issued by the USACE on September 3, 2014 (NAO-2008-2136). This parcel was visited and determined to have approximately 3.4 acres of wetlands and 854 linear feet of stream including 2.0 acres of PFO, 1.2 acres of PSS, 0.2 acres of PEM, 689 linear feet of R2/R3/R4, and 165 linear feet of R6. Other waters of the U.S. that are present under this PJD include 0.9 acres of POW.

On October 22, 2015, a PJD was issued by the USACE for the remaining Inventory Corridor wetlands that are hydrologically connected to the waters of the U.S. (NAO-2008-03470). These wetlands and other waters of the U.S. total approximately 46,979 linear feet of stream (45,341 linear feet of R2/R3/R4 stream and 1,638 linear feet of R6 stream) and 312 acres of wetlands (263 acres of PFO, 12 acres of PSS, and 37 acres of PEM). Other waters of the U.S. that are present under this PJD include and 17 acres of POW and 38,584 linear feet of jurisdictional ditch.

The Inventory Corridor falls within the Blackwater River (HUC 03010202) and Hampton Roads (HUC 02080208) sub-basins. The Hampton Roads sub-basin drains to the James River and ultimately the Chesapeake Bay; whereas the Blackwater River sub-basin drains to the Chowan River and ultimately the Albemarle Sound in North Carolina. All streams located within the Inventory Corridor drain to the Chesapeake Bay or Albemarle Sound.

3.4.3.1.1 Cowardin Classification System

All wetlands identified within the Inventory Corridor can be classified under the Cowardin wetland classification as follows:

3.4.3.1.2 Palustrine Emergent Wetlands

Non-tidal PEM wetlands are dominated by herbaceous (non-woody) vegetation (Cowardin, et.al. 1979). All Inventory Corridor watersheds contain a substantial amount and multiple types of PEM wetlands. Some are naturally occurring PEM wetlands, while others are artificially maintained in an emergent state due to a variety of reasons. The naturally occurring PEM wetlands typically result from inundation for too long of a duration during the growing season to allow ready succession by woody species. Typical species include softstem bulrush (*Juncus effusus*), switchgrass (*Panicum virgatum*), deertongue (*Dichanthelium clandestinum*), sweet flag (*Acorus calamus*), blunt spikerbush (*Eleocharis obtusa*), smartweed (*Polygonum punctatum*), rice cutgrass (*Leersia oryzoides*), and common cattail (*Typha latifolia*).

Artificially maintained PEM wetlands identified within the Inventory Corridor include wetlands along maintained utility easements and roadway rights-of-way, along with farmed wetlands (primarily pastures). Utility easements and roadway rights-of-way are usually maintained in an emergent state by mowing or

herbicide application, while the pastures are maintained in this state by livestock grazing and trampling. In wetter portions of maintained utility easements and roadway rights-of-way, the emergent vegetation species are similar to the naturally occurring PEM wetlands. The pasture emergent wetlands typically exhibit low species diversity due to the constant disturbance and grazing from livestock. Commonly occurring species in these wetlands include species that are less preferred as forage by the livestock, and that are readily adaptable to disturbance, such as common soft rush (*Juncus effusus*), wartremoving herb (*Murdannia keisak*), hairy buttercup (*Ranunculus sardous*), and curly dock (*Rumex crispus*).

3.4.3.1.3 *Palustrine Scrub-Shrub Wetlands*

The PSS wetlands identified within the Inventory Corridor consist primarily of mid-successional wetland communities transitioning towards forested communities, semi-permanently flooded vegetated fringe communities around permanent water bodies, and semi-permanently or temporarily flooded riparian communities along low-gradient Coastal Plain small-stream swamp systems. A large portion of the PSS wetlands consist of recently harvested forested communities that are in early to mid-successional stages of regeneration. The location of these recently harvested communities in the landscape generally dictates the composition of the species occurring in each particular area. The PSS wetlands occurring as semi-permanently flooded are typically found around many of the manmade ponds along the Inventory Corridor.

The PSS wetlands occurring in semi-permanently or temporarily flooded riparian communities are found along low-gradient Coastal Plain small-stream swamp systems. These communities generally have not resulted from human activity and timber harvesting, but rather have resulted from beaver-induced backflooding, followed by the subsequent death of non-flood tolerant tree species and harvesting of other flood tolerant tree species by beavers. These areas typically have a mix of open water, emergent wetlands areas, shrub hummocks, and scattered stands of tree species tolerant of deeper and longer durations of flooding. The true shrubs in these communities include species tolerant of permanently or semi-permanently flooded conditions, such as swamp azalea (*Rhododendron viscosum*) and possumhaw viburnum (*Viburnum nudum*), but some other less flood tolerant species are often found growing on hummocks formed from old decaying tree stumps, such as wax myrtle (*Morella cerifera*) and highbush blueberry (*Vaccinium fuscatum*).

3.4.3.1.4 Palustrine Forested Wetlands

The PFO wetlands identified along the corridor include flatwoods and riparian wetlands located along narrow headwater ephemeral streams, intermittent streams, large stream floodplains, and small-stream swamp systems. All of these wetlands are ultimately connected hydrologically to the larger Coastal Plain small-stream swamp systems.

The forested wetlands associated with the large flatwoods typically occur at some of the highest elevations in the landscape. These large flats are primarily precipitation and groundwater-driven systems, where the groundwater rises to the surface in the winter and spring, then draws back down in the summer and fall. When the groundwater from these systems is discharged at the surface, the water discharges down ephemeral drainageways or flows out of the side slopes as seeps that discharge downslope to nearby swamp systems. The hydrologic regimes of these systems appear to be closely linked to underlying geology and soil composition and structure. The flatwoods located on the Rains Fine Sandy Loam soil series in the study area also tend to be considerably wetter than the flatwoods located on the Slagle, Craven, Eunola, and Eulonia soil series, but not quite as wet as the Myatt Loam flatwoods. Historically, Rains soil flatwoods were often dominated by pond pine (*Pinus serotina*), but this species is now rarely encountered and has been largely replaced by planted loblolly pine (*Pinus taeda*). Some pond pine is encountered in Rains soil

flatwoods in Suffolk. The commonly encountered trees in Rains flatwoods are the same species encountered in the seasonally saturated portions of the Myatt Loam flatwoods. The shrub layer is generally similar as well, but in some locations was observed to support species more often associated with pocosins.

The Inventory Corridor contains the floodplains of larger Coastal Plain small-stream swamp systems, where bald cypress is the dominant tree canopy species, but some swamp tupelo still can be found. These swamp systems are typically underlain by sandy organic soils with low pH. These swamp systems are sometimes referred to as "blackwater" swamps because of their clear tea-colored water resulting from leaching of the organic material. These swamps are classified as "high value wetlands" as defined in Virginia's wetland regulations when 10 percent or more (singly or in combination) in a vegetative stratum of Atlantic white cedar (*Chamaecyparis thyoides*), bald cypress, water tupelo (*Nyssa aquatic*), or overcup oak (*Quercus lyrata*) are present.

3.4.3.1.5 Palustrine Unconsolidated Bottom and Palustrine Open Water

All the Inventory Corridor sub-basins have palustrine waters with unconsolidated bottom (PUB), largely in the form of conveyance ditches. Ditches have been created to drain low lying areas, and have the ability to transfer pollutants downstream in the watershed. These waters are permanently to periodically flooded and have a substrate of sand, gravel, mud, or cobble.

Also present in the corridor are manmade ponds (which are palustrine open water (POW)). These ponds have been created primarily by the damming of stream drainages. The water quality in these ponds can be quite variable depending on the source of runoff supplying the pond's hydrology, which can include chemicals from agricultural practices, or if the hydrology of the pond is groundwater driven.

3.4.3.1.6 Wetland Subclasses Based on Hydrogeomorphic (HGM) Approach

In addition to being classified under the Cowardin Classification System, wetlands within the Inventory Corridor can alternatively be grouped into three subclasses based on their geomorphic setting, water sources, and hydrodynamics. These include bottomland hardwood forests, bald cypress/tupelo swamps, and wet flatwoods. Following is a brief description of each wetland subclass.

***3.4.3.1.7** Bottomland Hardwood Forest*

Bottomland hardwood forests within the Inventory Corridor can generally be described as hardwood dominated forests located in floodplains and river terraces. These communities may be classified under the Cowardin wetland classification system as palustrine forested with non-tidal wetland regimes that vary from semi-permanently flooded to intermittently exposed, permanently flooded, saturated, intermittently flooded, or temporarily flooded (Cowardin et al., 1979). Further classification describes these systems in a geomorphic context as low-gradient alluvial wetlands (Brinson, 1993). *The Natural Communities of Virginia: Classification of Ecological Community Groups* (Fleming et al., 2012) categorizes such wetlands as Coastal Plain / Piedmont bottomland / floodplain forests represented by wetlands not dominated by bald cypress or tupelo (*Nyssa* spp.).

Wetland hydrodynamics are dominated by unidirectional flow where flow velocities correspond with low-gradient landforms. Singular or multiple inflow points can be present while outlets are generally unobstructed, and typically convey surface hydrology to downstream resources. Lateral migration is present in periods when groundwater discharge/precipitation events exceed soil permeability. Chemically reduced soil matrices generally display strong redoximorphic features including concentrations, depletions, and other features indicating chemical reduction and oxidation of iron and manganese compounds.

Vegetation within the canopy of bottomland hardwood forests is generally composed of species including red maple (*Acer rubrum*), black gum (*Nyssa sylvatica),* water oak (*Quercus nigra*), laurel oak (*Quercus laurifolia*), sweet gum (*Liquidambar styraciflua*), green ash (*Fraxinus pennsylvanica*), American holly (*Ilex opaca*), willow oak (*Quercus phellos*), and sweet bay (*Magnolia virginiana*). The scrub shrub stratum is composed of shrubs and shrub sized tree species including black willow (*Salix nigra*), possum haw (*Viburnum nudum*), coastal sweet pepper bush (*Clethra alnifolia*), and highbush blueberry (*Vaccinium fuscatum).* The herbaceous stratum is composed of broadleaf cattail (*Typha latifolia*), lizard's tail (*Saururus cernuus*), Virginia iris (*Iris virginica*), spotted lady's thumb (*Persicaria maculosa*), touch-me-not (*Impatiens capensis*), netted chain fern (*Woodwardia areolata*), cinnamon fern (*Osmunda cinnamomea*), giant cane (*Arundinaria tecta*), common rush (*Juncus effusus*), and various sedge species. The vine stratum is characterized by greenbrier (*Smilax rotundifolia*), laurel greenbrier (*Smilax laurifolia*), poison ivy (*Toxicodendron radicans*), and Japanese honeysuckle (*Lonicera japonica*).

3.4.3.1.8 *Bald Cypress / Tupelo Swamps*

Bald cypress/tupelo swamps within the Inventory Corridor are associated with inundated forest areas typically located along watercourses. These communities may be classified under the Cowardin wetland classification system as palustrine forested with non-tidal wetland regimes that vary from semi-permanently flooded, intermittently exposed, or permanently flooded (Cowardin et al., 1979). Further classification describes these systems in a geomorphic context as low-gradient alluvial wetlands (Brinson, 1993). *The Natural Communities of Virginia: Classification of Ecological Community Groups* (Fleming et al., 2012) categorizes such wetlands as Bald Cypress – Tupelo Swamps represented by wetlands dominated by bald cypress and tupelos. Wetland hydrodynamics are similar to the bottomland hardwood forests within the Inventory Corridor.

Vegetation within the canopy of bald cypress / tupelo swamps is generally composed of bald cypress, water tupelo and swamp tupelo (*Nyssa biflora*). Occasionally, green ash, red maple, overcup oak, and American elm (*Ulmus americana*) are found in the canopy, but are more commonly understory trees. Carolina ash (*Fraxinus caroliniana*) is often dominant in the shrub layer. The herbaceous stratum is sparse to seasonally lush, and commonly includes lizard's tail, false nettle (*Boehmeria cylindrica*), greater marsh St. John's-wort (*Hypericum walteri*), small beggar-ticks (*Bidens discoidea*), weak stellate sedge (*Carex seorsa*), giant sedge (*Carex gigantea*), taper-leaf water horehound (*Lycopus rubellus*), and catchfly cutgrass (*Leersia lenticularis*).

3.4.3.1.9 *Wet Flatwoods*

Wet flatwoods communities are defined as pine-dominated or mixed hardwood communities that typically develop as a result of silviculture, successional growth, or secondary pine-hardwood communities resulting from continued cutting and agricultural abandonment (Fleming et al., 2012). These communities may be classified under the Cowardin wetland classification system as palustrine forested with non-tidal wetland regimes that vary from saturated to intermittently flooded, or temporarily flooded (Cowardin et al., 1979). Further classification describes these systems in a geomorphic context as low-gradient non-alluvial wetlands (Brinson, 1993). *The Natural Communities of Virginia: Classification of Ecological Community Groups* (Fleming et al., 2012) categorizes such wetlands as Non-Riverine Flatwoods and Swamps.

Wetland hydrodynamics are generally fed by precipitation with water loss through evapotranspiration, with some retention of floodwaters within depressions; groundwater is also a seasonal component of the hydrodynamics in these systems. Wet flatwoods generally lack inlets, while outlets, when present, are generally intermittent or restricted. Lateral migration is present in periods when groundwater discharge /

precipitation events exceed soil permeability, although this duration is decreased in higher slope gradients. Reduced soil matrices with strong redoximorphic features provide evidence that there is seasonal vertical fluctuation of the water table.

Vegetation within wet flatwoods varies depending upon whether the communities are under active or historic silviculture, how recently it has been logged, dominance of pine, and to what degree the understory has been manipulated. Late-successional stands of wet flatwoods include swamp chestnut oak (*Quercus michauxii*), cherrybark oak (*Quercus pagoda*), willow oak, laurel oak, water oak, pin oak (*Quercus palustris*), and white oak (*Quercus alba*). Common understory species include American hornbeam (*Carpinus caroliniana*), giant cane, American holly, coastal sweet pepper bush, sweetbay magnolia, coastal dog-hobble (*Leucothoe axillaris*), and highbush blueberry. Herb layers usually contain netted chain fern and a variety of sedges. Late successional stands of wet flatwoods are greatly reduced in extent due to agricultural clearing and silviculture. Early to mid-successional wet flatwoods, which are prevalent throughout the Inventory Corridor, include sweet gum, red maple, pond pine (*Pinus serotina*), and loblolly pine (*Pinus taeda*) in the canopy. Understory species typically consist of sweetbay magnolia, black gum, red bay (*Persea palustris*), and coastal dog-hobble, and giant cane.

3.4.3.1.10 Navigable Waters of the U.S. (Section 10 Waters)

The Blackwater River is the only navigable WOUS within the Inventory Corridor subject to regulation under Section 10 of the Rivers and Harbors Act of 1899 (as determined by the Norfolk District USACE) (see **Figure 3.4-1**).

3.4.3.2 Wetland Functions

Functions of the wetlands located within the project LOD depend on their physical, geographic, and environmental characteristics. Influencing factors can include size and proximity of wetlands to ongoing development activity, geologic setting, soil characteristics, presence and duration of hydrology, landscape position, vegetation cover type, and dominant ecological community type, all of which were assessed with the modified "western Kentucky" method and "wet flatwoods" method. Functions of impacted wetlands were evaluated within 96 wetland assessment areas.

In general, cypress/tupelo and bottomland hardwood systems strongly performed "maintain characteristic subsurface hydrology", "cycle nutrients", "remove and sequester elements and compounds", "export organic carbon", "maintain characteristic plant community", and "provide habitat for wildlife". To a lesser degree, cypress/tupelo performed "temporarily store surface water and retain particulates"; this is a model constraint – if a FEMA floodplain is not present, the model assumes these two functions are not being performed. Although these functions are performed at cypress/tupelo and bottomland hardwood wetlands, the model is not sensitive enough to evaluate these functions effectively. Mineral flat wetlands strongly performed "maintain characteristic water regime", and to a lesser degree, "habitat", "maintain characteristic plant community", and "carbon cycling processes" were performed. Most mineral flats have been logged in the past, and therefore vegetation species composition and structure are in the process of transitioning to climax communities, and do not perform these functions at high levels.

3.4.4 Impacts to Wetlands and Other Waters of the U.S.

A brief summary of impacts to jurisdictional WOUS that will result from the FHWA/VDOT Preferred Alternative is provided below. A detailed description of impacts to WOUS including avoidance and minimization efforts, detailed project design and impact maps, construction methods, a summary of impacts to streams and wetlands, functional assessment methodology and results, and comprehensive compensatory

mitigation plan, was included in a detailed Joint Permit Application that was prepared for the Section 404 permitting process.

3.4.4.1 Permanent Impacts

Construction of the FHWA/VDOT Preferred Alternative will result in direct permanent impacts (cut/fill, secondary, right-of-way conversion, and bridge conversion).

3.4.4.1.1 Permanent Stream Impacts

The primary direct impact of highway construction on surface water resources is associated with the number and nature of the surface water crossings. The majority of the crossings will consist of bridges or culverts. Stream crossings by bridges have less direct impact than culvert crossings. The bridging of sensitive resources discussed in the previous section, as well as the bridging of streams for hydraulic purposes, results in a reduction in direct impacts to streams.

The Project will result in permanent impacts to 6,874 linear feet of stream, including 5,027 linear feet of perennial (R2/R3) stream, 1,453 linear feet of intermittent stream (R4), and 394 feet of ephemeral (R6) stream (see Figure 3.4-3).

3.4.4.1.2 Permanent Wetland Impacts

Construction of the FHWA/VDOT Preferred Alternative will result in direct permanent impacts (cut/fill, secondary, right-of-way conversion, and bridge conversion). Cut/fill impacts are caused by directly placing fill into wetlands. Right-of-way conversion impacts are due to mechanical clearing that permanently keeps wetlands in an emergent state. Bridge conversion impacts are due to bridge decks that limit tree growth (mostly due to shading) and thus keep the aquatic resource in a scrub-shrub, herbaceous, and/or open water state. Secondary impacts are those which result when WOUS are hydrologically isolated due to primary impacts, nearby cuts, and utility isolation. Total direct permanent wetland impacts of the LOD of the FHWA/VDOT Preferred Alternative would be 39.77 acres of vegetated wetlands, including 32.38 acres of PFO wetlands, 1.91 acres of PSS wetlands, and 5.48 acres of PEM wetlands. Figure 3.4-2 shows the wetlands and proposed bridges within the Inventory Corridor and within the LOD of the FHWA/VDOT Preferred Alternative.

3.4.4.1.3 Permanent Pond Impacts

Through the placement of fill, the project will result in permanent impacts to seven open waterbodies (i.e., ponds) totaling approximately 3.9 acres. The ponds being impacted by the project are less than 20 acres in size, lack active wave-formed or bedrock shoreline features, have a water depth less than six feet at low water, and have a salinity due to ocean-derived salts less than 0.5 parts per thousand, and are, therefore, classified as palustrine open water according to the Cowardin Classification System.

In order from west to east, the first pond is a portion of a wetland/stream complex located just east of Yellow Hammer Road that has been impounded between existing Route 460 and the Norfolk Southern Railroad most likely due to a non-functioning culvert under existing Route 460. The second and third ponds are in active aquacultural use as part of the Perry Minnow Farm. These ponds appear to have been historically part of a stream/wetland complex, but have been excavated and expanded significantly to their current capacity. These ponds are routinely drawn down and maintained. The fourth pond is located on a crop farm just east of Old Myrtle Road and is comprised of a portion of a stream/wetland complex that has been impounded by an earthen dam. The fifth pond is located on a hunt club property and is comprised of a portion of a stream/wetland complex that has been impounded by an earthen dam. The sixth pond is located

on a crop farm just west of Route 58 and is comprised of the headwater portion of a stream/wetland complex that has been impounded and partially excavated. The seventh pond is located on the same crop farm and is comprised of a portion of a wetland/stream complex that has been impounded by a small earthen dam. This pond also receives significant input from drain tiles that drain the surrounding fields.

3.4.4.1.4 Permanent Jurisdictional Ditch Impacts

The project will permanently impact 9,339 linear feet of jurisdictional ditch.

3.4.4.2 Temporary Impacts

The project will result in temporary impacts to streams, ponds, and ditches caused by construction access necessary to place roadway embankments, install pipe culverts and headwalls, and erect retaining walls and bridge abutments.

3.4.4.2.1 Temporary Stream Impacts

The project will result in temporary impacts to 1,225 linear feet of stream, including 973 linear feet of perennial stream, 206 linear feet of intermittent stream, and 46 linear feet of ephemeral stream.

3.4.4.2.2 Temporary Wetland Impacts

Construction of the FHWA/VDOT Preferred Alternative will result in temporary impacts to approximately 1.31 acres of PEM wetlands.

3.4.4.2.3 Temporary Impacts to Other Waters of the U.S.

Temporary impacts to other waters of the U.S. include 1,763 linear feet of jurisdictional ditch and 0.12 acres of open water (two ponds). The two ponds being temporarily impacted are located on a hunt club property comprised of a portion of a stream/wetland complex that has been impounded by an earthen dam and on a crop farm just west of Route 58 comprised of the headwater portion of a stream/wetland complex that has been impounded and partially excavated.

3.4.4.2.4 Temporary Impacts to Navigable Waters of the U.S. (Section 10 Waters)

The FHWA/VDOT Preferred Alternative crosses only one Section 10 Water, the Blackwater River. Temporary impacts to navigation are anticipated during construction of bridges over the Blackwater River. Temporary portages may be needed for river use during construction. Construction of bridges and culverts into and around water bodies may also temporarily and/or permanently change the water velocity and depth, which could in turn impact navigability. Construction duration may be the best measure for determining temporary impacts to navigability. There would be no long-term impacts since the FHWA/VDOT Preferred Alternative would cross in the same vicinity as the existing bridge, but the new bridge would be much longer than the existing bridge.

3.4.5 Impacts to Wetland Functions

Wetland functions remaining after construction of the Preferred Alternative are related to the type of wetland impact - permanent cut/fill, permanent right of way conversion, permanent bridge conversion, and permanent secondary.

Permanent cut/fill impacts are those that are caused by directly placing fill material, dredging, cutting slopes, installing drainage ditches, installing outlet/inlet protection, or any other construction activity that results in the direct permanent loss of wetland function. Permanent cut/fill impacts are considered to result in the total loss of wetland function for the wetland that is being directly impacted. Placement of fill for the road prism is an example of a permanent cut/fill impact.

Permanent right of way conversion impacts occur when the vegetation of a forested or scrub-shrub wetland is cut and permanently maintained as an emergent wetland. No fill is placed, and the wetland generally retains some level of function, with most of the functional loss occurring as a result of decreased structural integrity of the vegetative component. A permanently maintained easement through a wetland is an example of a permanent conversion impact.

Permanent bridge conversion impacts occur when the vegetation of a forested or scrub-shrub wetland is cut and permanently maintained as an emergent wetland, due to bridge deck heights that limit tree growth (mostly due to shading) and thus keep the aquatic resource in an emergent state. No fill is placed, and the wetland generally retains some level of function, with most of the functional loss occurring as a result of decreased structural integrity of the vegetative component.

Permanent secondary impacts occur when WOUS are hydrologically isolated due to primary impacts, nearby cuts, and utility isolation. The wetland generally retains some level of function, but with alteration of wetland hydrology, it is possible for a permanent secondary impact to become an upland. Therefore, for the purpose of this project, permanent secondary impacts were treated the same as a cut/fill impact, with a total loss of wetland function.

3.4.6 Mitigation

3.4.6.1 Avoidance and Minimization

VDOT has conducted extensive coordination with USACE, EPA, and VDEQ to avoid and minimize impacts to wetlands and streams to the greatest extent practicable. Through the development and refinement of the proposed project, a variable width Inventory Corridor, typically 500 feet, was maintained for the purposes of identifying resources within a reasonable proximity to the Project alignment and for providing greater flexibility to further avoid and minimize impacts as design advanced. The potential wetland impact baseline within the Design Corridor was 49 acres prior to the application of any avoidance and minimization measures. The baseline impacts to streams within the Design Corridor was 9,473 linear feet.

As a part of the avoidance and minimization process, VDOT evaluated the merits of modifying the following three design elements:

1. Horizontal Alignment: A horizontal alignment shift to primarily avoid but to also minimize impacts to each wetland group. Several horizontal shifts were applied to the project as a direct result of the avoidance and minimization meetings and discussions with USACE, EPA, and VDEQ.
2. Vertical Alignment: Vertical alignment shifts to reduce the impact of roadway fill slopes and in turn minimize wetland impacts. Wherever possible, across the entire length of the project, the engineering team lowered the proposed vertical profile for the roadway in an attempt to further reduce wetland impacts, while balancing any vertical alignment adjustments against drainage design requirements.
3. Typical Section: A modification to the typical section to reduce wetland impacts based on reducing the section width and increasing the side slope steepness. Section modifications included the use of guardrail at the outside shoulder to reduce clear zone requirements, retaining walls at the edge of shoulders to reduce the side slope footprint, and median barriers to reduce the median width.

As a result of the avoidance and minimization measures, the project will result in a reduction of permanent impacts (including cut/fill, permanent conversion from bridge shading and clearing of right-of-way outside

of the fill prism, and secondary impacts) to 39.77 acres of vegetated wetlands and 6,874 linear feet of stream. The acreage of wetland impacts is small in relation to the total amount of wetlands within the HUCs, as seen in **Table 3.4-1**.

Table 3.4-1: Wetland Impacts Compared to Wetlands Within Each HUC

HUC	Wetland Impacts[1]	Wetlands within Each HUC [1,2]	Percent of Wetlands in HUC Impacted by the Preferred Alternative
03010202 (HUC-8)	15 acres	206,399 acres	0.007%
0301020203 (HUC-10)	15 acres	68,664 acres	0.022%
030102020304 (HUC-12)	15 acres	16,195 acres	0.093%
02080208 (HUC-8)	24 acres	318,578 acres	0.008%
0208020801 (HUC-10)	24 acres	121,724 acres	0.020%
020802080102 (HUC-12)	10 acres	13,415 acres	0.075%
020802080103 (HUC-12)	14 acres	8,156 acres	0.172%

[1] Acreage is rounded to the nearest whole number; acreage is not cumulative among HUC-8, HUC-10, and HUC-12.
[2.] The acreage of wetlands in each HUC-8 and HUC-12 was estimated by comparing the delineated wetlands to the NWI wetlands within the LOD and applying the same factor to the NWI wetlands within the HUC-8 and HUC-12.

3.4.6.2 Compensatory Mitigation

In 2008, USACE and EPA issued regulations (33 CFR §325 and 332, the "Mitigation Rule") governing compensatory mitigation for activities authorized by permits issued by USACE. The regulations establish performance standards and criteria for the use of permittee-responsible compensatory mitigation, mitigation banks, and in-lieu programs to improve the quality and success of compensatory mitigation. Compensatory mitigation is a critical tool in helping the federal government to meet the longstanding national goal of ''no net loss'' of wetland acreage and function. Function means the physical, chemical, and biological processes that occur in ecosystems. The Mitigation Rule emphasizes a watershed approach to compensatory mitigation and presents the following "preference hierarchy" for compensatory mitigation (in order of preference):

- **Mitigation Banking:** A wetlands mitigation bank is a wetland area that has been restored, established, enhanced, or preserved, which is then set aside to compensate for future conversions of wetlands for development activities. Permittees, upon approval of regulatory agencies, can purchase credits from a mitigation bank to meet their requirements for compensatory mitigation. The value of these "credits" is determined by quantifying the wetland functions or acres restored or created. The bank sponsor is ultimately responsible for the success of the project. Mitigation banking is performed "off-site," meaning it is at a location not on or immediately adjacent to the site of impacts, but generally within the same watershed. Federal regulations establish a flexible preference for using credits from a mitigation bank over the other compensation mechanisms. Mitigation banking is a form of "third party" compensation, where the liability for project success is transferred to the mitigation bank.
- **In-Lieu-Fee Mitigation:** In-lieu-fee mitigation is mitigation that occurs when a permittee provides funds to an in-lieu-fee (ILF) sponsor (a public agency or non-profit organization). Usually, the sponsor collects funds from multiple permittees in order to pool the financial resources necessary to build and maintain the mitigation site. The ILF sponsor is responsible for the success of the mitigation. Like banking, ILF mitigation is also "off-site," but unlike mitigation banking, it

typically occurs after the permitted impacts. Similar to mitigation banking, ILF mitigation is a form of "third party" compensation, where the liability for project success is transferred to the ILF sponsor. In Virginia, the ILF program is administered as the Virginia Aquatic Resources Trust Fund Program Instrument (VARTF). It is a binding agreement among the USACE Norfolk District, DEQ, and the Nature Conservancy of Virginia (TNC). This agreement details the VARTF, which allows land owners and developers to offset their project's impacts on Virginia's streams, rivers, and wetlands. When the impact to a wetland, stream, or river is minimized but remains unavoidable, the program allows permit applicants to pay into a trust fund. This trust fund is used for aquatic resource creation or restoration. The overall goal of the program is a no-net-loss of wetland acreage. The TNC administers the program by providing a web-based portal to submit project documentation, receive payment vouchers, and to serve as a regulatory clearinghouse for verifying impacts, watersheds, payments, and verifications under the Final Rule.

- **Permittee-Responsible Mitigation:** Permittee-responsible mitigation involves the restoration, establishment (*i.e.*, creation), enhancement, or preservation of wetlands undertaken by a permittee in order to compensate for wetland impacts resulting from a specific project. The permittee performs the mitigation after the permit is issued and is ultimately responsible for implementation and success of the mitigation. Permittee-responsible mitigation may occur at the site of the permitted impacts or at an off-site location within the same watershed. With permittee-responsible mitigation, the permittee maintains liability for the construction and long-term success of the site.

Under the Mitigation Rule, compensatory mitigation may be performed through four methods: restoration, enhancement, establishment, and in certain circumstances, preservation. Restoration should generally be the first option considered because the likelihood of success is greater and the impacts to potentially ecologically important uplands are reduced compared to establishment, and the potential gains in terms of aquatic resource functions are greater, compared to enhancement and preservation. The four compensatory mitigation methods are as follows:

- **Restoration:** Re-establishment or rehabilitation of a wetland or other aquatic resource with the goal of returning natural or historic functions and characteristics to a former or degraded wetland. Restoration may result in a gain in wetland function or wetland acres, or both. Restoration is divided into two categories: re-establishment and rehabilitation.
    - Re-establishment means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.
    - Rehabilitation means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.
- **Establishment (Creation):** The development of a wetland or other aquatic resource where a wetland did not previously exist through manipulation of the physical, chemical and/or biological characteristics of the site. Successful establishment results in a net gain in wetland acres and function.
- **Enhancement:** Activities conducted within existing wetlands that heighten, intensify, or improve one or more wetland functions. Enhancement is often undertaken for a specific purpose such as to improve water quality, flood water retention, or wildlife habitat. Enhancement results in a gain in

wetland function, but does not result in a net gain in wetland acres.

- **Preservation:** The permanent protection of ecologically important wetlands or other aquatic resources through the implementation of appropriate legal and physical mechanisms (*i.e.*, conservation easements, title transfers). Preservation may include protection of upland areas adjacent to wetlands as necessary to ensure protection or enhancement of the aquatic ecosystem. Preservation does not result in a net gain of wetland acres and may only be used in certain circumstances, including when the resources to be preserved contribute significantly to the ecological sustainability of the watershed.

When considering options for successfully providing the required compensatory mitigation, the USACE district engineer shall consider the type and location options in the order presented in §332.3 (b)(2) through (b)(6) of this section, i.e.: mitigation bank credits; in-lieu fee program credits; permittee-responsible mitigation under a watershed approach; permitee-responsible mitigation, on-site and in-kind; permittee-responsible mitigation, off-site and/or out-of-kind. However, the Mitigation Rule also states that when evaluating compensatory mitigation options, the USACE district engineer will consider what would be environmentally preferable. In making this determination, the district engineer must assess the likelihood for ecological success and sustainability, the location of the compensation site relative to the impact site and their significance within the watershed, and the costs of the compensatory mitigation project. Compensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a permit.

A wetland functional assessment (see **Section 3.4.3.2.1**) was conducted in part to help determine the type and amount of compensation required for the Project that would adequately replace the lost wetland acreage and functions. The functional assessment resulted in FCI scores for each wetland. Impacted wetlands were divided into two categories by the interagency team based on a combination of FCI scores, site-specific knowledge, and best professional judgement. These categories helped determine the type and amount of required compensation, as described below.

3.4.6.2.1 Category I Wetlands

Category I wetlands are those for which in-kind compensation is available through current mitigation banking credits. In general, Category I wetlands have lower FCI scores when compared to other wetlands within the project corridor. These wetlands comprise all of the mineral flat wetlands and the lower functioning riverine wetlands within the project corridor. Compensation for impacts to Category I wetlands will be achieved through purchase of wetland credits from approved mitigation banks with the ratios typically applied in Virginia – 2:1 for forested wetlands; 1.5:1 for scrub-shrub wetlands, and 1:1 for emergent wetlands. VDOT proposes to compensate for permanent impacts to 9.303 acres of Category I wetlands located in the Blackwater River sub-basin (HUC 03010202) through the application of 13.6 wetland credits previously purchased from the Halifax Farm mitigation bank. VDOT proposes to compensate for permanent impacts to 18.349 acres of Category I wetlands located in the Hampton Roads sub-basin (HUC 02080208) through the application of 32.1 wetland credits previously purchased from the Great Dismal Swamp Restoration Bank – Lewis Farm Mitigation Bank. These ratios will compensate for the wetland acreage and functions lost by Category I wetlands as a result of the proposed project.

3.4.6.2.2 Category II Wetlands

Category II wetlands are those wetlands for which in-kind compensation is not available through current mitigation banking credits. Moreover they are characterized by high ecological function (e.g., FCI), relatively uncommon occurrence in Virginia, and are difficult to replace. In general, Category II wetlands

have higher FCI scores compared to Category I wetlands and typically consist of bald cypress/tupelo wetlands and bottomland hardwood wetlands that are seasonally inundated to permanently saturated.

During pre-application coordination meetings, the USACE, EPA, and VDEQ indicated that because of the reasons above, currently available credits from mitigation banks would not adequately compensate for the lost functions of these wetlands and that any such compensation would be considered "out-of-kind". Therefore, VDOT is proposing to compensate for impacts to Category II wetlands through project-specific mitigation solutions, described below.

3.4.6.2.3 Functional Loss Determination

Using the HGM methodologies, the functional loss of Category II wetlands impacted by the proposed project was determined by scoring the wetlands in their existing, pre-construction conditions as well as their projected post-construction conditions. The functional loss for each post-construction impact was based on one of four categories of impact:

- **cut/fill** – where no wetland functions remain after construction;
- **permanent right-of-way conversion** - where a partial loss of wetland function is realized, mainly due to cleared vegetation;
- **bridge conversion**, where a partial loss of wetland function is realized, mainly due to cleared vegetation; and,
- **secondary impacts**, where no wetland functions remain after construction.

Following is a summary of the functional loss associated with each category:

In the Blackwater River sub-basin, a total of 3.79 acres of permanent cut/fill impacts to PFO, PSS, and PEM Category II wetlands are expected as a result of the project. In the Hampton Roads sub-basin, a total of 2.62 acres of permanent cut/full impacts to PFO Category II wetlands are expected as a result of the project. Cut/fill impacts will result in a loss of all wetland functions within the immediate footprint of the impact.

In the Blackwater River sub-basin, a total of 1.303 acres of permanent right-of-way conversion impacts to PFO and PSS Category II wetlands are expected as a result of the project. In the Hampton Roads sub-basin, a total of 0.4280 acres of right-of-way conversion impacts to PFO Category II wetlands are expected as a result of the project. Because forested and scrub-shrub vegetation will be permanently converted and maintained as emergent vegetation, the loss of vegetation structure is the primary impact to the wetland.

In the Blackwater River sub-basin, a total of 1.026 acres of bridge conversion impacts to PFO Category II wetlands are expected as a result of the project. In the Hampton Roads sub-basin, a total of 2.875 acres of bridge conversion impacts to PFO Category II wetlands are expected as a result of the project. Because vegetation will be maintained, the temporal loss of vegetation will be the most apparent parameter lost.

In the Blackwater River sub-basin, a total of 0.071 acres of secondary impacts to PFO Category II wetlands are expected as a result of the project. In the Hampton Roads sub-basin, no secondary impacts to Category II wetlands are expected as a result of the project. Secondary impacts will result in a loss of all wetland functions.

3.4.6.2.4 Restoration

VDOT is proposing to restore approximately 20.99 acres of degraded/impounded Category II wetlands. The goal of the proposed restoration sites is to restore natural/historic functions to aquatic resources that have been significantly degraded from impoundment. VDOT conducted an initial search to identify sites that could offer potential Category II wetland restoration in the Blackwater River (03010202) and Hampton Roads sub-basins (HUC 02080208) by reviewing a variety of sources including aerial imagery, NWI maps, United States Geological Survey (USGS) maps, and other publically available sources. In general, three major categories of disturbed wetlands occur in the vicinity of the project corridor:

- farmed wetlands that currently have wetland hydrology but through repeated disturbance are not functioning as mature wetlands;
- prior converted wetlands that have been drained and cleared for crop or timber production and do not currently exhibit wetland hydrology; and,
- wetlands that have been degraded though flooding from diking/impounding.

Farmed wetlands and prior converted wetlands were typically wet mineral flats and other non-riverine wetlands that were dry enough, at least during some portion of the growing season, to effectively drain, if necessary, and work the land. Riverine wetlands and swamps were typically not as easily drained and cultivated and therefore represent a very small percentage of converted wetlands. Thus, the majority of alteration or degradation to Category II wetlands was in the form of diking or impounding. Because of this, restoring farmed wetlands and prior converted wetlands typically results in restoration of Category I wetlands and not Category II wetlands unless significant excavation is performed. For this reason, VDOT's search focused on diked/impounded areas that are situated adjacent to existing Category II wetlands and would have likely been Category II wetlands prior to conversion.

Likelihood of success was also considered during site selection. Characteristics that were considered include the presence of NWI mapped wetlands with water regimes characteristic of Category II wetlands, the presence of NRCS mapped hydric soils, and aerial signatures of Category II wetlands. A total of seven sites (two sites in the Hampton Roads watershed and five sites in the Blackwater River watershed) were considered. A field reconnaissance was conducted for each of the sites to determine suitability – two sites in Hampton Roads and two sites in Blackwater River sub-basins were determined to possess qualities that would provide restoration of Category II wetlands and, therefore, were selected as mitigation sites for the project.

The plans developed for each restoration site were designed to approximate as closely as possible the pre-impounded, historic footprint of the degraded wetland. To the extent practicable, modification of the existing contours will be kept to a minimum and will be used mainly to re-establish pre-impounded, historic contours. The footprint of the restored wetland may vary slightly form the historic limits, but will be mostly be within the limits of the historic footprint of the pre-ponded wetland.

In order to determine functional uplift of each potential mitigation site, FCI scores were calculated for the existing, pre-construction conditions, as well as what the FCI score would be immediately after removing impoundments. This change would show what functional uplift is provided without any further implementation of site design. When impoundments are removed, model variables such as $V_{SOILPERM}$, the permeability of the soil; V_{PORE}, the porosity of the soil; and V_{FREQ}, the flooding frequency of the soil would change as hydrology returns to historic conditions. Then the FCI score was calculated for post-construction conditions to determine what the functional uplift would be from establishment of a site. Model variables

such as V_{COMP}, the composition of plant communities; V_{GVC}, the amount of groundcover, and V_{WD}, the volume of woody debris would increase due to the establishment of a site. The results of this analysis show that the proposed restoration sites would offset the functional loss as a result of the construction of the FHWA/VDOT Preferred Alternative.

3.4.6.2.5 Preservation

Successful establishment of shrubs and trees within the restoration sites will take several years. According to the assessment models, the proposed restoration sites will adequately replace functions and acreage that would be lost as a result of the project; however, the assessment models are not sensitive enough to fully account for temporal loss of vegetative structure. In order to replace the temporal loss of late successional and climax communities, VDOT is proposing to preserve approximately 100 acres of mature bald cypress/tupelo wetlands located along the Blackwater River and Antioch Swamp, referred to hereafter as the Antioch Tract (which includes three parcels in Isle of Wight County).

Preservation of the Antioch Tract would add approximately 164.5 acres (including 100 acres of mature bald cypress/tupelo wetlands) to the 1,017-acre Antioch Pines Natural Area Preserve owned by the DCR. It has two miles of frontage along the Blackwater River, a state-designated scenic waterway, and one mile along Antioch Swamp. These waterways support occurrences of several rare plants and animals including the state rare eastern lampmussel (*Lampsilis radiata*, G5/S2S3/NL/NL), and are designated by DCR as the Antioch Swamp Stream Conservation Unit. The property also lies within the Zuni Pine Barrens Conservation Site which encompasses 68 occurrences of rare plants and animals and significant natural communities. The Antioch Tract is also home to the largest single specimen of overcup oak in the United States. A significant number of rare species could be restored to the property's uplands through habitat management. The landowner has expressed interest in permanently conserving the property and DCR has indicated a desire to serve as the long-term land steward.

Through the purchase of 45.7 mitigation bank wetland credits, restoration of 20.99 acres of degraded Category II wetlands, and preservation of 100 acres of mature bald cypress/tupelo wetlands identified by DCR as having significant ecological value, VDOT will compensate for losses associated with wetland impacts that will result from the project.

3.4.6.2.6 Streams

Required compensation for permanent stream impacts was determined using stream scores derived from the January 2007 Unified Stream Methodology (USM) for use in Virginia that was developed jointly by USACE and VDEQ. Streams were assessed using Form 1 (perennial/and intermittent streams) and Form 1a (ephemeral streams) of the USM to assign a Reach Condition Index (RCI) to each stream reach. The RCI was then be used to calculate compensation requirements for stream impacts associated with the project. Parameters used to determine RCI include channel condition, riparian buffers, instream habitat/available cover, and channel alteration.

To compensate for stream impacts due to construction of the project, VDOT will purchase a total of 8,873 stream credits. In the Blackwater sub-basin, 2,354 stream credits will be purchased from approved mitigation banks. In the Hampton Roads sub-basin, a combination of 6,519 approved stream credits from mitigation banks and "advance credits" from the Virginia Aquatic Resources Trust Fund (VARTF) will be purchased.

3.4.6.2.7 Jurisdictional Ditches

The majority of the Project's jurisdictional ditch impacts (8,449 linear feet) are to ditches that were constructed along roads for the purpose of conveying stormwater from the road surface. The remaining impacts (890 linear feet) are to ditches that convey water from agricultural and recreational fields. The current function of the ditches is to convey water. The Project has been designed to adequately convey all water in and around the road and is, therefore, compensating for any temporary impact to the primary function of the ditches, which is to convey water.

3.4.6.2.8 Navigable Waters of the U.S. (Section 10 Waters)

Impacts to the navigability of Section 10 waters will be closely coordinated with USACE and other relevant agencies and will be minimized to the maximum extent practicable. A navigation channel opening will be maintained during the majority of the construction period, which will be marked appropriately, with signage at a sufficient distance up and downstream to alert river users. All impacts to navigation are anticipated to be temporary, and navigability should be restored after completion of construction. It may be necessary to provide temporary portage options during construction.

3.4.6.2.9 Ponds

The project will also result in impacts to seven open water wetlands (*i.e.*, ponds); however, compensation is typically not required for losses of ponds and impoundments. These areas were avoided where practicable. Compensation was not proposed by VDOT for these ponds; however, USACE has determined that compensation is required for four of the ponds that were impounded streams.

3.4.6.3 Temporary Impacts to Wetlands and Streams

To reduce temporary impacts, avoidance and minimization measures were employed similar to permanent impacts. Where practicable, the existing natural root mat, stumps, and herbaceous vegetation will be used as a base for any temporary access routes. Geotextile fabric will be placed on the existing surface and BMPs will be used for all stream crossings such as temporary ground protection wooden mats, prefabricated equipment pads, or washed free-draining aggregate placed on geotextile fabric. All mats, aggregate and fabric will be removed after construction is complete. All temporarily impacted streams, ponds and wetlands will be restored to preconstruction elevations once construction is completed and compacted soil will be loosened by ripping or other approved methods. Temporarily impacted areas will be seeded or planted with the same vegetative cover type originally present in the area, including supplemental erosion control grasses if necessary. A specific planting plan for temporarily impacted areas will be developed as the Project advances to final stages of design. Compensatory mitigation is not proposed for temporary impacts to wetlands, streams, and ponds.

3.5 AQUATIC BIOLOGY

3.5.1 Introduction

This section describes the aquatic biological resources associated with the Inventory Corridor. The purpose of this section is to identify and analyze the environmental consequences resulting from the proposed improvements. Resources discussed include vertebrate and invertebrate aquatic wildlife.

A wide diversity of aquatic habitat is present within the Inventory Corridor. These habitats provide valuable resources for many aquatic and water-dependent species. Riparian corridors along the Blackwater River and larger tributaries contribute to regional biodiversity. The biodiversity of certain stream segments has

been adversely affected by nonpoint source pollution (increased sedimentation, nutrient loading, and fecal coliform) over a long history of timbering and agricultural practices (particularly those associated with livestock management). The biodiversity of streams in urbanized areas has been affected by channel modifications and by point and nonpoint source pollution. Biodiversity-ranked aquatic communities known as Stream Conservation Units (SCUs) designated by VDCR-DNH are discussed in more detail in the Regional Biodiversity section, **Section 4.1.3.4,** of this document.

3.5.2 Methodology

Information on the aquatic biological resources in the Inventory Corridor was compiled from readily available reference sources for fisheries and wildlife information in the Commonwealth. The DGIF's Fish and Wildlife Information Service (VAFWIS) was utilized for obtaining fish and wildlife species and habitat information (DGIF, 2014a). This online service provides a listing of historic and recently confirmed observations of species within a certain geographic area. The VDEQ Ecological Data Application System (EDAS) datasets were utilized to obtain benthic invertebrate family occurrence data for the Inventory Corridor (VDEQ, 2014d). Both of these datasets draw from past monitoring and collection events.

3.5.3 Findings

3.5.3.1 Fish Species and Associated Habitat

The Inventory Corridor contains a variety of aquatic habitat including coastal plain streams, stream swamp systems, ponds, and rivers. These varied aquatic habitats contain a wide diversity of fish species. Based on a review of DGIF's VAFWIS, 99 fish species are known or have the potential to occur in the Inventory Corridor (DGIF, 2014a). Members of the sunfish (*Lepomis* spp.), darter (*Percina* spp. and *Etheostoma* spp.), dace (*Rhinichthys* spp. and *Clinostomus* spp.), minnow (*Pimephales* spp. and *Hybognathus* spp.), and shiner (*Notropis* spp., *Notemigonus* spp., *Cyprinella* spp., and Luxilus spp.) families have been recorded. Game species such as largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), and bluegill (*Lepomis macrochirus*) have been documented (DGIF, 2014a). Other recreationally important fish species found in the Inventory Corridor include channel catfish (*Ictalurus punctatus*), bowfin (*Amia calva*), yellow perch (*Perca flavescens*), and chain pickerel (*Esox niger*). All fisheries in the Inventory Corridor are warmwater fisheries. There are no Natural Trout Waters or Stockable Trout Waters located within the Inventory Corridor (DGIF, 2014a).

