CHESAPEAKE
BAY CROSSING STUDY
TIER 1 NEPA

NATURAL RESOURCES TECHNICAL REPORT

MDTA
Maryland
Transportation
Authority

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ABBREVIATIONS AND ACRONYMS

CAC – Chesapeake Bay Critical Area Commission
CARA – Corridor Alternatives Retained for Analysis
CBCS – Chesapeake Bay Crossing Study
CFR – Code of Federal Regulations
COMAR – Code of Maryland Regulations
CWA – Clean Water Act
EFH – Essential Fish Habitat
EIS – Environmental Impact Statement
EO – Executive Order
ESA – Endangered Species Act
FCA – Forest Conservation Act
FEMA – Federal Emergency Management Administration
FHWA – Federal Highway Administration
FIDS – Forest Interior Dwelling Bird Species
FMP – Fisheries Management Plan
FPPA – Farmland Protection Policy Act
FTA – Federal Transit Administration
HAPC – Habitats of Particular Concern
IDA – Intensely Developed Areas
IPAC – Information, Planning, and Consultation System
GIS – Geographic Information Systems
JPA – MDE/USACE Joint Permit Application
LDA – Limited Development Areas
MBSS – Maryland Biological Stream Survey
MDE – Maryland Dept. of the Environment
MDNR – Maryland Dept. of Natural Resources
MDTA – Maryland Transportation Authority
MLEIN – Maritime Law Enforcement Information Network
MMC – Marine Mammal Commission
MMPA – Marine Mammal Protection Act
MNHP – Maryland Natural Heritage Program
MSA – Magnuson-Stevens Act
MWRR - Maryland Watershed Resources Registry
NEPA – National Environmental Policy Act
NFIP – National Flood Insurance Program
NOAA – National Oceanic and Atmospheric Administration
NOB – Natural Oyster Bar
NWI – National Wetland Inventory
NPDES – National Pollutant Discharge Elimination System
OMP – Oyster Management Plan
RCA – Resource Conservation Areas
RTE – Rare. Threatened, Endangered
SAV – Submerged Aquatic Vegetation
SSA – Sole Source Aquifer
SSPRA – Sensitive Species Project Review Areas
TEA – Targeted Ecological Areas
TMDL – Total Maximum Daily Load
USACE – U.S. Army Corps of Engineers
USDOT – U.S. Dept. of Transportation

USEPA – U.S. Environmental Protection Agency
USFWS – U.S. Fish and Wildlife Service
WHPA – Wellhead Protection Area
WOUS – Waters of the U.S.
WSSC – Wetlands of Special State Concern

1.0 INTRODUCTION

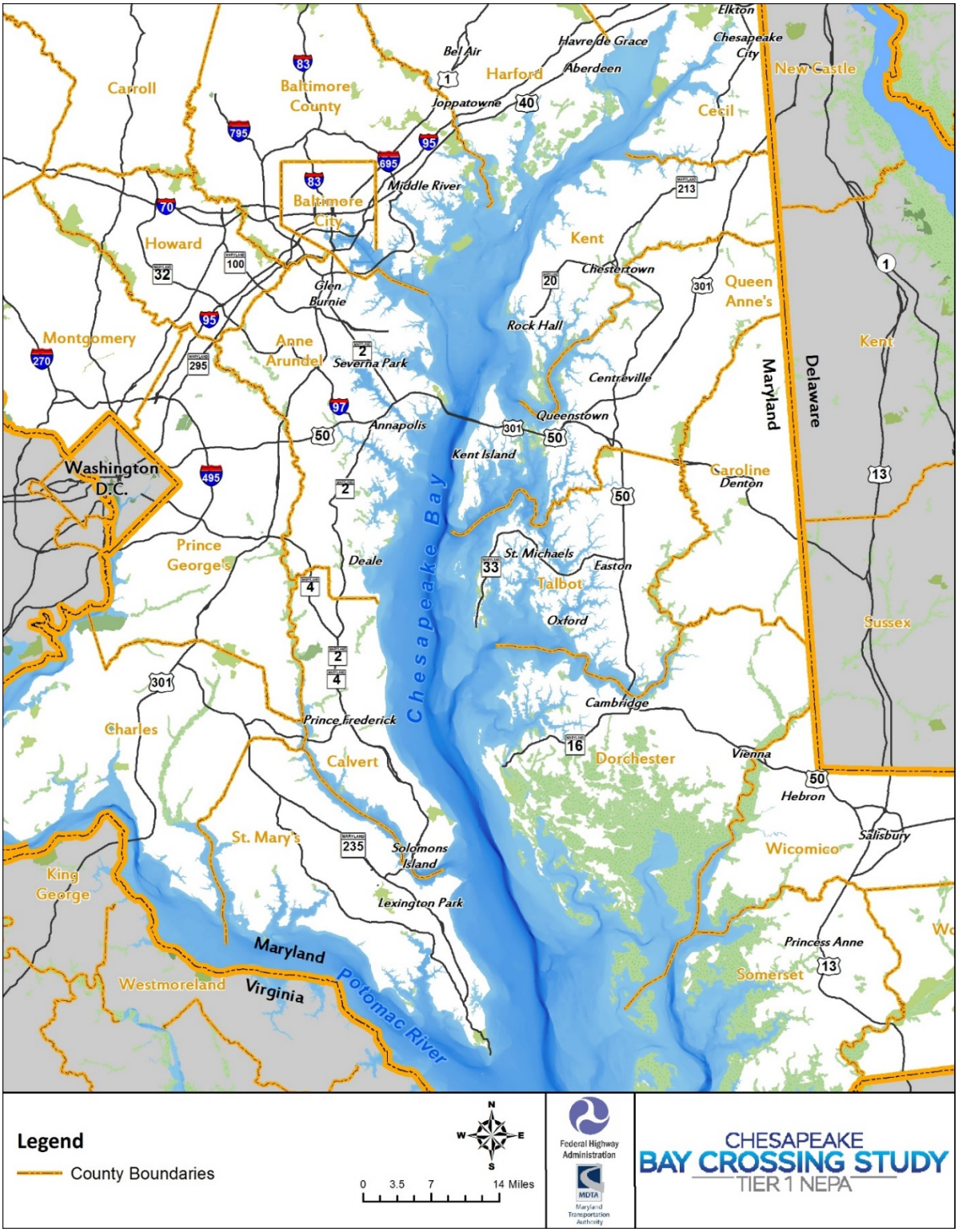
1.1 Project Description

The Maryland Transportation Authority (MDTA), in coordination with the Federal Highway Administration (FHWA) is preparing a Tier 1 Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) for the Chesapeake Bay Crossing Study: Tier 1 NEPA (Bay Crossing Study). The purpose of the Bay Crossing Study is to consider corridors for providing additional traffic capacity and access across the Chesapeake Bay in order to improve mobility, travel reliability and safety at the existing Governor William Preston Lane Jr. Memorial (Bay) Bridge. Evaluation of any potential new crossing corridor will include an assessment of existing and potentially expanded transportation infrastructure needed to support additional capacity, improve travel times, and accommodate maintenance activities, while considering financial viability and environmental responsibility. The Tier 1 study initiates the NEPA process with the goal of narrowing the scale and scope of this complex project prior to more detailed analysis in a future Tier 2 NEPA analysis. The Tier 1 study area includes the entire length of the Chesapeake Bay in Maryland, extending nearly 100 miles from the northern part of the Chesapeake Bay near Havre de Grace, Maryland south to near Point Lookout, Maryland (**Figure 1-1**).

The purpose of this technical study report is to provide a broad view of key sensitive natural resources within the limits of the Chesapeake Bay Crossing Study (CBCS) study area and further define the occurrence of key natural resources within the three Corridor Alternatives Retained for Analysis (CARA) via an examination, using existing Geographic Information Systems (GIS) resources, of where those natural resources are most prevalent. **Section 4.0** provides background information and regulatory context and **Section 5.0** provides a comparative analysis of existing conditions and an analysis of the affected environment associated with each of the three CARA. Sensitive resources determined to be relevant for this level of analysis include the following:

- Wetlands, Surface Waters, Water Quality, and Drinking Water Supply Sources
- Federal Emergency Management Administration 100-Year Floodplains
- Chesapeake Bay Critical Area
- Public Lands
- Terrestrial Habitat
- Sensitive Species Project Review Areas (Including Rare, Threatened and Endangered Species)
- Aquatic Resources
- Topography, Geology & Soils
- Sea Level Rise

Figure 1-1: BCS Site Vicinity Map



1.2 Purpose and Need

The purpose of the Chesapeake Bay Crossing Study: Tier 1 NEPA is to consider corridors for providing additional capacity and access across the Chesapeake Bay in order to improve mobility, travel reliability and safety at the existing Governor William Preston Lane Jr. Memorial (Bay) Bridge. Evaluation of the CARA included an assessment of existing and potentially expanded transportation infrastructure needed to support additional capacity, improve travel times, and accommodate maintenance activities, while considering financial viability and environmental responsibility. The Tier 1 NEPA analysis considers a "No-Build" alternative and addresses the following needs listed under **Section 1.2.1** through **1.2.4**.

1.2.1 Adequate Capacity

The existing two spans of the Bay Bridge, which are part of US 50/US 301 between Anne Arundel and Queen Anne's counties, Maryland, carry increasing volumes of travelers. Congestion resulting from high regional travel demand by weekday commuter and summer weekend recreation trips is expected to worsen by the planning horizon year of 2040 due to planned growth in population and employment. Additional capacity is needed to address existing congestion, future congestion, and related safety concerns, all resulting from increasing travel volume on the Bay Bridge and approach transportation network.

1.2.2 Dependable and Reliable Travel Times

The anticipated population increase in communities on both sides of the Chesapeake Bay and associated increase in commuter travel, as well as expected increased tourism and recreational travel, will continue to stress mobility across and around the Bay. Marylanders and visitors need dependable Chesapeake Bay crossing options with reliable operating speeds and travel times that provide access to employment and recreation areas, as well as facilitate emergency services and evacuation events.

1.2.3 Flexibility to Support Maintenance and Incident Management in a Safe Manner

Maintenance and rehabilitation activities will increase and exacerbate congestion as the Bay Bridge ages. Additional capacity is needed to maintain flexible options for safe travel during maintenance and for management of other incidents on the Bay Bridge. Safety of travelers, maintenance workers and incident responders will also be considered during corridor alternative development.

1.2.4 Additional Considerations

Additional capacity across the Chesapeake Bay and/or improvements to existing facilities must be financially viable. In order to assess potential additional Bay crossings, it is necessary to consider the means to pay for the development, operation and maintenance of such facilities.

The Chesapeake Bay is a critical environmental resource in Maryland; therefore, any Bay Crossing improvements must take into account the sensitivity of the Bay, including existing environmental conditions and the potential for any new capacity to adversely impact the Bay and the important natural, recreational, socio-economic and cultural resources it supports.

2.0 ALTERNATIVES CONSIDERED

The alternatives assessed in this technical study include three CARA and the No-Build Alternative. MDTA conducted a comprehensive screening of 14 corridors throughout the extent of the Chesapeake Bay in Maryland, along with four Modal and Operational Alternatives (MOA) and the No-Build Alternative. The evaluation included whether the alternatives would provide adequate capacity and dependable and reliable travel times at the existing Bay Bridge and new crossing, as well as flexibility to support maintenance and incident management at the existing Bay Bridge. The screening also took into account environmental responsibility and financial viability, which are other considerations identified in the Purpose and Need. An inventory of natural resources within the corridors was developed to inform the screening. The screening resulted in the identification of three CARA; none of the MOA were carried forward for further Tier 1 Analysis as standalone alternatives.

2.1 No-Build Alternative

The No-Build Alternative is included as a baseline for comparison to the corridor alternatives described below. The No-Build Alternative includes all currently planned and programmed infrastructure projects and regular maintenance at the existing Bay Bridge, located between Anne Arundel County and Queen Anne's County. The No-Build Alternative includes existing transportation systems management/travel demand management (TSM/TDM) measures including contraflow lanes on the existing bridge, as well as any planned and funded TSM/TDM measures such as automated contraflow lanes.

2.2 Corridor Alternatives Retained for Analysis

MDTA conducted a comprehensive screening of 14 corridors throughout the extent of the Chesapeake Bay in Maryland. The screening process resulted in the identification of three CARA known as Corridor 6, Corridor 7, and Corridor 8 (**Figure 2-1**). Each CARA is a two-mile wide corridor extending far enough on each shore to connect to existing major roadway infrastructure of 4 lanes or greater. Specific roadway alignments are not identified in this Tier 1 Study; identification of alternative alignments would occur if a Preferred Corridor is selected and carried forward into Tier 2.

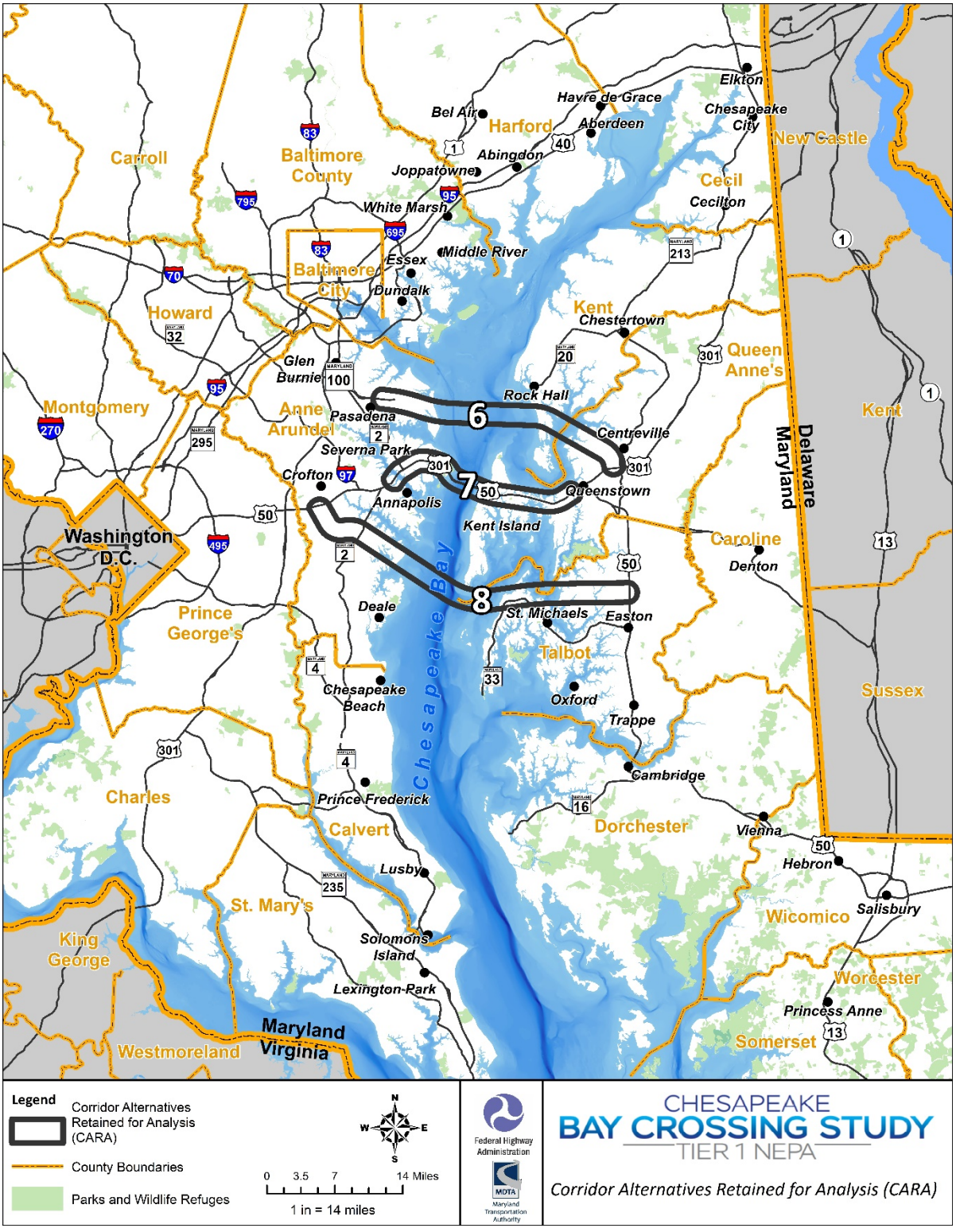
2.2.1 Corridor 6

From west to east, Corridor 6 begins with a tie-in at MD 100 and follows MD 177, with the crossing located north of Gibson Island. After crossing the Chesapeake Bay, Corridor 6 returns to land on the Eastern Shore north of the Eastern Neck National Wildlife Refuge, roughly perpendicular to MD 445. From there, the corridor turns southeast to cross the Chester River and does not follow existing roadway network until the tie-in with US 301 south of Centreville.

2.2.2 Corridor 7

Corridor 7 follows existing infrastructure along the location of the existing Bay Bridge. From west to east, the corridor begins just west of the US 50/301 crossing of the Severn River. The corridor continues to follow US 50/301 over the Severn River, crossing the Chesapeake Bay and returning to land on Kent Island near Stevensville. The corridor continues to follow US 50/301 over Kent Narrows, ending at the US 50/301 split near Queenstown. While this corridor follows the existing crossing along its centerline, a new crossing and the associated infrastructure could potentially be located anywhere within the two-mile wide corridor.

Figure 2-1: CARA Location map



2.2.3 Corridor 8

From west to east, Corridor 8 begins with a tie-in at US 50/301 at the interchange with MD 424. From there, the corridor roughly follows MD 424 and MD 214. The crossing begins near Mayo on the western shore, passing just south of the southern tip of Kent Island, then curving northeast. The corridor returns to land on the Eastern Shore near MD 33, west of St. Michaels. From there, Corridor 8 crosses the Miles River, and does not follow the existing roadway network until it ties in with MD 50 north of Easton.

Additionally, a field investigation was conducted to photo document general characteristics and existing conditions within each of the three CARA. **Appendix A** provides a series of figures identifying the location and direction of the photos collected during the field investigation. The photos included identifying captions keyed to the photo location figures. The photos generally depict existing natural resources within each corridor, concentrating on large undisturbed forested areas, areas within the Critical Area, wetlands and open waters, and public lands.

3.0 METHODOLOGY

For the purposes of this Natural Resources Technical Report, the three CARA designated for detailed evaluation are defined as two-mile wide study areas and designated as Corridors 6, 7, & 8 (see **Figure 2-1)**. Corridor 6 is a 28-mile long corridor that generally extends from Pasadena, MD in Anne Arundel County across the Bay to just south of Centreville, MD in Queen Anne's County. The total area associated with Corridor 6 is approximately 34,950 acres and consists of 16,870 acres of land area and 18,080 acres of open waters associated with the Chesapeake Bay and tributaries to the Bay.

Corridor 7 is a 22-mile long corridor and generally parallels the existing Bay Bridge from Annapolis, in Anne Arundel County, across the Bay to Queenstown in Queen Anne's County. The total area associated with Corridor 7 is approximately 27,930 acres and consists of 18,330 acres of land area and 9,600 acres of open waters associated with the Chesapeake Bay and tributaries to the Bay. For the discussion of existing conditions and affected environment in **Section 5,** it should be noted that whereas Corridors 6 and 8 propose completely new locations, the utilization of existing infrastructure associated with Corridor 7 could minimize potential impacts. The existing Bay Bridge is approximately 4.3 miles long and, combining both spans, 66 feet wide for a total area of approximately 34.5 acres.

Corridor 8 is a 37-mile long corridor that extends from the vicinity of Crofton in Anne Arundel County across the Bay to Route 50, just north of Easton in Talbot County. The total area associated with Corridor 8 is approximately 46,680 acres and consists of 26,200 acres of land area and 20,480 acres of open waters associated with the Chesapeake Bay and tributaries to the Bay. Detailed information about the specific locations, tie-in infrastructure, and terminus locations of each corridor is provided in **Section 2.2**.

Natural resources within the two-mile wide corridors were identified based on agency input throughout the scoping process, review of existing available scientific literature, Geographic Information System (GIS) databases and mapping, and field reconnaissance of the corridor study areas conducted in June 2019. The agency input included recommendations from federal and state agencies concerning the natural resources relevant to this study and the datasets and information available for the associated natural resources. Field reconnaissance was conducted to document general characteristics and existing conditions, but did not involve detailed investigations to determine the limits of jurisdictional resources.

The following federal and state agencies were consulted for information regarding natural resources within the limits of the study area corridors:

- Chesapeake Bay Critical Area Commission
- Federal Emergency Management Administration
- Federal Highway Administration
- Maryland Dept. of the Environment
- Maryland Dept. of Natural Resources
- Maryland Natural Heritage Program
- National Oceanic and Atmospheric Administration
- U.S. Army Corps of Engineers
- U.S. Dept. of Transportation
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

More specific information regarding data gathering sources are presented within the discussion of each resource in **Section 5,** and references are listed in **Section 6**.

The total amount of existing natural resources has been quantified in **Section 5** using the limits of the study area for each of the three corridors and overlaying existing GIS-based natural resource data layers. The total percentage of the existing resource to corridor study area size is also provided in the associated tables in Section 5.

This level of analysis provides a relative comparison of the total amount of the associated resource within each corridor study area but does not quantify actual impacts. Because the study areas are extensive and a limit of disturbance, construction methods, and construction timing are not yet known, quantifying actual impacts to natural resources is not possible during this Tier 1 analysis. The purpose of the Tier 1 analysis is to provide a comparison of the total amount of the associated resource within each study area corridor and the location within the study area where the resource is most prevalent. The results of this Tier 1 study will provide the basis for corridor selection and a more detailed environmental impact assessment under a Tier 2 analysis once specific alignments are considered. For example, more detailed analysis will include an assessment of specific habitat types and their role in the natural environment as appropriate, beyond the inventory of resources conducted in this Tier 1 study.

4.0 REGULATORY CONTEXT

4.1 Wetlands, Surface Waters, Water Quality, and Drinking Water Supply Sources

4.1.1 Wetlands & Surface Waters

At the Federal level, jurisdictional Waters of the U.S. (WOTUS), which includes wetlands and surface waters, are afforded regulatory protection under numerous sections of the Clean Water Act (CWA), including Section 404. Regulations adopted pursuant to CWA Section 404 also identifies jurisdictional wetlands as Special Aquatic Sites. Special Aquatic Sites are defined in part in 40 CFR Part 2303.3 (q-1) as "areas possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values." The U.S. Environmental Protection Agency (USEPA) and

U.S. Army Corps of Engineers (USACE) share responsibility for implementing Section 404, which specifically regulates dredge and fill activities affecting WOUS.

The term WOTUS can be used to describe all waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce; including; navigable waters, interstate waters, territorial seas, rivers, streams, tributaries, and wetlands.

Section 404 regulations at 40 CFR Part 2303.3(t) defines a jurisdictional wetland as follows:

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

The Maryland legislature passed the Non-tidal Wetlands Protection Act in 1989. The Act, administered by Maryland Department of the Environment (MDE) via Code of Maryland Regulations (COMAR) Title 26.23, mandates the establishment of a statewide program for the conservation, enhancement, regulation, creation, and monitoring of non-tidal wetlands in the state. MDE also regulates activities in a 25-foot wetland buffer around non-tidal wetlands. The 25-foot wetland buffer is expanded to 100 feet for non-tidal Wetlands of Special State Concern (WSSC). Impacts to jurisdictional wetlands, wetland buffers, and waters require authorization via the MDE/USACE Joint Permit Application (JPA) process.

The Maryland Tidal Wetlands Act restricts construction and development actions in tidal wetlands. Tidal wetlands are administered by MDE via COMAR Title 26.24 and provides protection against unregulated activities that would affect adversely the value of the tidal wetland as a source of nutrients to finfish, crustacea, and shellfish of significant economic value.

The U.S. Fish and Wildlife Service (USFWS) and the Maryland Department of Natural Resources (MDNR) maintain databases of wetland and waters resources. These resources show the general location, type, and configuration of wetlands that can be identified through conventional aerial photo interpretation techniques. The wetlands identified by these databases do not identify the specific jurisdictional limits of protected wetland resources but rather are provided to aid in natural resource planning and conservation. Because of the broad scale nature of this Tier 1 NEPA study, the MDNR & National Wetland Inventory (NWI) wetlands databases are the primary tools for identifying potential wetlands in this technical study. Field wetland delineations would be conducted at a later phase if a corridor alternative is carried forward for further evaluation in Tier 2.

Maryland non-tidal WSSC are designated for special protection under the state's non-tidal wetlands regulations. COMAR Title 26, Subtitle 23, Chapter 06, Sections 01 & 02 identifies WSSC and affords them certain protections including a 100-foot buffer. These are wetlands with exceptional ecological and educational value. WSSC are often buffered within a Sensitive Species Project Review Area (SSPRA) but there are specific instances when they are not. SSPRA are discussed further in **Section 4.6**.

Construction of new bridge crossings and reconstruction or modification of existing crossings over navigable WOTUS requires U.S. Coast Guard approval in accordance with Section 9 of the Rivers and Harbors Act of 1899 and the General Bridge Act of 1946. The General Bridge Act of 1946, as amended, the Rivers and Harbors Act of 1899, as amended, and the Act of March 23, 1906 (commonly known as the

"Bridge Act" of 1906), as amended, require the location and plans of bridges and causeways across the navigable waters of the United States be submitted to and approved by the Secretary of Homeland Security prior to construction. The USACE, acting under Section 10 of the Rivers and Harbors Act, also regulates work in, or affecting, navigable WOTUS.

Executive Order (EO) 11990, Protection of Wetlands, established a national policy and mandates that federal agencies act to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance their natural value. Each agency, to the extent permitted by law, must avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds there is no practical alternative to such construction and the proposed action includes all practical measures to minimize harm to wetlands that may result from such use.

The Maryland Watershed Resources Registry (MWRR) is an online GIS mapping tool that provides publicly available data concerning the locations of existing watershed resource preservation areas, including; riparian preservation and restoration areas, upland preservation and restoration areas, wetland restoration and preservation areas, and stormwater infrastructure preservation and restoration areas. The MWRR was established by an interagency team of state and federal agencies and designed to assist land-use planning using a watershed approach. The MWRR is a tool that prioritizes areas for preservation and restoration and is helpful for transportation projects that are required to avoid or minimize impacts or provide mitigation for unavoidable impacts.

4.1.2 Water Quality

The Clean Water Act, passed in 1972, is a federal law regulating the discharge of pollutants into surface waters, including lakes, rivers, streams, wetlands and coastal areas. The CWA is administered by the EPA with assistance from States that receive delegated authority to do so. EPA sets water quality standards, handles enforcement, and assists state and local governments with developing pollution control plans. Section 401 of the CWA requires that an applicant for a federal license or permit provide a certification that any discharges into any of the aforementioned surface waters comply with state-established water quality standards. The certification, provided by the state or authorized tribe in which the discharge originates, declares that the discharge will comply with applicable provisions of the CWA. Section 402 of the CWA mandates that all construction sites on an acre or greater of land; and municipal, industrial, and commercial facilities that discharge wastewater or stormwater directly from a point source into a surface water of the U.S. obtain authorization via the National Pollutant Discharge Elimination System (NPDES) permit process. NPDES permit authorizations ensure the Nation's receiving waters achieve and water quality standards.

The Maryland Scenic and Wild Rivers Act of 1968 established the Maryland Scenic and Wild Rivers System to preserve and protect the natural values and enhance the water quality of rivers, or segments of rivers, which possess outstanding scenic, geologic, ecologic, historic, recreational, agricultural, fish, wildlife, cultural, and other similar resource values.

Surface waters in Maryland are assigned a use class (COMAR 26.08.02), a set of designated uses that define an intended human and aquatic life objective, use, or goal for a water body. The determination of designated use includes consideration of existing conditions and potential uses which may be made possible by anticipated improvements in water quality. The specific designated use classes are as follows:

- Use Class I – Water Contact Recreation, Protection of Non-tidal Warm Water Aquatic Life
- Use Class I-P – Use Class I Designated Uses and Public Water Supply
- Use Class II – Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting
    - Shellfish Harvesting Subcategory
    - Seasonal Migratory Fish Spawning and Nursery Subcategory (Chesapeake Bay only)
    - Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory (Chesapeake Bay only)
    - Open-Water Fish and Shellfish Subcategory (Chesapeake Bay only)
    - Seasonal Deep-Water Fish and Shellfish Subcategory (Chesapeake Bay only)
    - Seasonal Deep-Channel Refuge Use (Chesapeake Bay only)
- Use Class II-P – Use Class II Designated Uses and Public Water Supply
- Use Class III – Non-tidal Cold Water
- Use Class III-P – Use Class III Designated Uses and Public Water Supply
- Use Class IV – Recreational Trout Waters
- Use Class IV-P – Use Class IV Designated Uses and Public Water Supply

Because certain periods of the year are considered crucial for the growth and propagation of aquatic species, each use class designation incorporates a timing restriction or stream closure period identifying when instream activities are not permitted.

The Chesapeake Bay tidal waters are also assigned a series of designated uses that reflect the various habitats associated with the Bay and its tidal tributaries. The five designated uses of Chesapeake Bay tidal waters reflect the water resource communities inhabiting them. Below are the designated use categories with a description of what is protected and the general locations of the associated habitat.