Numerous intermittent streams are located in the Inventory Corridor and typically do not support permanent populations of fish; however, they provide seasonal breeding grounds for some fish species and temporary refuge for juveniles. Additionally, intermittent streams are important to fish resources primarily as seasonal sources of water and nutrients delivered downstream to more suitable fish habitats. Intermittent stream channels contribute nutrients to downstream reaches from primary production and leaf litter. Productivity of perennial streams depends on delivery of materials from intermittent stream channels (Reid and Ziemer, 1994).

Native and non-native fish species, including gamefish, have been introduced to the Inventory Corridor through stocking of farm ponds by private landowners, generally for private recreation. Commonly stocked fish include largemouth bass, bluegill, redbreast sunfish (*Lepomis auritus*), pumpkinseed (*Lepomis gibbosus*), black crappie (*Pomoxis nigromaculatus*), red-ear sunfish (*Lepomis microlophus*), and channel catfish (DGIF, 2014a). Many of the stocked fish species have escaped the original stocking location into adjacent streams, expanding the range of these species.

Essential Fish Habitat (EFH) is defined by the Magnuson-Stevens Fishery Conservation and Management Act, amended in 1996, as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802 (10)). EFH regulations apply largely to marine fisheries, but are also applicable to freshwater spawning waters for anadromous species. The Inventory Corridor is located in the divide between the James River/Chesapeake Bay drainage. Both drainages have several species of anadromous fish; however, no designated anadromous fish waters are located within the Inventory Corridor. The closest designated anadromous fish water is located on the Blackwater River with the upstream boundary located approximately one mile above Route 603 in Isle of Wight County. No EFH is located within the Inventory Corridor.

3.5.3.2 Benthic Communities

Benthic macroinvertebrates are common inhabitants of streams and ponds within the Inventory Corridor. These organisms usually inhabit bottom substrates for at least part of their life cycle. Macroinvertebrates commonly found include arthropods, annelids, crustaceans, and mollusks. Arthropods observed in Inventory Corridor water bodies include mayflies (Order *Ephemeroptera*), stoneflies (Order *Plecoptera*), caddisflies (Order *Trichoptera*), true bugs (Order *Hemiptera*), dragonflies (Order *Odonata-Anisoptera*), damselflies (Order *Odonata-Zygoptera*), true flies (*Order Diptera*), and butterflies/moths (Order *Lepidoptera*). Annelids include leeches (Order *Hirudinea*) and oligochaete worms (Orders *Haplotaxida* and *Opisthopora*). Crustaceans and mollusks include freshwater clams (Order *Veneroida*), aquatic snails (Order *Gastropoda*), freshwater mussels (Order *Unionoida*), crayfish and shrimp (Order *Decapoda*). According to the VDEQ EDAS database, over 150 families of benthic macroinvertebrates have been observed in Virginia's Coastal Plain streams and ponds over the last 4 years (VDEQ, 2014d). The most abundant families include *Chironomidae*, *Hydropsychidae*, *Elmidae*, *Heptageniidae*, and *Ephemerellidae*. Because different groups of macroinvertebrates have different tolerances to the chemical and physical characteristics of water bodies, the species compositions within different water bodies may differ depending on the bottom substrate and quality of the water.

3.5.3.3 Waterfowl and Other Water-Dependent Migratory Birds

Waterfowl occur in a wide variety of habitats including agricultural fields, forests, and wetlands; however, waterfowl generally depend on the aquatic habitats within the Inventory Corridor for food and nesting habitat. Riparian areas along both perennial and intermittent channels are particularly rich in insects and fruit, providing important food sources for water-dependent species. Many species prefer patches of riparian vegetation as a part of their territory, even if they do not depend fully upon them. Additionally, the streams and ponds provide habitats for aquatic plants, aquatic invertebrates, fish, and amphibians, which in turn provide food resources for waterfowl. River segments with open tree canopy, farm ponds, and the wetlands surrounding these areas provide suitable habitat for a variety of waterfowl. More stable wetland communities contain mature living trees and standing dead trees suitable for cavity nesting species. Agricultural fields lack plant diversity and have a relatively high level of disturbance compared to wetland habitats, which limits their viability for wildlife. However, depending on the time of year and type of crop, water-dependent species could use agricultural lands on a limited basis for refuge and foraging.

Waterfowl and wading species that occur in the Inventory Corridor include double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), great egret (*Ardea alba egretta*), tricolored heron (*Egretta tricolor*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), American black duck (*Anas rubripes*), hooded merganser (*Lophodytes cucullatus*), and wood duck (*Aix sponsa*) (DGIF, 2014a). The majority of these species occur as winter residents or spring

and fall migrants. Species such as the great blue heron, green heron, Canada geese, mallards, and wood ducks nest within the Inventory Corridor.

Waterways, water bodies, and wetlands within the Inventory Corridor provide suitable habitat for a number of migratory bird species that are dependent on aquatic habitat for at least a portion of their life cycle. VAFWIS identifies 100 water-dependent migratory bird species listed for protection under the Migratory Bird Treaty Act that have the potential for occurrence within the Inventory Corridor (DGIF, 2014a). Out of the 100 water-dependent species, there are six species listed as a "Species of Management Concern" for the northeast region (USFWS, 1995). The "reason for concern" for two of these species, least bittern and northern harrier, is reported to be "dependence on vulnerable or restricted habitats". For the remaining four species, the USFWS-designated "reason for concern" is not directly linked to habitat loss. While VAFWIS indicates that 100 water-dependent species potentially exist within the Inventory Corridor, only 17 of these species have been recorded within the Inventory Corridor. American bittern and northern harrier are the only water-dependent migratory bird species observed within the Inventory Corridor that are listed as "Species of Management Concern".

3.5.3.4 Other Wildlife Species Associated with Aquatic Habitats

Aquatic habitats (including open waters and wetlands) provide food sources and denning for water-dependent animals. Aquatic habitats, including their associated riparian zones, may also be used as travel corridors within and between watersheds. Open water habitats may provide escape from terrestrial predators. Several water-dependent mammals, including river otter (*Lontra canadensis*), beavers (*Castor canadensis*), marsh rice rats (*Oryzomys palustris*), and muskrats (*Ondatra zibethicus*), have been observed in streams and wetlands within the Inventory Corridor. The northern water snake (*Nerodia sipedon sipedon*) and northern copperhead (*Agkistrodon contortrixccontortrix mokasen*) are also commonly found in wetlands within the Inventory Corridor, as are several species of aquatic turtles, including the eastern mud turtle (*Kinosternon subrubrum subrubrum*), eastern musk turtle (*Sternotherus odoratus*), northern red-bellied cooter (*Pseudemys rubriventris*), snapping turtle (*Chelydra serpentine*), eastern painted turtle (*Chrysemys picta*), and spotted turtle (*Clemmys guttata*) (DGIF, 2014a).

Amphibians are also very common in aquatic habitats of the Inventory Corridor. Most amphibians require open water to breed, and some need open water throughout the year to support their life cycles. Intermittent streams may be particularly important for young amphibians because these streams on average support fewer predators than perennial streams. Ephemeral ponds scattered throughout the mineral flatwoods in the Inventory Corridor also provide breeding habitat that may be suitable for amphibians, including listed threatened and endangered species such as the barking tree frog (*Hyla gratiosa*) and the Mabee's salamander (*Ambystoma mabeei*). Several species of frogs have been recorded or observed within the Inventory Corridor. These species include the eastern cricket frog (*Acris crepitans*), Brimley's chorus frog (*Pseudacris brimleyi*), Cope's gray tree frog (*Hyla chrysoscelis),* northern spring peeper (*Pseudacris crucifer*), southern chorus frog (*Pseudacris nigrita*), American bullfrog (*Lithobates catesbeianus*), southern leopard frog (*Lithobates sphenocephalus utricularius*), and the green frog (*Lithobates clamitans*). Common toads are the American toad (*Anaxyrus americanus*), southern toad (*Anaxyrus terrestris*), and Fowler's toad (*Anaxyrus fowleri*). Salamander and newt species that have been recorded and observed include the red-spotted newt (*Notophthalmus viridescens*), northern red-backed salamander (*Plethodon cinereus*), marbled salamander (*Ambystoma opacum*), and the spotted salamander (*Ambystoma maculatum*) (DGIF, 2014a).

3.5.4 Impacts

Aquatic organisms and their associated habitats will incur some impacts as a result of roadway construction, maintenance, and vehicular passage. These impacts may result from the movement and compaction of soils, thus causing alterations to hydrology, water quality, and habitat. The construction of bridges and culverts into and around water bodies may change the water velocity, depth, and sedimentation rates, which in turn could impact downstream habitat. These activities may also impede the normal movement of aquatic biota.

It is expected that construction activities would temporarily increase turbidity levels and sedimentation. Following construction, the expected traffic would impact water quality through vehicular deposition of pollutants. The pollutants in highway runoff generally include heavy metals, inorganic salts, aromatic hydrocarbons, and suspended solids (FHWA, 1998). Additional detail about water quality impacts is included in **Section 3.1-4.**

3.5.4.1 Fish Species and Associated Habitat

Fish assemblages within the Inventory Corridor are comprised of abundant and commonly occurring warmwater game and non-game species typical of Coastal Plain streams. Impacts to smaller streams and ponds (intermittent and early perennial streams) are important, as they act as breeding grounds for a number of fish species and their prey. Without implementation of best management practices and low-impact hydraulic design measures, direct effects to warmwater fisheries of the Inventory Corridor could include loss of habitat and impediments to upstream/downstream migration. With proposed spanning of major streams on structures and minimizing the amount of fill placed in the vicinity of stream crossings, direct effects to warmwater fisheries habitat or fish populations will be minor. Given the large number of warmwater fishery streams in the vicinity, the minor proposed loss of streams is not anticipated to have a substantial effect on fisheries.

All seven of the ponds being permanently impacted by the project were created within stream/wetland complexes and likely harbor fish assemblages. Two of the ponds are being actively managed for aquaculture. As such, they are frequently drawn down, cleaned, and restocked and would, therefore, contain little, if any, natural fish communities. The remaining five ponds are very small and may or may not be stocked with game fish for recreational fishing. Ponds that are not fully drained as a result of the project would be expected to maintain a similar level of fish assemblage after project construction is completed and the ponds re-stabilize. Impacts to the ponds are expected to have a minimal effect on fisheries.

3.5.4.2 Benthic Communities

Benthic macroinvertebrates would be affected by construction of the project. Habitat would be temporarily affected by changes in turbidity and sedimentation rates. Community diversity may be temporarily affected by clearing activities that would cause changes in acidity or alkalinity and temperature. Without best management practices being implemented during construction, such affects would be more intense and potentially damaging. Habitat within the footprint of any fill in aquatic systems would be permanently lost. However, the seasonal fluctuations and the itinerant nature of benthic communities would likely allow for any impacts to be more temporary than permanent, and provide for re-population of affected stream reaches post-construction. Stream impacts are accounted for in **Section 3.4.4.4**, above. It is anticipated that temporary and permanent impacts to benthic communities will be proportional to the length of stream bottom and ditches and area of open water (ponds) impacted by the FHWA/VDOT Preferred Alternative.

3.5.4.3 Waterfowl and Other Water-Dependent Migratory Birds

Minor effects on waterfowl and water-dependent migratory birds would occur during implementation of the FHWA/VDOT Preferred Alternative. The FHWA/VDOT Preferred Alternative would unavoidably cause habitat reduction, habitat fragmentation, and isolation of habitat within the Inventory Corridor.

Biota with life histories dependent on aquatic habitat, including waterfowl and water-dependent migratory birds, would be directly impacted from loss of wetlands, streams, and ponds. Road construction could lead to the placement of fill that would cause alterations to hydrology, water quality, and aquatic habitat. Impacts to waterfowl and water-dependent migratory birds would generally be related to construction activities that remove aquatic habitat. Construction of bridges and culverts, while avoiding complete removal of aquatic habitat, could still change water velocity, depth, and erosion and sedimentation rates, which could alter waterfowl movements. Generally, these birds would be expected to avoid the construction area and move to similar undisturbed habitats nearby; however, impacts could occur if disturbances result in increased stress, increased travel time to foraging areas from roosts or nest sites, or lower foraging success. These birds would be expected to repopulate in the vicinity of a given impact area after construction if conditions were favorable to their life history requirements and ecological tolerances. Additionally, roadway noise could result in impacts to waterfowl and water-dependent migratory birds, because roadway noise could alter habitat utilization, strain communication, and increase stress, since avian species are particularly vulnerable to such disturbance.

3.5.4.4 Other Wildlife Species Associated with Aquatic Habitats

Direct impacts on other wildlife species associated with aquatic habitat would be expected as a result of the FHWA/VDOT Preferred Alternative. Direct impacts to wetlands, streams, and ponds from construction and construction-related activities would result in certain losses of biota that are dependent on aquatic habitat. Additionally, direct impacts on habitat and habitat quality through fragmentation would occur. The presence of construction equipment and unavoidable disturbance of stream bottoms would result in both permanent and temporary losses of aquatic species. Organisms present at the time of displacement that could not migrate would experience the greatest impact through mortality relative to the local populations at the time. Most mammals, amphibians, and reptiles associated with aquatic habitat could translocate to adjacent or nearby areas that would be undisturbed or significantly less disturbed where they could re-populate.

Temporary and direct impacts to wildlife species would also be expected from land disturbance activities that remove vegetative cover of wetlands, streams, and ponds. Disturbance related to canopy removal would result in animal relocation and could create a situation that encourages development of opportunistic edge-dwelling communities. Direct impacts could also result from road operation as incidental death of aquatic-associated species could occur from collisions with vehicles. All of the impacts discussed here, such as fragmentation and removal of vegetative cover, would be less in the areas where the FHWA/VDOT Preferred Alternative is aligned along the existing location of Route 460, since these areas already experience fragmentation and disturbance from the existing road.

3.5.5 Mitigation

Mitigation involves avoiding and minimizing direct impacts. Impacts to aquatic-associated species would be minimized through project design, such as bridging and reducing roadway footprints. Bridges would minimize habitat impacts by allowing the natural hydrologic processes to remain largely intact. Additionally, culverts would be designed to maintain low-flow channels to minimize aquatic passage obstruction, primarily through countersinking new culverts below bottom. All roadway crossings would

utilize structures designed to adequately pass design floods and accommodate passage of aquatic organisms. VDOT has sized all culverts to maintain adequate hydrology under the new road. All new pipes will be countersunk six inches below the bottom of the stream to provide passage for aquatic species. Design and construction techniques which reduce water quality impacts and protect aquatic species, as described in the Virginia Stormwater Management BMP Clearinghouse, will be incorporated into the project. Techniques include stabilization of slopes, channels, swales, and embankments after construction activities are completed; minimization of excavation; installation of turbidity barriers around the area of construction; and prohibiting species specific activities during any required time of year restrictions. Stormwater management basins will be located outside of streams. Performing in-stream activities during low- or no-flow conditions will also mitigate impacts from run-off and sedimentation. In areas where work must be done within a stream, silt fencing and other engineering controls will be used to minimize run-off and sedimentation. Temporary construction activities would adhere to standard erosion and sediment controls and stormwater measures and the associated monitoring protocols. Temporary impacts would also be reduced by minimizing staging areas and construction access roads in valuable habitat areas. During final design, additional avoidance and minimization measures may be possible.

3.6 WILD AND SCENIC RIVERS

3.6.1 Introduction

The purpose of this section is to assess potential impacts to Wild and Scenic Rivers that may result from the FHWA/VDOT Preferred Alternative. The Wild and Scenic Rivers Act of 1968 was enacted to preserve remarkable scenic, recreational, geological, wildlife, historical, cultural, or other similar values along rivers or segments of rivers. The National Wild and Scenic Rivers System, managed by the National Parks Service (NPS), is intended to preserve the free flowing condition of the listed rivers, to protect their water quality, and to promote conservation. Eligible river segments are usually only accessible by trail and are free of impoundments.

The Virginia Scenic Rivers Act of 1970 protects rivers and segments of rivers in Virginia which possess scenic, recreational, and/or historic values. Scenic Rivers occur throughout Virginia and are evaluated on 13 different criteria when being proposed for State Scenic River status. These criteria include:

- Stream corridor vegetation
- Streambed and stream flow modifications
- Human development of visual corridor
- Historic features
- Landscape
- Quality of fishery
- Rare, threatened or endangered species
- Water quality
- Parallel roads
- Crossings
- Special features affecting aesthetics
- Recreational access
- Land conservation

3.6.2 Methodology

Presence or absence of designated Scenic Rivers within the vicinity of the Inventory Corridor was determined through review of the National Wild and Scenic Rivers system operated by NPS and the state-level Scenic Rivers program operated by VDCR.

Since there are no federal wild and scenic rivers within the vicinity of the Inventory Corridor, no information was obtained from the NPS national database. Information on state Scenic Rivers was obtained from the VDCR Blackwater Scenic River Report (VDCR, 2009a), the 2013 Virginia Outdoors Plan (VDCR, 2013), and the VDCR's Recreation Planning – Scenic Rivers Program webpage (VDCR, 2014b).

3.6.3 Findings

There are no National Wild and Scenic Rivers located in or immediately downstream of the Inventory Corridor.

According to the Virginia Outdoors Plan (VDCR, 2013), there is one State Scenic River that occurs within the Inventory Corridor, a portion of the Blackwater River, which was designated a State Scenic River in 2010 (see **Figure 3.6-1**). The Scenic River status for this section of the Blackwater River extends 56 miles and begins at Proctor's Bridge at U.S. Route 621 and terminates at the Virginia-North Carolina border where it joins the Nottoway River to form the Chowan River (VDCR, 2009a). The State Scenic River status was recommended for the Blackwater River due to the aesthetic and recreational qualities, its environs, the unique flora and fauna, and the historic setting of this river section. Approximately 500 feet of the State Scenic River segment of the Blackwater River runs through the Inventory Corridor.

The Blackwater River flows north-to-south through the Coastal Plain of eastern Virginia. The river corridor is a free-flowing, undefined, meandering river predominately forested with swamps, earthen bluffs, and occasional development. Forests along the Blackwater River are typically new-growth forests, characterized by tupelo, cypress swamps, upland pine stands, and hardwoods. Downed trees are common within the river, creating ideal beaver den habitat and creating braided channels during low water seasons. Agricultural land is typically 100 yards from the river channel, creating a riparian buffer between the river corridor and the agricultural land use. The Blackwater River corridor is primarily undeveloped, with the largest developed area being Zuni, located at the intersection of the Blackwater River and Route 460. Most other development along the river has occurred along roads at intersections of bridges where other small communities have developed (VDCR, 2009a).

Water quality for the State Scenic River portion of the Blackwater River is good, with no visible pollution despite the presence of tannin in the water which limits visibility. The river fully supports various aquatic life, wildlife, and recreation uses. The predominant recreational use of the Blackwater River is boating and fishing (VDCR, 2009a). However, the water quality rating is low for most activities within the Blackwater River. There are various health hazards for aquatic life and humans within the Blackwater River, including dissolved oxygen content in the water and high mercury levels in fish.

3.6.4 Impacts

Since there are no federally designated wild and scenic rivers in Virginia, there would be no impacts to national wild or scenic rivers.

Impacts to the state-listed Blackwater River would include both short- and long-term impacts. The FHWA/VDOT Preferred Alternative would span the Blackwater River with in the same location as the existing bridge, but with a wider bridge footprint and longer bridge (see **Figure 3.6-1**). Short-term impacts

would be expected from the presence of construction and construction equipment in the project area that crosses the Blackwater River watershed. Impacts from increased runoff and deforestation on water quality would be anticipated within the Blackwater River. Impacts related to construction would be short-term and minor as appropriate BMPs and mitigation measures would be implemented to reduce impacts. Negligible impacts to recreational uses of the Blackwater River such as boating or fishing would also be expected during construction as passage through the construction area may be impeded in the vicinity of the bridge construction. Portaging around this area would be possible.

The proposed Blackwater River bridge will be approximately 11 feet tall with associated approaches. Overall, this new structure will be more visible than the current bridge and would, therefore, impact the aesthetic and landscape resources of the Blackwater River and its scenic nature for users of the river. Alternatively, motorists crossing the Blackwater River would be afforded a much better and more scenic view of the Blackwater River.

3.6.5 Mitigation

The Blackwater River will be subjected to equipment noise, visual intrusions, and nonpoint source pollution during construction activities. These impacts will be mitigated through the use of BMPs and stormwater management techniques. Design and engineering measures would also be used to preserve the Blackwater River floodplains and areas along the Blackwater River where the FHWA/VDOT Preferred Alternative would intersect the river. Minimal tree clearing techniques would be utilized.

3.7 COASTAL ZONE MANAGEMENT RESOURCES

3.7.1 Introduction

The purpose of this section is to assess potential impacts to Coastal Zone Management Resources that may result from the FHWA/VDOT Preferred Alternative. The CZMA of 1972 and federal consistency regulations (15 CFR §930, Subpart D, §930.50 et seq.) stipulate that activities in Virginia's CMA which have a federal component (e.g., those requiring federal permits, licenses or approval) and can affect a Virginia coastal use or resource must be consistent with the enforceable policies of the CZMP. VDEQ administers the Virginia CZM Program through a network of state agencies and local governments, which share responsibility for administering the enforceable policies as follows: *Fisheries Management* (VMRC and DGIF), *Subaqueous Lands Management* (VMRC), *Wetlands Management* (VMRC and VDEQ), *Dunes Management* (VMRC), *Nonpoint Source Pollution Control* (VDEQ), *Point Source Pollution Control* (VDEQ, State Water Control Board), *Shoreline Sanitation* (VDH), *Air Pollution Control* (VDEQ, Air Pollution Control Board), and *Coastal Lands Management* (VDEQ).

Coastal uses include public access, recreation, fishing, historic or cultural preservation, development, energy infrastructure and use, hazard management, marinas, floodplain management, scenic and aesthetic enjoyment, and resource creation or restoration. Coastal resources include biological or physical resources that are found within a state's coastal zone on a regular or cyclical basis. Biological and physical resources include, but are not limited to, air, tidal and non-tidal wetlands, ocean waters, estuaries, rivers, streams, lakes, aquifers, submerged aquatic vegetation, land, plants, trees, minerals, fish, shellfish, invertebrates, amphibians, birds, mammals, and reptiles, etc.

The CMA is comprised of 29 counties, 15 cities, and 42 incorporated towns. It includes 5,000 miles of shoreline, the Potomac, Rappahannock, York, and James Rivers and all of the waters therein. In addition,

it encompasses parts of the Chesapeake Bay and Albemarle-Pamlico Sound watersheds and the entire watershed of Virginia's Atlantic Coast and out to the three nautical mile Territorial Sea Boundary.

3.7.2 Methodology

Information on the CMA and the CZMP enforceable policies was obtained from VDEQ's Coastal Zone Management website (VDEQ, 2014e). Sources reviewed for determination of the extent of the CMA within the FHWA/VDOT Preferred Alternative included topographic mapping, USFWS National Wetlands Inventory Mapping, Code of Virginia Erosion and Sediment Control Laws, VMRC's Subaqueous Lands Management Laws and Fisheries Management Laws, the VDEQ's guidance on point and nonpoint source pollution controls, Air Pollution regulations and Coastal Lands Management regulations, the DGIF's Wildlife Information Database, the VDH's Shoreline Sanitation database, and field reconnaissance.

3.7.3 Findings

One county and one city within the Inventory Corridor are in the CMA: the County of Isle of Wight and the City of Suffolk.

The proposed action would reasonably affect the coastal resources and uses pertaining to the following CZMP enforceable policies (a brief description of the policies is provided):

- Fisheries Management (VMRC and DGIF) - The program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. Implementation of the FHWA/VDOT Preferred Alternative would reasonably be expected to have an effect on the warmwater fisheries present within the vicinity of the Inventory Corridor due to construction in and around wetlands and waterbodies.
- Subaqueous Lands Management (VMRC) - The management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the VDEQ Water Division. Implementation of the FHWA/VDOT Preferred Alternative would reasonably be expected to have an effect on subaqueous lands due to construction in and around waterbodies.
- Wetlands Management (VMRC and VDEQ) - The purpose of the wetlands management program is to preserve tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetland preservation. The Virginia Water Protection Permit program includes protection of wetlands – both tidal and non-tidal. Implementation of the FHWA/VDOT Preferred Alternative would reasonably be expected to have an effect on the wetlands present within the vicinity of the Inventory Corridor due to construction in and around wetlands.
- Nonpoint Source Pollution Control (VDEQ) - Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth. Implementation of the FHWA/VDOT Preferred Alternative would reasonably be expected to have an effect on nonpoint source pollution due to soil disturbing construction activities.
- Point Source Pollution Control (VDEQ, State Water Control Board) – Implementation of the FHWA/VDOT Preferred Alternative would reasonably be expected to have an effect on point

source pollution due to soil disturbing construction activities.

- Air Pollution Control (VDEQ, Air Pollution Control Board) - The program implements the federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. Implementation of the FHWA/VDOT Preferred Alternative would reasonably be expected to have an effect on air pollution from construction vehicle emissions, fugitive dust, and from vehicles traveling on the right-of-way after construction.
- Coastal Lands Management (VDEQ) – Portions of the study area are within Chesapeake Bay Preservation Areas. Chesapeake Bay Preservation Areas feature Resource Protection Areas, which consist of a 100-foot-wide vegetated buffer area that starts at the edge of water (or wetlands or mean high water) and continues landward for 100 feet. This serves as a buffer between activities on the land and the water. However, public roads and appurtenant facilities are exempt from these regulations, provided they are consistent with certain conditions (9 VAC 10-20-150 B).

Implementation of the FHWA/VDOT Preferred Alternative would not reasonably be expected to affect the resources and uses of the following CZMP enforceable policies:

- Shoreline Sanitation (VDH) - The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth. Implementation of the FHWA/VDOT Preferred Alternative does not include the installation of septic tanks.
- Dunes Management (VMRC) - Dune protection is carried out pursuant to the Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes. This program is administered by the VRMC (Virginia Code §28.2-1400 through §28.2-1420). The Inventory Corridor does not contain dunes.

3.7.4 Impacts

The majority of the study area is within the jurisdiction of the CZMP. Impacts to fisheries from the FHWA/VDOT Preferred Alternative are described in **Sections 3.4.4.3 and 3.5.4.1**. Impacts to subaqueous lands are described in **Section 4.1.4**. Impacts to wetlands can be found in **Section 3.4.4**. Impacts from point and nonpoint source pollution are described in **Section 3.5.4**. Minor adverse air pollution impacts from construction would be short-term. Air pollution impacts during use would be long-term, minor adverse. All portions of the study area are in Maintenance/Attainment for all criteria pollutants. Impacts to coastal lands would result from point and nonpoint source pollution resulting from land disturbing activities in Chesapeake Bay Preservation Areas. The project is not expected to cause or contribute to a new violation of any NAAQS, increase the frequency or severity of any violation, or delay timely attainment of any NAAQS.

VDOT has provided the Commonwealth of Virginia with the Virginia Department of Transportation's (VDOT's) Consistency Certification and necessary data and information under Coastal Zone Management Act (CZMA) Section 307(c)(3)(A) and 15 CFR Part 930, subpart D, for the Project, seeking concurrence from DEQ that the proposed activity complies with the enforceable policies of Virginia's Coastal Zone Management Program (VCP) and will be conducted in a manner consistent with the Program.

3.7.5 Mitigation

Mitigation of impacts to fisheries is described in **Section 3.5.4**. Impacts to aquatic-associated species would be minimized through project design, such as bridging and reducing roadway footprints. Bridges would minimize habitat impacts by allowing the natural hydrologic processes to remain largely intact. Additionally, culverts would be designed to maintain low-flow channels to minimize aquatic passage obstruction, primarily through countersinking new culverts. Direct and indirect impacts on species associated with aquatic habitat would be mitigated to the maximum extent practicable through the use of BMPs, engineering controls, or other stormwater management techniques. Impacts to habitat would likely be offset in the watershed by habitat restoration or enhancement via wetland, stream, and riparian buffer mitigation sites. However, this replacement habitat would be at different locations from the impacted habitat in varying degrees.

Temporary construction impacts to fish and macroinvertebrates will be minimized through appropriate use of temporary stream crossing structures and strict adherence to erosion and sedimentation controls.

Temporary construction activities would adhere to proper erosion and sediment controls and stormwater BMPs to reduce impacts to adjacent water bodies. Stormwater management basins would be located outside of streams and rip rap will be placed at outfalls to prevent scour to streams. Performing in-stream activities during low- or no-flow conditions would also mitigate impacts from run-off and sedimentation. In areas where work must be done within a stream, silt fencing and other engineering controls would be used to minimize run-off and sedimentation. Temporary impacts could also be reduced by minimizing staging areas and construction access roads in valuable habitat areas, as described in **Section 3.5.5.1**.

Impacts to subaqueous lands are described in **Section 3.5**. Mitigation of impacts to wetlands can be found in **Section 3.4.5**.

Impacts to terrestrial habitats would be reduced through measures that reduce the roadway footprint or median as the design progresses. Bridging of more significant habitats and corridors will be a design consideration to help maintain habitat connectivity and avoid fragmentation, particularly in conjunction with aquatic crossings. While wetland habitats would be mitigated based primarily on Section 404 requirements, upland and riparian habitats could be included where feasible to provide connectivity and added-value. VDOT will continue to coordinate development of the mitigation plan with FHWA, USACE, and EPA, with input from the appropriate resource agencies such as USFWS, DGIF, and VDCR-DNH to address concerns with natural community impacts.

In general, examples of mitigation measures which may be employed to avoid impacts to biodiversity include shifting alignment to avoid habitat; spanning/bridging resources, especially SCUs; use of bottomless culverts; countersinking of new culverts; limiting clearing of existing vegetation to the greatest extent possible; strict adherence to erosion and sediment control guidelines and the implementation of stormwater BMPs; and adherence to maintaining applicable buffer for species habitat (EPA, 1994). For unavoidable direct impacts to natural communities and biodiversity, mitigation may also include habitat restoration and/or enhancement, conservation initiatives, riparian corridor restoration, establishment of vegetated buffers along field edges for edge habitat, and upland forest corridor restoration. Other means of mitigating these habitat impacts may include acquisition of lands to expand state Wildlife Management Areas. Such acquisition would be targeted at restoring, enhancing, or preserving forest lands critical to establishment or maintenance of wildlife corridors and migratory bird habitat within the region.

Additionally, measures such as expanding the size of existing State Natural Area Preserves may also be a viable mitigation option in cooperation with VDCR-DNH and TNC.

Avoidance and minimization measures have been applied to the greatest extent practicable. Avoidance and minimization measures may include but are not limited to the use and appropriate placement of erosion and sediment control measures and implementation of BMPs, including the use of upgraded erosion and sediment controls in environmentally sensitive areas; bridging and spanning of certain streams; alignment shifts to avoid parallel stream impacts and the resulting need for stream relocation; the use of cofferdams; footprint reduction including steepening of slopes and the use of retaining walls on steeper slopes; properly countersunk culverts; stream relocation utilizing natural channel design to improve skew angle and shorten culverts, if new culverts are necessary; and ensuring groundwater recharge/wetland hydrology maintenance through the location of outfalls and vegetated swales. During construction and after completion, stormwater generated from the FHWA/VDOT Preferred Alternative will be treated with updated stormwater management facilities and structures, as described in **Section 3.4.5.3**.

Mitigation of impacts from nonpoint source pollution is described in **Section 3.6.5**.

These impacts would be mitigated through the use of BMPs and stormwater management techniques, where applicable. Design and engineering measures would also be used to preserve the Blackwater River floodplains and areas along the Blackwater River where the FHWA/VDOT Preferred Alternative would intersect the river. Minimal tree clearing techniques would be utilized. Noise attenuation considerations will be considered during final design.

In order to mitigate air pollution emissions from construction, all construction activities would be performed in accordance with VDOT Road and Bridge Specifications. Impacts to coastal lands would be mitigated by adhering to both the Erosion and Sediment Control Law (§10.1-560 et seq. of the Code of Virginia) and the Stormwater Management Act (§10.1-603.1 et seq. of the Code of Virginia). In addition, the FHWA/VDOT Preferred Alternative would be constructed according to an approved erosion and sediment control plan and a stormwater management plan. With concurrence from VDEQ that the proposed activity complies with CZMP, adherence to these mitigation measures and the conditions of any required permits would provide consistency with the enforceable policies of the CZMP.

4.0 TERRESTRIAL RESOURCES

4.1 NATURAL COMMUNITIES, WILDLIFE HABITAT, AND BIODIVERSITY

4.1.1 Introduction

Portions of the Inventory Corridor have experienced noticeable alterations over the past several hundred years, primarily due to human activity. Agricultural and forestry practices throughout the study area as well as urbanization along the railroad, U.S. Route 460, and other major thoroughfares have removed, altered, and encroached on the various terrestrial wildlife habitats found in the Inventory Corridor; however, some remain relatively unaltered. The major terrestrial systems identified within the Inventory Corridor include hardwood and pine forests, agricultural lands (cropland and pasture), and brush/old field communities. The forested portions of these systems are made up of a variety of natural communities that provide greater opportunity for biodiversity than the agricultural lands and brush/old field communities. Areas with greater human-induced disturbance include current and former agricultural fields, as well as recent clearcuts that have yet to regenerate to forested systems.

4.1.2 Methodology

NOAA's 2010 Coastal Change Analysis Program (C-CAP) land cover dataset was utilized initially to review and identify general land uses, forest types, and other large-scale vegetation communities within the Inventory Corridor (NOAA 2010). The C-CAP land cover is based on data analyzed by NOAA, with land coverage classification adapted from the Cowardin wetland classification system (Cowardin, et al. 1979) and the Land Use and Land Cover Classification System for Use with Remote Sensor Data (Anderson, et al. 1976), also known as the "Anderson Land Use Classification".

Natural vegetation communities of the Inventory Corridor were classified according to The *Natural Communities of Virginia: Classification of Ecological Groups and Community Types* (Fleming et al., 2012, and 2013). Natural vegetation communities were identified and mapped in the field during the spring and summer of 2015. Onsite surveys were conducted to determine the natural community types based on *The natural communities of Virginia: Classification of ecological community groups, second approximation (version 2.6)* (Fleming et al., 2013). Natural community boundaries were estimated in the field and hand sketched on field maps using 2013 VGIN true color and color infrared aerial imagery as the base mapping, and then were later digitized in GIS to produce final shapefiles for analysis (See **Figure 4.1-1, Sheets 1-7**).

The VDCR's GIS database of natural heritage sites was reviewed for identification of unique communities. The data was contained within the 2015 Comprehensive Environmental Data and Reporting (CEDAR) System GIS database, updated April 2015, (VDOT 2015). The database contains three related datasets: Conservation Sites, General Location Areas for Natural Heritage Resources, and Karst Screening Areas. Conservation Sites include both terrestrial and aquatic data, and this dataset was the focus of the impact analysis contained herein as it contains the higher-value and most up-to-date occurrence information, per VDCR's metadata:

> "Conservation Sites represent key areas of the landscape worthy of protection and stewardship action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant or animal, or significant natural community or geological feature. Sites are designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. For rare aquatic species we define Stream Conservation Units (SCUs), which identify stream reaches that contain aquatic natural heritage resources, including upstream and downstream buffer and tributaries associated with this reach. There are almost 2000 terrestrial and SCU site records in the Conservation Sites coverage; these sites encompass all viable, recently-verified element occurrences documented in our databases. Conservation Sites and SCUs are given a biodiversity significance ranking based on the rarity, quality, and number of natural heritage resources they contain. Conservation Sites can be used to identify land management needs and protection priorities. They can also be used as a screening tool, to identify potential conflicts with development activities, and they can be used for proactive planning to ensure that development projects successfully avoid or enhance natural heritage resources."

4.1.3 Findings

4.1.3.1 Natural Communities

The Inventory Corridor contains three main terrestrial forest types: (1) deciduous forest, (2) evergreen forest, and (3) mixed evergreen/deciduous forest (NOAA 2010). While forested wetlands are addressed

as components of **Section 3.4** of this document, they are also included herein as some upland and wetland habitats are integrally linked, and sometimes very difficult to distinguish from one another above the ground surface. Terrestrial forest types comprise approximately 25 percent of the Inventory Corridor (or approximately 552 acres out of the 2153-acre Inventory Corridor). For purposes of this study, these forest types can be correlated to natural community types, as defined under *Natural Communities of Virginia: Classification of Ecological Groups and Community Types*. These forest communities are described in greater detail below and their correlation to Virginia Natural Communities are presented in **Table 4.1-1**. Although not formally recognized under the *Natural Communities of Virginia*, pine plantations within the Inventory Corridor can be thought of as an early-successional planted-pine variant of the Non-Riverine Flatwoods and Swamps.

Table 4.1-1: Ecosystem Classification Cross-Reference

C-CAP LAND COVER CLASSIFICATION	NATURAL COMMUNITIES OF VIRGINIA	ACREAGE WITHIN INVENTORY CORRIDOR
Deciduous Forest	Mesic Mixed Hardwood Forests	229.44
	Piedmont/Coastal Plain Oak-Beech/Heath Forests	113.28
	Bald Cypress-Tupelo Swamps	80.71
	Coastal Plain/Piedmont Bottomland Forests	100.6
	Coastal Plain Depression Wetlands	0.95
	Semipermanent Impoundments	5.84
Evergreen Forest	Non-Riverine Flatwoods and Swamps, Planted-Pine Variant	216.71
Mixed Forest	Pine/Scrub Oak Sandhills	1.37

Source: NOAA 2010, and Fleming et al., 2013

4.1.3.1.1 Deciduous Forests

Upland deciduous forests in the Inventory Corridor are primarily made up of low elevation mesic forests, including Mesic Mixed Hardwood Forests and Piedmont/Coastal Plain Oak-Beech/Heath Forests. These occasionally occur on north-facing slopes or bluffs, but are more often found on interstream (the area between streams) moist flatwoods. Repeated logging has reduced their extent in the Coastal Plain.

Mesic Mixed Hardwood Forests typical of the Inventory Corridor are comprised of mesophytic deciduous tree species such as American beech (*Fagus grandifolia*), tulip-poplar, white oak (*Quercus alba*), northern red oak (*Quercus rubra*), and sweet gum; although many have been impacted by forestry practices focused on faster yield of pulpwood, and loblolly pine now dominates those stands. This forest type typically occupies moist uplands, ravines, lower slopes, and well-drained "flatwoods" on acidic, relatively nutrient-poor soils. This forest type has generally been sheltered from the influence of fire by the topography and moisture of these sites. Common understory sapling and shrub species include flowering dogwood (*Cornus florida*), ironwood, black cherry (*Prunus serotina*), American holly, sourwood (*Oxydendrum arboretum*), red maple, red bay (*Persea borbonia*), sassafras (*Sassafras albidum*), American witch-hazel (*Hamamelis virginiana*), giant cane, lowbush blueberry (*Vaccinium vacillans*), and deerberry (*Vaccinium stamineum*). Common herbaceous species within the Inventory Corridor include seedlings of the aforementioned canopy and understory species, Christmas fern (*Polystichum acrostichoides*), river oats (*Chasmanthium laxum*),

Indian cucumber root (*Medeola virginiana*), and beech drops (*Epifagus virginiana*). Common vine species within the Inventory Corridor include poison ivy, Japanese honeysuckle, Virginia creeper (*Parthenocissus quinquefolia*), and common greenbrier. Approximately 229 acres of Mesic Mixed Hardwood Forests were identified in the Inventory Corridor.

The Piedmont/Coastal Plain Oak-Beech/Heath Forests of the Inventory Corridor are widely spread and occupy relatively small patches in the overall landscape. They are very similar to Mesic Mixed Hardwood Forests but tend to occupy drier, steeper slopes. This forest type is typically dominated in the overstory by white oak, American beech, water oak, and chestnut oak (*Quercus montana*). The understory and shrub layer tends to contain sourwood, American holly, blackgum, and common sweetleaf (*Symplocos tinctoria*). In most instances, there is little to no herbaceous layer. In the northwestern portion of Suffolk and northeastern portion of Isle of Wight, this community commonly includes disjunct populations of mountain laurel (*Kalmia latifolia*), a species more typically found in the mountains and western piedmont. Like the Mesic Mixed Hardwood Forests, these forests have been impacted by the same forestry practices focused on faster yields and whose tree canopy is now similarly dominated by loblolly pine, although the understory remains comprised of the typical species found in this community type. Approximately 113 acres of Piedmont/Coastal Plain Oak-Beech/Heath Forests were identified in the Inventory Corridor.

The wildlife utilizing these habitats includes many habitat generalists, but relatively few habitat specialists. The deciduous hardwood forests provide important sources of both hard and soft mast that are eaten by many bird and mammal species. Additionally, the oaks and beech trees often develop heart rot, allowing cavities to form that many species use as denning or nesting sites. As much as 42% of the bird and mammal species using these forests are cavity nesting or denning species (Benyus, 1989). Common mammals that utilize these habitats include white-footed mouse (*Peromyscus leucopus*), woodland vole (*Microtus pinetorum*), gray squirrel (*Sciurus carolinensis*), southern flying squirrel (*Glaucomys volans*), raccoon (*Procyon lotor*), gray fox (*Urocyon cinereoargenteus*), black bear (*Ursus americanus*), and white-tailed deer (*Odocoileus virginianus*). Bird species commonly found in these forests include the wild turkey (*Meleagris gallopavo*), Cooper's hawk (*Accipiter cooperii*), whip-poor-will (*Caprimulgus vociferus*), great crested flycatcher (*Myiarchus crinitus*), black-capped chickadee (*Parus atricapillus*), tufted titmouse (*Parus bicolor*), eastern wood peewee (*Contopus virens*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), northern flicker (*Colaptes auratus*), pileated woodpecker (*Dryocopus pileatus*), white-breasted nuthatch (*Sitta carolinensis*), ovenbird (*Seiurus aurocapillus*), blue-gray gnatcatcher (*Polioptila caerulea*), and black and white warbler (*Mniotilla varia*). Reptiles and amphibians commonly occurring in these habitats include eastern box turtle (*Terrapene carolina*), five-lined skink (*Eumeces fasciatus*), black rat snake (*Elaphe obsoleta obsoleta*), black racer (*Coluber constrictor*), marbled salamander, slimy salamander (*Plethodon glutinosus*), and spotted salamander.

The primary wetland natural communities that are dominated by deciduous forest include Bald Cypress-Tupelo Swamps, and Coastal Plain/Piedmont Bottomland Forests, Semipermanent Impoundments, and Coastal Plain Depression Wetlands. Wetland forests within the Inventory Corridor are discussed further in **Section 3.4.3**.

Bald Cypress-Tupelo Swamps are seasonally to semipermanently inundated and dominated by bald cypress, water tupelo, and swamp tupelo with varying densities of muck-tolerant herbs present. They often contain Carolina ash in the understory, with climbing hydrangea (*Decumaria barbara*) and coral greenbrier (*Smilax walteri*) as the most common vines present. Approximately 80 acres of Bald Cypress-Tupelo Swamps were identified in the Inventory Corridor.

Because this habitat is typically flooded for long periods of time, the wildlife that most commonly utilizes this habitat type includes aquatic species and tree canopy species. Mammals encountered in this community include water loving species such as the river otter and beaver, and tree dwelling species such as gray squirrel, raccoon, and Virginia opossum (*Didelphis virginiana*). Bird species commonly encountered include great blue heron, wood duck, double-crested cormorant, barred owl (*Strix varia*), red-shouldered hawk (*Buteo lineatus*), pileated woodpecker, red-bellied woodpecker (*Melanerpes carolinus*), hooded merganser, belted kingfisher (*Ceryle alcyon*), northern parula (*Parula americana*), prothonotary warbler (*Protonotaria citrea*), common grackle (*Quiscalus quiscula*), and American woodcock (*Scolopax minor*). Reptiles and amphibians occurring in this habitat type include mud snake (*Farancia abacura*), rainbow snake (*Farancia erytrogramma*), northern copperhead, northern watersnake, red-belly watersnake (*Nerodia erythrogaster*),eastern mud turtle, eastern musk turtle, northern red-bellied cooter, snapping turtle, eastern painted turtle, spotted turtle, eastern cricket frog, Brimley's chorus frog, Cope's gray tree frog, northern spring peeper, southern chorus frog, American bullfrog, southern leopard frog, green frog, and red-spotted newt.

Coastal Plain/Piedmont Bottomland Forests are a community with much variation across the landscape. They include temporarily to seasonally flooded floodplains and terraces with a wide array of species. Typical overstory species include shagbark hickory (*Carya ovata*), red maple, sweetgum, green ash, and sycamore. Deciduous holly (*Ilex decidua* var. *decidua*), Elliott's blueberry, and ironwood are common understory species, and the herbaceous layer is comprised of a variety of forbs, grasses and sedges that include *Carex typhina*, *Carex louisianica*, *Leersia lenticularis*, and lizard's tail. Approximately 101 acres of Coastal Plain/Piedmont Bottomland Forests were identified in the Inventory Corridor.

These forests serve as important wildlife corridors in the Inventory Corridor. Wildlife utilizing this habitat type include many of the species found in the Cypress-Tupelo community, but also include more terrestrial species that use the habitat to move from area to area. Mammals utilizing these riparian corridors include white-tailed deer, black bear, gray fox, coyote (*Canis latrans*), Virginia opossum, raccoon, bobcat (*Felis rufus*), mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), gray squirrel, southeastern shrew (*Sorex longirostris*), and southern short-tailed shrew (*Blarina carolinensis*). Bird species using these forests include red-shouldered hawk, sharp-shinned hawk (*Accipiter striatus*), barred owl, eastern screech owl (*Otus asio*), American crow (*Corvus brachyrhynchos*), northern waterthrush (*Seiurus novaeboracensis*), Carolina wren (*Thryothorus ludovicianus*), gray catbird (*Dumetella carolinensis*), eastern phoebe (*Sayornis phoebe*), mourning dove (*Zenaida macroura*), numerous woodpecker species, and numerous warbler, vireo, thrushes, and sparrow species. Reptiles and amphibians using these forests include eastern box turtle, northern copperhead, garter snake (*Thamnophis sirtalis*), black rat snake, eastern hognose snake (*Heterodon platirhinos*), canebrake rattlesnake (*Crotalus horridus atricaudatus*), black racer, pickerel frog (*Rana palustris*), southern leopard frog, and Cope's gray tree frog.