- Migratory Fish and Spawning Nurseries – Migratory fish including striped bass, perch, shad, herring, and sturgeon are protected during the winter/spring spawning and nursery season. The habitat consists of tidal freshwater to low salinity habitats primarily found in the upper mainstem of the Bay and the upper reaches of the Bay's tidal rivers and creeks.
- Shallow Water – Underwater bay grasses and the fish and crab species that depend on this shallow water habitat. The habitat consists of near shoreline shallow waters.
- Open Water Fish and Shellfish – Water quality in surface water habitats in order to protect sportfish and bait fish. The habitat includes tidal creeks, rivers, embayments and the mainstem of the Bay.
- Deep Water Fish and Shellfish – Water quality in deep water in order to protect bottom-feeding fish, crabs, oysters, and the bay anchovy. The habitat includes the deeper transitional water column and bottom habitats between the well-mixed surface waters and the very deep channels during the summer months.
- Deep Channel Seasonal Refuge – Bottom sediment-dwelling worms and small clams that act as a food source for bottom-feeding fish and crabs in the very deep channel in summer.

In compliance with Sections 303(d), 305(b), and 314 of the CWA and the Safe Drinking Water Act of 1974, MDE has developed a prioritized list of waterbodies that currently do not meet state water quality standards. MDE monitors streams and waterbodies for a variety of water quality parameters including temperature; dissolved oxygen levels; pH; the presence of fecal coliform, *Escherichia coli*, and enterococci bacteria; total phosphorus and chlorophyll-a levels; and metals and toxics in the water column, sediments,

and fish tissues. Criteria specific to the Chesapeake Bay includes dissolved oxygen levels, chlorophyll a, and water clarity. By monitoring these parameters, MDE determines which waterbodies have impaired water quality and how the type or extent of impairment affects the primary uses of the waterbody.

Maryland's water quality standards define the water quality needed to support the designated uses by establishing numeric physical and chemical criteria. If a waterbody fails to meet the water quality standards, it would not support one or more of its designated uses, as described above. These waters are considered impaired and placed on the 303(d) list, as required by the CWA. Once a waterbody has been identified as impaired due to human activities and placed on the 303(d) list, MDE is required to develop a Total Maximum Daily Load (TMDL) for the parameters that do not meet state water quality standards. The TMDL is a pollution reduction plan that defines the maximum amount of a pollutant(s) that a waterbody can receive and still meet water quality standards, identifies the necessary pollution reductions from major sources of nitrogen, phosphorus, and sediment across the Bay jurisdictions, and sets pollution limits necessary to meet water quality standards. A TMDL implementation plan, including Waste Load Allocations, is developed by MDE once the TMDL is approved by the USEPA. The goal of the TMDL Implementation Plan is to restore the impaired waterbody and maintain its water quality for its designated uses.

As part of Maryland's anti-degradation policy in COMAR 26.08.02.04, as required by 40 CFR 131.12, MDE has established a tiered system for water quality. Tier I waters have the minimum standards that a water must meet. Tier II are waters that have existing water quality that is significantly better than the minimum requirements. Impacts to Tier II waters and watersheds require MDE coordination as part of the Joint Permit Application (JPA) approval process. Tier III is currently being developed as Outstanding National Resource Water.

Water quality is also tied to aquatic organisms, and the TMDL standards and Tiered designations created by MDE are informed by Maryland Biological Stream Survey (MBSS) data. Collected through MDNR, MBSS data includes information on benthic macroinvertebrate and fish communities, and results in Indices of Biotic Integrity. These indices fall on a scale of 1.00 to 5.00 (5 being the highest integrity ranking) and are used to determine Tier II waters and provide information on species found within watersheds and stream systems.

4.1.3 Drinking Water Supply Sources

Public drinking water supplies come from natural groundwater or surface water. Groundwater supplies are formed by precipitation that seeps into the ground and gets stored in open spaces and pores or in layers of sand and gravel known as aquifers. A sole source aquifer (SSA) is defined by the EPA as one that supplies at least 50 percent of the drinking water for its service area with no reasonably available alternative should that SSA become contaminated.

Surface water is water that collects on the ground or in a stream, river, lake, reservoir, or ocean. Surface water is constantly replenished through precipitation, and lost through evaporation and seepage into ground water supplies. According to the EPA, 68% of community water system users received their water from a surface water source.

A wellhead protection area (WHPA) is a surface and subsurface land area regulated to prevent contamination of a drinking water well or well field supplying a public drinking water system. The WHPA

program was established under the *Safe Drinking Water Act of 1986* and is implemented through state governments. The EPA approved Maryland's Wellhead Protection Program in June of 1991. Maryland's program provides technical assistance, information, and funding to local governments, to aid in the protection of their water supplies.

4.2 100-Year Floodplains

The U.S. Department of Transportation 1979 Order 5650.2, "Floodplain Management and Protection" prescribes the various policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts that may result from agency actions, planning programs, and budget requests.

EO 11988, Floodplain Management, requires federal agencies to implement effective planning measures designed to avoid long- and short-term adverse impacts associated with development and modification of the 100-year floodplain, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. EO 11988 further states that each agency shall take appropriate action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains. The Federal Emergency Management Administration (FEMA) uses Flood Insurance Rate Maps to identify the regulatory 100-year floodplain for the National Flood Insurance Program.

COMAR 26.17.04, Construction on Nontidal Waters and Floodplains, provides MDE with the authority to regulate 100-year floodplains. Work within floodplains requires authorization via the Maryland JPA process. MDE requires engineering analyses for bridges, culverts, and other construction activities that could have an effect on the course, current, or cross-section of non-tidal streams and waterbodies, including the floodplain. Permit compliance for activities within a jurisdictional floodplain includes mandates that development may not increase flooding or create a dangerous situation during flooding on downstream properties.

The National Flood Insurance Act of 1968 led to the creation of the National Flood Insurance Program (NFIP). The NFIP provides flood insurance for structures and contents in communities that adopt and enforce an ordinance outlining minimal floodplain management standards and identifies areas of high and low flood hazard to establish flood insurance rates for structures inside the flood hazard areas. The NFIP was amended by the Flood Disaster Protection Act in 1973 which made the purchase of flood insurance mandatory for the protection of property within flood hazard areas.

4.3 Chesapeake Bay Critical Area

The Critical Area Act of 1984 protects and manages development of all lands within 1,000 feet of the Mean High Water Line of tidal waters or the landward edge of tidal wetlands and all waters of and lands under the Chesapeake Bay and its tributaries. The Chesapeake Bay Critical Area Commission (CAC) was established to develop and implement land use programs in an effort to minimize adverse effects on water quality and habitats, while also accommodating growth and its indirect effects on the environment. Title 27 of COMAR establishes the Critical Area Commission for the Chesapeake and Atlantic Coastal Bays.

Within the Critical Area, three land classifications have been designated: Intensely Developed Areas (IDAs), Limited Development Areas (LDAs), and Resource Conservation Areas (RCAs). Each of these areas has specific regulations that dictate future development while accounting for the current surrounding

land use and land cover. In addition, areas of rare habitats, for both plants and animals, are regulated within the Critical Areas. Colonial bird nesting areas, waterfowl staging areas, tidal wetlands, anadromous fish spawning areas, and other locally significant areas are also protected. Coordination with the Critical Area Commission Staff will be required to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

4.4 Public Parks and Wildlife Refuges

Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966 prohibits USDOT agencies from impacting publicly owned parks, recreation areas, wildlife and water fowl refuges, unless there is no feasible and prudent alternative to that use and the action includes all possible planning to minimize harm to the property resulting from such a use. Use of a Section 4(f) property occurs when land is permanently incorporated into a transportation project, when there is a temporary occupancy, or when the property's use is substantially impaired. Section 4(f) applies to projects that receive funding from or require approval by an agency of the USDOT and is implemented by the FHWA and FTA through the regulation 23 CFR 774.

The Land and Water Conservation Fund Program of 1965 was established to increase the net quantity of public outdoor recreational space. Section 6(f) of this legislation provides matching funds to states or municipalities for planning, improvements, or acquisition of outdoor recreational lands. In most cases, Section 6(f) properties are recreational lands that are also regulated under Section 4(f) and review and approval under both regulations runs concurrently.

Program Open Space (POS) was established by MDNR in 1969 as a tool for providing financial and technical assistance to local subdivisions for the planning, acquisition, and development for recreation land or open space areas. The program provides funding for open space and recreational facilities for the public good.

4.5 Terrestrial Habitat

Due to the broad use of available habitat by terrestrial and aquatic wildlife, numerous federal and state agencies may be involved in the regulation of proposed habitat impacts. Federal and state agencies regulate and manage activities associated with terrestrial and aquatic wildlife and their habitats on conserved lands and through the enforcement of laws related to hunting and fishing as well as threatened and endangered species. A concern for natural wildlife and habitat is the introduction and spread of invasive species. EO 13112, Invasive Species, defines invasive species as an alien species whose introduction does, or is likely to cause, economic or environmental harm or harm to human health. In accordance with EO 13112, and as amended by EO 13751, no federal agency can authorize, fund, or carry out any action that it believes is likely to cause or promote the introduction or spread of invasive species. Other regulations governing invasive species include the Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990 (as amended), Lacey Act of 1900 (as amended), Plant Protection Act of 2000, Federal Noxious Weed Act of 1974 (as amended), and the Endangered Species Act (ESA) of 1973 (as amended).

The Lacy Act of 1900 provides for civil and criminal penalties for the illegal trade of animals and plants. Today the Lacy Act regulates the import of any species protected by international or domestic law and prevents the spread of invasive or non-native species.

The Plant Protection Act of 2020 (PPA) was enacted to prevent the introduction and/or dissemination of plant pests within the United States. For the purposes of the PPA, plant pests is defined as "any living

stage (including active and dormant forms) of insects, mites, nematodes, slugs, snails, protozoa, or other invertebrate animals, bacteria, fungi, other parasitic plants or reproductive parts thereof; viruses; or any organisms similar to or allied with any of the foregoing; or any infectious agents or substances, which can directly or indirectly injure or cause disease or damage in or to any plants or parts thereof, or any processed, manufactured, or other products of plants."

The Federal Noxious Weed Act of 1974 (NWA) established a federal program to control the spread of noxious weeds and provided the Secretary of Agriculture with the authority to declare plants noxious weeds and limit their spread without a permit. The NWA also grants the Secretary the authority to inspect, seize, and destroy product and quarantine areas or limit the spread of such weeds.

The Endangered Species Act of 1973 (ESA) is designed to protect critically imperiled species from extinction as a "consequence of economic growth and development untempered by adequate concern and conservation." More specific information about the ESA is provided below in **Section 4.6**.

Forest impacts from activities requiring an erosion and sediment control permit on areas 40,000 square feet or greater are regulated under the Forest Conservation Act (FCA). Enacted in 1991, the FCA was created to preserve existing forested lands and protect Maryland forests from being cleared. FCA Easements protect a forest on private land by limiting certain activities. Easements are generally created as part of a forest conservation plan.

Forest Interior Dwelling Bird Species (FIDS) are regulated as a protected resource within the Chesapeake Bay Critical Area (COMAR 27.01.09.04). FIDS habitat includes documented FIDS breeding areas within existing riparian forests that are at least 300 feet in width and that occur adjacent to streams, wetlands, or the Chesapeake Bay shoreline, and other forest areas used as breeding areas by forest interior dwelling birds. FIDS require large forest areas to breed successfully and maintain viable populations.

4.6 Unique and Sensitive Areas

For the purposes of this Tier 1 analysis, Unique and Sensitive Areas are defined as habitats and biological resources that have special environmental attributes worthy of protection and retention. The following regulatory narrative identifies some of the environmental statutes and guidelines associated with the unique and sensitive areas identified within limits of the corridor study areas.

The ESA directs all federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purposes of the Act. Section 7 of the Act, called "Interagency Cooperation," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Under Section 7, Federal agencies must consult with the USFWS when any action the agency carries out, funds, or authorizes may affect a listed endangered or threatened species. There are two parts to Section 7 of the ESA that are related to interagency cooperation, including:

- Section 7(a)(1) -– requires Federal agencies shall to utilize their authorities in furtherance of the purposes of this Act the ESA by carrying out programs for the conservation of listed endangered and threatened species;

- Section 7(a)(2) - requires the agencies to ensure that their activities are not likely to do not jeopardize the continued existence of listed species or adversely modify designated critical habitats.

If the Federal agency, after discussions with USFWS, determines that the proposed action is not likely to affect any listed species in the project area, and if the Service concurs, the informal consultation is complete and the proposed project moves ahead. If it appears that the agency's action may affect a listed species, that agency may then prepare a biological assessment to assist in its determination of the project's effect on a species.

To identify the presence of federally-listed rare, threatened, or endangered species or habitat, NWI wetlands, or migratory birds within a specific study area, the USFWS provides the Information, Planning and Consultation (IPaC) system. IPaC is an online tool and is useful for identifying potential impacts early in the project development process. Results of the IPaC search performed for this Tier 1 analysis are provided in **Section 5.6**. Copies of the USFWS IPaC correspondence are provided in **Appendix C** of this document.

The Chesapeake Bay constitutes a significant portion of the Atlantic Flyway for migratory birds. The Migratory Bird Treaty Act of 1918 makes it unlawful without a waiver to pursue, hunt, take, capture, kill, or sell birds listed therein as migratory birds. The statute does not discriminate between live or dead birds and also grants full protection to any bird parts including feathers, eggs, and nests. The USFWS issues permits for otherwise prohibited activities under the act. These include permits for taxidermy, falconry, propagation, scientific and educational use, and depredation, an example of the latter being the killing of geese near an airport, where they pose a danger to aircraft.

The Bald and Golden Eagle Protection Act provides for the protection of the bald eagle and the golden eagle by prohibiting the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit.

Maryland's GreenPrint Program was established in an effort to "preserve the most ecologically valuable natural lands in Maryland" (Maryland's Green Infrastructure Assessment 2003). These areas have been identified in MDNR's Green Infrastructure Assessment (GIA) data set, which was created using satellite imagery, road and stream locations and biological data, and were defined to best address the conservation needs of Maryland FIDS. Areas identified include unfragmented natural areas, called "hubs", defined as contiguous forest blocks and wetland complexes of at least 250 acres, rare or sensitive species habitats, biologically important rivers and streams, and existing conservation lands managed for natural values. "Corridors" are linear stretches of land, at least 1,100 feet wide, which follow the best ecological or most natural routes between hubs to help animals, plant seeds, water, and other important resources move between hubs. Areas of disconnect between the hubs and corridors are called "gaps" (MDNR 2016).

Targeted Ecological Areas (TEAs) are lands and watersheds of high ecological value that have been identified as conservation priorities by the MDNR for natural resource protection. These areas, which include GI hubs and corridors when appropriate, represent the most ecologically valuable areas in the State: they are the "best of the best". TEAs are preferred for conservation funding through Program Open Space.

The MDNR Wildlife and Heritage Service administers the Maryland Natural Heritage Program (MNHP), which was established in 1979 to protect nongame, rare, threatened, and endangered plants and animals, as well as their respective habitats. Seventy-nine (79) ecological community groups and 226 community types have been recognized by the MNHP, and examples include Delmarva Bays, Tidal Wetlands, and Coastal Seepage Swamps. This natural community classification allows for consistency across state agencies in describing natural communities, while allowing for prioritized land acquisition and protection. While some of these communities, such as wetlands, will follow stricter regulations due to existing legislation, the MNHP provides a framework of protection so these identified communities can be avoided during development activities.

Correspondence was submitted to MDNR to determine the presence of state-listed RTE species or habitat within the limits of the study areas for the three potential corridors. Results of the MDNR correspondence performed for this Tier 1 analysis are provided in **Section 5.6**. A copy of the MDNR correspondence is provided in **Appendix C** of this document.

While not subject to specific regulations, MDNR models and tracks the habitat and breeding locations of certain species important to the Chesapeake Bay, specifically the Northern diamondback terrapin (*Malaclemys terrapin terrapin*) and the horseshoe crab (*Limulus Polyphemus*). Chesapeake Bay habitat locations have been modeled based on documented occurrences of these species, salinity, and substrate, and then ranked by MDNR scientists. These areas should be examined as potentially sensitive areas during the review of project activities.

Sensitive Species Project Review Areas or SSPRA is a digital map data layer representing the general locations of documented rare, threatened and endangered species in Maryland. Created and updated by the MDNR Wildlife and Heritage Service, this data layer contains buffered polygons but does not delineate or strictly represent habitats of threatened and endangered species. The data layer incorporates various types of regulated areas under the Critical Area Criteria and other areas of concern statewide, including: Natural Heritage Areas, Listed Species Sites, Other or Locally Significant Habitat Areas, Colonial Waterbird Sites, Non-tidal WSSC, and Geographic Areas of Particular Concern.

NOAA Fisheries has implemented an interactive, GIS-based online tool called the ESA Section 7 Mapper to identify ESA listed species and critical habitat in marine areas along the east coast from Maine to North Carolina. While this tool does not replace the Section 7 consultation process, the mapper provides technical assistance for agencies to use as a first step in determining if a proposed Federal action occurs within an area associated with a listed species or critical habitat. Within the Section 7 Mapper, Consultation Areas represent NOAA's best estimate of the spatial and temporal range of listed species' life stages, behaviors, and critical habitat in the Greater Atlantic Regional Fisheries Office (GARFO) region.

4.7 Aquatic Resources

Aquatic biota within the Chesapeake Bay estuary range from micro and macroinvertebrates through aquatic bird species and marine mammals. The distribution of aquatic biota is dependent on many biotic and abiotic factors, including salinity, temperature, dissolved oxygen, available substrates and other habitat components, predator/prey relationships, presence of macroalgae, etc. Numerous federal and state agencies may be involved in the regulation of certain aquatic biota either directly or indirectly through the protection of habitat.

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 was established to prevent introduction of and to control the spread of introduced aquatic nuisance species.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), enacted in 1976, is the primary law governing fisheries management in federal waters and is the legal provision for promoting optimal exploitation of U.S. coastal fisheries. Federal action agencies which fund, permit, or carry out activities that may adversely affect essential fish habitat (EFH) are required to consult with the National Marine Fisheries Service (NOAA Fisheries). NOAA defines “adverse effect” as any impact that reduces the quality and/or quantity of EFH habitat and may include direct or indirect physical, chemical, or biological alterations of the associated waters or substrate. Also, adverse effects may result from actions within or outside of EFH and may include site-specific or habitat-wide impacts, including; individual, cumulative, or synergistic consequences of proposed actions.

The Fish and Wildlife Coordination Act (FWCA) was enacted in 1934 to provide protection to fish and wildlife resources when federal actions result in impacts to natural bodies of water, including the Bay and its associated tributaries. The FWCA predates the MSA and provides the basic authority for the involvement of the USFWS in evaluating impacts to fish and wildlife from proposed water resource development projects. The FWCA requires the consideration of all fish and wildlife resources, the effects of the proposed actions on these resources, and mitigating strategies for the improvement of the resources.

The 1987 Chesapeake Bay Agreement was established by a joint committee of representatives from the State of Maryland, the Commonwealths of Pennsylvania and Virginia, the District of Columbia, the EPA, and the Chesapeake Bay Commission with the goal of restoring and protecting the habitat and ecological relationships of living resources of the Bay. Under the Agreement, Fisheries Management Plans (FMP) were developed to provide a framework for Bay jurisdictions to generate compatible and coordinated management measures to conserve and utilize the Bay’s commercial and recreational fishery resources. When preparing an FMP, fisheries managers must adhere to regulations established by the MSA. NOAA Fisheries is responsible for review of FMP’s associated with marine and saltwater fisheries while the USFWS oversees freshwater fisheries.

The Marine Mammals Protection Act (MMPA) prohibits the “taking” of marine mammals and enacts a moratorium on the import, export, and sale of any marine mammal, along with any marine mammal part or product within the United States. The Act defines "take" as "the act of hunting, killing, capture, and/or harassment of any marine mammal; or, the attempt at such." The MMPA defines harassment as "any act of pursuit, torment or annoyance which has the potential to either injure a marine mammal in the wild or disturb a marine mammal by causing disruption of behavioral patterns, which includes, but is not limited to, migration, breathing, nursing, breeding, feeding, or sheltering." The MMPA provides for enforcement of its prohibitions, and for the issuance of regulations to implement its legislative goals.

Authority to manage the MMPA was divided between the Secretary of the Interior through the USFWS, and the Secretary of Commerce, which is delegated to the National Oceanic and Atmospheric Administration (NOAA). Subsequently, a third federal agency, the Marine Mammal Commission (MMC), was established to review existing policies and make recommendations to the Service and NOAA to better

implement the MMPA. Coordination between these three federal agencies is necessary in order to provide the best management practices for marine mammals.

Under the MMPA, the Service is responsible for ensuring the protection of sea otters and marine otters, walruses, polar bears, three species of manatees, and dugongs. NOAA was given responsibility to conserve and manage pinnipeds including seals and sea lions and cetaceans such as whales and dolphins.

Aquatic biota resources in the Chesapeake Bay are protected through adherence to erosion/sediment control regulations as part of Maryland's Stormwater Management Act. Compliance with these regulations would be required for authorization of a state or federal wetland/waters impact permit. To comply with these regulations, projects must adhere to associated time of year work restrictions to protect spawning habitat of specific finfish, including diadromous species. Diadromous fish propagation waters are also a habitat protection area within the Chesapeake Bay Critical Area.

4.7.1 Essential Fish Habitat (EFH)

Essential Fish Habitat (EFH) is defined under the MSA as "*those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity*". EFH habitat characteristics include sediment type, type of bottoms (sand, silt and clay), structures underlying the water surface, and aquatic community structures. Habitats of Particular Concern (HAPC) are a subset of EFH and define habitat that is either rare, stressed by development, provide important ecological functions for federally managed species, or are especially vulnerable to anthropogenic degradation.

4.7.2 Submerged Aquatic Vegetation (SAV)

Submerged Aquatic Vegetation (SAV) consists of a taxonomically diverse group of plants that live entirely beneath the surface of the water. SAV are rooted aquatic plants that provide food and shelter for a variety of aquatic biota including fish, crabs, ducks and geese. SAV benefits also include trapping and absorbing pollutants and excess nutrients. SAV are regulated as a special aquatic site under Section 404 of the CWA and is designated as a HAPC for summer flounder by the Mid-Atlantic Fishery Management Council.

In Maryland, various agencies are charged with the protection of SAV resources and place timing restrictions on dredging or disturbance activities within SAV beds. MDNR prohibits disturbance or dredging activities within SAV beds or bed buffer zones between April 15 and October 15. The USACE Baltimore district prohibits disturbance activities with SAV beds between April 1 and June 30 and April 15 and October 15 for SAV with two growing seasons. The USEPA prohibits SAV disturbance between March 31 and June 15 and the USFWS prohibits disturbance between March and June. NMFS timing restrictions are species dependent and prohibits disturbance between April 15 and October 15 for most species and between April 1 and June 30 for horned pondweed (*Zannichellia palustris*).

While this Tier 1 analysis provides a comparison of mapped SAV resources within each of the proposed corridor study areas using existing GIS resources (**Section 5.7**), a detailed survey will be conducted once a more defined study area is carried forward via a Tier 2 analysis. The survey will include a dated map that delineates where SAV beds occur and details of how the SAV was sampled to determine its distribution. Design and implementation of a survey methodology will be coordinated with MDNR and will identify the existence, extent, and density of SAV resources.

4.7.3 Oyster Resources

In 2019, MDNR released an Oyster Management Plan (OMP) that provides a framework and guidance for implementing a coordinated effort for the protection, rebuilding, and management of native Eastern oyster (*Crassostrea virginic*a) populations within the tidal tributaries and subtidal zones of the Chesapeake Bay. Maryland's oyster population is estimated to be at historically low levels due to multiple factors, including; harvest pressure, lack of habitat, disease mortality, reduced water quality, and a combination of these factors.

The OMP calls for the creation and protection of oyster sanctuaries with the goals of protecting broodstock, enhancing natural recruitment, and encouraging disease tolerance. Sanctuaries with healthy oyster populations also provide ancillary ecological benefits, including; improved water quality and habitat for other species, and the enhancement of oyster populations outside of the limits of the sanctuaries.

The harvesting of oysters within sanctuary areas is prohibited and enforced by MDNR by administratively suspending or revoking harvest licenses using a point system for multiple and/or egregious harvesting violations. The ability to protect sanctuaries has improved as a result of the implementation of the Maritime Law Enforcement Information Network (MLEIN). The MLEIN consists of Maryland State Police surveillance helicopters accompanied by Natural Resource officers, and a series of cameras and radar units designed to detect the unique signature of boats.

4.8 Topography, Soils, & Geology

Erosion and Sediment Control

The Environment Article, Title 4, Subtitle 1 requires the MDE to implement a statewide erosion and sediment control program to control sediment-laden runoff from land disturbing activities. MDE's program includes adopting regulations that establish criteria and procedures for erosion and sediment control throughout Maryland. Each county and municipality, in turn, is required to adopt an erosion and sediment control ordinance that meets the intent of Maryland's sediment control laws and the regulations.

In January 2012, MDE adopted revised erosion and sediment control regulations and the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control (Standards and Specifications). The revisions include more stringent stabilization requirements and establishing grading unit criteria. Additionally, the Standards and Specifications now describe how an erosion and sediment control plan must be designed in concert with a site's stormwater management plan as required by the Stormwater Management Act of 2007 (Act). The Act requires an integrated review of erosion and sediment control plans and stormwater management plans via a comprehensive plan review process to ensure that environmental site design (ESD) is implemented to the maximum extent practicable on all sites. ESD is defined in the Act as "using small-scale stormwater management practices, nonstructural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources."

Steep Slopes & Highly Erodible Soils

Slopes provide an environment for movement of soils and pollutants during land disturbance activities. While soils have varying degrees of erodibility, all soils are subject to movement especially on "steep

slopes." The United States Department of Agriculture (USDA) Natural Resource Conservation Service defines steep slopes as those with gradients of 20 percent or greater. Highly erodible soils are defined as soils with an erodibility factor K greater than 0.35 and with a slope greater than 5 percent. Projects located in the Chesapeake Bay Critical Area may be subject to a more restrictive definition of steep slopes or highly erodible soils. Preservation of steep slopes adjacent to watercourses is especially important because of the potential of adverse effects on water quality and aquatic habitat.

Geology

The land that comprises Maryland is part of six physiographic regions. A physiographic region is an underlying area in which the geology and climate history have resulted in landforms that are distinctly different from adjacent areas. The study area for the CARA corridors are located entirely within the Atlantic Coastal Plain physiographic region. The Atlantic Coastal Plain is underlain by unconsolidated sediments including gravel, sand, silt, and clay which overlaps the rocks of the eastern Piedmont along an irregular line of contact known as the Fall Zone.

4.9 Sea Level Rise

Climate change is a result of increased greenhouse gases emissions associated with human activities. One of the effects of climate change is the rise in sea levels. According to NOAA, global sea levels have risen approximately 2.6 inches since the advent of satellite sea level tracking in 1993 and continue to rise at a rate of one eighth of an inch per year. Sea level rise is the result of thermal expansion caused by warming oceans and increased melting of land-based ice. In the United States, approximately 40 percent of the population live in high-density coastal areas that are vulnerable to the effects of sea level rise. With over 3,100 miles of bay and coastline, Maryland is especially vulnerable to rising sea levels.

The Maryland Commission on Climate Change (MCCC) was established by Executive Order (EO 01.01.2007.07) and charged with the development of an action plan for mitigation and adaptation to the projected consequences of climate change and the associated rise in sea level. The MCCC action plan emphasizes the need for strategic planning for transportation-related projects as proposed new routes can channel development patterns for decades or even centuries. The action plan provides the basis for guiding and prioritizing state-level activities with respect to both climate science and adaptation policy over the near and long term. The action plan was also the catalyst for the Greenhouse Gas Emissions Act (GGRA) of 2009. The GGRA requires the State to reduce greenhouse gas emissions by 25 percent from a 2006 baseline by 2020. Supported by subsequent MCCC reports, the GGRA was extended in 2016 to achieve the goal of reducing emissions by 40 percent by 2030.

5.0 EXISTING CONDITIONS AND ENVIRONMENTAL INVENTORY

This section provides a broad view analysis, using existing GIS resources, of the location of select environmental resources within the entire CBCS study area identified in **Section 2**. To further define existing conditions within the corridor study areas, a desktop analysis was performed comparing the total extent (in acres or linear feet) of existing natural resources associated with each corridor. This level of analysis provides a relative comparison of the total amount of the associated resource within each corridor study area but does not quantify actual impacts of any potential future crossing. Because the study areas are extensive and a limit of disturbance, construction methods, and construction timing are not yet available, actual impacts to natural resources are not quantified during this Tier 1 analysis. The

results of this Tier 1 study will provide the basis for corridor selection and a more detailed environmental impact assessment under a Tier 2 analysis.

In addition to the desktop analysis, a field investigation of each of the three CARA was conducted to document general characteristics and existing conditions. A photo log and photo keys of representative environmental features identified during the field investigation are provided in **Appendix A**. These photos generally depict existing natural resources within each corridor, concentrating on large undisturbed forested areas, areas within the Critical Area, wetlands and open waters, and public lands.

The existing conditions associated with each corridor describe geographic details associated with where the specific resources were identified. **Appendix B** provides reference maps of the corridor study areas with additional geographic details.

Table 5-1 below is a summary table of existing mapped natural resources for each corridor. This table summarizes the information on the individual tables provided for each natural resource category in **Section 5** below.

Table 5-1 - Summary of Existing Natural Resources

NATURAL RESOURCE	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
NWI Non-Tidal Wetlands	1,340	1,520	2,270
MDNR Non-Tidal Wetlands	1,200	1,500	2,080
MDNR Non-Tidal Wetlands	18,460	10,870	24,940
WSSC	80	10	0
MWRR High Value Wetland Preservation Areas	56	4	50
Surface Waters*	344,380	394,020	471,890
100-Year FEMA Floodplain	3,050	6,640	3,950
Critical Area	4,910	9,810	8,120
Public Lands	1,310	1,920	1,360
FIDS	7,020	6,900	11,410
FCA Easements	140	130	110
SSPRA	2,720	2,180	8,630
Green Infrastructure	4,880	4,480	11,450
EFH	18,080	9,600	20,480
SAV	40	270	460
Oyster Resources	11,130	3,460	7,960
Oyster Sanctuaries	6,470	1,580	2,090
Steep Slopes	2,090	0	3,090
Hydric Soils	3,580	5,390	8,250
Highly Erodible Soils	5,560	9,280	9,050
Sea Level Rise 2050	350	1,310	680
Sea Level Rise 2100	1,470	3,230	1,620

*Listed as Linear Feet. All Other Resources Listed in Acres. All values rounded to closest 10.

5.1 Wetlands, Surface Waters, Water Quality, and Drinking Water Supply Sources

Wetland and surface water data were obtained from existing online GIS resources, including USFWS NWI, MDNR Wetland Inventory, the Maryland iMap Data Portal, and the MWRR, and do not represent the jurisdictional limit of wetlands/waters. However, these online resources are useful tools for natural resource planning for a Tier 1 Study.

The CBCS study area encompasses large areas of wetlands, open waters associated with the Bay, and multiple tributary riverine systems. The Eastern Shore systems consist of flat sandy plains cut by wide, slow-moving rivers bordered by swamp forests and tidal swamps. The west side of the bay is dominated by a broad plain with generally low slopes and gentle drainage divides dissected by a series of major rivers.

Figures 5-1, **5-2**, and **5-3** identify the general location of the highest concentrations of mapped wetland and surface water resources within the CBCS study area. **Figure 5-1** identifies the location of mapped NWI wetlands and surface waters within the CBCS study area. According to the mapping, the highest concentrations of NWI resources are located along the southern portion of the Eastern Shore, primarily within Dorchester, Wicomico, and Somerset Counties. Also located within this area is the Blackwater National Wildlife Refuge (NWR). The Blackwater NWR was established in 1933 as a waterfowl sanctuary for birds migrating along the Atlantic Flyway and consists of large areas of palustrine freshwater wetlands, freshwater impoundments, and brackish tidal wetlands.

Figure 5-2 identifies the location of mapped MDNR wetlands and Maryland Wetlands of Special State Concern (WSSC) within the CBCS study area. The highest concentration of MDNR wetlands and WSSC are also located along the southern portion of the Eastern Shore, primarily in Dorchester County. There are also smaller pockets of WSSC along the Western Shore in Calvert and St. Mary's County. As indicated in **Section 4.1**, WSSC are afforded additional levels of protected status, including a 100-foot wetland buffer.

Figure 5-3 identifies the location of Maryland Scenic and Wild Rivers and MDE Tier II High Quality Waters. According to these mapping resources, there are two Maryland Scenic and Wild Rivers within the CBCS study area, the Severn River, located along the middle section of the Western Shore near Annapolis, MD, and the Patuxent River, located along the southern section of the Western Shore near Solomons Island, MD. MDE Tier II High Quality Waters were identified primarily south of Solomons Island on the western shore and along the central portion of the Eastern Shore, near Queenstown, MD. No federally-designated Scenic and Wild Rivers were identified within the CBCS study area.

The limits of the study areas associated with Corridors 6, 7, and 8 were overlain with the NWI and MDNR wetlands, WSSC, and surface waters GIS layers to provide a comparative analysis of existing conditions and potential impacts associated with each two-mile wide corridor. The total amount of mapped non-tidal wetlands, tidal wetlands, which includes open waters of the Bay, and linear feet of surface water resources associated with tributary rivers and streams located within each of the three study corridors is provided in **Tables 5-2**, **5-3**, and **5-4** below. Also provided in the tables is the percentage of mapped resource area to total corridor study area.

The MWRR provides a comparative analysis by assigning a point value between one and five, with five representing the highest value, to potential wetland preservation areas. The limits of the study areas were

overlain with the MWRR Wetland Preservation GIS layer to determine the total acreage of wetland preservation areas with a point value of four or five. An assigned value of four or five represents the wetland areas with the highest potential to provide ecological benefits to their associated watershed. The results of this comparative analysis are also provided in **Table 5-2** below.

Table 5-2: Mapped Wetlands and Surface Water Resources

CORRIDOR	NWI NON-TIDAL WETLANDS (ACRES)	MDNR NON-TIDAL WETLANDS (ACRES)	WETLANDS OF SPECIAL STATE CONCERN (ACRES)	NON-TIDAL WETLAND PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	HIGH VALUE MWRR WETLAND PRESERVATION AREAS (ACRES)
6	1,340	1,200	80	4%	56
7	1,520	1,500	10	5%	4
8	2,270	2,080	0	5%	50

Note: values rounded to closest 10, except MWRR wetlands which are rounded to the closest acre.

Table 5-3: Mapped Tidal Wetlands

Corridor	MDNR TIDAL WETLANDS	TIDAL WETLAND PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	18,460	53%
7	10,870	39%
8	24,940	53%

Note: values rounded to closest 10.

Table 5-4: Mapped Surface Waters

Corridor	River And Stream Surface Waters (LF)	Surface Waters of the Bay (Acres)	Surface Water Percentage of Total Corridor Study Area
6	344.380	18,080	52%
7	394,020	9,600	34%
8	471,890	24,480	52%

Note: values rounded to closest 10.

Table 5-5 below provides a breakdown of the MDNR mapped wetlands within each corridor by the associated Cowardin wetland classification code and percentage of the total. Cowardin wetland classification codes used for this analysis are as follows:

- ES – Estuarine
- L – Lacustrine
- PEM – Palustrine Emergent
- PFO – Palustrine Forested
- PSS – Palustrine Scrub/Shrub
- PUB – Palustrine Unconsolidated Bottom
- PUS – Palustrine Unconsolidated Shore

Figure 5-1: NWI Resources

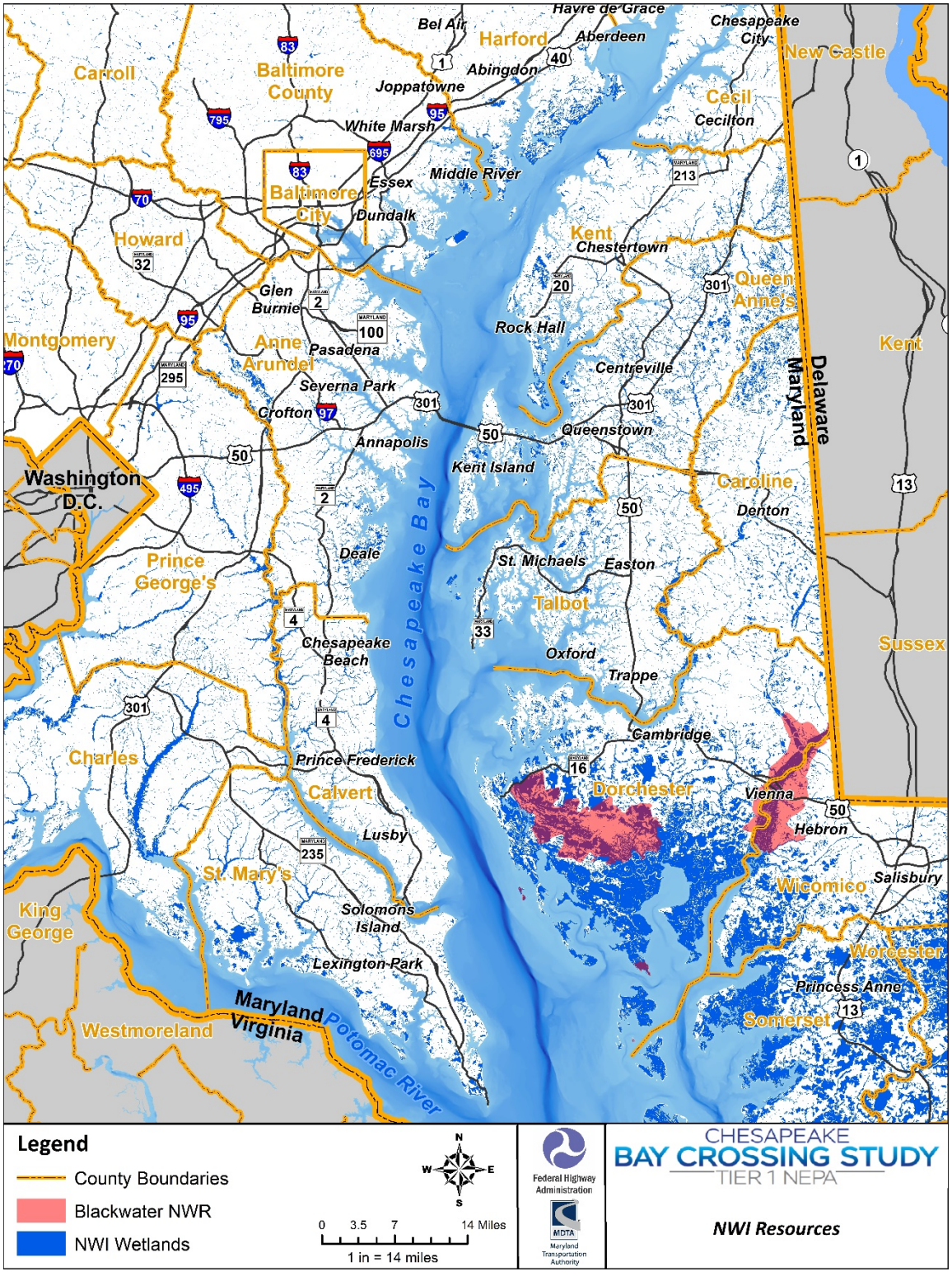


Figure 5-2: DNR Wetlands and Wetlands of Special State Concern

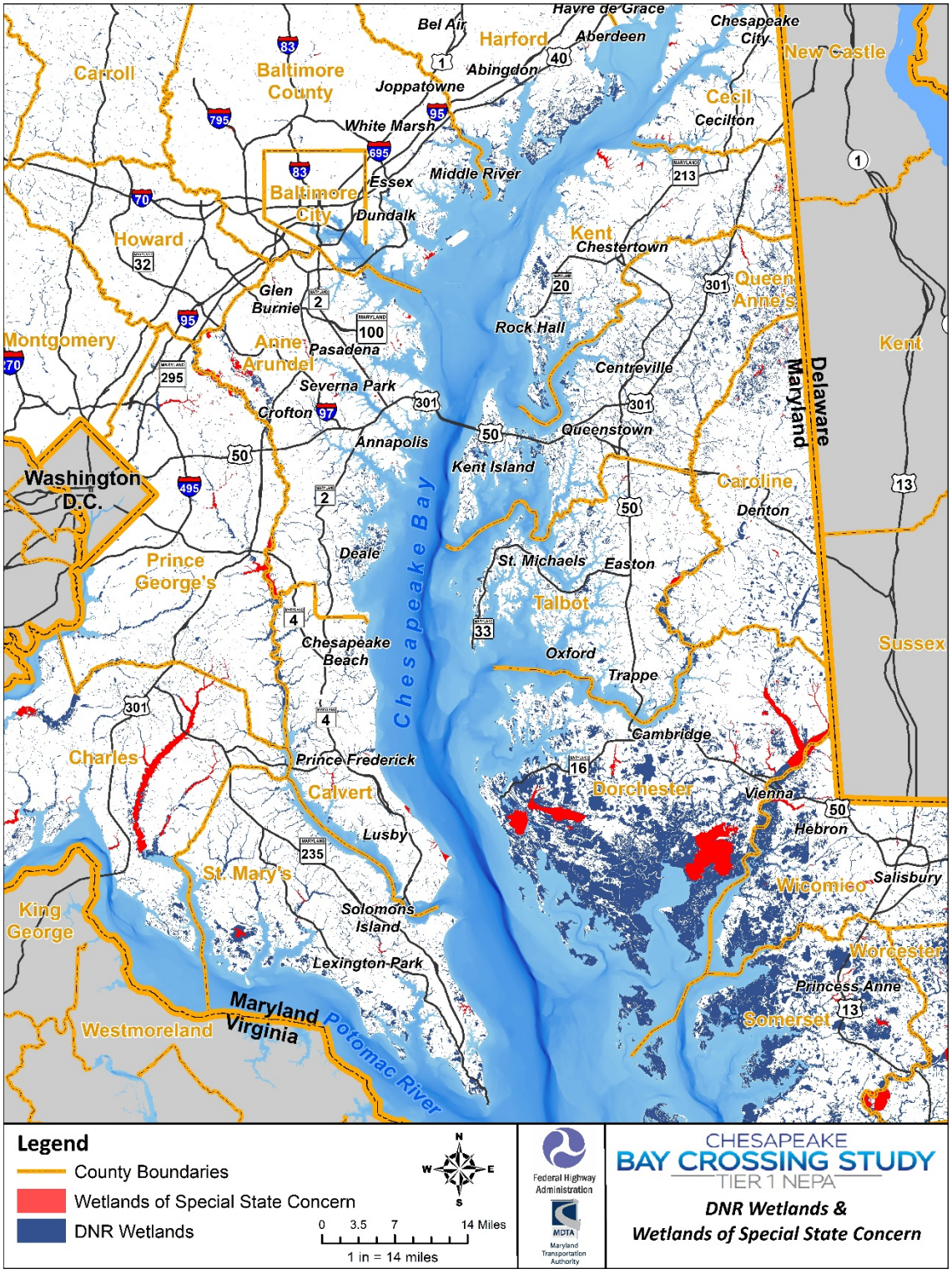
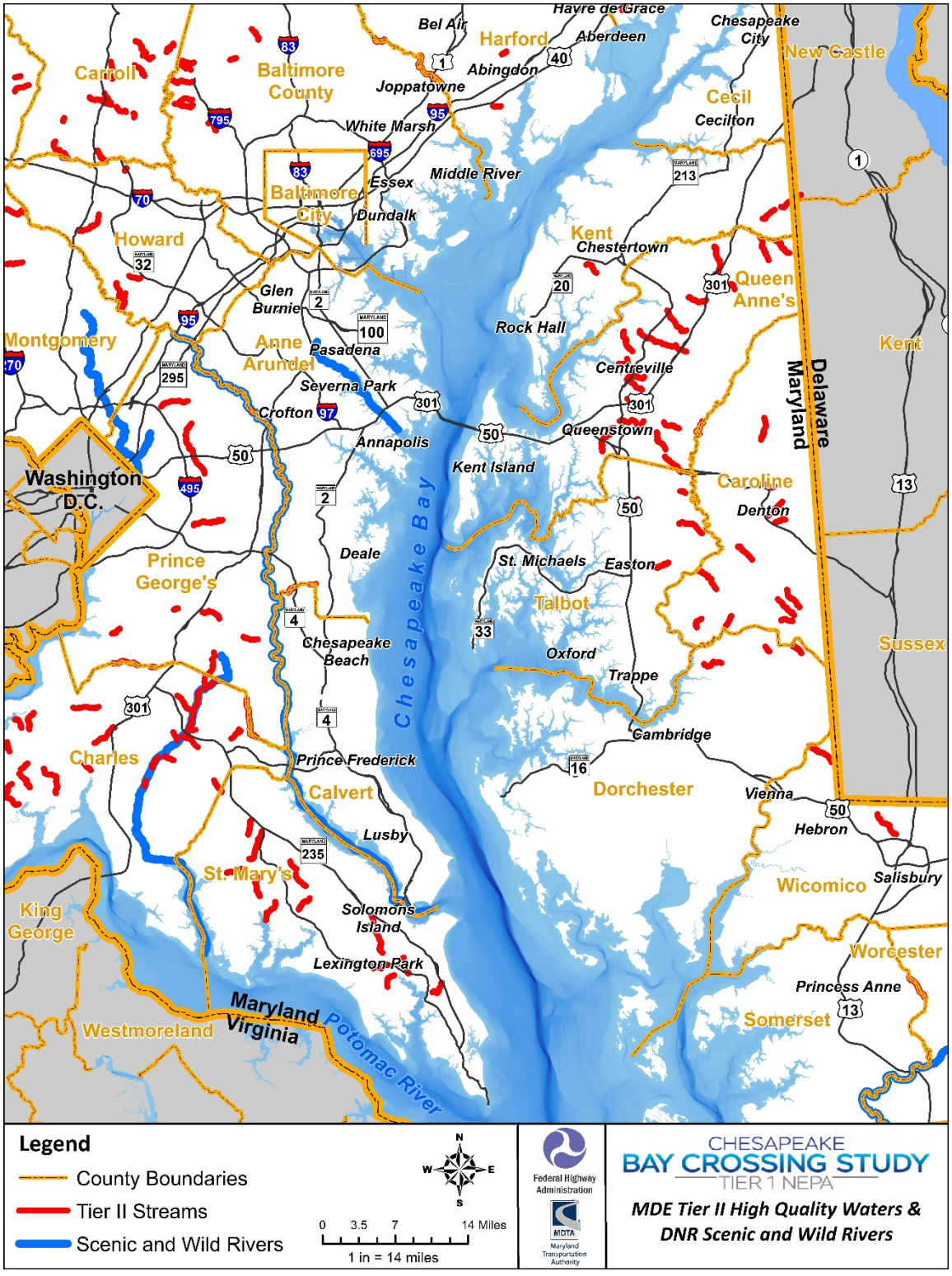


Figure 5-3: MDE Tier II High Quality Waters and DNR Scenic and Wild Rivers



According to the data, the vast majority of mapped MDNR wetlands identified within the corridors are classified as Estuarine (ES) wetlands followed by a relatively large percentage of PFO wetlands. The percentage distribution of wetland types is relatively uniform between the three corridors (**Table 5-5**).

Table 5-5: Mapped MDNR Wetlands by Cowardin Wetland Classification (Percentage of total)

Corridor	ES	L	PEM	PFO	PSS	PUB	PUS
6	89.2%	0.2%	0.7%	8.8%	0.3%	0.9%	0%
7	88.0%	0%	0.7%	10.3%	0.5%	0.6%	<0.1%
8	88.6%	0%	0.2%	10.0%	0.4%	0.8%	<0.1%

5.1.1 Corridor 6

Wetlands

Corridor 6 extends from Pasadena, west of the Bay, to Centreville east of the Bay. The corridor contains approximately 1,340 acres of mapped non-tidal NWI wetlands, 1,200 acres of mapped non-tidal MDNR wetlands, and 80 acres of mapped WSSC. Mapped non-tidal wetlands constitute approximately 4 percent of the total area associated with Corridor 6. Corridor 6 also contains approximately 18,460 acres of mapped tidal wetlands, of which, 18,080 acres consist of open waters of the Bay. The remaining tidal wetlands consist of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 52 percent of the total corridor study area.

The total acreage of wetland preservation area identified by the MWRR with a point value of four or five is 56. This represents the largest total of high value wetland preservation areas of the three corridor study areas. The vast majority of these high value areas are located within Kent County in the eastern portion of the corridor study area, east of the Bay.

The majority of the mapped wetlands associated with Corridor 6 are located east of the Bay, just south of Rock Hall, MD (**Figures 5-4 and 5-5**). The extreme western portion of the corridor, along MD 177, is highly developed and consists largely of retail establishments and residential development along both sides of the roadway with little to no mapped wetlands. The largest concentration of mapped NWI and MDNR wetlands within the western portion of Corridor 6, west of the Bay, are located between North Shore Road and Hickory Point Road and were identified both north and south of MD 177. This area also contains the 76 acres of mapped WSSC. The WSSC are associated with Fresh Pond, the Magothy Greenway Natural Area, and the North Greys Creek Bog Tributary.

The eastern side of the Bay is more rural in nature and consists largely of farmland and low-density residential housing. The majority of the mapped wetlands in this area are located east of MD 445 (Eastern Neck Island Road). On the eastern side of the Chester River, near the town of Centreville, the mapped wetlands are concentrated along the river shoreline with sparse concentrations as the corridor continues east.

Figure 5-4: CARA NWI Resources

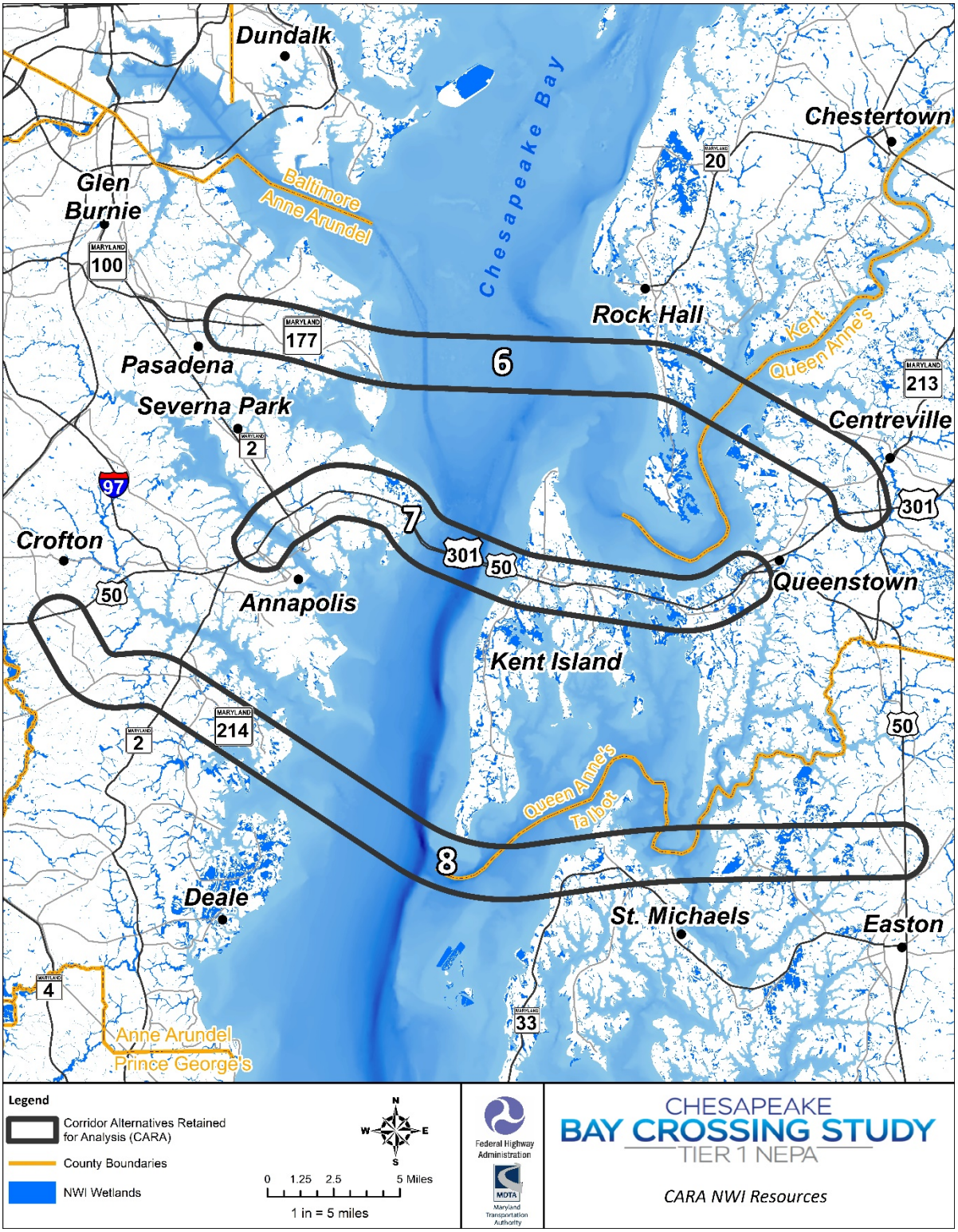
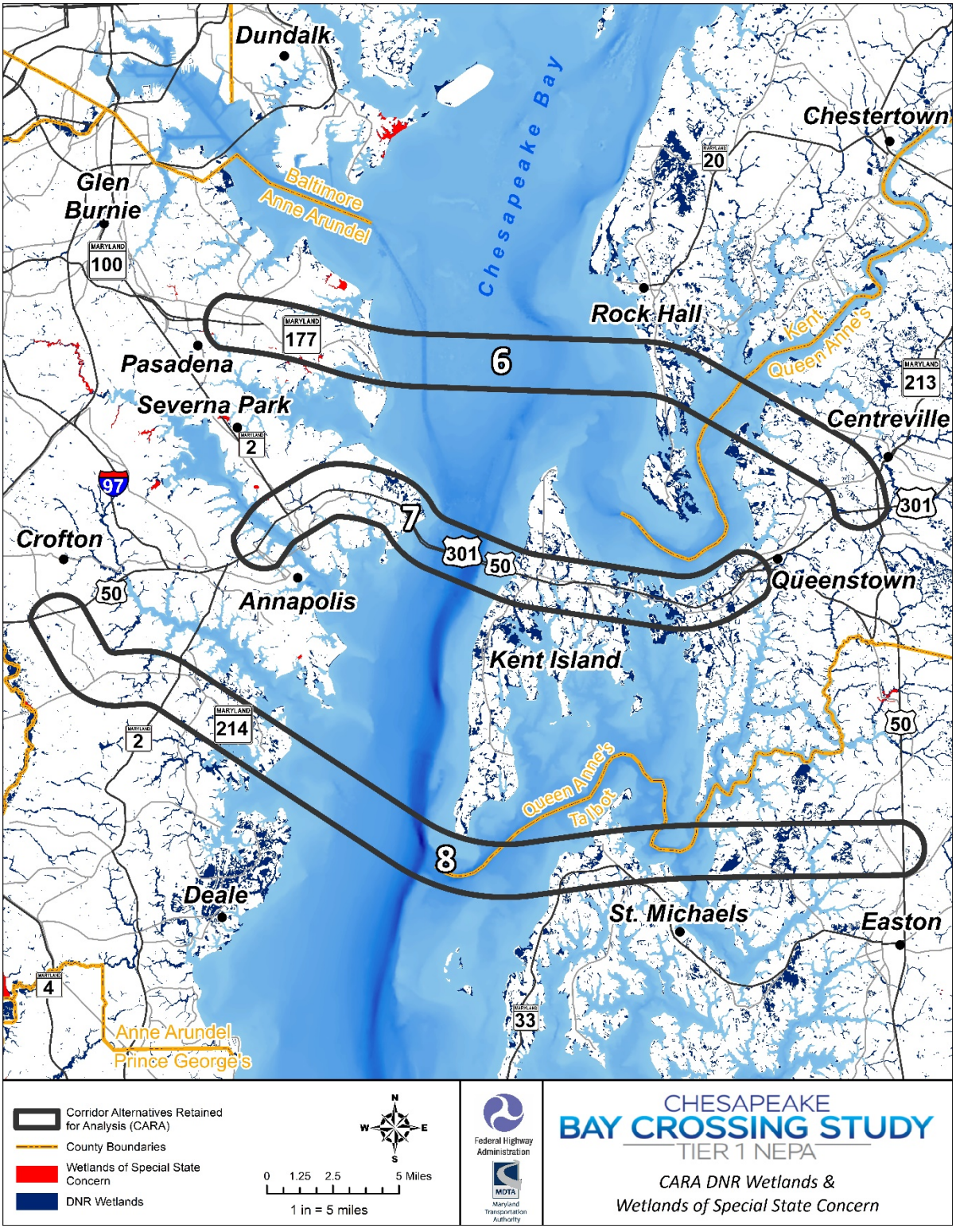


Figure 5-5: CARA DNR Wetlands and Wetlands of Special State Concern



The majority of the wetlands associated with Corridor 6 are classified as Estuarine (ES) (89.2%) with lesser concentrations of Palustrine Forested (PFO) (8.8%). Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), Lacustrine (L), and Palustrine Unconsolidated Bottom (PUB) wetlands each constitute less than 1% of the remaining total.

Based on the location of mapped wetland resources within Corridor 6, the largest amount of impacts would likely occur within the eastern section of the corridor just south of Rock Hall with the least amount of potential impacts within the western section of the corridor, between Pasadena, MD and the shoreline of the Bay. Coordination with MDE and USACE would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

Surface Waters

Corridor 6 contains approximately 344,380 linear feet of mapped surface waters associated with tributary rivers and streams, and 18,080 acres of surface water area associated with the Bay (**Figure 5-6**). Beginning in the western section, before the Bay, the corridor intersects multiple mapped tributary surface waters including, from west to east, Baily's Branch, Rock Creek, Brookfield Branch, Beachwood Branch, Nanny's Branch, Main Creek, South Greys Creek, North Greys Creek, Cornfield Creek, and Locust Cove Creek. Generally, surface waters on the north side of MD 177 drain north while surface waters on the south side of MD 177 drain south. The surface waters west of the Bay are classified as Use Class I until they reach the limits of tide where they are classified as Use Class II.