Semipermanent Impoundments and Coastal Plain Depression Wetlands are wetland natural communities that occur infrequently and cover relatively small areas within the Inventory Corridor. Semipermanent Impoundments typically occur along shorelines of beaver and man-made ponds and are subject to water level fluctuations seasonally and unpredictably. Community composition can vary widely, with common species being predominantly herbaceous and aquatic, including pickerelweed (*Pontederia cordata* var. *cordata*), arrow-arum, common rush, and tussock sedge (*Carex stricta*). Approximately 6 acres of Semipermanent Impoundments were identified in the Inventory Corridor. Coastal Plain Depression Wetlands are typically small in size and are thought to be formed in shallow sinkholes due to the dissolution

of their underlying shell marl deposits. The duration and amount of seasonal inundation drive the species composition of the communities, which can vary from forested to entirely herbaceous. Tree species occurring in the forested variant include red maple, swamp tupelo, and willow oak. Shrubs in this community typically include swamp dog-hobble and buttonbush, with a wide variety of herbs potentially occurring including southern waxy sedge (*Carex glaucescens*), cypress-swamp sedge (*Carex joorii*), Walter's sedge (*Carex striata* var. *brevis*), long-tubercled spikerush (*Eleocharis tuberculosa*), square-stem spikerush (*Eleocharis quadrangulata*), creeping rush (*Juncus repens*), narrow-leaved seedbox (*Ludwigia linearis*), and woolgrass. Approximately 1 acre of Coastal Plain Depression Wetlands were identified in the Inventory Corridor.

Wildlife associated with these habitats includes species previously discussed in the aquatic community descriptions in **Section 3.5.3**. The Semipermanent Impoundments typically possess fish fauna, and therefore represent less important amphibian breeding areas than the Coastal Plain Depression Wetlands. The Coastal Plain Depression Wetlands are ephemeral ponds with no connection to other surface waters that are found within the Non-Riverine Flatwoods and Swamps community. These habitats are generally fish-free, and are used heavily as breeding sites for many of the Inventory Corridor's amphibian species, including some of the listed threatened and endangered species.

4.1.3.1.2 Evergreen Forest

For the purposes of this study, pine plantations are categorized as Non-Riverine Flatwoods and Swamps (Planted Pine Variant), as this is likely the natural community in which they would be classified if unaltered. These communities are somewhat early-successional forests which have been planted and managed as part of a concerted forestry management plan focused on fast yields of pulpwood for paper production. These forests are common throughout the Inventory Corridor. The dominant tree species is loblolly pine, with some drier stands that include Virginia pine (*Pinus virginiana*) or wetter stands that include pond pine. Hardwood saplings in the understory are common in the pine dominated areas, particularly if the pine forest is more mature and no longer actively managed. Common understory sapling and shrub species include sweet gum, tulip poplar, American holly, flowering dogwood, sassafras, giant cane, and highbush blueberries. Common herbaceous species within the Inventory Corridor include seedlings of the aforementioned canopy and understory species, river oats, pink lady's slipper (*Cypripedium acaule*), bracken fern (*Pteridium aquilinum*), cinnamon fern (*Osmundastrum cinnamomeum*), and dog fennel (*Eupatorium capillifolium*). Common vine species within the Inventory Corridor include common greenbrier and muscadine grape (*Vitis rotundifolia*). Approximately 217 acres of Non-Riverine Flatwoods and Swamps were identified in the Inventory Corridor.

The wildlife associated with these communities is relatively diverse, but is primarily composed of habitat generalists, and common species associated with all previously described communities can be found in these planted pine variants of the Non-Riverine Flatwoods and Swamps.

4.1.3.1.3 Mixed Forest

Mixed evergreen/deciduous forests occur throughout the Inventory Corridor in both uplands and wetlands. The vast majority of these stands formerly were Mesic Mixed Hardwood Forests, which are now being managed for pine pulpwood production, and are now dominated by or co-dominated by loblolly pine. Only one natural stand of mixed evergreen/deciduous forest was identified during the field surveys; a small area of Pine/Scrub Oak Sandhills. Pine/Scrub Oak Sandhills are ridges of sandy soils underlain by clay subsoils that support a mix of scrub oaks and loblolly pine. In the region, these communities are most frequently encountered in the region along the eastern bank of the Blackwater River, well outside of the Inventory

Corridor. Loblolly pine is the pine species most commonly found in these communities in Virginia. Historically, the loblolly pine was preceded by longleaf pine in the overstory, but logging and lack of a natural fire regime have allowed loblolly to take over. The deciduous overstory and understory species include turkey oak (*Quercus laevis*), blackjack oak (*Quercus marilandica* var. *marilandica*), southern red oak, sand post oak (*Quercus margarettae*), water oak, and bluejack oak (*Quercus incana*). Shrub species typically include dwarf wax myrtle (*Morella pumila*), poison oak (*Toxicodendron pubescens*), and deerberry. On somewhat wetter soils, the tree canopy is dominated by loblolly pine, sweet gum, tulip poplar, red maple, and black gum, and the common shrub species will include Carolina laurel (*Kalmia carolina*), huckleberries (*Gaylussacia frondosa*, *Gaylussacia dumosa* var. *dumosa*, and *Gaylussacia baccata*), staggerbush (*Lyonia mariana*), creeping blueberry (*Vaccinium crassifolium*), and inkberry (*Ilex glabra*). While herbs are not very dense in these communities, silvery bluestem (*Andropogon ternarius* var. *ternarius*) and southern bracken fern (*Pteridium aquilinum* ssp. *pseudocaudatum*) are typical species that occur. Approximately 1.4 acres of Pine/Scrub Oak Sandhills were identified in the Inventory Corridor.

The wildlife associated with the Pine/Scrub Oak Sandhills is not as diverse as other habitats within the Inventory Corridor, but it does include several game birds and mammals including white-tailed deer, wild turkey, eastern bobwhite (*Colinus virginianus*), and gray squirrel. Common reptiles inhabiting these sandhills include the scarlet snake (*Cemophora coccinea*), eastern kingsnake (*Lampropeltis getulus*), mole kingsnake (*Lampropeltis calligaster*), black racer, corn snake (*Elaphe guttata*), eastern fence lizard (*Sceloporus undulatus*), and ground skink (*Scincella lateralis*). Few amphibians occupy this habitat, but several toad species and tree frog species occur, such as oak toad (*Bufo quercicus*), American toad, Fowler's toad, pinewoods tree frog (*Hyla femoralis*), and gray tree frog. Very few habitat specialist species occur in this community.

4.1.3.2 Ecology and Habitat of Agricultural Lands

Approximately 909 acres of agricultural lands are located in the Inventory Corridor (see **Figure 4.1-2, Sheets 1-7**). Agricultural land uses include cropland (both row crops and non-row crops), confined feeding lots (primarily for pigs), and pastureland (for cattle and horses). Among the food crops grown within the Inventory Corridor are soybeans, corn, and peanuts. Cotton is the predominant non-food crop. Hay crops, grown as fodder for livestock, are interspersed throughout. Several nurseries are located in the Inventory Corridor. The majority of the non-cultivated agricultural land appears to be utilized by cattle and horses for grazing (i.e., pastures) and is dominated by various opportunistic grass (*Poaceae*) species and other common herbaceous species.

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). Despite these factors, agricultural lands are used by wildlife on a limited basis, with the species composition often depending on the type of crop being cultivated, the time of year, and the methods of harvesting. Agricultural areas, including corn and soybean fields, pastures, and nurseries are important forage areas for many wildlife species. Foraging by wildlife includes actual consumption of the plant crop but also includes nondestructive foraging. Foraging by insectivorous birds and mammals and consumption of weed seeds by wildlife is beneficial to agriculture. Wildlife often consumes waste grain left behind by mechanical harvesting machines or fruit that has fallen on the ground. In other cases, however, loss and damage to crops by wildlife have been clearly documented. Corn is consumed by over 100 species of wildlife, including 17 species of waterfowl and gamebirds, 59 species of songbirds, 10 species of fur and game mammals, 6 species of small mammals, and by deer and black bear (Graham 2002).

In addition to attracting foraging wildlife, agricultural fields attract predators. Foxes, coyotes and raccoons frequently use agricultural fields for hunting small mammals and birds that are attracted to the agricultural fields. In addition, birds of prey such as red tailed hawks (*Buteo jamaicensis*), red shouldered hawks (*Buteo lineatus*), great horned owls (*Bubo virginianus*) and barn owls (*Tyto alba*) frequently hunt and roost near agricultural fields hunting small mammals and other prey species (Graham 2002).

The boundary between active agricultural fields and adjacent habitats often creates "edge" habitat or edges. Edges are areas where two habitat types meet, such as an agricultural field and a forest. Edges are unique because they combine some of the characteristics of two or more habitats. Edges are inhabited by some of the animals and plants that are characteristic of each original habitat, plus species that are specially adapted to live in edges. Therefore, edges usually have more diverse wildlife communities than unbroken blocks of habitat. The brushy nature of some field edges provides nesting, brooding, feeding, and escape cover for a wide variety of animals. Predators often concentrate their hunting activities near edges because of the abundance and variety of prey animals that are attracted to this special habitat (Jones, *et al.*1994).

Edges are also important because they form a refuge for many soft-mast producing plants that cannot survive in mature forests or cultivated fields. Most of these plants need full sunlight to thrive and cannot tolerate the shade and competition within a forest or the repeated disturbance associated with cultivation and grazing. Soft-mast is an important source of food for many wildlife species during the summer (Jones, et al. 1994). Important soft-mast plants include blackberry and blueberry species. Despite being relatively small (only a few feet wide in most cases), edge habitat between agricultural fields and adjacent forest lands provides habitat and foraging for a diverse assemblage of species. The edge habitat offers forage and cover for white-tailed deer and a variety of smaller mammals - including eastern cottontail, mice, moles, voles, and shrews. Additionally, edges provide nesting and foraging for many different bird species such as sparrows (*Emberizidae)*, finches (*Carpodacus*) and eastern bobwhite quail (*Colinus virginianus*).

4.1.3.3 Ecology and Habitat of Brush and Old Fields

Approximately 22.45 acres of brush and old fields are located within the Inventory Corridor (see **Figure 4.1-3, Sheets 1-7**). Typically these areas have been timbered, grazed, or utilized as cropland in the recent past. Most of these areas have lain fallow for a number of years and have been left to revegetate through natural succession.

Abandoned pastures and agricultural fields can provide excellent wildlife habitat. These areas contain an interspersion of plant communities, which is beneficial to many species. The agricultural lands are typically dominated by herbaceous plant species such as various grasses, goldenrods (*Solidago* spp.), dog fennel, common flax (*Linum usitatissimum*), Queen Anne's lace (*Daucus carota*), common ragweed (*Ambrosia artemisiifolia*), thistles (*Carduus* spp.), broomsedge (*Andropogon* spp.), wild aster, beggerlice (*Bidens* spp.), sunflowers, wild strawberry, blackberry (*Rubus* spp.), sumac, wild plum, and persimmon. All of these plants provide wildlife with either food or cover. Many songbirds use clumps or islands of wild plum and blackberry for nesting; quail use them for escape cover; deer browse on the twigs; and a host of species eat the fruits.

The timbered areas provide similar wildlife benefits as the abandoned pastures and agricultural fields, but are often dominated by the species that were harvested. The most common tree species harvested is pine; however, some hardwood logging is also performed in the Inventory Corridor. Additional early successional species include black locust (*Robinia pseudoacacia*), tree-of-heaven (*Ailanthus altissima*), Japanese honeysuckle, blackberries, and greenbriers.

As with the edge habitat between agricultural fields and adjacent habitats, brush and old field communities adjacent to forest lands provide habitat and foraging for a diverse assemblage of species. The dense regrowth typical to many of these areas offers forage and cover for white-tailed deer and a variety of smaller mammals - including eastern cottontail, mice, moles, voles, and shrews. Predators and birds of prey frequent these communities in search of prey. Red fox, Cooper's hawk, broad-winged hawk (*Buteo platypterus*), red-shouldered hawk, and the red-tailed hawk are common predators. Various bird species, such as sparrows, eastern bluebird (*Sialia sialis*), American goldfinch (*Carduelis tristis*), blackbirds (*Euphagus* spp.), and the brown-headed cowbird (*Molothrus ater*) also utilize the brush and old field communities in the Inventory Corridor. These areas are especially important to many reptiles as they require sunlight to provide thermoregulation for biological activities that require elevated body temperature, such as digestion, ecdysis (shedding), courtship, and gestation.

4.1.3.4 Regional Biodiversity

The habitat diversity within the Route 460 Inventory Corridor varies greatly. It includes a patchwork of riparian corridors, farm fields, abandoned fields, pastureland, and various forest types. This variety in habitats contributes to a relatively rich assemblage of plants and animals in the Inventory Corridor. Biodiversity tends to be greater in areas with larger landscape diversity and edge habitat (i.e. the transition between forest and fields) and tends to decrease as the natural habitat decreases. There are several areas within the Inventory Corridor that are protected because they contain rare and unique communities and/or provide habitat for rare species, but the general abundance of such sites is fairly typical for Virginia's Rolling Coastal Plain and Mid-Atlantic Flatwoods ecoregions.

In the late 1980's, the Virginia Natural Area Preserves System was established to protect the significant natural areas in Virginia. Properties that are in the Virginia Natural Area Preserves System have legally binding restrictions on future activities on those properties. There are two Natural Area Preserves located within a few miles of the Route 460 Inventory Corridor. Those areas include the Blackwater Ecological Preserve and the Antioch Pines Natural Area Preserve (VDCR 2014a).

The Blackwater Ecological Preserve and the Antioch Pines Natural Area Preserve are located immediately adjacent to each other in Isle of Wight County. The Blackwater River forms the western boundary of the Blackwater Ecological Preserve. Antioch Pines lies immediately to the north and to the south of the Blackwater Ecological Preserve, and includes Antioch Swamp. These preserves are managed through prescribed fire, and have prescribed burns conducted on them 5-10 times a year. This is done to maintain the habitat for 23 rare species of plants and animals. These species would lose their natural habitat if the prescribed fires were not conducted. Examples of these species include pixie moss (*Pyxidanthera barbulata*), white-fringed orchid (*Platanthera blephariglottis*), pale grass-pink (*Calopogon pallidus*), rose pogonia (*Pogonia ophioglossoides*), purple pitcher plant (*Sarracenia purpurea*), and sandbog deathcamas (*Zygadenus glaberrimus*).

VDCR-DNH maintains a database of biodiversity-ranked (BRANK) communities that occur throughout the state. The BRANK system is used to determine the significance of these communities, and is based on natural features or elements (e.g. species, community type, etc.) and the ability of VDCR-DNH to protect the site. The following biodiversity ranks are used to determine a site's significance:

B1 Outstanding Significance: only site known for an element; excellent occurrence of a G1 species (Globally, Extremely Rare).

B2 Very High Significance: excellent example of a rare community type; good occurrence of a

G1 species; or excellent occurrence of a G2 or G3 species (Globally, Very Rare or Rare to Uncommon).

B3 High Significance: excellent example of any community type; good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type; excellent or good occurrence of state-rare species.

B5 General Biodiversity Significance: good or marginal occurrence of a community type or state-rare species.

Biodiversity-ranked communities that are reported to occur either within the project Inventory Corridor or in very close proximity to the Inventory Corridor are shown in **Figure 4.1-4** and listed in **Table 4.1-2**. Only two of these sites are crossed by the Inventory Corridor – Antioch Swamp SCU (BRANK B3) and Zuni Conservation Site (BRANK B5). These represent only a very small percentage of the land area within the Inventory Corridor, and the distribution and abundance of these sites is not dissimilar to other areas within the state.

Table 4.1-2: Rare or Unique Communities in the Project Area

Community Name	Description	Acreage	County/City	BRANK	Legal Status
Antioch Swamp SCU	Stream Conservation Unit	3,158	Southampton and Isle of Wight	B3	SL
Zuni Pine Barrens Conservation Site	Conservation Site	2,155	Isle of Wight	B2	NL
Zuni Conservation Site	Conservation Site	184	Isle of Wight	B5	NL
Devil's Millpond Conservation Site	Conservation Site	195	Isle of Wight	B4	NL

Source: VDOT 2015

4.1.3.5 Wildlife Corridors

Due to a long history of agricultural and silvicultural activities, most uplands within the region are so highly fragmented that they afford little contribution with respect to wildlife corridors. Riparian corridors, on the other hand, have been less altered over history and presently serve as components of several prominent wildlife corridors within the region. Research has shown that riparian corridors perform a valuable role in sustaining wildlife diversity, especially in areas that have a reduced amount of natural habitat. These riparian areas often provide the primary corridors for wildlife migration between isolated areas of natural habitat.

Three wildlife corridors generally having a width less than a half mile were identified in the field within the Inventory Corridor (See **Figure 4.1-4**). These wildlife corridors are associated with contiguous or (where interrupted by existing roads or utility lines) near-contiguous forest communities, generally following streams or other waterbodies. Two of the corridors generally run north-south, one along the lower Blackwater River and one along Burnt Mills Swamp to Antioch Swamp, both following branches of the Antioch Swamp SCU. The third corridor trends generally west-east along Ennis Mill Swamp into the headwaters of Lake Prince, crossing the Inventory Corridor twice.

Depending on the width and vegetative composition of the forested portions of these corridors, they may also represent important sites for forest interior dwelling species (FIDS). These species typically require large, relatively unfragmented tracts of hardwood or mixed hardwood forest located within heavily forested

landscapes or regions to successfully breed and maintain viable populations. They prefer hardwood/mixed hardwood tracts in excess of 100 acres or they require large contiguous linear tracts of hardwood or mixed hardwood forest that are a minimum of 600 feet wide, as many of these species prefer nest sites to be located greater than 300 feet from the forest edge. This diverse group includes Neotropical migrants such as tanagers, warblers, and vireos that breed in North America and winter in the Caribbean, Central and South America; as well as residents and short-distance migrants such as woodpeckers, some hawks, and owls (Jones, et al. 2001).

Although most FIDS are still fairly common, populations of some forest interior bird species have been declining during the last 30-40 years. The main factor contributing to the decline of FIDS is forest fragmentation and loss of mature forests. Forest fragmentation reduces the size of forest patches, reducing the total area of contiguous habitat available to birds and increases the isolation of habitat, reducing the quality of that which remains (Jones, et al. 2001).

4.1.4 Impacts

4.1.4.1 Natural Communities

Construction of the FHWA/VDOT Preferred Alternative would result in some effects to the general ecology of the roadway's surroundings. The FHWA/VDOT Preferred Alternative would affect terrestrial natural communities and associated wildlife habitat through conversion of existing land coverage to paved road surfaces and maintained right-of-way. This conversion would result in the loss of wildlife habitat and could affect wildlife migration patterns as a result of this habitat fragmentation (see **Section 4.1.4.4** for further explanation). Those affected terrestrial natural communities large enough to be captured in the field surveys of natural communities are summarized according to community classification in **Table 4.1-3**, below. Natural communities impacted by the FHWA/VDOT Preferred Alternative are shown on **Figure 4.1-1, Sheets 1-7**.

Table 4.1-3: Potential Impacts to Natural Communities

Natural Communities of Virginia	Within LOD of the Preferred Alternative (acres)
Mesic Mixed Hardwood Forests	63.8
Piedmont/Coastal Plain Oak-Beech/Heath Forests	26.1
Bald Cypress-Tupelo Swamps /	6.8
Coastal Plain/Piedmont Bottomland Forests	18.9
Pine Scrub Oak Sandhills	0.3
Coastal Plain Depression Wetlands	0
Semi-Permanent Impoundments	0.9
Subtotal (before Pine Plantation):	**116.8**
Non-Riverine Flatwoods and Swamps, Planted-Pine Variant[1]	46.8
Total (with Pine Plantation):	**163.6**

Source: VDCR 2013a

1 For the purposes of this study, pine plantations were categorized as Non-Riverine Flatwoods and Swamps, Planted-Pine Variant, as this is likely the natural community in which they would be classified if unaltered. Since Non-Riverine Flatwoods and Swamps, Planted-Pine Variant is not a Natural Communities of Virginia classification, this category was separated from the other classifications in the table.

4.1.4.2 Agricultural Lands and Brush/Old Fields

Land used for agricultural crops is prevalent throughout the Inventory Corridor and will be impacted by the FHWA/VDOT Preferred Alternative. A total of approximately 251 acres will be impacted.

Brush-covered lands and old fields are difficult to quantify as they are typically in a transitional process, often from fallow cropland into forest or from clearcut forest to agriculture or pine plantation. Brush and old fields were mapped in the field during the natural community field mapping effort. Approximately 8.9 acres of brush and old field habitat will be impacted by the FHWA/VDOT Preferred Alternative.

4.1.4.3 Regional Biodiversity

The construction of the FHWA/VDOT Preferred Alternative would lead to the direct loss, fragmentation and/or degradation of habitat, and in turn, potentially impact biodiversity. The types of activities that may potentially impact biodiversity could include vegetation removal, earth moving in the form of cut and fill, and direct construction impacts to sensitive habitats. In addition to the physical destruction of habitat, soil erosion and other forms of pollution may degrade habitat and impact biodiversity. Upon completion of construction, roadway operation and maintenance may result in continued impacts to wildlife that may impact regional biodiversity. These impacts may include physical barriers to wildlife movements, vehicle wildlife collisions, degradation of aquatic habitats due to contaminated runoff and fuel, or chemical spills associated with vehicular accidents. Maintenance activities that may cause impacts include vegetation management (including physical and chemical vegetation controls) and salting and sanding roads during winter storms. These activities can result in an increase in runoff pollution. Additional potential impacts may include impacts to animal foraging behavior and displacement of wildlife, alteration of topography, noise and visual disturbance, and introduction of invasive species (EPA 1994).

Of particular concern to biodiversity would be the FHWA/VDOT Preferred Alternative's direct impact to two biodiversity-ranked communities due to construction of the FHWA/VDOT Preferred Alternative (see **Figure 4.1-4**). **Table 4.1-4** provides a summary of the acres of impact to each of these communities. A discussion of the potential impacts to each rare or unique community by the FHWA/VDOT Preferred Alternative is provided below.

Table 4.1-4: Potential Impacts to Rare or Unique Communities

Community Name	BRANK	Listing Status	Total Acres	Impacts (in Acres)
Antioch Swamp SCU	B3	SL	3,158	2.75
Zuni Conservation Site	B5	NL	184	2.57
			Total Acreage of Impact:	**5.32**

Source: VDOT 2015

Antioch Swamp SCU

The 3,158-acre Antioch Swamp SCU encompasses much of the main stem of the Blackwater River and its tributaries in Southampton and Isle of Wight Counties just west and east of Zuni. The FHWA/VDOT Preferred Alternative follows the existing Rt. 460 corridor and crosses the Antioch Swamp SCU two times; once over a tributary of the Blackwater River just east of Zuni and once across the main stem of the Blackwater River just west of Zuni. Potential impacts at both of the crossings could include direct loss of riparian habitat and potential degradation of water quality from erosion and construction activities. It is not anticipated that there would be significant increases in fragmentation of the existing riparian corridor, because Route 460 already crosses these locations. The FHWA/VDOT Preferred Alternative would directly impact 2.75 acres of this SCU. This represents a very small percentage of the 3,158-acre conservation site land area.

Zuni Conservation Site

The FHWA/VDOT Preferred Alternative has the potential to impact approximately 2.57 acres of the 184-acre Zuni Conservation Site. The site is currently bisected by existing Route 460 and Fire Tower Road. This site would not be confused with the Zuni Pine Barrens Preserves (Preserves), which is composed of the Antioch Pines Natural Area Preserve and the Blackwater Ecological Preserve. The Preserves are protected by the Virginia Natural Area Preserves Act of 1989 and management adheres to regulations set forth by DCR. The FHWA/VDOT Preferred Alternative will serve to widen existing Route 460 and Fire Tower Road and will therefore, not represent a substantial new impact to this resource. The Zuni Conservation Site is located over 1.5 miles north of the northernmost extent of the Zuni Pine Barrens Preserves. Unlike the Pine Barrens Preserves, the Zuni Conservation Site does not have legal protections, nor is it actively managed by VDCR (VDCR 2014a). Potential minor impacts include direct loss, degradation, and fragmentation of habitat, since the FHWA/VDOT Preferred Alternative bisects the site, although any such impacts are expected to be minimal as the crossing is collocated with the existing 460 and Fire Tower Road. No existing culverts provide connectivity at this crossing, and as a part of this project, no new culverts are proposed. Implementation of the FHWA/VDOT Preferred Alternative would also not be expected to have major negative indirect impacts to the Zuni Pine Barrens Preserves, as it would neither limit future northern expansion of the Preserves, nor impact the conduct of prescribed burns within the Preserves any more than the presence of the existing 460 roadway does.

4.1.4.4 Wildlife Corridors

Wildlife corridors would potentially be impacted by the construction of the FHWA/VDOT Preferred Alternative (**see Figure 4.1-4**). These impacts would be expected to be limited in nature at the Blackwater River and Burnt Mills Swamp crossings as these crossings are collocated with the existing 460 crossing. The two crossings of the wildlife corridor along Ennis Mill Swamp are on new location, and as such would be expected to have more significant impacts on that corridor. Other narrower riparian corridors, even small streams, also provide some function for wildlife movement and will be impacted as a result of the proposed project. These potential impacts may include fragmentation of the wildlife corridor, creation of a barrier that could limit the movement of terrestrial and aquatic life, direct habitat loss, increased noise that may interfere with the ability of wildlife to continue to use the corridor, and highway lighting that could potentially impact some animals usage of the wildlife corridor (Beier, et al. 2008).

4.1.4.4.1 Forest Interior Dwelling Species Habitat

Additional potential impacts could occur to FIDS habitat. Potential direct impacts would be loss and fragmentation of mature hardwood and mixed hardwood/pine forests from construction of the FHWA/VDOT Preferred Alternative. The direct loss of forest habitat results in smaller forest tracts that may no longer be adequate to accommodate a bird's territory, provide an ample supply of food, or provide the necessary forest structure for breeding. In addition to area requirements, many FIDS have additional habitat requirements for nesting. Reduction of forest size often results in the loss of specialized habitats/microhabitats. Small forests cannot sustain the same environmental conditions that larger forests can, such as higher humidity and complex vegetative structure (Jones et. al. 2001).

The FHWA/VDOT Preferred Alternative crossings of Ennis Mill Swamp and Eley Swamp would potentially impact FIDS habitat as these crossings are on new alignment through the riparian corridor, and would increase fragmentation of the system, which is already bisected by several roads. The crossings of Ennis Mill Swamp have the potential to impact two FIDS habitats, each of which are approximately 470

acres. The crossing of Eley Swamp has the potential to impact one FIDS habitat that is approximately 250 acres.

4.1.5 Mitigation

4.1.5.1 Natural Communities

Impacts to terrestrial habitats would be reduced through measures that reduce the roadway footprint as the design progresses. Bridging of more significant habitats and corridors is a design consideration that was implemented to help maintain habitat connectivity and avoid fragmentation, particularly in conjunction with aquatic crossings. A compensatory mitigation plan has been developed for the FHWA/VDOT Preferred Alternative, which addresses impacts to wetland habitats. While wetland habitats would be mitigated based primarily on Section 404 requirements, upland and riparian habitats could be included where feasible to provide connectivity and added-value. VDOT is coordinating development of the mitigation plan with FHWA, USACE, and EPA, with input from the appropriate resource agencies such as USFWS, DGIF, and VDCR-DNH, to address concerns with natural community impacts. Further mitigative measures are detailed in the Regional Biodiversity and Wildlife Corridor sections below.

4.1.5.2 Agricultural Lands and Brush and Old Fields

Impacts to agricultural lands and old fields were minimized through project design that incorporates alignment shifts and narrowing of the roadway footprint. Working with the Virginia Department of Agriculture, VDOT met with identified property owners and representatives in order to better understand the commercial operation and access needs of the agricultural properties along the 16-mile build portion of the FHWA/VDOT Preferred Alternative and to determine whether it would be feasible to reduce impacts to agricultural lands. Based upon feedback from these meetings, VDOT considered potential Inventory Corridor adjustments to better balance agricultural and access impacts with impacts to other resources, including wetlands and streams. Following this evaluation, two areas were identified for adjusting the inventory corridor:

- East of Windsor in the vicinity of Old Myrtle Road
- East of Route 258 in the vicinity of Deer Path Trail

Both locations reduced agricultural and commercial operational impacts while still maintaining acceptable project cost and jurisdictional wetland impacts in these areas. Additionally, displacements were reduced and access to these parcels was improved.

4.1.5.3 Regional Biodiversity

Mitigation for biodiversity impacts is intended to address the cumulative impacts of all project-related activities within the LOD of the FHWA/VDOT Preferred Alternative (EPA 1994). The presence of biodiversity-ranked communities that may be impacted by the FHWA/VDOT Preferred Alternative requires special consideration and coordination with various federal and state agencies. Through coordination with these agencies, potential impacts to target species and their habitats have been evaluated and avoided by implementing various practices as part of the project design. In general, examples of mitigation measures which have been considered and employed wherever practicable to avoid impacts to biodiversity include shifting alignment to avoid potential areas; spanning/bridging resources, especially SCUs; the use of bottomless arch culverts; countersinking of new culverts; limiting clearing of existing vegetation; the strict adherence to erosion and sediment control guidelines and the implementation of stormwater BMPs; and the adherence to maintaining applicable buffer for a species habitat (EPA 1994).

For unavoidable and direct impacts to natural communities and biodiversity, mitigation may also include habitat restoration and/or enhancement (as part of wetland and stream compensation being provided in the watershed), conservation initiatives, riparian corridor restoration as part of wetland and stream compensation, establishing vegetated buffers along field edges for edge habitat in wetland restoration and preservation sites, and upland forest corridor restoration in wetland restoration and preservation sites. Additionally, mitigation measures such as expanding the size of existing State Natural Area Preserves is planned in cooperation with VDCR-DNH, as part of the compensatory mitigation plan.

4.1.5.4 Wildlife Corridors

Bridges and culverts are of a size that will allow a variety of terrestrial and aquatic life to pass underneath or through the structure to minimize vehicle collisions (Bond, 2003). Bridge crossings will have a minimum "edge" for wildlife passage that is either upland or wetlands that are not inundated that would allow passage of some mammals. Efforts to maintain or improve the native riparian vegetation adjacent to bridges and culverts have been demonstrated to further encourage usage of the passages by wildlife, especially in relation to identified wildlife corridors (Bond, 2003). Vegetation outside of the LOD will not be affected and should provide for continued use of riparian corridors by wildlife. While right-of-way fencing provided along the limited access roadway will be an obstruction to some movements of wildlife, fencing will be installed in a manner that provides a pathway through and under bridges and culverts. The fencing will help to funnel the wildlife to the bridges and culverts, thus allowing some passage. Fencing will tie to the bridge abutments and culvert headwalls.

4.1.5.5 Forest Interior Dwelling Species Habitat

Impacts to FIDS habitat have been minimized through project design that incorporates alignment shifts and narrowing of the roadway footprint. Although no direct compensatory mitigation measures are anticipated, preservation of the Antioch Tract for wetland mitigation will also preserve a large area of FIDS habitat.

4.2 THREATENED AND ENDANGERED SPECIES

4.2.1 Introduction

The Virginia Department of Transportation (VDOT) has performed the appropriate studies (including field habitat assessments and presence/absence surveys) and has conducted agency coordination to assess potential impacts that may occur to threatened and endangered species as a result of the FHWA/VDOT Preferred Alternative. A JPA requesting authorization to impact wetlands and streams was submitted to the USACE, VDEQ, and VMRC in November 2015. The JPA document addresses potential threatened and endangered species impacts that could be associated with the FHWA/VDOT Preferred Alternative.

4.2.2 Agency Coordination

VDOT has conducted threatened and endangered species coordination with resource agencies through field visits, pre-application meetings, and phone discussions. **Table 4.2-1** below summarizes threatened and endangered species agency coordination efforts conducted for the Project.

Table 4.2-1: Threatened and Endangered Species Coordination Summary

ID No.	Agency	Summary of Coordination	Coordination Date
	U.S. Environmental Protection Agency, Virginia Marine Resources Commission, Virginia Department of Environmental Quality, Virginia Department of Game and Inland Fisheries, and Virginia Department of Conservation and Recreation	Meeting held during which DGIF recommended surveys for barking tree frog and Mabee's salamander due to the high probability of potential habitat.	April 1, 2015
	U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Virginia Department of Environmental Quality, and Virginia Department of Game and Inland Fisheries.	Field meeting to visit high quality and representative low quality sites for Mabee's salamander and barking treefrog. The purpose was to obtain concurrence from DGIF regarding suitability of potential breeding habitats identified by VDOT, and determine where presence/absence surveys would occur.	April 23, 2015
1	U.S. Fish and Wildlife Service	Email request for red-cockaded woodpecker habitat assessment report	January 28, 2016
2	Virginia Department of Conservation and Recreation	Letter recommending northern long eared bat coordination with USFWS	December 18, 2015
3	Virginia Department of Conservation and Recreation	Letter recommending northern long eared bat coordination with USFWS and recommended survey for robust baskettail, barking treefrog, and eastern big eared bat	January 19, 2016
4	Virginia Department of Transportation	Letter to USFWS requesting comments on threatened and endangered species, clarification on northern long-eared bat, and providing red-cockaded woodpecker habitat assessment report	March 29, 2016
5	Virginia Department of Transportation	Letter to DGIF requesting comments on threatened and endangered species	March 29, 2016
6	Virginia Department of Transportation	Conveyance of salamander and barking tree frog survey report to DGIF	April 5, 2016
7	U.S. Fish and Wildlife Service	Email recommending re-coordination of project in light of promulgation of final 4(d) rule for northern long-eared bat.	April 12, 2016
8	Virginia Department of Game and Inland Fisheries	Email response providing concurrence with survey results and proposed conservation measures outlined in March 29, 2016 letter from VDOT.	April 20, 2016
9	U.S. Fish and Wildlife Service	Self-Certification Letter and Project Review Package generated using IPaC	April 20, 2016
10	Virginia Department of Transportation	Letter from VDOT transmitting the April 20, 2016 Self-Certification Letter and Project Review Package to USFWS.	April 24, 2016

4.2.3 Database Review

In addition to coordinating with resource agencies, VDOT queried threatened and endangered species databases to determine if any federal- or state-listed species have been documented within the vicinity of the project. The databases include the DGIF Virginia Fish and Wildlife Information Service (VAFWIS), the U.S. Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation (IPaC) database, and the VDCR-DNH online searchable database. The results of the database queries are included in Exhibit 11A: USFWS Project Review Package of the JPA.

Because of the variability in relevance of the various species "hits" returned from query results, an initial screening process was used to pare down the list of species returned from the database queries to a smaller list of species relevant to the FHWA/VDOT Preferred Alternative. This initial screening process was informed using a combination of site-specific knowledge, species life history requirements, resource agency coordination, and best professional judgement. Eleven species were identified from the database query results for initial assessment (**see Table 4.2-2**).

Table 4.2-2: Threatened and Endangered Species Evaluation Matrix

Common Name	Scientific Name	Legal Status	IPaC	VDCR-DNH (12 Digit HUC)	VAFWIS (2-Mile Buffer)	Habitat Present (Field-Verified)	Further Coordination Recommended
Northern long-eared bat	*Myotis septentrionalis*	FT	X	---	---	YES	YES
Red-cockaded Woodpecker	*Picoides borealis*	FE/SE	X	---	---	NO	NO
Bald Eagle	*Haliaeetus leucocephalus*	MBTA/ BGEPA[5]	---	---	C	YES	NO
Little Brown Bat	*Myotis lucifungus*	SE	---	---	---	NO	NO
Tri-colored Bat	*Perimyotis subflavus*	SE	---	---	---	NO	NO
Mabee's Salamander	*Ambystoma mabeei*	ST	---	X	P	YES	NO
Barking Tree Frog	*Hyla gratiosa*	ST	---	---	---	YES	NO
Canebrake Rattlesnake	*Crotalus horridus*	SE	---	---	P	NO	NO
Henslow's Sparrow	*Ammodramus henslowii*	ST	---	---	P	NO	NO
Blackbanded Sunfish	*Enneacanthus chaetodon*	SE	---	---	P	NO	NO
Black Rail	*Laterallus jamaicensis*	SE	---	---	P	NO	NO

FE = federal endangered; FT = federal threatened; SE = state endangered; ST = state threatened; P = potential habitat; C = confirmed observation. The Dismal Swamp southeastern shrew was delisted on April 1, 2016.

4.2.4 Habitat Assessments and Presence/Absence Surveys

Of the eleven species included in Table 4.2-1, four are listed as "potential" by the VAFWIS query results, but are not listed by any other database queries. "Potential" species are those that, through DGIF modeling, have been identified as having potential habitat within the query radius. DGIF's VAFWIS Coordination Recommendations indicate that no coordination is recommended if a species is only documented by this dataset and no others; therefore, canebrake rattlesnake, black rail, blackbanded sunfish, and Henslow's sparrow were not considered further.

Field habitat assessments were conducted for six species within the Inventory Corridor: northern long-eared bat (NLEB), red-cockaded woodpecker, bald eagle, Dismal Swamp southeastern shrew (listed at the time habitat assessments were conducted), Mabee's salamander, and barking tree frog. Habitat assessments

[5] The bald eagle has been delisted at both the state and federal levels; however, it is still afforded legal protection under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA)

were conducted from April through July, 2015. Based on the results of the habitat assessment and DGIF recommendations, VDOT conducted presence/absence surveys in the Inventory Corridor for the barking tree frog and Mabee's salamander during the respective species sampling seasons in 2015. VDOT conducted a field review of potentially suitable sampling sites with DGIF and chose four Mabee's salamander sampling sites and ten barking tree frog sampling sites. The results of the habitat assessments and presence/absence surveys are presented in detail below.

4.2.4.1 Species Background

4.2.4.1.1 Northern Long-eared Bat (Myotis septentrionalis)

The NLEB was listed by the USFWS as threatened in April 2015. The NLEB is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, extending southward to parts of southern states from Georgia to Louisiana, even reaching into eastern Montana and Wyoming. Virginia is within the native range of the NLEB.

Suitable winter habitat (hibernacula) for the NLEB includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (0-9 degrees Celsius) with high humidity and minimal air currents. NLEBs will typically hibernate between mid-fall through mid-spring each year.

During the summer, NLEBs roost individually or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches diameter at breast height [DBH]). NLEBs have also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable). NLEBs 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. Suitable summer habitat for NLEBs consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. NLEBs typically occupy their summer habitat from mid-May through mid-August each year, and the species may arrive or leave some time before or after this period.

The greatest and most immediate threat for the NLEB is the disease, white-nose syndrome (WNS). Specifically, declines due to WNS have significantly reduced the number and size of NLEB populations in some areas of its range. This disease has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand.

4.2.4.1.2 Bald Eagle (Haliaeetus leucocephalus)

Bald eagles are no longer federally or state listed. Bald eagles were removed from the federal list in 2007 and from the state list in 2013. However, bald eagles currently are protected under the Bald and Golden Eagle Protection Act which prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. The bald eagle is common throughout Virginia where there is suitable habitat. They are a fairly common summer and winter visitor in the Chesapeake Bay region and nearby counties.

The bald eagle forages along coastal areas, rivers, and large bodies of water. Nesting sites are commonly located in large forested areas adjacent to marshes, on farmland, or in seed tree cut-over areas. Although some threats, such as contaminants or habitat loss may occur on a localized basis, none of the existing or

potential threats are likely to cause the bald eagle to become in danger of extinction within the foreseeable future throughout all or any significant portion of its range (USFWS, 2012a).

4.2.4.1.3 Red-Cockaded Woodpecker (Picoides borealis)

The red-cockaded woodpecker was listed as a federal endangered species in 1973. The species is native to the southeast U.S. and is non-migratory. The species was classified as endangered because of its perceived rarity, declines in local populations, and a presumed reduction in available nesting habitat. The species nests in old growth pines which are declining in numbers due to current commercial timbering methods. Fire, which at one time maintained the open pine stands that this woodpecker prefers, is now suppressed. Other threats include forest fragmentation, catastrophic events, and demographic and genetic processes affecting populations confined to isolated areas.

This species is limited to stands where mature pine (greater than 80 years old) occurs or predominates, and it shows a preference for open woods. It selects mature to over-mature live pines, often infected with red heart disease (Fomes pini) for nest cavity excavation. They prefer longleaf pines. They live in social groups called clans of up to ten individuals, but never more than one breeding pair per colony. They forage for insects mainly within pines. In Virginia, the red-cockaded woodpecker nests between late April and early June. The female lays two to five eggs in the breeding male's nest cavity. The eggs are incubated for approximately 10 days and the young fledge at 26 to 29 days.

The red-cockaded woodpecker is a very rare permanent resident south of the Chesapeake Bay and the James and Appomattox Rivers. Historically, this species has been recorded in Southampton, Sussex and Suffolk Counties, with nesting verified only in Sussex County. In Virginia, this species is currently found only within the Piney Grove Preserve in Sussex County. This population represents the species' northernmost extent and in 2012 had 10 breeding pairs. The results of a 2012 winter population count on the preserve yielded 53 individuals. The Piney Grove Preserve is not located within the Inventory Corridor.

4.2.4.1.4 Mabee's Salamander (Ambystoma mabeei)

Mabee's salamander is a small and rare terrestrial forest salamander that breeds in temporary pools. This species is found in savannas in burrows at the edges of bogs or ponds. They also occur in low wet woods and swamps. They are found in areas adjacent to water such as ditches and pools and have been found under pieces of paper or small logs in sandy areas adjacent to water. Breeding sites in Virginia consist of fish-free vernal ponds. These are typically Coastal Plain sinkhole ponds surrounded by mixed hardwood and pine forests (DGIF, 2014a).

These salamanders have been recorded in 14 cities/counties in Virginia including Isle of Wight, Southampton, Suffolk, Surry and Sussex. Mabee's salamanders are listed as a threatened species in Virginia. Threats include habitat fragmentation, aquatic and terrestrial habitat loss, road mortality, and alteration of hydrology mostly due to urbanization (DGIF, 2014a).

4.2.4.1.5 Barking Tree Frog (Hyla gratiosa)

The barking tree frog is the largest tree frog in North America. This species was designated state threatened in 1992. This species is known to be common in most other states where the barking tree frog occurs but is rare in Virginia. The major threat to this species is from continued logging of stands of native pine. Particularly detrimental is the conversion of these mature pine stands to high density monocultures of loblolly pine. This species is threatened because of limited distribution and attractiveness in the pet trade (DGIF, 2014a).

In general, this species has been found in sandy areas near shallow pools in pine savannas and in lowland woods and swamps. In Virginia, they have been observed in the following habitats: temporary pools in powerline right-of-ways, forested wetland depressions, natural Carolina bays and sinkhole or cypress ponds. The primary limiting factor for this species is the number of breeding ponds. This species requires deeper and more permanent ponds than those required by other tree frog species. These ponds must be free of predaceous fish. These ponds and the surrounding forests are being drained and otherwise altered for agriculture, forestry, and urban development. The barking tree frog has been recorded at locations outside the Inventory Corridor, but has not been recorded within the Inventory Corridor.

4.2.4.1.6 Little Brown Bat (Myotis lucifungus)

The little brown bat was designated state endangered on April 1, 2016. The hibernacula are typically located in caves in western Virginia. The little brown bat typically roosts in trees or structures, including occupied residences. The DGIF has not identified any roost trees in Virginia; however, DGIF is aware of three structures that serve as roosts for little brown bats. Similar to the NLEB, the WNS is the greatest and most immediate threat for the little brown bat.

4.2.4.1.7 Tri-colored Bat (Perimyotis subflavus)

The tri-colored bat was designated state endangered on April 1, 2016. Similar to the little brown bat, the hibernacula are typically located in caves in western Virginia. The tri-colored bat typically roosts in trees, rock crevices, or unoccupied structures, such as barns. The DGIF has not identified any trees or structures that serve as roosts for tri-colored bats. Similar to the NLEB, the WNS is the greatest and most immediate threat for the tri-colored bat.

4.2.5 Findings and Conclusions

4.2.5.1 Northern Long-eared Bat (Myotis septentrionalis)

The Inventory Corridor does not contain suitable winter hibernacula or habitat for the NLEB; however, there is suitable summer roosting and foraging habitat. Therefore, the NLEB has the potential to occur within nearly the entirety of the LOD of the FHWA/VDOT Preferred Alternative. To determine the amount of potential habitat that may be impacted by the project, forested land with trees greater than 3-inch DBH were estimated within the Inventory Corridor (approximately 743 acres). Of this total, approximately 162.7 acres of suitable forested habitat is anticipated to be impacted by construction of the FHWA/VDOT Preferred Alternative.

On February 16, 2016, the USFWS promulgated the final 4(d) rule which significantly changed USFWS' recommended conservation measures. The final 4(d) rule states:

> *Under this final 4(d) rule, incidental take within the WNS zone involving tree removal is not prohibited if two conservation measures are followed. The first measure is the application of a 0.25 mile (0.4 km) buffer around known occupied northern long-eared bat hibernacula. The second conservation measure is that the activity does not cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius around the maternity roost tree, during the pup season (June 1 through July 31).*

According to occurrence data managed by DGIF and available online through the NLEB Winter Habitat and Roost Tree Application, no known or documented hibernacula or maternity roosts occur within the FHWA/VDOT Preferred Alternative Inventory Corridor; therefore, VDOT is proposing no further work for this species. In VDOT's opinion, the project may affect, but is not likely to adversely affect the NLEB.

4.2.5.2 Bald Eagle (Haliaeetus leucocephalus)

The Inventory Corridor contains suitable foraging and roosting habitat for bald eagle, but no active nests currently occur within the Inventory Corridor. The closest active bald eagle nest is located on Lake Meade approximately 4,500 feet southeast of the project's eastern terminus. Active bald eagle nest locations are depicted on **Figure 4.2-1**.

Because no active nests occur within the Inventory Corridor, no effects to bald eagle are anticipated and no further coordination is proposed.

4.2.5.3 Red-Cockaded Woodpecker (Picoides borealis)

This species was listed in the IPaC database query results for the Inventory Corridor due to historic records. All known existing occurrences of this species in Virginia are now confined within Piney Grove Preserve which is located well outside of the Inventory Corridor. There is no suitable habitat and no known occurrences of this species in the Inventory Corridor.

The FHWA/VDOT Preferred Alternative will result in no effect to the red-cockaded woodpecker and no further coordination is recommended.