On the east side of the Bay, between the Bay and the Chester River, Corridor 6 intersects with the lower stem of the Chester River, Church Creek, and Grays Inn Creek. On the east side of the Chester River, near the town of Centreville, the corridor intersects with Corsica River tributaries, Chester River tributaries, Grove Creek, Reed Creek, Earle Creek, Mill Stream and Gravel Run. Mill Stream and Gravel Run are classified as Tier II High Quality Waters. The tributary surface waters west of the Bay are classified as Use Class I until they reach the limits of tide where they are classified as Use Class II.

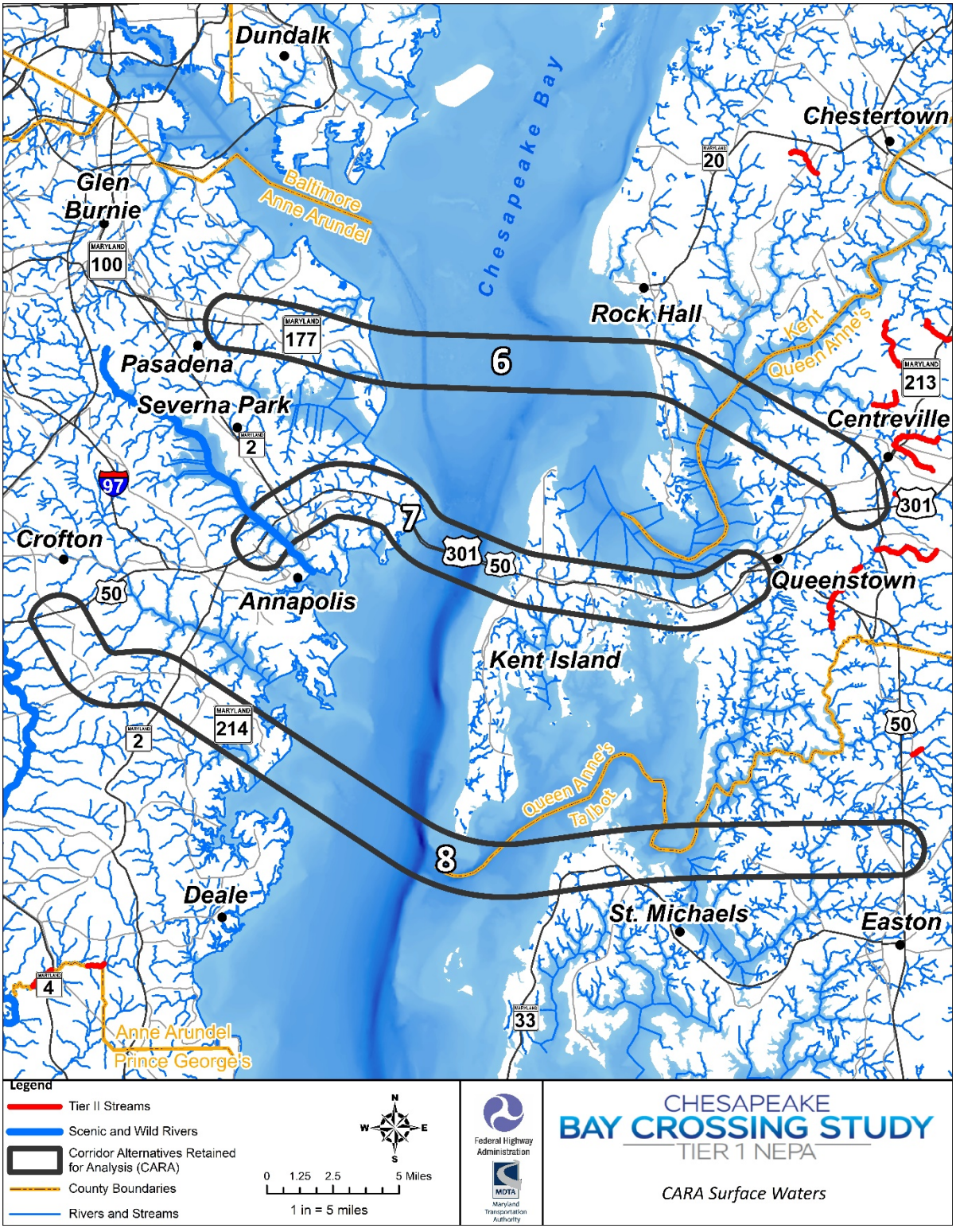
Surface waters within the limits of Corridor 6 are fairly evenly distributed. Coordination with MDE and USACE would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

5.1.2 Corridor 7

Wetlands

Corridor 7 includes the existing Bay Bridge alignment and contains approximately 1,520 acres of mapped non-tidal NWI wetlands, 1,500 acres of mapped non-tidal MDNR wetlands, and 10 acres of mapped WSSC. Mapped non-tidal wetlands constitute approximately 5 percent of the total area associated with Corridor 7. Corridor 7 also contains approximately 10,870 acres of mapped tidal wetlands, of which, 9,600 acres consist of open waters of the Bay. The remaining tidal wetlands consist of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 34 percent of the total corridor study area. (**Figures 5-4** and **5-5**).

Figure 5-6: CARA Surface Waters



There are a total of four acres of wetland preservation area identified by the MWRR with a point value of four or higher in Corridor 7. This represents the lowest total of high value wetland preservation areas of the three corridor study areas. The majority of these high value areas are located within Queen Anne's County in the eastern portion of the corridor study area, east of the Bay.

The western portion of Corridor 7, west of the Bay, consists largely of residential development and associated retail establishments with relatively large areas of undeveloped forested areas. The majority of the mapped wetlands west of the Bay are located north of the US 50/301 alignment and within Sandy Point State Park. Very little mapped wetland resources are located on the south side of US 50/301 west of the Bay. The central portion of Corridor 7 spans Kent Island. Although Kent Island is highly developed, a relatively high concentration of mapped wetland resources were identified both north and south of the US 50/301 alignment. Wetlands on Kent Island were concentrated around the existing tidal waterways which bisect the corridor. The highest concentration of mapped wetlands associated with Corridor 7 were identified east of Kent Island and along the Eastern Shore. This section of the corridor is typical of Eastern Shore communities and transitions to low-density residential and farmlands just west of Queenstown. The highest concentration of mapped wetlands on the Eastern Shore were identified south of the US 50/301 alignment, west of Perry's Corner Road and along the shoreline of Marshy Creek.

The majority of the wetlands associated with Corridor 7 are classified as Estuarine (ES) (88%) with lesser concentrations of Palustrine Forested (PFO) (10%). Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), Palustrine, Unconsolidated Bottom (PUB) and Palustrine Unconsolidated Shore (PUS) wetlands each constitute less than 1% of the remaining total.

Based on the location of mapped wetland resources within Corridor 7, the largest amount of potential impacts would occur within the section of the corridor along Kent Island and the eastern extent of the corridor, between Queenstown, MD and the Bay. Impacts to mapped wetlands within the western section of Corridor 7 can be minimized by avoiding the northern portion of the corridor, just west of the Bay. Coordination with MDE and USACE would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

Surface Waters

Corridor 7 contains approximately 394,020 linear feet of mapped surface waters associated with tributary rivers and streams, and 9,600 acres of surface water area associated with the Bay (**Figure 5-6**). The western portion of the corridor intersects with the Severn River and multiple tributaries to the Severn River within the extreme western portion of the study area. The Severn River is classified by MDNR as a Scenic and Wild River. Continuing east, Corridor 7 intersects with Mill Creek, Whitehall Creek, and Meredith Creek before spanning the Bay. As it continues east across the Bay, Corridor 7 intersects with Thompson Creek and Cox Creek on Kent Island, and the Wye River and Wye River East within the eastern portion of the corridor. The Wye River is classified as a Tier II High Quality Water. The larger, tidal waters associated with Corridor 7 are classified as Use Class II waters, while the smaller, non-tidal tributaries are classified as Use Class I.

Surface waters with the limits of Corridor 7 are fairly evenly distributed with slightly higher concentrations west of the Bay. Coordination with MDE and USACE would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

5.1.3 Corridor 8

Wetlands

Corridor 8 contains approximately 2,270 acres of mapped non-tidal NWI wetlands, 2,080 acres of mapped non-tidal MDNR wetlands. Mapped non-tidal wetlands constitute approximately 5 percent of the total area associated with Corridor 8. Corridor 8 also contains approximately 24,940 acres of mapped tidal wetlands, of which, 24,480 acres consist of open waters of the Bay. The remaining tidal wetlands consist of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 53 percent of the total corridor study area. This represents the highest total of mapped NWI and MDNR wetlands of the three corridors (**Figures 5-4 and 5-5**). There are no WSSC identified within the limits of Corridor 8.

Corridor 8 contains a total of 59 acres of wetland preservation area identified by the MWRR with a point value of four or five. The vast majority of these high value areas are located within Talbot County in the eastern portion of the corridor study area, east of the Bay. It should be noted Corridor 8 is the only study area with wetland preservation areas with a value of 5.

The western portion of Corridor 8 begins just south of Crofton, at the intersection of US 50/301 and MD 42 and extends southeast to the Bay. This portion of the corridor consists largely of low density residential development and farmland. The majority of the mapped wetlands within the western section of the corridor are located adjacent to the Bay with sparsely mapped wetlands west of MD 2. The highest concentration of mapped wetlands within Corridor 8 are located north of MD 33, near the town of St. Michaels, and between the Bay and US 50, along the Eastern Shore. This section of Corridor 8 consists primarily of low-density residential and farmland.

The majority of the wetlands associated with Corridor 8 are classified as Estuarine (ES) (88.6%) with lesser concentrations of Palustrine Forested (PFO) (10%). Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), Palustrine, Unconsolidated Bottom (PUB) and Palustrine Unconsolidated Shore (PUS) wetlands each constitute less than 1% of the remaining total.

Based on the location of mapped wetland resources within the limits of Corridor 8, the largest amount of potential impacts would occur within the eastern extent of the corridor, along the Eastern Shore. The least amount of potential impact would occur within the western extent of the corridor, west of MD 2. Coordination with MDE and USACE would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

Surface Waters

Corridor 8 contains approximately 471,890 linear feet of mapped surface waters associated with tributary rivers and streams, and 20,480 acres of surface water area associated with the Bay (**Figure 5-6**). Between US 50 and the Bay, Corridor 8 bisects several smaller streams including Tarnans Branch, several unnamed tributaries to the Patuxent River, Flat Creek, Chandlers Branch, Kings Branch, Marriots Branch, Davidsonville Branch, Beards Creek, Glebe Branch, Pocahontas Creek, Bear Neck Creek, Sellman Creek, and, as the corridor approaches the bay, the tidal South River and the Rhode River. The non-tidal tributaries in this area are classified as Use Class I while the tidal systems are classified as Use Class II.

As it continues east across the Bay, Corridor 8 intersects with the tidal Harris Creek, Broad Creek, Edge Creek, Tred Avon River, the Choptank River, and several non-tidal tributaries to these systems. The non-tidal tributaries in this area are classified as Use Class I while the tidal systems are classified as Use Class II. There are no mapped Wild and Scenic Rivers within the limits of Corridor 8. The watershed for Kings Creek, a Tier II High Quality Water, is located within eastern portion of Corridor 8.

Surface waters with the limits of Corridor 8 are fairly evenly distributed with slightly higher concentrations east of the Bay. Coordination with MDE and USACE would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

5.1.4 Conclusions

Results of the GIS based mapping inventory for wetlands and surface waters indicate that the highest total of mapped non-tidal, tidal wetland, and waters resources are associated with Corridor 8. This includes the total surface area of open waters of the Bay. Corridor 8 also contained the highest amount of mapped tributary rivers and streams.

Based on the Maryland WRR, Corridors 6 and 8 contain the highest total amount of wetland preservation areas with a point value of 4 or higher. The majority of these high value areas are located within the eastern portion of the corridor study areas, east of the Bay. Corridor 8 was the only corridor with wetland preservation areas with a point value of 5.

Impacts to jurisdictional tidal or non-tidal WOTUS will require coordination with MDE and USACE once a limit of disturbance associated with a more defined project area is established. In cases where mapped resources span the width of the corridor study area, impacts would be unavoidable. In these cases, avoidance and minimization efforts should be employed to the maximum extent practicable. These efforts include incorporation of specific avoidance strategies and Best Management Practices (BMP).

For unavoidable impacts, mitigation must follow the replacement guidelines associated with the regulatory permit requirements applicable at the time of construction. Typically mitigation includes replacing the impacted wetland areas with wetlands of similar functions and values, ideally as geographically close to the area of the impacted wetlands as possible. The ratio of replacement wetland to acres of impacts varies depending on whether the mitigation provides for similar functions and values, occur in the same watershed, and other factors. For impacts to streams, maintaining naturalized stream

corridors and aquatic passage at newly constructed road crossings or road widening areas will be a priority.

Drinking Water Resources

A search of online resources was conducted to determine whether the study area corridors intersected with any sole source aquifers or drinking water reservoirs. According to the EPA's National GIS database there were no SSAs within the study area limits of the three study area corridors (**Figure 5-7**). Also, according to MDNR's Maryland Geological Survey, there are no drinking water supply reservoirs within the limits of study area corridors (**Figure 5-7**).

GIS layers of wellhead protection areas (WHPA) are not available for Maryland. WHPAs require a field delineation or a request can be made to MDE's Water Supply Program to assist in defining the area. Coordination with MDE will be required concerning the location and potential impacts to WHPA's should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

5.2 FEMA 100-Year Floodplain

The 100-year floodplain is the land that is predicted to flood during a 100-year storm, which has a 1-percent chance of occurring in any given year. Based on the expected 100-year flood flow rate, the flood water level can be mapped as an area of inundation. The resulting floodplain map is referred to as the 100-year floodplain.

Impacts to the jurisdictional 100-year floodplain associated with non-tidal waters are authorized via the USACE/MDE JPA process. The majority of mapped 100-year floodplains throughout all three corridors are tidal with lesser concentrations of non-tidal floodplain associated with smaller, non-tidal creeks and tributaries.

As identified on **Figure 5-8** (100-Year Floodplain), the highest concentration of jurisdictional 100-year floodplain within the entire CBCS study area is located along the southern portion of the Maryland Eastern Shore, primarily within Dorchester, Wicomico, and Somerset Counties. The broad, expansive floodplain within this area is a result of the low-lying, flat topography of the southern portion of the Eastern Shore. This area is especially susceptible to flooding associated with tide and storm surge. Distribution of the 100-year floodplain throughout the remainder of the CBCS study area is relatively uniform with slightly higher concentrations along the western shore, between Aberdeen and Baltimore.

Figure 5-9 provides a graphic depiction of the location and distribution of the 100-year floodplain within each of the three corridor study areas. **Table 5-6** below provides a breakdown of the total area, in acres, of 100-year floodplain within each of the corridors.

Table 5-6: 100-Year FEMA Floodplain

Corridor	100-Year FEMA Floodplains (acres)	Percentage of Total Corridor Study Area
6	3,050	9%
7	6,640	24%
8	3,950	8%

Figure 5-7: Drinking Water Supply Sources

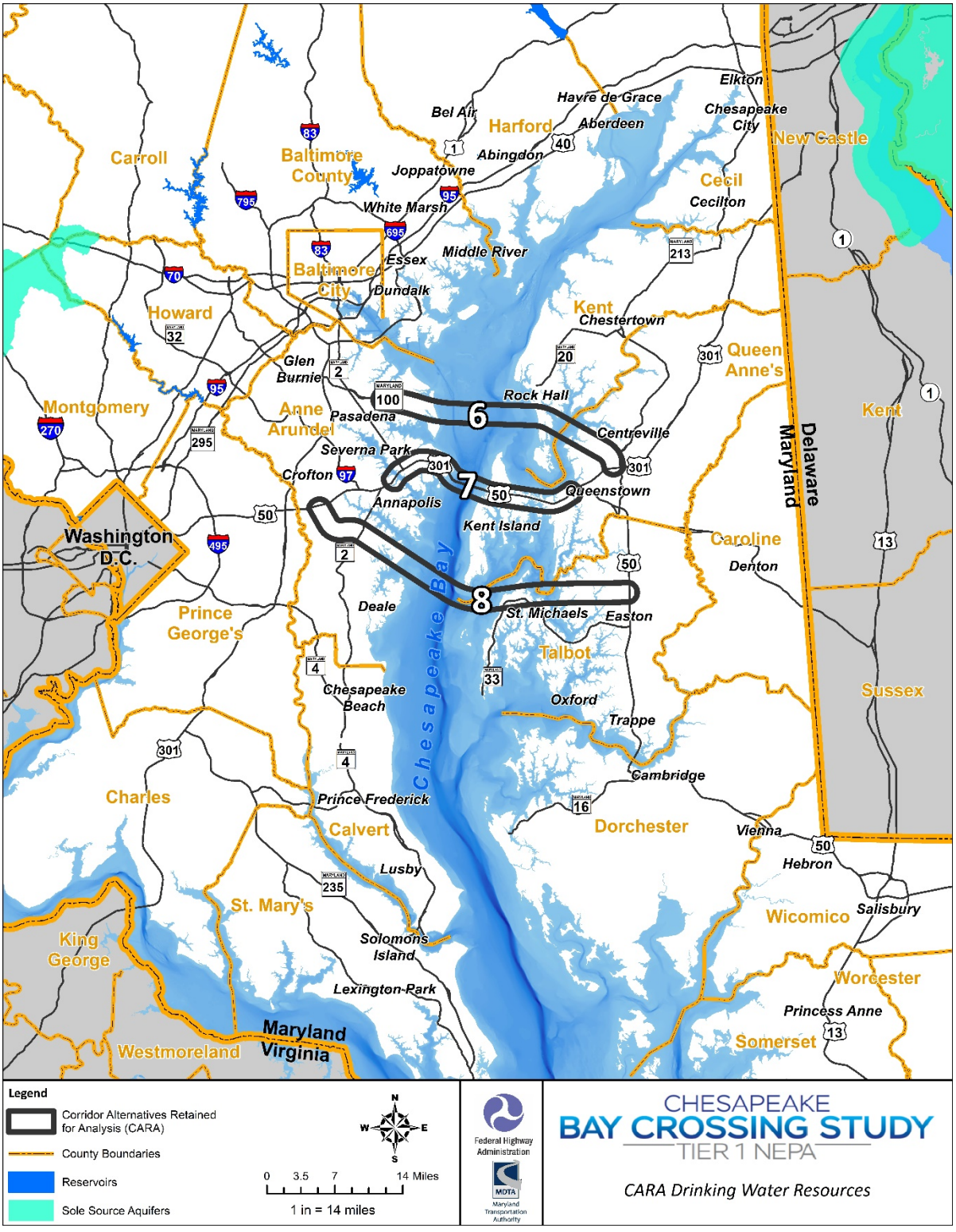
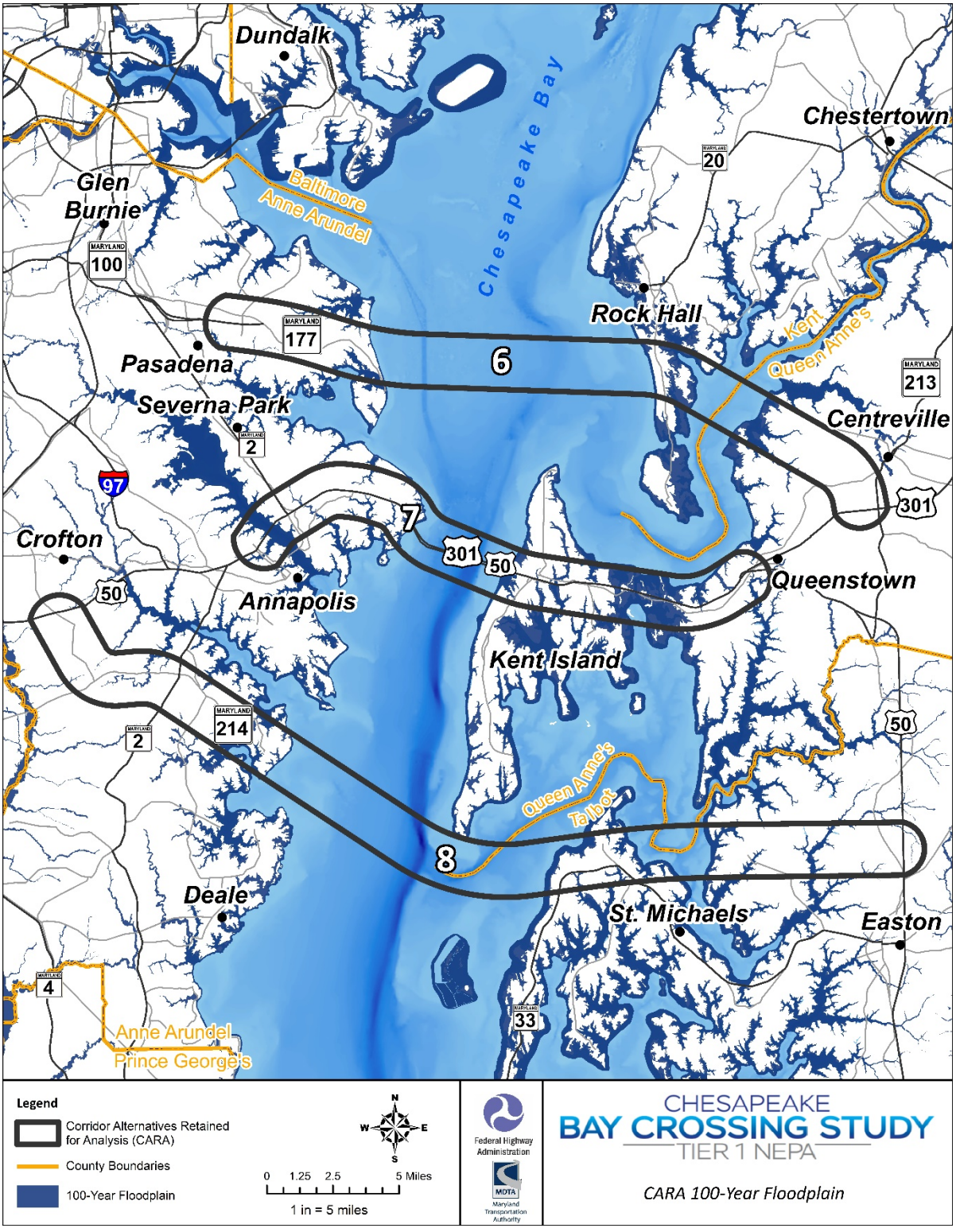


Figure 5-8: 100-Year Floodplain

Figure 5-9: CARA 100-Year Floodplain



5.2.1 Corridor 6

Corridor 6 contains approximately 3,050 acres of 100-year FEMA floodplain and intersects the least amount of mapped floodplain of the three corridors (**Figure 5-9**). The western portion of Corridor 6 contains very little mapped floodplain with the exception of the area associated with Sillery Bay, the Magothy River, and the Chesapeake Bay. The eastern side of the corridor, along the Eastern Shore contains large areas of mapped floodplain which are primarily associated with tidal waters of the Chester River and the Bay. Mapped floodplain within the eastern extent generally spans the entire corridor width.

Based on the distribution of 100-year FEMA floodplain within the limits of Corridor 6, the area with the highest potential for impacts is located just south of Rock Hall, MD and along the west bank of the Chester River. The majority of the floodplain within the western section of Corridor 6 could be avoided by placing an alignment within the central portion of the corridor.

5.2.2 Corridor 7

Corridor 7 contains approximately 6,640 acres of mapped 100-year FEMA floodplain and intersects the largest area of floodplain of the three corridors (**Figure 5-9**). Within the western portion of Corridor 7, along US 50, the largest area of floodplain spans the entire width of the study area and is associated with tidal portions of the Severn River and the non-tidal floodplains associated with several Severn River tributaries. Further east, Corridor 7 intersects with the tidal floodplains associated with Mill Creek, Whitehall Creek, Meredith Creek, and the floodplain adjacent to the Bay. Large areas of tidal wetlands are located on Kent Island within Corridor 7, primarily between Kent Island and the Eastern Shore. The tidal floodplains identified on Kent Island are those associated with the shoreline the Bay on both sides of the Island, Thompson Creek, Cox Creek, Crab Alley Creek, and Kirwan Creek. The portion of Corridor 7 that spans the Eastern Shore intersects with tidal floodplains associated with the Chester River and Winchester Creek along the northern side of the alignment, and the Wye River along the southern side.

Based on the distribution of 100-year FEMA floodplain within the limits of Corridor 7, the area with the highest potential for impacts is located within the eastern section of the corridor, between Kent Island and the Eastern Shore.

5.2.3 Corridor 8

Corridor 8 contains approximately 3,950 acres of mapped 100-year floodplain (**Figure 5-9**). Within the western portion, Corridor 8 intersects with the floodplain associated Flat Creek, King's Branch, and Beards Creek. Further east, Corridor 8 intersects floodplain associated with several tidal waters including Bear Neck Creek, Whitemarsh Creek, Sellman Creek, Muddy Creek, Williamson Branch, Mill Swamp Branch, and the mapped floodplain adjacent to the Bay. After spanning the open waters of the Bay, Corridor 8 intersects the tidal floodplain associated with the shoreline of the Bay, Harris Creek, the Miles River, the Tred Avon River, and the Choptank River. The mapped floodplains within the limits of Corridor 8 generally extend the entire width of the corridor.

Based on the distribution of 100-year FEMA floodplain within the limits of Corridor 8, the area with the highest potential for impacts is located just south of MD 14, within the western section of the corridor.

5.2.4 Conclusions

Based on the orientation of existing floodplains related to the proposed corridors, the majority of floodplain encroachments within either of the three corridors would be from perpendicular crossings.

Perpendicular crossings typically result in less floodplain fill and maximizes floodwater conveyance and storage compared with longitudinal encroachments. During the project design phase, a hydrologic and hydraulic analysis would be required by MDTA to evaluate potential floodplain impacts. The results of the study would be used to provide adequate design to ensure proper conveyance of floodwaters to minimize potential impacts to floodplains and downstream properties.

According to FEMA floodplain mapping, the highest amount of mapped 100-year floodplain is associated with Corridor 7. However, much of the mapped floodplain is associated with the open waters of the Severn River and open waters of the Bay in the vicinity of Kent Island.

Measures to limit potential effects to the mapped floodplains should be incorporated into the planning and design process should a corridor alternative be carried forward for further evaluation during a Tier 2 evaluation. Impacts to the jurisdictional 100-year floodplain associated with non-tidal waters are authorized by MDE via the JPA process. The majority of mapped 100-year floodplains throughout all three corridors are tidal with lesser concentrations of non-tidal floodplain associated with smaller, non-tidal creeks and tributaries. Because the mapped floodplain spans the entire width of the corridor study areas in several places, impacts to floodplain resources would be unavoidable.

Avoidance and minimization efforts should be employed to the maximum extent practicable consistent with permitting and other regulatory requirements and Executive Order 11988. EO 11988, Floodplain Management, requires federal agencies to implement effective planning measures designed to avoid long- and short-term adverse impacts associated with development and modification of the 100-year floodplain, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. EO 11988 further states that each agency shall take appropriate action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

5.3 Chesapeake Bay Critical Area

The Chesapeake Bay Critical Area encompasses land that is within 1,000 feet of the mean high tide line of the bay and adjacent streams and rivers. The CAC also regulates a 100-foot buffer which consists of the first 100-feet landward of tidal waters, tidal wetlands, or tributary streams. For further protection, the 100-foot buffer is expanded for steep slopes, adjacent non-tidal wetlands, and hydric or highly erodible soils.

Figure 5-10 identifies the location within the entire CBCS study area of the three land classifications discussed in **Section 4.3**, including the IDA, RCA, and LDA, but also includes two additional areas identified as Corporate Land (CL) and Federal Land (FED). These designations are for lands that are corporately owned or owned by the federal government and are not classified as RCA, LDA, or IDA because activities on these lands are not directly regulated through the state's Critical Area Program but are regulated through the Coastal Zone Management Act.

Figure 5-10: Chesapeake Bay Critical Area

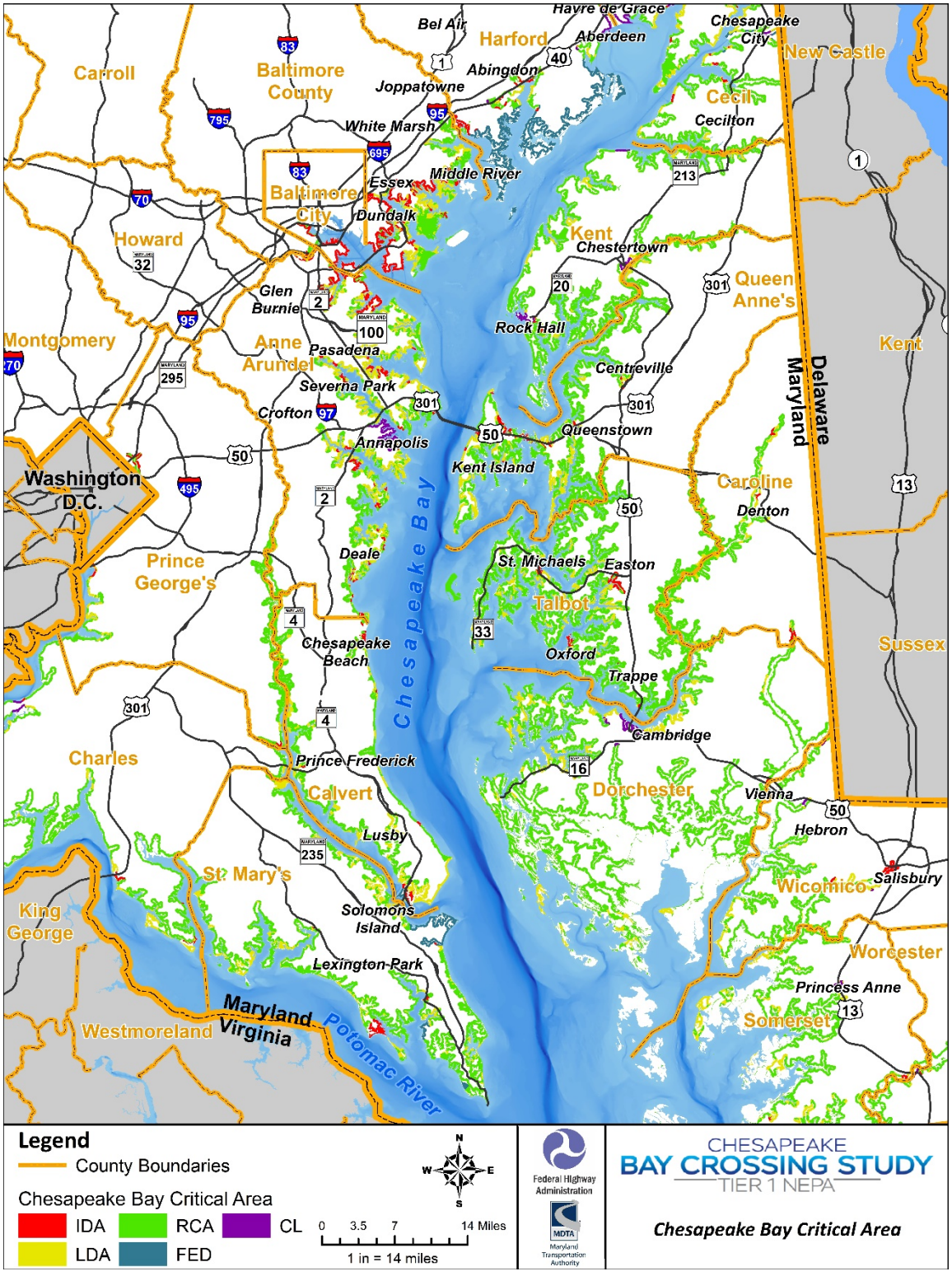


Figure 5-11 provides a graphic depiction of the location and distribution of Critical Area within the limits of the three study area corridors. This data was obtained from the Maryland iMap GIS data portal. **Table 5-7** below provides a breakdown of total area, in acres, of IDA, LDA, and RCA located within the limits of the three study area corridors.

Table 5-7: Chesapeake Bay Critical Area

Corridor	IDA (acres)	LDA (acres)	RCA (acres)	Total Within Corridor (acres)	Percentage of Total Corridor Study Area
6	50	1,080	3,780	**4,910**	**14%**
7	1,300	3,370	5,140	**9,810**	**35%**
8	160	1,420	6,540	**8,120**	**17%**

5.3.1 Corridor 6

Corridor 6 contains approximately 4,910 acres of land area that falls within the limits of the Critical Area, the overall majority of which is classified as RCA (**Figure 5-11**). Within the western extent, the Critical Area is generally limited to the northern and southern edges of the corridor until it spans the western shoreline area of the Bay. The majority of Critical Area within the western extent of Corridor 6 is classified as RCA with lesser concentrations of LDA. One small roughly 50-acre section of IDA was identified within the western portion of the Corridor 6 and was associated with the Long Point neighborhood along Sillery Bay. The eastern portion of Corridor 6 intersects Critical Area along the entire width at the eastern shoreline of the Bay and along both banks of the Chester River. Mapped Critical Area along the Eastern Shore is primarily RCA with lesser concentrations of LDA.

5.3.2 Corridor 7

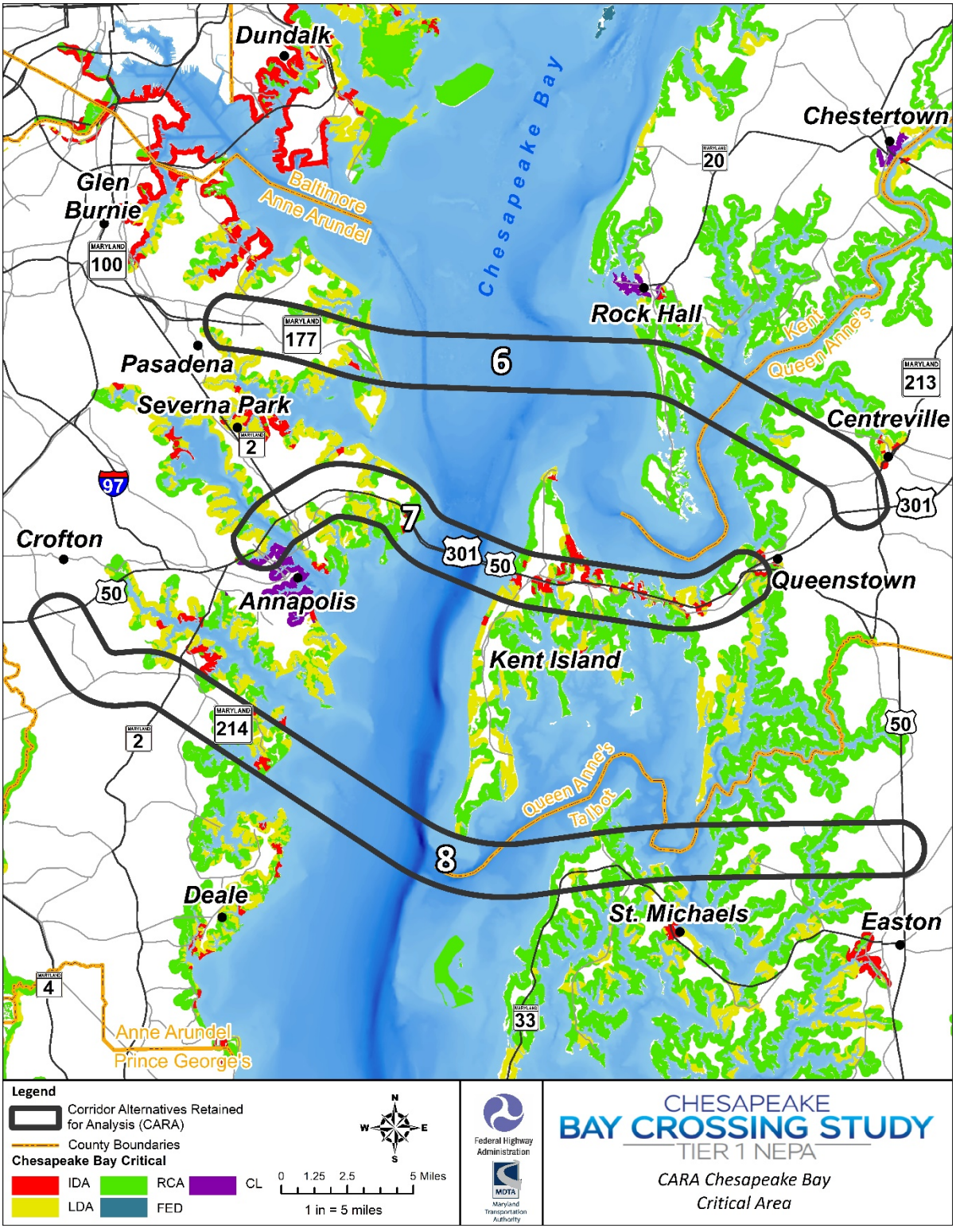
Corridor 7 contains approximately 9,810 acres of land that falls within the limits of the Critical Area. The majority is classified as RCA but the corridor also contains relatively high levels of LDA and IDA (**Figure 5-11**). Within the western extent, the Critical Area is primarily associated with the Severn River and the western shoreline of the Bay. A large portion of the western extent of Corridor 7, primarily along the northern corridor border, is located outside the limits of the Critical Area. A large are of CL is mapped within the western portion of Corridor 7, just north of Annapolis, MD. Impacts to CL are administered under the Coastal Zone Management Act, not the Critical Area Program.

The majority of the section of Corridor 7 that spans Kent Island is located within the limits of the Critical Area and due to the high level of existing development, the majority of IDA identified within Corridor 7 occurs on Kent Island. The eastern extent of the corridor intersects with the Critical Area associated with the Wye River and the south bank of the Chester River.

5.3.3 Corridor 8

Corridor 8 contains approximately 8,120 acres of land that falls within the limits of the Critical Area (**Figure 5-11**). The western extent of Corridor 8 contains relatively little Critical Area with the exception of where the corridor spans the western shore of the Bay. A small area of IDA is also located within the western portion of the corridor, just south of MD 214.

Figure 5-11: CARA Chesapeake Bay Critical Area



The majority of mapped Critical Area associated with Corridor 8 is located within the eastern portion of the Corridor, along the Eastern Shore. RCA constitutes the majority of Critical Area within Corridor 8. Lesser concentrations of LDA were also mapped with the majority occurring within the western portion of the corridor along the Bay.

5.3.4 Conclusions

The Maryland Assembly enacted the Critical Area Act (CAA) in 1984 to address the increasing pressure placed on the Bay associated with land use and population growth. The CAA allows state and local governments to work together to address land development impacts on aquatic habitats and resources by developing specific local programs that would minimize adverse impacts to water quality caused by pollutants in runoff, conserve fish, wildlife and plant habitat within the critical area, and establish land use policies which would accommodate growth.

For any corridor alternative, the majority of mapped Critical Area occurs in areas identified as RCA. RCAs consist primarily of natural areas or areas where resource utilization activities are taking place. Because RCAs make up most of the Critical Area and provide the greatest opportunity for meeting the goals of the Critical Area Program, the land use regulations are the most restrictive.

According to the GIS mapping sources, the highest total amount of land in the Critical Area within the CARA is within the limits of Corridor 7. Due to the nature of the proposed project, Critical Area impacts would not be completely avoidable for a new crossing within any of the CARA.

Due to the nature of the proposed project, impacts to areas under the jurisdiction of the Chesapeake Bay Critical Area Commission would not be completely avoidable for a new crossing within any of the CARA. Coordination with the Critical Area Commission Staff would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. During the planning process, special attention must be paid to areas with steep slopes and highly erodible soils as these areas will be subject to Critical Area buffer expansion.

5.4 Public Lands

The public lands identified in **Table 5-8** and on **Figure 5-12** are categorized by County, State, or Federally managed areas. Data were obtained from several online GIS data sets; including, ArcGIS/USA Parks, the Maryland iMap Data Portal, and the MDNR GIS Data Portal and includes County parks and/or open space; State parks, forests, or wildlife refuges; and National parks, forests or wildlife refuges. According to these data sets, Corridor 7 contains the largest area of public lands. Impacts or takes of public parks and wildlife refuges will require adherence to Section 4(f) of the U.S. Department of Transportation Act of 1966, Section 6(f) of the Land and Water Conservation Fund Program, and/or MDNR's Program Open Space.

It should be noted that the Eastern Neck Island National Wildlife Refuge is located between Corridors 6 and 7, and will not be directly impacted by a future alignment in any of the corridor alternatives. Also, Sandy Point State Park, an MDNR property and located within the limits of Corridor 7, is under Land and Water Conservation Fund 6(f) compliance. Lands under 6(f) compliance are required to be used for public outdoor recreation, and if the land use changes, replacement land must be obtained as mitigation for the change in use.

Table 5-8: Public Lands

Corridor	County Lands (acres)	State Lands (acres)	Federal Lands (acres)	Total Within Corridor (acres)	Percentage of Total Corridor Study Area
6	1,310	0	0	**1,310**	**4%**
7	980	940	0	**1,920**	**7%**
8	1,060	0	300	**1,360**	**3%**

5.4.1 Corridor 6

Corridor 6 contains approximately 1,310 acres of public land, all of which is County-owned (**Figure 5-12**). Within the western section, west of the Bay, the corridor intersects with Beachwood Park, Jacobsville Park, the Lake Shore Athletic Complex, and the Magothy Greenway Natural Area on the south side of MD 100 & MD 177; Bodkin Park and the Compass Point Park north of MD 177; and Downs Memorial Park on the western shoreline of the Bay. Within the eastern extent of Corridor 6, along the Eastern Shore, the corridor intersects with the Route 18 4H Park. No federal or state-owned lands were identified within the limits of Corridor 6.

Impacts to public lands within the western section of Corridor 6 can be largely avoided by remaining close to the MD 177. Also, the mapped public lands within the eastern section of the corridor are relatively sparse and located generally within the central and, to a lesser extent, the southern section of the corridor. Avoiding impacts to these lands would require remaining within the northern section of the corridor. Coordination with public land agencies would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

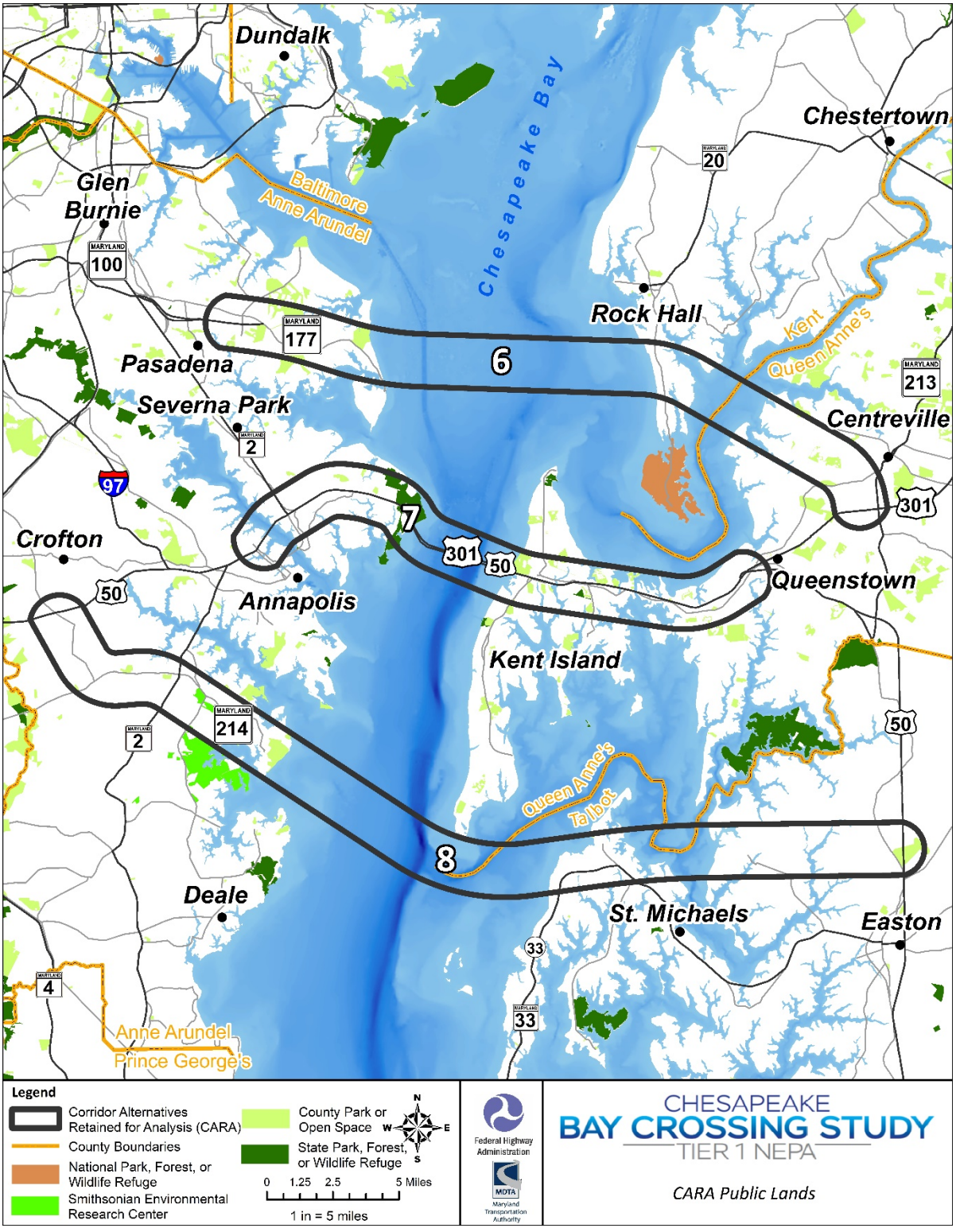
5.4.2 Corridor 7

Corridor 7 contains approximately 1,920 acres of public land consisting of 980 acres of County lands and 940 acres of State land (**Figure 5-12**). The western section of the corridor intersects with the County-owned Broadneck Park and Bay Head Park, north of US 50 and the Sandy Point State Park along the western shore of the Bay.

On Kent Island and the Eastern Shore, the corridor intersects several County-owned parks including the Terrapin Nature Area, Old Love Point Park, Long Point Park, Ferry Point Park, and the Queenstown Harbor Lakes Golf Course on the north side of US 301, and Mowbray Park, the Wildfowl Trust of North America property, and Grasonville Park on the south side of US 301. No federal public lands were identified within the limits of Corridor 7.

Because the public lands generally span the width of Corridor 7, impacts would be unavoidable. Coordination with public land agencies would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

Figure 5-12: CARA Public Lands



5.4.3 Corridor 8

Corridor 8 contains approximately 1,360 acres of public land consisting of 1,060 acres of County-owned land and 300 acres of Federal land (**Figure 5-12**). The western section of Corridor 8 intersects with County-owned Riva Area Park and Central Avenue Park along MD 214, west of MD 2. Between MD 2 and the Bay, the corridor intersects with the county-owned Beverly Triton Beach Park and the federally-owned lands associated with the Smithsonian Institution. The eastern extent of the corridor intersects with Glebe Park, just north of Easton. There were no State-owned lands identified within the limits of Corridor 8.

The majority of public lands associated with Corridor 8 are located within the western section of the corridor. Following the existing MD 214 corridor would result in the least amount of public land impacts. Public land is sparse within the eastern section of Corridor 8 and are confined to the extreme eastern section of the corridor, adjacent to US 50. Coordination with public land agencies would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

5.4.4 Conclusions

According to the GIS data sets, Corridor 7 contains the largest total area of mapped public lands associated with each corridor. The largest concentrations are located within the western section of the corridor, adjacent to the Bay, and are associated with Sandy Point State Park to the north of US Rt. 50 and state lands owned by MDNR, south of Rt. 50. Because these two areas span the width of Corridor 7, impact avoidance in this area would be difficult.

Impacts or takes of public parks and wildlife refuges will require adherence to Section 4(f) of the USDOT Act of 1966, Section 6(f) of LWCF Program, and/or MDNR's Program Open Space. **Appendix B** includes maps showing more detailed locations of mapped public lands within each corridor.

5.5 Terrestrial Habitat

The CBCS study area encompasses varies types of terrestrial habitat, including; upland and riparian forested areas, scrub-shrub and herbaceous uplands, agricultural lands, freshwater wetlands, beaches, marshes, tidal flats, and large areas of urban and suburban development. The GIS mapping for terrestrial habitat focuses on upland habitats that are afforded regulatory protection, including Forest Conservation Easements and FIDS habitat. Existing conditions for wetland areas are covered in **Section 5.1**. FIDS habitat within the Critical Area is subject to specific mitigation requirements as determined by the local jurisdiction with input from MDNR and the Critical Area Commission staff.

Figure 5-13 provides a visual depiction of the location of the most concentrated forest resources within the CBCS study area, identifying FCA easements and areas of potential FIDS habitat. FCA Easements protect a forest on private land by limiting certain activities. Easements are generally created as part of a forest conservation plan. According to these mapping sources, the majority of the FCA easements are located along the Western Shore, between Deale in Anne Arundel County and Solomons Island in Calvert County.

Figure 5-13: Forest Conservation Act Easements and Potential FIDS Habitat

The total amount of FIDS habitat and FCA easements within each of the three study corridors is presented in **Table 5-9**. Data were obtained from the MDNR GIS Data Portal and identifies the largest amount of FIDS habitat within Corridor 8 with the highest concentration located within the western portion of the proposed corridor. Corridor 6 contains the largest amount of area within an existing FCA easement with all easements located within the western portion of the corridor.

Table 5-9: FIDS & FCA Easements

Corridor	FIDS (acres)	FCA Easements (acres)	Percentage of Total Corridor Study Area
6	7,020	140	20%
7	6,900	130	25%
8	11,410	110	25%

5.5.1 Corridor 6

Corridor 6 contains approximately 7,020 acres of potential FIDS habitat with the largest concentrations occurring within the western portion of the corridor, on the west side of the Bay (**Figure 5-14**). This section of the corridor still contains relatively large areas of forest interspersed with residential development. Corridor 6 also intersects with 140 acres of FCA Easements, all of which are located along the MD 177 corridor, within the western extent of the corridor. The eastern portion of Corridor 6 also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields associated with farming activities. Photos of potential FIDS areas associated with Corridor 6 can be found in **Appendix A**.

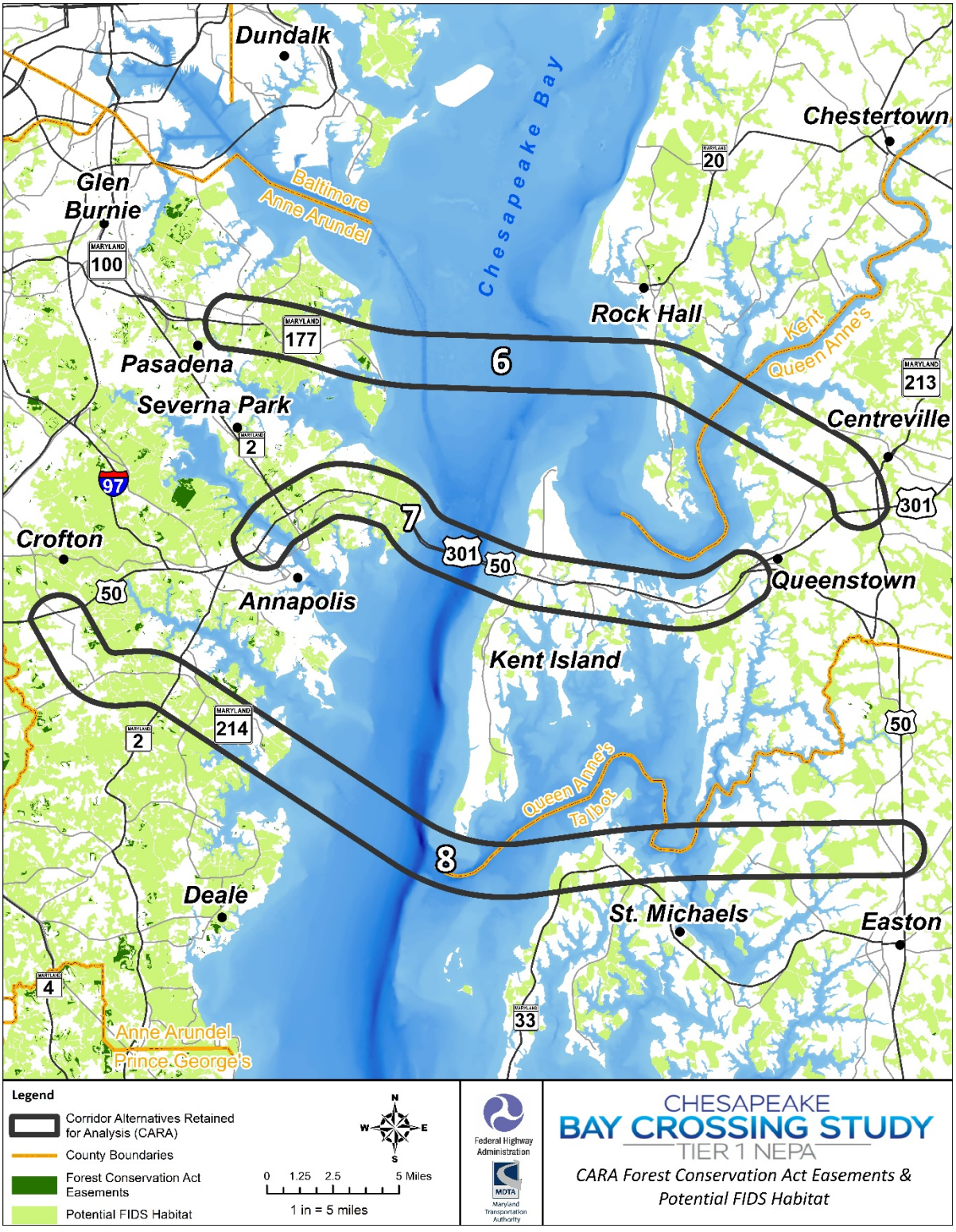
5.5.2 Corridor 7

Corridor 7 contains approximately 6,900 acres of potential FIDS habitat with the largest concentrations occurring within the western portion of the corridor. Corridor 7 also intersects with 130 acres of FCA Easements, all of which are located within the western portion of the corridor (**Figure 5-14**). This section of the corridor still contains relatively large areas of forest interspersed with residential development. The section of Corridor 7 that spans Kent Island contains relatively few areas of FIDS due to the high level of development. The eastern portion of Corridor 7, just west of Queenstown, also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields associated with farming activities. Photos of potential FIDS areas associated with Corridor 7 can be found in **Appendix A**.

5.5.3 Corridor 8

Corridor 8 contains approximately 11,410 acres of potential FIDS habitat, the largest amount of the three corridors with the largest concentrations located within the western portion of the corridor. This section of the corridor still contains relatively large tracts of forest areas, particularly along the MD 24 alignment, west of MD 2. Corridor 8 also contains 110 acres FCA easements, all of which are located within the extreme western portion of the Corridor study area, west of MD 2 (**Figure 5-14**).

Figure 5-14: CARA Forest Conservation Act Easements and Potential FIDS Habitat



The eastern portion of Corridor 8 also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields associated with farming activities. Photos of potential FIDS areas associated with Corridor 8 can be found in **Appendix A**.

5.5.4 Conclusions

For any corridor alternative selected for further analysis, impact assessment must consider potential changes and effects to terrestrial resources based on ecological importance and their likelihood to be adversely affected by project activities. FIDS resources and FCA easements are important terrestrial habitats because they represent areas with the ability to support a wide variety of vegetation, wildlife, and species of concern. Project activities that may affect terrestrial resources during construction include demolition of existing infrastructure, vegetation removal, and construction of project-related infrastructure.

Because of the amount of FIDS habitat and FCA easements identified within all three corridors, project related impacts would be unavoidable. The area with the lowest potential for impacts is associated with the central section of Corridor 7, where it spans Kent Island. Coordination with MDNR and County planning agencies would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

5.6 Unique & Sensitive Areas

Figure 5-15 identifies the location of SSPRAs within the entire CBCS study and represents the general locations of various types of areas of concern statewide, including; Targeted Ecological Areas, Natural Heritage areas, listed species sites, locally significant habitat areas, colonial waterbird sites, non-tidal wetlands of special state concern, and geographic areas of particular concern.

According to the mapping resources identified on **Figure 5-15**, the highest concentration of SSPRA occurs in Dorchester County, along the lower portion of the Eastern Shore in and around the Blackwater National Wildlife Refuge. The lowest concentration of SSPRA occurs within the central portion of the Western Shore, between Baltimore City and Prince Frederick in Calvert County.

MDNR's GIS Data Portal's SSPRA coverage layer was used to provide a comparative analysis of unique and sensitive areas within each of the three study corridors (**Table 5-10**). Corridor 8 contains the highest concentration of SSPRA, with the majority located within the Eastern Shore portion of the corridor. There is also a relatively large concentration of SSPRA located within the western section of Corridor 6 (**Figure 5-16**).