4.2.5.4 Mabee's Salamander (Ambystoma mabeei)

Potential habitat for Mabee's salamander (forested areas adjacent to vernal ponds) occurs in the Inventory Corridor. Based on a field assessment of potential habitat and agency coordination, DGIF recommended that presence/absence surveys be conducted at four locations (see **Figure 4.2-3**). The Mabee's salamander surveys were conducted according to the DGIF's approved survey methods, and involved qualified biologists dip netting at least 50 percent of each of the pond areas during each sampling event in an attempt to capture adult or larval Mabee's salamanders. These sites were surveyed on four occasions in May of 2015. No Mabee's salamanders were found. According to DGIF survey protocols and personal communication with DGIF's state herpetologist salamanders do not breed consistently every year; therefore, two consecutive years of survey would be required to determine definitively whether or not Mabee's salamander is present.

Initial negative survey results suggest that there is a low probability that the Mabee's salamander occurs within the Inventory Corridor. In addition, since the field review with DGIF, the design of the proposed project has been advanced and is avoiding all four locations of identified suitable habitat; therefore, it appears that there will be no effect to Mabee's salamander and no further survey work is proposed.

4.2.5.5 Barking Tree Frog (Hyla gratiosa)

Potential habitat for barking tree frog occurs within the Inventory Corridor. Based on a field assessment of potential habitat and agency coordination, DGIF recommended that presence/absence surveys be conducted at ten locations (see **Figure 4.2-4**).

Barking tree frog surveys involved visiting each site within 48 hours of an adequate rain event from 30 minutes after sunset to 1:00 am. Biologists conducted 5 minute audio surveys at each location, listening for barking tree frog vocalizations. Sites were visited on May 21, June 4, July 15 and August 8 of 2015. No barking tree frog vocalizations were identified during the 2015 surveys. According to DGIF's state herpetologist, frogs do not breed consistently every year; therefore, two consecutive years of surveys would be required to determine definitively whether or not barking tree frogs are present.

Initial negative survey results suggest that there is a low probability that barking tree frogs occur within the Inventory Corridor. It is VDOT's opinion that the FHWA/VDOT Preferred Alternative will result in no effect to barking tree frog and no further work is proposed.

4.2.5.6 Little brown bat (Myotis lucifungus) and tri-colored bat (Perimyotis subflavus)

On April 1, 2016, two additional bat species were listed as state-endangered – the little brown bat and the tri-colored bat. According to the DGIF Guidance Document on Best Management Practices for Conservation of Little Brown Bats and Tri-colored Bats (approved February 16, 2016):

- *The DGIF knows about 132 hibernacula (places where these animals hibernate during the winter) with little brown and or tri-colored bats present. These hibernacula typically are located in western Virginia and are typically caves;*
- *The DGIF has not tracked and is not aware of any little brown or tri-colored bat roost trees (places where the animals live when not hibernating) in Virginia; and,*
- *Little brown and big brown bats are the two species most commonly found in human-occupied dwellings and the ones most likely to cause human conflicts. The DGIF is currently aware of three structures that serve as roosts for little brown bats. Tri-colored bats utilize human structures as well, but are more commonly found in barns, sheds, and abandoned structures and less so in occupied dwellings. Currently, the DGIF is not aware of any tri-colored bat roosts in Virginia.*

VDOT has no knowledge of hibernacula or roosts for little brown bat or tri-colored bat within the Inventory Corridor of the FHWA/VDOT Preferred Alternative; therefore, VDOT is currently not proposing any conservation measures or presence/absence surveys for these two bat species.

4.2.6 Mitigation

The potential impacts to threatened or endangered species resulting from the project have been avoided and minimized by conducting presence/absence surveys, identifying potential habitat, and incorporating design measures such as bridging, countersinking culverts, and reducing the roadway footprint and median width. In addition, temporary impacts will be further reduced through proper location and minimization of staging areas, construction access roads, and modifying construction techniques in valuable habitats.

VDOT has completed due diligence studies and coordinated with DGIF, DCR, and USFWS. On March 29, 2016, VDOT provided a letter to DGIF outlining species conclusions, avoidance and minimization measures, and proposed conservation measures. In an email dated April 20, 2016, DGIF provided concurrence with VDOT's survey results and proposed conservation measures.

On March 29, 2016 VDOT provided a letter to USFWS outlining species conclusions, avoidance and minimization measures, and proposed conservation measures. In an email dated April 12, 2016, USFWS recommended that VDOT re-coordinate the project under the northern long-eared bat final 4(d) rule which was promulgated on February 16, 2016. VDOT re-coordinated the project using the USFWS' online IPaC database. Re-coordination through IPaC resulted in findings of "no effect" for red-cockaded woodpecker, "may affect, not likely to adversely affect" for northern long-eared bat, "no effect" for critical habitat, and "no Eagle Act permit required." On April 24, 2016 VDOT transmitted an April 20, 2016 Self-Certification Letter and Project Review Package to USFWS. The aforementioned agency correspondence is included in Appendix A – Threatened and Endangered Species Agency Concurrence Letters.

USFWS typically does not respond to Self-Certification Letters since the certification letter is USFWS' official response. However, if USFWS has additional questions or does not concur with project determinations, USFWS will contact VDOT during the 30-day review period. Because USFWS did not respond to VDOT's Self-Certification Letter within the 30-day review period, the Self-Certification Letter and the Project Review Package, complete the review of this project in accordance with the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended, and the Bald and Golden Eagle Protection Act (16 U.S.C. 668—6680, 54 Stat. 250), as amended.

As a result of the implementation of the aforementioned conservation measures, coordination, and due diligence, no further action or coordination with USFWS, DGIF, or DCR is required.

4.3 INVASIVE SPECIES

4.3.1 Introduction

Invasive species are nonnative plant, animal, or microbial species that cause, or are likely to cause, economic or ecological harm or harm to human health (EO 13112). "Nonnative" (or "alien", "exotic", or "nonindigenous") means they have been introduced by human action, intentionally or accidentally, into a region outside their natural geographic range. Introductions can occur through a variety of pathways, including intentional transport of a species for commercial purposes, accidental introduction such as invasive plant species seeds in fill material, or intentional releases such as illegal stocking of fish or for biological control of a pest (EPA, 2012a). Invasive species found in the study area were identified through published sources and online resources. These resources included DGIF (DGIF, 2012), DCR (DCR, 2014c), Virginia Invasive Species Working Group (VISWG) (VISWG 2012 & 2014), and the Center for Invasive Species and Ecosystem Health's (CISE) Early Detection and Distribution Mapping System (EDSS) (CISE, 2014).

Transportation corridors, such as roads and highways, allow opportunities and can serve as conduits for the dispersal of invasive species (particularly plant species). Where transportation corridors cross waterways, these effects can quickly expand to other areas. Invasive species can move on vehicles and in the loads they transport. Invasive plants can be moved from site to site during roadside maintenance operations. Weed seed can inadvertently be introduced by equipment into a corridor during construction on equipment and through the use of mulch, imported soil, water, or gravel and sod. Some invasive plant species may be deliberately planted as part of erosion control, landscape, and wildflower projects (NCHRP, 2006).

Invasive species cause harm to native species, natural communities, and ecosystem processes. Invasive species are a major factor in freshwater fish extinctions and endangerments. Over 45 percent of current and candidate ESA-listed species are considered to be at risk at least partly due to invasive species (USFWS, 2012b). Invasive species can also cause great economic harm, costing Virginia over $1 billion and the United States more than $120 billion in damages every year (Pimentel et al., 2005).

4.3.2 Methodology

Invasive species found within the vicinity of the Inventory Corridor were identified through published sources and online resources. These resources included DGIF (DGIF, 2012), VDCR (VDCR, 2014c), Virginia Invasive Species Working Group (VISWG, 2012 & 2014), and the Center for Invasive Species and Ecosystem Health's Early Detection and Distribution Mapping System (CISE, 2014).

4.3.3 Findings

4.3.3.1 Invasive Plants

DCR, in partnership with the Virginia Native Plant Society, has published an advisory Virginia Invasive Plant Species List (obtained at http://www.dcr.virginia.gov/natural-heritage/invsppdflist). This list includes terrestrial, wetland, and aquatic plants. The plants are ranked by their invasiveness, which is based on their impact on natural areas and other species, their potential to disperse and invade natural landscapes, their distribution and abundance, and their difficulty to manage. The plants are given Virginia Invasiveness Ranks of high, medium, and low (VDCR, 2014c). The list contains 90 species, of which 38 species are given a rank of Highly Invasive and are potentially present in Virginia's Coastal Plain. One Highly Invasive species, Chinese lespedeza (*Lespedeza cuneata*), is recorded throughout eastern Virginia in the Atlas of the Virginia Flora (Virginia Botanical Associates, 2014). In addition, the VISWG has identified three invasive plant species, listed in bold lettering in **Table 4.3-1**, as of "High Concern" in Virginia (VISWG, 2014). The vast majority of these are ready colonizers of disturbed areas. Highly invasive plant species are presented in **Table 4.3-1**.

Table 4.3-1: Highly Invasive Plant Species Observed with Potential to Occur Within the Vicinity of the Inventory Corridor

Common Name	Scientific Name	Aquatic/ Wetland or Terrestrial	Origin and Dispersal Pathways	Disturbed area colonizer?	Recorded in Inventory Corridor County/City
Alligator weed	*Alternanthera philoxeroides*	Aquatic/ Wetland	Accidental via ballast water. Natural propagation followed.	Yes	Isle of Wight
Amur Honeysuckle	*Lonicera maackii*	Terrestrial	Introduced from Asia in the 1700s and 1800s. Natural propagation followed.	Yes	Suffolk
Autumn olive	*Elaeagnus umbellata*	Terrestrial	Intentional introduction for revegetation of disturbed areas. Natural propagation followed.	Yes	Not Recorded in Inventory Corridor
Beach vitex	*Vitex rotundifolia*	Terrestrial	Intentionally introduced to stabilize dunes. Natural propagation followed.	No	Not Recorded in Inventory Corridor
Canada thistle	*Cirsium arvense*	Terrestrial	Introduced by colonists in early 17th century. Natural propagation followed.	Yes	Not Recorded in Inventory Corridor
Chinese lespedeza	*Lespedeza cuneata*	Terrestrial	Intentional introduction for erosion control, soil improvement, and wildlife food and cover. Natural propagation followed.	Yes	Southampton, Isle of Wight, and Suffolk
Chinese privet	*Ligustrum sinense*	Terrestrial	Incidental release from horticultural trade. Natural propagation followed.	Yes	Southampton, Isle of Wight, and Suffolk
Cinnamon vine	*Discorea polystachya*	Terrestrial	Introduced from Asia for ornamental, food, and medicinal purposes and escaped cultivation in the mid-1990s. Natural propagation followed.	Yes	Isle of Wight and Suffolk
Cogon grass	*Imperata cylindrica*	Terrestrial	Incidental and intentional release. Used as packing material and planted for forage and erosion	Yes	Not Recorded In Inventory Corridor

Common Name	Scientific Name	Aquatic/ Wetland or Terrestrial	Origin and Dispersal Pathways	Disturbed area colonizer?	Recorded in Inventory Corridor County/City
			control. Natural propagation followed.		
Common reed	***Phragmites australis ssp. australis***	**Aquatic/ Wetland**	**Accidental via ballast water. Natural propagation followed.**	**Yes**	**Southampton, Isle of Wight, and Suffolk**
Eurasian water-milfoil	*Myriophyllum spicatum*	Aquatic/ Wetland	Intentional introduction. Natural propagation followed. Can reach new water bodies by attaching to boating equipment.	No	Isle of Wight
European stinging nettle	*Urtica dioica*	Terrestrial	Introduced from Europe in the mid-1800s. Natural propagation followed.	Yes	Not Recorded in Inventory Corridor
Garlic mustard	*Alliaria petiolata*	Terrestrial	Native to Europe and introduced in the 1800s for medicinal and culinary purposes. Natural propagation followed.	No	Not Recorded in Inventory Corridor
Hydrilla	*Hydrilla verticillata*	Aquatic/ Wetland	Incidental release from aquarium trade. Natural propagation followed.	No	Not Recorded in Inventory Corridor
Japanese honeysuckle	*Lonicera japonica*	Terrestrial	Intentional introduction for ornamental ground cover, erosion control and wildlife food and habitat. Natural propagation followed	Yes	Southampton, Isle of Wight, and Suffolk
Japanese knotweed	*Reynoutria japonica*	Terrestrial	Incidental release from horticultural trade. Natural propagation followed.	Yes	Southampton, Isle of Wight, and Suffolk
Japanese sand sedge	*Carex kobomugi*	Terrestrial	Intentional for use as erosion control and as a sand stabilizer. Natural propagation followed.	Yes	Not Recorded in Inventory Corridor
Japanese stiltgrass	***Microstegium vimineum***	**Aquatic/ Wetland**	**Incidental release, likely from use as a packing material for porcelain. Natural propagation followed.**	**Yes**	**Southampton, Isle of Wight, and Suffolk**
Johnson-grass	*Sorghum halepense*	Terrestrial	Intentionally introduced as a forage crop. Natural propagation followed.	Yes	Southampton, Isle of Wight, and Suffolk
Kudzu vine	*Pueraria montana* var. *lobata*	Terrestrial	Intentional introduction for use as a soil stabilizer, animal fodder, and ornamental vine. Natural propagation followed.	Yes	Southampton, Isle of Wight, and Suffolk
Large flower primrose willow	*Ludwigia grandiflora* ssp. *hexapetala*	Aquatic/ Wetland	Introduced from South America and natural propagation followed.	No	Not Recorded in Inventory Corridor
Lesser celandine	*Ficaria verna*	Terrestrial	Incidental release from horticultural trade. Natural propagation followed.	No	Not Recorded in Inventory Corridor
Marsh dewflower	*Murdannia keisak*	Aquatic/ Wetland	Incidental release, imported with rice. Ducks favor the seeds and may be a dispersal vector.	Yes	Southampton, Isle of Wight, and Suffolk

Common Name	Scientific Name	Aquatic/ Wetland or Terrestrial	Origin and Dispersal Pathways	Disturbed area colonizer?	Recorded in Inventory Corridor County/City
Mile-a-minute	*Persicaria perfoliata*	Terrestrial	Introduced in the late 1800s to 1930s from eastern Asia and the Philippines. Natural propagation followed.	Yes	Suffolk
Morrow's honeysuckle	*Lonicera morrowii*	Terrestrial	Planted as an ornamental and for wildlife food and cover. Natural propagation followed.	Yes	Not Recorded in Inventory Corridor
Multiflora rose	*Rosa multiflora*	Terrestrial	Imported by horticulturists. Intentional introduction for wildlife food and cover, soil erosion control, headlight glare reducer on highway medians. Natural propagation followed.	Yes	Southampton and Suffolk
Oriental bittersweet	*Celastrus orbiculatus*	Terrestrial	Incidental release from horticultural trade. Natural propagation followed.	Yes	Isle of Wight
Parrot feather	*Myriophyllum aquaticum*	Aquatic/ Wetland	Incidental release from aquarium trade. Natural propagation followed.	No	Southampton and Isle of Wight
Porcelain-berry	*Ampelopsis brevipedunculata*	Terrestrial	Introduced in the 1870s as bedding and landscape plant. Natural propagation followed.	Yes	Not Recorded in Inventory Corridor
Purple loosestrife	*Lythrum salicaria*	Aquatic/ Wetland	Incidental release from horticultural trade and medicinal purposes. Natural propagation followed.	Yes	Suffolk
Spotted knapweed	*Centaurea stoebe* ssp. *micranthos*	Terrestrial	Accidental release possibly mixed in with alfalfa seed or ship ballast. Natural propagation followed.	Yes	Isle of Wight
Tree-of-heaven	***Ailanthus altissima***	**Terrestrial**	**Incidental release from horticultural trade. Natural propagation followed.**	**Yes**	**Southampton, Isle of Wight, and Suffolk**
Water hyacinth	*Eichhornia crassipes*	Aquatic/ Wetland	Introduced as an ornamental in the United States in 1884 at the Cotton States Exposition in New Orleans. Natural propagation followed.	No	Not Recorded in Inventory Corridor
Waterwheel	*Aldrovanda vesiculosa*	Aquatic/ Wetland	Native to Europe, Asia, Africa, and Australia; mainly spread through the movement of waterfowl.	No	Not Recorded in Inventory Corridor
Wavyleaf grass	*Oplismenus hirtellus* ssp. *undulatifolius*	Terrestrial	Native to Southern Europe and Southeast Asia; fruits attach onto passing animals to aid seed dispersal.	No	Not Recorded in Inventory Corridor
Wineberry	*Rubus phoenicolasius*	Terrestrial	Imported as breeding stock for blackberry cultivars. Natural propagation followed.	Yes	Southampton and Isle of Wight
Winged euonymus	*Euonymus alatus*	Terrestrial	Introduced in North American in the 1860s for ornamental purposes. Natural propagation followed.	Yes	Not Recorded in Inventory Corridor

Common Name	Scientific Name	Aquatic/ Wetland or Terrestrial	Origin and Dispersal Pathways	Disturbed area colonizer?	Recorded in Inventory Corridor County/City
Yellow flag	*Iris pseudacorus*	Aquatic/ Wetland	Introduced in North America in the early 1800s for ornamental plantings, erosion control, and sewage treatment. Natural propagation followed.	No	Isle of Wight

Species in **bold** typeface are species of "High Concern" in Virginia (VISWG, 2014).
Sources: VDCR, 2014c, CISE, 2014, VISWG, 2014.

4.3.3.2 Invasive Animals and Other Organisms

There are many species of invasive animals that are of concern in Virginia. Like the plants, these species can be terrestrial or aquatic. The Virginia Invasive Species Management Plan (VISWG, 2012) lists 20 invasive animal species as well as one protozoan, one virus, one fungus, and one prionic species/organism. This list is not a complete list of all invasive species as it contains only those that are managed or discussed in the plan. In addition, VISWG has identified nine invasive animal/insect/fungus species of "High Concern" in Virginia (VISWG, 2014). Invasive species are presented in **Table 4.3-2**.

Table 4.3-2: Invasive Animal and Other Species of Concern in Virginia

Common Name	Scientific Name	Lifeform	Aquatic or Terrestrial	Origin and Dispersal Pathways	Established in VA?
Asian clam[1]	*Corbicula fluminea*	Animal	Aquatic	Accidental via human transport by ballast water, recreational watercraft and equipment and aquaculture escape. Intentional, released for food item. Natural dispersal followed.	Yes
Asian longhorn beetle[1]	*Anoplophora glabripennis*	Animal	Terrestrial	Accidental via the transportation of infested wood and firewood. Natural dispersal followed.	No
Black carp[1]	*Mylopharyngodo piceus*	Animal	Aquatic	Accidental, imported in grass carp stocks. Natural dispersal followed.	No
Blue catfish[1]	*Ictalurus furcatus*	Animal	Aquatic	Intentional stocking for sport fishing. Natural dispersal followed.	Yes
Chinese mitten crab[2]	*Eriocheir sinensis*	Animal	Aquatic	Accidental via ballast water. Intentionally released for food item. Natural dispersal followed.	No
Chronic wasting disease[1]	transmissible spongiform encephalopathies (TSEs)	Prion	Terrestrial	Deer neurological disease. Likely spread animal to animal contact or soil or other medium to animal. Deer carcass transport as well.	Yes
Emerald ash borer[1 & 2]	*Agrilus planipennis*	Animal	Terrestrial	Accidental via the transportation of infested wood. Natural dispersal followed.	Yes
Feral pig[3]	*Sus scrofa*	Animal	Terrestrial	Accidental and intentional release. Natural dispersal followed.	Yes
Gypsy moth[1]	*Lymantria dispar*	Animal	Terrestrial	Accidental human transport of egg masses.	Yes
Hemlock wooly adelgid[1]	*Adelges tsugae*	Animal	Terrestrial	Accidental via the transportation of infested wood. Natural dispersal followed.	Yes
Imported fire ant[1 & 2]	*Solenopsis invicta*	Animal	Terrestrial	Natural and accidental via the transportation of infested soil, nursery stock, grass, sod, and any equipment	Yes

Common Name	Scientific Name	Lifeform	Aquatic or Terrestrial	Origin and Dispersal Pathways	Established in VA?
				that contains soil. Natural dispersal followed.	
Mosquito spp.[1]	*Aedes albopictus; Ochlerotatus japonicus*	Animal	Aquatic (larva)	Accidental via the commercial movement of scrap tires for retreading, recycling, or other purposes. Natural dispersal followed.	Yes
MSX disease[1]	*Haplosporidium nelsoni*	Protozoan	Aquatic	This protozoan infects native oysters. The infective stage of has not been determined.	Yes
Mute swan[1]	Cygnus olor	Animal	Aquatic	Intentional introduction for private estates and city parks. Natural dispersal followed.	Yes
New Zealand mudsnail[1]	*Potamopyrgus antipodarum*	Animal	Aquatic	Accidental: Human transport via ballast release and recreational activities. Natural dispersal followed.	No
Non-native oysters[1]	*Crassostrea ariakensis*	Animal	Aquatic	Intentional release for commercial harvest.	Unknown
Northern snakehead fish[2]	*Channa argus*	Animal	Aquatic	Imported and sold as live fish food at some markets and in the aquarium trade.	Yes
Nutria[1]	*Myocaster coypus*	Animal	Aquatic	Imported from South America for their pelts. Intentional and accidental releases. Natural dispersal followed.	Yes
Pine shoot beetle[1]	*Tomicus piniperda*	Animal	Terrestrial	Accidental via the transportation of infested wood. Natural dispersal followed.	No
Quagga mussel[1]	*Dreissena bugensis*	Animal	Aquatic	Accidental: Human transport via ballast release and recreational activities.	No, eradicated in 2006
Rapa whelk[1 & 2]	*Rapana venosa*	Animal	Aquatic	Accidental: Human transport via ballast release and recreational activities. Natural dispersal followed.	Yes
Rusty crayfish[1 & 2]	*Orconectes rusticus*	Animal	Aquatic	Accidental: Use as bait. Natural dispersal followed.	No
Siberian moth[1]	*Dendrolimus sibiricus*	Animal	Terrestrial	Could be imported on infected plants. Currently not in United States. Natural dispersal. Adults can travel up to 100km per year.	No
Sirex wood wasp[2]	*Sirex noctilio*	Animal	Terrestrial	Accidental via the shipment of infested wood packing materials. Natural dispersal followed.	No
Snakehead fishes[1 & 2]	*Channa sp.*	Animal	Aquatic	Intentional release. Natural dispersal followed.	Yes
Sudden oak death[1 & 2]	*Phytophthora ramorum*	Fungus	Terrestrial	Accidental via the shipment of infected trees from nurseries. Natural dispersal followed.	No
West Nile virus[1]	*Flavivirus sp.*	Virus	Aquatic (transmitted by mosquitos)	Infected birds via migrations.	Yes
Zebra mussel[1 & 2]	*Dreissenia polymorpha*	Animal	Aquatic	Accidental: Human transport via ballast release and recreational activities.	Yes, restricted to one pond.

Source: [1] VISWG, 2012. [2] VISWG, 2014. [3] DGIF, 2012.

4.3.4 Impacts

There is potential for invasive species to become established along the limits of disturbance of the FHWA/VDOT Preferred Alternative during and following construction. Invasive species that have been

previously recorded in the Inventory Corridor and are colonizers of disturbed areas are of the most concern. Species that meet both criteria are listed in **Table 4.3-3**. Construction of the project has the potential to spread invasive species via the entering and exiting of contaminated construction equipment, the inclusion of invasive species in seed mixtures and mulch, and the improper removal and disposal of invasive species so that seed is spread along the highway. Invasive species can also become introduced by contaminated vehicles using the highway post-construction.

Table 4.3-3: Highly Invasive Plant Species Observed with Potential to Occur Within the Vicinity of the Inventory Corridor

Common Name	Scientific Name	Aquatic/ Wetland or Terrestrial	Recorded in Inventory Corridor County/City
Alligator weed	*Alternanthera philoxeroides*	Aquatic/ Wetland	Isle of Wight
Amur Honeysuckle	*Lonicera maackii*	Terrestrial	Suffolk
Chinese lespedeza	*Lespedeza cuneata*	Terrestrial	Southampton, Isle of Wight, and Suffolk
Chinese privet	*Ligustrum sinense*	Terrestrial	Southampton, Isle of Wight, and Suffolk
Cinnamon vine	*Discorea polystachya*	Terrestrial	Isle of Wight and Suffolk
Common reed	***Phragmites australis ssp. australis***	**Aquatic/ Wetland**	**Southampton, Isle of Wight, and Suffolk**
Japanese honeysuckle	*Lonicera japonica*	Terrestrial	Southampton, Isle of Wight, and Suffolk
Japanese knotweed	*Reynoutria japonica*	Terrestrial	Southampton, Isle of Wight, and Suffolk
Japanese stiltgrass	***Microstegium vimineum***	**Aquatic/ Wetland**	**Southampton, Isle of Wight, and Suffolk**
Johnson-grass	*Sorghum halepense*	Terrestrial	Southampton, Isle of Wight, and Suffolk
Kudzu vine	*Pueraria montana* var. *lobata*	Terrestrial	Southampton, Isle of Wight, and Suffolk
Marsh dewflower	*Murdannia keisak*	Aquatic/ Wetland	Southampton, Isle of Wight, and Suffolk
Mile-a-minute	*Persicaria perfoliata*	Terrestrial	Suffolk
Multiflora rose	*Rosa multiflora*	Terrestrial	Southampton and Suffolk
Oriental bittersweet	*Celastrus orbiculatus*	Terrestrial	Isle of Wight
Parrot feather	*Myriophyllum aquaticum*	Aquatic/ Wetland	Southampton and Isle of Wight
Purple loosestrife	*Lythrum salicaria*	Aquatic/ Wetland	Suffolk
Spotted knapweed	*Centaurea stoebe* ssp. *micranthos*	Terrestrial	Isle of Wight
Tree-of-heaven	***Ailanthus altissima***	**Terrestrial**	**Southampton, Isle of Wight, and Suffolk**
Wineberry	*Rubus phoenicolasius*	Terrestrial	Southampton and Isle of Wight
Winged euonymus	*Euonymus alatus*	Terrestrial	Not Recorded in Inventory Corridor

Species in **bold** typeface are species of "High Concern" in Virginia (VISWG, 2014).
Sources: VDCR, 2009b, CISE, 2014, VISWG, 2014.

4.3.5 Mitigation

While VDOT may not be directly responsible for the encroachment of invasive plants and animals into the right-of-way for the FHWA/VDOT Preferred Alternative, VDOT is responsible for discouraging their

introduction and spread, particularly following new construction projects, in accordance with the FHWA directive implementing Executive Order 13112.

Invasive species must be managed through a variety of strategies to minimize their environmental and economic impact. Potential methods to eliminate and control invasive plant and animal species are described in VDOT's Road and Bridge Specifications, which is a required guideline for highway construction projects in Virginia. Construction methods that minimize the potential for encroachment or establishment of invasive species include selective tree removal, trimming, and cleanup (Section 601); proper application of topsoil (Section 602); seeding (Section 603); sodding (Section 604); planting (Section 605), soil retention covering to suppress invasive species colonization (Section 606); herbicides (Section 607); mowing (Section 608); proper clearing and grubbing (Section 301); installation of drainage structures (Section 302); and earthwork (Section 303).

In removal, trimming, and cleanup of trees (Section 601.03), stumps of living trees and shrubs shall be coated with an herbicide solution within 48 hours after they are cut. The exposed surface of stumps and exposed live roots shall be saturated with herbicide to the point of runoff. When trimming trees, branches and limbs that affect sight distance or the open vista and dead or diseased branches and limbs more than two inches in diameter that will hinder the healthy normal growth of trees shall be removed as designated by the Engineer. Cuts shall be made flush at the collar of the supporting trunk or limb. Debris shall be disposed of by burning or chipping or in accordance with the requirements of Section 106.04. Burning shall also be performed in accordance with the requirements of Section 107.16. Fires shall be located and supervised so that they will not spread or damage vegetation.

To mitigate for potential dispersal of invasive species via the application of topsoil, Class A topsoil shall conform to the requirements of Section 244.02(b)1. Class B topsoil shall conform to the requirements of Section 244.02(b)2, as specified in Section 602.02.

Seed shall conform to the requirements of Section 244.02(c). Fertilizer shall conform to the requirements of Section 244.02(d). Lime shall conform to the requirements of Section 244.02(e). Mulch shall conform to the requirements of Section 244.02(g), as specified in Section 603.02.

Sod shall conform to the requirements of Section 244.02(h), as specified in Section 604.02.

Plants shall conform to the requirements of Section 244.02(i). Drainage stone shall conform to the requirements of Section 204. Composted yard waste shall conform to the requirements of Section 244.02 (j). Geotextile drainage fabric shall conform to the requirements of Section 245. Topsoil shall conform to the requirements of Section 244.02(b). Horticultural Grade perlite shall conform to the requirements of Section 244.02(j). Tree tubes shall conform to the requirements of Section 244.02(j), as specified in Section 605.02. Tree anchors and staking and guying materials shall conform to the requirements of Section 244.02(j). All other miscellaneous planting materials shall conform to the requirements of Section 244.02(j) and 244.02(k), as specified in Section 605.02.

Plant bed preparation shall only be required on slopes of 3:1 or flatter. Where grass and weeds are present, the Contractor shall treat the designated bed area(s) with a broad spectrum grass and weed killing herbicide at least two weeks prior to beginning bed preparation, or physically remove turf and weeds immediately before bed preparation. The entire area of the plant bed shall be cultivated to a depth of four inches by a rotary cultivator or other approved method. The Contractor shall then apply composted yard waste at a depth of three inches over the entire plant bed and re-till to form a homogenous soil medium. Soil shall be

cultivated so that there are no clods larger than two inches in diameter. Any remaining grass, sod, and weeds shall be removed from the bed. Rocks over three inches in diameter, clods, roots, and other objectionable material remaining on the surface shall be removed and disposed of in accordance with the requirements of Section 106.04 or as approved in writing by the Engineer. Individual planting pits shall not be dug until after the bed is prepared to the satisfaction of the Engineer, as specified in Section 605.03.

Materials for protective coverings and soil stabilization mats shall conform to the requirements of Section 244.02(k), as specified in Section 606.02.

Removal of weeds, grass, and root growth may be completed by hand or through the application of "pre-emergent" and "post emergent" herbicides as approved by the Engineer. All herbicide applications shall be performed by certified pesticide applicators in accordance with the requirements of Section 601. Additional weeding may be performed when requested by the Engineer and with written agreement from both parties. The Engineer also reserves the right to delete individual weeding cycles at no cost to the Department when necessary. The Contractor shall be responsible for replacing plants that are damaged or that die due to the application of herbicide treatments. When herbicides are used for post emergent weed control, the weeds shall be cut to a height of six inches or as recommended by the manufacturer if necessary, prior to applying the herbicide. Other pesticides, adjuvants, and plant growth regulators may be used when approved by the Engineer, as specified in Section 605.05.

During mowing operations, designated areas will be mowed to a height of not less than four inches when and as directed by the Engineer until final acceptance, as specified in Section 608.01.

Installation of drainage structures requiring backfill for areas where unsuitable material has been removed shall be placed and compacted in accordance with the requirements of Section 303.04(g), as specified in Section 302.03. Class I backfill material shall be crusher run aggregate, No. 25 or 26; aggregate base material, Size 21A or 21B; flowable fill; or crushed glass conforming to the size requirements for crusher run aggregate size 25 and 26, as specified in Section 302.03.

During earthwork, excavation for borrow shall consist of approved material required for the construction of the roadway and shall be obtained from approved sources outside the project limits. Borrow excavation shall conform to the requirements of AASHTO M57 and the requirements herein. Materials for temporary silt fences, geotextile fabric silt barriers, and filter barrier shall conform to the requirements of Sections 242.02(c) and 245.03(a). Geotextile materials used for embankment stabilization shall conform to the requirements of Section 245.03(e). Mulch shall conform to the requirements of Section 244.02(g), as specified in Section 303.02.

In order to effectively control invasive species, contractors' bidding packages will be required to include specific provisions that manage acquired rights-of-way for invasive species control by implementing the VDOT Road and Bridge Specifications applicable to the circumstances. While rights-of-way are at risk from invasive species colonization from adjacent properties, implementing these provisions would reduce or minimize potential for introduction, proliferation, and spread of invasive species. In addition, the implementation of BMPs for erosion/sediment control and abatement of pollutant loading would minimize secondary impacts to adjoining communities and habitat by reducing excess nutrient loads that could encourage invasive species proliferation.

With respect to aquatic invasive species, federal and state resource agency guidelines and resource documents will be applied to assist with invasive species management responsibilities, including the 2012

Virginia Invasive Species Management Plan and guidance provided by the USFWS program website (https://www.fws.gov/invasives/). VDOT will implement control techniques into management plans at the preliminary design level. To ensure compliance and enforceability, specific management procedures for invasive aquatic species will be incorporated into the Section 404 and 401 water quality permit special conditions (such as required annual monitoring reports and contingency planning).

4.4 MINERAL RESOURCES AND UNIQUE GEOLOGICAL FEATURES

4.4.1 Introduction

This section provides information on potential impacts to mineral resources that may result from the FHWA/VDOT Preferred Alternative. No unique features, such as faults and fractures, were identified along the FHWA/VDOT Preferred Alternative. Mineral mining along the FHWA/VDOT Preferred Alternative consists of sand and gravel operations. Sand and gravel deposits are not considered to be a unique geologic feature. The Virginia Department of Mines, Minerals, and Energy (DMME) believes that there may be marl or titanium deposits in the Coastal Plain Province of Virginia that could potentially be mined; however, neither of these are believed to be present along the FHWA/VDOT Preferred Alternative.

The FHWA/VDOT Preferred Alternative is located in the Coastal Plain Physiographic Province of Virginia, which is characterized by poorly to well-sorted unconsolidated marine and fluvial sediments varying from clay to gravel with lateral variations in thickness. These sediments generally increase in thickness towards the east, often controlled by cyclic transgression and regression depositional sequences of the ocean that typically coarsen with depth. Coastal Plain sands, gravels, and sediments are of Quaternary and upper Tertiary age, underlain by marine, deltaic, and fluvial clays, silts, and sands of lower Tertiary age, underlain by fluvial-deltaic to shallow-shelf sands and clays of Cretaceous age, underlain by crystalline bedrock.

The Coastal Plain has a terraced landscape that stair-steps down to the coast and major rivers. The risers (scarps) are former shorelines. The higher, older plains in the western part of the Coastal Plain are more dissected by stream erosion than the lower, younger terraces. This landscape was formed over the last few million years as sea level rose and fell in response to the repeated melting and growth of large continental glaciers and as the Coastal Plain slowly uplifted.

4.4.2 Methodology

Mineral resources and unique geological features were identified through published sources and online resources such as the DMME website (http://www.dmme.virginia.gov).

4.4.3 Findings

Many geologic formations are found throughout the FHWA/VDOT Preferred Alternative. Five primary formations are located within the Inventory Corridor: the Shirley Formation, Windsor Formation, Charles City Formation, Holocene alluvium, and the Chesapeake Group **(See Figure 4.4-1)**.

Formations within the Inventory Corridor are discussed below.

- Shirley Formation: This formation is located adjacent to the Holocene alluvium formation in the western portion of the Inventory Corridor, and intersects the LOD at two locations. It consists of light to dark gray, blue gray to brown sand, gravel, silt, clay and peat. It constitutes the surficial deposits of riverine terraces, bay barriers, and bay-floor plains.

- Charles City Formation: This formation is located in the western and eastern portions of the Inventory Corridor and intersects the LOD at five locations. It consists of light to medium gray and light to dark yellow and yellow brown to red brown sand, silt, and clay. These deposits typically occur on riverine terraces and Coastal Plains and are present beneath flat to gently seaward–sloping plains in the Suffolk area. They were formed in a fluviomarine–estuarine environment.
- Windsor Formation: This formation is bound between the Charles City Formation and Chesapeake Group, is centrally located within the Inventory Corridor, and intersects the LOD at two locations. It consists of gray and yellowish- to reddish-brown sand, gravel, silt, and clay. It constitutes surficial deposits of extensive plain east of Surry scarp and of coeval, fluvial-estuarine terraces west of scarp.
- Holocene alluvium: This formation is located in the western portion of the Inventory Corridor and intersects the LOD at one location. It consists of alluvium deposits, including gravelly sand and sandy gravel, silt, and clay, and is located in channels, point bars, and floodplains.
- The Chesapeake Group: This group is limited to the eastern portion of the Inventory Corridor and intersects the LOD at five locations. It consists of fine to coarse grained sand, silt and clay; shells can be common. These sediments were deposited in shallow inner- to middle-shelf waters. The formations within the Chesapeake Group from youngest to oldest consist of: Chowan River Formation, Yorktown Formation, Eastover Formation, St. Mary's Formation, Choptank Formation, and the Calvert Formation.

The DMME, Division of Mineral Mining (DMM) regulates the operation and reclamation of all non-coal mineral mining operations, including quarries, sand and gravel pits, and other surface and underground mining in Virginia. DMM provides for the safe and environmentally sound production of Virginia's non-fuel minerals. DMM administers both health and safety and surface mining reclamation regulatory programs.

The only economic mineral resource occurring within the Inventory Corridor is sand and gravel, which is used largely for aggregate. Sand and gravel mining operations are in a constant state of flux regarding closure of active operations and opening of new operations. The DMME, Division of Mineral Mining (DMM) provided a list of current permitted sand and gravel operations for counties and cities within the FHWA/VDOT Preferred Alternative (DMM, 2014). In 2013, the DMM reported that there were 45 permitted sand and gravel operations mining 2,542,216 tons of material. According to the DMM interactive website, there are no mineral mines located within the Inventory Corridor. The only mineral mines located within approximately one-mile of the Inventory Corridor include Presson Pit, a sand and gravel pit permitted in 1994 and released in 2006 and located near the intersection of Route 460 and Old Myrtle Road, and Jones Pit, a sand pit permitted in 1988 and released in 2014 and located near the intersection of Kings Fork Road and Joshua Lane (DMM, 2016).

4.4.4 Impacts

Although no sand and gravel mines are currently listed on the DMM website, this could change over time as new sand and gravel operations are developed. Other potential direct impacts could occur as a result of construction of the FHWA/VDOT Preferred Alternative on new alignment on top of existing sand and gravel deposits, thus preventing future access to those deposits.

Impacts may also be realized through the development of new sand and gravel mining operations as a result of the need for fill material for the roadway. Development of new mining operations would represent a

positive economic impact to the region, but could represent an adverse effect on other natural resources such as forestland, agricultural lands, and wetlands where the mining operations occur.

4.4.5 Mitigation

The loss of any potential future mining operations or the removal of potential mining deposit areas that lie within the footprint of the roadway itself would be offset by the opening of new mining sites for production of suitable fill material for construction of the roadway.

5.0 INDIRECT EFFECTS AND CUMULATIVE IMPACTS

5.1 INDIRECT EFFECTS ANALYSIS

This section presents an analysis of the potential indirect impacts related to the FHWA/VDOT Preferred Alternative. For the purposes of this analysis, the methodology followed for analyzing indirect effects are prescribed in the TRB NCHRP Report 466: *Desk Reference for Estimating the Indirect Effect of Proposed Transportation Projects* (TRB, 2002). Potential consequences have been estimated based on the extent of direct impacts to the resources as well as the identification of potential indirect effects on these resources both inside and outside of the induced growth areas.

5.1.1 Analyze Indirect Effects and Evaluate Analysis Results

Waters, wetlands, and water quality; floodplains; state wild and scenic rivers; natural communities, wildlife, and biodiversity; and threatened and endangered species were considered notable natural resources within the study area and are carried forward for analysis in this step. Direct effects would occur through physical alteration or destruction of habitat by the roadway and its associated right-of-way. Each direct impact can cause additional indirect impacts as discussed below.

One of the most important indirect effects associated with habitat alteration/destruction is habitat fragmentation. Habitat fragmentation can have wide-ranging implications, and may result in creation of more edge habitat, barriers to wildlife movement, reduction in patch size, loss of interior or area-sensitive species, disruption of wildlife foraging patterns, increased opportunity for invasive species establishment, and generally reduced biological diversity. The study area's riparian corridors are generally the least disturbed within the natural landscape of the study area. Indirect effects to the riparian corridors may occur through restriction of movements by wildlife into and out of them as a result of fragmentation of the wildlife corridors, as well as more locally restricted movements of wildlife into and out of these protected areas.

The primary indirect effect associated with the introduction of pollutants from roadway runoff is the degradation of nearby terrestrial and aquatic habitat from increased deposition of sediments or contamination from chemical pollutants in the form of heavy metals, inorganic salts, asbestos, and petroleum products and their byproducts. When runoff enters waters that are already impaired, the impacts are cumulative and can result in accelerated changes in the macrobenthic community structure and composition, which in turn can affect the fish and amphibian populations that rely on them as a food source, as well as the birds and aquatic mammals that prey on the fish and amphibians. The effects can result in changes in community structure at a local level, but may also extend further to include changes in ecosystem structure and function in the absence of proper mitigation. Potential effects to impaired waters and possible mitigation are presented in **Chapter 3.0, Sections 3.4.3.2.1** and **3.4.4.1.1** and discussed in detail in the ***Natural Resources Technical Report*** (VDOT, 2014i) and the ***Supplemental Natural Resources Technical Report*** (VDOT, 2016f).

According to studies, rural roads have lower levels of stormwater pollutants than urban roads. Similarly, roads with lower ADT have lower levels of stormwater pollutants than roads with higher ADT. Based on previous studies, rural roads with less than 30,000 ADT volumes do not produce the level of pollutants required to measurably affect surrounding water quality (Driscoll et al, 1990). As discussed in the ***Supplemental Traffic and Transportation Technical Report*** (VDOT, 2016h), neither the existing Route 460, nor the new Route 460, is projected to exceed this 30,000 ADT threshold through 2040. A recent study found that there is very little long-term impact to water quality from stormwater runoff from bridges in either rural or urban areas, and minimal short-term impacts to water quality (Wagner et al., 2011). It should be noted that the Wagner study investigated the effects of runoff from bridges only, and not from fill/culvert crossings of streams. A number of other studies have found that there are numerous factors besides ADT that could potentially influence the pollutant levels within stormwater runoff, including rainfall volume, rainfall frequency, and surrounding land use (VDOT 2014z). Because of the numerous variables, a meaningful projection of the extent of pollutant loads from any alternative cannot be made without extensive analysis. In lieu of this analysis, the best predictor of the relative degree of impacts to water quality from the alternatives is the extent of direct impacts to streams, i.e., the number of streams crossed.

The disruption or alteration of natural processes leads to the indirect effect of changing hydrologic flow dynamics through the local natural communities and sometimes altering these dynamics at the ecosystem level such that the ability of the system to maintain itself is altered. Preserving the systems is important because they are a major pathway for energy flow and dissipation in the Coastal Plain, an area of flat, low-lying land with many rivers, marsh and swampland. Some of the potential effects that may occur as a result of changes to natural processes in the wetlands of the study area include changes to floodwater storage capacity and retention times, vegetative community composition and structure, nutrient cycling, and aquatic life movement. For example, an increase in sunlight in riparian areas due to a new roadway can alter vegetation community composition (introduction of invasive species, changes in light regime which favor full-sun plants) and water chemistry (decrease in dissolved oxygen and increase in temperature, both which impact nutrient cycling and aquatic life). The effects described in the preceding paragraph could result from the FHWA/VDOT Preferred Alternative.

Hydrologic modifications from wildlife activity are relatively commonplace in these systems, such as tree removal and dam construction caused by beavers, and consequently, these low gradient small stream swamp systems are adapted to these natural hydrologic modifications. However, these systems may not be able to fully adapt to hydrologic modifications that result as an indirect effect of construction of the FHWA/VDOT Preferred Alternative. While the changes that occur to the parameters identified above generally tend to be localized around the disturbance sites, and because the systems are adapted to some naturally caused regular changes in hydrologic flow it is difficult to predict the effect that FHWA/VDOT Preferred Alternative changes in the hydrologic regime may have on the system when added to natural effects.

Indirect effects to wetland functions may be realized as a result of the proposed Project, such as providing habitat for wildlife and maintaining characteristic plant communities. To assess indirect effects to wetland functions along the FHWA/VDOT Preferred Alternative accurately, modifications of two published hydrogeomorphic functional assessment methodologies were used to evaluate existing and post-construction functions. Both methodologies, fully outlined in **Chapter 3**, were modified to reflect regional ecological conditions and due to time constraints and the extent of data that had already been collected in the impact areas.

Functional assessment values were established for wetland types exhibiting a variety of conditions within the area. Reference standard wetlands were selected and scored in order to calibrate atypical, typical, and optimal conditions of potentially affected wetlands. Lower scoring systems are generally located in the top of watersheds; while higher scoring wetlands (bottomlands) were lower in the watershed. Features located in the top of watersheds are typically more degraded by anthropogenic activities including farming, ditching, channelization of streams, and fill. Ease of fill and successful alteration outcomes (as compared to large swamps) are the primary causes of degradation. Wetlands (bottomlands) lower in the watershed, typically those considered high scoring, have generally not been drastically altered because their hydrologic conditions make them difficult to access and modify. The functional assessments identified the highest functioning wetlands of those being directly impacted.

The small clearing of riparian areas for placement of culverts and eventual maintenance of the area within the right-of-way (approximately ten feet on each side of road) would expose those lengths of the stream to temperature increases.

5.1.1.1 Wetland Impacts

Direct impacts to wetlands fall into four categories:

- cut/fill – where no functions remain after construction;
- permanent right-of-way (ROW) conversion - where a partial loss of function is realized, mainly due to cleared vegetation;
- bridge conversion, where a partial loss of function is realized, mainly due to cleared vegetation; and,
- altered hydrology or hydrologic isolation causing a partial loss of function.

Direct impacts from cut/fill would result in loss of all wetland functions within the immediate footprint of the impact. The wetland functions most affected by right-of-way conversion, bridge conversion, and hydrologic alteration are cycle nutrients, export organic carbon, maintain characteristic plant community, and provide habitat for wildlife for bottomland hardwood wetlands and cypress/tupelo wetlands and habitat, maintain characteristic plant community, and carbon cycling processes for wet flatwoods. The magnitude of the effects to wetland functions directly and indirectly impacted from conversion and hydrologic alteration/isolation is generally less than effects from cut/fill. However, hydraulic alteration can remove all wetland function if the site is converted to an upland.

Indirect impacts are those effects on wetlands surrounding the directly impacted areas, as well as up and down stream. Indirect impacts to wetlands caused by roadway construction may include blocking water flow, increasing or decreasing water volume, dust from construction activities, habitat fragmentation, noise, vibration associated with construction, shading, forming mudwaves, introduction of invasive species, and disturbance due to temporary construction staging.