Table 5-10: Sensitive Species Project Review Areas (SSPRA)

Corridor	SSPRA (acres)	Percentage of Total Corridor Study Area
6	2,720	6%
7	2,180	8%
8	8,630	11%

Figure 5-15: Sensitive Species Project Review Areas

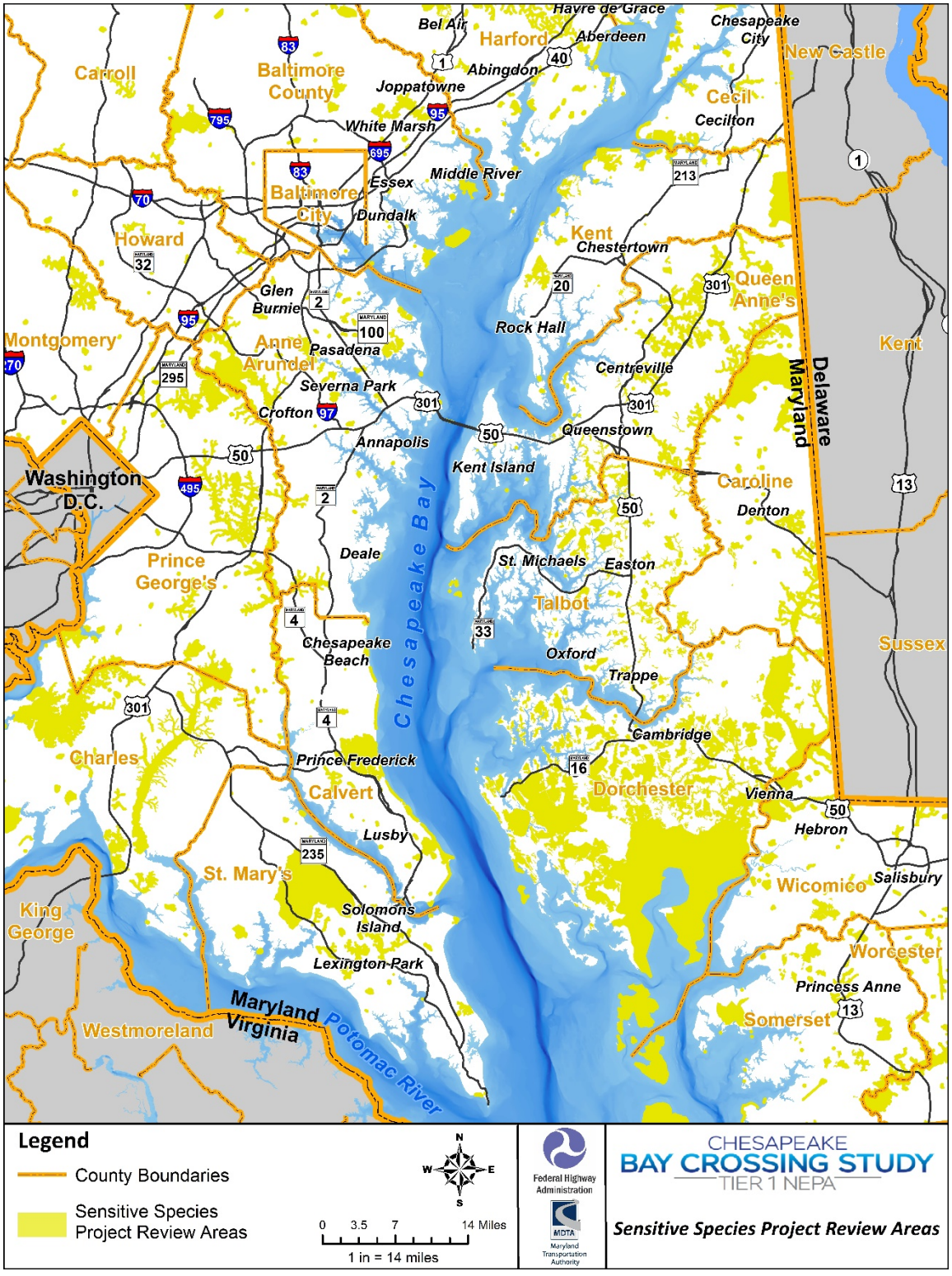


Figure 5-16 : CARA Sensitive Species Project Review Areas

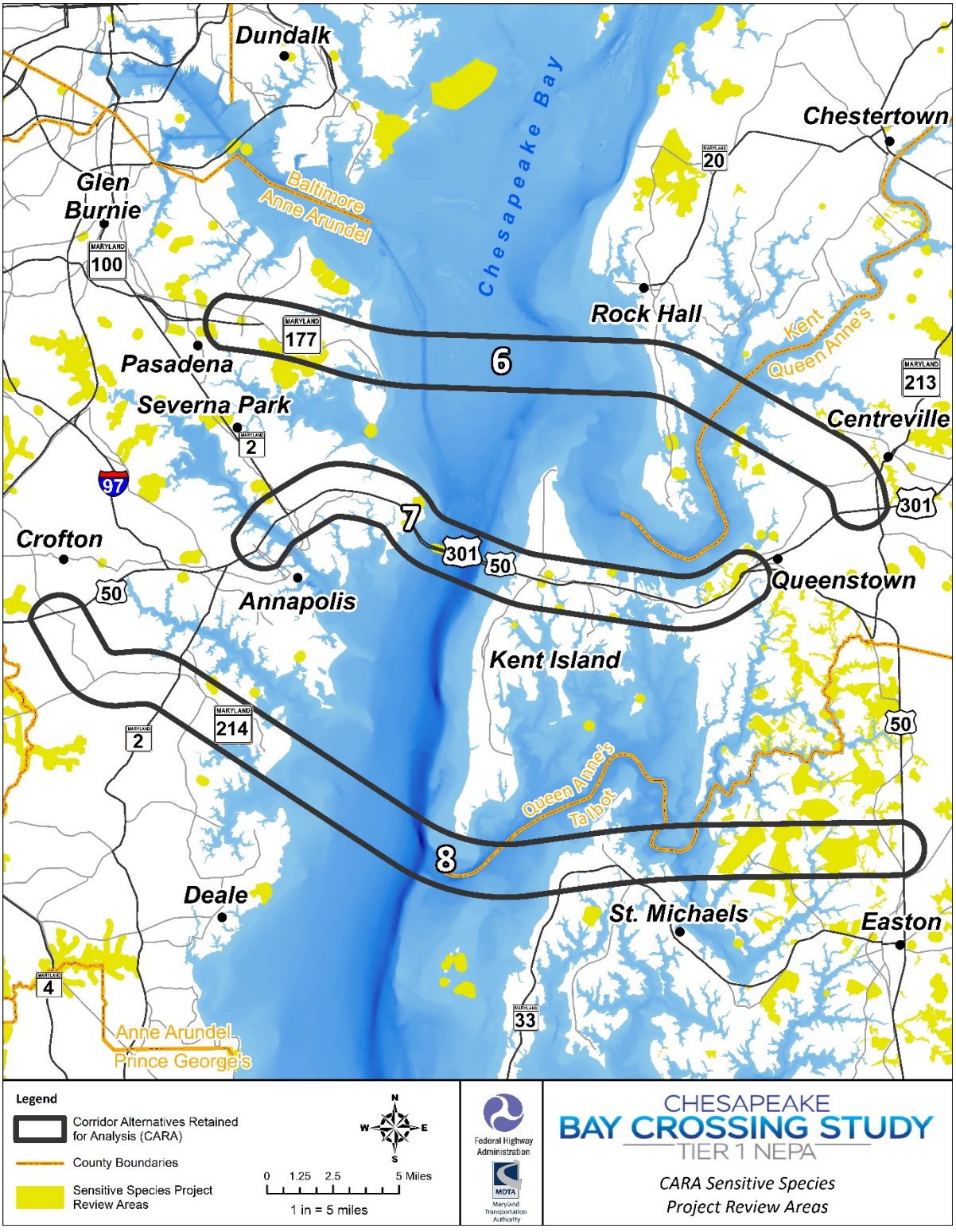


Figure 5-17 identifies the location of Green Infrastructure (GI) hubs and corridors within the entire CBCS area. This data was obtained from the MD iMap Data Portal. Areas identified include unfragmented natural areas, called "hubs." Hubs were defined as contiguous forest blocks and wetland complexes of at least 250 acres, rare or sensitive species habitats, biologically important rivers and streams, and existing conservation lands managed for natural values. "Corridors" are linear stretches of land, at least 1,100 feet wide, which follow the best ecological or most natural routes between hubs to help animals, plant seeds, water, and other important resources move between hubs. According to the mapping resources identified on **Figure 5-17**, GI areas are fairly evenly distributed throughout the CBCS area.

Table 5-11 provides a comparative analysis of existing GI areas identified within the limits of the three study corridors. As indicated, Corridor 8 contains the highest amount of GI and contains a significant amount of GI hubs (**Figure 5-18**). Corridor 6 contains the highest amount of GI corridors which generally span the width of the corridor on both the western and eastern sides of the Bay.

Table 5-11: Green Infrastructure

Corridor	Green Infrastructure Corridors (acres)	Green Infrastructure Hubs (acres)	Total Within Corridor (acres)	Percentage of Total Corridor Study Area
6	3,150	1,730	**4,880**	**14%**
7	1,260	3,220	**4,480**	**16%**
8	2,100	9,350	**11,450**	**25%**

Federally Listed Species

An online search of the USFWS iPaC system to determine the presence of federally-listed RTE species or habitat and migratory birds was conducted for each of the study area corridors. The results of the search identified the presence of Northern Long-eared Bat (*Myotis septentrionalis*, federally-listed threatened) within the limits of all three corridors. The iPaC results also identified several migratory birds within all three corridor study areas that are protected under the Migratory Bird Treaty Act. Copies of the USFWS IPaC correspondence are provided in **Appendix C** of this document. Coordination with the USFWS will be required for potential impacts to Northern Long-eared Bat and migratory birds for any corridor carried forward to a Tier 2 analysis.

The NOAA Section 7 mapper was utilized to determine the presence of federally-listed marine species or critical habitat within the limits of the corridor study areas. The search yielded the same results for all three study area corridors. The following list identifies the federally-listed RTE species, protection status, species life stage, and critical habitat identified within the corridor study areas.

Figure 5-17 : Green Infrastructure

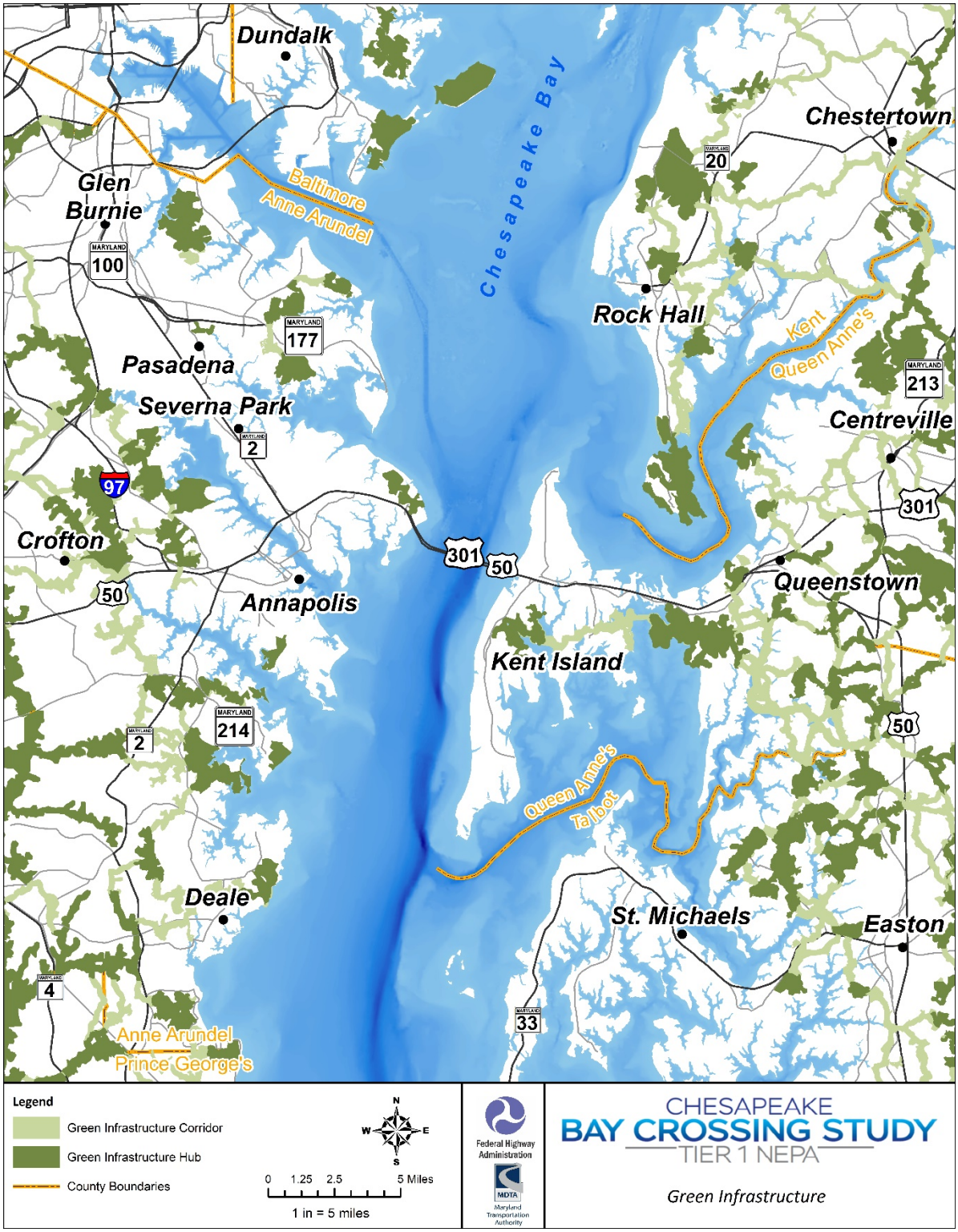
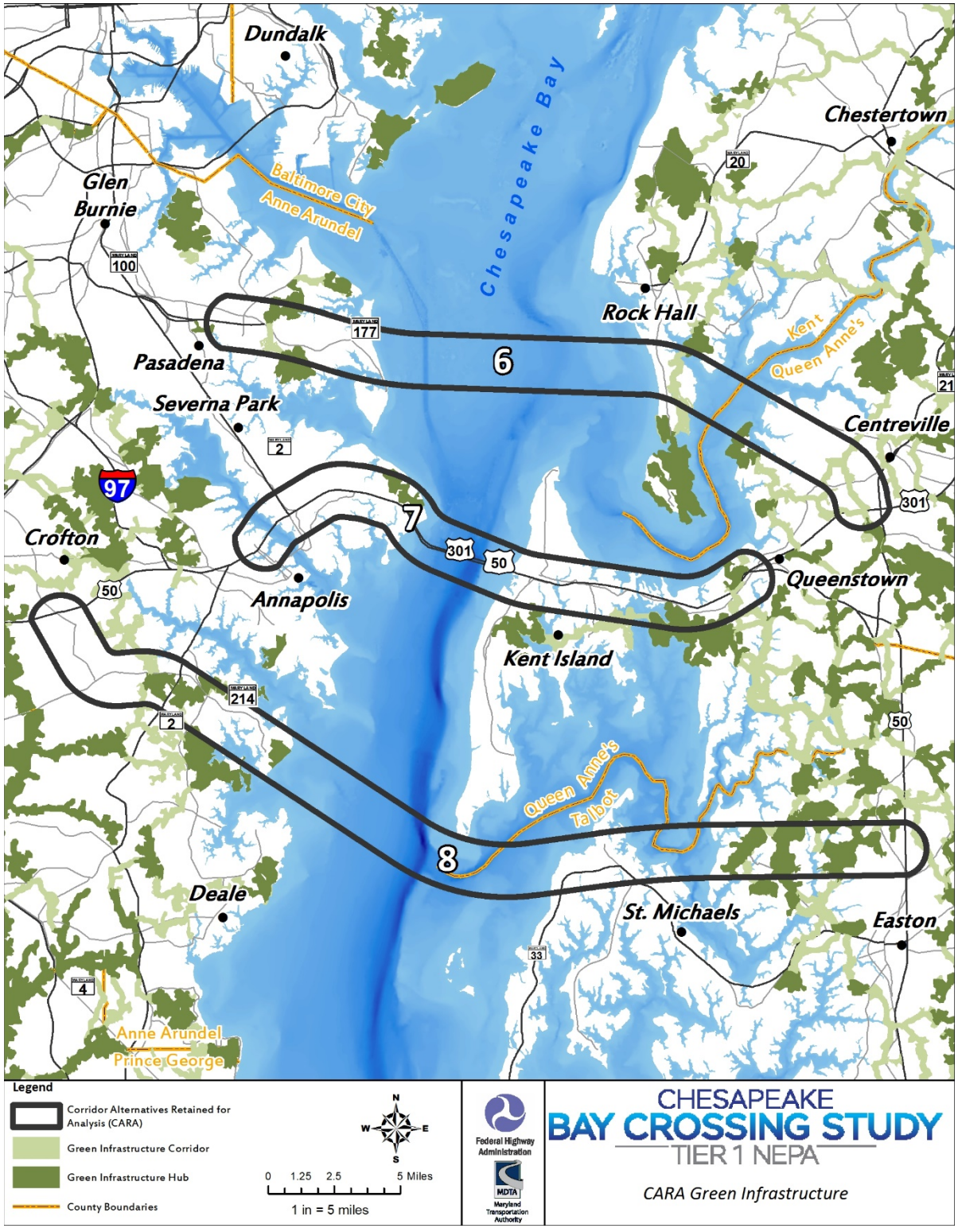


Figure 5-18 : CARA Green Infrastructure



- Loggerhead Turtle (*Caretta caretta*)/Threatened/Adults and Juveniles/migrating and foraging
- Green Sea Turtle (*Chelonia mydas*)/Threatened/Adults and Juveniles/migrating and foraging
- Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)/Endangered/Adults and Juveniles/migrating and foraging
- Leatherback Sea Turtle (*Dermochelys coriacea*)/Endangered/Adults and Juveniles/migrating and foraging
- Shortnose Sturgeon (*Acipenser brevirostrum*)/Endangered/Adult/overwintering, migrating and foraging
- Atlantic Sturgeon (*Acipenser oxyriynchus oxyriynchus*)/Endangered/Subadult, Juvenile, Adult/migrating and foraging

State Listed Species

Correspondence was submitted to MDNR to determine the presence of state-listed RTE species or habitat within the limits of the study areas for the three potential corridors. A copy of the MDNR correspondence is provided in **Appendix C** of this document. **Table 5-12** identifies the state-listed RTE species, the corridor where the species was identified, and the species protection status.

Table 5-12: MDNR Listed Species

Corridor	Species Scientific Name	Species Common Name	State Status
6	*Chamaedaphne calyculata*	Leatherleaf	Threatened
6	*Castanea dentata*	American Chestnut	Rare
6	*Eriocaulon parkeri*	Seven-angle Pipewort	Endangered
6	*Sarracenia purpurea*	Northern Pitcherplant	Threatened
6	*Utricularia cornuta*	Horned Bladderwort	Highly Rare
6	*Juncus pelocarpus*	Brown-fruit Rush	Endangered
6	*Sagittaria spatulata*	Spongy Arrowhead	Rare
6	*Nehalennia integricolis*	Southern Sprite	Highly Rare
6	*Nehalennia gracilis*	Sphagnum Sprite	Rare
6	*Erythrodiplax minuscula*	Little Blue Dragonlet	Highly Rare
6	*Nannothemis bella*	Elfin Skimmer	Endangered
6	*Ladona exusta*	White Corporal	Endangered
6	*Arundinaria tecta*	Switch Cane	Rare
6	*Carex exilis*	Coast Sedge	Endangered
7	*Homalosorus pycnocarpos*	Glade Fern	Threatened
7	*Sternula antillarum*	Least Tern	Threatened
7	*Laterallus jamaicensis*	Black Rail	Endangered
7	*Porzana carolina*	Sora	Rare
7	*Falco peregrinus anatum*	Peregrine Falcon	In Need of Conservation
8	*Hylodesmum pauciflorum*	Few-flowered Trick-trefoil	Endangered
6, 7, 8	*Sciurus niger cinereus*	Delmarva Fox Squirrel	In Need of Conservation

5.6.1 Corridor 6

Corridor 6 contains approximately 2,720 acres of area mapped as SSPRA, with a relatively large area within the western section of the corridor, directly adjacent to MD 177. This area is generally associated with the Magothy Greenway Natural Area and the areas directly adjacent. The eastern portion of Corridor 6 contains relatively sparse areas of SSPRA which are located along the western bank of the Chester River (**Figure 5-16**). These SSPRA are labeled as MDNR Targeted Ecological Areas. Targeted Ecological Areas are lands and watersheds of high ecological value that have been identified as conservation priorities by MDNR for natural resource protection. As SSPRA generally extends the width of the western portion of Corridor 6, impacts would be unavoidable in this area. Impacts to SSPRA within the eastern portion of Corridor 6 could potentially be avoided by siting a potential alignment within the central portion of the corridor study area.

Corridor 6 contains approximately 3,150 acres of GI corridors and 1,730 acres of GI hubs. The GI corridors were identified on both sides of the Bay and generally extend the corridor width. The majority of the GI hubs within Corridor 6 were identified on the Western Shore of the Bay with smaller concentrations on the Eastern Shore, adjacent to the Chester River (**Figure 5-18**). Avoiding impacts to the GI hubs would require siting the alignment within the central portion of the corridor. As the GI corridors span the entire width of Corridor 6, impacts would be unavoidable.

The MDNR identified several non-tidal wetland areas associated with Corridor 6 collectively known as the Mountain Road Bogs that are known to contain RTE species. These areas include the Upper Magothy Marshes, Main Creek Bog, South Gray's Bog, Cockey Creek Swamp, Blackhole Creek Bog, Fresh Pond, and North Gray's Bog Complex. The Mountain Road Bogs were identified west of the Bay in Anne Arundel County near MD 177. Also identified within the limits of Corridor 6 was an area of Delmarva Fox Squirrel (*Sciurus niger cinereus*) habitat located east of the Bay in Queen Anne's County, along Mill Stream Branch.

Waterfowl Concentration Areas (WCA) were identified within the limits of all three study area corridors. These are recognized areas of open water and wetlands adjacent to land that are utilized by significant numbers of ducks, geese, and swans for feeding and resting during the winter months. WCAs may be subject to construction-related time of year restrictions. Coordination with the MDNR will be required for potential impacts to state-listed RTE species or habitat, habitat protection areas, or waterfowl concentration areas for any corridor carried forward to a Tier 2 analysis.

5.6.2 Corridor 7

Corridor 7 contains approximately 2,180 acres of SSPRA with the largest concentrations located on Kent Island and further east along the Eastern Shore (**Figure 5-16**). The SSPRA identified on Kent Island is associated with Targeted Ecological Areas located south of US 301 and a small area identified as the Terrapin Nature Area, north of US 301. Further east, SSPRA were identified on the Eastern Shore, west of Queenstown, and were associated with Targeted Ecological Areas south of US 301 along the eastern shoreline of Prospect Bay and the Queenstown Harbor Lakes Course, north of US 301, along the eastern bank of the Chester River. A relatively small amount of mapped SSPRA was also identified within the western portion of Corridor 7 and is associated with Sandy Point State Park, located on the north side of US 301, along the west bank of the Bay. SSPRA impacts associated with the western section of Corridor 7 would be minimal and could be completely avoided by remaining south of Sandy Point State Park.

Avoiding impacts within the eastern section would be difficult as a majority of mapped SSPRA within Corridor 7 is located on Kent Island and the Eastern Shore, and is evenly distributed throughout the width of the corridor.

Corridor 7 contains approximately 1,260 acres of GI corridors and 3,220 acres of GI hubs. GI corridors were identified along the southern portion of Corridor 7, on Kent Island, and within the eastern section of the Corridor 7, just west of Queenstown. No GI corridors were identified within the western section of Corridor 7. GI hubs were identified within the western section of Corridor 7 and were associated with Sandy Point State Park. GI hubs were also identified within the eastern section of Corridor 7, just west of Queenstown (**Figure 5-18**). Avoiding impacts to GI hubs within the western portion of Corridor 7 would require siting the alignment on the south side of US 301. Siting the alignment within the central portion of Corridor 7, along Kent Island and the Eastern Shore, would minimize potential impacts to GI hubs within the central and eastern sections of the corridor. GI corridor impacts associated with Corridor 7 would be relatively minimal and associated with one section, west of Queenstown, where the GI corridor spans the entire width of Corridor 7.

Within the limits of Corridor 7, the MDNR identified a wetland area called Rucker's Ravine within the Pines-on-Severn community in Anne Arundel County that supports the State-listed threatened Glade Fern (*Homalosorus pycnocarpos*). Several Great Blue Heron colonies were identified in Queen Anne's County and another south of Sandy Point State Park in Anne Arundel County. Habitat protection areas for Least Tern (*Sternula antillarum* – State threatened), Black Rail (*Laterallus jamaicensis* – State endangered), and Sora (*Porzana Carolina* – State rare) was also identified in Sandy Point State Park. The MDNR also lists the Bridge itself and building rooftops in the Stevensville area as nesting habitat for several bird species. Finally, Delmarva Fox Squirrel habitat is identified in Queen Anne's County in the area north of US 50. Waterfowl Concentration Areas were identified, as described above under Corridor 6.

5.6.3 Corridor 8

Corridor 8 contains approximately 8,630 acres of SSPRA which constitutes the largest total amount of SSPRA of the three corridors with the vast majority located within the extreme eastern portion of the corridor study area, along the Eastern Shore (**Figure 5-16**). One small area of SSPRA was identified within the western portion of Corridor 8, along the northern corridor edge just north of MD 214 and is associated with a Targeted Ecological Area adjacent to the eastern bank of Glebe Creek. The eastern portion of Corridor 8 intersects with several Targeted Ecological Areas that generally span the entire width of the corridor and constitutes the vast majority of land area within the section between US 50 and the Eastern Shore of the Bay. The western section of Corridor 8 contains very small areas of mapped SSPRA along the northern extent of the corridor. Impacts could be avoided by siting the alignment within the central or southern portion of the corridor. Avoiding impacts within the eastern section would be difficult as a majority of mapped SSPRA within Corridor 8 is located on the Eastern Shore, and is fairly evenly distributed throughout the width of the corridor.

Corridor 8 contains approximately 2,100 acres of GI corridors and 9,350 acres of GI hubs. The majority of these resources were identified within the eastern section of the corridor, along the Eastern Shore, with lesser but still significant resources identified within the western section of the corridor (**Figure 5-18**).

Impacts to GI corridors and GI hubs within Corridor 8 would be unavoidable as these resources generally extend the width of the corridor on both sides of the Bay.

Within the limits of Corridor 8, MDNR identified several areas designated as habitat protection areas, or areas known or suspected to provide habitat for RTE species. These areas include Glebe Creek Woods in Anne Arundel County, Copperville Wet Woods in Talbot County along the Miles River, and Third Haven Woods along Goldsborough Neck Road in Talbot County. Delmarva Fox Squirrel habitat was identified within the limits of Corridor 8 in Talbot County north of Easton.

5.6.4 Conclusions

Utilizing the SSPRA and Green Infrastructure GIS data layers provides a broad view of existing areas classified, for the purposes of this document, as sensitive and unique. The SSPRA data depicts the general location of threatened and endangered species habitat, Natural Heritage Areas, Colonial Waterbird Sites, non-tidal WSSC, and Geographic Areas of Particular Concern. Green Infrastructure mapping identifies forested hubs and corridors. These include large, undisturbed tracts of forest and the corridors that provide the ecological connection. According to these data sources, Corridor 8 contains the largest areas of mapped SSPRA and Green Infrastructure both by total land area. Within the Eastern Shore section of Corridor 8, mapped SSPRA and Green Infrastructure resources span the entire width of the study area and impacts would be unavoidable. For unavoidable impacts, minimization efforts and coordination with multiple resource agencies will be required should a corridor alternative be carried forward to a Tier 2 evaluation.

5.7 Aquatic Resources

For this analysis, aquatic resources are those associated with the Chesapeake Bay and its major tributaries. **Figures 5-19** (EFH) and **5-20** (Oyster Resources and SAV) depict where the associated aquatic resources are most abundant within the entire CBCS study area. Oyster resources were identified as Natural Oyster Bars (NOB) or Oyster Sanctuaries. Sanctuaries are areas where the wild harvest of oysters is prohibited and are provided more stringent protective measures. NOB's are also called "public" oyster bars. MDNR regulates the harvesting of oysters in NOBs and places timing restrictions and quantity limits for both commercial and recreational harvesting. Diadromous fish propagation areas are located throughout the Bay and tributaries. Diadromous species in the Bay include hickory and American shad, striped bass, blueback herring, alewife, white perch and yellow perch. The portion of the Bay and its tributaries north of Baltimore are critical spawning habitat areas. These include the Patapsco River, Gunpowder River, Susquehanna River, Elk River, and Sassafras River. On the Eastern Shore, spawning habitat is identified in Chester River, Choptank River, Fishing Bay, Nanticoke River, Wicomico River, and Manokin River. On the western shore, primary anadromous spawning areas are located within the South River, Severn River, Magothy River, Patuxent River, and Saint Mary's River along the Potomac. As depicted on **Figure 5-19**, EFH occurs generally throughout the extent of the CBCS study area.

NOB's (**Figure 5-20**) are located from the mouth of the Patapsco River near Baltimore south throughout the Bay and tributaries. Extensive areas of oyster bars are located on the Eastern Shore at the mouths of the Chester River, Eastern Bay, Choptank River, Fishing Creek, Fishing Bay, Wicomico River, and Manokin River. On the Western Shore, oyster bars are generally narrower in width and located closer to the shoreline but extend from the Patapsco River south to Point Lookout at the mouth of the Potomac River.

Figure 5-19: Essential Fish Habitat

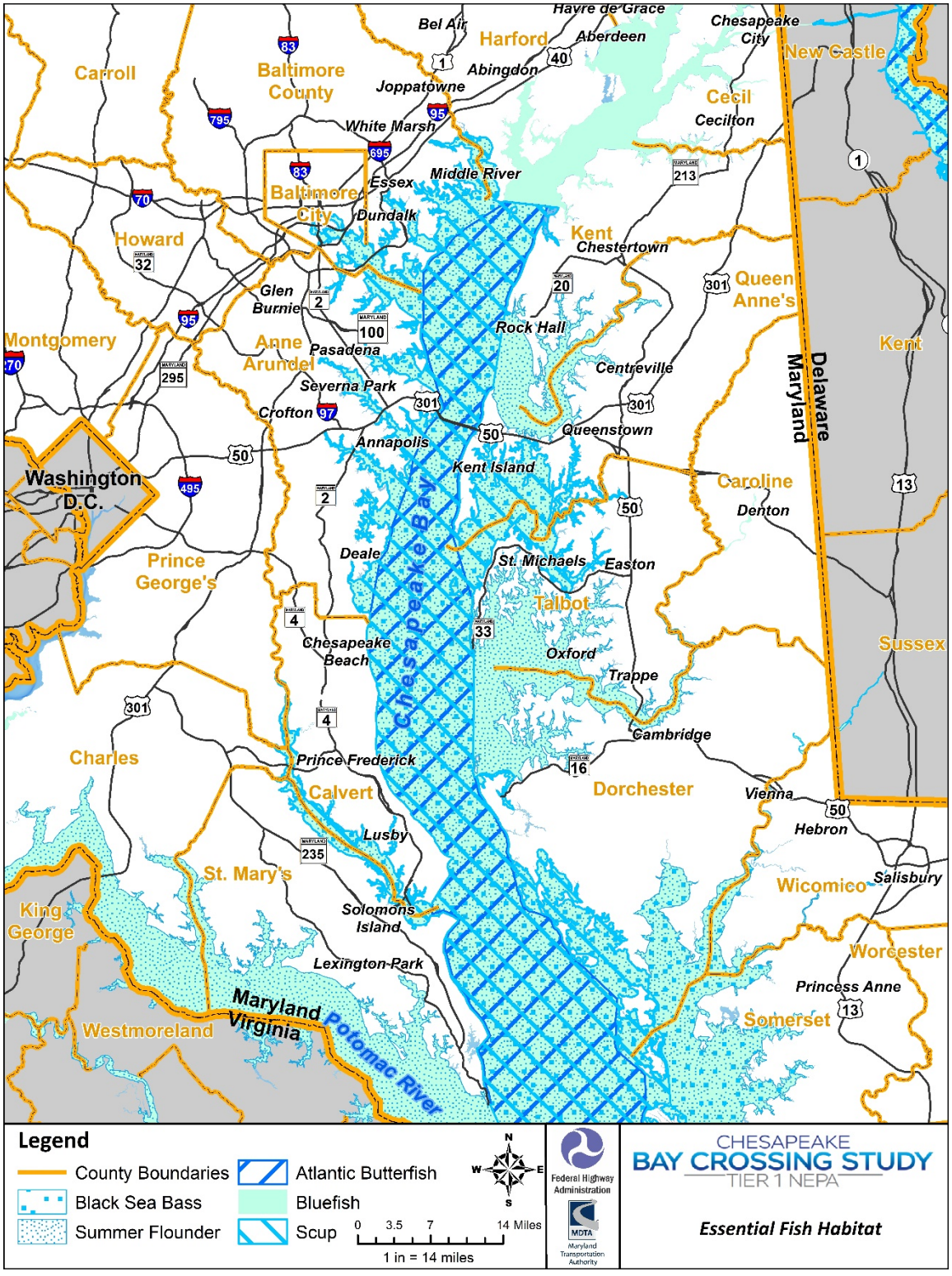
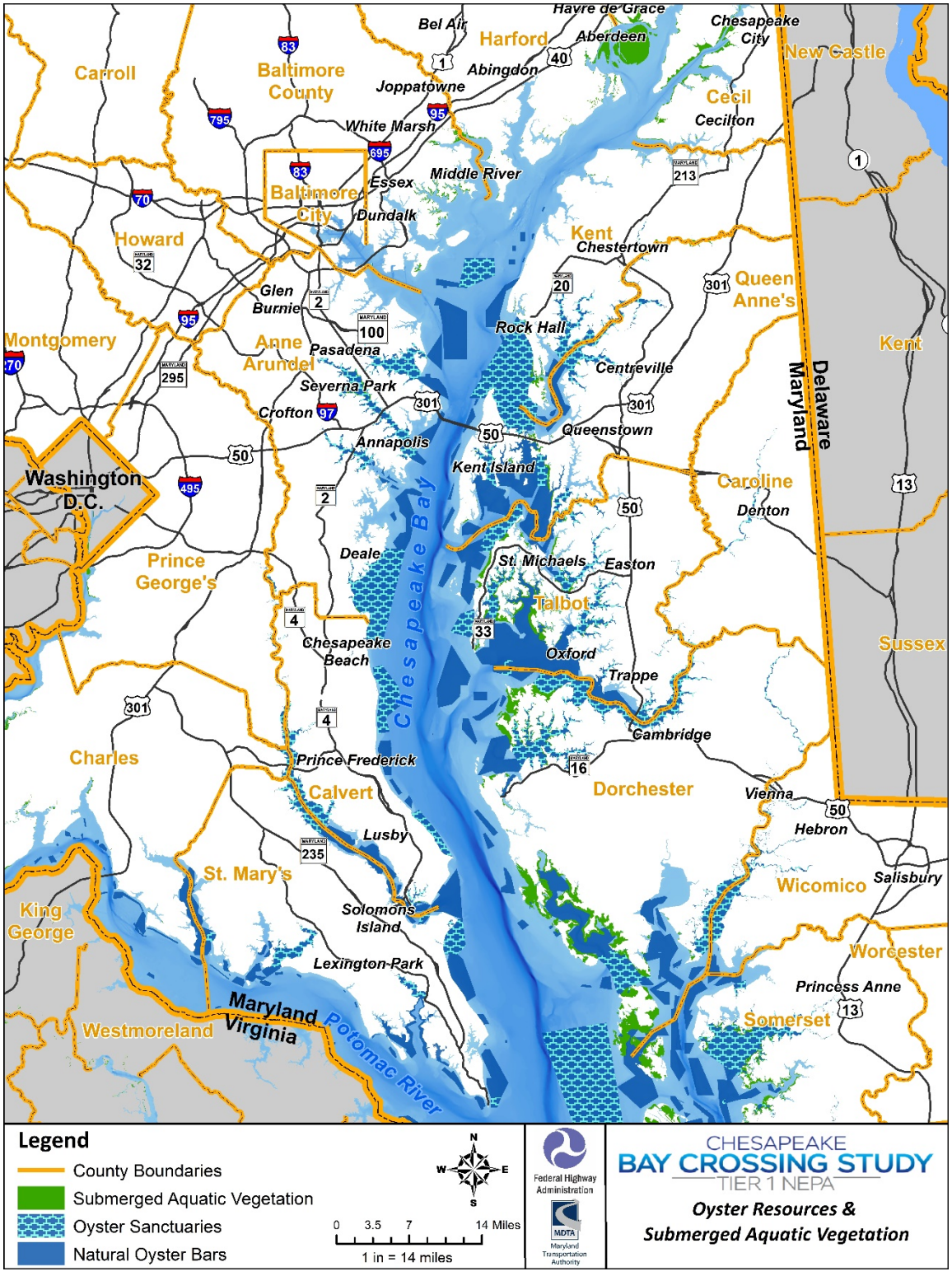


Figure 5-20: Oyster Resources and Submerged Aquatic Vegetation



Oyster sanctuaries are mapped throughout the Bay and tributaries with the largest concentrations located between Rock Hall, MD and the northern extent of Kent Island, and along the western shore adjacent to Deale, MD (**Figure 5-20**).

SAV (**Figure 5-20**) is considered one of the most important components of the Chesapeake Bay ecosystem. SAV beds trap sediment in their roots and remove pollutants from the water column. These beds are important for spawning fish and crustaceans and critical food for migratory waterfowl during the winter. SAV are located throughout the shallow shoreline areas of the Bay, however, certain areas have higher concentrations of SAV beds due to favorable water depths, substrates, and water quality. The northern part of the Bay at the mouth of the Susquehanna River, known as the "Susquehanna Flats" is identified as one of the largest SAV areas within the Bay. On the Eastern Shore, SAV is identified within the Elk River, Sassafras River, Chester River, Eastern Bay, Choptank River, Fishing Creek, Honga River, Manokin River, and Big Annemessex River. Extensive areas of SAV are shown surrounding Bloodsworth Island and South Marsh Island in the southern portion of the Bay.

While much of the larger study area is considered EFH for several species, all mapped areas are not equivalent in their potential for aquatic resource productivity. Both oyster reefs and SAV are considered particularly valuable habitat for federally managed species and their prey. SAV has been designated as a habitat area of particular concern (HAPC) for summer flounder by the Mid-Atlantic Fishery Management Council. HAPCs are subsets of EFH identified based on one or more of the following considerations: 1) the importance of the ecological function; 2) extent to which the habitat is sensitive to human-induced degradation; 3) whether and to what extent, development activities are stressing the habitat type; and/or 4) rarity of habitat type (50 CFR 600.815(a)(8)).

A breakdown of aquatic resources identified within the limits of the three study corridors, including data associated with EFH, SAV, NOBs, and oyster sanctuaries is provided in **Table 5-13**. The EFH data were obtained from the NOAA EFH Data Inventory that categorizes EFH by fish species. The categories include habitat for Atlantic butterfish (*Peprilus tricanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), and summer flounder (*Paralichthys dentatus*). For the purposes of this comparative analysis, these fish species have been combined into a single EFH category.

Table 5-13: Aquatic Resources

Corridor	EFH (acres)	EFH Percentage of Total Corridor Study Area	SAV (acres)	NOB (acres)	NOB Percentage of Total Corridor Study Area	MDNR Oyster Sanctuaries (acres)
6	18,080	52%	40	11,130	32%	6,470
7	9,600	34%	270	3,460	12%	1,580
8	20,480	44%	460	7,960	17%	2,090

Note: values rounded to closest 10 acres.

5.7.1 Corridor 6

Corridor 6 contains approximately 18,080 acres of mapped EFH with a large area associated with the open waters of the Bay and, within the eastern portion of the corridor, where the corridor spans the lower portion of the Chester River (**Figure 5-21**). The portion of Corridor 6 that spans the main channel of the Bay is mapped as EFH for scup (*Stenotomus chrysops*), Atlantic butterfish (*Peprilus triacanthus*), summer flounder (*Paralichthys dentatus*), black sea bass (*Centropristis striata*), and bluefish (*Pomatomus saltatrix*). The eastern portion of the Bay and within the lower Chester River, is mapped as EFH for summer flounder and bluefish.

Corridor 6 also contains approximately 11,130 acres of mapped NOBs, with the largest concentrations located adjacent to the Eastern Shore and within the lower portions of the Chester River. NOBs were also mapped within the open waters of the Bay and the lower portions of the Magothy River and Sillery Bay (**Figure 5-22**). Of the 11,130 acres of mapped NOBs, 6,470 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 6 are located along the bank of the Eastern Shore (**Figure 5-22**). Relatively small amounts of SAV (40 acres) were identified within the limits of Corridor 6 with one small section located within the eastern portion of the corridor, within the lower stem of the Chester River (**Figure 5-22**).

5.7.2 Corridor 7

Corridor 7 contains the least amount of total area spanning open waters and contains the least amount of EFH at approximately 9,600 acres (**Figure 5-21**). The largest concentrations occur within the area spanning the main channel of the Bay and within the coves and inlets in and around Kent Island and the Eastern Shore. The main channel of the Bay is mapped as EFH for scup, Atlantic bluefish, summer flounder, black sea bass, and bluefish. The open water areas adjacent to Kent Island and the Eastern Shore are mapped as EFH for summer flounder, scup, and black sea bass. Relatively small areas of EFH for bluefish, scup, and summer flounder are also mapped within the western portion of the Corridor 7, within the Severn River.

Corridor 7 also contains the least amount of oyster resources at approximately 3,460 acres with the largest mapped areas associated with the Severn River in the western portion of the corridor and within the coves and inlets of Kent Island and Eastern Shore within the central and eastern portions of the corridor (**Figure 5-22**). Of the 3,460 acres of mapped NOB's, 1,580 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 7 are associated with the Severn River (**Figure 5-22**). A relatively large concentration of SAV (approximately 270 acres) was identified within the eastern portion of Corridor 7, between Kent Island and the Eastern Shore (**Figure 5-22**).

5.7.3 Corridor 8

Corridor 8 contains the largest amount of area spanning open water and therefore contains the highest acreage total of EFH at approximately 87,680 acres. The western portion of the corridor, within and adjacent to the Rhode River is mapped as EFH for bluefish, black sea bass, summer flounder, and scup. The main channel of the Bay, within the limits of Corridor 8 is mapped as EFH for scup, Atlantic butterfish, summer flounder, black sea bass, and bluefish. The eastern portion of Corridor is mapped as EFH for scup, summer flounder, black sea bass, and bluefish (**Figure 5-21**).

Figure 5-21: CARA Essential Fish Habitat

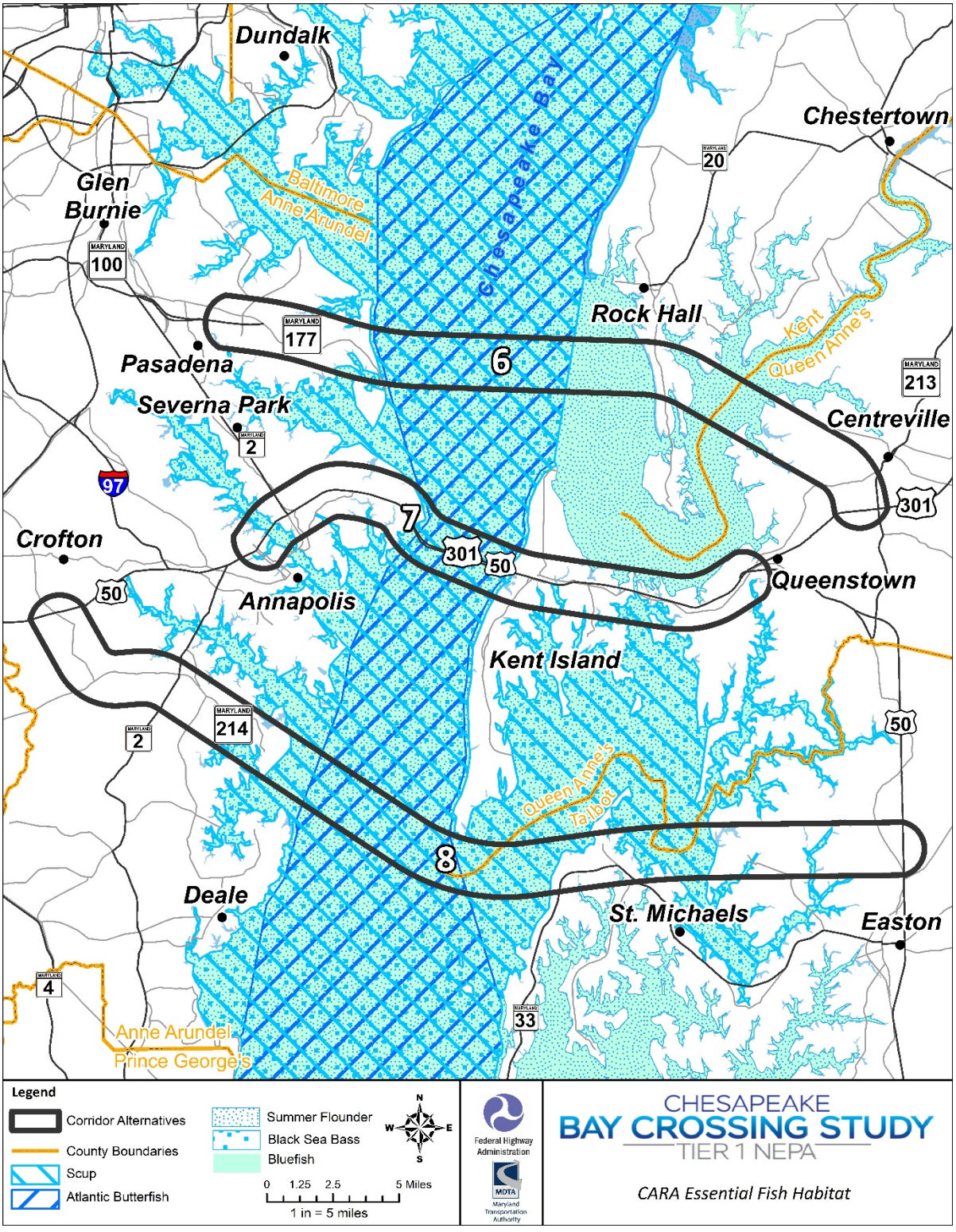
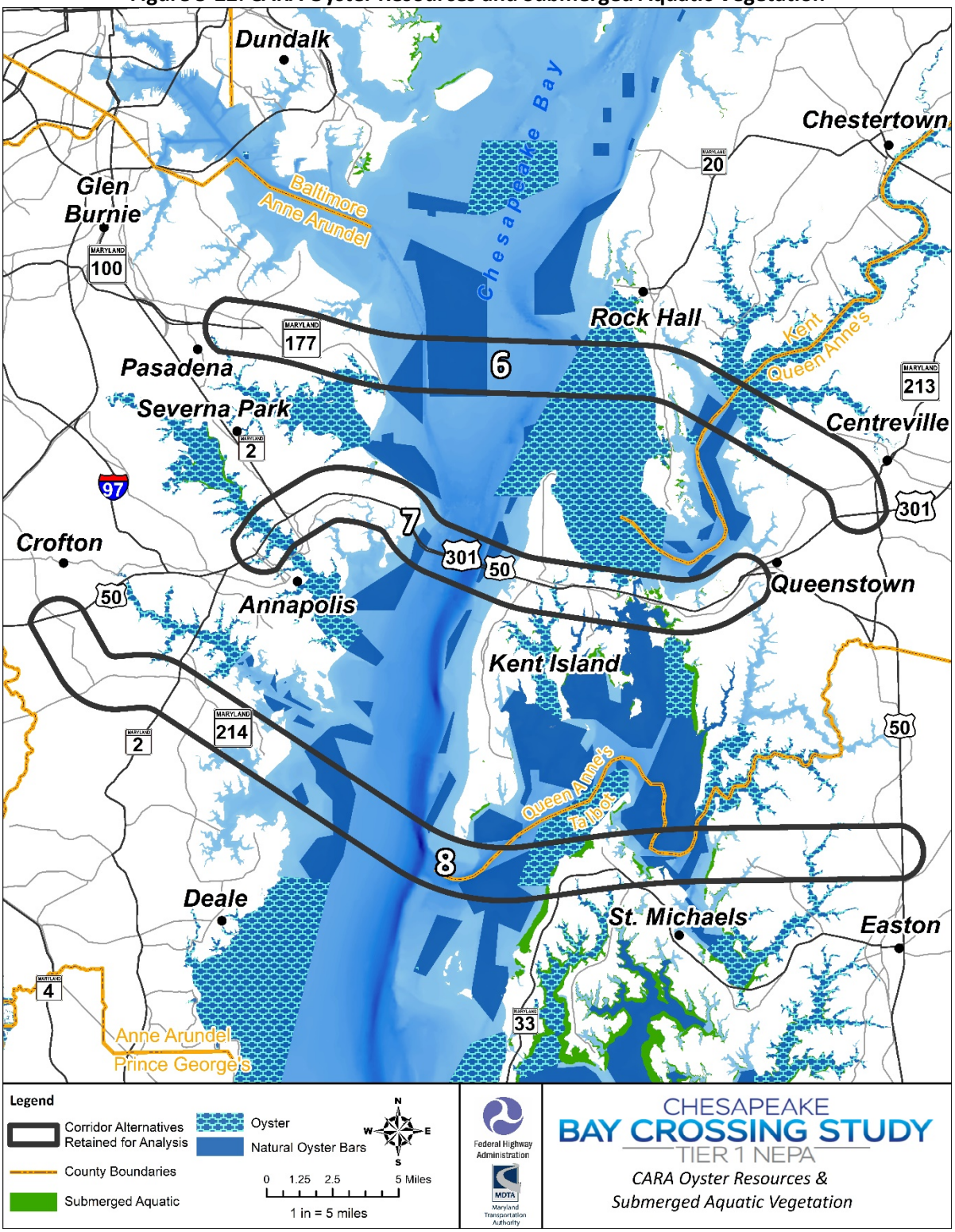


Figure 5-22: CARA Oyster Resources and Submerged Aquatic Vegetation



Corridor 8 also contains 7,960 acres mapped as NOB's with the majority occurring in the near shore areas adjacent to the Eastern Shore (**Figure 5-22**). Of the 7,960 acres of mapped NOB's, 2,090 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 8 are located along the bank of the Eastern Shore (**Figure 5-22**). Corridor 8 contains the largest areas of mapped SAV which are concentrated exclusively along the shoreline areas within Marshy Creek and the Chester River, within the eastern portion of the corridor study area (**Figure 5-22**).

5.7.4 Conclusions

Because all three corridors span large expanses of open water associated with the Bay and large tidal tributaries to the Bay, impacts to aquatic resources would be unavoidable. Permanent impacts to aquatic resources could result from the placement of piers and pilings, and the areas filled for approaches and scour protection measures. Temporary impacts could result from cofferdams, causeways or temporary roads, work bridges or barges, dredge material dewatering and disposal, construction staging areas, and removal of benthos which could alter foraging behaviors. During the construction phase, specifically during dredging and filling activities for bridge and pier construction, adjacent areas can be affected based on the tides and currents due to the re-suspension of sediment in the water column. Local and temporary siltation and turbidity may reduce the photic zone in areas of SAVs, may release contaminants in the sediment, and would result in the temporary loss of benthic communities which provide food sources for fish.

Impacts to individual EFH species would vary based on the habitat considered essential for that particular species. Following is a list of the EFH species identified in **Section 5.7** and the associated habitat that may be impacted by any of selected corridor alternatives.

- Summer Flounder – Bottom habitats with a substrate of silt, mud, or fine sand
- Bluefish – Estuaries within the mixing and seawater zones from April through November
- Atlantic Butterfish – Bay, estuaries, and brackish backwaters
- Black Sea Bass – Estuaries within the mixing and seawater zones during the spring and summer
- Scup – Featureless bottoms within the bay floor during the spring and summer

The corridor study areas intersect with larger tributaries that serve as critical spawning habitat for diadromous fish including American Shad. Corridor 6 spans the Chester River along the Eastern Shore and provides the largest area of critical spawning habitat of the three corridor study areas. Corridor 6 also spans a small section of Magothy River spawning habitat, located along the Western Shore. Corridor 8 spans a relatively large area of critical spawning habitat associated with the Eastern Bay and Miles River, also along the Eastern Shore. Corridor 7 contains the least amount of critical spawning area and is associated with the Severn River, along the Western Shore near Annapolis, MD.

The corridor study areas also encompass large areas associated with open waters of the Bay and Bay tributaries that are important to the commercial and recreational fishing industries. Commercial fishing areas include crabbing grounds, pound net locations, and natural oyster bars. Important recreational fishing areas include the smaller tributary systems, artificial reefs within the Bay, and public access areas and boat ramps. Potential impacts to these areas will require further investigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

NOAA Fisheries is responsible for the stewardship of the Bay's resources and the associated habitat to ensure productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy ecosystems. Coordination with the Chesapeake Bay Oyster Alliance, MDNR, the Virginia Marine Resources Commission, USACE, USFWS, and NOAA, among others, would be required during a Tier 2 NEPA study to evaluate potential aquatic resource impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies should be implemented once a limit of disturbance associated with a more defined project area is established.

The Marine Mammals Protection Act (MMPA) prohibits the "taking" of marine mammals and enacts a moratorium on the import, export, and sale of any marine mammal, along with any marine mammal part or product within the United States. The Act defines "take" as "the act of hunting, killing, capture, and/or harassment of any marine mammal; or, the attempt at such." The MMPA defines harassment as "any act of pursuit, torment or annoyance which has the potential to either injure a marine mammal in the wild or disturb a marine mammal by causing disruption of behavioral patterns, which includes, but is not limited to, migration, breathing, nursing, breeding, feeding, or sheltering." The MMPA provides for enforcement of its prohibitions, and for the issuance of regulations to implement its legislative goals.

Several large marine mammals are known to spend a portion of their life cycle within the Chesapeake Bay, including the Bottlenose Dolphin (*Tursiops truncates*) which is regularly seen in the lower and middle portions of the Bay during the summer months. Other mammals that are at least part time visitors to the Bay include Humpback Whales (*Megaptera novaeangliae*) and Florida Manatees (*Trichechus manatus latirostris*).

Authority to manage the MMPA is divided between the Secretary of the Interior through the USFWS, and the Secretary of Commerce, who in turn delegated this responsibility to the National Oceanic and Atmospheric Administration (NOAA). Subsequently, the Marine Mammal Commission (MMC), was established to review existing policies and make recommendations to the Service and NOAA to better implement the MMPA. Coordination between these three federal agencies is necessary in order to provide the best management practices for marine mammals.

"Special Aquatic Sites" are regulated under Section 404 of the CWA as a subset of WOTUS and are classified as areas which possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. NOB's, oyster sanctuaries, and SAV are all considered Special Aquatic Sites under Section 404. These sites are generally recognized as significantly influencing or positively contributing to the overall environmental health of the entire ecosystem and receive special attention under EPA's Section 404 (b) (1) guidelines. Because degradation or destruction of these areas may result in an irreversible loss of valuable aquatic habitat, emphasis must be placed on avoidance and minimization should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

5.8 Topography, Soils, & Geology

A comparative analysis of the amount of steep slopes, hydric or partially hydric soils, and highly erodible soils located within each of the three study corridors is presented in **Table 5-14**. Steep slopes are depicted on **Figure 5-23** and defined as slopes of 15 percent or greater. A graphic depiction of the underlying

geology associated with the three study corridors is provided in **Figure 5-24**. This steep slope and soils information was obtained from the Maryland iMap dataset. The source for the soils data was the *Soil Survey Geographic Database for Maryland*.

Topography relative to aquatic habitat is also represented on **Figure 5-23**. Deep water habitats were identified within the limits of Corridor's 7 and 8. These deep water areas may serve as refuge areas for fish and shellfish as discussed in **Section 4.1.2**. Deep water habitat was not identified within the limits of Corridor 6.

The study areas are located entirely within the Atlantic Coastal Plain physiographic region and underlain by nine geologic units. The largest geologic unit identified within each of the three corridors was Lowland Deposits. Hydric soils, partially hydric soils, and highly erodible soils are depicted in **Figure 5-25**.

Table 5-14: Topography & Soils

Corridor	Steep Slopes (acres)	Percentage of Total Corridor Study Area	Hydric & Partially Hydric Soils (acres)	Percentage of Total Corridor Study Area	Highly Erodible Soils (acres)	Percentage of Total Corridor Study Area
6	2,090	6%	3,580	10%	5,560	16%
7	0	0%	5,390	20%	9,280	33%
8	3,090	7%	8,250	18%	9,050	19%

5.8.1 Corridor 6

Corridor 6 intersects with approximately 2,090 acres of land identified as having moderately rolling to steep slopes **(Figure 5-23)**. These areas are classified as steep slopes for this assessment. Relatively large areas of steep slopes were identified within the western portion of Corridor 6, adjacent to MD 177. This constitutes a relatively large percentage of the total land area within this section of the corridor. The section of Corridor 6 that spans the Eastern Shore is mapped entirely with nearly flat to gently rolling soils with no mapped steep slopes.

Corridor 6 contains approximately 3,580 acres of mapped hydric and partially hydric soils and 5,560 acres of mapped highly erodible soils. The vast majority of these areas are located within the eastern portion of the alignment, along the Eastern Shore (**Figure 5-25**).

5.8.2 Corridor 7

There were no steep slope areas identified within the limits of Corridor 7 (**Figure 5-23**). The slopes within the western portion of the alignment are generally mapped as gently to moderately rolling while the section of Corridor 7 that spans Kent Island and the Eastern Shore are almost entirely mapped as nearly flat to gently rolling slopes.

Corridor 7 does contain large areas of highly erodible soils (approximately 9,280 acres), primarily within the western portion of the corridor, adjacent to the Bay and on Kent Island, with lesser concentrations along the Eastern Shore near Queenstown, MD. Corridor 7 also contains approximately 5,390 acres of mapped hydric and partially hydric soils with large areas identified on Kent Island and the Eastern Shore with lesser concentrations within the western portion of the corridor study area (**Figure 5-25**).