A fill roadway directly impacts wetlands through placement of fill, but also can have the indirect effect of changing hydrology both upstream and downstream of the culverts. If adequate drainage structures are not selected during roadway construction, the habitat functional value of wetlands may be reduced by changing the plant community associated with the area. More frequent backflooding above the fill roadway may be experienced, which can have the indirect effect of changing the vegetative community, shifting it to more flood tolerant vegetative species, converting a wetland into an unvegetated open water area, or converting adjacent uplands into wetlands. The roadway and culverts may also reduce flooding downstream and may

restrict water flow into formerly braided channel stream swamp systems downstream, resulting in less frequent inundation and changes in flow patterns. This can result in a shift toward less flood tolerant vegetative communities downstream of the roadway, and may convert a wetland into an upland by altering the hydrologic regime. Impeding water flow at the major stream/wetland crossings through placement of fill material without adequate drainage structures could reduce the habitat functional value of the wetlands by changing the plant community associated with the area.

These types of changes will also affect certain functions. If culverts are incorrrectly sized or installed, or maintained, bottomland hardwood wetland Hydrogeomorphic (HGM) model variables $V_{SURFCON}$, V_{FREQ}, and V_{WTD}, which impact the wetland functions of "export organic carbon", "temporarily store surface water", "retain particulates", "remove and sequester elements and compounds", and "maintain characteristic plant community", may be reduced outside of the area of direct effect. These impacts to wetland functions are particularly important to high quality wetland systems that contain bald cypress, water tupelo, and overcup oak, which require specific hydrologic regimes.

The mineral flat HGM model variable V_{DRAIN}, which impacts the wetland function "maintain characteristic water regime", may also be reduced in the indirect effects study area. These hydrology modifications could lead to backwater flooding, which could cause vegetation changes due to prolonged inundation. In the bottomland hardwood HGM, an increase in flooding could cause tree death (model variables V_{TBA}, V_{TDEN}), leading to an increase in the model variables V_{SNAG}, V_{WD}, and V_{LOG}, thus changing the wetland functions of "cycle nutrients", "provide habitat for wildlife", "export organic carbon", and "maintain characteristic plant community", which would be noticed in the area of indirect effect. The mineral flat HGM would experience a change in the model variables V_{WD}, V_{FOOD}, $V_{DENSITY}$, and V_{REGEN}, which are incorporated in the "habitat", "carbon cycling processes", and "maintain characteristic plant community" functional capacity indexes (FCI). Additionally, if flooding changes plant communities, the bottomland hardwood HGM variable V_{COMP} (wetland functions "provide habitat for wildlife" and "maintain characteristic plant community") and mineral flat HGM variables V_{FQAI} and $V_{INVASIVES}$ (wetland functions "carbon cycling processes" and "maintain characteristic plant community") may be noticed in the area of indirect effects. An increase in flooding is particularly detrimental to high value swamp systems, which require fluctuating water regimes for seedling germination and plant survival.

Direct impacts to wetlands will also result in habitat fragmentation, both in the areas of direct and indirect effects. The bottomland hardwood HGM variables V_{TRACT}, V_{CORE}, and $V_{CONNECT}$, which are incorporated into the provide habitat for wildlife FCI, would be reduced due to the construction of the proposed project. In the mineral flat HGM, habitat fragmentation would be noticed in the $V_{NATURAL}$ model variable, which is incorporated in the "maintain characteristic water regime and habitat" FCIs.

The FHWA/VDOT Preferred Alternative has seven crossings of larger named swamp systems, and several crossings of smaller unnamed systems. The indirect impacts associated with any given stream swamp crossing will, to some extent, depend on other natural disruptions to hydrologic flow characteristics both upstream and downstream, as well as other manmade modifications to the system's hydrology, such as railroad or road crossings, mill pond dams, irrigation pond dams, etc. Indirect effects could also be associated with petroleum from vehicles, and salt or chemicals due to road maintenance.

Photointerpretation and NWI mapping was used to estimate wetlands within the induced growth areas. Approximately 3,865 acres of wetlands are located in the induced growth area of the FHWA/VDOT

Preferred Alternative. Most of the areas that are undeveloped and are not actively used for agriculture are wetlands, typically part of large wetland systems associated with Lake Meade and the Nansemond River.

5.1.1.2 Surface Waters Impacts

The primary direct impact of highway construction on surface water is associated with the number and nature of the surface water crossings. All of the crossings would consist of bridges or culverts. Perpendicular crossings cause less direct impact than parallel or diagonal crossings because of their shorter length in the waterway. Stream crossings by bridges tend to have less direct impact than culvert crossings. Cofferdams used in bridge construction and lack of scour protection around culverts increase surface water impacts.

Indirect impacts that may be expected from construction include temporary increases in downstream sedimentation and turbidity. These adverse effects could temporarily reduce downstream water quality and potentially impact fisheries and macrobenthic populations. Following construction, traffic could indirectly impact water quality through spills and vehicular deposition of pollutants such as heavy metals, asbestos, and petroleum products and their byproducts. Additionally, treatment of streets and roadways during icing or snow events, although not currently common in the study area, could result in the deposition of salt or sand on the roadways. These materials are deposited between precipitation events onto the roadway surfaces, the median areas, and adjoining right-of-way, and are later washed into the surface waters by wind, rain, and snow or ice melt. If these pollutants are allowed to run off untreated into impaired waterways, the indirect effects to both the water quality and the aquatic biota can be magnified to the point that they result in changes to the public water supply and the aquatic community structure and composition.

Aquatic biology impacts are likely to occur as a result of roadway construction, maintenance, and usage. These impacts may result from the placement of fill that causes alterations to hydrology, changes in water quality, and changes to aquatic habitat, or they may occur as a result of degradation of aquatic habitat from runoff of highway pollutants. Construction of bridges and culverts into and around water bodies may change the water velocity, depth, and erosion and sedimentation rates, which in turn could impact downstream habitat. Similarly, if pipes are not maintained, obstructions can develop, limiting movement of organisms. These activities also may impede the normal movement of aquatic biota, and could isolate or separate populations of some species.

Within the area of potential induced growth for the FHWA/VDOT Preferred Alternative there are approximately 173,712 linear feet of intermittent and perennial streams that may be impacted. Indirect effects from induced growth can include filling and relocation of streams for development, impoundment of streams to create recreational ponds or lakes and irrigation ponds for agriculture, water withdrawal for water-dependent activities, and utility infrastructure improvements.

5.1.1.3 Floodplains Impacts

Potential direct impacts to floodplains can include displacement due to filling/causeways and reduction in flood storage capacity, leading to indirect impacts such as alteration of drainage patterns, water quality degradation, changes in flood flow elevations, and associated effects on floral and faunal communities.

Additionally, development within induced growth areas has the potential to affect 1,000 acres of 100-year floodplains, as determined with FEMA mapping; there are no floodways within the induced growth areas.

5.1.1.4 State Wild and Scenic Rivers

The Blackwater River is the only State Wild and Scenic River within the FHWA/VDOT Preferred Alternative indirect effect study area. Indirect effects to this feature would be similar to the indirect effects discussed above in Surface Water Impacts. Additional indirect effects to the asthetic quality of the river, one of the reasons for designating this river as a State Wild and Scenic River, include noise and viewshed alterations at locations in close proximity to the project location. The induced growth area does not contain a State Wild and Scenic River, and therefore no indirect effects to this resource will occur within the identified induced growth areas.

5.1.1.5 Wildlife/Regional Biodiversity Impacts

The construction of the FHWA/VDOT Preferred Alternative can lead to the direct loss, fragmentation, and/or degradation of habitat and in turn potentially impact wildlife and regional biodiversity. Additional potential impacts may also include impacts to animal foraging behavior and displacement of wildlife, alteration of topography, noise and visual disturbance, and introduction of invasive species (EPA, 1994). This section primarily addresses terrestrial wildlife habitats including upland habitats, wildlife corridors, and biodiversity-ranked sites. Aquatic wildlife habitat is addressed in the sections on surface waters and wetlands. There is overlap between terrestrial and aquatic habitats with regard to wildlife corridors and biodiversity-ranked sites, as all of the wildlife corridors identified in the study area are riparian corridors which may include both wetland and upland habitat, and some of the biodiversity-ranked sites are wetland habitats.

The types of activities associated with construction of the FHWA/VDOT Preferred Alternative that may potentially impact wildlife and regional biodiversity include vegetation removal, earth moving in the form of cut and fill, and direct construction impacts to sensitive habitats. In addition to the physical destruction of habitat and soil erosion, other forms of pollution may degrade habitat. Upon completion of construction, roadway operation and maintenance may result in continued impacts to wildlife that may impact regional biodiversity. These may include physical barriers to wildlife movements, vehicle wildlife collisions, introduction of invasive plant species that change the character of habitat, and degradation of aquatic habitats due to contaminated runoff and fuel or chemical spills associated with vehicular accidents. Maintenance activities that may cause impacts include vegetation management (including physical and chemical vegetation controls) and salting and sanding roads during winter storms. These activities can result in an increase in runoff pollution.

Fragmentation of forested ecosystems may also contribute to indirect impacts on wildlife species, reducing the habitat value of the area for species that require large contiguous tracts of forested habitat. Some of the potential negative effects of fragmentation include reduction in total habitat area available, increase in edge habitat, lower diversity due to smaller woods patches, potential isolation of populations, increased vulnerability of species moving between fragmented patches, increased vulnerability to external competition and predation, and potential decreased flow of genetic material through the landscape.

Roadway noise may also result in direct and/or indirect impacts to wildlife, although these impacts are very difficult to quantify. It has been suggested that roadway noise can have possible adverse effects (altered

habitat utilization, strained communication, and heightened metabolic rates) on wildlife, especially avian communities[7].

Other direct impacts may include some takes (killing) of individuals of smaller, less mobile wildlife species within the right-of-way during construction. Following construction, indirect take of wildlife can be expected as a result of wildlife-vehicle collisions.

Development within the induced growth areas could cause indirect effects to wildlife/regional biodiversity by potentially affecting approximately 3,979 acres of forested habitat (both wetland and upland), as determined by National Oceanic and Atmospheric Administration Coastal Change Analysis Program data. Detailed information on the natural communities, other terrestrial wildlife habitat, wildlife corridors, and biodiversity-ranked sites that may be affected is provided in the ***Supplemental Natural Resources Technical Report*** (VDOT, 2016f).

5.1.1.6 Threatened and Endangered Species Impacts

Direct loss of individuals of listed species known from the study area is not anticipated to occur as a result of the project. However, habitat (including roosting or foraging habitat) loss within the project footprint could result in indirect impact to these species. Like other wildlife, indirect effects could occur due to reduction in total habitat area available, lowered diversity due to habitat fragmentation, potential isolation of populations, increased vulnerability of species moving between fragmented patches, impacts to conservation areas, increased vulnerability to external competition and predation, and potential decreased flow of genetic material through the landscape. Additionally, indirect effects associated with the increase in edge habitat could be positive or negative, depending upon the species' desired habitat. The species potentially subject to these indirect impacts are NLEB, barking tree frog, Mabee's salamander, and the bald eagle. These species and their habitat requirements are discussed in detail in the ***Supplemental Natural Resources Technical Report*** (VDOT, 2016f). Following is a description of the potential indirect effects to each species:

- While, the FHWA/VDOT Preferred Alternative does not contain suitable winter hibernacula or habitat for the NLEB, suitable summer roosting and foraging habitat exists throughout the FHWA/VDOT Preferred Alternative. Indirect effects of the project would be a reduction in suitable summer roosting and foraging habitat due to removal of trees. An increase in ambient noise levels adjacent to the road would also reduce the area of potential habitat due to the bat's sensitivity to higher noise levels. A positive indirect effect would be the addition of summer roosting habitat for the NLEB in the form of bridge structures.
- Mabee's salamander has very specific habitat, favoring ephemeral ponds; the project has been shifted to avoid potential habitat identified within the Inventory Corridor. Indirect effects of the project could be a reduction in water quality/quantity due to runoff from the new roadway.
- The barking tree frog is typically located in sandy areas near shallow fish-free pools in pine savannas and in lowland woods and swamps. Indirect effects of the project would be potential reduction in water quality/quantity due to runoff from the new roadway and a loss of potential habitat due to the construction of the road. In addition, an increase in the ambient noise levels

[7] McClure CJW, Ware HE, Carlisle J, Kaltenecker G, Barber JR. 2013 An experimental investigation into the effects of traffic noise on distributions of birds: avoiding the phantom road. Proc R Soc B 280: 20132290. http://dx.doi.org/10.1098/rspb.2013.2290

adjacent to the road would reduce the area of potential habitat due to the frog's sensitivity to higher noise levels.

- Bald eagles favor tall structures with open views. Indirect effects of the project would be a reduction in nesting habitat due to tree removal. Additionally, the increase in ambient noise levels adjacent to the road would reduce the area of potential habitat due to their sensitivity to higher noise levels.

Threatened and Endangered species database searches for the induced growth areas indicated that the five species described above, as well as two additional species [red-cockaded woodpecker (federally and state endangered) and canebrake rattlesnake (state endangered)] may be present or may have habitat elements present within the induced growth areas. Induced growth could reduce habitat, cause habitat fragmentation, increase road mortality, and alter hydrology in adjacent areas, all due to urbanization.

5.1.2 Develop Mitigation

Methods to mitigate impacts to these natural resources are described below.

5.1.2.1 Wetland Mitigation

Mitigation for wetland impacts is generally thought of in terms of three types of actions: avoidance, minimization, and compensation. Avoiding and minimizing direct effects will also serve to reduce indirect effects. The FHWA/VDOT Preferred Alternative alignment was developed by balancing potential wetland impacts with impacts to other resources, such as residences and businesses, as well as cost. Thus, the primary avoidance measure was shifts out of wetlands where practicable. Modifications to the roadway design were also made as a result of the wetland functional assessment discussed in **Chapter 3**, to shift impacts to the upper portion of the watershed, away from the higher quality wetlands.

Impacts to wetlands will be minimized through a number of measures. The most effective impact minimization effort is shifting a roadway out of wetlands, which was incorporated wherever practicable. Construction of bridges over sensitive wetland areas and streams also serves as an effective avoidance and minimization strategy. Wetlands under a bridge experience a certain amount of impact due to placement of footers, piers or pilings, shading, or temporary construction measures. Hydrologic flow patterns and velocities can be altered to some extent by bridges, which can lead to minor alterations in the adjacent wetland communities; however, the overall impact to wetlands and flow patterns upstream and downstream will be substantially reduced by bridging and maintaining an appropriate hydraulic opening. In areas where bridging is not implemented, adequately sized culverts serve as an effective avoidance and minimization strategy to maintain hydraulic connectivity to wetlands upstream and downstream. Direct wetland impacts have also been reduced through design measures that reduce the footprint of the roadway.

Staging areas will not be located in wetlands and borrow material will not be excavated from wetlands. Additionally, temporary causeways will not be used for bridge construction. These measures will reduce potential for indirect impacts. Implementation of strict erosion and sediment control measures during construction will minimize permanent and temporary impacts to wetlands, and thereby indirect effects as well. Additionally, various control measures will be incorporated into the roadway design and maintenance plans to reduce impacts to wetland hydrology and water quality, including stormwater BMPs as a means of mitigating expected impacts to water quality. BMPs also slow the release of stormwater, reducing erosion of wetlands.

While induced development has the potential to impact these wetlands, future development would be required to attain the necessary permits, which would require the implementation of avoidance and minimization measures for potential impacts.

5.1.2.2 Surface Waters Mitigation

Under the regulatory frame work of the VPDES and Virginia Erosion and Sediment Control and Stormwater Control laws, VDOT will employ stormwater management control features, including use of BMPs during construction and post construction, to minimize temporary and permanent, and direct and indirect impacts to surface waters. These BMPs have been proven to be an effective means of capturing and treating highway runoff to remove heavy metals and nutrients. Properly managed BMP's can intercept runoff and store nonpoint pollutants like sediment, nutrients, and certain heavy metals without being degraded. Vegetation also can slow runoff and dissipate its energy and regulates stream temperature by providing streamside shading; therefore, temporarily disturbed areas will be revegetated. In the event of a spill, the VDOT hazmat team will coordinate with first responders to reduce direct and indirect impacts to surface waters.

Although the indirect effects associated with a roadway construction project are generally considered negative effects, a potential positive indirect effect for the 16 miles of improved roadway would be the implementation of water quality BMPs that meet current guidelines. Modern stormwater measures, such as stormwater management ponds, sediment basins, vegetative controls, and other measures would be implemented to capture runoff from Route 460 improvements on both the improved and new alignment that currently flow into the watershed unabated. These measures would reduce or detain discharge volumes and remove many pollutants, thereby reducing long-term impacts to water quality. Surface runoff from bridges would be collected and treated in stormwater BMPs to prevent degradation of surface drinking water supplies.

During construction, VDOT will adhere to standard erosion and sediment control and stormwater measures and the associated required monitoring protocols, as outlined in Chapter 10 of VDOT's Drainage Manual (VDOT, 2012). Examples of control measures that may be considered include sediment traps and sediment basins. Such measures would minimize the indirect effects associated with sediment transport during construction.

Design and construction techniques which reduce water quality impacts and protect aquatic species, as described in the Virginia Stormwater Management BMP Clearinghouse, will be incorporated into the project. Techniques include stabilization of slopes, channels, swales, and embankments after construction activities are completed; minimization of excavation; installation of turbidity barriers around the area of construction; and prohibiting species specific activities during any required time of year restrictions.

VDOT's practice is generally to maintain both water quality and quantity post-development equal to or better than pre-development, as described in the current guidance, Minimum Requirements for the Engineering, Plan Preparation and Implementation of Post Development Stormwater Management Plans (Instructional and Informational Memorandum Number: IIM-LD-195.8, VDOT – Location and Design Division). One of the mitigation measures used to achieve this goal is the implementation of a monitoring program to measure pollutant concentrations at several outfall locations before, during, and after construction. If pollutant levels exceed established thresholds, actions would be taken to mitigate impacts and the affected public would be notified as required. Additional details on the post-construction stormwater management plan would be developed during the design stage of the project. Nevertheless, the

plan would be developed in accordance with the most up-to-date federal and state regulations and it is not anticipated that the indirect effects would extend very far downstream from the crossings.

Direct impacts to fish and macroinvertebrates will be avoided or minimized through various project design considerations, such as bridging, without the use of causeways, countersinking of culverts, and minimizing the roadway footprint and median; reducing such direct impacts should also reduce the potential for indirect impacts. Bridging without causeways protects the natural stream bottom, minimizing what otherwise could be substantial upstream and downstream effects to hydrologic conditions, and accommodating aquatic organisms. Properly sized culverts will also maintain wetland hydrology upstream and downstream of the crossing. To prevent bottom scour, banks surrounding culverts will be stabilized using riprap. Implementation of roadside ditches through wetlands will be avoided, where practicable, to avoid any drainage impacts to adjacent wetlands. Temporary construction impacts to fish and macroinvertebrates will be minimized through appropriate use of temporary stream crossing structures and strict adherence to erosion and sedimentation controls.

Development in any induced growth areas will be subject to the same erosion and sediment control as described above for the indirect effects study area.

5.1.2.3 Floodplain Mitigation

The designation of the LOD of the FHWA/VDOT Preferred Alternative was focused on avoiding and minimizing floodplain encroachment to ensure that the FHWA/VDOT Preferred Alternative meets the goals of EO 11998 and FHWA policy as set forth in 23 CFR 650.

Similar to the bridging of wetlands and streams to minimize impacts, most 100-year floodplains (including 100-year floodplain crossings on the new alignment portion of the FHWA/VDOT Preferred Alternative) were bridged to reduce the indirect effects on floodplains.

The design of the roadway was based on hydraulic and hydrology evaluations to ensure that increases in flood risk to regulated floodplains and impacts to floodplain values would not result from construction. Near-perpendicular crossings of the floodplain will be spanned by bridges or culverts per design criteria outlined in VDOT's highway construction specifications and in keeping with any Federal or state regulatory requirements. Bridge crossings will be constructed using the minimum number of piers to ensure structural stability within floodways. Fill placed within floodplains for bridge abutments will be minimized. All bridges would be constructed without the use of causeways, which will minimize degradation to floodplains. By minimizing direct effects to floodplains through these measures, there should be very little to no indirect effects.

During final design, a detailed hydraulic survey and hydrology study would evaluate the effect of the proposed roadway improvements on stormwater discharge. The hydraulic study will ensure that no substantial increase in downstream flooding will occur. Design modifications to eliminate or minimize encroachments to the extent practicable are required by EO 11988. It should be noted that while the acreage of floodplains within the induced growth areas are much greater than the direct impacts, any development that would occur in these induced growth areas would be subject to the same regulations.

5.1.2.4 State Wild and Scenic Rivers

The Blackwater River is the only State Wild and Scenic River within the FHWA/VDOT Preferred Alternative indirect effect study area. Mitigation for indirect effects to this feature would be similar to the indirect effects mitigation discussed above in Surface Water Mitigation. Although the degree of impact

associated with visual and noise would be negligible, mitigation of these effects was considered. To mitigate for viewshed impacts, material selection and aesthetic treatment may be among the considerations for the Blackwater Bridge. The applicability of noise mitigation was considered; however, the visual impact associated with any potential noise walls would outweigh the reduction in sound levels experienced by users of the river.

5.1.2.5 Wildlife/Regional Biodiversity Mitigation

The impacts to wildlife expected as a result of the project will be minimized through use of design measures, such as bridging, countersinking culverts, and reducing the roadway footprint and median width. Using bridges for crossings of streams and associated riparian corridors serves to minimize habitat impacts by allowing the natural hydrologic processes to remain largely intact while also providing wildlife crossings. Additionally, culverts would be designed to maintain low-flow channels to minimize aquatic passage obstruction.

Forests with a mid-story shrub layer have been shown to dampen traffic noise substantially, with the dampening effect increasing with distance from the roadway in a near exponential fashion. Potential noise impacts will be minimized by limiting damage to forest stands along the roadway, which also serves to reduce habitat losses. In addition, temporary impacts will be reduced through proper location and minimization of staging areas and construction access roads in valuable habitats. Development in any induced growth areas will be subject to regulations and standards designed to minimize impacts to aquatic resources.

5.1.2.6 Threatened and Endangered Species Mitigation

The potential impacts to threatened or endangered species resulting from the project will be reduced through use of design measures such as bridging, countersinking culverts, and reducing the roadway footprint and median width. In addition, temporary impacts will be reduced through proper location and minimization of staging areas, construction access roads, and modifying construction techniques in valuable habitats. Mitigation measures could include contractor training in recognizing and avoiding threatened and endangered species and their habitats, and restoration of habitat. While many of these mitigation actions would be incorporated to offset direct impacts, they also would mitigate indirect effects outside of the area of direct impact. Development in any induced growth areas will be subject to state and federal laws protecting threatened and endangered species.

5.1.3 Summary

The centerline of the alignment was located to avoid and minimize impacts to important resources, including natural resources. Beyond this effort, further mitigation strategies have been included in this NEPA analysis, which have focused on those impacts that are anticipated. Consideration has been given to avoiding, minimizing, and mitigating reasonably foreseeable indirect impacts during design, and will be for construction activities. Should future induced growth and development in the vicinity of the FHWA/VDOT Preferred Alternative impact regulated waters and wetlands, each development project would require review, approval, and/or permits. During the review of any proposed development in waters and wetlands, regulatory agencies would require consideration of avoidance and minimization measures and compensatory mitigation to offset impacts to wetlands and streams, and other regulated natural resources.

Because all roadway crossings would utilize structures designed to adequately pass design floods and accommodate passage of aquatic organisms, and the roadway project would incorporate stormwater BMPs

to mitigate pollutant runoff, it is not anticipated that the indirect effects to natural resources would be extensive or extend very far up or downstream from the crossings or in adjacent areas.

5.2 CUMULATIVE IMPACTS ANALYSIS

The goal of the cumulative impacts analysis is to assess the incremental impact of the transportation project in combination with past, present, and reasonably foreseeable future actions in order to consider and inform decision-makers on the contribution of a specific project to the overall long-term changes in characteristics and trends of an area's natural and manmade environment. Not all of the resources directly impacted by a project require a cumulative impact analysis. The resources subject to a cumulative impact assessment are determined based on the specifics of the project being evaluated (FHWA, 2014). Refer to **Chapter 4** of the **Final SEIS** for the methodology and description of past, present, and future projects.

5.2.1 Characterize the Stresses Affecting these Resources

The historic development of the region is most represented by the extensive levels of forestry and farming that have occurred. The landscape first experienced by the European colonists has been transformed into a landscape that scarcely represents the old growth forests that they encountered. More recently, tree plantings and natural regrowth have reshaped the region's forest environment to what it is today. The existing forest resources in the study area continue to be impacted by limited levels of development and ongoing forestry activities. Although timber harvesting in the region has declined, forest loss across the state continues to be an issue. The Virginia Department of Forestry (DOF) reports that statewide it is able to conserve approximately 3,000 acres of forest land for every 16,000 acres that are lost. Urbanization, development, and associated municipal infrastructure represent the greatest factors in this forestland deficit (DOF, personal communication). The lack of urbanized areas within the study area suggests that forest loss may not be occurring at this rate; however, the amount of modern day forest loss in the study area is minor compared to the impacts that occurred during European settlement.

Farming has had similar impacts on resources within the study area. Farming activities required land clearing similar to forestry. Once cleared, these lands were manipulated with drainage ditches, ponds, nonnative plantings, and chemicals to maintain these manipulated conditions. These agricultural practices and the associated runoff from agricultural fields have, historically, had a significant impact on the water quality resources. Although there have been reductions in the intensity of farming in the study area, much of the previously developed farmlands are maintained as such today.

These past actions have served as the greatest stresses to the resources in the study area. The presence of impaired waters and threatened and endangered species within the study area are both indicators that these resources have been greatly impacted by past actions and could be sensitive to future impacts.

5.2.2 Determine Environmental Consequences

The purpose of this section is to identify the important cause-and-effect relationships between human activities and resources, determine the magnitude and significance of cumulative impacts, and discuss monitoring of cumulative impacts.

The actions considered for this analysis include the past, present, and reasonably foreseeable future actions listed in **Chapter 4** of the **Final SEIS**, as well as the historic forestry and farming practices that predate the cumulative impacts study timeframe that began in the 1850s. These actions form the baseline to which the incremental effects of the proposed action will be added to determine the cumulative impacts.

The FHWA/VDOT Preferred Alternative consists of 16 miles of improvements and another 36 miles of No Build status quo conditions. Cumulative impacts are not anticipated for the 36-mile No Build segment of the FHWA/VDOT Preferred Alternative.

The limited level of data available to document resources in the study area prevents detailed analysis on the cause-and-effect relationships between human activities and resource conditions in the study area. CEQ guidance states that when such data are not available, qualitative evaluation procedures may be used. **Table 5.2-1** is based on an example provided by the CEQ for qualitatively evaluating relative effects. It is presented in the X+Y=Z format discussed in the methodology section of this Chapter (CEQ, 1997).

Table 5.2-1: Relative Cumulative impacts

Resource	Proposed Action/FHWA/VDOT Preferred Alternative (X)		Past Actions (Y)	Present Actions (Y)	Reasonably Foreseeable Future Actions (Y)	Cumulative Effect (Z)
Waters, Wetlands, and Water Quality	No Build	There would be no new impacts.	Historical land use included conversion (draining through ditches, drain tiles, and other methods) of significant acres of wetlands and direct impacts to streams from forestry and farming activities which cleared and filled wetlands. Past land use activities that pre-date current water quality regulations resulted in significant sediment and nutrient runoff from farming and logging practices. Wetlands, including high value bottomlands and swamps, were likely impounded in many areas, to provide a water source for silvicultural and agricultural uses. This impoundment would likely have reduced the wetland's ability to cycle nutrients, remove and sequester elements and compounds, retain particulates, export organic carbon, maintain water level regime, maintain characteristic plant community and provide habitat for wildlife. Streams were also impounded to create water sources. Anthropogenic changes to the environment, including farming, led to degradation of water bodies (and thus impaired waters).	Continued runoff from existing farming activities, along with potential erosion and runoff from forestry practices. Limited development may impact the resource. Public transportation projects would be the only action likely to impact bottomland swamps due to difficulty of construction in these habitats and difficulty of obtaining authorization to impact this resource. New development accompanied by stormwater management facilities to reduce impact to previously disturbed environment.	Continued runoff from existing farming activities, along with potential erosion and runoff from forestry practices. Limited development may impact the resources. Public transportation projects would be the only action likely to impact bottomland swamps due to difficulty of construction in these habitats and difficulty of obtaining authorization to impact this resource. New development accompanied by stormwater management facilities to reduce impact to previously disturbed environment.	Farming and logging practices have already impacted water quality in the area. Continued runoff would likely occur from existing and future farming and logging activities, along with potential erosion. Conversion of wetlands either through draining or impoundment eliminates the functions that they provide (as noted in past actions), which serve to treat the runoff prior to it entering the entering the surface waters. The loss of lower value, previously impacted wetlands under agricultural and silviculture operations, could occur with new residential, commercial, or industrial development.
	FHWA/VDOT Preferred Alternative	The FHWA/VDOT Preferred Alternative would impact approximately 39.77 acres of vegetated wetlands (with four of the acres from conversion due to shading by bridges) and 6,874 linear feet of stream. Impacts to high value wetlands would include approximately 12.12 acres of high value wetlands and a reduction in the HGM wetland functions of temporarily store surface water, cycle nutrients, remove and sequester elements and compounds, retain particulates, export organic carbon, maintain water level regime, maintain characteristic plant community and provide habitat for wildlife. The FHWA/VDOT Preferred Alternative could cause some additional impacts related to induced growth. While the project could affect water quality/quantity, it is being designed through applicable guidance dictating minimization of water quality impacts.				Farming and logging practices have already impacted water quality in the area. Continued runoff would likely occur from existing and future farming and logging activities, along with potential erosion. Conversion of the wetlands either through draining or impoundment eliminates the functions that they provide (as noted in past actions), which serve to treat the runoff prior to it entering the surface waters. The loss of lower value, previously impacted wetlands under agricultural and silviculture operations, could occur with new residential, commercial, or industrial development. Although the project would impact wetland and streams, the project would mitigate this loss through restoration and preservation of wetlands, as well as purchasing credits through approved mitigation banks, which have already created or restored wetlands. The wetlands that the Project is proposing to restore would be within the same subbasins as those that will be impacted, and will be designed to provide the same functions as those that will be impacted.

Resource	Proposed Action/FHWA/VDOT Preferred Alternative (X)		Past Actions (Y)	Present Actions (Y)	Reasonably Foreseeable Future Actions (Y)	Cumulative Effect (Z)
Floodplains	No Build	There would be no change to existing floodplain values.	Access to and over waterways for forestry, farming, and transportation facilities resulted in loss of floodplain area and related values. Road crossings of floodplains, such as by Route 460, impacted floodplains by displacement due to filling and reduction in flood storage capacity, alteration of drainage patterns, water quality degradation, changes in flood flow elevations, and associated effects on plant and animal communities. Forests have been removed in floodplains for timber harvesting and agriculture. The sizing of waterway crossings by the railroad has resulted in backwater occurrences during flood events.	Limited impacts to floodplains, due to low levels of growth as well as protection afforded by state and federal floodplain management regulations.	Limited impacts to floodplains, due to low levels of growth as well as protection afforded by state and federal floodplain management regulations.	Floodplains have experienced substantial effects over time with destruction and alteration as well as placing buildings and structures (including the railroad embankment) within floodplains. Continued limited impacts to floodplains, as new access to/over waterways are expected to be limited.
	FHWA/VDOT Preferred Alternative	There would be 6 floodplain crossings and potential downstream impacts. However, the FHWA/VDOT Preferred Alternative has been designed to manage flood events in accordance with state and federal requirements. Development within induced growth areas has the potential to affect 1,000 acres of 100-year floodplains, as determined with FEMA mapping; there are no floodways within the induced growth areas.				Floodplains have experienced substantial effects over time with destruction and alteration as well as placing buildings and structures (including the railroad embankment) within floodplains. Continued impacts to floodplains, due to anticipated low levels of growth in floodplains in the induced growth areas, mitigated by protection by state and federal floodplain management regulations.
State Wild and Scenic Rivers	No Build	There would be no change to existing scenic river values.	Impacts to the scenic features that may qualify a river for listing occurred through the removal of forests and the placement of crossing structures. It is unknown whether waterways in the study area other than the Blackwater River might have met criteria for scenic rivers were it not for past actions.	Currently there is limited development adjacent to the river.	Development adjacent to the Blackwater River could occur due to its scenic qualities.	The Blackwater River and other waterways in the study area have experienced substantial effects over time with the placement of crossing structures, as well as through agricultural and silvicultural activities. Future development adjacent to the Blackwater River could occur due to its scenic qualities.
	FHWA/VDOT Preferred Alternative	The project would cross the Blackwater River at the current location of Route 460. The bridge is designed to be higher in elevation in order to minimize flooding and backwater effects to the resource. Since the project would be replacing an existing structure and would not affect the alignment of the river, the scenic nature of the river would be minimally impacted by the new higher bridge. There may be some additional noise effects to river users due to heavier traffic and the higher elevation of the bridge and roadway in the vicinity of the river. In addition, the induced growth area does not contain a State Wild and Scenic River, and therefore no indirect effects to this resource would occur within the identified induce growth areas.				The Blackwater River and other waterways in the study area have experienced substantial effects over time with the placement of crossing structures, as well as through agricultural and silvicultural activities and associated runoff. While the new bridge would not encourage new development, bridging of this river and resulting noise and traffic could result in a direct impact to the qualities and features that qualify it for the Scenic River Program. In addition, development adjacent to the Blackwater River could occur due to its scenic qualities and improved access along Route 460.

Resource	Proposed Action/FHWA/VDOT Preferred Alternative (X)		Past Actions (Y)	Present Actions (Y)	Reasonably Foreseeable Future Actions (Y)	Cumulative Effect (Z)
Natural Communities, Wildlife, and Biodiversity	No Build	No change to existing resources.	Intensive disruption, fragmentation, and modification of wildlife habitat to support forestry and farming. Runoff from these activities degraded aquatic habitats. Streams were impounded to create water sources, blocking the movement of aquatic organisms and isolating some populations.	Continued, but reduced impact to wildlife habitat from forestry. Ongoing agricultural activities prevent the establishment of normal habitat conditions on agricultural lands for many wildlife species. Runoff from agricultural activities contribute to further degradation of aquatic habitats. Limited levels of industrial, commercial, and residential growth contribute minor impacts to wildlife habitat.	Continued, but reduced impact to wildlife habitat from forestry. Continued agricultural activities prevent many wildlife species from establishing normal habitat conditions on agricultural lands. Limited levels of industrial, commercial, and residential growth contribute minor impacts to wildlife habitat.	Wildlife has experienced substantial effects over time with the destruction and alteration of habitat. Continued, but reduced impact to wildlife habitat from forestry. Continued agricultural activities prevent many wildlife species from establishing normal habitat conditions on agricultural lands. Limited levels of industrial, commercial, and residential growth contribute minor impacts to wildlife habitat.
	FHWA/VDOT Preferred Alternative	The new corridor would remove existing habitat, fragment habitat and movement corridors, and likely lead to some downstream impacts. Impacts may include physical barriers to wildlife movements, vehicle wildlife collisions, introduction of invasive plant species that change the character of habitat, and degradation of aquatic habitats due to contaminated runoff and fuel, chemical spills associated with vehicular accidents, and maintenance activities. Fragmentation of forested ecosystems may reduce the habitat value of the area for species that require large contiguous tracts of forested habitat, reduce the total habitat area available, increase edge habitat, lower diversity due to smaller woods patches, isolate populations, increase vulnerability of species moving between fragmented patches, increase vulnerability to external competition and predation, and decrease flow of genetic material through the landscape.				Wildlife has experienced substantial effects over time with the destruction and alteration of habitat. Continued, but reduced impact to wildlife habitat from forestry and agriculture will continue. Particularly east of Zuni where the new Route 460 diverts from the existing Route 460 on a new roadway through agricultural fields and forests, construction and maintenance activities may lead to further habitat fragmentation and degradation and reduced local biodiversity. Furthermore, as a result of the improved Route 460 roadway and improved access to the area, somewhat greater, though still limited, levels of industrial, commercial, and residential growth may contribute minor disruptions to wildlife habitat.
Threatened and Endangered Species	No Build	No change to existing resources.	Intensive disruption, fragmentation, and modification of species and habitat, including terrestrial and aquatic, as well as takings of individuals, to support forestry and farming.	Continued, but reduced impact to species and habitat from forestry. Maintaining manmade environment to support farming prevents species from reestablishing. Limited levels of industrial, commercial, and residential growth contribute minor disruptions to wildlife habitat. The Endangered Species Act and related regulations protect species from adverse	Continued, but reduced impact to species and habitat from forestry. Maintaining manmade environment to support farming prevents species from reestablishing. Limited levels of industrial, commercial, and residential growth contribute minor disruptions to wildlife habitat. The Endangered Species Act and related regulations and required measures resulting from these laws would protect species from adverse impacts	Continued, but reduced impact to species and habitat from forestry. Maintaining manmade environment to support farming prevents species from reestablishing. Limited levels of industrial, commercial, and residential growth contribute minor disruptions to wildlife habitat. The Endangered Species Act and related regulations would protect species from adverse impacts associated with certain actions.

Resource	Proposed Action/FHWA/VDOT Preferred Alternative (X)		Past Actions (Y)	Present Actions (Y)	Reasonably Foreseeable Future Actions (Y)	Cumulative Effect (Z)
	FHWA/VDOT Preferred Alternative	The new corridor would fragment existing habitats and lead to downstream impacts. The Endangered Species Act and related regulations and required measures resulting from these laws would protect species from adverse impacts associated with certain actions.		impacts associated with certain actions.	associated with certain actions.	Continued, but reduced impact to species and habitat from forestry will continue. Maintaining manmade environment to support farming prevents species from reestablishing. Somewhat greater, though still limited, levels of industrial, commercial, and residential growth have contribute minor disruptions to wildlife habitat; however, the potential impacts to threatened or endangered species resulting from the project will be reduced through use of design measures. The Endangered Species Act and related regulations and required measures resulting from these laws would protect species from adverse impacts associated with certain actions.

5.2.2.1 Determine the Magnitude and Significance of Cumulative impacts

Following the identification of important cause-and-effect relationships, CEQ guidance recommends a discussion on the magnitude and significance of cumulative impacts. As discussed earlier in this Chapter, population growth and economic development in the study area date back to early colonization. Through the centuries, much of the population growth and development in the region was based on timber and agriculture. The growth of these natural resource-based industries was supported by the construction of the railroad and Route 460. In recent years, the growth of the natural resource-based economy has slowed and, in some cases, declined, such as in response to the recession and subsequent downturn in lumber demand for housing construction.

As illustrated in **Table 5.2-1**, the largest impacts to Waters, Wetlands, and Water Quality occurred as part of the historic forestry and farming activities. These actions resulted in the clearing of forests, wetlands and riparian buffers, ditching and ponding of rivers and swamps, and uncontrolled stormwater runoff. Pesticides, excessive nutrients, and other chemicals were introduced to the region's waters, further degrading the resources before these impacts could be checked through regulations and improved stormwater management techniques; input of chemicals continue from some agricultural activities. Future actions would be developed within the framework of these regulatory and technological controls which should reduce impacts to these resources from these sorts of chemicals. Two specific controls for checking future impacts are USACE and VDEQ water quality permits and TMDL-related requirements established by VDEQ. These controls serve to minimize excessive impacts, identify avoidance and other mitigation measures, and set limits on the amount of pollutants that are allowed to enter receiving bodies of water. The FHWA/VDOT Preferred Alternative would also be subject to these controls to minimize excessive impacts. Ambient conditions upstream, produced as a result of silvicultural activities, wildlife activity, etc., would have greater impact on the parameters measuring stream quality than the effect of the FHWA/VDOT Preferred Alternative. Potential effects to impaired waters and possible mitigation are discussed in detail in **Section 3.1**. To compare these previously permitted impacts in two of the study area subbasins and the impacts of the FHWA/VDOT Preferred Alternative in all of the study area subbasins (39.77 acres of wetlands and 6,874 linear feet of stream in the LOD of the FHWA/VDOT Preferred Alternative) to the total number of wetlands and streams in the study area, an adjustment factor methodology was applied to NWI data across the entire natural resource study area. Based on this adjustment factor there are 212,352 acres of wetlands and 1,516 miles (8,005,991 feet) of streams in the study area. The permitted impacts listed above represent less than 0.02 percent of the total wetlands and less than 0.09 percent of the total streams in the study area. Although the study area contains four subbasins, the FHWA/VDOT Preferred Alternative is located in only two subbasins, the Blackwater and Hampton Roads, and therefore the Nottoway and Lower James subbasins would not be affected by the proposed project. A portion of the wetlands impacted by the project are considered high functioning bottomland hardwood and cypress/tupelo wetlands, impacts to which could not be offset through purchase of existing mitigation bank credits. In order to offset impacts to these high functioning wetlands, VDOT is developing several "permittee-responsible" off-site mitigation sites to restore high functioning bottomland hardwood and cypress/tupelo wetlands that have been degraded through impoundment.

Species now listed as threatened and endangered were also greatly impacted through forestry and farming actions. Forestry actions removed habitat for many species that are now protected by federal and/or state laws. The continued harvesting of forest resources resulted in regular impacts to these species and their habitats. Similarly, farming activities stripped the region of important habitat and applied different techniques (ditching, clearing, etc.) to maintain this manmade habitat and prevent critical habitats from

reestablishing. Since the passage of federal and state regulations to identify and protect rare, threatened, and endangered species, impacts to these species by current and/or future actions have been reduced from what they would have been if allowed to continue unabated. The reduction has come about as a result of coordination with agencies responsible for protecting aquatic and wildlife species, consideration of alternatives that minimize and avoid impacts, and conservation and mitigation measures. Therefore, future impacts to threatened and endangered species would be controlled and limited through this process. These checks would be in place if the FHWA/VDOT Preferred Alternative were implemented.

5.2.2.2 Monitoring

The CEQ guidance paper used to direct this analysis specifically recommends discussing means of monitoring cumulative impacts of a FHWA/VDOT Preferred Alternative (CEQ, 1997). According to CEQ, monitoring of cumulative impacts involves assessing the accuracy of predictions of effects and the success of mitigation. Monitoring is intended to serve as a basis for adaptive management. However, highway agencies who develop and construct roadways typically do not have opportunity for adaptive management of future growth or other activities that contribute to cumulative impacts. Monitoring future cumulative impacts is further complicated when various entities have planning review and control over such future activities, such as the several localities that will be affected by the FHWA/VDOT Preferred Alternative. Monitoring that will be undertaken if the FHWA/VDOT Preferred Alternative is implemented includes monitoring and inspection during construction to insure compliance with regulations and permits, performance monitoring and maintenance of the wetland/stream mitigation bank(s) by the bank managers, and monitoring of any wetland or stream compensation constructed/restored by VDOT.

5.2.3 Cumulative Impact Conclusion

Past and present actions have shaped the current state of natural resources within the study area, and future actions will continue to shape these resources irrespective of this project. Historic forestry and farming activities have had the greatest impact on the region. These actions led to the degradation and/or loss of the natural resources that existed when colonists settled the region and have continued to the present. These actions not only impacted the region but maintained the effects of those impacts to the present day such that the environment has not returned to its original state.

Initially, there was a great deal of growth along the railroad corridor. The region's population grew as the natural resource-based economy expanded. In more recent years, the natural resource-based economy has slowed. Virginia's forest products industry has been particularly hard hit, losing over 19,000 jobs state-wide from 2006 to 2011. The severe recession from 2007 to 2009 and the housing market downturn caused rapid contraction in demand for wood products used in housing construction, furniture, and related products. The pulp and paper industry also has been affected by the general state of the economy, and faces reduced demand for its products because of the growth in electronic media. The result of these forces is a smaller forest products industry that is much leaner and more efficient (Weldon Cooper, 2013). The farming industry has faced similar pressure from international competition and from domestic competition from larger farms. These downturns have resulted in a loss of jobs in the region, but also less frequent and intense impacts to the natural environment. However, extensive agricultural activities continue throughout the study area.

While the FHWA/VDOT Preferred Alternative would introduce measurable impacts to natural resources, impacts to wetlands and streams under the FHWA/VDOT Preferred Alternative would represent less than one percent of the total wetlands and streams that exist in the substantially human-altered environment. The incremental cumulative impacts of the FHWA/VDOT Preferred Alternative to the region's resources

would be minimal in relation to past agriculture and forestry activities. Present and reasonably future economic development, agriculture and forestry and are expected to cumulatively impact resources far less than historic actions, as discussed herein.

REFERENCES

Ainslie, W.B., Smith, R.D., Pruitt, B.A., Roberts, T.H., Sparks, E.J., West, L., Godshalk, G.L., and Miller, M.V.. (1999). A regional guidebook for assessing the functions of low gradient, riverine wetlands in western Kentucky. Technical Report WRP-DE-17, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 130pp. (and appendices).

Anderson, J. R., Hardy, E. E., Roach, J. T., & Witmer, R. E. (1976). *A Land Use and Land Cover Classification System for Use With Remote Sensor Data*. USGS- Geological Survey Professional Paper 964. Retrieved from http://landcover.usgs.gov/pdf/anderson.pdf.

Balazik, M. T., Garman, G. C., Van Eenennaam, J. P., Mohler, J. & Woods III, L. C. (2012). Empirical evidence of fall spawning by Atlantic Sturgeon in the James River, Virginia. *Transactions of the American Fisheries*, *141*, 1465-1471.

Bat Conservation International and Southeastern Bat Diversity Network (BCI). (2013). *A conservation strategy for Rafinesque's Big-Eared Bat (Corynorhinus rafinesquii) and Southeastern Myotis (Myotis austroriparius)*. Bat Conservation International, Austin, TX. Retrieved from http://www.batcon.org/pdfs/ConservationPlanforCORAandMYAU_2014.pdf.

Beier, P. Majka, D., Newell, S. & Garding, E. (2008). *Best management practices for wildlife corridors*. Northern Arizona University. Retrieved from http://corridordesign.org/dl/docs/corridordesign.org_BMPs_for_Corridors.pdf.

Benyus, J.M. (1989). Northwoods Wildlife: A Watcher's Guide to Habitats. NorthWood Press, Inc.; Minocqua, Wisconsin.

Bilkovic, D., Angstadt, K., & Stanhope, D. (2009). Atlantic sturgeon spawning habitat on the James River. *Final report to NOAA Chesapeake Bay Office*. Award Number NA06NMF4570303. Virginia Institute of Marine Science, Center for Coastal Resources Management, Gloucester Point, Virginia. Retrieved from http://ccrm.vims.edu/research/mapping_surveying/sturgeon/Report/SturgeonSpawningHabitat_FinalReport_New.pdf.

Bond, M. (2003). *Principles of wildlife corridor design*. Center for Biological Diversity. Retrieved from http://www.biologicaldiversity.org/publications/papers/wild-corridors.pdf.

Brinson, M.M. (1993). A hydrogeomorphic classification of wetlands, Technical Report WRP-DE-4, U.S. Army Corps of Engineers. Engineer Waterways Experiment Station; Vicksburg, MS.

Brumm, H. (2004). The impact of environmental noise on song amplitude in a territorial bird. *Journal of Animal Ecology*. *73*:434-440.

Center for Conservation Biology (CCB). (2013). *Red- Cockaded Woodpeckers Fledge 20 Birds at Piney Grove Preserve*. Retrieved from http://www.ccbbirds.org/2013/07/24/red-cockaded-woodpeckers-fledge-20-birds-at-piney-grove-preserve/.

Center for Conservation Biology (CCB). (2014). *Eagle Nest Locator*. Retrieved from http://www.ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/.

Center for Invasive Species and Ecosystem Health (CISE). (2014). *Early Detection and Distribution Mapping System*. Retrieved from http://www.eddmaps.org/distribution/.

City of Norfolk, VA, Department of Utilities. (2014). *Water quality report*. Norfolk, VA. Retrieved from http://va-norfolk.civicplus.com/DocumentCenter/View/15287.

City of Portsmouth, VA, Department of Public Utilities. (2013). *2012 Annual water quality report*. Portsmouth, VA. Retrieved from http://www.portsmouthva.gov/publicutil/ccr/Portsmouth-Water-Quality-Report-2012.pdf.

City of Suffolk, VA, Department of Public Utilities. (2012). Annual water quality report. Suffolk, VA. Retrieved from http://www.suffolkva.us/files/5813/6907/5780/2012waterqualityreport.pdf.

Cooper, T. R. U.S. Fish and Wildlife Service, Division of Migratory Birds. (2012). *Status assessment and conservation plan for the Henslow's Sparrow (Ammodramus henslowii)*.

Cowardin, L. M., Carter, V., Golet, F. C., & LaRoe, E. T. (1979). *Classification of wetlands and deepwater habitats of the United States*. Northern Prairie Wildlife Research Center. Retrieved from http://www.npwrc.usgs.gov/resource/wetlands/classwet/.

Daniel II, J. W., Martin, C.J., Rhode, L. C. (2013). *Virginia stormwater program moved to the DEQ*. Williams Mullen. Retrieved from http://www.williamsmullen.com/news/virginia-deq-become-lead-stormwater-agency>.

Department of Mines, Minerals, and Energy (DMME). (2014). Mapping resource center. Retrieved from http://www.dmme.virginia.gov/DMLR/MappingLandingPage.shtml.

Department of Mines, Minerals and Energy (DMME), Division of Mineral Mining (DMM). (2016). DMM Interactive Map Page. Retrieved from https://www.dmme.virginia.gov/webmaps/DMM/.

Dunning, John B. 2006. Bachman's Sparrow (*Peucaea aestivalis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from: http://bna.birds.cornell.edu/bna/species/038.

Elizabeth City State University (ECSU). (1998). pH data analysis. The Great Dismal Swamp Boardwalk Hydrology Project. Retrieved from http://mmt.cs.ecsu.edu/boardwalk/pH.html.

Endangered and Threatened Wildlife and Plants; Delisting of the Dismal Swamp Southeastern Shrew (Sorex Longirostris Fisheri), 65 Fed. Reg. 10420 (February 28, 2000). (50 C.F.R. pt 17, pp. 10420-10426).

Environmental Protection Agency (EPA). (1994). *Evaluation of ecological impacts from highway development*. Retrieved from http://www.epa.gov/compliance/resources/policies/nepa/ecological-impacts-highway-development-pg.pdf.

Environmental Protection Agency (EPA). (1996). *Managing wetlands to control nonpoint source pollution*. Retrieved from http://water.epa.gov/polwaste/nps/outreach/point11.cfm.

Environmental Protection Agency (EPA). (1999*). Preliminary data summary of urban stormwater best management practices*. (EPA-821-R-99-012. USEPA). Retrieved from: www.epa.gov/waterscience/guide/stormwater/#report.

Environmental Protection Agency (EPA). (2003). *Protecting water quality from urban runoff*. Retrieved from http://www.epa.gov/npdes/pubs/nps_urban-facts_final.pdf.

Environmental Protection Agency (EPA). (2005). *National management measures to protect and restore wetlands and riparian areas for the abatement of nonpoint source pollution*. Retrieved from http://water.epa.gov/polwaste/nps/outreach/point11.cfm.

Environmental Protection Agency (EPA). (2012a). *What is nonpoint source pollution?* Retrieved from http://water.epa.gov/type/oceb/habitat/pathways.cfm.

Environmental Protection Agency (EPA). (2012b). *Pathways for invasive species introduction*. Retrieved from http://water.epa.gov/polwaste/nps/whatis.cfm.

Environmental Protection Agency (EPA). (2014a). *My WATERS mapper*. Retrieved from http://watersgeo.epa.gov/mwm/.

Environmental Protection Agency (EPA). (2014b). *Low Impact Development (LID)*. Retrieved from http://water.epa.gov/polwaste/green/.

Environmental Protection Agency (EPA). (2014c). *Clean Water Act Definition of "Waters of the US".* Retrieved from http://water.epa.gov/lawsregs/guidance/wetlands/CWAwaters.cfm.

Federal Emergency Management Agency (FEMA). (2013). Flood insurance study, City of Suffolk, Virginia.

Federal Emergency Management Agency (FEMA). (2014). Flood insurance study Isle of Wight County, Virginia and incorporated areas. Ferree, C., Anderson, M. G. (2013). *A map of terrestrial habitats of the Northeastern United States*. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA.

Federal Emergency Management Agency (FEMA). (2016). FEMA Flood Map Service Center, Map Number 51093C0230E. Retrieved from https://msc.fema.gov/portal.

Fleming, G.P., K.D. Patterson, K. Taverna, and P.P. Coulling. (2012). The Natural Communities of Virginia: classification of ecological community groups. Second Approximation Version 2.5. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. Retrieved from www.dcr.virginia.gov/natural-heritage/natural-communities.

Fleming, G.P., K.D. Patterson, K. Taverna. (2013). The Natural Communities of Virginia: classification of ecological community groups. Second Approximation Version 2.6. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. Retrieved from www.dcr.virginia.gov/natural-heritage/natural-communities.

Forman, R.T.T., Deblinger, R.D. (2000). The ecological road-effect zone of a Massachusetts (U.S.A.) suburban highway. *Conservation Biology. 14* (1): 36-46.

Gilmour, C. C., Henry, E. A. (1991). Mercury methylation in aquatic systems affected by acid deposition, *Environmental Pollution, (*Volume 71, Issues 2–4), pp 131-169. Retrieved from *http://dx.doi.org/10.1016/0269-7491(91)90031-Q* Accessed 4 June 2014.

Graham, K. L. (2002). *Human influences on forest wildlife habitat*. (Final Technical Report Chapter 3). Washington, DC: Southern Forest Resource Assessment. Retrieved April 2014 from *http://www.srs.fs.usda.gov/sustain/report/terra3/terra3-14.htm*>.

Hampton Roads Transportation Planning Organization. (2012). Hampton Roads 2034 Long Range Transportation Plan. Retrieved from http://www.hrtpo.org/page/2034-long-range-transportation-plan.

Havens, K.J., Jacobs, A., Rogerson, A., Roggero, M., Rheinhardt, R.D., Wardrop, D.. (2012). *A regional guidebook for applying the hydrogeomorphic approach to assessing wetland functions of wet hardwood flats on mineral soils in the Mid-Atlantic coastal plain*.

Jones, E. J., Karriker, K. S., Megalos, M. A. (1994). Working with wildlife. *Managing Edges for Wildlife, 15*. N.C. Cooperative Extension Service. Retrieved from http://www.ces.ncsu.edu/forestry/pdf/www/www15.pdf.

Jones, C., McCann, J., McConville, S. (2001). *A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area*. Annapolis, MD: Critical Area Commission for the Chesapeake and Atlantic Coastal Bays. Retrieved from http://www.dnr.state.md.us/criticalarea/pdfs/tweetyjune_2000.pdf. Accessed July 2014.

Mason, R.P., Fitzgerald, W.F., Morel, F.M.M. (1994). The biogeochemical cycling of elemental mercury: Anthropogenic influences. *Geochimica et Cosmochimica Acta, 58*, Issue 15, p 3191-3198. Retrieved from http://dx.doi.org/10.1016/0016-7037(94)90046-9. Accessed 4 June 2014.

Megaritis, A. G., Murphy, B. N., Racherla, P. N., Adams, P. J., Pandis, S. N. (2014). Impact of climate change on mercury concentrations and deposition in the eastern United States. *Science of The Total Environment, 487*, 299-312. Retrieved from: http://dx.doi.org/10.1016/j.scitotenv.2014.03.084. Accessed on 4 June 2014.

Mitchell, J. C., Reay, K. K. (1999). Atlas of *amphibians and reptiles* in Virginia. Richmond, VA: Virginia Department of Game and Inland Fisheries. Wildlife Diversity Division.

Mungur, A.S., Shutes, R.B.E., Revitt, D.M., and House, M.A. (1995). An assessment of metal removal from highway runoff by a natural wetland. *Water Science and Technology, 32*, 3, 169-175.

Musick, J.A., Hager, C.H. (2007). *Atlantic sturgeon restoration in Chesapeake Bay*. Final Report. NOAA/NMFS Grant Number: NA06NMF4050068. Retrieved from http://www.nero.noaa.gov/statefedoff/grantfactsheets/VA/FINAL%20REPORTS/FINAL%20NA06NMF4050068.pdf.

National Audubon Society, Inc. (2014). *Bachman's Sparrow*. Retrieved from http://birds.audubon.org/species/bacspa.

National Cooperative Highway Research Program (NCHRP). (2006). *Evaluation of Best Management Practices for Highway Runoff Control*. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_565.pdf.

National Oceanic and Atmospheric Administration (NOAA). (2010). *Coastal change analysis program (C-CAP) regional land cover* [Data]. Retrieved from: http://www.csc.noaa.gov/htdata/ccap/ccap_regional_dates/va_2010_ccap_land_cover.zip. Accessed March 2014.

Natureserve. (2014). Natureserve Explorer: An Online Encyclopedia of Life. Retrieved from http://explorer.natureserve.org/. Accessed April 2014.

Pimentel, D., Zuniga, R., Morrison, D. (2005). Update on the environmental and economic costs associated with alien invasive species in the United States. *Ecological Economics, 52* (3), 273-288.

Reid, L. M., Ziemer, R. R. (1994). *Evaluating the Biological Significance of Intermittent Streams*. USDA Forest Service, Pacific Southwest Research Station.

Reijnen, R., Foppen, R., (1994). The effects of car traffic on breeding bird populations in woodland I: Evidence of reduced habitat quality for Willow Warblers (*Phylloscopus trochilus*) breeding close to a highway. *The Journal of Applied Ecology. 31* (1), 85-94.

Townsend, J. F. (2014). Natural Heritage Resources of Virginia: *Rare Plants, Natural Heritage* (Technical Report 14-02). Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. Retrieved from http://www.dcr.virginia.gov/natural_heritage/documents/plantlist14.pdf.

Transportation Research Board (TRB). (2006). *Evaluation of best management practices for highway runoff control*. NCHRP Report 565. National Cooperative Highway Research Program. Washington, D.C.

Tri-Cities Area Metropolitan Planning Organization. (2012). Tri-Cities MPO 2035 Long Range Transportation Plan. Retrieved from http://www.craterpdc.org/transportation/mpo.htm.

U.S. Army Corps of Engineers (USACE). (1987). *Corps of Engineers Wetlands Delineation Manual*. (Final Report: Technical Report Y-87-1). St. Petersburg, FL.

U.S. Army Corps of Engineers (USACE). (1995). *An Approach for Assessing Wetlands Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices*. Retrieved from http://el.erdc.usace.army.mil/elpubs/pdf/wrpde9.pdf.

U.S. Army Corps of Engineers (USACE), Norfolk District (2008). *Virginia off-site mitigation location guidelines*. Retrieved from http://www.nao.usace.army.mil/Portals/31/docs/regulatory/guidance/Virginia%20Offsite%20Mitigation%20Site%20Selection%20Guidelines.pdf.

U.S. Army Corps of Engineers (USACE). (2010). Engineer Research and Development Center Environmental Laboratory Wetlands Regulatory Assistance Program (2010). *Regional supplement to the Corps of Engineers wetland delineation manual: Atlantic and Gulf coastal plain region (version 2.0)*. Vicksburg, Miss.

U.S. Army Corps of Engineers (USACE). (2012). April 2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coast Plain Region Version 2.0. Retrieved from http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/reg_supp.aspx.

U. S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). (2014a). *National plants database*. Retrieved from http://plants.usda.gov/index.html. Accessed March 2014.

U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). (2014b). *Web soil survey*. Retrieved from http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed March 2014.

U. S. Federal Highway Administration (FHWA). (1998). Turner-Fairbank Highway Research Center. *Is highway runoff a serious problem?* McLean, Va: Office of Engineering R & D. Retrieved from http://www.fhwa.dot.gov/publications/research/infrastructure/structures/98079/runoff.cfm.

U. S. Federal Highway Administration (FHWA). (2011). *Noise effects on wildlife*. Retrieved from http://www.fhwa.dot.gov/environment/noise/noise_effect_on_wildlife/effects/wild00.cfm.

U. S. Federal Highway Administration (FHWA). (2012). *Is Highway Runoff a Serious Problem*. Retrieved from http://www.fhwa.dot.gov/publications/research/infrastructure/structures/98079/runoff.cfm.

U.S. Fish and Wildlife Service (USFWS). (1995). *Species of management concern*. Retrieved from http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/speccon/SMC_TBL.PDF.

U.S. Fish and Wildlife Service (USFWS). (2003). *Recovery plan for the Red-Cockaded Woodpecker (Picoides borealis)*. Second Revision. U.S. Fish and Wildlife Service, Atlanta, GA. 296pp.

U.S. Fish and Wildlife Service (USFWS). (2007a). *Dwarf wedgemussel (Alasmidonta heterodon) 5-year review: summary and evaluation*. U.S. Fish and Wildlife Service, Atlanta, GA. 27pp.

U.S. Fish and Wildlife Service (USFWS). (2007b). *National bald eagle management guidelines*. U.S. Fish and Wildlife Service, Atlanta, GA. Retrieved from http://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf.

U.S. Fish and Wildlife Service (USFWS). (2011). *National wetlands inventory, conterminous 48 States*. Retrieved from http://www.fws.gov/wetlands/redirect.html.

U.S. Fish and Wildlife Service (USFWS). (2012a). *Questions and answers about Bald Eagle recovery and delisting*. Retrieved from http://www.fws.gov/midwest/eagle/recovery/qandas.html.

U.S. Fish and Wildlife Service (USFWS). (2012b). *The cost of invasive species*. Retrieved from http://www.fws.gov/home/feature/2012/pdfs/costofinvasivesfactsheet.pdf.

U.S. Fish and Wildlife Service (USFWS). (2014a). *Information, planning, and conservation system*. Retrieved from http://ecos.fws.gov/ipac/.

U.S. Fish and Wildlife Service (USFWS). (2014b). *Northern Long-Eared Bat interim conference and planning guidance*. Retrieved from http://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf.

U.S. Geological Survey (USGS). (2014). *National hydrography dataset. State of Virginia*. [Data file]. Retrieved from ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution/NHDH_VA_931v210.zip.

Virginia Botanical Associates (2014). *Digital Atlas of the Virginia Flora*. Retrieved from http://www.vaplantatlas.org). c/o Virginia Botanical Associates, Blacksburg. Accessed: September 2014.

Virginia Department of Conservation and Recreation (VDCR), Division of Soil and Water Conservation (DSWC). (1999). *Virginia stormwater management handbook. 1st edition*, (1). Richmond, VA. Retrieved from http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/HndbkVolumeI.pdf.

Virginia Department of Conservation and Recreation (VDCR), Division of Natural Heritage (DNH). (2003). *Invasive alien plant species in Virginia*. Retrieved from http://www.dcr.virginia.gov/natural_heritage/invspinfo.

Virginia Department of Conservation and Recreation (VDCR). (2009a). *Blackwater scenic river report Isle of Wight and Southampton counties cities of Franklin and Suffolk*. Retrieved from http://www.dcr.virginia.gov/recreational_planning/documents/srreportblwa.pdf.

Virginia Department of Conservation and Recreation (VDCR). (2013). Virginia outdoors plan. Retrieved from http://www.dcr.virginia.gov/recreational_planning/documents/vopall.pdf.

Virginia Department of Conservation and Recreation (VDCR). (2014a). *Natural heritage: Virginia natural area preserves*. Retrieved from http://www.dcr.virginia.gov/natural_heritage/natural_area_preserves.

Virginia Department of Conservation and Recreation (VDCR). (2014b). *Recreation planning - scenic rivers*. Retrieved from http://www.dcr.virginia.gov/recreational_planning/srmain.shtml.

Virginia Department of Conservation and Recreation (VDCR). (2014c). *Virginia Invasive Plant Species List 2014.* Retrieved from http://www.dcr.virginia.gov/natural_heritage/invspinfo.shtml.

Virginia Department of Environmental Quality (VDEQ). (2005). *Wellhead protection plan*. Retrieved from: http://www.deq.virginia.gov/Portals/0/DEQ/Water/GroundwaterProtectionSteeringCommittee/wellheadplan.pdf.

Virginia Department of Environmental Quality (VDEQ). (2012). *Integrated Report.* Retrieved from http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2012305(b)303(d)IntegratedReport.aspx.

Virginia Department of Environmental Quality (VDEQ). (2014a). *Virginia 305(b)/303(d) water quality integrated report to Congress and the EPA administrator for the period January 1, 2005 through*

December 31, 2010. Richmond, Va: Department of Conservation and Recreation. Retrieved from http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityAssessments/IntegratedReport/2012/ir12_Integrated_Report_All_Final.pdf.

Virginia Department of Environmental Quality (VDEQ). (2014b). *Water quality monitoring data and dictionary 1995-present*. Provided by Roger Stuart (VDEQ) on 17 April 2014.

Virginia Department of Environmental Quality (VDEQ). (2014c). *Virginia environmental geographic information*. [Datasets]. Retrieved from http://deq.state.va.us/ConnectWithDEQ/VEGIS/VEGISDatasets.aspx.

Virginia Department of Environmental Quality (VDEQ). (2014d). *EDAS database of benthic macroinvertebrates*. Retrieved from http://www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/WaterQualityMonitoring/ProbabilisticMonitoring/ProbMonDataSources.aspx.

Virginia Department of Environmental Quality (VDEQ). (2014e). *Coastal zone management program*. Retrieved from http://www.deq.virginia.gov/Programs/CoastalZoneManagement.aspx.

Virginia Department of Game and Inland Fisheries (DGIF). (2011a). *2011 Canebrake Rattlesnake Conservation Plan*. Bureau of Wildlife Resources. DGIF, Richmond, VA. Approved February 29, 2012. Retrieved from http://www.dgif.virginia.gov/wildlife/reptiles/snakes/canebrake-rattlesnake/conservation-plan/canebrake-rattlesnake-conservation-plan.pdf. Accessed April 2014.

Virginia Department of Game and Inland Fisheries (DGIF). (2011b). *Coordination recommendations*. Retrieved from http://www.dgif.virginia.gov/environmental-programs/files/VAFWIS-Coordination-Recommendations.pdf.

Virginia Department of Game and Inland Fisheries (DGIF). (2012). *Feral swine in Virginia: Unwelcome guests*. Richmond, VA. Retrieved from http://www.dgif.virginia.gov/wildlife/feral-hogs/feral-swine-unwelcome-guests.pdf.

Virginia Department of Game and Inland Fisheries (DGIF). (2014a). *Fish and wildlife information service*. Retrieved from http://www.vafwis.org/fwis/?Title=VAFWIS+Species+Information+By+Name&vUT=Visitor>.

Virginia Department of Game and Inland Fisheries (DGIF). (2014b). Special *legal status faunal species in Virginia*. Retrieved from http://www.dgif.virginia.gov/wildlife/virginiatescspecies.pdf.

Virginia Department of Health (VDH). (2013). Fish Consumption Advisory Fact Sheet. Retrieved from http://www.vdh.state.va.us/epidemiology/dee/publichealthtoxicology/advisories/Fish%20Consumption%20Advisory%20Fact%20Sheet%2010%2018%203013.pdf.

Virginia Department of Health (VDH). (2011). Source Water Protection Program webpage. Retrieved from http://www.vdh.state.va.us/ODW/SourceWaterProtection.htm. Accessed May 2014.

Virginia Department of Transportation (VDOT). (2005). *Water Quality and Water Resources*. Retrieved from http://www.virginiadot.org/projects/resources/460_DEIS_Section_4_10.pdf.

Virginia Department of Transportation (VDOT). (2013). *Comprehensive environmental data and reporting (CEDAR) system*. [GIS database]. Retrieved from http://environment.fhwa.dot.gov/histpres/va_cedar.asp.

Virginia Department of Transportation (VDOT). (2014). *Instructional and Informational Memorandum Number: IIM-LD-195.8, VDOT – Location and Design Division.* Retrieved from http://www.extranet.vdot.state.va.us/locdes/electronic_pubs/iim/IIM195.pdf.

Virginia Department of Transpiration (VDOT). (2015b). Route 460 Project Southeast Virginia Final Supplemental Environmental Impact Statement Waters of the U.S. (Including Wetlands) Delineation Report. Unpublished Report.

Virginia Geographic Information Network (VGIN). (2013). C*olor infrared aerials* [hard drive provided by VDOT].

Virginia Invasive Species Working Group (VISWG). (2012). *Virginia invasive species management plan 2012*. (Technical Document 12-13). Virginia Department of Conservation and Recreation, Division of Natural Heritage: Richmond, VA. Retrieved from http://www.dcr.virginia.gov/natural_heritage/vaisc/documents/2012_VISMP.pdf.

Virginia Invasive Species Working Group (VISWG). (2014). *Twelve invasive species of high concern in Virginia*. Virginia Department of Conservation and Recreation, Division of Natural Heritage: Richmond, VA. Retrieved from http://www.dcr.virginia.gov/natural_heritage/vaisc/documents/VISWG-Invasives-Brochure.pdf.

Virginia uniform statewide building code: administrative amendments. (1973 ed.). (1973). Article 8, Part C, Section 872.6. Richmond, VA: The Board of Housing and Community Development.

Wagner, C.R., Fitzgerald, S.A., Sherrell, R.D., Harned, D.A., Staub, E.L., Pointer, B.H., and Wehmeyer, L.L. (2011). *Characterization of stormwater runoff from bridges in North Carolina and the effects of bridge deck runoff on receiving streams.* U.S. Geological Survey Scientific Investigations report 2011-5180, 95p. + 8 appendix tables.

Wiggins, D. (2005). *Loggerhead Shrike (Lanius ludovicianus): a technical conservation assessment*. USDA Forest Service, Rocky Mountain Region. Retrieved from http://www.fs.fed.us/r2/projects/scp/assessments/loggerheadshrike.pdf.

GLOSSARY

Alien – A species occurring in an area outside of its historically known natural range as a result of intentional or accidental dispersal by human activities.

Alluvial – Made up of or found in the materials that are left by the water of rivers, floods, etc.

Anadromous – Pertaining to a fish that spends most of its adult life at sea, but returns to fresh water to spawn.

Benthic Zone – Ecological region near the bottom of a body of water such as an ocean, lake or stream, including the sediment surface and some sub-surface layers.

Benthic invertebrates – Organisms that live in or on the bottom sediments of rivers, streams, and lakes.

Biological Oxygen Demand (BOD) – The amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period.

Biota – The total collection of organisms of a geographic region.

Bubble Curtain – A system that produces bubbles of air to act as a barrier to break the propagation of waves (explosive or acoustic) or the spreading of contaminants.

Cofferdam – A temporary enclosure built within, or in pairs across, a body of water and constructed to allow the enclosed area to be pumped out, creating a dry work environment for the major work to proceed.

Cretaceous – A geologic period from circa 145 ± 4 to 66 million years ago. In the geologic timescale, the Cretaceous follows the Jurassic period.

DBH (Diameter at breast height) – The width of a plant stem as measured at 4.5 feet above the ground surface.

Deciduous – Referring to trees or shrubs that lose their leaves seasonally.

Ecdysis – The act of molting or shedding an outer cuticular layer.

Ecotone – A transitional zone between two communities containing the characteristic species of each.

Ephemeral Ponds – Depressions with impeded drainage (usually in forest landscapes) that hold water for a period of time following snowmelt and spring rains, but typically dry out by mid-summer.

Exotic species – A species introduced into habitats where they are not native.

Facultative species – Species that can occur both in wetlands and uplands; there are three subcategories of facultative species: (1) *facultative wetland plants* (FACW) that usually occur in wetlands (estimated probability 67-99%), but occasionally are found in nonwetlands; (2) *facultative plants* (FAC) that are equally likely to occur in wetlands or nonwetlands (estimated probability 34-66%); and *facultative upland plants* (FACU) that usually occur in nonwetlands (estimated probability 67-99%), but occasionally are found in wetlands (1-33%).

Fluvial – The term used in geography and geology to refer to the processes associated with rivers and streams and the deposits and landforms created by them.

Hydric Soil – A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

Hydrophytes (Hydrophytic vegetation) – A plant that grows in water or very moist ground; an aquatic plant.

Infiltration – The process by which water on the ground surface enters the soil.

Invasive – Organisms not native to a region, and whose introduction causes economic or environmental harm or harm to human health.

Impervious – Impenetrable. Impervious materials include asphalt, concrete, brick, and stone.

Mesic habitat – A type of habitat with a moderate or well-balanced supply of moisture.

Mitigation – Actions taken to make impacts less severe, harmful, or painful.

Non-indigenous – Not originating in or characteristic of a particular region or country; non-native.

Non-Point Source – In regards to water pollution, there is no single identifiable localized source of pollution.

Nonwetland – Any area that has sufficiently dry conditions that hydrophytic vegetation, hydric soils, and/or wetland hydrology are lacking; it includes upland as well as former wetlands that are effectively drained.

Noxious plants – Non-native species that have been introduced from other parts of the world and, because of their aggressive growth and lack of natural enemies, they can be highly destructive, competitive, or difficult to control.

Obligate upland species (UPL) – A plant species that is nearly always found in nonwetlands under natural conditions; its frequency of occurrence in nonwetlands is 99% or more.

Obligate wetland species (OBL) – A plant species that is nearly always found in wetlands under natural conditions; its frequency of occurrence in wetlands is 99% or more.

Palustrine – Relating to a system of inland, nontidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation (vegetation that is rooted below water but grows above the surface).

Point Source – In regards to water pollution, this is a single identifiable localized source of pollution.

Quaternary – Of, relating to, or being the geological period from the end of the Tertiary to the present time or the corresponding system of rocks.

Riparian – Adjacent to rivers and streams.

Scarp – A steep slope or long rock that occurs from erosion or faulting and separates two relatively level areas of differing elevations.

Silviculture – The practice of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values.

Subaqueous Lands – Land that is submerged underwater.

Tertiary – Noting or pertaining to the period forming the earlier part of the Cenozoic Era, occurring from 65 million to 2 million years ago, characterized by the development and proliferation of mammals.

LIST OF ACRONYMS

Acronym	Definition
BCI	Bat Conservation International
BMPs	Best Management Practices
BRANK	Biodiversity-ranked
CBA	candidate build alternative
CBA 1	new alignment alternative south of existing Route 460
CBPA	Chesapeake Bay Preservation Act
C-CAP	Coastal Change Analysis Program
CCB	Center for Conservation Biology
CEDAR	Comprehensive Environmental Data and Reporting
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CLOMR	Conditional Letters of Map Revision
CMA	Coastal Management Area
CTB	Commonwealth Transportation Board
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Virginia Coastal Zone Management Program
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
DMME	Virginia Department of Mines, Minerals, and Energy
DMM	DMME Division of Mineral Mining
DoD	Department of Defense
ECSU	Elizabeth City State University
EDAS	Ecological Data Application System
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIDS	Forest Interior Dwelling Species
GIS	Geographic Information System
HUC	Hydrologic Unit Code
I-295	Interstate 295
IPaC	Information, Planning, and Conservation
ISTEA	Intermodal Surface Transportation Efficiency Act
JPA	Joint Permit Application

LEDPA	Least Environmentally Damaging Practicable Alternative
LID	Low-Impact Development
LOD	Limits of Disturbance
LOMR	Letters of Map Revision
LRTP	Long Range Transportation Plan
mg/L	milligrams per liter
MOU	Memorandum of Understanding
MPOs	Metropolitan Planning Organizations
MS4	Municipal Separate Storm Sewer System
NEPA	National Environmental Policy Act
NLEB	Northern long-eared Bat
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Parks Service
OBL	Obligate
PEM	Palustrine Emergent
PFO	Palustrine Forested
POW	Palustrine Open Water
PSS	Palustrine Scrub/Shrub
PUB	Palustrine Unconsolidated Bottom
PWS	Public Water Supply
RCW	Red-cockaded woodpecker
ROD	Record of Decision
SCU	Stream Conservation Unit
SEIS	Supplemental Environmental Impact Statement
SPCC	Spill Prevention Control and Countermeasure
STRAHNET	Strategic Highway Network
SWM	Stormwater Management
SWPPP	Specific Stormwater Pollution Prevention Plan
SYIP	Six-Year Improvement Plan
T&E	Threatened and Endangered
T&E Waters	Threatened and Endangered Species Waters
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TSM	Transportation System Management
U.S.	United States
U.S. DOT	U.S. Department of Transportation
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USM	Unified Stream Methodology
VDACS	Virginia Department of Agriculture and Consumer Services
VDCR	Virginia Department of Conservation and Recreation

VDCR-DNH	Virginia Department of Conservation and Recreation- Division of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
DGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDOT	Virginia Department of Transportation
VAFWIS	Virginia Fish and Wildlife Information Service
VGIN	Virginia Geographic Information Network
VMRC	Virginia Marine Resources Commission
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WNS	White-Nose Syndrome
VISWG	Virginia Invasive Species Working Group
WOUS	Waters of the U.S.

APPENDIX A: THREATENED AND ENDANGERED SPECIES AGENCY CONCURRENCE LETTERS

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219 2000

Charles A. Kilpatrick, P.E.
Commissioner

March 29, 2016

Mr. Troy Andersen
U.S. Fish and Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

RE: Request for comments regarding threatened and endangered species
U.S. Army Corps of Engineers Public Notice NAO-2008-03470
Route 460 Project Southeast Virginia

Dear Mr. Andersen,

The Virginia Department of Transportation (VDOT) is in the process of preparing the Final Supplemental Environmental Impact Statement (SEIS) for the Route 460 Project Southeast Virginia (the Project). In conjunction with the Final SEIS, in November 2015, VDOT submitted a joint permit application (JPA) to the U.S. Army Corps of Engineers (USACE), Virginia Department of Environmental Quality (DEQ), and the Virginia Marine Resources Commission (VMRC) for impacts to wetlands and streams that would result from construction of the Project. Section 11.0 of the JPA addressed threatened and endangered species that could potentially be impacted by the project. The purpose of this letter is 1) to request the U.S. Fish and Wildlife Service's (USFWS) review and concurrence regarding the information and conclusions presented in the JPA and to be presented in the Final SEIS, 2) to provide USFWS with VDOT's modified conclusion based on the final 4(d) rule for northern long-eared bat (*Myotis septentrionalis*), and 3) to provide USFWS with additional requested information regarding the red-cockaded woodpecker (*Picoides borealis*).

In the November 2015 JPA, VDOT proposed to conduct presence/absence surveys for northern long-eared bat during the 2016 survey season and to develop project-specific conservation measures based upon the survey results. This proposal was based on the interim 4(d) rule published April 2, 2015. Since the JPA was submitted, the final 4(d) rule has been promulgated (effective February 16, 2016) which has substantially changed USFWS' recommended conservation measures. The final 4(d) rule states:

> *Under this final 4(d) rule, incidental take within the White Nose Syndrome (WNS) zone involving tree removal is not prohibited if two conservation measures are followed. The first measure is the application of a 0.25 mile (0.4 km) buffer around known occupied northern long-eared bat hibernacula. The second conservation measure is that the activity does not cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius around the maternity roost tree, during the pup season (June 1 through July 31).*

No known or documented hibernacula or maternity roosts occur within the Project Inventory Corridor or current Limits of Disturbance, depicted in **Attachment 1**; therefore, VDOT proposes to modify the conservation measures documented in the November 2015 JPA. VDOT will not conduct presence/absence surveys for northern long-eared bat and VDOT proposes to conduct no further work for this species.

As stated in the November 2015 JPA, there is no suitable habitat and there are no known occurrences of red-cockaded woodpecker (RCW) within the Project Inventory Corridor or current Limits of Disturbance. In an email dated January 28, 2016, the USFWS requested a habitat assessment report for RCW. A habitat assessment report for red-cockaded woodpecker, concluding that there is no suitable potential habitat is present, is attached for your review (**Attachment 2**).

VDOT requests your review of this letter in combination with the information submitted in the JPA and respectfully requests USFWS' concurrence with the conclusions and recommendations proposed by VDOT. In order to adequately plan for the 2016 survey season, VDOT requests your response no later than April 15, 2016. Please do not hesitate to contact me at (804) 371-6756 or Angel.Deem@VDOT.Virginia.gov if you should have any questions or need additional information.

Sincerely,

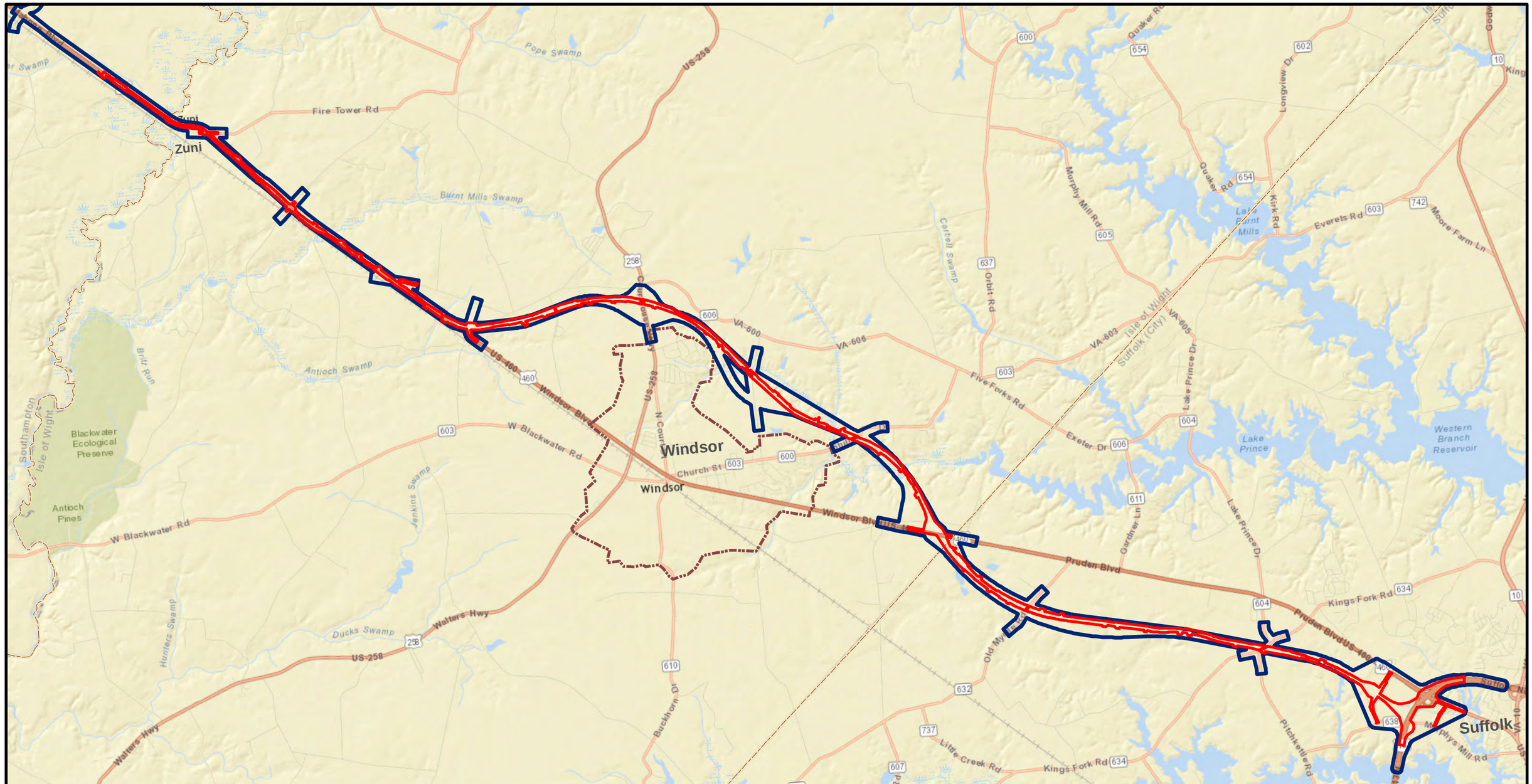
Angel Deem

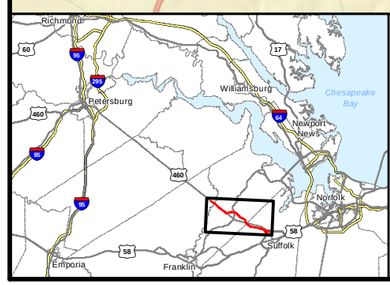
Angel Deem
Environmental Division Director

Enclosures
1. Project Map
2. Red-Cockaded Woodpecker Habitat Assessment Report

cc: Edward Sundra, Federal Highway Administration
Alice Allen-Grimes, U.S. Army Corps of Engineers
Nina O'Malley, Virginia Department of Environmental Quality
Mike Johnson, Virginia Marine Resources Commission
Ray Fernald, Virginia Department of Game of Inland Fisheries
Ernie Aschenbach, Virginia Department of Game and Inland Fisheries
Rene Hypes, Virginia Department of Conservation and Recreation

Attachment 1. Project Map





Current Limits of Disturbance (LOD)

Inventory Corridor

County Boundary

Town Boundary

ROUTE 460 PROJECT SOUTHEAST VA

VDOT Virginia Department of Transportation
U.S. Route 460 Corridor Improvements Project
VDOT Project No.0460-969-007, P101, R201, C501
Southampton County, Isle of Wight County, and City of Suffolk, Virginia

0 0.5 1 1.5 2 2.5 3 3.5 4 Miles

Route 460 Project Corridor

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; Esri World Street Map

Attachment 2. Red-Cockaded Woodpecker Habitat Assessment Report

RED COCKADED WOODPECKER HABITAT ASSESSMENT

FHWA PROJECT NUMBER STP-000S (276)
USACE PROJECT NUMBER NAO-2008-03470
VDOT UPC 100432; PROJECT NUMBER 0460-969-101, P101, r201, c501

March 22, 2016

RED-COCKADED WOODPECKER HABITAT ASSESSMENT

1.1 INTRODUCTION

The red-cockaded woodpecker was listed as a federal T&E species in 1973. The species is native to the southeast U.S. and is non-migratory. The species was classified as endangered because of its perceived rarity, declines in local populations, and a presumed reduction in available nesting habitat. The species nests in old growth pines which are declining in numbers due to current commercial timbering methods. Fire, which at one time maintained the open pine stands that this woodpecker prefers, is now suppressed. Other threats include forest fragmentation, catastrophic events, and demographic and genetic processes affecting populations confined to isolated areas (USFWS 2003).

This species is limited to stands where mature pine (greater than 80 years old) occurs or predominates, and it shows a preference for open woods. It selects mature to over-mature, live pines often infected with red heart disease (*Fomes pini*) for nest cavity excavation. They prefer longleaf pines (*Pinus palustris*). They live in social groups called clans of up to ten individuals, but never more than one breeding pair per colony. They forage for insects mainly within pines. In Virginia, the red-cockaded woodpecker nests between late April and early June. The female lays two to five eggs in the breeding male's nest cavity. The eggs are incubated for approximately 10 days and the young fledge at 26 to 29 days (USFWS 2003).

The red-cockaded woodpecker is a very rare permanent resident south of the Chesapeake Bay and the James and Appomattox Rivers. Historically this species has been recorded in Southampton, Sussex and Suffolk Counties, with nesting verified only in Sussex County (VDGIF 2014). Virginia represents the northern range limit for the red-cockaded woodpecker and since the early 2000s the state population has been restricted to a single breeding site, Piney Grove Preserve. Long term restoration of the habitat at Piney Grove by the Nature Conservancy along with partners such as the U.S. Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, and the Virginia Department of Conservation and Recreation, has now provided red-cockaded woodpeckers with substantially more breeding and foraging opportunities than have ever existed at this site. These intensive management efforts have brought this population back from 2 breeding groups in 2002 to 14 breeding groups in 2015. A total of 21 young were fledged in 2015, which was a relatively low reproduction rate for the colonies, however, the 2015-2016 annual winter population survey recorded the highest number of red-cockaded woodpeckers in decades with 69 individuals distributed among 14 groups. The Piney Grove population continues to grow every season as the winter survey has shown through time with 29 birds detected in 2002, 45 birds in 2011, 57 birds in 2013, and 69 birds in 2015. Among the 69 birds detected during the 2015-2016 winter survey were 16 of the 21 birds fledged in 2015; a very high survival percentage. With the clear successes at Piney Grove Preserve due to the intensive habitat management, attempts are underway to establish a new colony in a portion of the Great Dismal Swamp National Wildlife Refuge using birds captured in North Carolina and relocated to artificial nest cavities within a stand of pine forest that has been similarly managed with prescribed fire to create suitable habitat.

Although the preferred alternative for the Route 460 improvements project will not impact the existing red-cockaded woodpecker colonies at the Piney Grove Preserve; or have any effect on the attempts to establish a new colony in the Great Dismal Swamp National Wildlife refuge, the USFWS requested that a

habitat assessment be performed on the preferred alternative to determine if suitable potential habitat exists within the study area.

1.2 METHODOLOGY

During the development of the Supplemental Environmental Impact Statement for the project, land cover types were evaluated and natural community mapping was performed. The National Oceanic and Atmospheric Administration (NOAA)'s 2010 Coastal Change Analysis Program (C-CAP) land cover dataset was utilized initially to review and identify general land uses, forest types, and other large-scale vegetation communities within the Inventory Corridor (NOAA 2010). The C-CAP land cover is based on data analyzed by NOAA, with land coverage classification adapted from the Cowardin wetland classification system (Cowardin, et al. 1979) and the Land Use and Land Cover Classification System for Use with Remote Sensor Data (Anderson, et al. 1976), also known as the "Anderson Land Use Classification".

Natural vegetation communities of the Inventory Corridor were classified according to The *Natural Communities of Virginia: Classification of Ecological Groups and Community Types* (Fleming and Patterson 2012, updated online July 2013 (VDCR 2013a)). Natural vegetation communities were identified and mapped in the field during the spring and summer of 2015. Onsite surveys were conducted to determine the natural community types based on Fleming and Patterson (VDCR 2013a). Natural community boundaries were estimated in the field and hand sketched on field maps using 2013 VGIN true color and color infrared aerial imagery as the base mapping, and then was later digitized in GIS to produce final shapefiles for analysis (See **Figure 1.1-1, Sheets 1-7**).

1.3 FINDINGS

The Inventory Corridor contains three main terrestrial forest types: (1) deciduous forest, (2) evergreen forest, and (3) mixed evergreen/deciduous forest (NOAA 2010). Terrestrial forest types comprise approximately 25 percent of the Inventory Corridor (or approximately 552 acres out of the 2153 -acre Inventory Corridor). For purposes of this study, these forest types can be correlated to natural community types, as defined under *Natural Communities of Virginia: Classification of Ecological Groups and Community Types*. These forest communities are described in detail in the Route 460 Supplemental Environmental Impact Satement, but their correlation to Virginia Natural Communities are presented in **Table 1**. Although not formally recognized under the *Natural Communities of Virginia*, pine plantations within the Inventory Corridor can be thought of as an early-successional planted-pine variant of the Non-Riverine Flatwoods and Swamps. Of the eight natural community types occurring in the Inventory Corridor, only the Non-Riverine Flatwoods and Swamps, Planted-Pine Variant has the potential to provide habitat for the red-cockaded woodpecker, and then only if the pine stands are maintained with an open understory by prescribed fire and whose age class ranges from 50-80 years old or older. The pine stands in the Inventory Corridor are somewhat early-successional forests which have been planted and managed as part of a concerted forestry management plan focused on fast yields of pulpwood for paper production. Loblolly pine (*Pinus taeda*) is typically harvested in Virginia for pulpwood, or for chip-and-saw. This means that the pine is typically harvested in 25-40 year rotations, and is not allowed to reach ages suitable for red-cockaded woodpacker habitation. These forests are common throughout the Inventory Corridor. The dominant tree species is loblolly pine, with some drier stands that include Virginia pine (*Pinus virginiana*) or wetter stands that include pond pine (*Pinus serotina*). There are no

pine stands within the Inventory Corridor that are dominated by longleaf pine, the preferred habitat of red-cockaded woodpeckers. Hardwood saplings in the understory are common in the pine dominated areas, particularly if the pine forest is more mature and no longer actively managed. Common understory sapling and shrub species include sweet gum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), American holly (*Ilex opaca*), flowering dogwood (*Cornus florida*), sassafras (*Sassafras albidum*), giant cane (*Arundinaria tecta*), and highbush blueberries (*Vaccinium* sp.). Common herbaceous species within the Inventory Corridor include seedlings of the aforementioned canopy and understory species, river oats (*Chasmanthium latifolium*), pink lady's slipper (*Cypripedium acaule*), bracken fern (*Pteridium aquilinum*), cinnamon fern (*Osmundastrum cinnamomeum*), and dog fennel (*Eupatorium capillifolium*). Common vine species within the Inventory Corridor include common greenbrier (*Smilax rotundifolia*) and muscadine grape (*Vitis rotundifolia*). Approximately 217 acres of Non-Riverine Flatwoods and Swamps, Planted Pine Variant, were identified in the Inventory Corridor.