Figure 5-23: CARA Topography

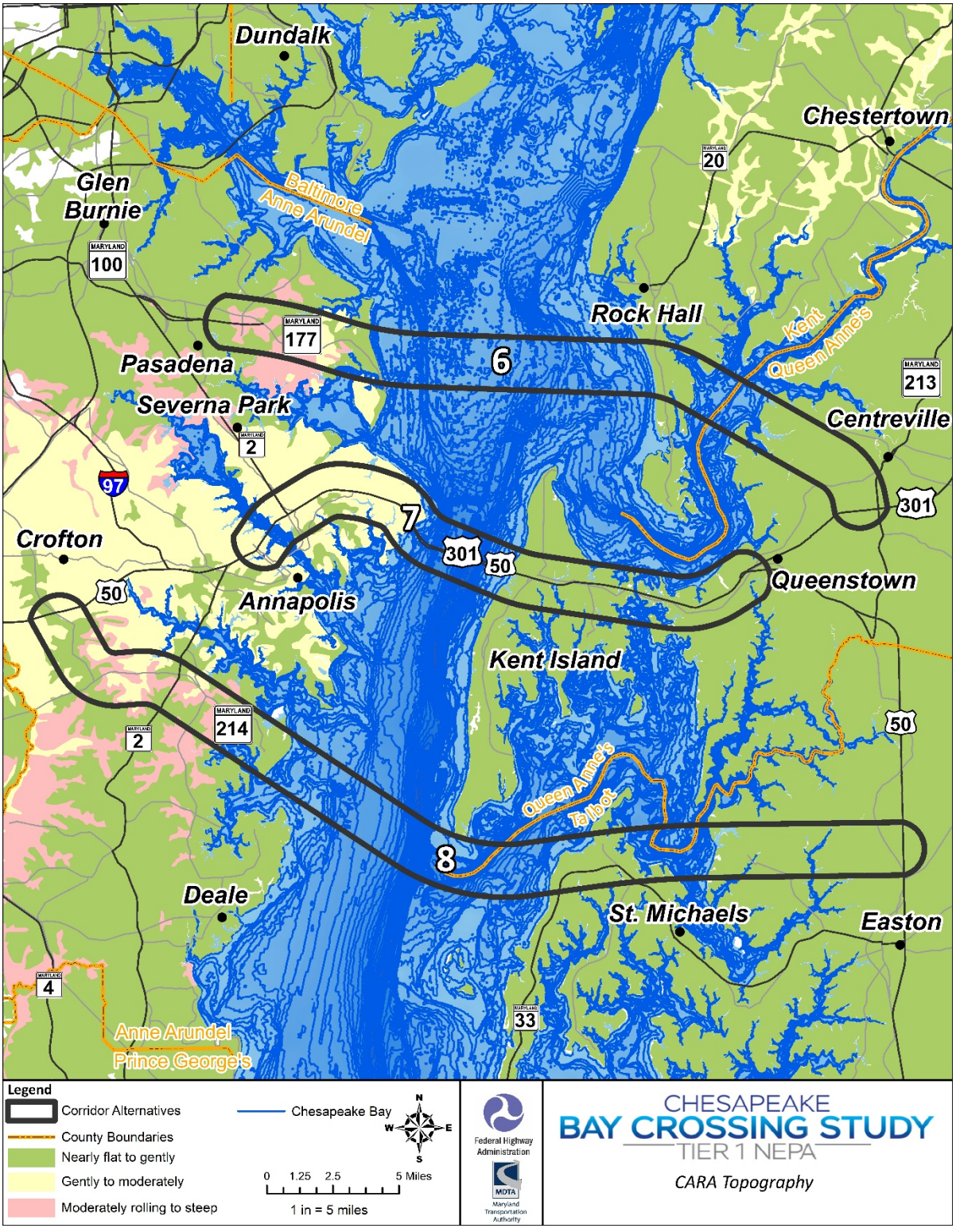


Figure 5-24: CARA Geology

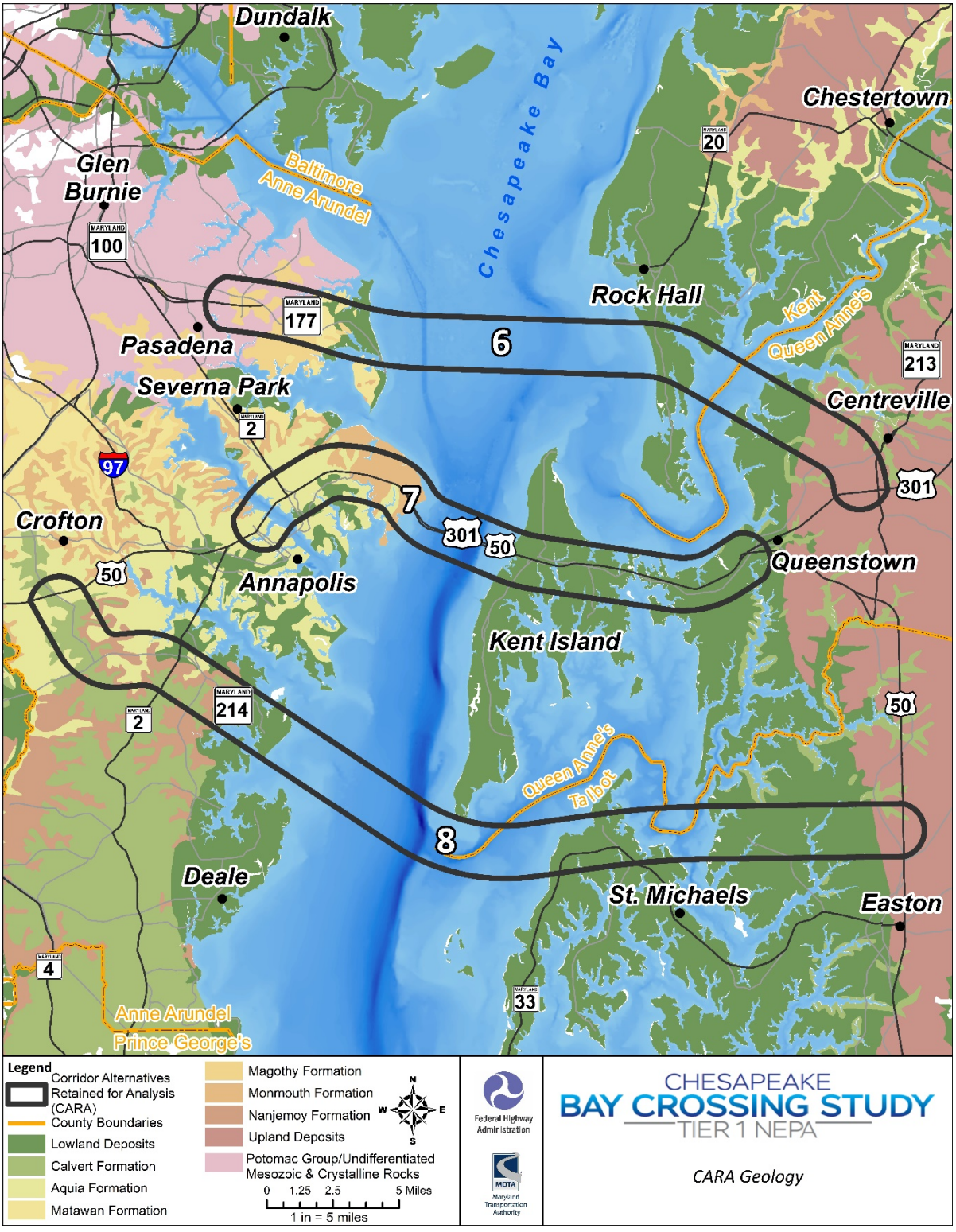
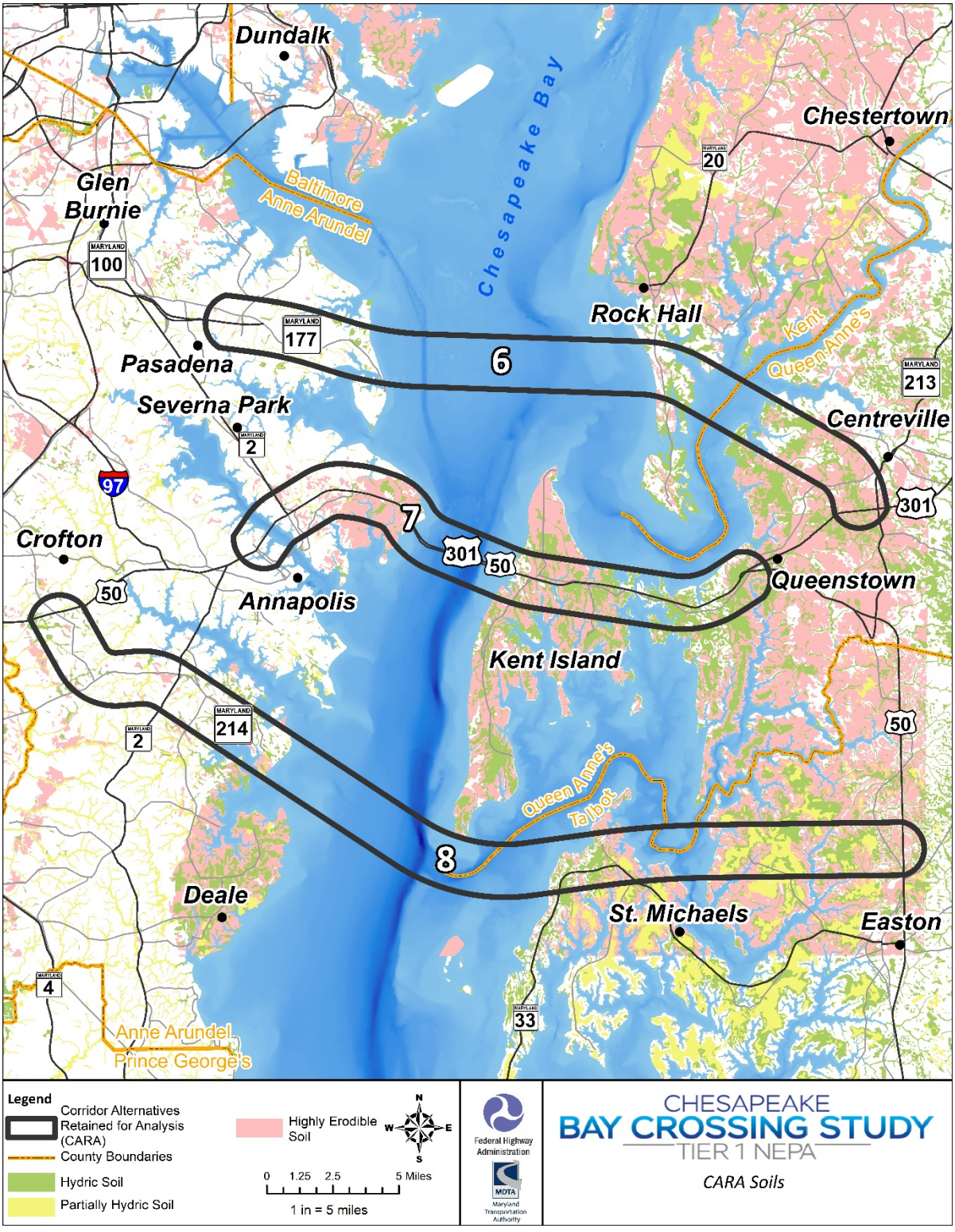


Figure 5-25: CARA Soils



5.8.3 Corridor 8

Corridor 8 intersects with approximately 3,090 acres of land mapped as steep slopes and are almost exclusively located within the western portion of the corridor. No steep slopes were mapped within the eastern portion of the corridor (**Figure 5-23**).

Corridor 8 contains approximately 8,250 acres of mapped hydric and partially hydric soils, the majority of which were identified within the eastern portion of the corridor, near the town of St. Michaels and further east within the corridor. Also, the majority of the approximately 9,050 acres of mapped highly erodible soils were identified within the eastern portion of the corridor (**Figure 5-25**).

5.8.4 Conclusions

According to the GIS mapping resources Corridor 8 contains the highest amount of steep slopes, hydric and partially hydric soils. Corridor 7 contains the highest amount of highly erodible soils.

Slope length and steepness are key influences on both the volume and velocity of surface runoff. Longer slopes deliver more runoff and steeper slopes increase runoff velocity. Preservation of steep slopes adjacent to watercourses is especially important because of the potential of adverse effects on water quality and aquatic habitat. Activities occurring within areas with steep slopes or highly erodible soils must adhere to the standards set forth in the *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control*. Further minimization and avoidance strategies would be implemented once a limit of disturbance associated with a more defined project area is established.

Although this Tier 1 study limited soils analysis to hydric, partially hydric, and highly erodible soils, the presence of other soils, including acidic soils, will require a more detailed analysis should a preferred corridor be carried forward to a more comprehensive Tier 2 study. Land disturbance within areas of acidic soils (pH lower than 5.5) will require strict adherence to stormwater management and erosion and sediment control requirements as well as other possible special handling procedures.

Understanding the geologic conditions underlying a project area is important in determining whether a project would be exposed to potential geologic hazards including landslides or seismic effects. Geologic hazards are defined by the USGS as “naturally occurring phenomena capable of causing loss or damage”. According to the USGS, the study areas for all three corridors are located within a geologic region with a low to medium risk for seismic hazard. A low to medium risk is further defined as an area with an expected number of damaging seismic activities of 4 to 10 every 10,000 years.

5.9 Sea Level Rise

A comparative analysis of the total amount of land area susceptible to sea level rise was performed for the three study area corridors. **Table 5-15** below identifies the total area of land, in acres, susceptible to sea level rise based on projections for 2050 and 2100. This data was obtained from the Maryland iMap GIS portal using the *Maryland Sea Level Rise by County in 2050 & 2100* datasets.

5.9.1 Corridor 6

Corridor 6 contains 350 acres of total land are susceptible to sea level rise based on projections for 2050 and 1,470 acres based on projections for 2100. The highest concentrations are located within the eastern section of the corridor and are generally associated with the shoreline of the Chester River (**Figure 5-26**).

Figure 5-26: CARA Sea Level Rise

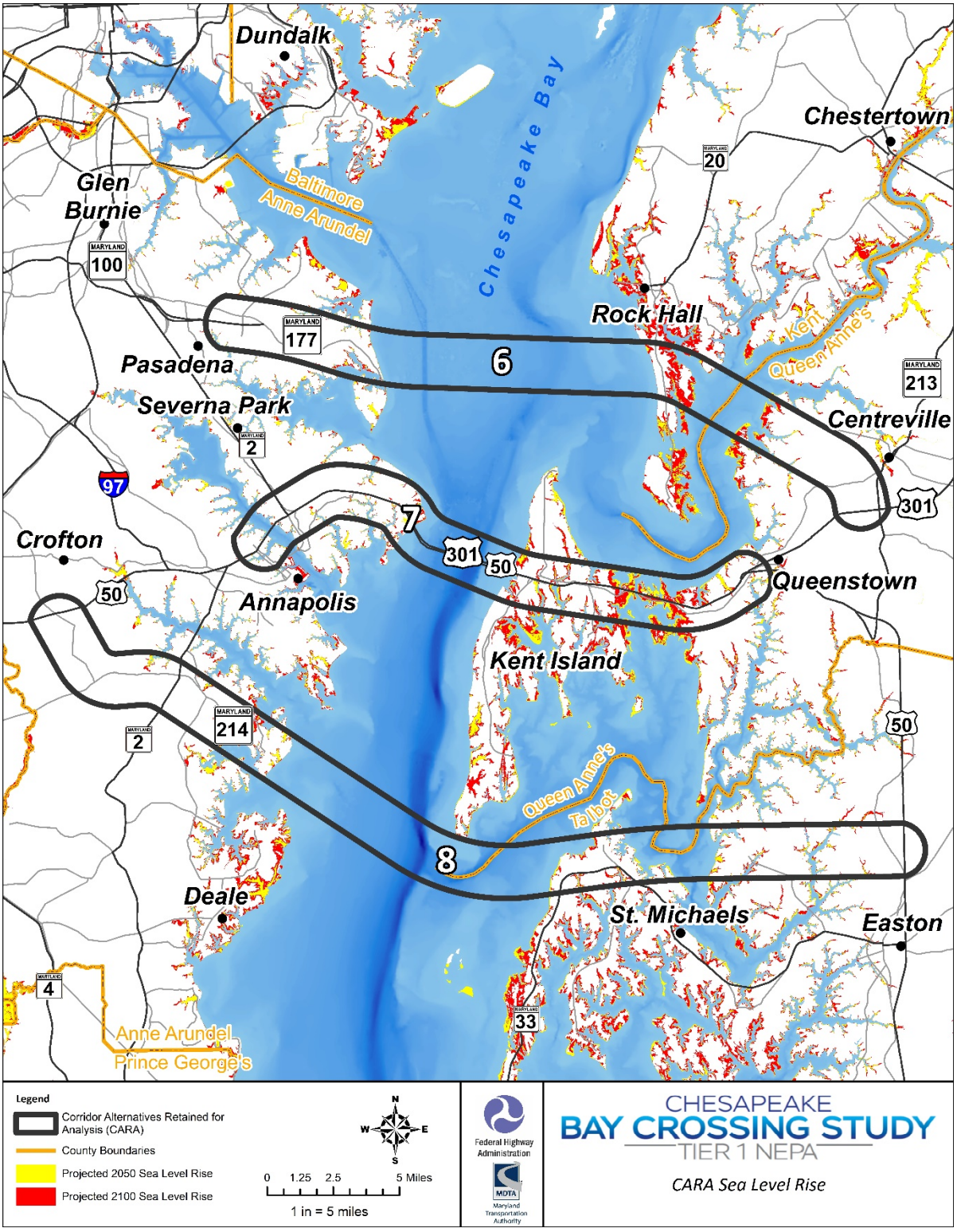


Table 5-15: Sea Level Rise

Corridor	Land Area Susceptible to Sea Level Rise (2050) (acres)	Percentage of Total Corridor Study Area (2050)	Land Area Susceptible to Sea Level Rise (2100) (acres)	Percentage of Total Corridor Study Area (2100)
6	350	1%	1,470	4%
7	1,310	5%	3,230	12%
8	680	1%	1,620	3%

5.9.2 Corridor 7

Corridor 7 contains 1,310 acres of total land area susceptible to sea level rise based on the projections for 2050 and 3,230 acres based on projections for 2,100. The highest concentrations are located within the section of the corridor that spans Kent Island and the Eastern Shore (**Figure 5-26**).

5.9.3 Corridor 8

Corridor 8 contains 680 acres of total land area susceptible to sea level rise based on the projections for 2050 and 1,620 acres based on projections for 2,100. The highest concentrations are located within the western section of the corridor and are generally associated with the tidal inlets and waterways adjacent to the bay (**Figure 5-26**).

5.9.4 Conclusions

According to the GIS mapping resources, Corridor 7 contains the highest amount of land area susceptible to a rise in sea level, both in total land area and total area relative to the corridor size. However, because of the coastal location of the three corridor study areas, spanning areas susceptible to sea level rise is unavoidable.

Over time, sea level rise and the associated tidal and storm surges will have impacts on coastal transportation infrastructure. Therefore, comprehensive analysis and adaptation to these potential impacts will be an important component of medium and long-range planning, and project development. It will also become increasingly important to continually incorporate adaptive management processes into planning as more updated data becomes available. According to FHWA, adaption strategies are actions taken to respond to vulnerabilities associated climate change and an associated rise in sea levels to ensure transportation reliability and resiliency. FHWA examples of adaptive strategies associated with transportation planning, include:

- Installation of flood barriers
- Elevating specific elements of critical infrastructure above the projected flood elevations
- Moving facilities to higher ground
- Designing assets for quick restoration after an extreme weather event
- Evacuation route planning

6.0 REFERENCES

ArcGIS. 2014. Stream Use Classes. https://www.arcgis.com/home/item.html?id=21708d15949846d39540bcf5789ea49c

CBS Baltimore. 2013. https://baltimore.cbslocal.com/2013/12/01/technology-is-a-new-weapon-in-fight-against-oyster-poaching/

Centers for Disease Control and Prevention. April 10, 2009. Water Sources. https://www.cdc.gov/healthywater/drinking/public/water_sources.html

Chesapeake Bay Foundation. No Date (a). Geography and Facts. http://www.cbf.org/about-the-bay/chesapeake-bay-watershed-geography-and-facts.html

Chesapeake Bay Foundation. No Date (b). Chesapeake Oyster Alliance. https://www.cbf.org/how-we-save-the-bay/programs-initiatives/chesapeake-oyster-alliance.html

Chesapeake Bay Foundation. No Date (c). Eastern Oysters, Great Shellfish of the Bay. https://www.cbf.org/about-the-bay/more-than-just-the-bay/chesapeake-wildlife/eastern-oysters/

Chesapeake Bay Program. No Date (d). Geology. https://www.chesapeakebay.net/discover/ecosystem/bay_geology

Chesapeake Bay Program. 2020. 14 Places to View the Chesapeake's Wintering Waterfowl. https://www.chesapeakebay.net/news/blog/14_places_to_view_the_chesapeakes_wintering_waterfowl

Code of Maryland (COMAR) Title 08.02. No Date. Department of Natural Resources – Fisheries Service. http://www.dsd.state.md.us/COMAR/subtitle_chapters/08_Chapters.aspx#Subtitle02

COMAR Title 08.03. No Date. Department of Natural Resources – Wildlife. http://www.dsd.state.md.us/COMAR/subtitle_chapters/08_Chapters.aspx#Subtitle03

COMAR Title 08.19. No Date. Department of Natural Resources – Forest Conservation. http://www.dsd.state.md.us/COMAR/subtitle_chapters/08_Chapters.aspx#Subtitle19

COMAR Title 26.23. No Date. Department of Environment – Non-tidal Wetlands. http://www.dsd.state.md.us/comar/subtitle_chapters/26_Chapters.aspx#Subtitle23

COMAR Title 26.24. No Date. Department of Environment – Tidal Wetlands. http://www.dsd.state.md.us/comar/subtitle_chapters/26_Chapters.aspx#Subtitle24

COMAR Title 27. No Date. Critical Area Commission for the Chesapeake Bay and Atlantic Coastal Bays. http://www.dsd.state.md.us/COMAR/subtitle_chapters/27_Chapters.aspx

Congressional Research Service. Clean Water Act Section 401: Background and Issues. 2015. https://fas.org/sgp/crs/misc/97-488.pdf

Environmental Protection Agency. No Date. About Waters of the United States. https://www.epa.gov/wotus-rule/about-waters-united-states

Environmental Protection Agency. October 18, 2018. Overview of the Drinking Water Sole Source Aquifer. https://www.epa.gov/dwssa/overview-drinking-water-sole-source-aquifer-program#What_Is_SSA

Environmental Protection Agency. August 19, 2019. Map of Sole Source Aquifer Locations. https://www.epa.gov/dwssa/map-sole-source-aquifer-locations

Federal Emergency Management Agency. August 1997. National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973. https://www.fema.gov/media-library/assets/documents/7277

Federal Highway Administration. No Date. Section 4(f) Tutorial. https://www.environment.fhwa.dot.gov/env_topics/4f_tutorial/overview.aspx?g=e%20-%20g

Inc.com. Environmental Law and Business. https://www.inc.com/encyclopedia/clean-water-act.html

Maryland.Gov. No Date. MD iMAP Maryland's Mapping & GIS Data Portal. https://imap.maryland.gov
Maryland Department of the Environment. No Date. Wetlands and Waterways Program. http://mde.maryland.gov/programs/water/WetlandsandWaterways/Pages/index.aspx

Maryland Department of the Environment. 2015. Stormwater Management and Erosion & Sediment Control Guidelines. https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Documents/SWM%20and%20ESC%20Guidelines%20for%20State%20and%20Federal%20Projects%20FEB%202015.pdf

Maryland Department of the Environment. No Date. Maryland's Designated Uses for Surface Waters. http://mde.maryland.gov/programs/Water/TMDL/WaterQualityStandards/Pages/wqs_designated_uses.aspx.

Maryland Department of the Environment. No date. Climate Change Program. https://mde.maryland.gov/programs/Air/ClimateChange/Pages/index.aspx

Maryland Department of the Environment. No Date. Wellhead Protection.

https://mde.state.md.us/programs/Water/water_supply/Source_Water_Assessment_Program/Pages/wellhead.aspx

Maryland Department of Natural Resources. 2019. Draft Maryland Oyster Management Plan. https://dnr.maryland.gov/fisheries/Documents/draft%20Maryland%20Oyster%20FMP_%2002_19_2019.pdf

Maryland Department of Natural. December 2016. 2015 Fishery Management Plans, Report to Legislative Committees. https://dnr.maryland.gov/fisheries/Documents/Full_FMP_2016.pdf

Maryland Department of Natural Resources. October 23, 2018. Summer 2018 Hypoxia Report. https://news.maryland.gov/dnr/2018/10/23/summer-2018-hypoxia-report/

Maryland Department of Natural Resources. No Date. GIS Data Portal. http://dnrweb.dnr.state.md.us/gis/data/data.asp

Maryland Department of Natural Resources. No Date. Development in the Critical Area. http://dnr.maryland.gov/criticalarea/Pages/development_in_CAC.aspx

Maryland Department of Natural Resources. No Date. Sensitive Species Project Review Areas. https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat

Maryland Department of Natural Resources. No Date. Land Acquisition and Planning. http://dnr.maryland.gov/land/Pages/Stewardship/Scenic-and-Wild-Rivers.aspx

Maryland Department of Natural Resources. 1993. Preparing a Sensitive Areas Element for the Comprehensive Plan. https://planning.maryland.gov/Documents/OurWork/mg3web.pdf

Maryland GIS Data Catalog. No Date. Maryland Wetlands – Special State Concern. http://data.imap.maryland.gov/datasets/5c2fe45a02ec400ea62d57f366ae12db_4

Merlin Online. 2019. https://gisapps.dnr.state.md.us/MERLIN/index.html
National Flood Insurance Act of 1968. January 11, 2020.
https://en.wikipedia.org/wiki/National_Flood_Insurance_Act_of_1968

National Oceanic and Atmospheric Administration. No Date. Essential Fish Habitat.
https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat
Penn State Extension. The Water We Drink. No Date. https://extension.psu.edu/the-water-we-drink

NOAA. No Date. Section 7: Species/Critical Habitat Information & Maps in the Greater Atlantic Region.
https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater

Rivers.gov. National Wild and Scenic Rivers System. https://www.rivers.gov/wsr-act.php
Stormwater One Online Training and Credentials. National Pollutant Discharge Elimination System (NPDES). https://stormwaterone.com/the-clean-water-act-and-national-pollutant-discharge-elimination-system

United States Department of Agriculture. No Date. Farmland Protection Policy Act. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs143_008275

United States Department of Agriculture. June 20, 2000. Title IV – Plant Protection Act. https://www.aphis.usda.gov/plant_health/plant_pest_info/weeds/downloads/PPAText.pdfUnited States Department of Agriculture. No Date. Web Soil Survey. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

United States Department of Transportation, Federal Highway Administration. No Date. Section 4(f) Tutorial. https://www.environment.fhwa.dot.gov/env_topics/4f_tutorial/overview.aspx?j=e#j

United States Department of Transportation, Federal Highway Administration. July 18, 2018. Bridges and Structures. Floodplains. https://www.fhwa.dot.gov/engineering/hydraulics/hydrology/floodplains.cfm.

United States Environmental Protection Agency (USEPA). May 24, 1977. 42 F.R. 26951. Executive Order 11988 - Floodplain Management. https://www.epa.gov/cwa-404/floodplain-management

United States Environmental Protection Agency (USEPA). May 24, 1977. 42 F.R. 26961. Executive Order 11990 – Protection of Wetlands. https://www.epa.gov/cwa-404/protection-wetlands

United States Environmental Protection Agency (USEPA). No Date. Overview of Section 404. https://www.epa.gov/sites/production/files/2015-03/documents/404_reg_authority_fact_sheet.pdf

United States Environmental Protection Agency (USEPA). No Date. Summary of the Clean Water Act. https://www.epa.gov/laws-regulations/summary-clean-water-act

United States Fish & Wildlife Service. No Date. Endangered Species Act: Section 7(a)(2) https://www.fws.gov/midwest/endangered/section7/index.html

United States Fish & Wildlife Service. February 25, 2020. Federal Laws that Protect Bald and Golden Eagles. https://www.fws.gov/midwest/eagle/history/protections.html

United States Fish & Wildlife Service. No Date. Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. https://www.fws.gov/laws/lawsdigest/NONINDI.HTML

United States Fish & Wildlife Service. No Date. Lacey Act. https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/lacey-act.html.

United States Fish & Wildlife Service. No Date. Section 7 Consultation, A Brief Explanation. https://www.fws.gov/midwest/endangered/section7/section7.html

United States Geological Service. June 2015. Understanding Nutrients in the Chesapeake Bay Watershed and Implications for Management and Restoration – the Eastern Shore. https://pubs.usgs.gov/circ/1406/pdf/circ1406.pdf

University of Maryland, Center for Environmental Science. June 10, 2019. Help Scientists Track Dolphins in the Chesapeake Bay. https://www.umces.edu/content/help-scientists-track-dolphins-chesapeake-bay-0

Watershed Resources Registry. Maryland Registry. No Date. https://watershedresourcesregistry.org/states/maryland.html

Wikipedia. Federal Noxious Weed Act of 1974. October 1, 2017. https://en.wikipedia.org/wiki/Federal_Noxious_Weed_Act_of_1974

Wikipedia. December 28, 2019. Wellhead Protection Area. https://en.wikipedia.org/wiki/Wellhead_protection_area

Wikipedia. July 6, 2019. Marine Mammal Protection Act. https://en.wikipedia.org/wiki/Marine_Mammal_Protection_Act

Wikipedia. January 9, 2020. Migratory Bird Act of 1918. https://en.wikipedia.org/wiki/Migratory_Bird_Treaty_Act_of_1918

APPENDIX A
SITE PHOTOGRAPHS & PHOTO KEYS

APPENDIX B
GEOGRAPHIC FEATURES FIGURES

APPENDIX C
AGENCY CORRESPONDENCE