TABLE 1
ECOSYSTEM CLASSIFICATION CROSS-REFERENCE

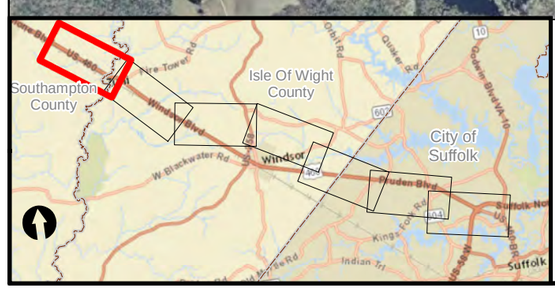
C-CAP LAND COVER CLASSIFICATION	NATURAL COMMUNITIES OF VIRGINIA	ACREAGE WITHIN INVENTORY CORRIDOR
Deciduous Forest	Mesic Mixed Hardwood Forests	229.44
	Piedmont/Coastal Plain Oak-Beech/Heath Forests	113.28
	Bald Cypress-Tupelo Swamps	80.71
	Coastal Plain/Piedmont Bottomland Forests	100.6
	Coastal Plain Depression Wetlands	0.95
	Semipermanent Impoundments	5.84
Evergreen Forest	Non-Riverine Flatwoods and Swamps, Planted-Pine Variant	216.71
Mixed Forest	Pine/Scrub Oak Sandhills	1.37

Source: NOAA 2010, and VDCR 2013a

The 217 acres of pine forest found within the Inventory Corridor is found in 60 locations ranging from 0.1 acre to 32.28 acres in size (see Figure 1.1-1, Sheets 1-7). Approximately 24 acres (7 locations) are recently clearcut and classified in the less than 10 year old age class; 45.6 acres (13 locations) are in the 10-15 year old age class; 14.88 acres (7 locations) are in the 15-20 year old age class; 27.93 acres (9 locations) are in the 20-25 year old age class; 83.5 acres (15 locations) are in the 25-30 year old age class; and 20.8 acres (9 locations) are in the 30-40 year old age class. No existing pine-dominated stands in the Inventory Corridor are older than the 30-40 year old age class.

1.4 CONCLUSIONS

The absence of pine-dominated forest stands aged 50-80 years or older, absence of longleaf pine, and absence of pine-dominated forest stands managed for an open understory through the use of prescribed fire, leads to the conclusion that there is no suitable potential habitat for red-cockaded woodpecker within the Preferred Alternative Inventory Corridor.



Pine Forest Age Classes

- Less than 10 years
- 10-15 years
- 15-20 years
- 20-25 years
- 25-30 years
- 30-40 years

ROUTE 460 PROJECT SOUTHEAST VA

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Southampton County, Isle of Wight County, and City of Suffolk, Virginia

Mile: 0 – 0.25 – 0.5 – 0.75
Feet: 0 – 1,000 – 2,000
1 inch = 1,000 feet (11x17)

Figure 1.1-1
RCW Habitat Assessment
Sheet 1 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; 2013 VGIN VBMP

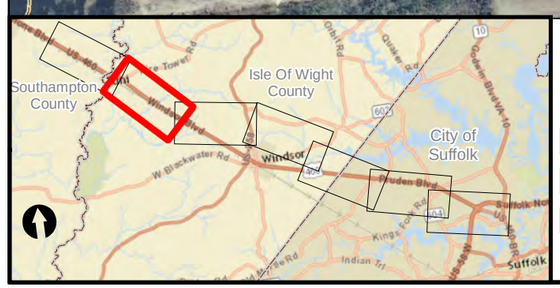

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Figure 1.1-1
RCW Habitat Assessment
Sheet 2 of 7

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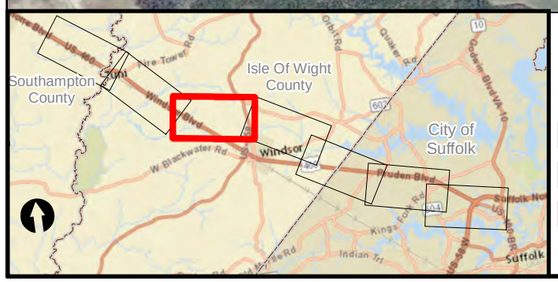

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Figure 1.1-1
RCW Habitat Assessment
Sheet 3 of 7

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Supplemental Environmental Impact Statement

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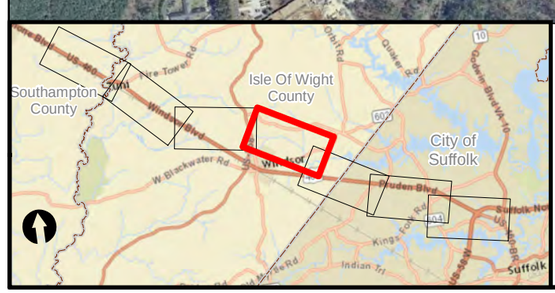

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Figure 1.1-1
RCW Habitat Assessment
Sheet 4 of 7

Route 460 Project Southeast VA
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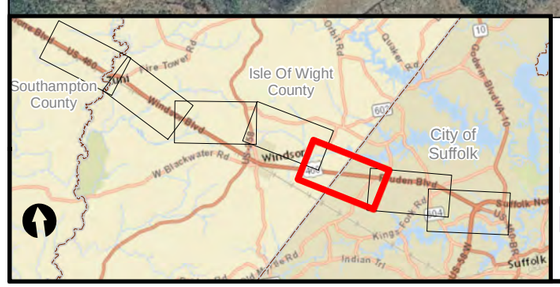

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Figure 1.1-1
RCW Habitat Assessment
Sheet 5 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

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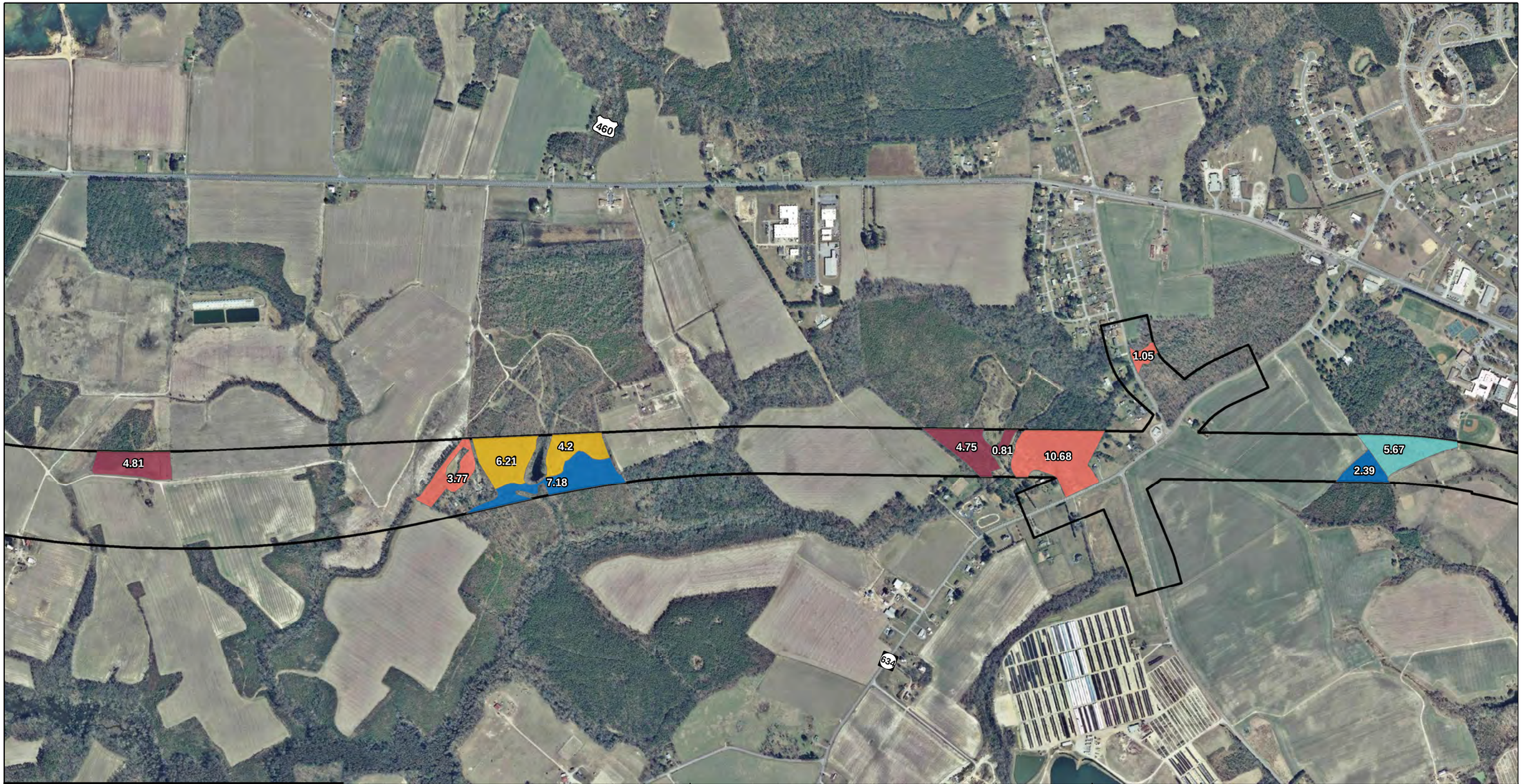

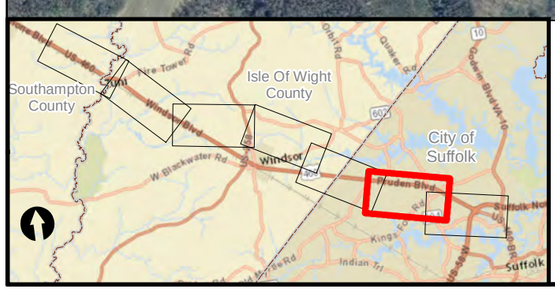

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Figure 1.1-1
RCW Habitat Assessment
Sheet 6 of 7

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Figure 1.1-1
RCW Habitat Assessment
Sheet 7 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; 2013 VGIN VBMP

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219 2000

Charles A. Kilpatrick, P.E.
Commissioner

March 29, 2016

Mr. Ernie Aschenbach
Virginia Department of Game and Inland Fisheries
Environmental Services Section
P.O. Box 90778
Henrico, Virginia 23228

RE: Request for comments regarding threatened and endangered species
U.S. Army Corps of Engineers Public Notice NAO-2008-03470
Route 460 Project Southeast Virginia

Dear Mr. Aschenbach,

The Virginia Department of Transportation (VDOT) is in the process of preparing the Final Supplemental Environmental Impact Statement (SEIS) for the Route 460 Project Southeast Virginia (the Project). In conjunction with the Final SEIS, in November 2015, VDOT submitted a joint permit application (JPA) to the U.S. Army Corps of Engineers (USACE), Virginia Department of Environmental Quality (DEQ), and the Virginia Marine Resources Commission (VMRC) for impacts to wetlands and streams that would result from construction of the Project. Section 11.0 of the JPA addressed threatened and endangered species that could potentially be impacted by the project. The purpose of this letter is 1) to request the Virginia Department of Game and Inland Fisheries' (VDGIF) review and concurrence regarding the information and conclusions presented in the JPA and 2) to provide you with a summary of species status changes and VDOT's resulting modified conclusions.

Northern long-eared bat (*Myotis septentrionalis*)

In the November 2015 JPA, VDOT proposed to conduct presence/absence surveys for northern long-eared bat during the 2016 survey season and to develop project-specific conservation measures based upon the survey results. This proposal was based on the interim 4(d) rule published April 2, 2015. Since the JPA was submitted, the final 4(d) rule has been promulgated (effective February 16, 2016) which has substantially changed USFWS' recommended conservation measures. The final 4(d) rule states:

> *Under this final 4(d) rule, incidental take within the White Nose Syndrome (WNS) zone involving tree removal is not prohibited if two conservation measures are followed. The first measure is the application of a 0.25 mile (0.4 km) buffer around known occupied northern long-eared bat hibernacula. The second conservation measure is that the activity does not cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius around the maternity roost tree, during the pup season (June 1 through July 31).*

VDGIF's recommendations regarding the northern long-eared bat are the same as the conservation measures outlined in the USFWS' final 4(d) rule. According to the DGIF Time of Year Restrictions (TOYR) Table (updated March 1, 2016):

> *We recommend compliance with the U.S. Fish and Wildlife Service ESA 4(d) rule for this species. VDGIF's standard recommendations therefore, are to prohibit tree removal within 150 feet of a documented maternity roost from 1 June through 31 July, and to prohibit tree removal within 0.25 miles of a documented hibernaculum.*

No known or documented hibernacula or maternity roosts occur within the Project Inventory Corridor or current Limits of Disturbance, depicted in **Attachment 1**; therefore, VDOT proposes to modify the conservation measures documented in the November 2015 JPA. VDOT will not conduct presence/absence surveys for northern long-eared bat and VDOT proposes to conduct no further work for this species.

Mabee's Salamander (*Ambystoma mabeei*)

During the 2015 survey season, VDOT, following consultation with VDGIF, conducted presence/absence surveys at four potential habitat sites that could have been affected by the Project. No Mabee's salamanders were found. Initial negative survey results suggest that there is a low probability that Mabee's salamanders occur within the Project Inventory Corridor. Additional avoidance and minimization measures along the Project alignment were implemented that resulted in avoidance of all four locations identified as suitable habitat for survey, detailed in Section 8.0 of the JPA and shown in **Attachment 2** As a result, it is VDOT's opinion that the Project will result in no effect to Mabee's salamander and no further work is recommended.

Barking Tree Frog (*Hyla gratiosa*)

During the 2015 survey season, VDOT, following consultation with VDGIF, conducted acoustic surveys for barking tree frogs at ten locations, shown in **Attachment 3**. No barking tree frog vocalizations were identified during the 2015 surveys. Initial negative survey results suggest that there is a low probability that barking tree frogs occur within the Project Inventory Corridor. In addition, VDOT has avoided and minimized impacts to potential barking tree frog habitat to the maximum extent practicable; therefore, it is VDOT's opinion that the Project will result in no effect to barking tree frog and no further work is recommended.

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

Effective April 1, 2016, the little brown bat (*Myotis lucifungus*) and the tri-colored bat (*Perimyotis subflavus*) will be listed as state-endangered. According to the VDGIF Guidance Document on Best Management Practices for Conservation of Little Brown Bats and Tri-colored Bats (approved February 16, 2016):

- *The VDGIF knows about 132 hibernacula (places where these animals hibernate during the winter) with little brown and or tri-colored bats present. These hibernacula typically are located in western Virginia and are typically caves;*
- *The VDGIF has not tracked and is not aware of any little brown or tri-colored bat roost trees (places where the animals live when not hibernating) in Virginia; and,*
- *Little brown and big brown bats are the two species most commonly found in human-occupied dwellings and the ones most likely to cause human conflicts. The VDGIF is currently aware of three structures that serve as roosts for little brown bats. Tri-colored bats utilize human structures as well, but are more commonly found in barns, sheds, and abandoned structures and less so in occupied dwellings. Currently, the VDGIF is not aware of any tri-colored bat roosts in Virginia.*

VDOT has no knowledge of hibernacula or roosts for little brown bat or tri-colored bat within the Project Inventory Corridor; therefore, VDOT is currently not proposing any conservation measures or presence/absence surveys for these two bat species.

Eastern big-eared bat (*Corynorhinus rafinesquii macrotis*)

In a letter dated January 19, 2016, the Virginia Department of Conservation and Recreation recommended a survey be conducted for the eastern big-eared bat (*Corynorhinus rafinesquii macrotis*). VDOT has queried VDGIF's Virginia Fish and Wildlife Information Service (VAFWIS) online database and VDGIF's Wildlife Environmental Review Map Service (WERMS) data. According to these VDGIF datasets, there are no known occurrences of eastern big-eared bat within the Project Inventory Corridor. Furthermore, the VAFWIS indicates that no confirmed or potential habitat for this bat species occurs within the Project Inventory Corridor. VDOT is, therefore, not proposing surveys or conservation measures for eastern big-eared bat.

VDOT requests your review of this letter in combination with the information submitted in the JPA and respectfully requests VDGIF's concurrence with the conclusions and recommendations proposed by VDOT. In order to adequately plan for the 2016 survey season, VDOT requests your response no later than April 15, 2016. Please do not hesitate to contact me at (804) 371-6756 or Angel.Deem@VDOT.Virginia.gov if you should have any questions or need any additional information.

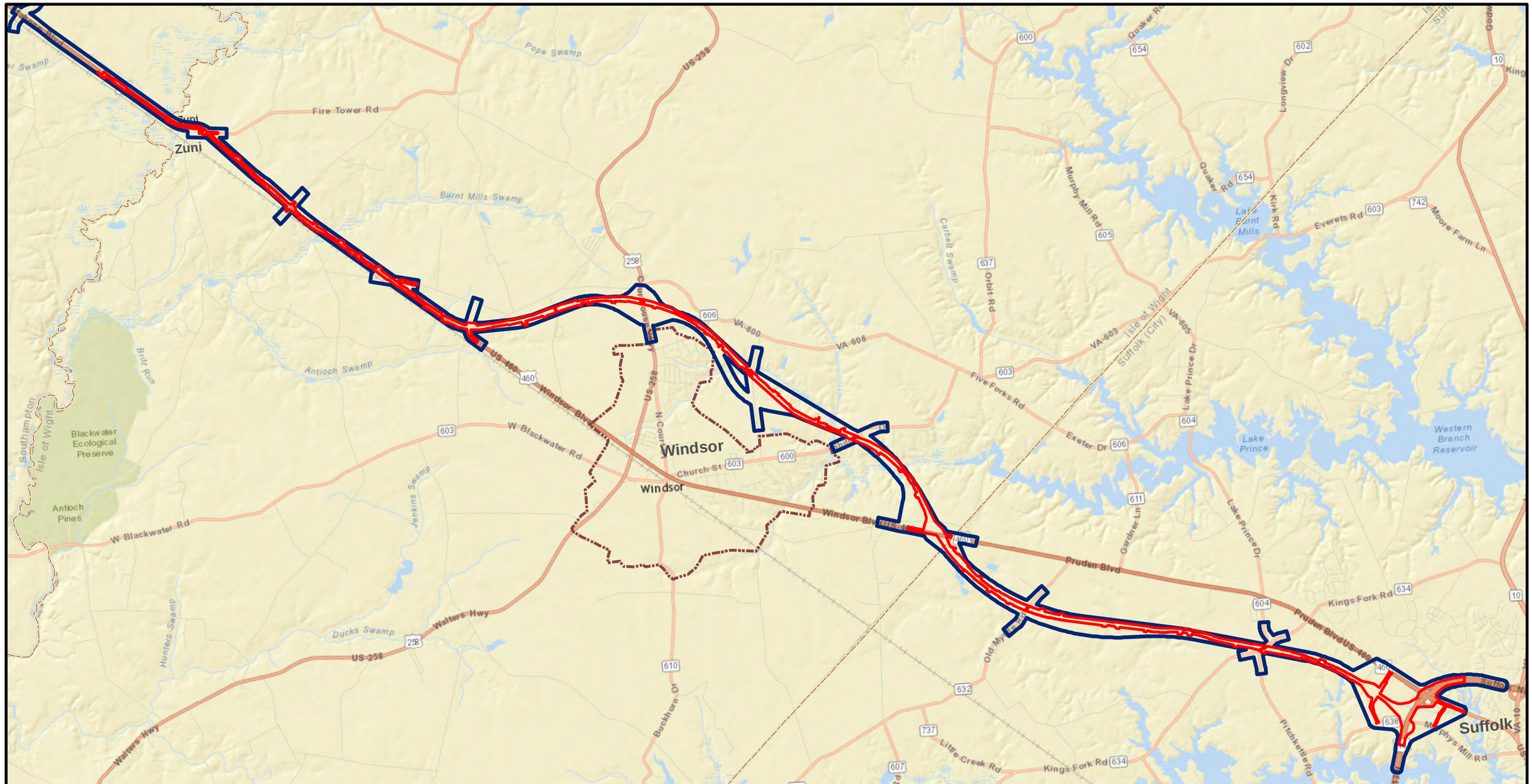
Sincerely,

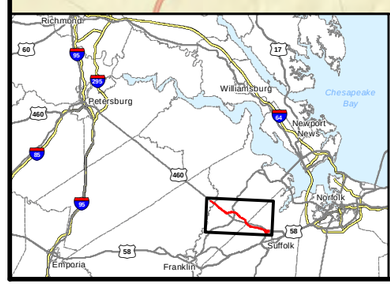
Angel Deem
Environmental Division Director

Enclosures
1. Project Map
2. Salamander Survey Locations
3. Barking Tree Frog Survey Locations

cc: Alice Allen-Grimes, U.S. Army Corps of Engineers
Nina O'Malley, Virginia Department of Environmental Quality
Mike Johnson, Virginia Marine Resources Commission
Ray Fernald, Virginia Department of Game of Inland Fisheries
Troy Andersen, U.S. Fish and Wildlife Service
Rene Hypes, Virginia Department of Conservation and Recreation

Attachment 1. Project Map





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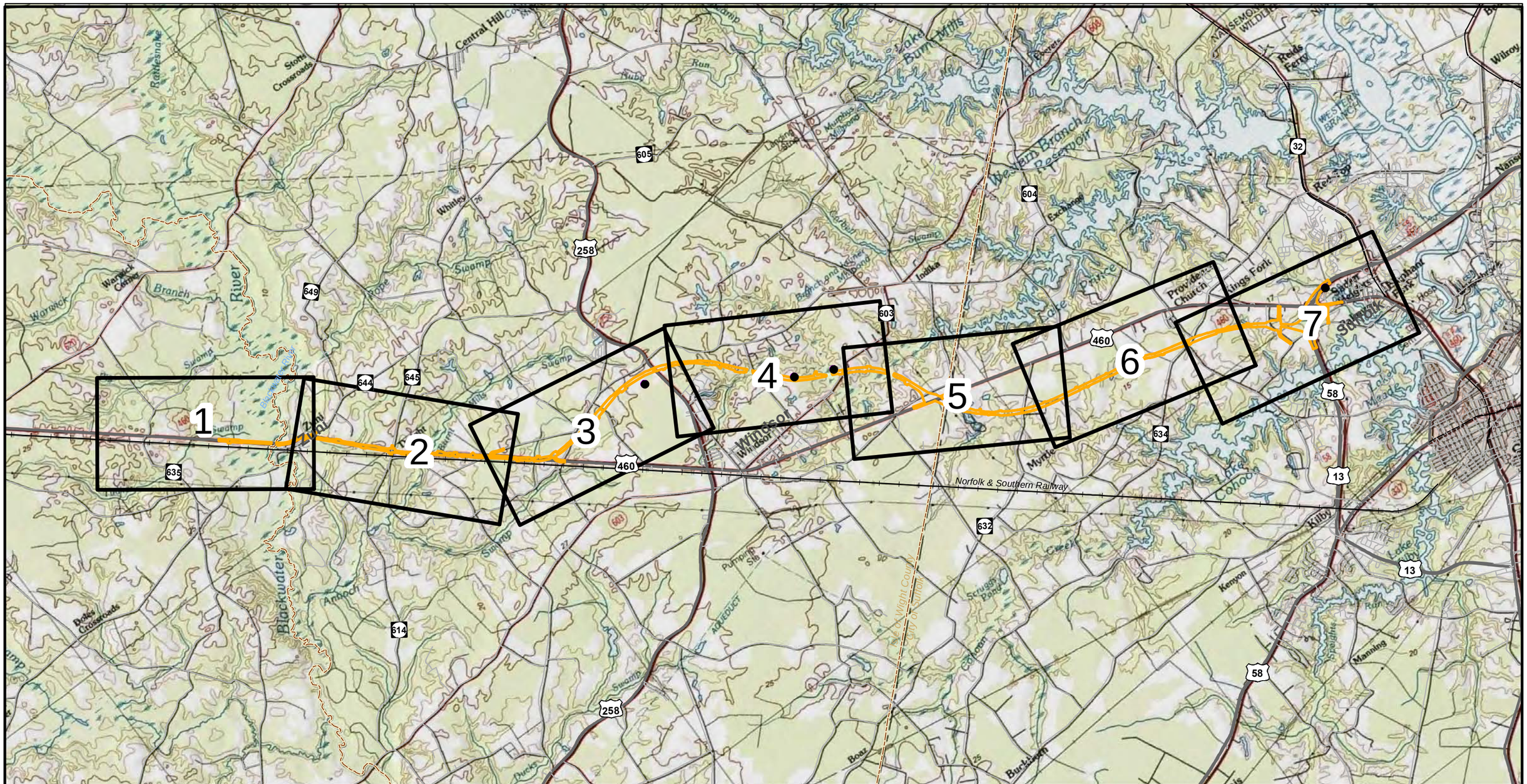
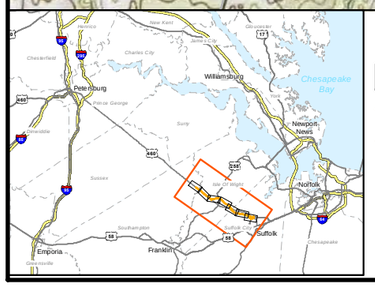
Route 460 Project Corridor

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; Esri World Street Map

Attachment 2. Salamander Survey Locations





- Salamander Survey Locations
- Index Sheet
- Preferred Alternative, Build Section
- County Boundary

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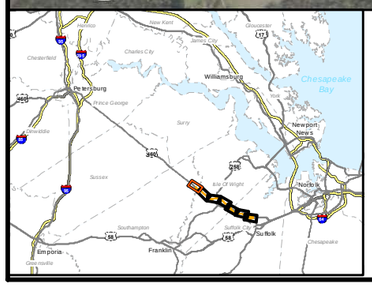
0 0.5 1 1.5 2 2.5 3 Miles

Salamander Survey Locations Index Sheet

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; Basemap: ESRI USA Topo Maps, © 2013 National Geographic Society



Salamander Survey Locations
Ponds
Preferred Alternative, Build Section
County Boundary

ROUTE 460 PROJECT SOUTHEAST VA

VDOT Virginia Department of Transportation
U.S. Route 460 Corridor Improvements Project
VDOT Project No.0460-969-007, P101, R201, C501
Southampton County, Isle of Wight County, and City of Suffolk, Virginia

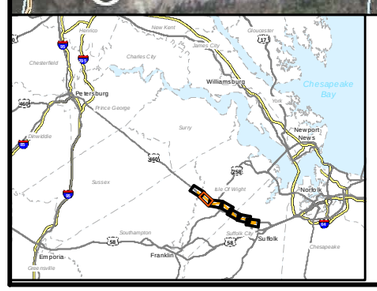
1 inch = 1,000 feet

0 0.2 0.4 0.6 Miles

Salamander Survey Locations
Sheet 1 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; Basemap: ESRI World Imagery and World Transportation, © 2014 ESRI



- Salamander Survey Locations
- Ponds
- Preferred Alternative, Build Section
- County Boundary

ROUTE 460 PROJECT SOUTHEAST VA

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1 inch = 1,000 feet

0 0.2 0.4 0.6 Miles

Salamander Survey Locations
Sheet 2 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

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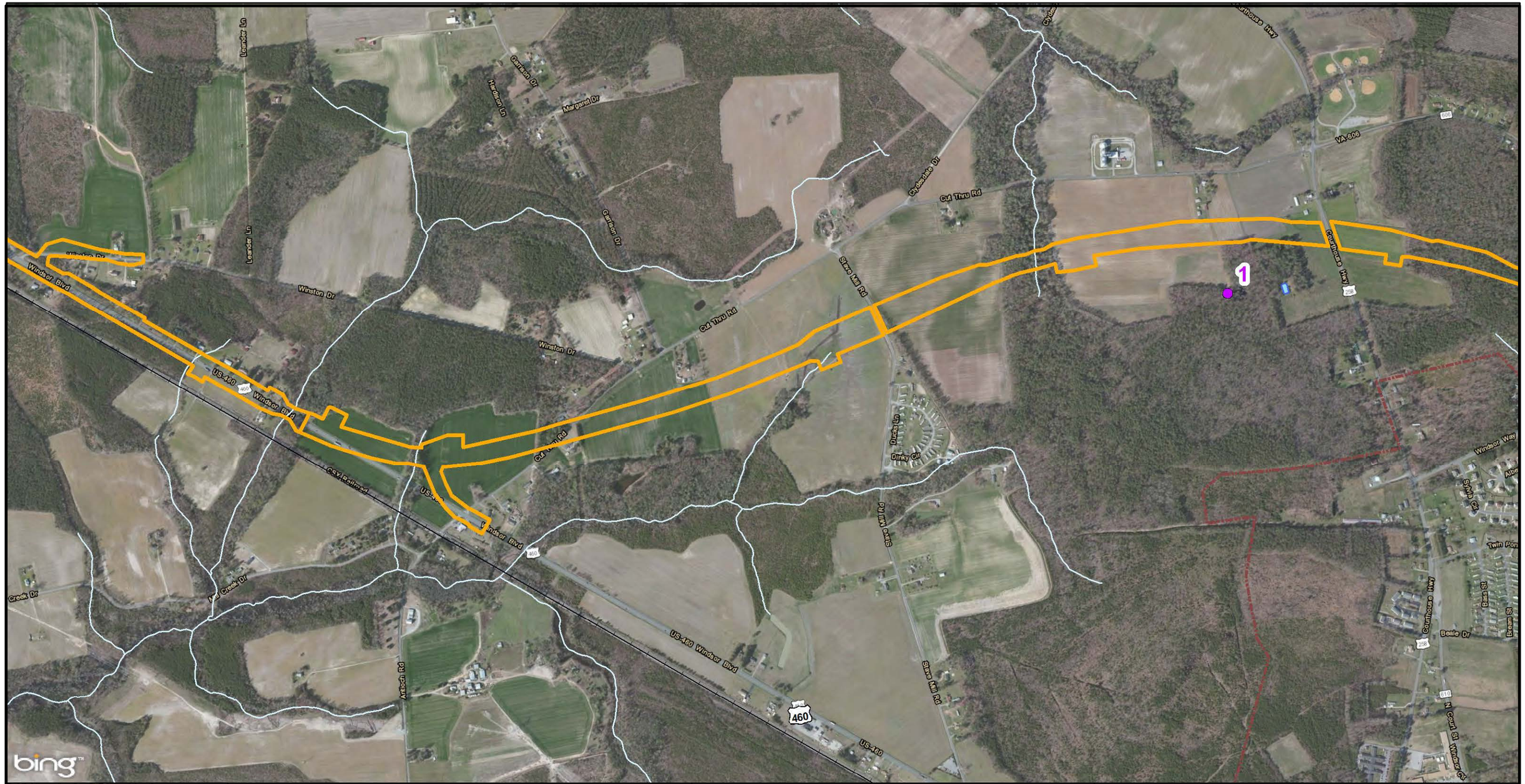

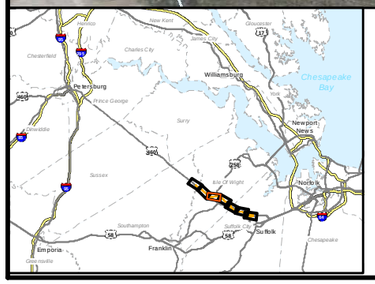

Salamander Survey Locations
Ponds
Preferred Alternative, Build Section
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ROUTE 460 PROJECT SOUTHEAST VA

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0 0.2 0.4 0.6 Miles

Salamander Survey Locations
Sheet 3 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

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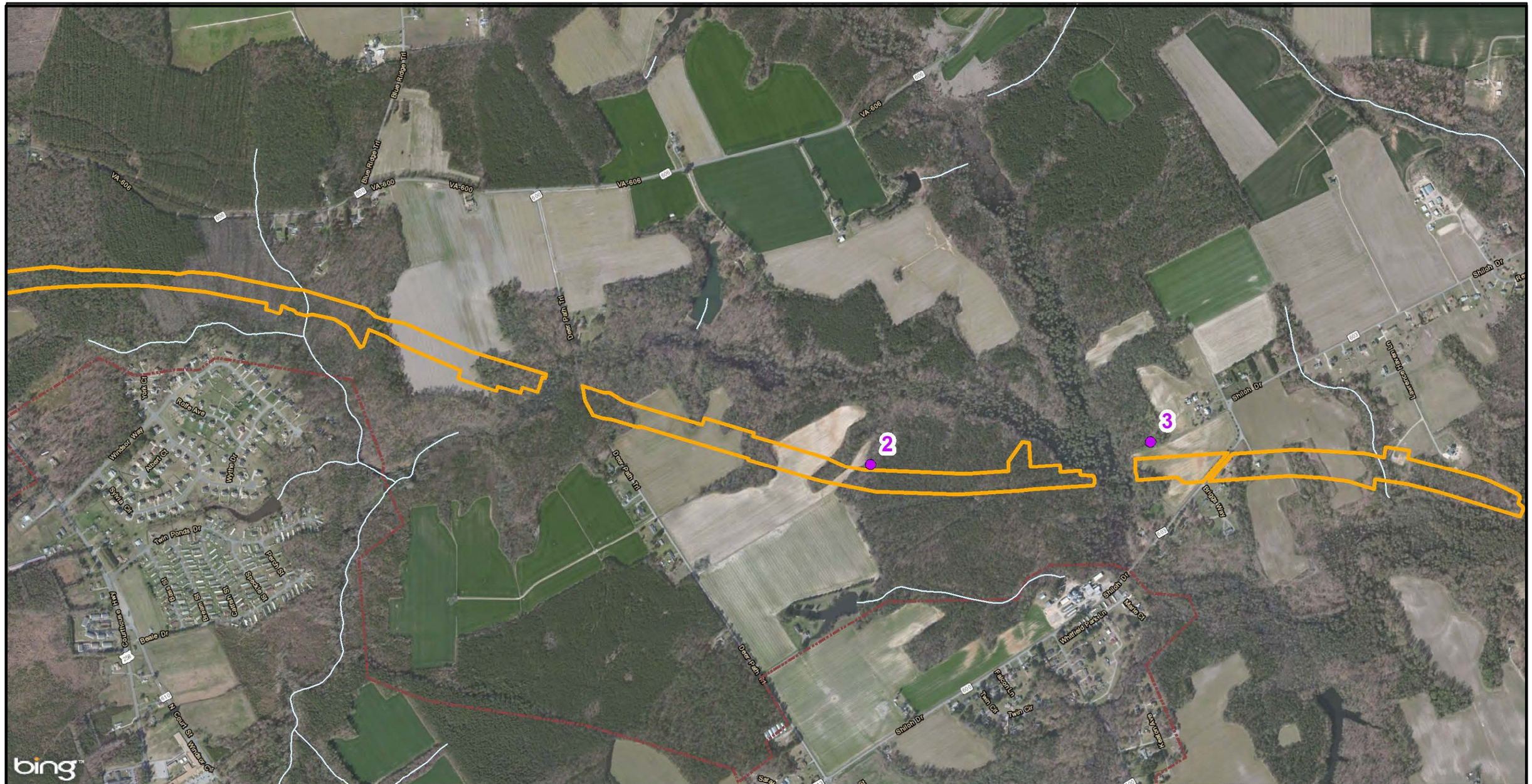

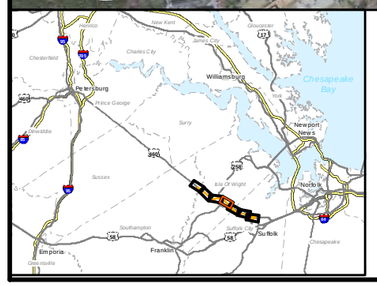

- Salamander Survey Locations
- Ponds
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ROUTE 460 PROJECT SOUTHEAST VA

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Southampton County, Isle of Wight County, and City of Suffolk, Virginia

1 inch = 1,000 feet

0 0.2 0.4 0.6 Miles

Salamander Survey Locations
Sheet 4 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

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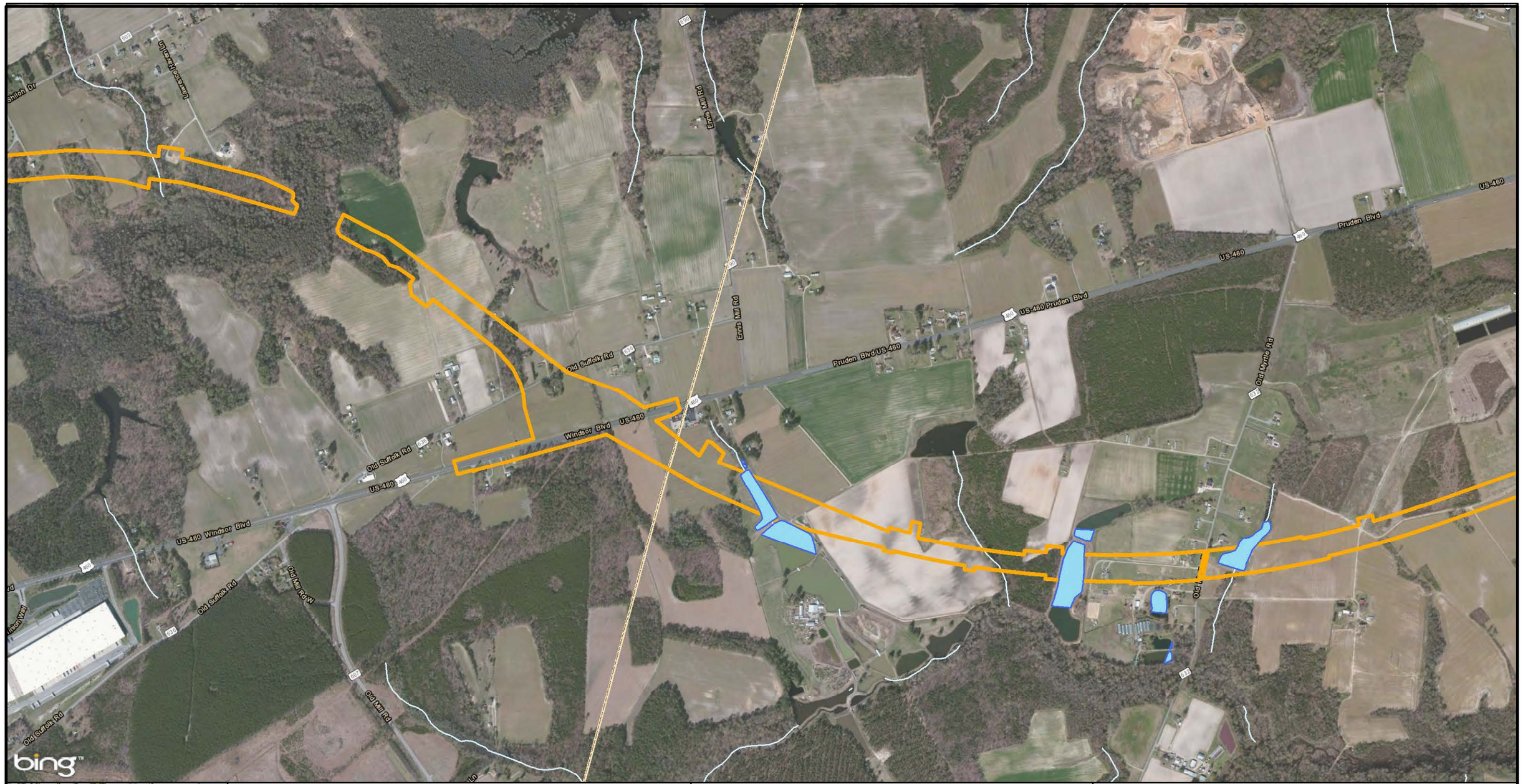

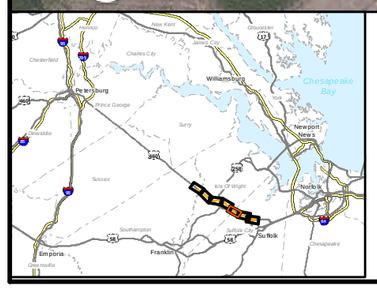

Salamander Survey Locations
Ponds
Preferred Alternative, Build Section
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ROUTE 460 PROJECT SOUTHEAST VA

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Southampton County, Isle of Wight County, and City of Suffolk, Virginia

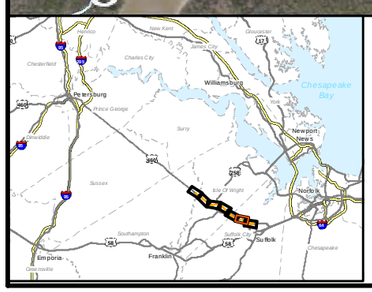
1 inch = 1,000 feet

0 0.2 0.4 0.6 Miles

Salamander Survey Locations
Sheet 5 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; Basemap: ESRI World Imagery and World Transportation, © 2014 ESRI



- Salamander Survey Locations
- Ponds
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- County Boundary

ROUTE 460 PROJECT SOUTHEAST VA

VDOT Virginia Department of Transportation
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Southampton County, Isle of Wight County, and City of Suffolk, Virginia

1 inch = 1,000 feet

0 0.2 0.4 0.6 Miles

Salamander Survey Locations
Sheet 6 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

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Salamander Survey Locations
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1 inch = 1,000 feet

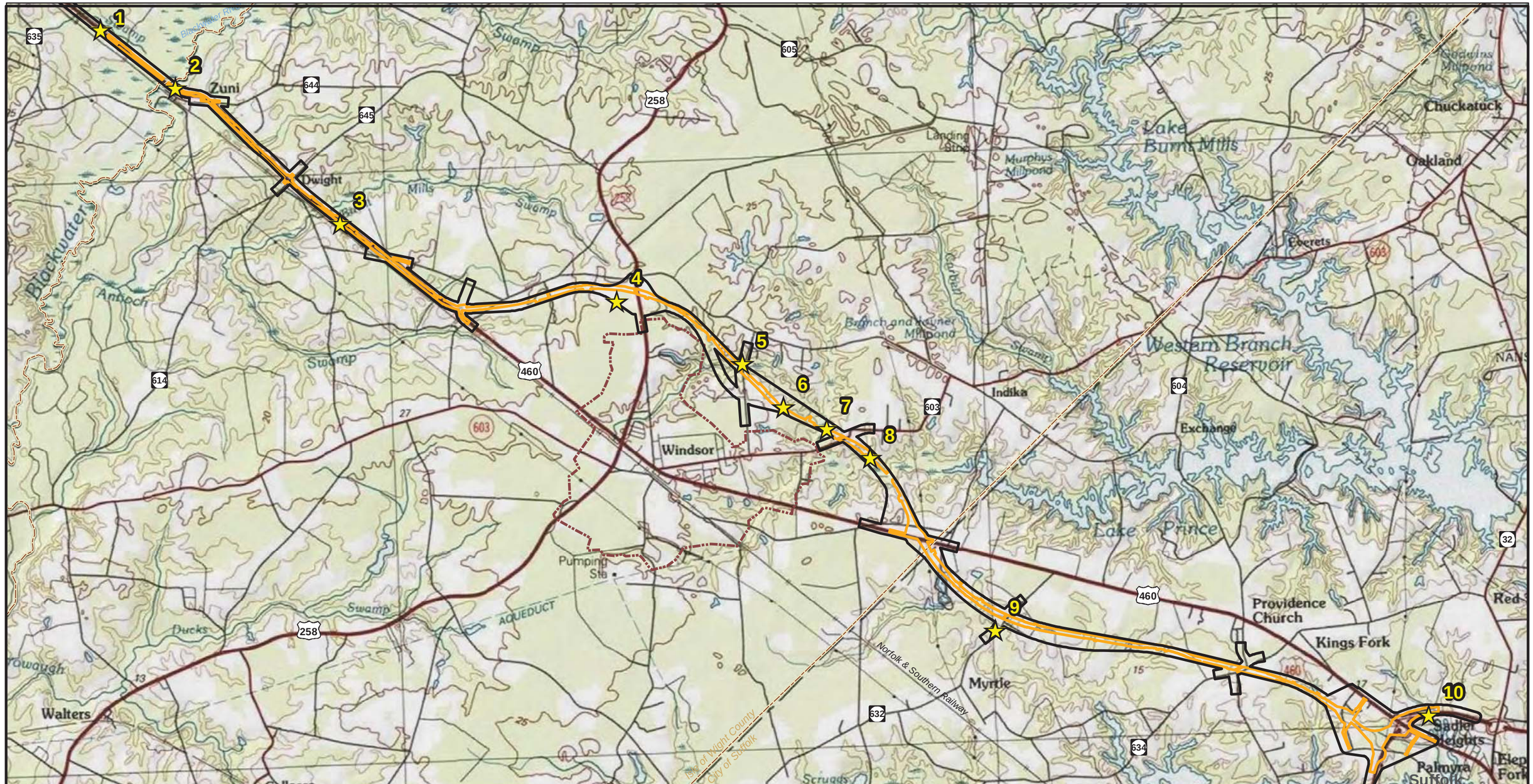
0 0.2 0.4 0.6 Miles

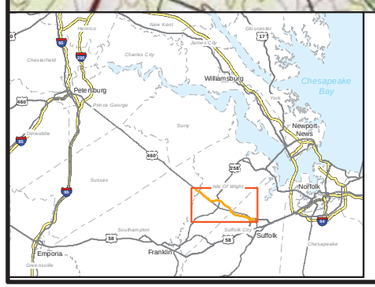
Salamander Survey Locations
Sheet 7 of 7

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT; Basemap: ESRI World Imagery and World Transportation, © 2014 ESRI

Attachment 3. Barking Tree Frog Survey Locations





Barking Tree Frog Survey Locations

Preferred Alternative Inventory Corridor

Preferred Alternative, Build Section

County Boundary

ROUTE 460 PROJECT SOUTHEAST VA

VDOT Virginia Department of Transportation

U.S. Route 460 Corridor Improvements Project

VDOT Project No.0460-969-007, P101, R201, C501

Southampton County, Isle of Wight County, and City of Suffolk, Virginia

0 0.5 1 1.5 2 2.5 3 3.5 4 Miles

Barking Tree Frog Survey Locations

Route 460 Project Southeast VA

Supplemental Environmental Impact Statement

Source: VDOT; Basemap: ESRI USA Topo Maps, © 2013 National Geographic Society

Sprenkle, Taylor

From: Parks, Caleb (VDOT) <Caleb.Parks@vdot.virginia.gov>
Sent: Tuesday, April 12, 2016 2:48 PM
To: Sprenkle, Taylor
Cc: Deem, Angel N. (VDOT)
Subject: FW: Rt 460 Project Souteast Virginia: Request for comment regarding T&E species

Hi Taylor,

Please see the information provided below from USFWS and advise what additional re-coordination is required.

Much appreciated,
Caleb

From: Hoskin, Sumalee [mailto:sumalee_hoskin@fws.gov]
Sent: Tuesday, April 12, 2016 11:41 AM
To: Parks, Caleb (VDOT)
Subject: Rt 460 Project Souteast Virginia: Request for comment regarding T&E species

Caleb,

Please follow the guidance below to re-coordinate your projects under the NLEB final 4(d) rule.

<u>You have previously consulted:</u>

- If a time-of-year restriction (TOYR) or surveys were recommended or you self-certified based on a self-imposed TOYR, you are encouraged to continue to implement the previous informal consultation.

- If you choose to rely upon the findings of the 1/5/2016 Programmatic Biological Opinion on the Final 4(d) rule for the NLEB to fulfill your project-specific section 7 responsibilities then please resubmit materials in accordance with the recently added Step 7b of our online project review process (http://www.fws.gov/northeast/virginiafield/endangered/projectreviews_step7b.html).

    - If this is a non-Federal action and you do not have any other species on your official species list, you do not need to contact the Service.

    - If this is a Federal action, submit your project per the additional guidance on our website. This will serve as the written notification per the framework described in the 1/5/2016 Programmatic Biological Opinion on the Final 4(d) rule for the NLEB.

Let me know if you have questions,
Sumalee

****

Sumalee Hoskin
US Fish & Wildlife Service
6669 Short Lane
Gloucester, VA 23061

Tel: 804-693-6694 ex. 2414
Fax: 804-693-9032
Visit us at http://www.fws.gov/northeast/virginiafield/

Sprenkle, Taylor

From: Parks, Caleb (VDOT) <Caleb.Parks@vdot.virginia.gov>
Sent: Sunday, April 24, 2016 12:20 PM
To: Sprenkle, Taylor; Nies, Nicholas
Cc: Deem, Angel N. (VDOT)
Subject: FW: ESSLog 32895; VDOT Route 460 Project Southeast Virginia - VDOT Requesting Comments Regarding T&E Species for by-pass around Windsor, VA

Importance: High

Taylor/Nick,

Please find below DGIF's support with the conclusions and recommendations proposed in our March 29th letter. Thanks very much for all your help with this effort.

Much appreciated,
Caleb

From: Aschenbach, Ernie (DGIF)
Sent: Wednesday, April 20, 2016 3:50 PM
To: Parks, Caleb (VDOT); Deem, Angel N. (VDOT); 'troy_andersen@fws.gov'; vdotprojects (DCR)
Cc: ProjectReview (DGIF); Fernald, Ray (DGIF)
Subject: ESSLog 32895; VDOT Route 460 Project Southeast Virginia - VDOT Requesting Comments Regarding T&E Species for by-pass around Windsor, VA
Importance: High

We have reviewed the letter summarizing VDOT's T&E surveys and proposed conservation measures for the above-referenced project. We appreciate the clarification VDOT provided pertaining to T&E amphibian surveys and results. We support the survey results and the proposed conservation measures.

DGIF previously reviewed the Joint Permit Application (JPA 15-1582) for this project and provided comments under separate cover (email to DEQ via December 17, 2015). Our JPA comments provided general recommendations to reduce impacts of linear utility project development on wildlife resources, to the extent practicable. We reiterate our recommendation that all instream work adhere to our standard recommendations for instream work.

We support VDOT coordination with DCR-DNH regarding documented occurrence of a state or federal threatened or endangered plant or insect species and/or other Natural Heritage coordination species. We also support VDOT's coordination with the USFWS pertaining to federally listed species.

Thanks.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
Phone: (804) 367-2733
Email: Ernie.Aschenbach@dgif.virginia.gov

We moved! Our new address is:

Physical
7870 Villa Park Dr, Suite 400
Henrico, VA 23228

Mailing
P O Box 90778
Henrico, VA 23228

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Date: April 20th, 2016

Self-Certification Letter

Project Name: Route 460 Project Southeast Virginia; VDOT UPC 100432

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Virginia Ecological Services online project review process. By printing this letter in conjunction with your project review package, you are certifying that you have completed the online project review process for the project named above in accordance with all instructions provided, using the best available information to reach your conclusions. This letter, and the enclosed project review package, completes the review of your project in accordance with the Endangered Species Act of 1973 (16 U.S.C. . 1531-1544, 87 Stat. 884), as amended (ESA), and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c, 54 Stat. 250), as amended (Eagle Act). This letter also provides information for your project review under the National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, 83 Stat. 852), as amended. A copy of this letter and the project review package must be submitted to this office for this certification to be valid. This letter and the project review package will be maintained in our records.

The species conclusions table in the enclosed project review package summarizes your ESA and Eagle Act conclusions. These conclusions resulted in:

- "no effect" determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- "may affect, not likely to adversely affect" determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- "may affect, likely to adversely affect" determination for the Northern long-eared bat (*Myotis septentrionalis*) and relying on the findings of the January 5, 2016 Programmatic Biological Opinion for the Final 4(d) Rule on the Northern long-eared bat; and/or
- "no Eagle Act permit required" determinations for eagles.

We certify that use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with the “no effect” or “not likely to adversely affect” determinations for proposed and listed species and proposed and designated critical habitat; the “may affect” determination for Northern long-eared bat; and/or the “no Eagle Act permit required” determinations for eagles. Additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages consideration of these species by avoiding adverse impacts to them. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of proposed or listed species, proposed or designated critical habitat, or bald eagles becomes available, this determination may be reconsidered. This certification letter is valid for 1 year.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Virginia is available at our website http://www.fws.gov/northeast/virginiafield/endspecies/project_reviews.html. If you have any questions, please contact Troy Andersen of this office at (804) 824-2428.

Sincerely,

Cindy Schulz
Field Supervisor
Virginia Ecological Services

Enclosures - project review package

IPaC Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 SHORT LANE
GLOUCESTER, VA 23061
PHONE: (804)693-6694 FAX: (804)693-9032
URL: www.fws.gov/northeast/virginiafield/

Consultation Code: 05E2VA00-2016-SLI-2266 April 14, 2016
Event Code: 05E2VA00-2016-E-02747
Project Name: Route 460 Project Southeast Virginia

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

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

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

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

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

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

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

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

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

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

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

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Route 460 Project Southeast Virginia

Official Species List

Provided by:

Virginia Ecological Services Field Office
6669 SHORT LANE
GLOUCESTER, VA 23061
(804) 693-6694
http://www.fws.gov/northeast/virginiafield/

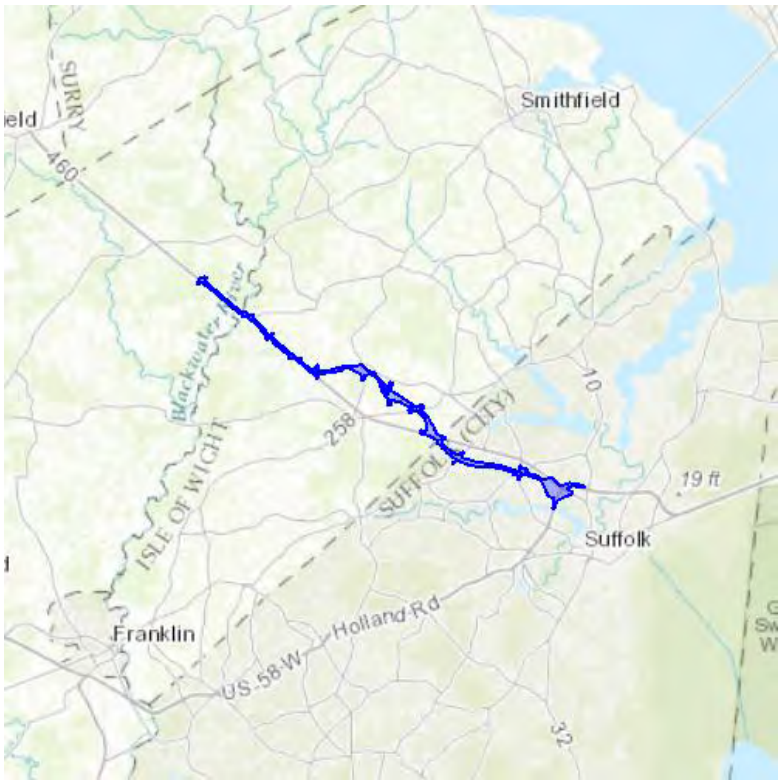
Consultation Code: 05E2VA00-2016-SLI-2266
Event Code: 05E2VA00-2016-E-02747

Project Type: TRANSPORTATION

Project Name: Route 460 Project Southeast Virginia
Project Description: Transportation Project. This is an update to 20161001 USFWS Letter. Consultation Code: 05E2VA00-2016-SLI-0011

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:



Project Coordinates: The coordinates are too numerous to display here.

Project Counties: Isle of Wight, VA | Southampton, VA | Suffolk, VA

Endangered Species Act Species List

There are a total of 2 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Birds	**Status**	**Has Critical Habitat**	**Condition(s)**
Red-Cockaded woodpecker *(Picoides borealis)* Population: Entire	Endangered		
Mammals			
Northern long-eared Bat *(Myotis septentrionalis)*	Threatened		

Critical habitats that lie within your project area

There are no critical habitats within your project area.

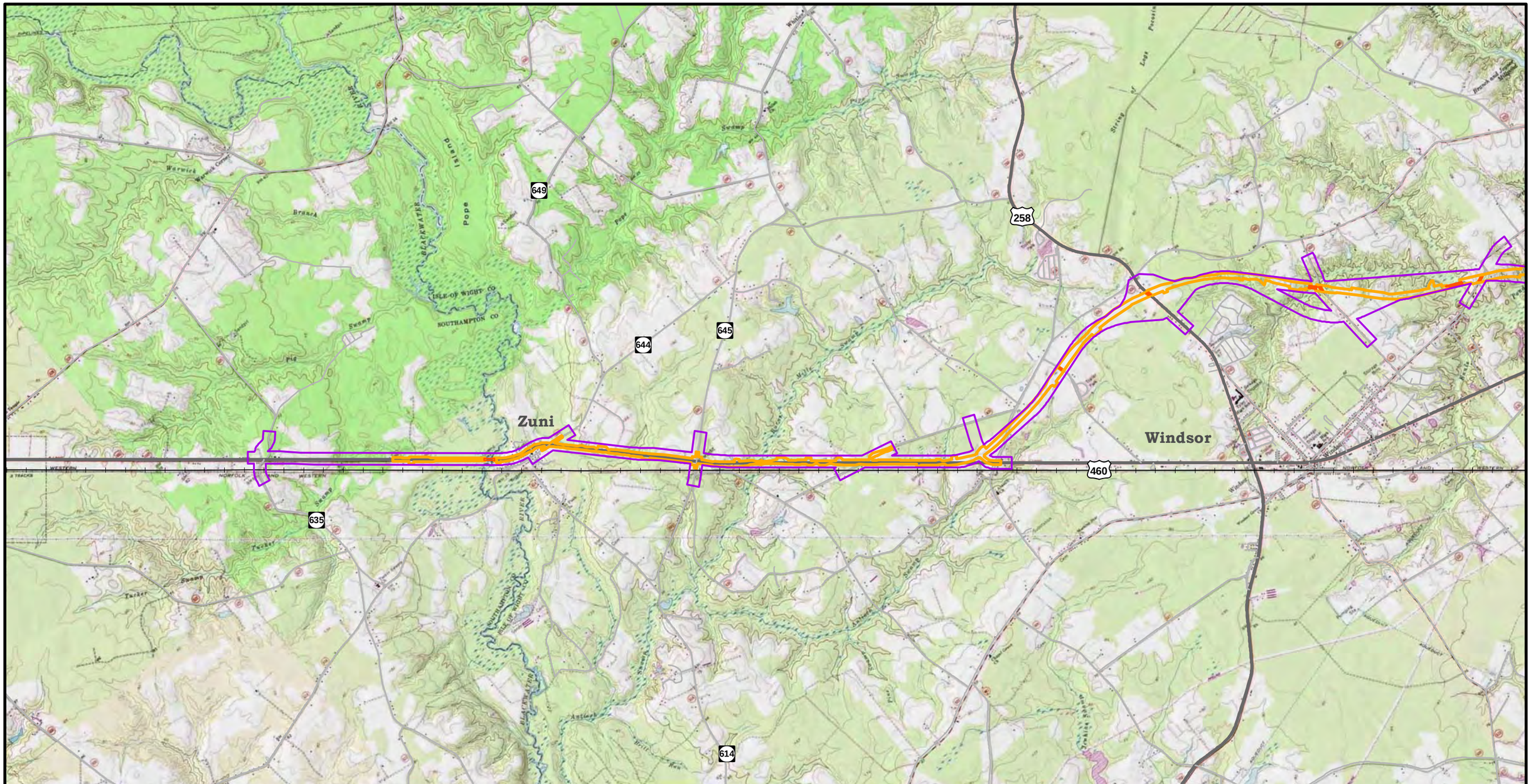
United States Department of Interior
Fish and Wildlife Service

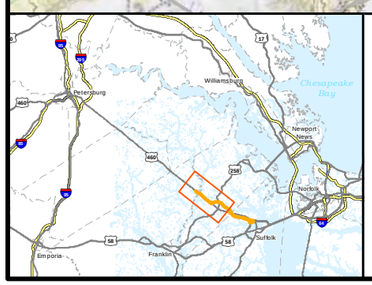
Project name: Route 460 Project Southeast Virginia

Appendix A: FWS National Wildlife Refuges and Fish Hatcheries

There are no refuges or fish hatcheries within your project area.

USGS Topographic Map





Preferred Alternative, Design Corridor
Proposed Bridge
Inventory Corridor
County Boundary

ROUTE 460 PROJECT SOUTHEAST VA

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Southampton County, Isle of Wight County, and City of Suffolk, Virginia

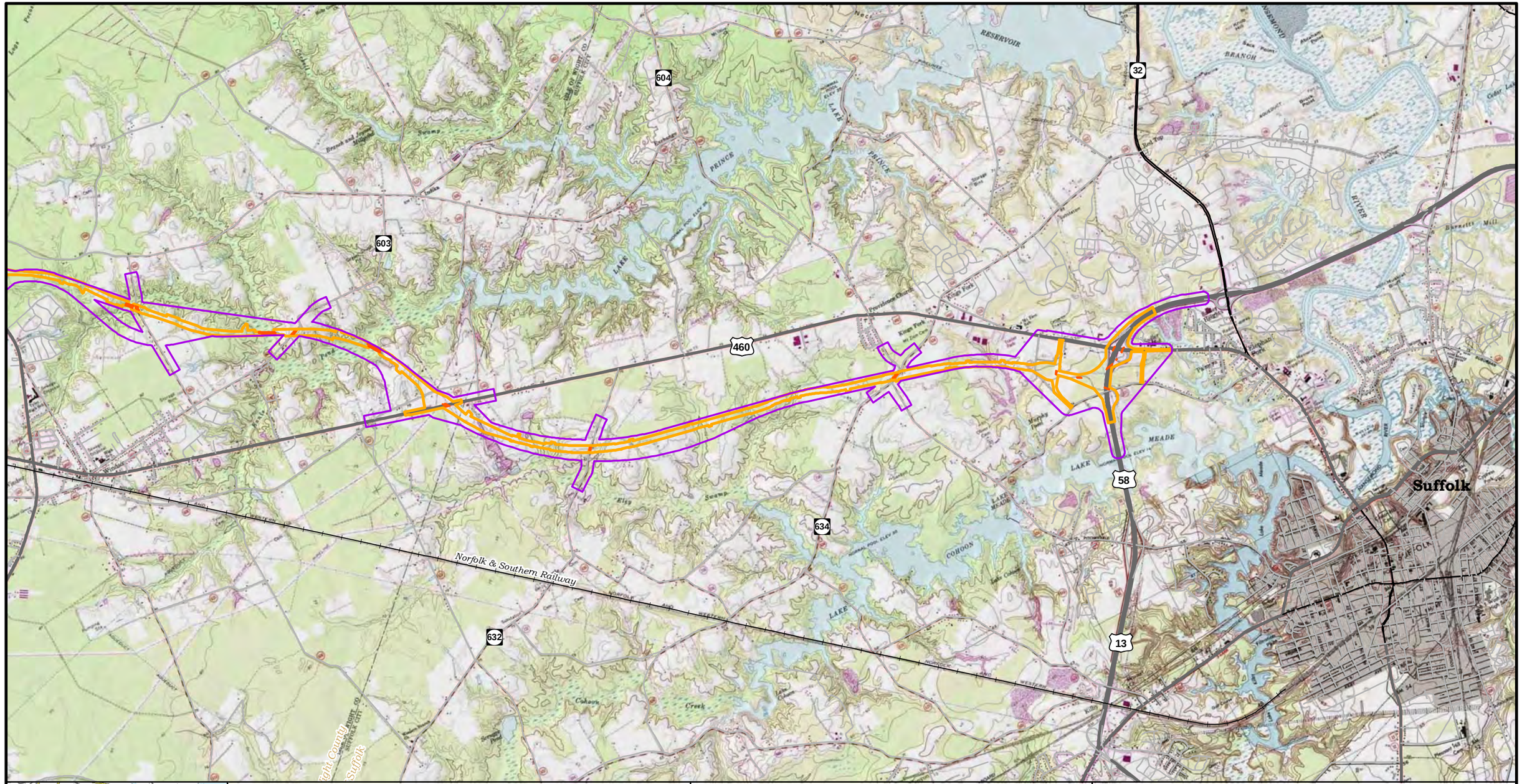
0 0.5 1 1.5 2 2.5 Miles

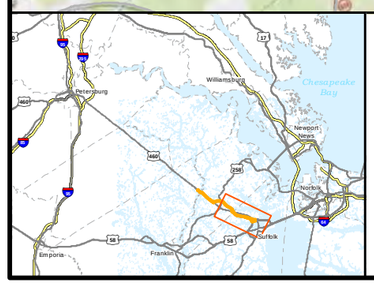
USGS Topographic Map

Sheet 1 of 2

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT, US Geological Survey





Preferred Alternative, Design Corridor
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0 0.5 1 1.5 2 2.5 Miles

USGS Topographic Map

Sheet 2 of 2

Route 460 Project Southeast VA
Supplemental Environmental Impact Statement

Source: VDOT, US Geological Survey

DGIF and DCR-DNH Database Review Results

Site Location

36,53,12.2 -76,51,23.3
is **the Search Point**

Show Position Rings
Yes No
4 miles and 1 mile at the **Search Point**

Show Search Area
Yes No
2 Search distance miles buffer

Display	**Search Point** is
at center	not at map center

Base Map Choices
Topography

Map Overlay Choices
Current List: Anadromous, TEWaters, BAEANests, BECAR, Trout, Search

Map Overlay Legend

T & E Waters
Federal
State

Trout Waters
Class I - IV
Class V - VI

Anadromous Fish Reach
Confirmed
Potential

Impediment

2 mile radius Search Area

Bald Eagle Concentration Areas and Roosts

Bald Eagle Nests

back

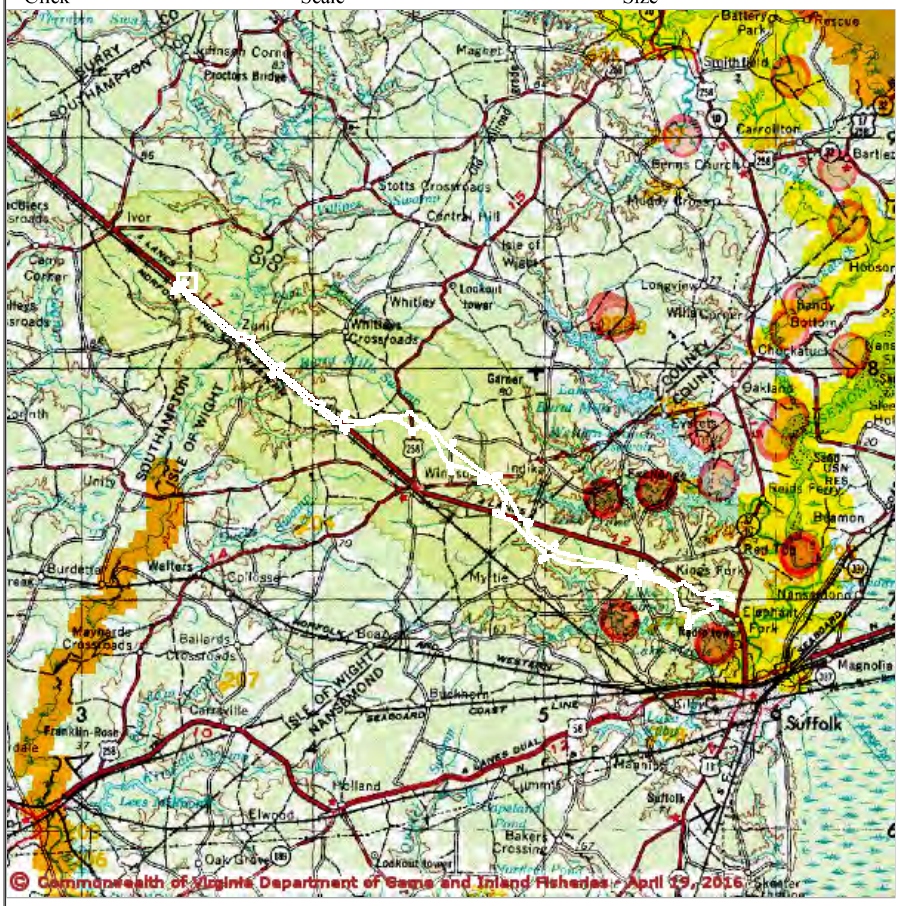
Refresh Browser Page

Map Click Pan Id M

Map Scale In Zoom Out

Screen Size Small Size Big

Help



N

5 0 5 10 15 20 Kilometers
2.5 0 2.5 5 7.5 10 Miles

Point of Search 36,53,12.2 -76,51,23.3
Map Location 36,49,17.1 -76,43,32.7

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

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

Map projection is UTM Zone 18 NAD 1983 with left 326885 and top 4095653. Pixel size is 52. . 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 2016-04-19 11:24:05 (qa/qc March 21, 2016 12:20 - tn=723010.0 dist=3218 I)
$poi=36.8867300 -76.8564799

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VaFWIS Search Report Compiled on 4/19/2016, 11:26:38 AM

Help

Known or likely to occur within a **2 mile buffer around polygon; center 36.8867300 -76.8564799**
in **093 Isle of Wight County, 175 Southampton County, 800 Suffolk City, VA**

View Map of Site Location

663 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 51) (51 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
010214	FESE	I	Logperch, Roanoke	Percina rex		BOVA
040228	FESE	I	Woodpecker, red-cockaded	Picoides borealis		BOVA,HU6
010032	FESE	II	Sturgeon, Atlantic	Acipenser oxyrinchus		BOVA
030074	FESE		Turtle, Kemp's ridley sea	Lepidochelys kempii		BOVA
030071	FTST	I	Turtle, loggerhead sea	Caretta caretta		BOVA
040120	FTST	I	Plover, piping	Charadrius melodus		BOVA
040144	FTST	IV	Knot, red	Calidris canutus rufa		BOVA,HU6
050022	FTST		Bat, northern long-eared	Myotis septentrionalis		BOVA
010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Potential	Habitat,HU6
030064	SE	I	Turtle, eastern chicken	Deirochelys reticularia reticularia		BOVA
040110	SE	I	Rail, black	Laterallus jamaicensis	Potential	BOVA,Habitat
050034	SE	I	Bat, Rafinesque's eastern big-eared	Corynorhinus rafinesquii macrotis		BOVA,HU6
020052	SE	II	Salamander, eastern tiger	Ambystoma tigrinum		BOVA

030013	SE	II	Rattlesnake, canebrake	Crotalus horridus	Potential	BOVA,Habitat,HU6
050020	SE		Bat, little brown	Myotis lucifugus lucifugus		BOVA
050027	SE		Bat, tri-colored	Perimyotis subflavus		BOVA,HU6
040096	ST	I	Falcon, peregrine	Falco peregrinus		BOVA
040293	ST	I	Shrike, loggerhead	Lanius ludovicianus		BOVA
040385	ST	I	Sparrow, Bachman's	Peucaea aestivalis		BOVA,HU6
040379	ST	I	Sparrow, Henslow's	Ammodramus henslowii	Potential	Habitat
020044	ST	II	Salamander, Mabee's	Ambystoma mabeei	Potential	BOVA,Habitat,HU6
020002	ST	II	Treefrog, barking	Hyla gratiosa		BOVA,HU6
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
070131	FS	I	Isopod, Phreatic	Caecidotea phreatica		BOVA,HU6
100176	FS	I	Skipper, Arogos	Atrytone arogos arogos		BOVA
040093	FS	II	Eagle, bald	Haliaeetus leucocephalus	Yes	BOVA,BBA,BAEANests,HU6
060029	FS	III	Lance, yellow	Elliptio lanceolata		BOVA,HU6
070105	FS	III	Crayfish, Chowanoke	Orconectes virginiensis		BOVA,HU6
100192	FS	III	Roadside-skipper, dusky	Amblyscirtes alternata		BOVA
100002	FS	III	Skipper, Duke's (or scarce swamp)	Euphyes dukesi		BOVA
010038	FS	IV	Alewife	Alosa pseudoharengus	Yes	BOVA,SppObs,HU6
100001	FS	IV	fritillary, Diana	Speyeria diana		BOVA
			Herring,			

010045	FS		blueback	Alosa aestivalis		BOVA
030067	CC	II	Terrapin, northern diamond-backed	Malaclemys terrapin terrapin	Potential	BOVA,Habitat,HU6
030063	CC	III	Turtle, spotted	Clemmys guttata	Yes	BOVA,SppObs,HU6
040129		I	Sandpiper, upland	Bartramia longicauda		BOVA
040225		I	Sapsucker, yellow-bellied	Sphyrapicus varius		BOVA
040319		I	Warbler, black-throated green	Setophaga virens	Potential	BOVA,BBA
040422		I	Warbler, Wayne's	Dendroica virens waynei	Potential	Habitat,HU6
010174		II	Bass, Roanoke	Ambloplites cavifrons		BOVA
020063		II	Toad, oak	Anaxyrus quercicus	Potential	BOVA,Habitat,HU6
040038		II	Bittern, American	Botaurus lentiginosus		BOVA
040052		II	Duck, American black	Anas rubripes		BOVA,HU6
040029		II	Heron, little blue	Egretta caerulea caerulea		BOVA
040036		II	Night-heron, yellow-crowned	Nyctanassa violacea violacea		BOVA
040105		II	Rail, king	Rallus elegans	Potential	BOVA,Habitat,HU6
040186		II	Tern, least	Sterna antillarum		BOVA
040187		II	Tern, royal	Sterna maxima maximus	Potential	BOVA,BBA
040320		II	Warbler, cerulean	Setophaga cerulea		BOVA,HU6
040304		II	Warbler, Swainson's	Limnothlypis swainsonii	Potential	BOVA,BBA,HU6
040266		II	Wren, winter	Troglodytes troglodytes		BOVA

To view **All 663 species** View 663

* FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FC=Federal Candidate; FS=Federal Species of Concern; 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

View Map of All Query Results from All Observation Tables

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams (4 records)

View Map of All Anadromous Fish Use Streams

Stream ID	Stream Name	Reach Status	Anadromous Fish Species			View Map
			Different Species	Highest TE*	Highest Tier**	
P118	Nansemond river	Potential	0			Yes
P144	Shingle creek	Potential	0			Yes
P178	Western branch	Potential	0			Yes
P24	Burnetts Mill	Potential	0			Yes

Impediments to Fish Passage (6 records)

View Map of All Fish Impediments

ID	Name	River	View Map
787	ISSAC WALTON DAM	TR-WESTERN BRANCH	Yes
779	LAKE COHOON DAM	COHOON CREEK	Yes
780	LAKE KILBY DAM	PITCH KETTLE CREEK	Yes
790	LAKE MEAD DAM	NANSEMOND RIVER	Yes
784	ROUNDTREE NORTH DAM	TR-WEST BR. NANSEMOND RIVER	Yes
783	ROUNTREE SOUTH DAM	TR-NANSEMOND RIVER	Yes

Colonial Water Bird Survey (1 records)

View Map of All Query Results Colonial Water Bird Survey

Colony_Name	N Obs	Latest Date	N Species			View Map
			Different Species	Highest TE*	Highest Tier**	
Ennis Pond	1	Apr 28 2003	1			Yes

Displayed 1 Colonial Water Bird Survey

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests (4 records)

View Map of All Query Results
Bald Eagle Nests

Nest	N Obs	Latest Date	DGIF Nest Status	View Map
SK0001	13	Apr 25 2007	HISTORIC	Yes
SK0301	14	Apr 18 2011	RECENTLY ACTIVE	Yes
SK0801	6	Apr 18 2011	UNKNOWN	Yes
SK9602	10	Apr 24 2000	HISTORIC	Yes

Displayed 4 Bald Eagle Nests

Species Observations

(188 records - displaying first 20 , 8 Observations with Threatened or Endangered species)

View Map of All Query Results
Species Observations

obsID	class	Date Observed	Observer	N Species			View Map
				Different Species	Highest TE*	Highest Tier**	
336114	SppObs	Jan 1 1977	VFC-B-VA. FISH COMMISSION	23	FS	IV	Yes
334192	SppObs	Jan 1 1972	VFC-VA. FISH COMM	21	FS	IV	Yes
334194	SppObs	Jan 1 1972	VFC-VA. FISH COMM	18	FS	IV	Yes
334010	SppObs	Jan 1 1971	VFC-B-VA. FISH COMMISSION	18	FS	IV	Yes
333894	SppObs	Jan 1 1971	VFC-VA. FISH COMM	17	FS	IV	Yes
331029	SppObs	Jan 1 1888	DSJ-JORDAN	26	FS	IV	Yes

85327	SppObs	Sep 3 2000	Shelly Miller	2	SS	III	Yes
9398	SppObs	Apr 22 1988	Mitchell D. Norman, VDGIF	1	SS	III	Yes
365589	SppObs	Jan 1 1900		1		III	Yes
623513	SppObs	Mar 29 2014	Emily; Lemmon| Hannah; Ralicki	3		IV	Yes
622108	SppObs	Mar 14 2014	Emily; Lemmon| Hannah; Ralicki	1		IV	Yes
623649	SppObs	Mar 14 2014	Emily; Lemmon| Hannah; Ralicki	2		IV	Yes
426932	SppObs	May 18 2005	VCU - INSTAR	9		IV	Yes
426933	SppObs	May 18 2005	VCU - INSTAR	11		IV	Yes
426930	SppObs	May 17 2005	VCU - INSTAR	9		IV	Yes
54707	SppObs	May 15 1996	Amanda L McKenney, VIMS	5		IV	Yes
54676	SppObs	Nov 30 1995	Amanda L McKenney, VIMS	3		IV	Yes
54665	SppObs	Sep 27 1995	Amanda L McKenney, VIMS	3		IV	Yes
54658	SppObs	Sep 25 1995	Amanda L McKenney, VIMS	3		IV	Yes
54650	SppObs	Aug 23 1995	Amanda L McKenney, VIMS	3		IV	Yes

Displayed 20 Species Observations

Selected 188 Observations View all 188 Species Observations

Habitat Predicted for Aquatic WAP Tier I & II Species (7 Reaches)

View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species

Stream Name	Tier Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
(03010202)	SE	010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Yes
Antioch Swamp (03010202)	SE	010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Yes

Britt Run (03010202)	SE	010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Yes
Burnt Mills Swamp (03010202)	SE	010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Yes
Pig Swamp (03010202)	SE	010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Yes
Pope Swamp (03010202)	SE	010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Yes
Warwick Branch (03010202)	SE	010347	SE	I	Sunfish, blackbanded	Enneacanthus chaetodon	Yes

Habitat Predicted for Terrestrial WAP Tier I & II Species (8 Species)

View Map of Combined Terrestrial Habitat Predicted for 8 WAP Tier I & II Species Listed Below

ordered by Status Concern for Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name	View Map
040110	SE	I	Rail, black	Laterallus jamaicensis	Yes
030013	SE	II	Rattlesnake, canebrake	Crotalus horridus	Yes
040379	ST	I	Sparrow, Henslow's	Ammodramus henslowii	Yes
020044	ST	II	Salamander, Mabee's	Ambystoma mabeei	Yes
030067	CC	II	Terrapin, northern diamond-backed	Malaclemys terrapin terrapin	Yes
040422		I	Warbler, Wayne's	Dendroica virens waynei	Yes
020063		II	Toad, oak	Anaxyrus quercicus	Yes
040105		II	Rail, king	Rallus elegans	Yes

Virginia Breeding Bird Atlas Blocks (9 records)

View Map of All Query Results
Virginia Breeding Bird Atlas Blocks

BBA ID	Atlas Quadrangle Block Name	Breeding Bird Atlas Species			View Map
		Different Species	Highest TE*	Highest Tier**	
58033	Chuckatuck, CW	1	FS	II	Yes
58036	Chuckatuck, SE	63		IV	Yes
55046	Ivor, SE	65		IV	Yes
56046	Raynor, SE	67		IV	Yes
58022	Suffolk, NE	76	FS	I	Yes

58021	Suffolk, NW	16		IV	Yes
57036	Windsor, SE	40		IV	Yes
56033	Zuni, CW	64		IV	Yes
56036	Zuni, SE	58		IV	Yes

Public Holdings: (1 names)

Name	Agency	Level
Antioch Pines State Natural Area Preserve	VA Dept. of Conservation and Recreation	State

Summary of BOVA Species Associated with Cities and Counties of the Commonwealth of Virginia:

FIPS Code	City and County Name	Different Species	Highest TE	Highest Tier
093	Isle of Wight	421	FESE	I
175	Southampton	402	FESE	I
800	Suffolk City	532	FESE	I

USGS 7.5' Quadrangles:
Sedley
Ivor
Zuni
Raynor
Buckhorn
Windsor
Suffolk
Chuckatuck

USGS NRCS Watersheds in Virginia:

N/A

USGS National 6th Order Watersheds Summary of Wildlife Action Plan Tier I, II, III, and IV Species:

HU6 Code	USGS 6th Order Hydrologic Unit	Different Species	Highest TE	Highest Tier
CU62	Blackwater River-Antioch Swamp	92	FTSE	I
CU63	Seacock Swamp-Reddy Hole Branch	82	FESE	I
CU65	Seacock Swamp-Round Hill Swamp	83	FTSE	I
CU66	Blackwater River-Corrowaugh Swamp	91	FTSE	I
JL44	Lake Kelby-Speights Run	71	FTSE	I
JL45	Cohoon Creek	81	FTSE	I

JL46	Lake Prince	78	FTSE	I
JL47	Western Branch Reservoir	81	FTSE	I
JL48	Nansemond River-Cedar Lake	83	FTSE	I

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Natural Heritage Resources

Your Criteria

Taxonomic Group: Select All

Global Conservation Status Rank: Select All

State Conservation Status Rank: Select All

Federal Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened

State Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened

Watershed (8 digit HUC): 02080208 - Hampton Roads,03010202 - Blackwater River

Subwatershed (12 digit HUC): JL45 - Cohoon Creek-Lake Cohoon-Lake Meade,JL46 - Lake Prince-Carbell Swamp-Ennis Pond,CU62 - Blackwater River-Antioch Swamp,CU63 - Seacock Swamp-Reddy Hole Branch

Virginia Coastal Zone: Select All

Search Run: 4/15/2016 9:32:53 AM

Result Summary

Total Species returned: 2

Total Communities returned: 0

Click scientific names below to go to NatureServe report.

Click column headings for an explanation of species and community ranks.

Common Name/Natural Community	Scientific Name	Global Conservation Status Rank	State Conservation Status Rank	Federal Legal Status	State Legal Status	Statewide Occurrences	Virginia Coastal Zone
Blackwater							
Blackwater River-Antioch Swamp							
AMPHIBIANS							
Mabee's Salamander	Ambystoma mabeei	G4	S1S2	None	LT	17	N
Seacock Swamp-Reddy Hole Branch							
BIRDS							
Red-cockaded Woodpecker	Picoides borealis	G3	S1	LE	LE	7	N

Note: On-line queries provide basic information from DCR's databases at the time of the request. They are NOT to be substituted for a project review or for on-site surveys required for environmental assessments of specific project areas.

For Additional Information on locations of Natural Heritage Resources please submit an information request.

To Contribute information on locations of natural heritage resources, please fill out and submit a rare species sighting form.

Critical Habitat Map

Rt. 460 Critical Habitat Map

April 19, 2016

1:2,311,162

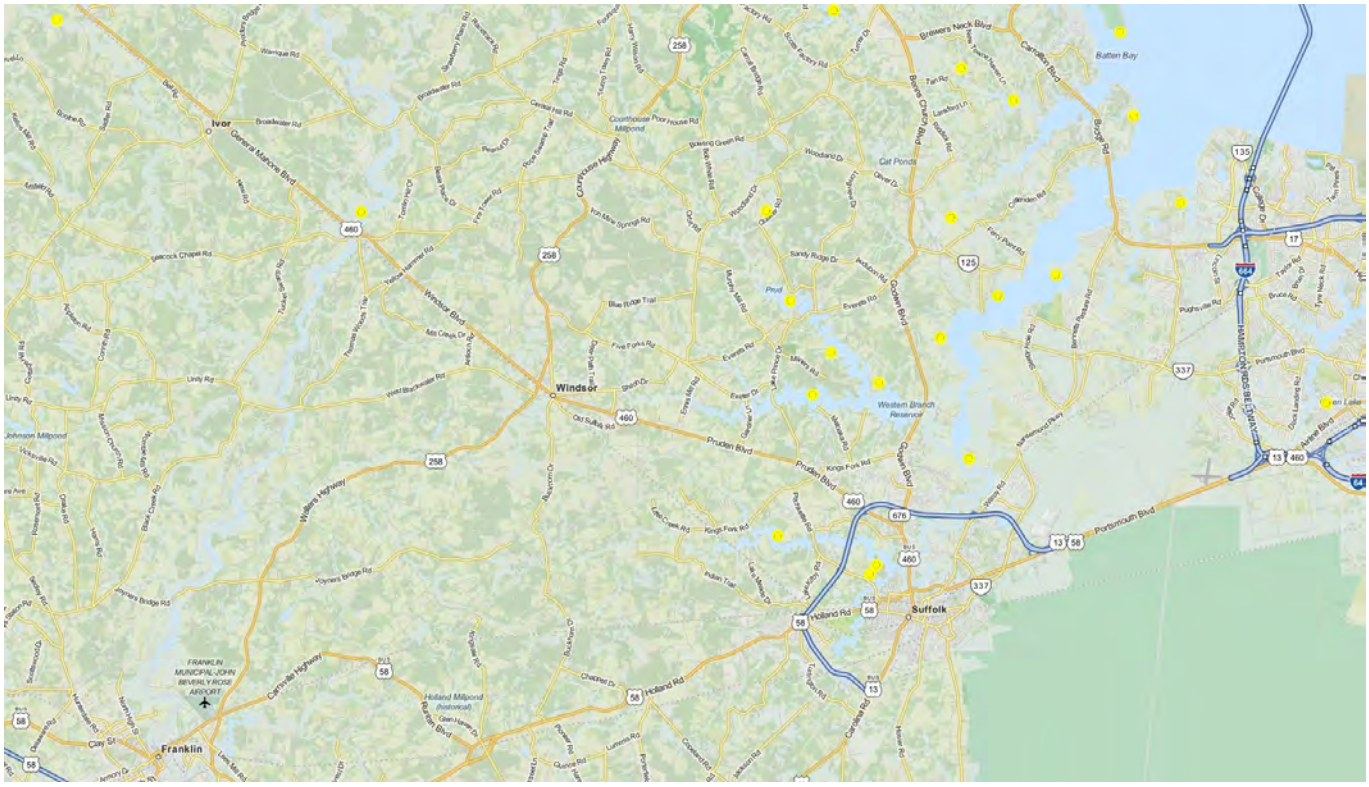
0 20 40 80 mi

0 30 60 120 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey,

Bald Eagle Mapping

CCB Mapping Portal



Layers: VA Eagle Nest Locator, VA Eagle Nest Buffers

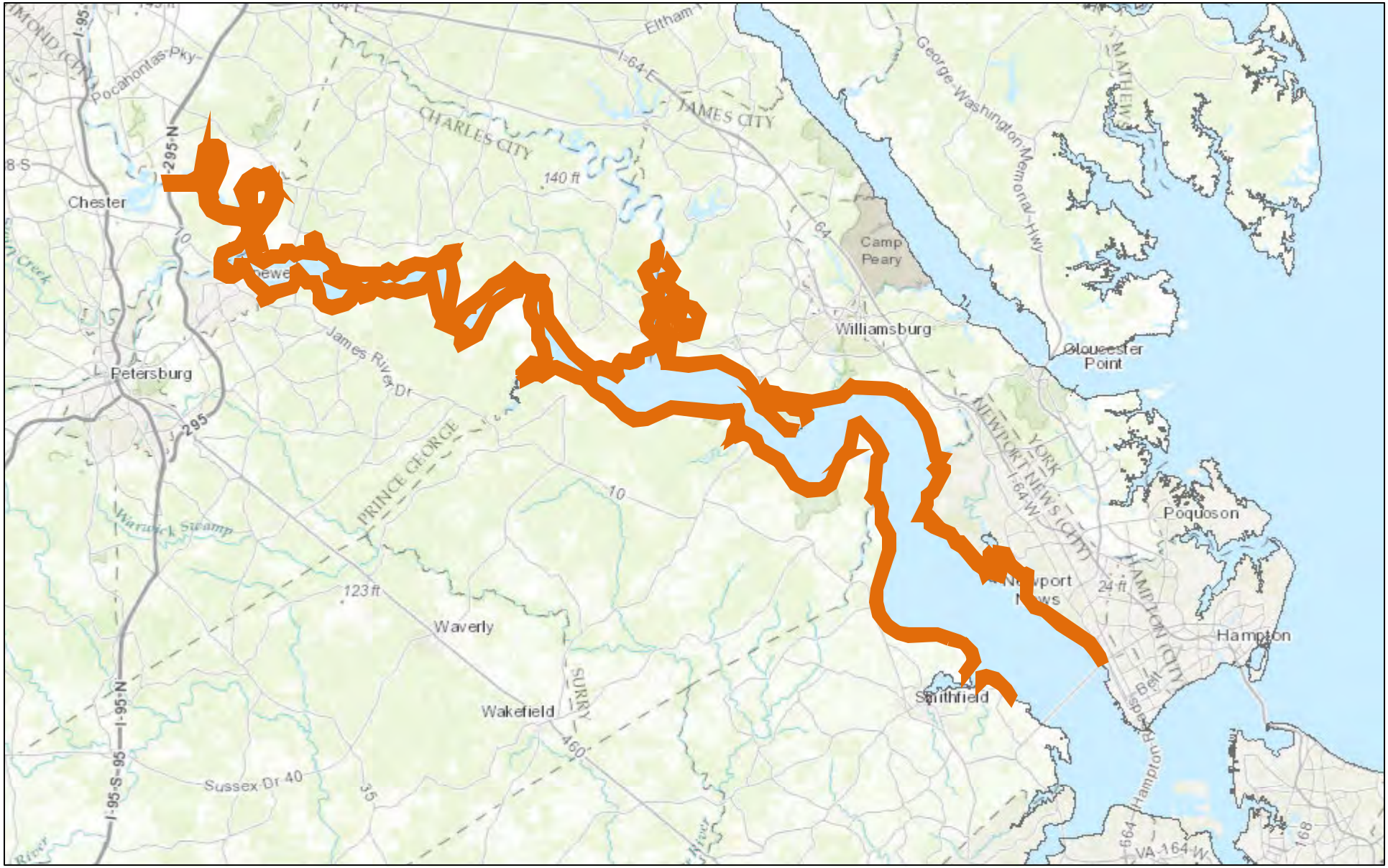
Map Center [longitude, latitude]: [-76.70276641845703, 36.8150568798048]

Map Link:
http://www.ccbbirds.org/maps/#layer=VA+Eagle+Nest+Locator&layer=VA+Eagle+Nest+Buffers&zoom=12&lat=36.8150568798048&lng=-76.70276641845703&legend=legend_tab_7c321b7e-e523-11e4--aa0-0e0c41326911&base=Street+Map+%28MapQuest%29

Report Generated On: 04/20/2016

The Center for Conservation Biology (CCB) provides certain data online as a free service to the public and the regulatory sector. CCB encourages the use of its data sets in wildlife conservation and management applications. These data are protected by intellectual property laws. All users are reminded to view the Data Use Agreement to ensure compliance with our data use policies. For additional data access questions, view our Data Distribution Policy, or contact our Data Manager, Marie Pitts, at mlpitts@wm.edu or 757-221-7503.

VA Bald Eagle Concentration Map



April 19, 2016

1:577,791

0 5 10 20 mi

0 5 10 20 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey,

Species Conclusion Table

Species Conclusions Table

Project Name: Rt. 460

Date: 04/19/2016

Species / Resource Name	Conclusion	ESA Section 7 / Eagle Act Determination	Notes / Documentation
Northern Long-eared Bat (*Myotis septentrionalis*)	Suitable Habitat Present, approximately 274 acres proposed for tree clearing.	May affect	Relying upon the findings of the 1/5/2016 Programmatic Biological Opinion for Final 4(d) Rule on the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions to fulfill our project-specific section 7 responsibilities.
Red-Cockaded woodpecker (*Picoides borealis*)	No suitable habitat present	No effect	Habitat assessment submitted on 03/22/2016 indicated no potential habitat present. –
Critical Habitat	No critical habitat present	No effect	
Bald eagle (*Haliaeetus leucocephalus*)	Unlikely to disturb nesting bald eagles. Does not intersect with an eagle concentration area.	No Eagle Act permit required	No nests within 660' and not within a concentration area.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219 2000

Charles A. Kilpatrick, P.E.
Commissioner

April 24, 2016

Mr. Troy Andersen
U.S. Fish and Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

RE: Online Project Review Self Certification Letter
U.S. Army Corps of Engineers Public Notice NAO-2008-03470
Route 460 Project Southeast Virginia

Dear Mr. Andersen,

In a letter dated March 29, 2016, VDOT requested USFWS's concurrence with VDOT's revised proposed conservation measures pursuant to the final 4(d) rule for the northern long-eared bat. In an email dated April 12th, 2016, USFWS recommended that VDOT re-coordinate the proposed Route 460 Project under the NLEB final 4(d) rule. VDOT has re-coordinated the Project through USFWS' Information for Planning and Conservation (IPaC) online review service. Attached for your review is the Online Project Review Self Certification Letter dated April 20, 2016.

VDOT requests USFWS' review and concurrence with the conclusions outlined in the review package. Please don't hesitate to contact me at (804) 371-6756 or Angel.Deem@VDOT.Virginia.gov if you have any questions or need any additional information.

Sincerely,

Angel Deem

Angel Deem
Environmental Division Director

Enclosure

1. Online Project Review Self Certification Letter dated April 20, 2016

cc: Mr. Edward Sundra, Federal Highway Administration
Ms. Alice Allen-Grimes, U.S. Army Corps of Engineers
Ms. Nina O'Malley, Virginia Department of Environmental Quality
Mr. Mike Johnson, Virginia Marine Resources Commission
Mr. Ray Fernald, Virginia Department of Game of Inland Fisheries
Mr. Ernie Aschenbach, Virginia Department of Game and Inland Fisheries
Ms. Rene Hypes, Virginia Department of Conservation and Recreation

US ROUTE 460 FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT